GLENCORE
INTERNATIONAL plc
INCORPORATED UNDER THE LAWS OF JERSEY









This document comprises a Prospectus relating to Glencore International plc (the "Company") and has been prepared in accordance with the Prospectus Rules of the Financial Services Authority (the "FSA") made under Section 73A of the Financial Services and Markets Act 2000 (as amended) (the "FSMA"), has been filed with the FSA and has been made available to the public as required by the Prospectus Rules.

Application has been made to the FSA for all of the Ordinary Shares, issued and to be issued in connection with the Global Offer, to be admitted to the premium listing segment of the Official List of the FSA (the "Official List") and to the London Stock Exchange plc (the "London Stock Exchange") and for such Ordinary Shares to be admitted to trading on the London Stock Exchange's main market for listed securities (together "UK Admission"). UK Admission constitutes admission to trading on a regulated market. Application has also been made to the Listing Committee of the Hong Kong Stock Exchange for listing of, and permission to deal in, all of the Ordinary Shares on the Main Board of the Hong Kong Stock Exchange ("HK Admission"). In the Global Offer, up to 988,973,234 new Ordinary Shares are being made available by the Company and up to 261,026,766 Ordinary Shares are being made available by the Selling Shareholder. Conditional dealings in the Ordinary Shares on a "when issued" basis are expected to commence on the London Stock Exchange on 19 May 2011. It is expected that UK Admission will become effective, and that unconditional dealings will commence in the Ordinary Shares on the London Stock Exchange, at 8.00 a.m. (London time) on 24 May 2011. **All dealings in the Ordinary Shares prior to the commencement of unconditional dealings on the London Stock Exchange will be of no effect if UK Admission does not take place and such dealings will be at the sole risk of the parties concerned. It is expected that HK Admission will become effective on 25 May 2011 and that unconditional dealings will commence in the Ordinary Shares on the Main Board of the Hong Kong Stock Exchange at 9.00 a.m. (Hong Kong time) on 25 May 2011. The new Ordinary Shares issued by the Company will rank *pari passu* in all respects with the existing Ordinary Shares.**

The Company and its Directors (whose names appear on page 30 of this Prospectus) accept responsibility for the information contained in this Prospectus. To the best of the knowledge and belief of the Company and the Directors (who have taken all reasonable care to ensure that such is the case), the information contained in this Prospectus is in accordance with the facts and contains no omission likely to affect the import of such information.

Prospective investors should read the whole of this Prospectus, including the discussions of certain risk and other factors that should be considered in connection with an investment in the Ordinary Shares, see "Risk Factors".

GLENCORE
INTERNATIONAL plc

GLENCORE INTERNATIONAL PLC

(incorporated in Jersey under the Companies (Jersey) Law 1991 with registered number 107710)

Prospectus
Global Offer of up to 1,250,000,000 Ordinary Shares at a price expected to be between 480 pence and 580 pence per Ordinary Share

Admission to the Premium Listing segment of the Official List and to trading on the London Stock Exchange and Secondary Listing on the Hong Kong Stock Exchange

Citi
Joint Global Co-ordinator
Joint Bookrunner
Joint Sponsor

Credit Suisse
Joint Global Co-ordinator
Joint Bookrunner

Morgan Stanley
Joint Global Co-ordinator
Joint Bookrunner
Joint Sponsor

Joint Bookrunners

BofA Merrill Lynch

BNP PARIBAS

Co-Bookrunners

Barclays Capital

Société Générale

UBS Investment Bank

Joint Lead Managers

Crédit Agricole CIB

HSBC

ING

Co-Lead Managers

ABN AMRO

Banco Santander

DBS

Liberum Capital

Natixis

The Royal Bank of Scotland

Co-Managers

BOC International

COMMERZBANK

Mizuho International plc

Rabobank International

Sberbank of Russia

Standard Chartered

Ordinary Share capital immediately following Admission

(assuming the Offer Price is set at the mid-point of the Offer Price Range and no exercise of the Over-Allotment Option)

Authorised		Issued and fully paid	
Number	**Amount**	**Number**	**Amount**
50,000,000,000	U.S.$500,000,000	6,893,292,886	US$68,932,928.86

Ordinary Shares of U.S.$0.01 each

The Offer Price Range is indicative only, it may change during the course of the Global Offer and the Offer Price may be set within, above or below the Offer Price Range. The amount to be raised and the number of Ordinary Shares to be issued or sold may be increased or decreased during the course of the Global Offer. A number of factors will be considered in determining the Offer Price, the amount raised in the Global Offer and the basis of allocation, including the level and nature of demand for the Ordinary Shares during the book-building process and prevailing market conditions. A pricing statement containing the Offer Price, confirming the number of Ordinary Shares which are the subject of the Global Offer and containing any other outstanding information (the "Pricing Statement") is expected to be published on or about 19 May 2011.

A copy of this Prospectus has been delivered to the Jersey registrar of companies in accordance with Article 5 of the Companies (General Provisions) (Jersey) Order 2002, and the Jersey registrar of companies has given, and has not withdrawn, consent to its circulation. The Jersey Financial Services Commission has given, and has not withdrawn, its consent under Article 2 of the Control of Borrowing (Jersey) Order 1958, to the issue of the Offer Shares by the Company. It must be clearly understood that, in giving these consents, neither the Jersey registrar of companies nor the Jersey Financial Services Commission takes any responsibility for the financial soundness of the Company or for the correctness of any statements made, or opinions expressed, with regard to it. The Jersey Financial Services Commission is protected by the Control of Borrowing (Jersey) Law 1947, as amended, against any liability arising from the discharge of its functions under that law.

Nothing in this Prospectus or anything communicated to the holders or potential holders of Ordinary Shares by or on behalf of the Company is intended to constitute, or should be construed as, advice on the merits of the subscription for or purchase of Ordinary Shares or the exercise of any rights attached thereto for the purposes of the Financial Services (Jersey) Law 1998.

Citi and Morgan Stanley have been appointed as UK Sponsors in relation to UK Admission. Citigroup Global Markets U.K. Equity Limited, Morgan Stanley and Credit Suisse have been appointed as Joint Global Co-ordinators. BNP Paribas, Citigroup Global Markets U.K. Equity Limited, Credit Suisse, Merrill Lynch and MSSL have been appointed as International Joint Bookrunners in relation to the International Offer. Citi Asia and Morgan Stanley Asia have been appointed as HK Sponsors in relation to HK Admission. BNP Paribas, Citi Asia, Credit Suisse Asia, Merrill Lynch Asia and Morgan Stanley Asia have been appointed as HK Joint Bookrunners in relation to the Hong Kong offer. Each of the UK Sponsors and the International Managers are authorised and regulated in the United Kingdom by the FSA and each of the HK Sponsors and the Hong Kong Managers is authorised and regulated in Hong Kong by the SFC and all of the Banks are acting exclusively for the Company and no one else in connection with the Global Offer and will not regard any other person (whether or not a recipient of this Prospectus) as a client in relation to the Global Offer and will not be responsible to anyone other than the Company for providing the protections afforded to their respective clients, nor for giving advice in relation to the Global Offer or any transaction or arrangement referred to in this Prospectus.

Recipients of this Prospectus are authorised to use it solely for the purpose of considering the acquisition of the Ordinary Shares and may not reproduce or distribute this Prospectus, in whole or in part, and may not disclose any of the contents of this Prospectus or use any information herein for any purpose other than considering an investment in the Ordinary Shares. Such recipients of this Prospectus agree to the foregoing by accepting delivery of this Prospectus.

The Ordinary Shares are subject to selling and transfer restrictions in certain jurisdictions. Prospective purchasers or subscribers should read the restrictions described in paragraph 12 "Selling and transfer restrictions" of Section VIII: "Details of the Global Offer". Each subscriber or purchaser for the Ordinary Shares will be deemed to have made the relevant representations described therein.

This Prospectus does not constitute an offer of, or the solicitation of an offer to subscribe for or buy, any Ordinary Shares to any person in any jurisdiction to whom it is unlawful to make such offer or solicitation in such jurisdiction.

The distribution of this Prospectus and the offer of the Ordinary Shares in certain jurisdictions may be restricted by law. No action has been or will be taken by the Company or the Underwriters to permit a public offering of the Ordinary Shares or to permit the possession, issue or distribution of this Prospectus (or any other offering or publicity materials or application form relating to the Ordinary Shares other than a separate prospectus to be issued by the Company in Hong Kong on or about 13 May 2011 in connection with the Hong Kong Offer) in any jurisdiction where action for that purpose may be required. Accordingly, neither this Prospectus nor any advertisement or any other offering material may be distributed or published in any jurisdiction except under circumstances that will result in compliance with any applicable laws and regulations. Persons into whose possession this Prospectus comes should inform themselves about and observe any such restrictions. Any failure to comply with these restrictions may constitute a violation of the securities laws of any such jurisdiction.

In particular, this Prospectus is not for release, distribution, issue or publication or directed at investors or the public in Hong Kong and does not constitute an offer of, or the solicitation of an offer to subscribe for or buy, any Ordinary Shares, to the public in Hong Kong. Any members of the public in Hong Kong who wish to invest in the Company should make their investment decision solely on the basis of the information contained in a separate prospectus to be issued by the Company in Hong Kong on or about 13 May 2011 in connection with the Hong Kong Offer that is authorised by the Hong Kong Stock Exchange for registration by the Registrar of Companies in Hong Kong.

This Prospectus is not a "web proof information pack" for the purposes of Hong Kong securities law.

The offer, subscription and/or sale of the Ordinary Shares has not been and will not be registered under the U.S. Securities Act of 1933, as amended (the "Securities Act") or under the applicable securities laws of any state of the U.S. and, subject to certain exceptions, may not be offered or sold within the U.S. or to, or for the account or benefit of, U.S. Persons (as defined in Regulation S under the Securities Act ("Regulation S")). The Global Offer is being made (i) in the U.S. to certain qualified institutional buyers (each a "QIB") as defined in Rule 144A under the Securities Act ("Rule 144A"), that are also Qualified Purchasers ("QPs") as defined in Section 2(a)(51) of the U.S. Investment Company Act of 1940, as amended (the "Investment Company Act") in reliance on Rule 144A or another exemption from registration under the Securities Act and (ii) to persons who are not U.S. Persons (as defined in Regulation S) in offshore transactions in reliance on Regulation S. Each prospective subscriber and/or purchaser in the U.S. is hereby notified that the offer and sale of the Ordinary Shares to it may be made in reliance on the exemption from the registration requirements of the Securities Act provided by Rule 144A. In addition, until 40 days after the commencement of the Global Offer, an offer or sale of any of the Ordinary Shares within the U.S. by any dealer (whether or not participating in the Global Offer) may violate the registration requirements of the Securities Act if the offer or sale is made otherwise than in accordance with Rule 144A or pursuant to another applicable exemption from registration under the Securities Act. The Company has not been and will not be registered under the Investment Company Act, and investors will not be entitled to the benefits of that Act. U.S. Persons will only be able to participate in the Global Offer if they are both (i) QPs and (ii) QIBs.

Ordinary Shares acquired by any U.S. Person as provided for in paragraph 12 "Selling and transfer restrictions" of Section VIII: "Details of the Global Offer" are not transferable except in compliance with the restrictions described in such paragraph. **The Ordinary Shares have not been approved or disapproved by the U.S. Securities and Exchange Commission (the "SEC"), any other Federal or State Securities Commission in the U.S. or any other U.S. Regulatory Authority, nor have any such authorities passed upon or endorsed the merits of the Global Offer or confirmed the accuracy or determined the adequacy of this Prospectus. Any representation to the contrary is a criminal offence in the U.S.**

Any prospective subscriber and/or purchaser and any person (including, without limitation, a nominee or trustee) who has a contractual or legal obligation to forward this Prospectus to (or for the account of) any U.S. Person, or to any jurisdiction outside the United Kingdom, should read paragraph 12 "Selling and transfer restrictions" of Section VIII: "Details of the Global Offer" of this Prospectus.

NOTICE TO NEW HAMPSHIRE RESIDENTS ONLY

NEITHER THE FACT THAT A REGISTRATION STATEMENT OR AN APPLICATION FOR A LICENCE HAS BEEN FILED UNDER CHAPTER 421-B OF THE NEW HAMPSHIRE REVISED STATUTES ("RSA 421-B") WITH THE STATE OF NEW HAMPSHIRE, NOR THE FACT THAT A SECURITY IS EFFECTIVELY REGISTERED OR A PERSON IS LICENSED IN THE STATE OF NEW HAMPSHIRE, CONSTITUTES A FINDING BY THE SECRETARY OF STATE OF THE STATE OF NEW HAMPSHIRE THAT ANY DOCUMENT FILED UNDER RSA 421-B IS TRUE, COMPLETE AND NOT MISLEADING. NEITHER ANY SUCH FACT NOR THE FACT THAT AN EXEMPTION OR EXCEPTION IS AVAILABLE FOR A SECURITY OR A TRANSACTION MEANS THAT THE SECRETARY OF STATE OF THE STATE OF NEW HAMPSHIRE HAS PASSED IN ANY WAY UPON THE MERITS OR QUALIFICATIONS OF, OR RECOMMENDED OR GIVEN APPROVAL TO, ANY PERSON, SECURITY OR TRANSACTION. IT IS UNLAWFUL TO MAKE, OR CAUSE TO BE MADE, TO ANY PROSPECTIVE PURCHASER, CUSTOMER OR CLIENT, ANY REPRESENTATION INCONSISTENT WITH THE PROVISIONS OF THIS PARAGRAPH.

Dated 4 May 2011.

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SUMMARY INFORMATION

This summary should be read as an introduction to this Prospectus only. Any decision to invest in the Ordinary Shares should be based on consideration of this Prospectus as a whole by the investor and not just this summary. Under the Prospectus Directive, in each Member State of the European Economic Area ("EEA"), civil liability attaches to those persons who are responsible for the summary, including any translations of the summary, but only if the summary is misleading, inaccurate or inconsistent when read together with other parts of this Prospectus. Where a claim relating to the information contained in this Prospectus is brought before a court, the plaintiff investor might, under the national legislation of the Member State of the EEA where such court is located, have to bear the costs of translating this Prospectus before the legal proceedings are initiated.

Overview and summary of operations

Glencore is a leading integrated producer and marketer of commodities, with worldwide activities in the marketing of metals and minerals, energy products and agricultural products and the production, refinement, processing, storage and transport of these products. Glencore operates globally, marketing and distributing physical commodities sourced from third party producers and own production to industrial consumers. Glencore has developed and built upon its expertise in the commodities it markets and cultivated long-term relationships with a broad supplier and customer base across diverse industries and geographic regions.

Glencore's marketing activities are supported by investments in industrial assets operating in Glencore's core commodities.

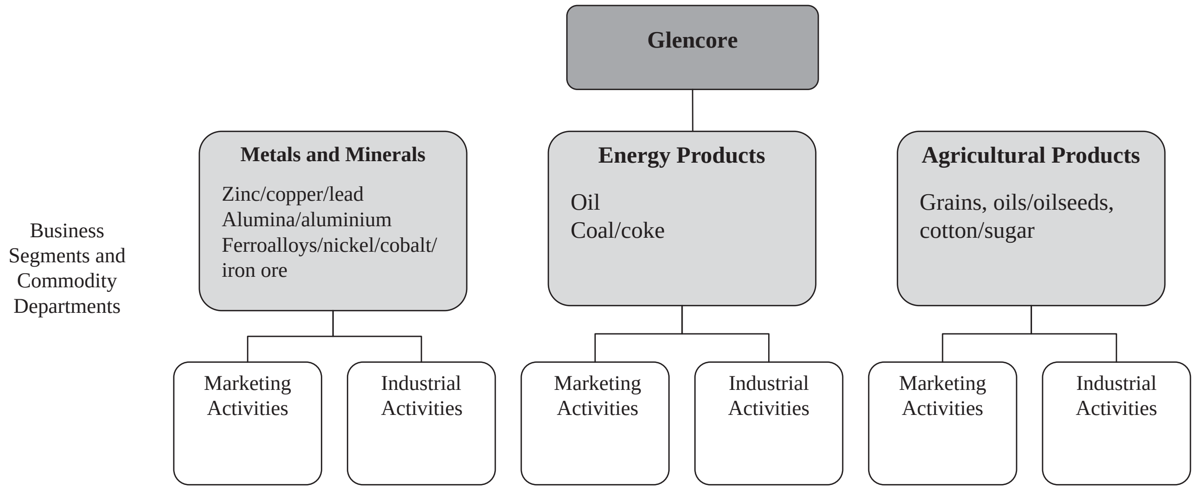
Glencore's industrial, geographical, commodity, supplier and customer diversity, in combination with its long-term relationships, have enabled it to operate profitably, even during periods of market weakness. Glencore's marketing operations are also less correlated to commodity prices than its industrial operations, making Glencore's earnings generally less volatile than those of pure producers of metals, mining and energy products.

Glencore focuses on maximising returns from the entire supply chain, taking into account its extensive global third party supply base, its logistics, risk management and working capital financing capabilities, extensive market insight, business optionality, its extensive customer base, strong market position and economies of scale. In contrast, this is not the business model of Glencore's main industrial competitors who are generally not set up to exploit the full range of value added margin and arbitrage opportunities throughout the commodity supply chain.

Glencore believes it is:

- the world's largest physical supplier of third party sourced commodities in respect of the majority of the metals and minerals it markets;
- among the world's largest non-integrated physical suppliers of crude oil and oil products;
- the world's largest participant in the supply of seaborne steam coal, including attribution of the volumes under a number of exclusive advisory and agency agreements with, amongst others, Xstrata;
- among the world's leading suppliers of sugar; and
- one of the leading exporters of grain from Europe, the CIS and Australia.

The following chart summarises Glencore's business structure:



Glencore's business segments are responsible for managing the marketing, sourcing, hedging, logistics and industrial investment activities for their respective commodities.

Glencore's marketing and industrial activities are supported by a global network of more than 50 offices located in more than 40 countries.

Glencore has an established record of successful strategic investments in industrial assets which have become an important component of its physical marketing activities.

Key strengths

Scale and leading market shares in commodity marketing globally

Glencore believes that it has significant market share positions in the addressable markets for zinc metal, zinc concentrate, copper metal, copper concentrate, alumina, aluminium, cobalt, seaborne export thermal coal and grains. Glencore's daily oil sales volumes represent approximately 3 per cent. of the world's daily oil consumption.

Core competence in commodity marketing, logistics, risk management and financing

Glencore is an established marketer of commodities and has built an outstanding market reputation as a reliable supplier of quality product. Glencore's experience has allowed it to build the market knowledge, insight and logistics capabilities required to generate value-added margins and seek arbitrage potential throughout the physical commodity supply chain.

Investments in high-quality low-cost extraction/processing operations with strong growth prospects

Glencore owns many high-quality assets, including Prodeco (coal) and Katanga (copper and cobalt). Glencore continues to invest in its high-quality, large-scale, long-life assets to increase production capacity.

Marketer with integrated production and processing capabilities

Glencore is differentiated from commodity production competitors in that it is also a substantial marketer of third party commodities. Glencore sees its ownership of industrial assets both as sources of self-produced commodities and as tools for increasing flexibility, optionality, security of supply and market knowledge.

Diversified across multiple commodities, suppliers and customers

Glencore markets a broad range of commodities (the three business segments are involved in the sourcing and marketing of more than 90 distinct commodities) from a diverse supply base to a diverse customer base.

Track record of value creation achieved

Glencore has been consistently profitable since the management buyout in 1994 and has a track record of growth across industry cycles. Since 2001, Glencore has achieved an average annual return on equity of 38 per cent.

World-class management and Board

Glencore's management is led by Ivan Glasenberg (Chief Executive Officer), supported by Steven Kalmin (Chief Financial Officer) and the rest of the management team. Between them, management has more than 200 years of experience at Glencore, where they have a proven track record of developing and growing the business. In addition to the management team and relevant experience of the Board, Glencore believes that there is considerable strength and depth below this level and it seeks to develop internal talent to ensure that this remains the case.

Resilient financial performance of marketing

Since the management buyout in 1994, Glencore's marketing operations have been profitable in every year of operation with a proven track record of resilience through industry cycles. Glencore believes that the financial performance of the marketing operations is less correlated to commodity prices than the industrial operations.

Barriers to entry

Glencore believes its scale, global reach and solid track record present significant barriers to entry into the global physical commodity marketing industry, which requires substantial access to credit markets and a global network supporting logistics and risk management capabilities and strong producer relationships.

Strategy

Continue to leverage geographic scope and diversification of operations

Glencore intends to build upon its position as one of the world's largest physical commodity suppliers and track record of extending product and geographical range by continuing to target market share increases and expansion in emerging markets.

Capitalise on strategic investments in industrial assets

Glencore's strategic investments in industrial assets are an important component of its physical sourcing strategy for its marketing activities. Glencore believes these investments provide a competitive advantage over peers which are less vertically integrated.

Use additional capital and liquidity to grow the business

Glencore believes the Global Offer will provide it with the financial resources needed to move it to the next stage of its development and achieve further sustainable growth.

Focus on cost management and further enhancing logistical capabilities

Glencore intends to continue its focus on cost control and operational efficiencies at its industrial assets and on the sourcing of competitively priced physical commodities from reliable third party suppliers.

Maintain conservative financial profile and investment grade ratings

Glencore's conservative financial profile and investment grade credit ratings have enabled it consistently to access the required funding on competitive terms and maintain healthy levels of liquidity. Glencore intends to continue to manage its financial position around maintaining its investment grade credit ratings.

Disciplined risk management

Glencore intends to continue its focus in this key area by maintaining and expanding its centralised risk management resources and information systems.

Place highest priority on employees, the environment and local communities

Glencore places the highest priority on its employees, the environment and the local communities where it operates.

Summary financial information

The table below sets out summary financial information of Glencore International as at and for the years ended 31 December 2008, 2009 and 2010, in each case prepared on a basis that consolidates the financial results and assets and liabilities of each of the companies constituting the Glencore International group before insertion of the Company as issuer and the integration of current shareholder parent entities (which will be completed prior to UK Admission). This information has been extracted without material adjustment from Section VI: "Historical Financial Information" and has been prepared on the basis described in the notes thereto, except for Adjusted EBITDA and cash cost information which have each been calculated as set forth in Section III: "Selected Historical Financial and Other Information".

Income statement data

	2008	2009	2010
		(U.S.$ million)	
Revenue	152,236	106,364	144,978
Cost of goods sold	(147,565)	(103,133)	(140,467)
Selling and administrative expenses	(850)	(839)	(1,063)
Share of income from associates and jointly controlled entities	1,067	82	1,829
(Loss)/gain on sale of investments—net	7	33	(6)
Other (expense)/income—net	(2,960)	35	(8)
Dividend income	238	12	13
Interest income	298	267	281
Interest expense	(1,135)	(854)	(1,217)
Income before income taxes and attribution	1,336	1,967	4,340
Income tax expense	(268)	(238)	(234)
Income before attribution	1,068	1,729	4,106
Attribution to profit participation shareholders	(677)	(650)	(2,460)
Income for the year	391	1,079	1,646
Attributable to:			
Equity holders	367	983	1,291
Non-Controlling interests	24	96	355

Balance sheet data

	2008	2009	2010
		(U.S.$ million)	
Non-current assets	24,803	27,551	35,491
Current assets	36,508	38,725	44,296
Total assets	61,311	66,276	79,787
Share capital, reserves and retained earnings, and amounts attributed to profit participation shareholders	15,405	16,686	19,613
Non-controlling interests	906	1,258	2,894
Invested capital	16,311	17,944	22,507
Other non-current liabilities	14,294	17,751	20,442
Total assets net of current liabilities	30,605	35,695	42,949
Current liabilities	30,706	30,581	36,838
Total equity and liabilities	61,311	66,276	79,787

Cash flow data

	2008	2009	2010
		(U.S.$ million)	
Cash generated by operating activities before working capital changes	4,587	3,095	4,234
Net cash generated/(used) by operating activities after working capital and net interest and income tax payments	5,960	(3,010)	111
Net cash used by investing activities	(2,950)	(1,164)	(4,755)
Net cash generated/(used) by financing activities	(2,842)	4,208	5,247
Increase in cash and cash equivalents	168	34	603
Cash and cash equivalents, beginning of year	658	826	860
Cash and cash equivalents, end of year	826	860	1,463

Other financial data and ratios

	2008	2009	2010
		(U.S.$ million)	
Adjusted EBITDA(1)(5)(unaudited)	5,701	3,108	6,201
Marketing activities	2,874	1,576	2,367
Industrial activities	2,827	1,532	3,834
Adjusted EBITDA pre-exceptional items(2)(5)	6,787	3,929	6,201
Marketing activities	3,215	1,606	2,367
Industrial activities	3,572	2,323	3,834
Adjusted EBIT(3)(5)	5,126	2,486	5,290
Marketing activities	2,861	1,561	2,337
Industrial activities	2,265	925	2,953
Adjusted EBIT pre-exceptional items(4)(5)	6,212	3,307	5,290
Marketing activities	3,202	1,591	2,337
Industrial activities	3,010	1,716	2,953
Gross debt (unaudited)(6)	18,316	24,066	30,616
Marketing activities	N/A	10,197	12,835
Industrial activities	N/A	13,869	17,781
Interest expense pre-exceptional items—net (unaudited)(7)	(837)	(587)	(897)
Marketing activities (unaudited)	N/A	N/A	(299)
Industrial activities (unaudited)	N/A	N/A	(598)
Capital expenditure	(1,875)	(1,116)	(1,890)
Current ratio (x) (unaudited)	1.19	1.27	1.20
Current capital employed(9) plus listed associates (at carrying value) to Gross debt(6) (x) (unaudited)	1.22	1.26	1.15
Net debt (unaudited)(6)	11,500	10,186	14,756
FFO(8)/Net debt(6) (%) (unaudited)	31.6	22.9	22.6
Adjusted EBITDA pre-exceptional items(2)/Net interest (x) (unaudited)	8.11	6.69	6.91
Income before attribution—pre-exceptional items	4,824	2,820	4,007
Income before attribution	1,068	1,729	4,106

Notes:

(1) Adjusted EBITDA consists of revenue less cost of goods sold and selling and administrative expenses plus share of income from associates and jointly controlled entities and dividends as disclosed on the face of the consolidated statement of income plus depreciation and amortisation.

(2) Adjusted EBITDA pre-exceptional items consists of Adjusted EBITDA as defined above, excluding exceptional items. Exceptional items represent significant items of income and expense which, due to their financial impacts, nature or the expected infrequency of the events giving rise to them, have been separated for internal reporting and analysis of Glencore's results. Exceptional items mainly include impairment charges on inventories and other assets.

(3) Adjusted EBIT consists of revenue less cost of goods sold and selling and administrative expenses plus share of income from associates and jointly controlled entities and dividends as disclosed on the face of the consolidated statements of income.

(4) Adjusted EBIT pre-exceptional items consists of Adjusted EBIT as defined above excluding exceptional items. Exceptional items represent items of income and expense, which, due to their financial impacts, nature or the expected infrequency of the events giving rise to them, have been separated for internal reporting and analysis of Glencore's results. Exceptional items mainly include impairment charges on inventories and other assets.

(5) Adjusted EBITDA, Adjusted EBIT, Adjusted EBITDA pre-exceptional items and Adjusted EBIT pre-exceptional items are not typically measures of operating income, operating performance or liquidity under IFRS; however, Glencore has presented these measures in this Prospectus as Glencore understands that some investors use these measures to determine a company's ability to service indebtedness and fund ongoing capital expenditure and dividends. Investors should not consider these measures in isolation, or as a substitute for income from operations, income for the year and cash flows from operating activities, as determined in accordance with IFRS, as an indicator of operating performance.

The following table is a composition of the key line items on the face of the consolidated statement of income that comprise Adjusted EBIT and reconciles Adjusted EBIT pre-exceptional items, Adjusted EBITDA and Adjusted EBITDA pre-exceptional items for the periods indicated. A reconciliation to net income before attribution is provided in the Adjusted financial information by business segment section in Section III: "Selected Historical Financial and Other Information":

	2008	2009	2010
		(U.S.$ million)	
Revenue	152,236	106,364	144,978
Cost of goods sold	(147,565)	(103,133)	(140,467)
Selling and administrative expenses	(850)	(839)	(1,063)
Share of income from associates and jointly controlled entities	1,067	82	1,829
Dividend income	238	12	13
Adjusted EBIT	5,126	2,486	5,290
Addback exceptional items	1,086	821	0
Adjusted EBIT pre-exceptional items	6,212	3,307	5,290
Addback Depreciation and amortisation	575	622	911
Adjusted EBITDA pre-exceptional items	6,787	3,929	6,201
Deduct exceptional items excluded above	(1,086)	(821)	0
Adjusted EBITDA	5,701	3,108	6,201

(6) Gross debt includes Current borrowings, Non-current borrowings and commodities sold with agreements to repurchase. It excludes amounts owing under the Prodeco call option arrangement and other financial liabilities. Net debt is gross debt less cash and cash equivalents, marketable securities and Glencore's assessment of readily marketable inventories. In calculating the illustrative allocation of borrowings to the marketing activities, Glencore has estimated what it believes to be the reasonable amount of borrowings attributable to funding the marketing activities' working capital requirements at the relevant period end date, with particular reference to the level of inventories, net cash margining and other accounts receivable and payable. The balance of group borrowings is allocated to industrial activities. See Section III: "Selected Historical and Other Information".

(7) In calculating the illustrative allocation of interest expense to the marketing activities, Glencore has taken into consideration the average amount of borrowings illustratively allocated to marketing activities as described in the preceding paragraph for the relevant period, what Glencore believes to be the appropriate distribution of funding tenors for the categories of funded assets within the marketing activities, and the average rate of interest incurred by the group during the relevant period on borrowings of the relevant tenor and interest basis. The balance of group interest expense is allocated to industrial activities. See Section III: "Selected Historical and Other Information".

(8) Funds From Operations ("FFO") equals cash provided by operating activities before working capital changes less tax and net interest payments plus dividends received.

(9) Current capital employed is current assets, presented before assets held for sale, less accounts payable, other financial liabilities and income tax payable.

Summary of the Global Offer

The Global Offer is expected to comprise of an issue of 893,292,886 new Ordinary Shares and 238,782,586 existing Ordinary Shares which will be sold by the Selling Shareholder in the International Offer (1,132,075,472 Ordinary Shares in aggregate), in each case assuming the Offer Price is set at the mid-point of the Offer Price Range. An additional 113,207,547 new Ordinary Shares will also be made available by the Company pursuant to the Over-Allotment Option (assuming the Offer Price is set at the mid-point of the Offer Price Range). All Offer Shares will be subscribed for or purchased at the Offer Price.

On 4 May 2011, in connection with the International Offer, the Company entered into subscription agreements with certain cornerstone investors (including, in the case of the cornerstone investors that are private banks, the ultimate beneficial owners of the International Offer Shares subscribed for under the relevant Cornerstone Investment Agreements) (the "Cornerstone Investors") who have agreed, subject to customary conditions, to subscribe for International Offer Shares at the Offer Price (the "Cornerstone Investment Agreements"). In aggregate, Cornerstone Investors have committed U.S.$3.1 billion for the subscription of Offer Shares. Based on an Offer Price at the mid-point of the Offer Price Range, the total number of International Offer Shares subscribed for by the Cornerstone Investors would be approximately 350,943,389 International Offer Shares, which represent approximately 31.0 per cent. of the Offer Shares, assuming that the Over-allotment Option is not exercised and that the Kazzinc Consideration Shares are not issued.

Offer Shares made available under the International Offer can, at the election of the relevant investors, be initially registered on the Jersey principal share register and traded on the London Stock Exchange or initially registered on the Hong Kong branch share register and traded on the Hong Kong Stock Exchange. All Offer Shares made available under the Hong Kong Offer shall be initially registered on the Hong Kong branch share register and can be traded on the Hong Kong Stock Exchange.

The total expenses of the Global Offer that are payable by the Company together with Swiss federal issuance stamp tax payable in connection with the Restructuring and the Global Offer are expected to be approximately U.S.$434.6 million (assuming the Offer Price is set at the mid-point of the Offer Price Range).

FTSE eligibility

Following discussions with FTSE, it is anticipated that the Company will be included in the FTSE 100 under the fast entry rule (at close of business on the first day of official trading).

Use of proceeds

The net proceeds from the Global Offer receivable by the Company are estimated to be pounds sterling, U.S. dollar and Hong Kong dollar amounts equivalent in aggregate to U.S.$7,456.2 million, after deduction of estimated underwriting commissions and estimated expenses of the Global Offer (assuming the maximum amount of the Underwriter's incentive commission and the discretionary elements of the fees of the Company's other advisers will be paid and including applicable VAT), assuming the Over-Allotment Option is not exercised and assuming the Offer Price is set at the mid-point of the Offer Price Range and exchange rates as at 29 April 2011.

The Company currently intends to apply the proceeds from the Global Offer in the following order of priority:

- approximately U.S.$2.2 billion of the net proceeds from the Global Offer towards meeting the cash portion of the consideration payable to Verny, pursuant to the Kazzinc SPAs in respect of Glencore's proposed acquisition of additional stakes in Kazzinc;
- approximately U.S.$5 billion of the net proceeds from the Global Offer towards meeting its budgeted total aggregate capital expenditure for the next three calendar years (ending 31 December 2013). Items falling within this include funding of significant expansion projects in respect of Kazzinc (estimated: U.S.$834 million), Mopani (estimated: U.S.$512 million), Prodeco (estimated: U.S.$919 million), the West African Oil Assets (estimated: U.S.$791 million) and Glencore's other industrial assets (estimated: U.S.$900 million); and
- in order to reduce its cost of borrowing and improve financial flexibility, use of a portion of any proceeds that are not applicable to or, immediately required for, the above purposes to reduce drawings under the U.S.$11,905 million revolving credit facilities and repay various other debt obligations of the Glencore Group. Should growth opportunities arise in the future, Glencore could either draw-down any remaining facilities or put in place new facilities.

Dividend policy

The Company intends to pursue a progressive dividend policy with the intention of maintaining or increasing its total ordinary dividend each year.

Dividends are expected to be declared by the Board semi-annually (with the half-year results and the preliminary full year results). Interim dividends are expected to represent approximately one-third of the total dividend for any year. Dividends will be declared and paid in U.S. dollars, although Shareholders will be able to elect to receive their dividend payments in pounds sterling, Euros or Swiss Francs based on the exchange rates in effect at the date of payment. Shareholders on the Hong Kong branch register will receive their dividends in Hong Kong dollars.

The Directors currently expect to declare an interim dividend of U.S.$350 million in August 2011 concurrent with publication of the interim results for the six months to 30 June 2011.

Lock-ups

The Company has entered into a lock-up arrangement in favour of the Joint Global Co-ordinators for a period of six months from the date of UK Admission. In addition, each Existing Shareholder has entered into a lock-up arrangement in favour of the Joint Global Co-ordinators and the Company for various periods from the date of UK Admission. These lock-up arrangements apply in the case of the Executive Directors until five years after UK Admission (with a staggered release after the first year of that period) and in the case of the other Existing Shareholders for a period of time of between one year and four years from Admission (with a staggered release after the first year of that period, if applicable). Furthermore, each Cornerstone Investor has entered into a lock-up arrangement in favour of the Joint Global Co-ordinators and the Company for a period of six months from the date of UK Admission. The lock-up arrangements are subject to certain exceptions.

Risk factors

Glencore's results of operations and financial condition could be materially adversely affected by the following risks:

Risks relating to Glencore

Glencore is exposed to risks related to:

- Declines in the current and expected volumes of supply or demand for commodities, to commodity prices and to deterioration in economic and financial conditions.
- Significant geopolitical risk.
- Liquidity risk.
- A reduction in Glencore's credit rating.
- Glencore's ability to attract, retain and compensate key employees may be impacted by its transition to a public company.
- Fluctuations in currency exchange and interest rates.
- Competition in the commodities industry.

Risks relating to Glencore's marketing activities

Glencore is exposed to risks related to:

- Its ability to identify and take advantage of arbitrage opportunities.
- The effectiveness of its hedging strategy.
- Counterparty risk.
- Risk management policies and procedures that may leave it exposed to unidentified or unanticipated risks.
- Reliance on third parties to source the majority of its products.
- Reliance on certain agreements for the sourcing of commodities.
- Significant amounts of freight, storage, infrastructure and logistics support required by its marketing activities and increases in costs thereof.
- Fluctuations in freight rates.

Risks relating to Glencore's industrial activities

Glencore is exposed to risks related to:

- Industrial assets through non-controlling stakes or joint ventures and strategic partnership arrangements.
- Delays in or failure to develop planned expansions or new projects.
- Operating risks and hazards at its industrial assets.
- Title to the land, resource tenure and extraction rights of industrial activities.
- Infrastructure at its industrial assets being adequate and remaining available.
- Increases in production costs.
- Stated mineral and hydrocarbon reserves, resources and mineralised potential are only estimates.

- The processes and chemicals used in Glencore's extraction and production methods and its shipping and storage activities.

Other risks relating to Glencore

Glencore is exposed to risks related to:

- Fraud and corruption due to the nature of its business and operations.
- Accidents at Glencore's industrial activities, logistics and storage facilities which could result in injuries and fatalities.
- Processing, storage and transportation of its commodities.
- Product safety and dangerous goods regulations.
- Dependence on its financial, accounting, marketing and other data processing information systems.
- The significant number of laws and regulations to which it is subject.
- Social, economic and other risks in the markets where Glencore operates which could cause disruptions to its business.
- Glencore's reputation in the communities in which it operates.
- Failure to make successful acquisitions or to integrate acquisitions effectively.
- A wide range of risks, not all of which can be covered, adequately or at all, by Glencore's insurance programme.
- The maintenance of positive employee relations and the ability to attract and retain skilled workers is key to the successful operation of Glencore's industrial activities.

Risks relating to an investment in the Ordinary Shares and the dual listing

- The price of the Ordinary Shares is subject to volatility.
- Future share issues by the Company and/or sales of Ordinary Shares could lower the market price of the Ordinary Shares. Further share issues or conversions of the Convertible Bonds could also dilute the interests of Shareholders.
- Shareholders in the U.S. may not be able to participate in future equity offerings.
- The rights afforded to Shareholders are governed by Jersey law. Not all rights available to shareholders under English law, Hong Kong law or U.S. law will be available to Shareholders.
- Foreign investors may find it difficult to enforce foreign judgments obtained against Glencore or any of its Affiliates.
- As a company due to be listed on the London Stock Exchange and the Hong Kong Stock Exchange, the Company will be subject to both United Kingdom and Hong Kong laws, regulations and policies and certain Hong Kong laws and regulations will not apply to the Company.

The Kazzinc transaction

Glencore has agreed with Verny to acquire additional stakes in Kazzinc. These purchases will increase its ownership from 50.7 per cent. to 93.0 per cent. for a total transaction consideration of U.S.$3.2 billion. Subject to satisfaction of certain conditions, which include receipt of applicable regulatory approvals and the occurrence of UK Admission, consideration for these purchases will be settled through the issuance of U.S.$1 billion of Ordinary Shares at the Offer Price (such issuance expected to occur at the earlier of UK Admission and satisfaction of applicable conditions precedent) and U.S.$2.2 billion in cash (to be paid in tranches between October and December 2011). The acquisition of these additional stakes is expected to be completed by the end of December 2011. The terms of the acquisition have been negotiated on an arm's length basis and the price and structuring of the consideration in respect of these purchases is based on Glencore's detailed valuation of Kazzinc. In addition, Glencore's stake in Kazzinc may be further increased to 99.4 per cent. through the exercise of a put or call option in respect of Verny Investments' remaining 6.4 per cent. interest in Kazzinc, which is conditional on amongst other things, an initial public offering of Kazzinc's gold assets.

Current Trading and Prospects

Introduction

Glencore's operating and financial performance over the first quarter of 2011 continued to benefit from improved market conditions as also experienced in the final months of 2010.

Marketing

Marketing operations began 2011 strongly with performance for the first quarter of 2011 in line with management expectations. In particular, following a challenging 2010, the oil division reported substantially improved results, more in line with 2009 performance, due to increased arbitrage opportunities as a result of market volatility and tighter supply conditions.

Industrial

Glencore's consolidated industrial activities and associates delivered a substantially improved performance over the first quarter of 2011, primarily on the back of a strong commodity price environment but also assisted by year-on-year production increases at many operations. Operating costs and capital expenditures, including expansion related capital expenditures, were broadly in-line with management expectations.

Summary and outlook

Overall, Glencore's businesses performed in line with management's expectations over the first quarter of 2011. Strong market conditions experienced in the first quarter are continuing into the second quarter of 2011. Despite recent events in Japan and the Middle East, the Directors remain confident that economic activity and commodity demand remain robust and Glencore remains well positioned for 2011. In this regard, the Directors reconfirm Glencore's previously announced intention to declare an interim dividend of U.S.$350 million in August 2011 concurrent with publication of the interim results for the six months to 30 June 2011.

RISK FACTORS

An investment in the Company's Ordinary Shares involves a significant degree of risk. Investors should carefully consider the risks and uncertainties described below and the other information contained in this Prospectus before making an investment decision. Glencore's business, results of operations, financial condition and/or prospects could be materially and adversely affected by any of these risks. The trading price of the Company's Ordinary Shares could decline due to any of these risks or other factors, and you may lose all or part of your investment. The risks described below are not the only ones which Glencore faces. The risks described below are those that Glencore currently believes may materially affect it and the Ordinary Shares and the list is not exhaustive. Additional risks and uncertainties not currently known to Glencore, or those that it currently deems to be immaterial, may become material and adversely affect Glencore's business, results of operations, financial condition, prospects and/or the value of the Ordinary Shares. This Prospectus also contains estimates and projections that involve risks and uncertainties. Glencore's results may differ significantly from those previously projected as a result of certain factors, including the risks which it faces, as described below and in other sections of this Prospectus. The order in which the following is presented does not necessarily reflect the likelihood of their occurrence or the relative magnitude of their potential material adverse effect on Glencore's business, results of operations, financial condition, prospects and/or the value of the Ordinary Shares.

Risks relating to Glencore

Glencore is exposed to declines in the current and expected volumes of supply or demand for commodities, to commodity prices and to deterioration in economic and financial conditions.

The current and expected volumes of supply and demand for the commodities in which Glencore is active vary over time based on changes in resource availability, government policies and regulation, costs of production, global and regional economic conditions, demand in end markets for products in which the commodities are used, technological developments, including commodity substitutions, fluctuations in global production capacity, global and regional weather conditions and natural disasters including, for example, the recent earthquake and tsunami in Japan, all of which impact global markets and demand for commodities. Furthermore, changes in current and expected supply and demand conditions impact the current and expected future prices (and thus the price curve) of each commodity.

Declines in the volume of each commodity produced or marketed by Glencore, as well as declines in the price of commodities, could materially adversely impact Glencore's business, results of operations and earnings. These declines could result in a reduction in the average marketing unit margin achieved in respect of the volumes handled by Glencore's marketing activities, or a reduction in the volume and/or margin in respect of commodities produced by Glencore's industrial assets.

In addition, a decline in economic and financial conditions globally or in a specific country, region or sector may have a material adverse effect on Glencore's business, results of operations or earnings. For example:

- the insolvency of key suppliers, particularly those with whom Glencore has long-term supply or off-take contracts, could result in supply chain difficulties and/or unmatched commodity price exposures and/or a reduction in commodities available for Glencore's marketing activities;
- although most commodities' fixed pricing periods are relatively short, a significant reduction or increase in commodity prices could result in customers or suppliers, as the case may be, being unwilling or unable to honour their contractual commitments to purchase or sell commodities on pre-agreed pricing terms;
- a tightening of available credit may make it more difficult for Glencore to obtain, or may increase the cost of obtaining, financing for its marketing activities and capital expenditures at its industrial assets;
- a decline in the value of inventories may result in write-downs; and
- production at Glencore's industrial assets may be curtailed or suspended as it becomes not economically viable.

In the first half of 2009, Glencore's financial results were adversely impacted by the failure of various customers to perform under certain pricing contracts primarily related to Glencore's coal business. Glencore believes these customers failed to perform, in part, because the global financial crisis put significant strain on their financial condition, liquidity profiles and customer base which was compounded by being faced with paying significantly higher prices for commodities under the contracts with Glencore than what they would have had to pay in the spot market. Should Glencore experience similar customer failure in the future as a result of economic factors or otherwise, its business, results of operations and earnings could be adversely affected.

Glencore is exposed to significant geopolitical risk.

Glencore operates and owns assets in a large number of geographic regions and countries and, as a result, is exposed to a wide range of political, regulatory and tax environments. These environments are subject to change in a manner that may be materially adverse for Glencore, including changes to government policies and regulations governing industrial production, foreign investors, price controls, export controls, tariffs, income and other forms of taxation (including policies relating to the granting of advance rulings on taxation matters), nationalisation or expropriation of property, repatriation of income, royalties, the environment and health and safety.

Relatively high commodity prices and other factors in recent years have resulted in increased resource nationalism in some countries, with governments repudiating or renegotiating contracts with, and expropriating assets from, companies that are producing in such countries. Many of the commodities that Glencore produces and markets are considered strategic resources for particular countries. Governments in these countries may decide not to recognise previous arrangements if they regard them as no longer being in the national interest. Governments may also implement export controls on commodities regarded by them as strategic (such as oil or wheat) or place restrictions on foreign ownership of industrial assets. Renegotiation or nullification of existing agreements, leases, permits or tax rulings, changes in fiscal policies (including new or increased taxes or royalty rates or the implementation of a windfall tax) and currency restrictions imposed by the governments of countries in which Glencore operates could all have a material adverse effect on Glencore.

Glencore has experienced nationalisation and expropriation of certain of its industrial assets and significant changes in the taxation regime applicable to specific assets in the past. For example, in 2007, the Bolivian government nationalised a smelter owned by a subsidiary of Glencore. However, in that instance, no material losses were sustained and Glencore continues to do business in Bolivia. In addition, in 2009, the government of Bolivia enacted a new constitution which requires mining entities to form joint ventures with the government. Glencore has entered into good faith negotiations with the government regarding this requirement, and a resolution of the issue is expected to be announced by the government in the near future. Glencore does not expect this resolution to have a material economic impact on the Group. While these particular incidents have not had a material adverse effect on Glencore's results or operations, it continues to do business in locations where it is exposed to a greater-than-average risk of overt or effective expropriation or nationalisation, including in countries where the government has previously (and in some cases, recently) expropriated assets held within the jurisdiction of other companies or where members of the government have publicly proposed that such action be taken.

Glencore's operations may also be affected by political and economic instability in the countries in which it operates. Such instability could be caused by, among other things, terrorism, civil war, guerrilla activities, military repression, civil disorder, crime, workforce instability, change in government policy or the ruling party, economic or other sanctions imposed by other countries, extreme fluctuations in currency exchange rates or high inflation.

The geopolitical risks associated with operating in a large number of regions and countries, if realised, could affect Glencore's ability to manage or retain interests in its industrial activities and could have a material adverse effect on the profitability, ability to finance or, in extreme cases, viability of one or more of its industrial assets. Although Glencore's industrial assets are geographically diversified across various countries, disruptions in certain of its industrial operations at any given time could have a material adverse effect on Glencore's marketing business.

Liquidity risk and a failure to obtain funds could limit Glencore's ability to engage in desired activities and grow its business.

Liquidity, or ready access to funds, is essential to Glencore's business. Liquidity risk is the risk that Glencore is unable to meet its payment obligations when due, or that it is unable, on an ongoing basis, to borrow funds in the market on an unsecured or secured basis at an acceptable price to fund actual or proposed commitments. A lack of liquidity may mean that Glencore will not have funds available to maintain or increase its marketing activities, grow its industrial activities production output as planned or take advantage of other opportunities that may arise in its marketing or industrial activities.

Glencore's marketing activities employ significant amounts of working capital to fund purchases of commodities for future delivery to Glencore's end customers, to meet margin requirements under derivative contracts and to fund the acquisition and maintenance of certain transport and storage assets which complement its marketing activities. Continued funding of and access to working capital is critical for Glencore to maintain its historic levels of marketing activity and increase such levels in the future. Glencore's industrial activities are also capital intensive and the continued funding of such activities is critical for Glencore to maintain its ownership interests in its industrial assets, to maintain production levels in periods when net operating cash flow is negative or insufficient to cover capital expenditures, to increase production levels in the future in accordance with its business plan and to grow its industrial activities through the acquisition of new assets. Glencore has budgeted a total aggregate capital expenditure of approximately U.S.$5 billion for the three calendar years ending 31 December 2013. Glencore expects to fund its planned capital expenditure from proceeds from the Global Offer.

Prudent liquidity risk management requires Glencore to maintain sufficient cash and cash equivalents through the accumulation of retained earnings and to have ready sources of committed funding available to meet anticipated and unanticipated funding needs. While Glencore adjusts its minimum internal liquidity targets in response to changes in market conditions, its liquidity may be impaired due to circumstances it is unable to control, such as general market disruptions, increases in the prices of commodities or an operational problem that affects its suppliers or customers or Glencore itself.

In addition to maintaining a cash position, Glencore relies on two other principal sources of liquidity: borrowings under various short-term and long-term bank and asset-backed facilities and issuance of notes in the debt capital markets. An inability to raise money in the long-term and short-term debt markets could have a material adverse effect on Glencore's liquidity. Glencore's access to debt in amounts adequate to finance its activities could be impaired by factors that affect Glencore in particular or the industries or geographies in which it operates. For example, lenders could develop a negative perception of Glencore's short-term or long-term financial prospects if Glencore incurred large losses, if the level of its marketing activities were to materially decrease due to a market downturn in the demand for commodities, or if its business was otherwise materially adversely affected. Although Glencore expects the continued support of financial institutions, there can be no assurance that additional credit or funding will be made available in the future.

Future debt financing, if accessible, may result in increased borrowing costs, increased financial leverage, decreased income available to fund further acquisitions and expansions and the imposition of restrictive covenants on Glencore's businesses and operations. In addition, future debt financing may limit Glencore's ability to withstand competitive pressures and render its businesses more vulnerable to economic downturns by exposing it to volatile interest rates, tighter credit markets and potentially reduced access to funding that may be needed to take advantage of future business opportunities.

A reduction in Glencore's credit rating could adversely affect Glencore.

Glencore's borrowing costs and access to the debt capital markets, and thus its liquidity, depend significantly on its public credit ratings. These ratings are assigned by rating agencies, which may reduce or withdraw their ratings or place Glencore on "credit watch", which would have negative implications. A deterioration of Glencore's credit ratings could increase its borrowing costs and limit Glencore's access to the capital markets, which, in turn, could reduce Glencore's earnings and adversely affect Glencore's liquidity.

Glencore's counterparties, including its customers, suppliers and financial institutions, are also sensitive to the risk of a ratings downgrade and may be less likely to engage in transactions with Glencore, or may only engage with Glencore at a substantially higher cost or on increased credit enhancement terms (e.g. letters of credit, additional guarantees or other credit support) which carry increased costs, if Glencore's ratings were downgraded to below investment grade. While Glencore does not anticipate its ratings to be downgraded below investment grade, if such an event were to occur, it could have a material adverse effect on Glencore's business, results of operations, financial condition or prospects.

Glencore's ability to attract, retain and compensate key employees may be impacted by its transition to a public company.

Glencore has operated within a private company structure and as an employee-owned company. Following Admission, Glencore, as a listed entity, will operate as a public company with the added administration this entails. This cultural change could result in certain key employees, whether skilled marketers, or otherwise, leaving. There are a number of other reasons why such personnel may leave. An employee may leave

Glencore to go to a competitor, to start their own business, to retire or for other reasons. In addition, based on the Offer Price Range, the Ordinary Shares issued to Existing Shareholders in the Restructuring will have a value significantly above the redemption value of Existing Shareholders' pre-Restructuring ownership interests. However, Glencore is not expecting an above-normal level of retirements shortly after Admission. Notwithstanding the high level of employee ownership, there are no secondary sales in the Global Offer by any employee or Director other than to fund expected personal tax liabilities triggered in connection with the Restructuring and/or Admission and to repay to Glencore a small tranche of outstanding loans and all Existing Shareholders are subject to lock-up arrangements ranging from 12 months, to staggered lock-ups of up to five years in the case of the Executive Directors, such lock-ups not being dependent upon continued employment.

Glencore seeks to provide competitive compensation arrangements to retain and attract highly skilled personnel that are important to its business, including salaries, bonus arrangements and share incentive arrangements. The Directors believe that Glencore's current compensation arrangements are competitive and adequate to allow Glencore to retain and attract the necessary calibre of employees. However, these compensation payments may not be as effective as the opportunity to receive ownership interests in Glencore that existed prior to the Restructuring and, as a result, Glencore may need to change its compensation arrangements to make them more attractive to such employees which could be at an increased cost to Glencore. The loss of any senior marketer, senior manager or other key personnel, as well as the inability to retain and/or attract new highly skilled personnel, could have a material adverse effect on Glencore's business.

Glencore is exposed to fluctuations in currency exchange and interest rates.

The significant majority of transactions undertaken by both Glencore's marketing and industrial activities are denominated in U.S. dollars. However, Glencore is exposed to fluctuations in currency exchange rates:

- through its industrial activities, because a large proportion of the operating costs of these assets are denominated in the currency of the country in which each asset is located, the largest of such currency exposures being to the Australian dollar, the Kazakhstan tenge and the Canadian dollar via Glencore's stake in Xstrata;
- through the costs of Glencore's global office network, which are denominated largely in the currency of the country in which each office is located, the largest of such currency exposures being to the Swiss franc, the pound sterling and the Euro; and
- through its marketing activities, although only a small minority of purchase or sale transactions are denominated in currencies other than U.S. dollars.

In respect of commodity purchase and sale transactions denominated in currencies other than U.S. dollars, Glencore generally hedges the specific future commitment through a forward exchange contract. Foreign exchange rates have seen significant fluctuation in recent years and a depreciation in the value of the U.S. dollar against one or more of the currencies in which Glencore incurs significant costs will therefore result in an increase in the cost of these operations in U.S. dollar terms and could adversely affect Glencore's financial results.

As discussed above, the reporting currency and the functional currency of the majority of Glencore's operations is the U.S. dollar, as this is assessed to be the principal currency of the economic environment in which Glencore operates. For financial reporting purposes, transactions in foreign currencies are converted into the functional currency of each entity using the exchange rate prevailing at the transaction date. Monetary assets and liabilities outstanding at year end are converted at year-end rates. The resulting exchange differences are recorded in the consolidated statement of income. The exchange rates between relevant local currencies and the U.S. dollar have historically fluctuated, and the translation effect of such fluctuations may have a material adverse effect on both Glencore Group members' individual and Glencore's consolidated results of operations or financial condition.

Glencore's exposure to changes in interest rates results from investing and borrowing activities undertaken to manage its liquidity and capital requirements. Substantially all of Glencore's borrowings, other than its long-term, fixed-rate public bonds, bear interest at floating rates. An increase in interest rates would therefore result in a relatively immediate increase in the cost of servicing Glencore's indebtedness and could adversely affect Glencore's financial results. Although borrowing costs are taken into account when setting transaction terms, there is no assurance that increased financing costs can be passed on to customers and/or suppliers. Glencore may elect in the future to enter into interest rate swaps to convert some or all of its floating-rate debt to fixed-rate debt or enter into fixed-rate to floating-rate swaps. There can be no assurance that Glencore will not be materially adversely affected by interest rate changes in the future.

The commodities industry is very competitive and Glencore may have difficulty effectively competing with other commodity marketing and industrial companies.

The commodities industry is characterised by strong competition. Glencore believes that the majority of its competitors tend to focus on a narrower commodity group or geographic area, or concentrate more heavily on industrial activities such as mining, smelting, processing, refining and food processing. Although Glencore faces intense competition in each of its business segments, in view of Glencore's diversification across different commodity groups and its global geographical presence and scale, Glencore does not believe that there is a precisely comparable company or peer group that can be defined as competing directly with Glencore across all of its business segments. However, some of these competitors or existing producers may, in the future, use their resources to broaden into all of the markets in which Glencore operates and therefore compete further against Glencore. These competitors may also expand and diversify their commodity sourcing, processing or marketing operations, or engage in pricing or other financial or operational practices that could increase competitive pressure on Glencore across each of its business segments. Increased competition may result in losses of market share for Glencore and could materially adversely affect Glencore's business, results of operations and financial condition.

Risks relating to Glencore's marketing activities

The success of Glencore's marketing activities depends in part on its ability to identify and take advantage of arbitrage opportunities.

Many of the commodity markets in which Glencore operates are fragmented and periodically volatile. As a result, discrepancies generally arise in respect of the prices at which the commodities can be bought or sold in different forms, geographic locations or time periods, taking into account the numerous relevant pricing factors, including freight and product quality. These pricing discrepancies can present Glencore with arbitrage opportunities whereby Glencore is able to generate profit by sourcing, transporting, blending, storing or otherwise processing the relevant commodities. Whilst the strategies used by Glencore's business segments to generate such margin vary from commodity to commodity, the main arbitrage strategies can be generally described as geographic-, product- and time-related. For further details on these arbitrage strategies, please see Section I: "Information on Glencore".

Glencore's profitability is, in large part, dependent on its ability to identify and exploit such arbitrage opportunities. A lack of such opportunities, for example due to a prolonged period of pricing stability in a particular market, or an inability to take advantage of such opportunities when they present themselves, because of, for example, a shortage of liquidity or an inability to access required logistics assets or other operational constraints, could adversely impact Glencore's business, results of operations and financial condition.

Glencore's hedging strategy may not always be effective and does not require all risks to be hedged.

Glencore's marketing activities involve a significant number of purchase and sale transactions across multiple commodities. To the extent Glencore purchases a commodity from a supplier and does not immediately have a matching contract to sell the commodity to a customer, a downturn in the price of the commodity could result in losses to Glencore. Conversely, to the extent Glencore agrees to sell a commodity to a customer and does not immediately have a matching contract to acquire the commodity from a supplier, an increase in the price of the commodity could result in losses to Glencore, as it then seeks to acquire the underlying commodity in a rising market. In order for Glencore to mitigate the risks in its marketing activities related to commodity price fluctuations and potential losses, Glencore has a policy, at any given time, of hedging substantially all of its marketing inventory not already contracted for sale at pre-determined prices through futures and swap commodity derivative contracts, either on commodities' exchanges or in the over the counter ("OTC") market. In the event of disruptions in the commodity exchanges or markets on which Glencore engages in these hedging transactions, Glencore's ability to manage commodity price risk may be adversely affected and this could in turn materially adversely affect its business, financial condition and results of operations.

In addition, there are no traded or bilateral derivative markets for certain commodities that Glencore purchases and sells, which limits Glencore's ability to fully hedge its exposure to price fluctuations for these commodities. In these instances, Glencore's ability to hedge its commodity exposure is limited to forward contracts for the physical delivery of a commodity or futures and swap contracts for a different, but seemingly related, commodity. For example, Glencore hedges physical concentrate positions using future contracts for the estimated payable metal contained in the concentrate, with the expectation that the relative value of these two commodities will change in a similar way. If, however, the relative value of the two commodities changes in a direction or manner that Glencore does not anticipate, Glencore may suffer a loss in those commodity positions. Furthermore, there are certain commodities, such as ferroalloys and alumina, where hedging is limited by the lack of a liquid market. Finally, subject to internal risk management, limits and policies, in some cases, Glencore takes deliberate directional positions without a corresponding opposite directional position in place as part of its marketing strategies which has, at certain points in the past resulted, and may in the future, result in losses. For further detail on Glencore's financial risk management strategies and policies, see Section IV: "Operating and Financial Review".

Glencore is subject to counterparty risk in its marketing activities.

Glencore's marketing activities are subject to non-performance risk by its suppliers, customers and hedging counterparties. For example:

- a significant increase in commodity prices could result in suppliers being unwilling to honour their contractual commitments to sell commodities to Glencore at pre-agreed prices;
- a significant reduction in commodity prices could result in customers being unwilling or unable to honour their contractual commitments to purchase commodities from Glencore at pre-agreed prices, as occurred in 2008 and 2009 during the global economic crisis;
- customers may take delivery of commodities from Glencore and then find themselves unable to honour their payment obligations due to financial distress or any other reasons; and
- hedging counterparties may find themselves unable to honour their contractual commitment due to financial distress or other reason.

Glencore seeks to reduce the risk of customer non-performance by requiring credit support from creditworthy financial institutions, where appropriate, and by imposing limits on open accounts extended. In addition, mark-to-market exposures in relation to hedging contracts are regularly and substantially collateralised (primarily with cash) pursuant to margining arrangements in place with such hedge counterparts. However, no assurance can be given that Glencore's attempts to reduce the risk of customer non-performance will be successful in every instance or that its financial results will not be adversely affected by the failure of a counterparty or counterparties to fulfil their contractual obligations in the future. Such failure would have an adverse impact on Glencore's business, results of operations and financial condition, including by creating an unintended, unmatched commodity price exposure.

Glencore's risk management policies and procedures may leave it exposed to unidentified or unanticipated risks.

Glencore's marketing activities are exposed to commodity price, foreign exchange, interest rate, counterparty (including credit), operational, regulatory and other risks. Glencore has devoted significant resources to developing and implementing policies and procedures to manage these risks and expects to continue to do so in the future. Nonetheless, Glencore's policies and procedures to identify, monitor and manage risks have not been fully effective in the past and may not be fully effective in the future.

Some of Glencore's methods of monitoring and managing risk are based on historical market behaviour that may not be an accurate predictor of future market behaviour. Other risk management methods depend on evaluation of information relating to markets, suppliers, customers and other matters that are publicly available or otherwise accessible by Glencore. This information may not in all cases be accurate, complete, up to date or properly evaluated. Management of operational, legal and regulatory risk requires, among other things, policies and procedures to properly record and verify a large number of transactions and events, and these policies and procedures may not be fully effective in doing so. Management of counterparty credit risk is mitigated with the use of credit enhancement products, including letters of credit, insurance and bank guarantees, but such risk cannot be eliminated entirely. Failure to mitigate all risks associated with Glencore's business could have a material adverse effect on Glencore's business, results of operations and financial condition.

Glencore uses, among other techniques, Value-at-Risk, or VaR, as a key risk measurement technique for its marketing activities. VaR does not purport to represent actual gains or losses in fair value on earnings to be incurred by Glencore, nor does Glencore expect that VaR results are indicative of future market movements or representative of any actual impact on its future results. VaR has certain limitations; notably, the use of historical data as a proxy for estimating future events, market illiquidity risks and tail risks. While Glencore recognises these limitations and continuously refines its VaR analysis, there can be no assurance that its VaR analysis will be an effective risk management methodology. For further details on Glencore's VaR calculations and analysis, please see Section IV: "Operating and Financial Review".

Glencore is reliant on third parties to source the majority of the commodities purchased by its marketing operations.

Glencore purchases a minority portion of the physical commodities sold by its marketing activities from its controlled industrial operations and associates, including Xstrata. The remainder of the commodities sourced by its marketing operations are purchased from third party suppliers and entities in which Glencore has a minority stake (excluding associates). For the year ended 31 December 2010, Glencore's marketing operations sourced approximately 69 per cent. of its commodity purchases from such third parties (excluding oil purchases). Glencore expects to continue to source commodities from such third parties in the future.

Glencore is exposed to both price and supply risks with respect to commodities sourced from third parties and entities in which it holds a minority stake. Any increases in Glencore's purchase price relative to the price at which Glencore markets a commodity could adversely affect Glencore's margins. Glencore's business, results of operations, financial condition and prospects could be materially adversely impacted if it is unable to continue to source required volumes of commodities from its suppliers on reasonable terms or at all.

Glencore relies on certain agreements for the sourcing of commodities and these agreements may be terminated or fail to be renewed.

Glencore is a party to various contracts with certain of its non-controlled industrial assets for the supply of commodities to its marketing business. Glencore has various spot and long-term agreements, including with Xstrata for the supply of copper, nickel, zinc, alloys and cobalt, with Nyrstar for the supply of zinc/lead and with UC Rusal and Century Aluminum for the supply of alumina and aluminium. For details of Glencore's arrangement with Xstrata, please see Section I: "Information on Glencore".

These agreements are an important source of commodities for Glencore's marketing activities and provide certainty of regular supply for Glencore. These supply agreements range from short-term spot contracts to multiple years in duration and have historically been renewed by Glencore and the supplier on commercially acceptable terms. However, in general, these companies have no obligation to renew their supply agreements. Glencore may not be able to compel the relevant company to enter into or renew a supply agreement with Glencore in cases where Glencore does not own 100 per cent. of the company or where related party transaction minority shareholder approval requirements apply. Purchases from Xstrata, UC Rusal, Nyrstar and Century Aluminum represented approximately 10.5 per cent. of Glencore's marketing purchases in the year ended 31 December 2010. Glencore relies on these agreements to source many of its key commodities and any termination or failure to renew such contracts at the end of their terms could have an adverse effect on Glencore's business, results of operations and financial condition. For further details on these arrangements, please see Section I: "Information on Glencore".

Glencore's marketing activities require access to significant amounts of freight, storage, infrastructure and logistics support and Glencore is exposed to increases in the costs thereof.

Glencore's marketing activities entail shipments of commodities in large quantities, often by ocean-going transport. Glencore often competes with other producers, purchasers or marketers of commodities or other products for limited storage and berthing facilities at ports and freight terminals, which can result in delays in loading or unloading Glencore's products and expose Glencore to significant delivery interruptions. Limitations or interruptions in rail, shipping or port capacity could impede Glencore's ability to deliver its products on time. In addition, increases in the costs of freight could adversely affect Glencore's business, results of operations or financial condition.

Glencore also requires significant storage capacity for its commodities, which it sources both through facilities in which Glencore holds equity stakes and pursuant to rental agreements with, among others, oil terminals and tank farms, metal and other warehouses and silos. Any decrease in Glencore's ability to access its customary levels of capacity from these storage facilities or an increase in the price at which Glencore can acquire storage capacity could have an adverse effect on Glencore's business by forcing Glencore to use storage facilities in less advantageous locations or at prices that make it less profitable for Glencore to supply its customers.

Coal is a bulk product, with unit freight costs often representing a significant portion of its price. As such, large fluctuations in unit freight costs could have a significant impact on the profitability of Glencore's marketing activities in respect of this commodity. Freight for coal, as well as certain other commodities, is sourced primarily through third parties and any difficulties accessing the necessary freight capacity on acceptable commercial terms could have an adverse effect on Glencore's business, results of operations or financial condition.

The Directors believe that Glencore's large size, global reach and longstanding relationships with third party suppliers of freight give it an advantage in ensuring its commodity transport needs are met. However, there can be no guarantee that Glencore will continue to be able to access freight to support its operations in adequate quantities or at reasonable prices.

Glencore's oil freight operations are affected by fluctuations in freight rates.

Glencore's oil freight desk has a large and diversified fleet of 203 vessels, as at 31 December 2010, operated under various short- and long-term time charters and commercial management arrangements; of which 176 vessels are held under time charter, both from third party owners and from Glencore's own joint-venture and 100 per cent. equity interests, and another 27 vessels are commercially managed for third party owners (not leased or owned). The average remaining fixed charge hire period for the majority of 176 vessels under time charter was approximately two years at such date. In total, Glencore has equity interests in 41 vessels, which are delivered or currently under construction, with expected progressive delivery until March 2012. The majority of these vessels service Glencore's Energy Products business segment.

The freight desk deals with other product desks on an arm's length basis and the other desks are able to "contract" with the freight desk or third party vessel operators; however, Glencore's oil freight desk has a last refusal right. Due to its internal requirements and the Directors' belief in Glencore's ability to achieve vessel utilisation above average industry levels, Glencore generally has a long position in fleet time chartering, thereby creating a significant exposure to fluctuations in spot freight rates. Freight rates are driven by, and generally follow, global patterns of economic development and trade. However, they are also influenced by developments and changes in seaborne and other transportation patterns, new shipbuilding supply, consumption and sourcing patterns, changes in weather patterns, environmental concerns, political conditions, armed conflicts, changes to regulatory regimes, canal and port closures, changes in fuel and lubricant prices, foreign exchange fluctuations, embargoes and strikes. Assuming Glencore holds a long position in freight at any given time, a decrease in freight rates could have a material adverse effect on the performance of Glencore's Energy Products business segment and, in turn, have a material adverse impact on Glencore's overall results of operations and financial condition.

The recent economic downturn led to a significant reduction in freight rates and had an adverse effect on the performance of the freight desk, which experienced significant losses in 2009 and 2010. While freight spot rates have recovered to some extent in the current year, there has yet to be a sustained improvement. There can be no assurance that freight losses will not be experienced in the future, which could have a material adverse effect on Glencore's business, results of operations and financial condition.

Risks relating to Glencore's industrial activities

Glencore holds some of its industrial assets through non-controlling stakes or joint ventures and strategic partnership arrangements.

Glencore does not control a number of its most significant industrial investments (including its stakes in Xstrata, Century Aluminum, Mutanda and UC Rusal). Although Glencore has sought to take steps to protect its industrial activities where it does not exercise control (including entering into a relationship agreement with respect to Xstrata and a shareholders agreement with respect to UC Rusal), the boards of these companies may:

- have economic or business interests or goals that are inconsistent with or are opposed to those of Glencore;
- exercise veto rights or take shareholders' decisions so as to block actions that Glencore believes to be in its best interests and/or in the best interests of all shareholders;
- take action contrary to Glencore's policies or objectives with respect to its investments or commercial arrangements; or

- as a result of financial or other difficulties, be unable or unwilling to fulfil their obligations under any joint venture or other agreement, such as contributing capital to expansion or maintenance projects.

Where projects and operations are controlled and managed by Glencore's co-investors or where control is shared on an equal basis, Glencore may provide expertise and advice, but it has limited or restricted ability to mandate compliance with Glencore's policies and/or objectives. Improper management or ineffective policies, procedures or controls of a non-controlled entity could adversely affect the business, results of operations and financial condition of the relevant investment and, therefore, of Glencore.

Glencore is exposed to the risk of delays in or failure to develop planned expansions or new projects.

Glencore has a number of significant expansions planned for its existing operations and plans for certain new greenfield projects, which Glencore estimates will require capital expenditure of approximately U.S.$5 billion for the three calendar years ending 31 December 2013. See Section IV: "Operating and Financial Review" for a further discussion of this capital expenditure.

The timing, implementation and cost of Glencore's expansion and development projects are subject to a number of risks, including:

- Glencore's continued ability or willingness to fund these projects if their free cash flow generation or prospects are not deemed sufficient;
- the failure to obtain, or termination of, necessary leases, licences, permits, consents and approvals;
- the effects of changes in laws and regulations affecting the countries and industries in which the relevant companies operate;
- construction difficulties, including difficulties related to shortages of equipment, labour or materials;
- work stoppages, weather interferences, unforeseen engineering, design, environmental or geological problems, or unanticipated cost increases;
- instability of production following commissioning;
- underestimation or mismanagement of project risks;
- changes in economic conditions, including a decline in the price of commodities, an increase in expected operational or capital expenditure costs and adverse movements in foreign exchange rates;
- the adverse exercise of regulatory discretion by relevant governments in countries or regions in which the companies engaged in the expansion operate;
- the effects of international and domestic political events; and
- the effects of future litigation, if any.

Any future upward revisions in estimated project costs, delays in completing planned expansions, cost overruns, suspension of current projects or other operational difficulties after commissioning, as a result of the above factors or otherwise, may have a material adverse effect on Glencore's business, results of operations and financial condition, in turn requiring Glencore to consider delaying discretionary expenditures, including capital expenditures, or suspending or altering the scope of one or more of its development projects.

Exploration and development of oil producing assets is highly uncertain. If Glencore is unsuccessful in developing its oil producing assets, its results of operations and growth prospects may be adversely affected.

In addition, there can be no assurance that Glencore will be able to effectively manage the risks arising from expansion of its operations. Glencore's current systems, procedures and controls may need to be expanded and strengthened to support Glencore's future operations. Any failure of Glencore to effectively manage its expansion plans or expanded operations could have a material adverse effect on Glencore's business and results of operations. There is no certainty that all or any of the elements of Glencore's current expansion strategy as described in this Prospectus will be delivered.

Once complete, the results of these projects could differ materially from those anticipated by Glencore and Glencore's significant capital expenditures related to these projects may not be offset by cashflows or other benefits from these projects in the timeframe anticipated by Glencore or at all.

Glencore's industrial activities involve a number of operating risks and hazards, many of which are outside Glencore's control.

Glencore's business is subject to numerous operating risks and hazards normally associated with the development and operation of natural resource projects, many of which are beyond Glencore's control. These operating risks and hazards include unanticipated variations in grade and other geological problems, seismic activity, climatic conditions such as flooding or drought, metallurgical and other processing problems, technical failures, unavailability of materials and equipment, industrial actions or disputes, industrial accidents, labour force disruptions, unanticipated transportation constraints, tribal action or political protests, force majeure factors, environmental hazards, fire, explosions, vandalism and crime. These risks and hazards could result in damage to, or destruction of, properties or production facilities, may cause production to be reduced or to cease at those properties or production facilities, may result in personal injury or death, environmental damage, business interruption and legal liability and may result in actual production differing from estimates of production, including those estimates contained in this Prospectus.

The realisation of such operating risks and hazards and the costs associated with them could materially adversely affect Glencore's business, results of operations and financial condition, including by requiring significant capital and operating expenditures to abate the risk or hazard, restore Glencore or third party property, compensate third parties for any loss and/or pay fines or damages.

Title to the land, resource tenure and extraction rights of industrial activities may be challenged.

Glencore has industrial activities investments in certain countries where title to land and rights in respect of land and resources (including indigenous title) has not been and may not always be clear, creating the potential for disputes over resource development. While Glencore does not believe that any such disputes are imminent, such a dispute, if related to a material industrial asset, could disrupt or delay relevant mining, processing or other projects and/or impede Glencore's ability to develop new industrial properties and may have a material adverse effect on Glencore's business, results of operations and financial condition.

Title to Glencore's mining and hydrocarbon rights may be challenged or impugned, and title insurance may not generally be available. In many cases, the government of the country in which a particular asset is located is the sole authority able to grant such rights and, in some cases, may have limited infrastructure and limited resources which may severely constrain Glencore's ability to ensure that it has obtained secure title to individual exploration licences or extraction rights. Glencore's title may be affected by, among other things, undetected defects. In addition, Glencore may be unable to conduct its activities or operations as permitted or to enforce its rights with respect to its properties. A successful challenge to Glencore's mining and/or hydrocarbon extraction rights may result in Glencore being unable to proceed with the development or continued operation of a mine or project which, in turn, may have a material adverse effect on Glencore's business, results of operations and financial condition.

The production, processing and product delivery capabilities of Glencore's industrial assets rely on their infrastructure being adequate and remaining available.

The mining, drilling, processing, development and exploration activities of the industrial assets in which Glencore holds an interest depend on adequate infrastructure. Certain of these assets are located in areas that are sparsely populated and difficult to access. Reliable roads, power sources, transport infrastructure and water supplies are essential for the conduct of these operations and the availability and cost of these utilities and infrastructure affect capital and operating costs and therefore Glencore's ability to maintain expected levels of production and results of operations. Unusual weather or other natural phenomena, sabotage or other interference in the maintenance or provision of such infrastructure could impact the development of a project, reduce production volumes, increase extraction or exploration costs or delay the transportation of raw materials to the mines and projects and commodities to end customers. Any such issues arising in respect of the infrastructure supporting or on Glencore's sites could have a material adverse effect on Glencore's business, results of operations, financial condition and prospects.

Industrial activities are exposed to an increase in production costs, including as a result of increased energy costs or shortages of equipment, spare parts and labour.

In relation to Glencore's industrial activities, Glencore's main production expenses include personnel expenses, maintenance and repairs, raw materials, energy and contractors. Increased costs could result from a number of factors beyond Glencore's control, including increased charges for fuel, other consumables, electricity, transport or site contractors or increased processing or storage costs for such commodities.

Furthermore, the resources industry is currently experiencing worldwide tightness in certain equipment, spare parts and specialised labour. Such shortages may increase the costs of Glencore's operations as a result of equipment, spare parts or labour becoming more expensive due to increased demand and tight supply. Such shortages may also cause delays to, and quality issues in respect of, Glencore's operations either as a result of equipment used in Glencore's operations being temporarily unavailable or not being available at all or there being insufficient resources to operate equipment or maintain production at the optimum capacity. Any resulting increase in costs or production delays could have a material adverse effect on Glencore's business, results of operations and financial condition.

Glencore's stated mineral and hydrocarbon reserves, resources and mineralised potential are only estimates and the anticipated volumes or grades may not be achieved.

The estimated resources described in this Prospectus should not be interpreted as a statement of the commercial viability, potential or profitability of any future operations. No assurance can be given that the anticipated tonnages and grades will be achieved, that the indicated level of recovery will be realised or that mineral and hydrocarbon reserves, resources and mineralised potential can be extracted or processed profitably. Actual reserves, resources or mineralised potential may not conform to geological, metallurgical or other expectations, and the volume and grade of ore or product recovered may be below the estimated levels. Lower market prices, increased production costs, reduced recovery rates and other factors may render Glencore's reserves, resources or mineralised potential uneconomic to exploit and may result in revision of its reserve estimates from time to time. Reserve data are not indicative of future results of operations. For assets outside the scope of the independent technical reports contained in Section XIV: "Independent Technical Reports", reserve data are based on information collected by Glencore. If Glencore's actual mineral and hydrocarbon reserves and resources are less than current estimates or if Glencore fails to develop its resource base through the realisation of identified or new mineralised potential, Glencore's business, results of operations and financial condition may be materially and adversely affected.

The processes and chemicals used in Glencore's extraction and production methods, as well as its shipping and storage activities, are subject to environmental hazards.

Where Glencore holds or has interests in industrial activities, these assets are generally subject to environmental hazards as a result of the processes and chemicals used in traditional extraction, production, storage, disposal and transportation methods. Environmental hazards may exist on Glencore's owned or leased properties or at those of the industrial activities in which it holds an interest, or may be encountered while its products are in transit. In addition, the storage of tailings at Glencore's industrial assets may present a risk to the environment, property and persons. There remains a risk of leakage from or failure of Glencore's tailings dams, as well as theft and vandalism during the operating life of the assets or after closure.

Additionally, Glencore conducts oil exploration and drilling activities and also stores and transports crude oil and oil products around the world. Damage to exploration or drilling equipment, a vessel carrying oil or to a facility where it is stored could lead to a spill, causing environmental damage with significant clean-up or remediation costs.

Glencore may be liable for losses associated with environmental hazards, have its licences and permits withdrawn or suspended or may be forced to undertake extensive remedial clean-up action or to pay for government-ordered remedial clean-up actions, even in cases where such hazards have been caused by any previous or subsequent owners or operators of the property, by any past or present owners of adjacent properties, by independent third party contractors providing services to Glencore or by acts of vandalism by trespassers. Any such losses, withdrawals, suspensions, actions or payments may have a material adverse effect on Glencore's business, results of operations and financial condition.

Other risks relating to Glencore

Due to the nature of its business and operations, Glencore is exposed to the risks of fraud and corruption.

As a diversified sourcing, marketing and distribution company conducting complex transactions globally, Glencore is exposed to the risks of fraud and corruption both internally and externally.

Glencore's marketing operations are large in scale, which may make fraudulent or accidental transactions difficult to detect. In addition, some of Glencore's industrial activities are located in countries where corruption is generally understood to exist.

Glencore seeks to comply fully with legislation such as the Foreign Corrupt Practices Act and the soon to be enacted Bribery Act and has put in place internal control policies and external diligence and compliance policies. However, there can be no assurance that such procedures and established internal controls will adequately protect it against fraudulent and/or corrupt activity and such activity could have an adverse effect on Glencore's business, reputation, results of operations, financial condition and/or prospects.

Accidents at Glencore's industrial activities, logistics and storage facilities could result in injuries and fatalities.

Any accidents or hazardous incidents causing personal injury or death or property or environmental damage at or to Glencore's mines, smelters, refineries, concentrators, drill rigs or related facilities (such as logistics and storage facilities) or surrounding areas may result in significant losses, interruptions in production, expensive litigation, imposition of penalties and sanctions or suspension or revocation of permits and licences. Risks associated with Glencore's open pit mining operations include flooding of the open pits, collapses of the open pit walls and accidents or failures in operation of large equipment for open pit mining and material transportation. Risks associated with Glencore's underground mining operations include flooding, underground fires and explosions (including those caused by flammable gas), cave-ins or ground falls, discharges of gases or toxic chemicals, sinkhole formation and ground subsidence. Risks associated with Glencore's oil exploration and deepwater drilling activities include explosions, spills and potential large-scale environmental pollution. Risks associated with the group logistics and storage operations may include the risk of ruptures and spills from crude oil and other product carriers; spillage, leakage or seepage of tailings or other hazardous substances found in storage or disposal facilities; and failure of tailings dams during the operating life of the mines or after closure. Injuries to and deaths of workers and contractors at mines and facilities controlled by Glencore have occurred in the past and may occur in the future. If accidents occur in the future, Glencore's business and results of operations may be adversely impacted.

Glencore is subject to risks relating to the processing, storage and transportation of its commodities.

Glencore relies on a network of processing, transportation and storage facilities that are subject to numerous risks and hazards. If any of these risks materialise Glencore's business, results of operations and financial condition could be materially adversely affected.

Glencore's processing and storage facilities, which include ore processing plants, smelters, refineries, grain silos, tank farms and oil terminals, are subject to risks and hazards, including accidental environmental damage, technical failure, vandalism and terrorism. In addition, Glencore also depends upon seaborne freight, rail, trucking, pipeline, overland conveyor and other systems to deliver its commodities to market. Disruption of these transport services due to weather-related problems, key equipment or infrastructure failures, strikes, maritime disaster or other events could temporarily impair Glencore's ability to supply its commodities to its customers and thus could adversely affect Glencore's operations.

Metal processing plants (ore processing plants, smelters and refineries) are especially vulnerable to interruptions, particularly where events cause a stoppage that necessitates a shutdown in operations. Stoppages in smelting, even if lasting only a few hours, can cause the contents of furnaces to solidify, resulting in a plant closure for a significant period and necessitating expensive repairs, any of which could adversely affect Glencore's smelting operations.

Transportation and storage of crude oil and oil products involves significant hazards that could result in fires, explosions, spills, maritime disaster and other unexpected or dangerous conditions. The occurrence of any of these events could result in a material adverse effect, either directly or indirectly, through resulting damages, claims and awards, remediation costs or negative publicity on Glencore's business.

Crop storage entails significant risks associated with the storage environment, including temperature, humidity levels, pests, parasites and/or diseases. Excessively high or low levels of moisture, temperature or humidity may result in damage to stored crops and seeds. An event that destroys or takes all or part of a silo complex or terminal out of service could result in the loss of stored crops and require Glencore to find alternative storage arrangements. Glencore may also be subject to the loss of stored crops as a result of catastrophic events, such as fires, explosions or natural disasters.

In addition, the vessels Glencore uses to transport its products may be exposed to a variety of natural calamities during operations, including violent storms, tidal waves, rogue waves and tsunamis. Any of these natural calamities could result in Glencore's vessels grounding, sinking, colliding with other vessels or property, or the loss of life. If one of the vessels suffers damage, in addition to the potential loss of its cargo, it would need to be repaired, and the costs relating to such losses or repairs may not be covered (either in part or in full) by the insurance policies that are in place. The costs of such repairs are unpredictable and could be substantial. In addition, vessels will require general repair and maintenance from time to time. The loss of earnings while the vessels are being repaired and repositioned, the cost of arranging for alternative transport, as well as the actual cost of such repairs, could adversely affect Glencore's business and results of operations. Furthermore, the vessels Glencore uses to transport its products may be exposed to piracy, terrorist attacks and other events beyond its control. These events could result in adverse effects to Glencore's business as a result of seizure of its cargoes and disruption to its customers' or suppliers' business. While Glencore has procured insurance for its operations against these types of risks, no insurance can compensate for all potential losses and there can be no assurance that the insurance coverage Glencore has will be adequate or that its insurers will pay a particular claim. As is the standard for policies of this type, Glencore's insurance policies do not cover risks arising from damage caused by wear and tear to the vessels that it owns directly or through joint ventures. In the event of damage to, or the loss of, a vessel or vessels and/or their cargoes, lack of adequate insurance coverage may have a material adverse effect on Glencore's business and results of operations.

Glencore is subject to risks relating to product safety and dangerous goods regulations.

Products sold by Glencore are in many cases covered by national and international product safety and dangerous goods regulations. In some instances, product safety regulations (e.g. the EU's Chemical Control Act, REACH) oblige manufacturers and importers to register their products and to regularly monitor and evaluate the risks and hazards of substances (chemicals, metals, etc.) to protect humans and the environment from harm during handling, storage and use. Any failure in complying with these obligations could result in a delay of Glencore's product delivery, a loss of insurance coverage, business interruption on the customer side, administrative or criminal sanctions and, in the extreme, banning (temporarily) from a marketplace. Such events could have a material impact on the local or global demand, reducing Glencore's marketing opportunities for such a product, or at least increase the handling costs while shipping and placing the product in the market, all of which could have a material adverse effect on Glencore's business, results of operations and financial condition.

Glencore is dependent on its financial, accounting, marketing and other data processing information systems to conduct its business.

Glencore's software applications for areas such as traffic, accounting and finance are primarily based on integrated standard components. Glencore's key business processes rely on in-house developed modules and are regularly adapted to suit its business needs. All of these applications are primarily managed from Glencore's headquarters in Baar and are available to all the major business locations. If any of these systems does not operate properly or is disabled, Glencore could suffer, among other things, financial loss, a disruption of its business, liability to its counterparties, regulatory intervention or reputational damage.

In addition, Glencore's operations are dependent on information systems and technology. The cost of maintaining Glencore's information systems may increase from its current level. Glencore relies on its headquarters in Baar, Switzerland, as well as its offices in London, Rotterdam and Stamford, Connecticut for the continued operation of its business. Glencore has taken precautions through disaster recovery sites to limit the impact that a disruption to these key offices could cause. Although precautions have been taken and plans are in place, a disaster or a disruption in the infrastructure at a main site and its disaster recovery site that supports Glencore's business, including a disruption involving electronic communications or other services used by it or third parties with whom it conducts business, or directly affecting its headquarters or other key offices, could have a material adverse impact on its ability to continue to operate its business without interruption. In addition, insurance and other safeguards might only partially reimburse Glencore for its losses, if at all.

Although Glencore performs and backs up all key functions of its business internally, it relies on third party products and services providers widely used in the industry for certain aspects of its business, including for certain information systems and technology. Severe interruptions or deteriorations in the performance of these third parties or failures of their information systems and technology could impair Glencore's operations.

Glencore is subject to a significant number of laws and regulations.

Glencore's activities are subject to extensive laws and regulations governing various matters. These include laws and regulations relating to taxation, anti-trust, environmental protection, management and use of hazardous substances and explosives, management of natural resources, licences over resources owned by various governments, exploration, development of projects, production and post-closure reclamation, the employment of expatriates, labour and occupational health and safety standards, and historic and cultural preservation. Additionally, in many of the developing countries where Glencore operates, the legal systems may not be mature and legal practice may not be developed, such that, in certain cases, there may be significant uncertainty as to the correct legal position as well as the possibility of laws changing or new laws and regulations being enacted, which has the potential to increase risk and compliance costs.

These laws and regulations may allow governmental authorities and private parties to bring lawsuits based upon damages to property and injury to persons resulting from the environmental, health and safety and other impacts of Glencore's past and current operations, and could lead to the imposition of substantial fines, penalties, other civil or criminal sanctions, the curtailment or cessation of operations, orders to pay compensation, orders to remedy the effects of violations and/or orders to take preventative steps against possible future violations. Moreover, the costs associated with compliance with these laws and regulations are substantial. More stringent enforcement or restrictive interpretation of current laws and regulations by governmental authorities or rulings or clearances obtained from such governmental authorities could cause additional expenditure (including capital expenditure) to be incurred or impose restrictions on or suspensions of Glencore's operations and delays in the development of its properties.

Glencore's subsidiaries and the companies in which Glencore holds investments are generally required, under applicable laws and regulations, to seek governmental licences, permits, authorisations, concessions and other approvals in connection with their activities. Obtaining the necessary governmental permits can be a particularly complex and time-consuming process and may involve costly undertakings. The duration and success of permit applications are contingent on many factors, including those outside Glencore's control. Failure to obtain or renew a necessary permit could mean that such companies would be unable to proceed with the development or continued operation of a mine or project, which, in turn, may have a material adverse effect on Glencore's business, results of operations, financial condition and prospects.

In addition, the enactment of new laws and regulations and changes to existing laws and regulations (including, but not restricted to, environmental laws, the imposition of higher licence fees, mining and hydrocarbon royalties or taxes), compliance with which could be expensive or onerous, could also have a material adverse impact on Glencore's ability to operate its business and/or the profitability of its industrial investments.

Glencore's smelting and mineral processing operations are generally energy intensive and depend heavily on fossil fuels. In addition, the methods of transportation used by Glencore's marketing operations in order to deliver commodities to customers around the world depend heavily on fossil fuels. Increasing regulation of greenhouse gas emissions, including the progressive introduction of carbon emissions trading mechanisms and tighter emission reduction targets in numerous jurisdictions in which Glencore operates is likely to raise energy costs and costs of production in the future. Regulation of greenhouse gas emissions in the jurisdictions of Glencore's major customers and in relation to international shipping could also have a material adverse effect on the demand for Glencore's products.

Social, economic and other risks in the markets where Glencore operates may cause serious disruptions to its business.

Through the geographic diversity of its operations, Glencore is exposed to risks of political unrest, strikes, war and economic and other forms of instability, such as natural disasters, epidemics, widespread transmission or communicable or infectious diseases, acts of God, terrorist attacks and other events beyond its control that may adversely affect local economies, infrastructure and livelihoods.

These events could result in disruption to Glencore's, its customers' or suppliers' businesses and seizure of, or damage to, any of their cargoes or assets. Such events could also cause the destruction of key equipment and infrastructure (including infrastructure located at or serving Glencore's industrial activities as well as the infrastructure that supports the freight and logistics required by Glencore's marketing operations). These events could also result in the partial or complete closure of particular ports or significant sea passages, such as the Suez or Panama canals or the Straits of Hormuz, potentially resulting in higher costs, congestions of ports or sea passages, vessel delays or cancellations on some trade routes. Any of these events could adversely impact Glencore's business and results of operations.

Glencore's reputation in the communities in which it operates could deteriorate.

If it is perceived that Glencore is not respecting or advancing the economic and social progress and safety of the communities in which it operates, Glencore's reputation and shareholder value could be damaged, which could have a negative impact on its "licences to operate", its ability to secure new resources and its financial performance.

Some of Glencore's current and potential industrial activities are located in or near communities that may regard such operations as having a detrimental effect on their safety or environmental, economic or social circumstances. The consequences of negative community reaction could also have a material adverse impact on the cost, profitability, ability to finance or even the viability of an operation. Such events could lead to disputes with national or local governments or with local communities or any other stakeholders and give rise to material reputational damage. If Glencore's operations are delayed or shut down as a result of political and community instability, its earnings may be constrained and the long-term value of its business could be adversely impacted. Even in cases where no action adverse to Glencore is actually taken, the uncertainty associated with such political or community instability could negatively impact the perceived value of Glencore's assets and industrial investments and, consequently, have a material adverse effect on Glencore's financial condition.

Glencore may fail to make successful acquisitions or fail to integrate acquisitions effectively.

From time to time, Glencore considers the acquisition of complementary businesses or assets where the opportunity is presented to do so at attractive prices. Business combinations entail a number of risks, including the ability of Glencore to integrate effectively the businesses acquired with their existing operations (including the realisation of synergies, significant one-time write-offs or restructuring charges, difficulties in achieving optimal tax structures and unanticipated costs). All of these may be exacerbated by the diversion of the Directors' attention away from other ongoing business concerns. In addition, although Glencore does not currently have significant shares of the total market for commodities which it markets (as set out in the section titled "Presentation of Information"), further acquisitions to be made by Glencore may be subject to certain approvals (e.g. anti-trust approvals) which may or may not be obtained. Glencore may also be liable for the past acts, omissions or liabilities of companies or businesses it has acquired, which may be unforeseen or greater than anticipated at the time of the relevant acquisition. In addition, various factors could impact Glencore's estimated synergies for potential acquisitions and have a material adverse impact on Glencore's business, results of operations and financial condition.

The industries in which Glencore operates are subject to a wide range of risks as described elsewhere in this section, not all of which can be covered, adequately or at all, by Glencore's insurance programme.

Glencore has a broad insurance programme in place which provides coverage for operations at a level believed by the Directors to be appropriate for the risks associated therewith. Such insurance protection is maintained with leading international insurance providers and includes coverage for physical loss and damage to owned vessels and kidnap and ransom, as well as third party liability, including for pollution. However, although Glencore's insurance is intended to cover the majority of the risks to which Glencore is exposed, it cannot account for every potential risk associated with its operations. Adequate coverage at reasonable rates is not always commercially available to cover all potential risks and no assurance can be given that, where available, such coverage would be sufficient to cover all loss and liability to which Glencore may be exposed. The occurrence of a significant adverse event not fully or partially covered by insurance could have a material adverse effect on Glencore's business, results of operations and financial condition.

The maintenance of positive employee relations and the ability to attract and retain skilled workers is key to the successful operation of Glencore's industrial activities.

Some of Glencore's employees, as well as employees in non-controlled industrial investments, are represented by labour unions under various collective labour agreements. Glencore, its subsidiaries or the industrial investments in which it holds an interest may not be able to satisfactorily renegotiate its collective labour agreements when they expire and may face tougher negotiations or higher wage demands than would be the case for non-unionised labour. In addition, existing labour agreements may not prevent a strike or work stoppage at its facilities in the future, and any strike or other work stoppage could have a material adverse effect on Glencore's business, results of operations and financial condition. Glencore's industrial activities have experienced strikes and other labour disputes in the past. Prodeco, in particular, experienced a 38-day strike by employees at one of La Jagua's concessions in 2010 and the Directors believe that strikes and other industrial actions will remain a risk to the business for the foreseeable future.

The success of Glencore's business is also dependent on its ability to attract and retain highly qualified and skilled engineers and other industrial, technical and project experts to operate its industrial activities in locations experiencing political or civil unrest, or in which they may be exposed to other hazardous conditions. Glencore may not be able to attract and retain such qualified personnel and this could have a material adverse effect on Glencore's business, results of operations and financial condition.

Risks relating to an investment in the Ordinary Shares

The price of the Ordinary Shares is subject to volatility.

The share prices of publicly traded companies can be highly volatile. The market price of the Ordinary Shares could be subject to significant fluctuations due to a change in sentiment in the market regarding the Ordinary Shares (or securities similar to them), including, in particular, in response to various facts and events, including any regulatory changes affecting Glencore's operations, variations in Glencore's operating results and/or business developments of Glencore and/or its competitors, the operating and share price performance of other companies in the industries and markets in which Glencore operates, large sales or purchases of shares, the publication of research analysts' reports regarding Glencore, its competitors or the sectors in which Glencore operates generally and general economic conditions unrelated to Glencore's actual performance or conditions in its key markets. Stock markets have in the past, and particularly in recent times, experienced significant price and volume fluctuations which have affected market prices of publicly traded companies' securities. Prior to the Global Offer, there has been no public market for the Ordinary Shares. A listing on the London Stock Exchange and the Hong Kong Stock Exchange does not guarantee, and Glencore can give no assurance, notwithstanding Admission, that active trading markets in the Ordinary Shares will develop or, if developed, that it will be sustained, stable or regarding the liquidity of that market. Furthermore, Glencore's operating results and prospects from time to time may be below the expectations of market analysts and investors. Any of these events could result in a decline in the market price of the Ordinary Shares. In addition, there is also no guarantee that the Ordinary Shares will remain listed on the London Stock Exchange and the Hong Kong Stock Exchange, and failure to maintain the Company's listings on these exchanges could adversely affect the liquidity of the market for the Ordinary Shares.

Future share issues by the Company and/or sales by Shareholders could lower the market price of the Ordinary Shares and adversely affect Glencore's ability to raise capital in the future. Further share issues could also dilute the interests of Shareholders.

The issue of additional shares by the Company or the sale or transfer of Ordinary Shares or the possibility of such issue or sale may cause the market price of the Ordinary Shares to fluctuate or decline or be lower than might otherwise be the case or result in the dilution of the interests of Shareholders. In particular, following Admission, it is expected that Existing Shareholders will control, in aggregate, approximately 83.6 per cent. of the Ordinary Shares (assuming no acquisition of Over-Allotment Shares pursuant to the Over-Allotment Option) and, notwithstanding the lock-up arrangements that Glencore has put in place with its Existing Shareholders, the possibility of significant sales by those Existing Shareholders may cause the market price of the Ordinary Shares to fluctuate or decline. In particular, there can be no assurance that there will be no significant disposals of Ordinary Shares following the expiry of the lock-up arrangements. Future share sales, or perceived future share sales, of substantial numbers of Ordinary Shares could materially and adversely affect Glencore's ability to raise capital in the future at a time and price favourable to Glencore.

Investors in the Global Offer may suffer a dilution in their interest upon any conversions by the holders of the Convertible Bonds.

Glencore Finance (Europe) S.A., one of Glencore's financing vehicles, has issued U.S.$2.3 billion guaranteed convertible bonds due 2014 (the "Convertible Bonds"). Following Admission, investors in the Convertible Bonds will be eligible to convert their bonds into Ordinary Shares of Glencore, which would in total represent 5.5 per cent. of the total issued share capital of the Company following Admission, assuming an Offer Price at the mid-point of the Offer Price Range, the Over-Allotment Option is not exercised and the Kazzinc Consideration Shares have not been issued. Any such conversions will have the effect of diluting the interest of the investors in the Global Offer.

Exchange rate fluctuations may adversely affect the foreign currency value of the Ordinary Shares and any dividends.

The Ordinary Shares will be quoted in pounds sterling on the London Stock Exchange and in Hong Kong dollars on the Hong Kong Stock Exchange. Dividends in respect of the Ordinary Shares, if any, will be declared in U.S. Dollars. Glencore's financial statements are, however, prepared in U.S. dollars. Fluctuations in the exchange rate between the U.S. dollar and each of the pounds sterling and the Hong Kong dollar will affect, amongst other matters, the pounds sterling and Hong Kong dollar value of the Ordinary Shares and of any dividends.

Shareholders in the U.S. may not be able to participate in future equity offerings.

The Articles provide for pre-emptive rights to be granted to Shareholders unless such rights are disapplied by a shareholder resolution. Shareholders in the U.S. may, however, not be entitled to exercise these rights unless the rights or Ordinary Shares are registered under the Securities Act or the Company has available to it, and utilises, an exemption from the registration requirements of the Securities Act.

There can be no assurance that the Company will file any such registration statement, or that an exemption from the registration requirements of the Securities Act will be available, which could result in Shareholders in the U.S. being unable to exercise their pre-emptive rights. The Company would expect to evaluate at the time of any rights or similar offering the costs and potential liabilities associated with any such registration statement or qualifying for an exemption from registration, as well as the indirect benefits of enabling Shareholders in the U.S. to exercise any pre-emptive rights for Ordinary Shares and any other factors considered appropriate at the time, prior to making a decision whether to file a registration statement with the U.S. Securities and Exchange Commission or utilise an exemption from the registration requirements of the Securities Act.

The Company and certain of its operating subsidiaries and associates may be subject to restrictions on their ability to pay dividends.

Glencore's results of operations and financial condition are entirely dependent on the financial performance of members and associates of the Glencore Group other than the Company. The Company's ability to pay dividends will depend, among other things, on the level of distributions, if any, received from the Company's operating subsidiaries and interests, and its level of cash balances. Certain of the Company's operating subsidiaries may, from time to time, be subject to restrictions on their ability to make distributions to the Company or return cash to it by other means, and there can be no assurance that such restrictions will not have a material adverse effect on the market price of the Ordinary Shares.

The rights afforded to Shareholders are governed by Jersey law. Not all rights available to shareholders under English law, Hong Kong law or U.S. law will be available to Shareholders.

The rights afforded to Shareholders will be governed by Jersey law and by the Articles, and these rights differ in certain respects from the rights of shareholders in typical English and Hong Kong companies and U.S. corporations. In particular, Jersey law significantly limits the circumstances under which shareholders of companies may bring derivative actions and, in most cases, only the corporation may be the proper claimant or plaintiff for the purposes of maintaining proceedings in respect of any wrongful act committed against it. Neither an individual nor any group of shareholders has any right of action in such circumstances. In addition, Jersey law does not afford appraisal rights to dissenting shareholders in the form typically available to shareholders of a U.S. corporation.

Foreign investors may find it difficult to enforce foreign judgments obtained against Glencore or any of its Affiliates.

The Company is a holding company organised as a public limited company incorporated in Jersey with business operations conducted through various subsidiaries. The majority of the Directors and all of its officers reside outside the U.S. In addition, substantially all of the Company's assets and the majority of the assets of its Directors and officers are located outside the U.S. As a result, it may not be possible for U.S. investors to effect service of process within the U.S. upon the Company or its Directors and officers located outside the U.S. or to enforce, in the U.S. courts or outside the U.S., judgments obtained against them in U.S. courts or in courts outside the U.S., including judgments predicated upon the civil liability provisions of the U.S. federal securities laws or the securities laws of any state or territory within the U.S.

There is also doubt as to the enforceability in England and Wales, Jersey, Switzerland and/or Hong Kong, whether by original actions or by seeking to enforce judgments of U.S. courts, of claims based on the federal securities laws of the U.S. In addition, punitive damages in actions brought in the U.S. or elsewhere may be unenforceable in England and Wales, Jersey, Switzerland and/or Hong Kong.

Risks related to the dual listing

The London Stock Exchange and the Hong Kong Stock Exchange have different characteristics.

Following the Global Offer, the International Offer Shares and the Hong Kong Offer Shares will be fungible and able to be traded on the London Stock Exchange or the Hong Kong Stock Exchange. Shareholders resident in Hong Kong will be able to hold their Ordinary Shares on a branch register of the Company maintained in Hong Kong. As there is no direct trading or settlement between the stock markets of London and Hong Kong, the time required to move Ordinary Shares held on the branch register of the Company maintained in Hong Kong to the principal share register of the Company maintained in Jersey (and vice versa) may vary and there is no certainty of when Ordinary Shares that are moved will be available for trading or settlement.

In addition, the London Stock Exchange and the Hong Kong Stock Exchange have different trading hours, trading characteristics (including trading volume and liquidity), trading and listing rules and investor bases (including different levels of retail and institutional participation). As a result of these differences, the trading price of the Ordinary Shares on the London Stock Exchange and the Hong Kong Stock Exchange may not be the same at any given time.

Furthermore, fluctuations in the Ordinary Share price on the London Stock Exchange could materially and adversely affect the Ordinary Share price on the Hong Kong Stock Exchange (and vice versa). Moreover, fluctuations in the exchange rate between United Kingdom pounds sterling and Hong Kong dollars could materially and adversely affect the prices of the Ordinary Shares listed on the London Stock Exchange and the Hong Kong Stock Exchange.

In addition and in accordance with the terms of the Underwriting Agreement, in the event that the Company, the Selling Shareholder and the Joint Global Co-ordinators (on behalf of the Banks) decide following the date of this Prospectus not to proceed with the Hong Kong Offer, the parties reserve the right to proceed with the International Offer and the Hong Kong Offer Shares will be made available in the International Offer on the basis of the information contained in this Prospectus. In such circumstances, HK Admission would not occur and there would be no listing of the Ordinary Shares on the Hong Kong Stock Exchange.

As a company due to be listed on the London Stock Exchange and the Hong Kong Stock Exchange, the Company will be subject to both United Kingdom and Hong Kong laws, regulations and policies.

Hong Kong laws, regulations and policies may differ in some respects from comparable laws, regulations and policies in the United Kingdom. The differences in compliance requirements may subject the Company to additional regulatory burdens. In the event of any conflict between the applicable laws, regulations and policies in the United Kingdom and those in Hong Kong, the Company will have to comply with the more onerous rules and may incur additional costs and require additional resources.

Certain Hong Kong laws and regulations will not apply to the Company.

The Company, whose primary listing on Admission will be on the London Stock Exchange, has applied for, and the Hong Kong Stock Exchange and the SFC have granted, a number of waivers and exemptions from Hong Kong laws and regulations.

Shareholders therefore will not obtain the rights and benefits afforded under those Hong Kong laws and regulations for which the Company has been granted waivers and exemptions by the Hong Kong Stock Exchange and the SFC. Additionally, if any of these waivers or exemptions were to be revoked, the Company may be subject to additional legal and compliance obligations, which might be costly and time consuming to comply with, which could adversely affect the Company and Shareholders.

DIRECTORS, SECRETARY, HEAD OFFICE AND ADVISERS

Directors	Simon Murray	*(Independent Chairman)*
	Ivan Glasenberg	*(Chief Executive Officer)*
	Steven Kalmin	*(Chief Financial Officer)*
	Anthony Hayward	*(Senior Non-Executive Director)*
	Peter Coates	*(Non-Executive Director)*
	Leonhard Fischer	*(Non-Executive Director)*
	William Macaulay	*(Non-Executive Director)*
	Li Ning	*(Non-Executive Director)*
Company Secretary	Prism CoSec Limited 271 Regent Street London W1B 2ES	
Assistant Company Secretary	Soon Yuk Tai Tricor Services Limited Level 28, Three Pacific Place 1 Queens Road East Hong Kong	
Registered Office	Queensway House Hilgrove Street St Helier Jersey JE1 1ES	
Headquarters	Baarermattstrasse 3 P.O. Box 777 CH-6341 Baar Switzerland	
UK Sponsors	Citigroup Global Markets Limited Citigroup Centre Canada Square London E14 5LB United Kingdom	
	Morgan Stanley & Co. International plc 25 Cabot Square London E14 4QA United Kingdom	
HK Sponsors	Citigroup Global Markets Asia Limited 50th Floor, Citibank Tower Citibank Plaza, 3 Garden Road Central Hong Kong	
	Morgan Stanley Asia Limited 46th Floor, International Commerce Centre I Austin Road West Kowloon Hong Kong	

Joint Global Co-ordinators	Citigroup Global Markets U.K. Equity Limited Citigroup Centre Canada Square London E14 5LB United Kingdom
	Morgan Stanley & Co. International plc 25 Cabot Square London E14 5LB United Kingdom
	Credit Suisse Securities (Europe) Limited One Cabot Square London E14 4QJ United Kingdom
Joint Bookrunners	Citigroup Global Markets U.K. Equity Limited Citigroup Centre Canada Square London E14 5LB United Kingdom
	Credit Suisse Securities (Europe) Limited One Cabot Square London E14 4QJ United Kingdom
	Morgan Stanley Securities Limited 25 Cabot Square London E14 5LB United Kingdom
	Citigroup Global Markets Asia Limited 50th Floor, Citibank Tower Citibank Plaza, 3 Garden Road Central Hong Kong
	Credit Suisse (Hong Kong) Limited 45/F, Two Exchange Square 8 Connaught Place Central Hong Kong
	Morgan Stanley Asia Limited 46th Floor, International Commerce Centre 1 Austin Road West Kowloon Hong Kong
Legal Adviser to the Company as to English, Hong Kong and U.S. law	Linklaters LLP One Silk Street London EC2Y 8HQ United Kingdom
	Linklaters 10th Floor Alexandra House Chater Road Hong Kong

Legal Adviser to the Company as to Jersey law	Mourant Ozannes 22 Grenville Street St Helier Jersey JE4 8PX
Legal Adviser to the Underwriters as to English, Hong Kong and U.S. law	Clifford Chance LLP 10 Upper Bank Street London E14 5JJ United Kingdom Clifford Chance 28th Floor Jardine House One Connaught Place Hong Kong
Legal Adviser to the Underwriters as to Jersey law	Ogier 11th Floor, Central Tower Queen's Road Central Hong Kong
Reporting Accountants	Deloitte LLP 2 New Street Square London EC4A 3BZ United Kingdom
Auditors	Deloitte AG General Guisan-Quai 38 P.O. Box 2232 CH-8022 Zurich Switzerland
Mineral Expert in respect of Kazzinc	Wardell Armstrong International Wheal Jane Baldhu Truro Cornwall TR3 6EH United Kingdom
Mineral Expert in respect of Prodeco	Minarco-MineConsult Pty Ltd. Level 16, Australia Square 264-278 George Street Sydney NSW 2000 Australia McElroy Bryan Geological Services Pty Ltd. Level 1, 680 Willoughby Road Willoughby Sydney New South Wales Australia
Mineral Expert in respect of Mopani, Katanga and Mutanda	Golder Associates South Africa (Pty) Limited Thandanani Park Matuka Close Midrand South Africa

Registrars	Computershare Investor Services (Jersey) Limited Queensway House Hilgrove Street St Helier Jersey JE1 1ES
	Computershare Hong Kong Investor Services Limited Shops 1712-1716, 17th Floor Hopewell Centre 183 Queen's Road East Wan Chai Hong Kong

GLOBAL OFFER STATISTICS

Offer Price Range (per Ordinary Share)[1]	480 to 580 pence
Maximum number of Ordinary Shares available under the Global Offer	1,250,000,000
Number of Ordinary Shares expected to be issued and sold in the Global Offer[2][3]	1,132,075,472
—New Offer Shares	893,292,886
—Sale Shares	238,782,586
Percentage of the issued Ordinary Share capital expected to be issued and sold in the Global Offer[2]	16.4%
Number of Ordinary Shares subject to the Over-Allotment Option[4]	113,207,547
Number of Ordinary Shares expected to be in issue following the Global Offer[2][5][6]	6,893,292,886
Expected market capitalisation of the Company at the Offer Price[2][6]	U.S.$60.9 billion
Estimated net proceeds of the Global Offer receivable by the Company[7]	U.S.$7,456 million

Notes:

(1) The Offer Price may be set within, above or below the Offer Price Range. To the fullest extent permitted by law, applications received under the International Offer are irrevocable and are based on the amount the applicant wishes to invest and not the number of Ordinary Shares or the Offer Price. It is expected that the Pricing Statement containing the Offer Price and the number of Ordinary Shares which are the subject of the Global Offer will be published on or about 19 May 2011. Further details of the Global Offer are contained in Section VIII: "Details of the Global Offer".

(2) Assumes an Offer Price at the mid-point of the Offer Price Range, the Over-Allotment Option is not exercised and there is no conversion of the Convertible Bonds.

(3) The Company will determine the aggregate number of Offer Shares, the number of New Offer Shares and the number of Sale Shares in light of the determination of the Offer Price on the Price Determination Date. In the Global Offer, the Company and the Selling Shareholder together intend to raise aggregate gross proceeds equivalent to approximately U.S.$10 billion at exchange rates prevailing at the Price Determination Date. The number of Sale Shares will be determined by the Company and the Selling Shareholder by reference to the Offer Price, exchange rates prevailing at the Price Determination Date, and the aggregate amount of the expected tax liabilities and loan repayments of Existing Shareholders. The number of New Offer Shares will (subject to the Company's right to increase or decrease the number of Ordinary Shares issued and/or sold under the Global Offer, as set out in Section VIII: "Details of the Global Offer") be determined so as to provide the balance of the intended aggregate gross proceeds of the Global Offer. The Company and the Selling Shareholder also reserve the right to increase or decrease the intended aggregate gross proceeds amount, subject to no more than 1,250,000,000 Ordinary Shares being issued and/or sold in the Global Offer. The aggregate number of Offer Shares, the number of Sale Shares and the number of New Offer Shares will each be set out in the Pricing Statement.

(4) Assumes an Offer Price at the mid-point of the Offer Price Range.

(5) Following Admission, investors in the Convertible Bonds will be eligible to convert their bonds into Ordinary Shares, which would in total represent 5.5 per cent. of the total issued share capital of the Company following Admission and following conversion, assuming an Offer Price at the mid-point of the Offer Price Range, the Over-Allotment Option is not exercised and the Kazzinc Consideration Shares have not been issued.

(6) Assumes that the Kazzinc Consideration Shares have not been issued.

(7) The estimated net proceeds receivable by the Company are stated after deduction of the estimated underwriting commissions and estimated expenses of the Global Offer (including Swiss federal issuance stamp tax payable in connection with the Restructuring and the Global Offer and VAT) payable by the Company, which are currently expected to be approximately U.S.$434.6 million, and assumes the Over-Allotment Option is not exercised. The Company will not receive any portion of the proceeds resulting from the sale of the Sale Shares by the Selling Shareholder in the Global Offer (other than where proceeds are paid to Glencore in respect of tax liabilities settled by the Company on behalf of certain Existing Shareholders where the Glencore Group has a withholding tax or other legal obligation to do so and in certain cases to repay a small tranche of outstanding loans extended by companies within the Glencore Group).

EXPECTED TIMETABLE OF PRINCIPAL EVENTS IN THE UK

Announcement of Offer Price Range	4 May 2011
Price Range Prospectus published	4 May 2011
Announcement of results of the Global Offer and notification of allocations[1]	7.00 a.m. on 19 May 2011
Publication of the Pricing Statement containing the Offer Price[1][2]	19 May 2011
Commencement of conditional dealings in Ordinary Shares on the London Stock Exchange	8.00 a.m. on 19 May 2011
UK Admission and commencement of unconditional dealings in Ordinary Shares on the London Stock Exchange	8.00 a.m. on 24 May 2011
Crediting of Ordinary Shares to CREST accounts	8.00 a.m. on 24 May 2011
Despatch of definitive share certificates (where applicable)	Week commencing 6 June 2011

Each of the times and dates in the above timetable is subject to change without further notice. References to times are to London time unless otherwise stated.

It should be noted that, if UK Admission does not occur for any reason (including the Restructuring not being implemented in all material respects as described in paragraph 3 of Section X: "Additional Information"), all conditional dealings will be of no effect and any such dealings will be at the sole risk of the parties concerned. Temporary documents of title will not be issued.

Notes:

(1) The announcement of results of the Global Offer and notification of allocations and publication of the Pricing Statement containing the Offer Price as set out in the expected timetable of principal events in the UK above and mentioned throughout this document may be adjusted in event of a "black" rainstorm warning or a tropical cyclone warning signal number 8 or above in force in Hong Kong at any time between 9.00 a.m. and 12.00 noon (Hong Kong time) on 18 May 2011, in which case details of the new dates and times will be announced publicly.

(2) The Pricing Statement will not automatically be sent to persons who receive this document but it will be available free of charge at the registered office of the Company (Queensway House, Hilgrove Street, St. Helier, Jersey JE1 1ES). In addition, the Pricing Statement will, subject to certain restrictions, be published in electronic form and be available on the Company's website at www.glencore.com.

EXPECTED TIMETABLE OF PRINCIPAL EVENTS IN HONG KONG

Opening of the Hong Kong Offer to retail investors in Hong Kong . . .	9.00 a.m. on 13 May 2011
Latest time to complete electronic applications under White Form eIPO Service through the designated website www.eipo.com.hk	11.30 a.m. on 18 May 2011
Application list open[(1)]	11.45 a.m. on 18 May 2011
Latest time for lodging Application Forms and giving electronic application instructions to HKSCC	12 noon on 18 May 2011
Latest time to complete payment of the White Form eIPO applications by effecting internet banking transfer(s) or PPS payment transfer . . .	12 noon on 18 May 2011
Application lists close	12 noon on 18 May 2011
Expected Price Determination Date	19 May 2011[(2)]
Announcement of the Offer Price	19 May 2011
Announcement of an indication of the level of interest in the International Offer, the level of applications in the Hong Kong Offer and the basis of allotment under the Hong Kong Offer to be published in the South China Morning Post (in English) and the Hong Kong Economic Times (in Chinese) and on the websites of the Hong Kong Stock Exchange at www.hkexnews.hk[(3)] and the Company at www.glencore.com on or before	24 May 2011
Results of allocations under the Hong Kong Offer (with successful applicants' identification document numbers or Hong Kong business registration numbers, where appropriate) to be available through a variety of channels and at www.iporesults.com.hk with a "search by ID" function from	24 May 2011
Despatch of share certificates or deposit of share certificates in CCASS in respect of wholly or partially successful applications in the Hong Kong Offer on or before[(4)]	24 May 2011
Despatch of refund cheques or white form e-Refund payment instructions/refund cheques in respect of wholly or partially unsuccessful applications in the Hong Kong Offer on or before	24 May 2011
Commencement of unconditional dealings in Ordinary Shares on the Hong Kong Stock Exchange expected from	9.00 a.m. on 25 May 2011

Each of the times and dates in the above timetable is subject to change without further notice. The Company will issue an announcement in Hong Kong to be published in the South China Morning Post (in English) and the Hong Kong Economic Times (in Chinese) if there is any change in the expected timetable of the Hong Kong Offer. References to times and dates are to Hong Kong time and dates unless otherwise stated.

Notes:

(1) If there is a "black" rainstorm warning or a tropical cyclone warning signal number 8 or above in force in Hong Kong at any time between 9.00 a.m. and 12.00 noon on 18 May 2011, the application lists will not open and close on that day.

(2) Please note that the price will be determined at the close of business in London on 18 May 2011.

(3) The announcement will be available for viewing on the "Main Board—Results of Allotment" page on the Hong Kong Stock Exchange's website.

(4) Notwithstanding the despatch of share certificates, share certificates will become valid only if the Global Offer has become unconditional in all respects (including the Underwriting Agreement not having been terminated in accordance with their terms). Investors who trade Ordinary Shares on the basis of publicly available allocation details or prior to the receipt of the share certificates do so entirely at their own risk.

PRESENTATION OF INFORMATION

General

Investors should rely only on the information in this Prospectus. No person has been authorised to give any information or to make any representations other than those contained in this Prospectus in connection with the Global Offer and, if given or made, such information or representations must not be relied upon as having been authorised by or on behalf of the Company, the Directors, the Selling Shareholder, the Existing Shareholders or the Banks. No representation or warranty, express or implied, is made by any Bank or any selling agent as to the accuracy or completeness of such information, and nothing contained in this Prospectus is, or should be relied upon as, a promise or representation by the Banks or any selling agent as to the past, present or future. In particular, the content of the Company's website (www.glencore.com) does not form part of this Prospectus and prospective investors should not rely on it. Further, Glencore does not accept any responsibility for the accuracy or completeness of any information reported by the press or other media, nor the fairness or appropriateness of any forecasts, views or opinions expressed by the press or other media regarding the Global Offer or Glencore. Glencore makes no representation as to the appropriateness, accuracy, completeness or reliability of any such information or publication.

Without prejudice to any obligation of the Company to publish a supplementary prospectus pursuant to section 87G of the FSMA and PR 3.4.1 of the Prospectus Rules, neither the delivery of this Prospectus nor any subscription or sale made under this Prospectus shall, under any circumstances, create any implication that there has been no change in the business or affairs of Glencore taken as a whole since the date hereof or that the information contained herein is correct as of any time subsequent to its date.

The contents of this Prospectus are not to be construed as legal, business or tax advice. Each prospective investor should consult his or her own lawyer, financial adviser or tax adviser for legal, financial or tax advice in relation to any subscription, purchase or proposed subscription or purchase of Ordinary Shares.

In connection with the Global Offer, the Banks and any of their affiliates, acting as investors for their own accounts, may subscribe for and/or purchase Ordinary Shares, and in that capacity may retain, purchase, sell, offer to sell or otherwise deal for their own accounts in such Ordinary Shares and other securities of the Company or related investments in connection with the Global Offer or otherwise. Accordingly, references in this Prospectus to the Ordinary Shares being issued, offered, subscribed, purchased, acquired, placed or otherwise dealt in should be read as including any issue or offer to, or subscription, purchase, acquisition, placing or dealing by, any Bank and any of its affiliates acting as an investor for its own accounts. The Banks do not intend to disclose the extent of any such investment or transactions otherwise than in accordance with any legal or regulatory obligations to do so.

None of the Company, the Directors, the Selling Shareholder, the Existing Shareholders or the Banks is making any representation to any offeree or purchaser of the Ordinary Shares regarding the legality of an investment by such offeree or purchaser.

Apart from the responsibilities and liabilities, if any, which may be imposed on the Banks by the FSMA, Hong Kong or the regulatory regime established thereunder or thereby or any other applicable regulatory regime, the Banks accept no responsibility whatsoever for the contents of this Prospectus or for any other statement made or purported to be made in it, in connection with the Company, the Ordinary Shares or the Global Offer. The Banks accordingly disclaim all and any liability whether arising in tort, contract or otherwise (save as referred to above) which they might otherwise have in respect of this Prospectus or any such statement.

No representation or warranty, express or implied, is made by the Banks named herein as to the accuracy or completeness of information contained in this Prospectus, and nothing in this Prospectus is, or shall be relied upon as, a promise or representation by the Banks.

Prior to making any decision as to whether to subscribe for or purchase the Ordinary Shares, prospective investors should read this Prospectus in its entirety. In making an investment decision, prospective investors must rely upon their own examination of the Company and the terms of this Prospectus, including the risks involved.

The investors also acknowledge that: (i) they have not relied on the Underwriters or any person affiliated with the Underwriters in connection with any investigation of the accuracy of any information contained in this Prospectus or their investment decision; and (ii) they have relied only on the information contained in this document, and that no person has been authorised to give any information or to make any representation concerning the Company or its subsidiaries or the Ordinary Shares (other than as contained in this document) and, if given or made, any such other information or representation should not be relied upon as having been authorised by the Company, the Selling Shareholder or the Underwriters.

Presentation of financial information and non-financial operating data

Historical financial information

The historical financial information in this Prospectus has been prepared in accordance with the requirements of the Prospectus Directive regulation, the UK Listing Rules, and IFRS issued by the International Accounting Standards Board ("IASB") and as adopted for use in the EU. The basis of preparation is further explained in Part VI: "Historical Financial Information". The historical financial information presented in this Prospectus consists of audited consolidated financial information for the years ended 31 December 2008, 31 December 2009 and 31 December 2010. The consolidated historical financial information contained in Section VI: "Historical Financial Information" has been prepared on a basis that consolidates the assets and liabilities of the companies comprising the Glencore Group. Internal transactions within the Glencore Group have been eliminated on consolidation.

The historical financial information included in Section VI: "Historical Financial Information" was audited in accordance with the Standards for Investment Reporting issued by the Auditing Practices Board in the United Kingdom. Neither this information nor the other financial information used in this Prospectus was prepared in accordance with accounting principles generally accepted in the U.S. ("U.S. GAAP"), audited in accordance with the auditing standards generally accepted in the U.S. ("U.S. GAAS"), or the auditing standards of the U.S. Public Company Accounting Oversight Board (the "PCAOB Standards"). No opinion or any other assurance with regard to any financial information was expressed under U.S. GAAP, U.S. GAAS or PCAOB Standards, and the historical financial information included in Section VI: "Historical Financial Information" and other financial information is not intended to comply with SEC reporting requirements. Compliance with such requirements would require the modification, reformulation or exclusion of certain financial measures. In addition, changes would be required in the presentation of certain other information. Potential investors should consult their own professional advisers to gain an understanding of the financial information in Section VI: "Historical Financial Information" and the implications of differences between the auditing standards noted herein.

Pro forma financial information

This Prospectus includes an unaudited pro forma net assets statement as at 31 December 2010 for the Company illustrating the effect of Admission had it occurred on 31 December 2010. Because of its nature, the pro forma financial information addresses a hypothetical situation and, therefore, does not represent the Company's actual financial position. The Prospectus Rules regarding the preparation and presentation of pro forma financial information vary in certain respects from Article 11 of Regulation S-X promulgated under the Securities Act and, accordingly, the unaudited pro forma financial information included herein should not be relied upon as if it has been prepared in accordance with such requirements.

Shareholders and potential investors should refer to the basis of preparation of the unaudited pro forma financial information set forth in Section VII: "Unaudited Pro Forma Financial Information".

Non-financial operating data

The non-financial operating data included in this Prospectus has been extracted without material adjustment from the management records of Glencore International and are unaudited.

Non-IFRS Measures

In this Prospectus, certain financial measures are presented that are not recognised by IFRS, including Adjusted EBIT, Adjusted EBIT pre-exceptional items, Adjusted EBITDA, Adjusted EBITDA pre-exceptional items and net debt (the "Non-IFRS Measures").

Adjusted EBIT

Adjusted EBIT consists of revenue less cost of goods sold and selling and administrative expenses plus share of income from associates and jointly controlled entities and dividends as disclosed on the face of the consolidated statements of income. Although Adjusted EBIT is not typically a measure of operating income, operating performance or liquidity under IFRS, the Directors have presented Adjusted EBIT in this Prospectus because they believe Adjusted EBIT is used by some investors to determine a company's ability to service indebtedness and fund ongoing capital expenditure and dividends. Adjusted EBIT should not, however, be considered in isolation or as a substitute for income from operations as determined in accordance with IFRS, or for cash flows from operating activities as determined in accordance with IFRS, or as an indicator of operating performance.

Adjusted EBITDA

Adjusted EBITDA consists of Adjusted EBIT (as defined above) plus depreciation and amortisation. Although Adjusted EBITDA is not typically a measure of operating income, operating performance or liquidity under IFRS, the Directors have presented Adjusted EBITDA in this Prospectus as they believe that Adjusted EBITDA is used by some investors to determine a company's ability to service indebtedness and fund ongoing capital expenditure and dividends.

Adjusted EBITDA has limitations as an analytical tool, and an investor should not consider these measures in isolation from, or as a substitute for, analysis of Glencore International's results of operations. Some of the limitations of Adjusted EBITDA are that:

- it does not reflect Glencore International's cash expenditures or future requirements for capital expenditure or contractual commitments;
- it does not reflect changes in, or cash requirements for, Glencore International or the Company's working capital needs (as applicable);
- it does not reflect the significant interest expense or the cash requirements necessary to service interest or principal payments in respect of any borrowings;
- although depreciation and amortisation are non-cash charges, the assets being depreciated and amortised will often have to be replaced in the future, and Adjusted EBITDA does not reflect any cash requirements for such replacements; and
- other companies in Glencore International's industry may calculate these measures differently from how Glencore International does, limiting their usefulness as a comparative measure.

Adjusted EBIT and Adjusted EBITDA may not be indicative of Glencore International's historical operating results, nor are they meant to be a projection or forecast of the Company's future results.

Adjusted EBITDA pre-exceptional items, Adjusted EBIT pre-exceptional items and Income before attribution pre-exceptional items

Adjusted EBITDA pre-exceptional items, Adjusted EBIT pre-exceptional items and Income before attribution pre-exceptional items are Adjusted EBITDA, Adjusted EBIT and Income before attribution, respectively, excluding exceptional items. Exceptional items represent significant items of income and expense which, due to their nature or the expected infrequency of the events giving rise to them, are separated for internal reporting and analysis of Glencore International's results. Exceptional items mainly include impairment charges on inventories and other assets.

These measures are intended to provide additional information to investors and analysts, do not have any standardised meaning prescribed by IFRS and should not be considered in isolation or as a substitute for measures of performance prepared in accordance with IFRS. These measures exclude the impact of cash costs of financing activities and taxes, and the effects of changes in operating working capital balances, and therefore are not necessarily indicative of income from operations or cash flow from operations as determined under IFRS. Other companies may calculate these measures differently.

Net debt

Glencore defines net debt as total current and non-current borrowings and commodities sold with agreements to repurchase less cash and cash equivalents, marketable securities and readily marketable inventory. Glencore includes marketable securities and readily marketable inventory as cash equivalents in its internal definition of net debt. Readily marketable inventory comprises inventory that is readily convertible into cash due to their liquid nature, widely available markets and the fact that any associated price risk is covered. This includes, for example, LME approved inventory (such as copper or aluminium) held at LME warehouses. Given the liquid nature of these inventories and associated funding, which represents a significant share of current assets and liabilities, Glencore believes it is appropriate to consider them as cash equivalents.

The Directors believe this Non-IFRS Measure is a valuable tool in analysing its net debt levels and computing certain debt coverage ratios. This measure is intended to provide additional information to investors and analysts, does not have any standardised meaning prescribed by IFRS and should not be considered in isolation or a substitute for measures of performance prepared in accordance with IFRS.

Pro forma financial information

In this Prospectus, any reference to "pro forma" financial information is to information which has been extracted without material adjustment from the unaudited pro forma financial information contained in Section VII: "Unaudited Pro Forma Financial Information". The unaudited pro forma net assets statement contained in Section VII: "Unaudited Pro Forma Financial Information" is based on the balance sheet of Glencore International as at 31 December 2010, extracted without material adjustment from Section VI: "Historical Financial Information". The unaudited pro forma net assets statement includes certain adjustments in respect of the Global Offer, including the crystallisation of tax items in connection with the Restructuring. However, the unaudited pro forma net assets statement is not necessarily indicative of what the financial position of Glencore International would have been had the Global Offer occurred on 31 December 2010.

The unaudited pro forma financial information is for illustrative purposes only. Because of its nature, the pro forma financial information addresses a hypothetical situation and, therefore, does not represent Glencore International's actual financial position. Future results of operations may differ materially from those presented in the pro forma financial information due to various factors.

Rounding

Percentages and certain amounts included in this Prospectus have been rounded for ease of presentation. Accordingly, figures shown as totals in certain tables may not be the precise sum of the figures that precede them.

Credit ratings

Credit ratings included or referred to in this Prospectus have been issued by Moody's and Standard and Poor's, each of which is established in the European Union and has applied to be registered under Regulation (EC) No 1060/2009 of the European Parliament and of the Council of 16 September 2009 on credit rating agencies.

Currencies

In this Prospectus, references to "pounds sterling", "£", "GBP", "pence" or "p" are to the lawful currency of the United Kingdom; references to "U.S. dollars", "dollars", "U.S.$", or "cents" are to the lawful currency of the U.S., references to "Hong Kong dollars" or "HK$" are to the lawful currency of Hong Kong, references to "Euros" or "€" are to the currency introduced at the start of the third stage of European economic and monetary union pursuant to the Treaty establishing the European Community, as amended, references to "Swiss Francs", "Swiss francs" or "CHF" are to the lawful currency of Switzerland and references to "South African Rand" or "ZAR" are to the lawful currency of the Republic of South Africa.

The Offer Price will be stated in pounds sterling. On 29 April 2011 (being the last practicable date prior to the publication of this Prospectus), £1.00 = HK$12.974 and £1.00 = U.S.$1.667, based on the exchange rate quoted by Bloomberg on that date.

The Company prepares its financial statements in U.S. dollars. The basis of translation of foreign currency for the purpose of inclusion of the financial information set out in Section VI: "Historical Financial Information" is described in that Section. Information derived from this financial information set out elsewhere in this Prospectus has been translated on the same basis.

Unless otherwise indicated, the financial information contained in this Prospectus has been expressed in U.S. dollars.

Indicative exchange rates of the U.S. dollar against the Australian Dollar, Swiss Franc, Euro, pounds sterling, Kazakh Tenge and South African Rand comprising the average rate used for income statement information and the period end rate used for balance sheet information, are shown below:

	Period					
	Year ended 31 December 2008		Year ended 31 December 2009		Year ended 31 December 2010	
	Average rate	Period end rate	Average rate	Period end rate	Average rate	Period end rate
Currencies						
AUD:U.S.$	1.1738	1.4371	1.2615	1.114	1.0863	0.9768
CHF:U.S.$	1.0826	1.0645	1.0855	1.0338	1.0425	0.9368
EUR:U.S.$	0.6799	0.7192	0.7173	0.6974	0.7539	0.7453
GBP:U.S.$	0.5399	0.6914	0.6387	0.6194	0.647	0.6402
KZT:U.S.$	120.3303	121.125	147.6582	148.52	147.3884	147.4
ZAR:U.S.$	8.258	9.37	8.4165	7.3774	7.3289	6.6237

Presentation of reserves and resources information

This Prospectus contains information relating to the reserves and resources of some of Glencore's industrial assets which have been extracted or derived from the following technical reports contained in Section XIV: "Independent Technical Reports":

- in relation to the mineral reserves and mineral resources of Prodeco (comprising the Calenturitas mine and the La Jagua complex), the technical report prepared by Minarco Mine Consult Pty Ltd. ("MMC") and McElroy Bryan Geological Services Pty Ltd. ("MBGS") (the "Prodeco Report");
- in relation to the mineral reserves and mineral resources of Katanga, Mopani and Mutanda, the technical reports prepared by Golder Associates South Africa (Pty) Ltd. ("Golders") (the "Katanga Report", the "Mopani Report" and the "Mutanda Report", respectively); and
- in relation to the mineral reserves and mineral resources of Kazzinc, the technical report prepared by Wardell Armstrong International Ltd. ("WAI") (the "Kazzinc Report").

Such information must be read in connection with the relevant technical report.

In this Prospectus, the mineral reserves and mineral resources estimates in relation to Katanga, Mutanda, Mopani, Prodeco and Kazzinc, initially prepared by Glencore, have been substantiated by evidence obtained from the relevant MER provider's site visits and observations, analyses and other evidence and take account of all relevant information supplied by Glencore. The basis of preparation for the MERs is set out in more detail in each of these reports.

Oil and gas reserves and resources information

The RPS Report (as contained in Section XIV: "Independent Technical Reports") presents information concerning oil and gas reserves and resources in accordance with the definitions and guidelines set forth in the 2007/SPE/AAPG/WPC/SPEE Petroleum Resource Management System ("PRMS") which is approved by the Society of Petroleum Engineers as the standard for classification and reporting. As set out in the PRMS, "reserves" are "those quantities of petroleum anticipated to be commercially recoverable by application of development projects to known accumulations from a given date forward under defined conditions". Reserves must further satisfy four criteria: they must be (i) discovered, (ii) recoverable, (iii) commercial and (iv) remaining (as of the evaluation date) based on the development project(s) applied. Reserves are further categorised in accordance with the level of certainty associated with the estimates and may be sub-classified based on project maturity and/or characterised by development and production status. "Contingent resources" are defined by PRMS as "those quantities of petroleum estimated, as of a given date, to be potentially recoverable from known accumulations, but the applied project(s) are not yet considered mature enough for commercial development due to one or more contingencies". Contingent resources may include, for example, projects for which there are currently no viable markets, or where commercial recovery is dependent on technology under development, or where evaluation of the accumulation is insufficient to clearly assess commerciality. Contingent Resources are further categorised in accordance with the level of certainty associated with the estimates and may be sub-classified based on project maturity and/or characterised by their economic status. "Prospective resources" are defined by PRMS as "those quantities of petroleum estimated, as of a given date, to be potentially recoverable from undiscovered accumulations by application of future development projects". Prospective resources have both an associated chance of discovery and a chance of development. Prospective resources are further subdivided in accordance with the level of certainty associated with recoverable estimates assuming their discovery and development and may be sub-classified based on project maturity.

Mineral reserves and mineral resources information

Glencore estimates its mineral reserves and mineral resources in accordance with internationally recognised mineral standards (which include the JORC Code and the 2007 edition of the South African Code for Reporting of Exploration Results, Mineral Resources and Mineral Reserves ("SAMREC")) based on information compiled by Competent Persons (as defined by the JORC Code). Golders, MMC and MBGS and WAI have reviewed the mineral reserves and mineral resources estimates compiled by Glencore in respect of Katanga, Mutanda and Mopani, Prodeco and Kazzinc (as set out in the relevant MER contained in Section XIV: "Independent Technical Reports") and have stated the mineral reserves and mineral resources in respect of the relevant industrial asset to be in compliance with the JORC Code.

Mineral resources are based on mineral occurrences quantified on the basis of geological data and an assumed cut-off grade, and are divided into measured, indicated and inferred categories reflecting decreasing confidence in geological and/or grade continuity. No allowances are included for dilution and losses during mining, but the reporting of resource estimates carries the implication that there are reasonable prospects for eventual economic exploitation. Measured and indicated resources may therefore be viewed as the estimation stage prior to the application of more stringent economic criteria for the reserve definition, such as a rigorously defined cut-off grade and mine design outlines, along with allowances for dilution and losses during mining. It is common practice, for example, for companies to include in the resources category material with a reasonable expectation of being converted to reserves, but for which either the detailed mine planning work has not been undertaken or for which an improvement in economic conditions or exploitation efficiencies would be required to enable the company to exploit the resources economically. An inferred resource is that part of a mineral resource for which tonnage, grade and mineral content can be estimated with a low level of confidence. This categorisation is inferred from geological evidence and assumed, but not verified, geological and/or grade continuity. It is based on information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes which may be limited or of uncertain quality and reliability. Mineral reserves are designated as proved and probable, and are derived from the corresponding measured and indicated resource estimates by including allowances for dilution and losses during mining. It is an explicitly stated further requirement that other modifying economic, mining, metallurgical, marketing, legal, environmental, social and governmental factors also be taken into account. The measured and indicated mineral resources can be reported as either being inclusive of those mineral resources modified to produce the ore reserves or additional to the ore reserves. In this Prospectus, measured and indicated resources are stated inclusive of reserves but with no allowance for ore loss or dilution. Inferred resources are stated on an exclusive basis.

Included in this Prospectus are various statements relating to mineral potential at Katanga, Mutanda, Mopani, Prodeco and Kazzinc. The relevant MER providers have reviewed the information supporting these statements compiled by Glencore and have stated the mineral potential as set out in the relevant technical report is in compliance with section 18 of the JORC Code. This disclosure of mineral potential, follows guidance in section 18 of the JORC Code; specifically, that the mineral potential should be expressed as a range of quantity and grade, with an explanation of the basis of the statement. The summary statement of potential for each target is expressed explicitly on the basis that (i) the potential range of quantity and grade is conceptual in nature, there has been insufficient exploration to define a mineral resource on the target and it is uncertain if further exploration will result in the discovery of a mineral resource on the target and (ii) the mineral potential constitutes a possible mineral deposit that is to be the target of further exploration.

Forward-looking statements

Certain information contained in this Prospectus, including any information as to Glencore's strategy, plans or future financial or operating performance constitutes "forward-looking statements". All statements, other than statements of historical fact, are forward-looking statements. The words "believe", "expect", "anticipate", "contemplate", "aim", "target", "plan", "intend", "continue", "budget", "estimate", "may", "should", "will", "would", "schedule" and similar expressions identify forward-looking statements.

Forward-looking statements are necessarily based upon a number of estimates and assumptions that, while considered reasonable by Glencore, are inherently subject to significant business, economic and competitive uncertainties and contingencies. Known and unknown factors could cause actual results to differ materially from those projected in the forward-looking statements. Such factors include, but are not limited to: the impact of global economic conditions; fluctuations in the currency markets; fluctuations in the spot and forward prices of certain commodities; changes in national and local government legislation, taxation, controls, regulations and political or economic developments in any countries where Glencore operates, or other countries in which Glencore may carry on business in the future; business opportunities that may be presented to, or pursued by, Glencore; Glencore's ability to successfully integrate future acquisitions; operating or technical difficulties in connection with mining or development activities; employee relations; availability and costs associated with mining inputs and labour; litigation; diminishing quantities or grades of reserves; adverse changes in Glencore's credit rating; and risk of trespass, theft and vandalism.

Investors are cautioned that forward-looking statements are not guarantees of future performance. Forward-looking statements may, and often do, differ materially from actual results. Any forward-looking statements in this Prospectus speak only as of the date of this Prospectus, reflect Glencore's current view with respect to future events and are subject to risks relating to future events and other risks, uncertainties and assumptions relating to Glencore's operations, results of operations, growth strategy and liquidity. Investors should specifically consider the factors identified in this Prospectus which could cause actual results to differ before making an investment decision. All of the forward-looking statements made in this Prospectus are qualified by these cautionary statements. Specific reference is made to "Risk Factors", Section I: "Information on Glencore" and Section IV: "Operating and Financial Review".

Subject to the requirements of the Prospectus Rules, the Disclosure and Transparency Rules, the Listing Rules, the Hong Kong Listing Rules or applicable law, the Company explicitly disclaims any intention or obligation or undertaking publicly to release the result of any revisions to any forward-looking statements in this Prospectus that may occur due to any change in the Company's expectations or to reflect events or circumstances after the date of this Prospectus.

Addressable markets

Included in this Prospectus are various statements relating to the size of the addressable markets for certain commodities in which Glencore acts as marketer. This information has been provided because Glencore considers these markets to be the relevant markets for consideration of its market shares.

Within the global production and supply of commodities, there are fragments of the market whose volumes are not accessible to a third party marketer such as Glencore. Therefore, these volumes should not be considered for the purpose of calculating market shares for that commodity. These fragments tend to fall within one of the three categories described below, although not all categories are deemed relevant to the calculation of the addressable market in each of Glencore's key commodities:

(i) Production in a vertically-integrated system: This relates only to intermediate products, such as a metallic concentrate or unprocessed agricultural products, which are moved between processing stages within a single company or vertically-integrated system, and do not require the assistance of a third party marketer to facilitate this.

(ii) Production consumed within a domestic/inland market: This relates to commodities that are produced and consumed domestically in a country and are therefore not exported. Glencore may still be involved in the import of these commodities into such country and therefore import volumes are included within the addressable market share calculation.

(iii) Production sold directly to end users: This relates primarily to finished products, such as a refined metal or processed agricultural products, which are sold directly to the consumers or end users by the producer without the assistance of a third party marketer.

All statements relating to "market share" or "addressable market" are statements of the Directors' beliefs, which have been calculated using a combination of data sourced from third party industry expert data providers and Glencore's own estimates. Furthermore, the different market dynamics of the various commodities which Glencore markets means that the calculation of market share positions and the size of the addressable markets may differ for each commodity.

The following tables set out the basis of calculation of the size of the addressable markets for the main commodities that Glencore markets, as well as the calculation of Glencore's approximate market shares in each of these markets. In each case, the source of the underlying data in each calculation is also indicated.

Basis of calculation

Metals and Minerals business segment

	Total market	Exclusions from addressable market	Addressable market	Glencore volumes marketed	Glencore's approximate % market share	Glencore's approximate % of total market
Calculation:	A	B	C (A – B)	D	E (D/C)	F (D/A)

A: Glencore defines the total market for each commodity within the Metals and Minerals business segment as total global production for that commodity based on data provided by CRU International Group ("CRU").

B: For commodities within the Metals and Minerals business segment, Glencore defines the addressable market as excluding: (i) for certain intermediate products, production within a vertically-integrated producing system, based on data provided by CRU; (ii) for certain intermediate products, all production within the Chinese domestic market, based on data provided by CRU; (iii) for certain finished metals, all volumes which are moved within a vertically-integrated producing system where those producers have downstream capability or which are sold directly by producers to end users without the use of an intermediary, based on data provided by CRU and Glencore's own estimates; and (iv) for certain finished metals, all production within the Chinese domestic market, based on data provided by CRU.

C: Addressable market is calculated as the total market (A) less exclusions from the addressable market (B).

D: Glencore volumes marketed are based on actual marketed volumes.

E: Glencore's market shares for commodities within the Metals and Minerals business segment are calculated as Glencore volumes marketed (D) divided by addressable market (C).

F: Glencore's share of total market for commodities within the Metals and Minerals business segment are calculated as Glencore's volumes marketed (D) divided by total market (A).

Commodity	Total market (million MT)	Exclusions from addressable market (million MT)	Addressable market (million MT)	Glencore volumes marketed (million MT)	Glencore's approximate % market share	Glencore's approximate % of total market
2010						
Zinc metal(2)(3)	12.7	10.0(4)	2.7(4)	1.7	60(4)	13
Zinc concentrates(1)(2)(3)	24.8	20.0(4)	4.8(4)	2.4	50(4)	10
Copper metal(2)(3)	18.7	15.9(4)	2.8(4)	1.4	50(4)	7
Copper concentrates(1)(2)(3)	46.9	40.8(4)	6.1(4)	1.8	30(4)	4
Lead metal(2)(3)	9.0	8.3(4)	0.7(4)	0.3	45(4)	3
Lead concentrates(1)(2)(3)	6.2	4.8(4)	1.4(4)	0.6	45(4)	10
Alumina(1)(2)	81.6	64.0	17.6	6.7	38	8
Aluminium(1)(2)	42.0	23.8	18.2	3.9	22	9
Nickel	1.4	N/A	1.4	0.2	14	14
Cobalt	0.077	N/A	0.077	0.018	23	23
Ferrochrome	9.1	N/A	9.1	1.5	16	16

Notes:

(1) Excludes production within a vertically-integrated producing system.

(2) Excludes all production within the Chinese domestic market.

(3) Excludes volumes sold directly by producers to end users without the use of an intermediary.

(4) Based on the mid-point estimated range for exclusions from addressable market figure.

Energy Products business segment

Commodity	Total market	Exclusions from addressable market	Addressable market	Glencore volumes marketed	Glencore's approximate % market share	Glencore's approximate % of total market
Calculation:	A	B	C (A – B)	D	E (D/C)	F (D/A)

A: Glencore defines the total market for crude oil and oil products within the Energy Products business segment as total global demand based on data sourced from the IEA, and defines the total market for coal and coke as total global production based on data provided by Merlin Trade and Consultancy Ltd.

B: For coal and coke within the Energy Products business segment, Glencore defines the addressable market being only seaborne export coal or coke, and so excludes all coal or coke which is not seaborne export. There are no exclusions from the addressable market for oil and oil products.

C: Addressable market is calculated as the total market (A) less exclusions from the addressable market (B).

D: Glencore volumes marketed are based on actual marketed volumes. For coal and coke, these volumes include attribution of volumes under agency and advisory agreements as well as on a principal basis.

E: Glencore's market shares for commodities within the Energy Products business segment are calculated as Glencore volumes marketed (D) divided by addressable market (C).

F: Glencore's share of total market for commodities within the Energy Products business segment are calculated as Glencore's volumes marketed (D) divided by total market (A).

Commodity	Total market (million MT)	Exclusions from addressable market (million MT)	Addressable market (million MT)	Glencore volumes marketed (million MT)	Glencore's approximate % market share	Glencore's approximate % of total market
2010						
Crude oil and oil products (million bbl/day)	87.8	N/a	87.8	2.5	3	3
Metallurgical coal	830.0	576.0	254.0	30	12	4
Thermal coal	4,556.0	3,864.0	692.0	196	28	4
Coke	575.0	562.8	12.2	0.7	6	Not meaningful
Total coal	5,961.0	5,002.8	958.2	226.7	24	4

Agricultural Products business segment

Commodity	Total market	Exclusions from addressable market	Addressable market	Glencore volumes marketed	Glencore's approximate % market share	Glencore's approximate % of total market
Calculation:	A	B	C (A – B)	D	E (D/C)	F (D/A)

A: Glencore defines the total market for each commodity within the Agricultural Products business segment as total global production for that commodity based on data provided by Informa and on data sourced from the United States Department of Agriculture.

B: For all commodities within the Agricultural Products business segment, Glencore defines the addressable market as being the traded or export market for that commodity, based on data provided by Informa and on data sourced from the United States Department of Agriculture.

C: Addressable market is calculated as the total market (A) less exclusions from the addressable market (B).

D: Glencore volumes marketed are based on actual marketed volumes.

E: Glencore's market shares for commodities within the Agricultural Products business segment are calculated as Glencore volumes marketed (D) divided by addressable market (C).

F: Glencore's share of total market for commodities within the Agricultural Products business segment are calculated as Glencore's volumes marketed (D) divided by total market (A).

Commodity	Total market (million MT)	Exclusions from addressable market (million MT)	Addressable market (million MT)	Glencore volumes marketed (million MT)	Glencore's approximate % market share	Glencore's approximate % of total market
2010						
Barley	171.3	155.4	15.9	3.8	24	2
Wheat (excl. durum wheat)	846.4	731.9	114.5	12.3	11	1
Corn	968.2	874.5	93.7	3.3	4	Not meaningful
Sun and rapeseed	99.6	87.5	12.1	3.1	26	3
Sunflower oil	12.2	8.1	4.1	0.8	20	7
Soybean	313.3	217.6	95.7	0.4	0.4	Not meaningful
Soybean oil	43.5	34.5	9.0	0.8	9	2
Soybean meal	175.7	118.4	57.3	2.9	5	2
Sugar	234	182.0	52.0	0.5	1	Not meaningful

U.S. considerations

Available information for U.S. investors

The Company has agreed that, for so long as any of the Ordinary Shares are "restricted securities" within the meaning of Rule 144(a)(3) under the Securities Act, the Company will, during any period in which it is neither subject to Section 13 or 15(d) of the U.S. Securities Exchange Act of 1934, as amended (the "Exchange Act"), nor exempt from reporting under the Exchange Act pursuant to Rule 12g3-2(b) thereunder, make available to any holder or beneficial owner of such restricted securities or to any prospective purchaser of such restricted securities designated by such holder or beneficial owner, upon the request of such holder, beneficial owner or prospective purchaser, the information required to be delivered pursuant to Rule 144A(d)(4) under the Securities Act.

SECTION I: INFORMATION ON GLENCORE

Investors should read the whole of this Prospectus and not just rely upon the summarised information, including the tables, in this Section I. Where stated, information in this section has been extracted without material adjustment from Sub-section B of Section VI: "Historical Financial Information" and from Section XIV: "Independent Technical Reports". Investors can find further background information on the commodities that Glencore markets in Section XIII: "Information on Commodities".

Overview

Glencore is a leading integrated producer and marketer of commodities, with worldwide activities in the marketing of metals and minerals, energy products and agricultural products and the production, refinement, processing, storage and transport of these products. Glencore operates on a global scale, marketing and distributing physical commodities sourced from third party producers and own production to industrial consumers, such as those in the automotive, steel, power generation, oil and food processing industries. Glencore also provides financing, logistics and other services to producers and consumers of commodities. Glencore's long experience as a commodity merchant has allowed it to develop and build upon its expertise in the commodities which it markets and cultivate long-term relationships with a broad supplier and customer base across diverse industries and in multiple geographic regions. Glencore's marketing activities are supported by investments in industrial assets operating in Glencore's core commodities. Glencore's industrial, geographical, commodity, supplier and customer diversity, in combination with its long-term supplier and customer relationships, has enabled Glencore to operate profitably, even during periods in which a particular commodity, industry, customer or geographic region may be experiencing some weakness. In addition, Glencore's marketing operations are less correlated to commodity prices than its industrial operations, which makes Glencore's earnings less volatile than those of producers of metals and mining products and energy products that do not also have marketing and logistics operations.

As a marketer, Glencore is able to differentiate itself from other production entities as, in addition to focusing on minimising costs and maximising operational efficiencies, Glencore focuses on maximising returns from the entire supply chain, taking into account its extensive and global third party supply base, its logistics, risk management and working capital financing capabilities, extensive market insight, business optionality, its extensive customer base, strong market position and penetration in most commodities and economies of scale. In contrast, this is not the business model of Glencore's mainly industrial competitors who are generally not set up to exploit the full range of value added margin and arbitrage opportunities which exist throughout the commodity supply chain.

Glencore's consolidated revenues for the years ended 31 December 2009 and 31 December 2010 were U.S.$106,364 million and U.S.$144,978 million, and its income before attribution for the years ended 31 December 2009 and 31 December 2010 were U.S.$1,729 million and U.S.$4,106 million. As at 31 December 2010, Glencore's total assets amounted to U.S.$79,787 million. Measured by revenues, Glencore believes it was one of the world's largest privately held companies during this period.

Selected key financial information in relation to Glencore's marketing and industrial activities for the years ended 31 December 2008, 31 December 2009 and 31 December 2010 is set out below. This information has been extracted without material adjustment from Section VI: "Historical Financial Information" except where marked as unaudited. Unaudited information has been extracted without material adjustment from Glencore's accounting records.

	2008	2009	2010
		(U.S.$ million)	
Marketing activities			
Revenue (unaudited)(1)	141,876	97,804	133,977
Adjusted EBITDA pre-exceptional items(2)	3,215	1,606	2,367
Adjusted EBIT pre-exceptional items(2)	3,202	1,591	2,337
Industrial activities			
Revenue (unaudited)(1)	10,360	8,560	11,001
Adjusted EBITDA pre-exceptional items(2)(3)(4)	1,853	1,468	1,992
Adjusted EBIT pre-exceptional items(2)(3)(4)	1,291	861	1,111
Share of income from associates and dividends (excl. Xstrata)(4)(5)	183	31	113
Share of income from associates (Xstrata)(4)(5)	1,536	824	1,729
Capex	1,875	1,116	1,890
Group			
Revenue	152,236	106,364	144,978
Adjusted EBITDA pre-exceptional items(2)(6)	6,787	3,929	6,201
Adjusted EBIT pre-exceptional items(2)(6)	6,212	3,307	5,290

Notes:

(1) Revenue is not split between Marketing and Industrial activities in the audited Historical Financial Information set out in Section VI of this document and is therefore marked as unaudited. Total segment and total Group revenue is audited.

(2) Includes variable bonus and other corporate selling, general and administrative expenses.

(3) Excludes share of income from associates and dividends.

(4) Adjusted EBITDA pre-exceptional items plus Share of income from associates and dividends and Adjusted EBIT pre-exceptional items plus Share of income from associates and dividends are audited.

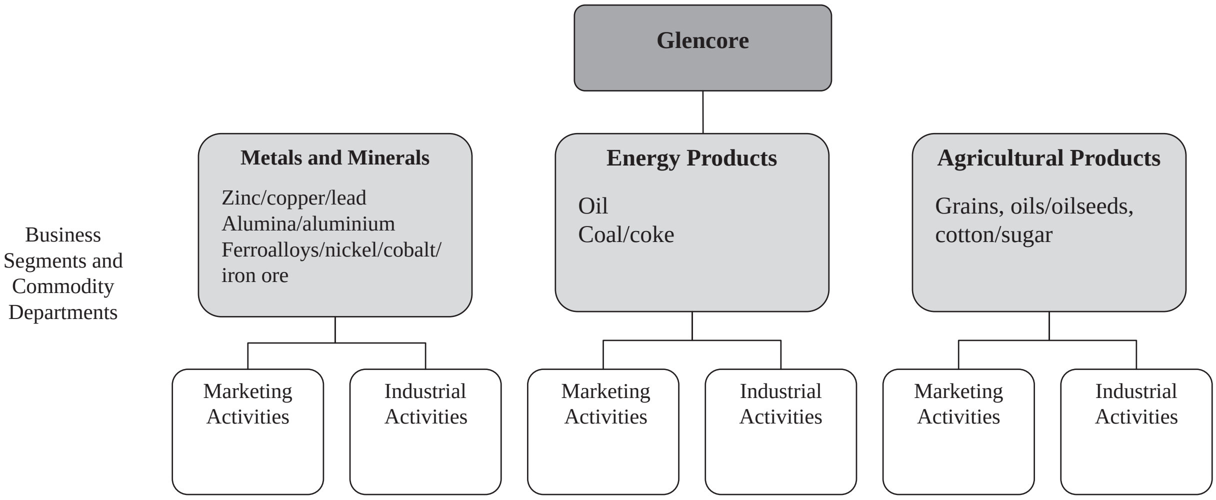
(5) Excludes exceptional items, see "Presentation of Information".

(6) Includes share of income from associates and dividends.

Glencore believes it is:

- the world's largest physical supplier of third party sourced commodities in respect of the majority of the metals and minerals it markets;
- among the world's largest non-integrated physical suppliers of crude oil and oil products;
- the world's largest participant in the supply of seaborne steam coal, including attribution of the volumes under a number of exclusive advisory and agency agreements with, amongst others, its associate company Xstrata;
- among the world's leading suppliers of sugar; and
- one of the leading exporters of grain from Europe, the CIS and Australia.

Glencore conducts its operations in three business segments: Metals and Minerals, Energy Products and Agricultural Products. The following chart summarises Glencore's business structure:



Glencore's business segments are responsible for managing the marketing, sourcing, hedging, logistics and industrial investment activities relating to the commodities which they cover.

Glencore's marketing and industrial investment activities are supported by a global network of more than 50 offices located in more than 40 countries throughout Europe, North, Central and South America, the CIS, Asia, Australia, Africa and the Middle East. Glencore's main offices are located in Baar (Switzerland), Stamford (Connecticut), London, Rotterdam, Beijing, Moscow and Singapore. This network provides Glencore with significant worldwide sourcing and distribution capabilities.

Glencore has an established record of successful strategic investments in industrial assets which have become an important component of its physical marketing activities. Glencore intends to continue to pursue selective strategic acquisitions and alliances to support and strengthen its core physical marketing activities as and when opportunities arise. Glencore evaluates each industrial asset investment opportunity on a stand-alone basis, however, also recognising its potential to support and strengthen Glencore's physical marketing activities or existing industrial coverage. Similarly, Glencore evaluates disposals of investments in industrial assets when they are no longer deemed to support its marketing activities and/or when compelling selling opportunities arise.

Selected key financial information in relation to the marketing and industrial activities of Glencore's business segments for the year ended 31 December 2010 is set out below. This information has been extracted without material adjustment from Section VI: "Historical Financial Information" except where marked as unaudited. Unaudited information has been extracted without material adjustment from Glencore's accounting records.

	Metals and Minerals		Energy Products		Agricultural Products		Corporate and Other[(4)]		Total	
	As a percentage of Glencore		As a percentage of Glencore		As a percentage of Glencore		As a percentage of Glencore		As a percentage of Glencore	
	(U.S.$ million)	*%*	*(U.S.$ million)*	*%*	*(U.S.$ million)*	*%*	*(U.S.$ million)*	*%*	*(U.S.$ million)*	*%*
Marketing activities										
Revenue (unaudited)[(1)]	37,889	28	87,850	66	8,238	6	0	0	133,977	100
Adjusted EBITDA pre-exceptional items	1,401	59	470	20	659	28	(163)	(7)	2,367	100
Adjusted EBIT pre-exceptional items	1,401	60	450	19	659	28	(173)	(7)	2,337	100
Industrial activities										
Revenue (unaudited)[(1)]	7,322	67	1,499	14	2,180	20			11,001	100
Adjusted EBITDA pre-exceptional items[(2)(3)]	1,820	91	313	16	88	4	(229)	(11)	1,992	100
Adjusted EBIT pre-exceptional items[(2)(3)]	1,112	100	189	17	39	4	(229)	(21)	1,111	100
Share of income from associates and dividends (excl. Xstrata)[(3)(4)]	48	42	46	41	19	17			113	100
Share of income from associates (Xstrata)[(3)(4)]	N/A		N/A		N/A		1,729	100	1,729	100
Capex	1,001	53	818	43	71	4			1,890	100
Group										
Revenue	45,211	31	89,349	62	10,418	7	0	0	144,978	100
Adjusted EBITDA pre-exceptional items[(5)]	3,269	53	829	13	766	12	1,337	22	6,201	100
Adjusted EBIT pre-exceptional items[(5)]	2,561	48	685	13	717	14	1,327	25	5,290	100

Notes:

(1) Revenue is not split between Marketing and Industrial activities in the audited Historical Financial Information set out in Section VI of this document and is therefore marked as unaudited. Total segment and total Group revenue is audited.

(2) Excludes share of income from associates and dividends.

(3) Adjusted EBITDA pre-exceptional items plus Share of income from associates and dividends and Adjusted EBIT pre-exceptional items plus Share of income from associates and dividends are audited.

(4) Includes variable bonus and other corporate selling, general and administrative expenses, as well as share of income from Xstrata.

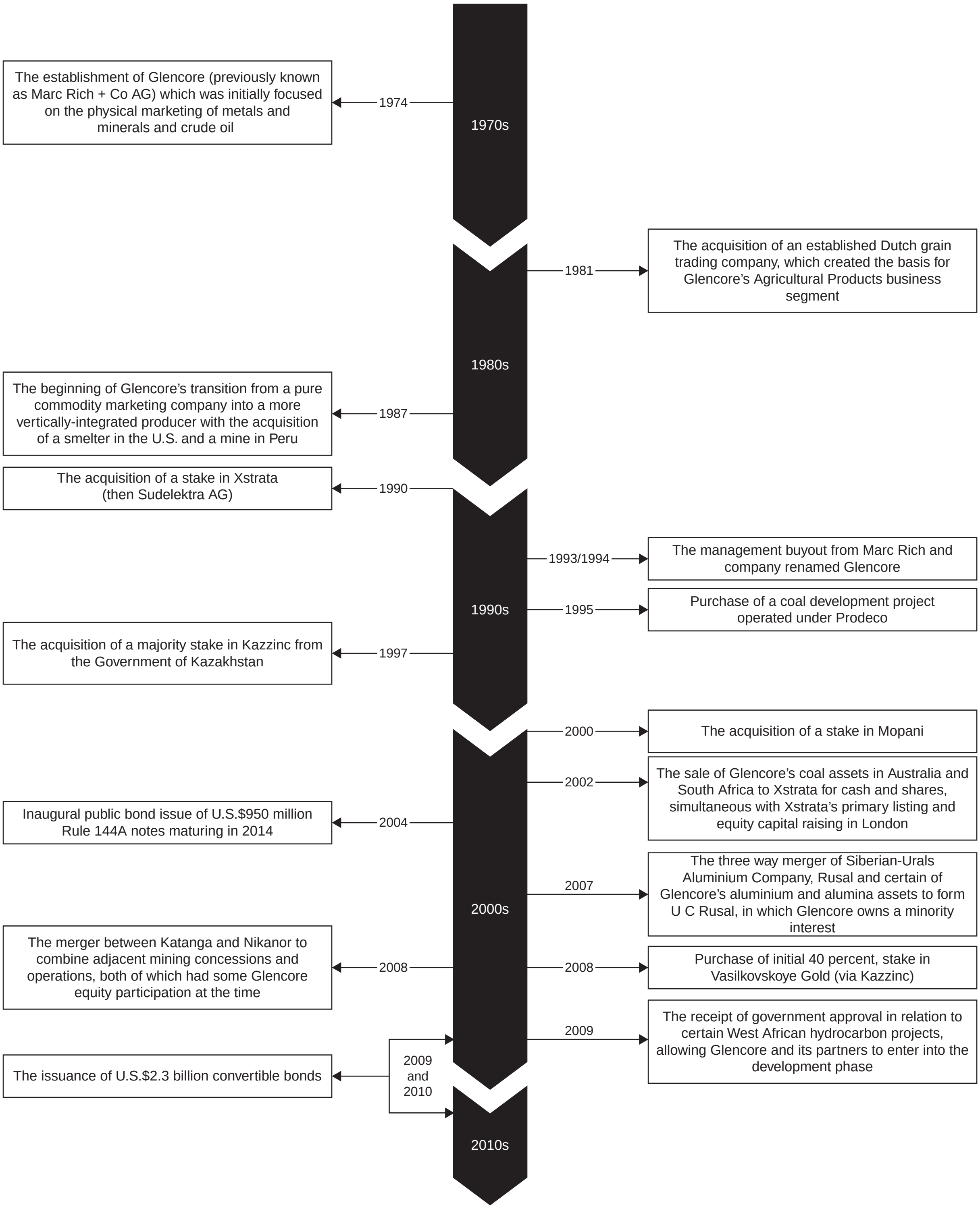
(5) Includes share of income from associates and dividends.

History

Glencore was founded in 1974 (previously known as Marc Rich + Co AG) and initially focused on the physical marketing of ferrous and non-ferrous metals and minerals and crude oil, and shortly thereafter expanded into oil products. In 1981, Glencore acquired an established Dutch grain trading company, which created the basis for its Agricultural Products business segment, and later Glencore added coal to its Energy Products business segment.

Starting in 1987, Glencore developed from a purely commodity marketing company into a diversified natural resources group through key acquisitions in mining, smelting, refining and processing in its three principal business segments. Glencore made its first equity investment in an industrial asset in 1987, when it acquired 27 per cent. of the Mt. Holly aluminium smelter in the United States and acquired its first controlling interest in an industrial asset in 1988, when it acquired a 66.7 per cent. interest in a zinc/lead mine in Peru. In 1994, the founder of Glencore sold his stake by way of a management buyout and the company was renamed Glencore International.

The following diagram sets out some key milestones in Glencore's history and shows its development over the course of 37 years into a leading diversified natural resources group with worldwide marketing and industrial activities.



Glencore has always been principally or wholly owned by management and key employees. See "Description of ownership structure" in Section II: "Directors and Corporate Governance", for further details of the group's ownership structure.

Competitive strengths

Glencore believes that its success has been built upon a unique combination of competitive strengths that have enabled it to grow into one of the world's largest diversified and vertically-integrated producers, processors and marketers of natural resources. These competitive strengths include:

Scale and leading market shares in commodity marketing globally

Glencore believes that it has significant market share positions in the addressable markets for zinc metal (approximately 60 per cent.), zinc concentrate (approximately 50 per cent.), copper metal (approximately 50 per cent.), copper concentrate (approximately 30 per cent.), alumina (approximately 38 per cent.), aluminium (approximately 22 per cent.), cobalt (approximately 23 per cent.), seaborne export thermal coal (approximately 28 per cent.) and grains (approximately nine per cent.). In addition, Glencore's daily oil sales volumes represent approximately 3 per cent. of the world's daily oil consumption. Glencore's global network of offices, its mining, smelting, refining and processing operations and its logistics and storage capabilities enable it efficiently to source, transport, process and physically deliver commodities throughout the world.

Glencore believes that being a major global physical marketer with leading market positions in its key commodities enables it to:

- flexibly and optimally manage product flows and logistics;
- access a broad spectrum of commodities in different grades and specifications to meet customer requirements;
- be competitive with pricing in tender and other bid processes;
- develop strong relationships with suppliers and customers;
- maintain a reputation for reliability with suppliers and customers;
- maintain knowledge of local market supply and demand dynamics;
- gain significant insight into trade flows and marketing requirements which enables continuous price discovery and rapid identification and investigation of arbitrage opportunities;
- benefit from economies of scale in relation to all key transaction components, including commodity purchases and sales, storage, transportation and risk management activities;
- market commodities linked to several different international exchanges;
- operate as a commodity supplier of last resort in difficult market conditions;
- act as a quasi-clearance house in the global physical commodities market; and
- identify strategic investment opportunities.

Core competence in commodity marketing, logistics, risk management and financing

Glencore is an established marketer of commodities and has, over a period of years, built an outstanding market reputation as a reliable supplier of quality product on a timely basis. In addition, Glencore's long experience has allowed it to build up the extensive market knowledge and insight, as well as full logistics capabilities, required to generate value added margins, as well as seek arbitrage potential throughout the physical commodity supply chain. Glencore's provision of value added services includes shipping, logistics, transportation, storage, risk management and marketing to producers and consumers of commodities, as well as arranging working capital and capital expenditure financing for its suppliers and customers, generally secured by future physical commodity flows and/or other assets.

The broad range of value added services Glencore can offer fulfils the needs of customers that do not have the equivalent internal capability and cannot outsource to other providers who can offer these services as seamlessly or efficiently as Glencore can provide them. Furthermore, Glencore's ability to arrange for short- and long-term financing for its customers and suppliers provides Glencore with long-term demand for and supply of its physical commodities. Glencore believes that the combination of its outstanding market reputation, its market knowledge and these value added services enables it frequently to be a preferred purchaser or supplier of commodities and generally to strengthen its long-term relationships with customers and suppliers. By way of illustration, six, nine and eight of the top ten suppliers of each of the Metals and Minerals, Energy Products and Agricultural Products business segments, respectively, have been clients for more than ten years. Similarly, nine, ten and eight of the top ten customers of each of the Metals and Minerals, Energy Products and Agricultural Products business segments, respectively, have been clients for more than ten years.

Access to a large shipping fleet and various freight intermediaries provides Glencore with very useful information on trade flows. Access to storage and other logistical assets increases Glencore's flexibility to blend products (such as oil distillates, metal concentrates and coal) and to manage the delivery of products in line with specific contractual quality requirements. Furthermore, Glencore believes that all of the above enable Glencore quickly and efficiently to seize time (contango) and other arbitrage opportunities, as they arise.

Investments in high-quality low-cost extraction/processing operations with strong growth prospects

Glencore owns many high-quality assets, for example Prodeco, which produces high grade thermal coal, and Katanga, which has significant high grade copper and cobalt reserves. Glencore continues to invest in its high-quality, large-scale, long-life assets to increase production capacity over the coming years. Production is expected to expand materially at several of Glencore's mining and processing assets, including Katanga's plans to ramp up copper production from 70k MT of annualised fourth quarter 2010 production capacity to 310k MT by 2015. Kazzinc is finalising the completion of major new metallurgy facilities (new copper smelter and lead smelter upgrade), while gold production is expected materially to increase, following the commissioning of the new Vasilkovskoje gold mine during 2010. At Mutanda a 20k MT SXEW plant was commissioned in the fourth quarter of 2010 and a 40k MT SXEW plant is due to be commissioned during the third quarter of 2011. Glencore is also, together with its partners, investing in the development of its West African Oil Assets, namely an initial two fields in Blocks I and O, with the aim of achieving production in the first quarter of 2012 and first quarter of 2014 at daily production levels of 50,000 bbls and 37,500 bbls, respectively. Finally, Prodeco is targeting 20.7 million MT of coal production per annum by 2015 compared to 10 million MT of production in 2010.

Marketer with integrated production and processing capabilities

Glencore is differentiated from commodity production competitors in that, in addition to being a producer, it is also a substantial marketer of commodities produced by third parties. Accordingly, Glencore sees its ownership of industrial assets not solely as sources of self-produced commodities, but also as tools for increasing flexibility, optionality and security of supply and for gaining valuable market knowledge.

Glencore's ownership of certain controlled industrial assets provides Glencore with access to long-term supply and throughput for its marketing activities. Of Glencore's total marketing purchases in the year ended 31 December 2010, approximately 30.6 per cent. related to commodities mined, produced or processed within Glencore's controlled industrial assets and associates (excluding oil department purchases). In addition to its investments in controlled industrial assets, Glencore also has stakes in non-controlled industrial assets, some of which are publicly traded companies, with which Glencore has secured long-term, arm's-length marketing and off-take agreements. This positioning throughout the supply chain allows Glencore to capture value at each stage and differentiates Glencore from less integrated producers of commodities, which tend to be more focused on the competitive sale of own products rather than enhanced global sourcing, distribution and marketing activities.

Glencore's ownership of industrial assets and knowledge of supply and end user commodity demand conditions gained from its global network of offices and relationships spanning more than 7,200 suppliers and customers (excluding agricultural farming origination) also provide Glencore with valuable insight into the broad production spectrum, flexibility to optimise between its own production and third party suppliers, access to strategic markets and operating and technical know-how. In addition, these factors provide Glencore with valuable access and insight into a range of industrial assets investment opportunities and, more broadly, assist Glencore to manage its industrial assets portfolio, including production volume and expansion decisions, as well as asset purchase and disposal decisions. This combination also promotes credibility with customers and other suppliers by positioning Glencore as both producer and marketer and enhancing Glencore's overall reputation as a secure and reliable long-term supplier.

Diversified across multiple commodities, suppliers and customers

Glencore markets a broad range of commodities from a diverse supply base to a diverse customer base. Glencore's three business segments are involved in the sourcing and marketing of more than 90 distinct commodities, including various grades, blends and products within such categories. Glencore has, for a long time, developed and built upon its expertise in these commodities, cultivating long-term relationships with a broad supplier and customer base across diverse industries and geographic regions. No customer represented more than 3.4 per cent. of Glencore's trade receivables as at 31 December 2010, or accounted for more than 3.0 per cent. of its consolidated revenues in the year ended 31 December 2010. For the year ended 31 December 2010, Glencore's top ten customers represented approximately 16 per cent. of Glencore's consolidated revenues, with the top ten customers for the Metals and Minerals, Energy Products and Agricultural Products business segments representing approximately 18 per cent., 26 per cent. and 23 per cent. of the revenue for each business segment, respectively. Other than oil, which represented approximately 56 per cent. of Glencore's consolidated revenues in the year ended 31 December 2010, no single commodity department accounted for more than approximately 13 per cent. of such revenues in that period. In addition, the geographic diversity of suppliers, including Glencore's own industrial assets, mitigates the risk of exposure to any one particular country or region and helps to ensure a steady supply of commodities for the marketing operations. Glencore's top ten suppliers represented approximately 22 per cent. of Glencore's consolidated cost of goods sold, with the top ten suppliers for the Metals and Minerals, Energy Products and the Agricultural Products business segments representing approximately 36 per cent., 32 per cent. and 21 per cent. of the costs of goods sold for each business segment, respectively. This industrial, geographical, commodity, supplier and customer diversity, in combination with Glencore's long-term supplier and customer relationships, has enabled Glencore to operate profitably even during periods in which a particular commodity, industry, customer or geographic region may be experiencing some weakness.

The geographic diversity of Glencore's operations is further demonstrated by the fact that it has skills and experience in operating and providing services across the globe, including in Eastern Europe, Central Africa and South America. Part of Glencore's geographic diversity is built on its willingness to invest in geographies and markets in which some of its competitors have historically avoided or been slower to enter and Glencore believes that its successful track record in this regard has enabled it to gain an effective first-mover advantage in a number of countries with high-quality strategic resources. Many of Glencore's important industrial assets are located in the CIS, Central Africa and South America, in which Glencore has been successfully operating for many years. By following its established strategy of teaming with experienced local partners, fostering good working relationships with local and national governments, investing in local infrastructure and communities and actively managing risk, Glencore believes that it has established a competitive advantage over many of its peers in this respect.

Track record of value creation

Glencore has been consistently profitable since the completion of the management buyout in 1994 and has a track-record of growth across industry cycles. Over the past ten years, Glencore has achieved an average annual return on equity of 38 per cent., ranging between 15 and 61 per cent.

Glencore has a favourable track record of creating value through both acquisitions and organic development of existing assets in its portfolio. For example, since Glencore's initial 2007 investment in Nikanor, Glencore has accumulated a 74.4 per cent. interest in Katanga resulting in an internal rate of return of approximately 50 per cent., based on Katanga's attributable market capitalisation as at 29 April 2011. Similarly, Kazzinc's recent acquisition and development of a large gold deposit is expected to produce favourable returns. Finally, Prodeco, which Glencore acquired in 1995, which together with the subsequent acquisition and consolidation of nearby coal mines, is now the third largest producer of export thermal coal in Colombia and should improve its market position going forward as it targets 20.7 million MT of coal capacity per annum by 2015 compared to 10 million MT of production in 2010. Glencore has also disposed of various assets over the years, which resulted in substantial gains, including the merger of part of its alumina/aluminium asset portfolio into UC Rusal in 2007 and the sale of certain coal assets to Xstrata at the time of its London IPO and the Cerrejón stake thereafter. In total, over the past ten years, Glencore has spent approximately U.S.$9.6 billion on its capital expenditure in controlled industrial assets.

World-class management and Board

Glencore's management is led by Ivan Glasenberg (Chief Executive Officer), supported by Steven Kalmin (Chief Financial Officer) and the rest of the management team. Between them, management has more than 200 years of experience working together at Glencore, where they have a proven track record of developing and growing the business. Ivan Glasenberg and the commodity heads have worked at Glencore for an average of 16 years and each was promoted to their current position from within the Company. Notwithstanding their long service with Glencore, they have a relatively low average age of 46 years.

In addition to the management team and the relevant experience of the Board, Glencore believes that there is considerable strength and depth below this level and it seeks to develop internal talent to ensure that this remains the case. Senior employees are incentivised to optimise the performance of their departments and have been empowered to make the decisions to achieve this.

Assuming the Over-Allotment Option is not exercised, the Kazzinc Consideration Shares have not been issued and the Offer Price is set at the mid-point of the Offer Price Range the number of Ordinary Shares in issue following the Global Offer will be 6,893,292,886 and, of these, 83.6 per cent. will be held by Existing Shareholders. Such Shareholders will be subject to lock-ups as described in Section VIII: "Details of the Global Offer". Glencore believes that this ownership structure aligns the interests of Shareholders, management and employees and will continue to foster a culture of excellence, teamwork and accountability. Existing Employee Shareholders have also entered into lockup arrangements as described in Section X: "Additional Information". Certain employees will in due course be incentivised through participation in employee share plans established by Glencore as described in Section X: "Additional Information".

Resilient financial performance of marketing

Since the management buyout in 1994, Glencore's marketing operations have been profitable in every year of operation and have a proven track record of resilience through industry cycles. Glencore believes that the financial performance of the marketing operations is less correlated to commodity prices than the industrial operations, as Glencore uses price hedging strategies, meaning that marketing profitability is primarily determined by volume activity and associated value added supply chain margins and other market conditions rather than the absolute flat price itself. Owing to the marketing activities being less volatile than the industrial activities, their relative contribution to group results tends to increase during times of falling commodity prices, such as occurred during the second half of 2008 and first half of 2009.

This lower correlation with commodity prices makes Glencore's earnings less volatile than those of producers of metals, mining and energy products that do not also have marketing and logistics operations. For example, in the period of the second half of 2008, where the Thomson Reuters Equal Weight Continuous Commodity Index fell 20 per cent. (as compared to the first half of 2008), Glencore's marketing operations reported positive net income before exceptional items for the same period. Glencore believes that the resilient financial performance of marketing will contribute to its ability to adhere to its stated dividend policy as described in this Section I.

Furthermore, because the marketing operations' funding requirements are highly linked to commodity prices, during periods of falling commodity prices (as experienced in the fourth quarter of 2008 in particular), the marketing operations require less working capital. Accordingly, the marketing activities tend to generate significant amounts of cash (via release of working capital) during periods of low commodity prices (such as those which occurred at the end of 2008), at a time when industrial operations tend to be less profitable and cash generative.

Barriers to entry

The advantages provided by scale, global reach and a solid track record are also believed to present significant barriers to sustainable competitive entry into the global physical commodity marketing industry, which requires, amongst other attributes, substantial access to credit markets and a global network which supports the assembly of logistics and risk management capabilities and strong producer relationships.

Strategy

Glencore's strategy is to maintain and build upon its position as one of the world's largest diversified natural resources marketing companies. Glencore's key strategic objectives include:

Continue to leverage geographic scope and diversification of operations

Glencore already has a large geographic footprint, with more than 50 offices in more than 40 countries around the world and, in many cases, industrial assets in key commodity producing and consuming locations. Similarly, Glencore's operations are already extremely diverse, covering a wide range of commodities, industries, suppliers and customers. Glencore's geographic scope and diversification of operations have allowed it to develop a track record of reliable supply performance with other large, global companies such as BHP Billiton and Shell. Glencore intends to build upon its position as one of the world's largest physical commodity suppliers and track record of extending product and geographical range by continuing to target market share increases in the geographies in which it currently operates and further expansion in emerging markets. Glencore believes that this strategy will allow it flexibly to align the geographic scope and diversity of its operations with the evolving global flows of natural resources. Glencore believes that the global scope of its operations will enable it to continue to supply a diversified range of physical commodities to its existing customer base and provide opportunities to continue developing new producer and consumer relationships and selectively target new business opportunities worldwide. Furthermore, Glencore believes that its geographic scope in countries and markets in which some of its competitors have historically avoided, or been slower to enter, has and will continue to provide an effective first-mover advantage in a number of geographies with high-quality strategic resources such as the CIS, parts of South America, the African Copperbelt and Australia.

Capitalise on strategic investments in industrial assets

Glencore's strategic investments in industrial assets are an important component of its physical sourcing strategy for its marketing activities, and Glencore believes these investments provide a competitive advantage over its marketing peers which are less vertically integrated, both upstream and downstream, and which do not have the market presence to build up the strong supply relationships that Glencore enjoys. Glencore's investments in industrial assets also provide it with other advantages such as information, technical expertise and local presence. While Glencore intends to remain focused on physical commodity sourcing, distribution and marketing, it also intends to continue to pursue selective strategic acquisitions and alliances which support and strengthen its core physical marketing and value added activities where such acquisitions have their own industrial and financial justification as and when such opportunities arise. Glencore believes that investment opportunities will continue to be created by, among other things, (i) the privatisation of natural resources producers in primarily emerging markets, (ii) the rebalancing of asset portfolios by other players in the natural resources industry and (iii) further industry consolidation as smaller producers sell out and/or seek capital to fund growth. Glencore will continue to apply its investment criteria to these opportunities, pursuing investments in industrial assets that are of strategic importance to its core business and that are projected to achieve its targeted return-on-capital objectives on a stand-alone basis. Glencore will continue to identify investment opportunities in which value can be created through the application of its market knowledge and operational and technical know-how. Similarly, Glencore evaluates disposals of certain investments, from time to time, particularly when they are no longer deemed to support its core business and/or when attractive selling opportunities arise.

Use additional capital and liquidity to grow the business

Glencore believes the Global Offer will provide it with the financial resources needed to move it to the next stage of its development and achieve further sustainable growth. More specifically, the Global Offer will provide Glencore with an upfront capital injection and, going forward, access to the equity capital markets. The amounts attributed out of net income for the year to profit participation shareholders are presented within "Invested Capital", comprising equity share capital, reserves, accumulated amounts attributed to profit participation shareholders and non-controlling interests. All amounts attributed to profit participation shareholders are to convert to ordinary shares in the Company as part of the Global Offer. Such conversion of existing partnership interests into traditional permanent equity capital on Glencore's balance sheet is also likely lead to enhanced and/or more robust credit ratings. Glencore intends to use this additional capital and access to liquidity, in combination with its existing brand, scale, product portfolio and logistics capabilities, to grow the business by, for example:

- investing in and expanding its existing industrial and logistics capacity;
- increasing the volumes marketed, for example, by purchasing additional commodities, in each case allowing Glencore to take advantage of additional opportunities which may present themselves in the market; and
- acquiring new industrial and logistics businesses as and when appropriate opportunities arise.

Focus on cost management and further enhancing logistical capabilities

Glencore intends to continue its focus on cost control and operational efficiencies at the industrial assets it controls and maintain its focus on the sourcing of competitively priced physical commodities from reliable third party suppliers. Glencore intends to supplement this focus on low-cost production and competitive sourcing with the continued development of its transport, shipping, storage and other logistical capabilities and, where appropriate, its ability to source these services from third parties at attractive levels. Glencore believes that the continued focus on these factors will enable it to continue to benefit from and exploit arbitrage opportunities occurring in the physical commodities markets in which it operates.

Maintain conservative financial profile and investment grade ratings

Glencore's conservative financial profile and investment grade credit ratings (currently BBB− from Standard & Poor's and Baa2 from Moody's) have enabled it consistently to access the bank and international debt capital markets on competitive terms to obtain required funding and maintain healthy levels of liquidity. Glencore intends to continue to manage its financial position around maintaining its investment grade credit ratings.

Disciplined risk management

Glencore already has a highly disciplined approach to risk management supported by its flat organisational structure and the privately owned nature of the business. Glencore intends to continue its focus in this key area by maintaining and expanding its centralised risk management resources and information systems and continuing to adopt and follow policies which are intended to mitigate and manage commodity price, credit and political risks. Examples of such policies which are already in place include:

- Minimise price risk: Glencore routinely hedges its exposure to price movements in its marketing inventories and forward purchase and sale commitments through futures and swap transactions or physically sells forward at pre-determined prices—in 2010, around 98 per cent. of Glencore's marketing inventory was covered by a sale at a pre-determined price or a hedge, which virtually eliminated Glencore's price risk on this inventory;
- Minimise credit risk: Glencore seeks to reduce the risk of non-payment by its customers by setting limits on open accounts extended to certain more creditworthy customers and by imposing credit support requirements and/or purchasing credit insurance products in respect of remaining customers; and
- Minimise political risk: Glencore seeks to remain diversified and where possible to obtain political risk insurance from creditworthy financial institutions in situations where Glencore believes that obtaining such insurance is financially prudent.

Place highest priority on employees, the environment and local communities

Glencore places the highest priority on its employees, the environment and the local communities where it operates. Regarding employees, Glencore takes a broad approach to employee welfare and will seek to maintain and improve its strong health and safety record. Regarding the environment, Glencore will demand high environmental performance standards from its controlled operations and, while executing marketing and logistics activities, to work with its partners and suppliers to ensure similar standards are demanded within the supply chain, as well as demanded of its non-controlled operations. Regarding local communities, Glencore will consult with and invest in the local communities where it operates.

Marketing activities—group level

Functions of the marketing activities

Glencore's marketing activities source a diversified range of physical commodities from third party suppliers and from industrial assets in which Glencore has full or part ownership interests. These commodities are sold, often with value added services such as freight, insurance, financing and/or storage, to a broad range of consumers and industrial commodity end users, with many of whom Glencore enjoys long-term commercial relationships. As a marketer, Glencore is able to differentiate itself from other production entities as, in addition to focusing on minimising costs and maximising operational efficiencies, Glencore focuses on maximising returns from the entire supply chain, taking into account its extensive and global third party supply base, its logistics, risk management and working capital financing capabilities, extensive market insight, business optionality, extensive customer base, strong market position and penetration in most commodities and economies of scale. In contrast, this is not the business model of Glencore's mainly industrial competitors who are generally not set up to exploit the full range of value added margin and arbitrage opportunities which exist throughout the commodity supply chain.

Types of arbitrage strategies

Many of the physical commodity markets in which Glencore operates are fragmented or periodically volatile. As a result, discrepancies generally arise in respect of the prices at which the commodities can be bought or sold in different geographic locations or time periods, taking into account the numerous relevant pricing factors, including freight and product quality. These pricing discrepancies can present Glencore with arbitrage opportunities whereby Glencore is able to generate profit by sourcing, transporting, blending, storing or otherwise processing the relevant commodities. Whilst the strategies used by Glencore's business segments to generate such margin vary from commodity to commodity, the main arbitrage strategies can be generally described as being:

- geographic: where Glencore leverages its relationships and production, processing and logistical capabilities in order to source physical commodities from one location and deliver them to another location where such commodities can command a higher price (net of transport and/or other transaction costs);
- product-related: where it is possible to exploit the blending or multi-use characteristics of the particular commodities being marketed, such as the various crude oil products, coal or concentrates, in order to supply products which attract higher prices than their base constituents, or exploit existing and/or expected price differentials; and
- time-related: where it is possible to exploit a difference between the price of a commodity to be delivered at a future date and the price of a commodity to be delivered immediately, where the available storage, financing and other related costs until the future date are less than the forward pricing difference.

Glencore uses market information made available by its marketing and industrial teams across its many locations to identify arbitrage opportunities. Glencore's marketing and investment activities and relationships with producers and consumers of raw materials are supported by a global network of more than 50 offices providing sourcing and distribution capabilities located in more than 40 countries throughout Europe; North, Central and South America, the CIS, Asia, Australia, Africa and the Middle East. This network provides Glencore with visibility over shifting supply and demand dynamics in respect of significant volumes of physical commodities across the globe. The detailed information from Glencore's widespread operations and close relationships with producers, consumers and logistics providers is available to Glencore's marketing operations and often enables them to identify opportunities, taking into account Glencore's extensive logistics capabilities, to source and supply physical commodities at attractive margins.

Types of marketing activities

Glencore's marketing activities can be categorised in order of focus as follows:

- Base supply chain activities: Glencore's primary marketing activities are those performed in the ordinary course of its global sourcing and distribution of commodities, including the provision of multiple value added services across the full supply chain and seeking arbitrage opportunities (discussed above) as they frequently arise.

- Event-driven activities: Glencore also seeks to optimise around an event or an anticipated event such as unexpectedly good or bad weather conditions, transport bottlenecks or failures (for example, a train derailment) or a labour or production issue as its global network alerts it to the possibility of such an event occurring or implications where such event has occurred. These types of events often cause global and/or regional "market tightness" (that is, a situation where available supply is insufficient to meet demand in a particular market) and Glencore's marketing operations will often be able to derive enhanced returns from such market conditions. These situations are, of course, not predictable, but generally occur reasonably frequently during any particular year.
- Price risk activities: Glencore also engages in some position taking within its marketing activities in which it applies its deep market intelligence and analysis to seek to profit from movements in the price and/or spread of a particular commodity, for example, by correctly anticipating a change in the price of a commodity and sourcing that commodity at a lower price than will be available later or selling that commodity at a higher price than will be available later. Glencore engages in price risk activities only in accordance with its risk policies and limits and price risk activities account for the substantial minority of Glencore's overall marketing operations.

Types of contractual arrangements

Glencore's marketing activities can be further segmented according to how much risk Glencore takes on a particular transaction:

- Purchase/off-take agreements: Under these arrangements, representing the substantial majority of transactions (approximately 99.9 per cent. of the Glencore Group's total revenues in 2008, 2009 and 2010), Glencore markets commodities which it purchases as principal (that is, commodities of which Glencore becomes the legal owner) and will receive nothing if it is unable to sell the commodity. Glencore ordinarily hedges or sells forward these commodities, meaning that it does not assume all the price or selling risk.
- Agency and advisory arrangements: Under these arrangements (which represent approximately 0.1 per cent. of the Glencore Group's total revenues in 2008, 2009 and 2010), Glencore markets commodities owned by a third party and is generally paid a fixed fee per unit of goods sold and/or a percentage of the sales revenue. Glencore therefore does not take principal purchase risk and derives fee-based income in respect of marketing services provided.

Glencore mitigates credit and performance risk in relation to suppliers and customers through the extensive application of measures such as credit insurance, letters of credit, security arrangements and/or bank and corporate guarantees. Glencore also leverages its network of global offices, which have direct access to and keep close relationships with its customers and suppliers.

There was no material non-performance by the Glencore Group of its contractual obligations in 2008, 2009 or 2010.

Logistics

Glencore's logistics operations are a key part of its marketing operations as they enable Glencore to fulfil its marketing obligations and to maximise arbitrage opportunities created by demand and supply imbalances. Physical sourcing and marketing of commodities requires highly professional handling and shipment of such goods from the supplier to the customer, including storage activities, as required. Typically, the staff handling the physical movement of goods (the "traffic team") account for a significant proportion of the headcount of a business segment. Glencore's dedicated chartering teams actively trade freight to gain market knowledge and volume benefits. The freight element of transactions is furthermore used to maintain maximum physical optionality so that full value can be extracted from the underlying commodity positions of each department, thereby complementing Glencore's overall ability to seize geographic and time spread arbitrage opportunities as they arise.

Competitors

Glencore believes that physical commodity marketing is a volume-driven business requiring highly professional risk management, substantial financial resources, market knowledge and product and logistical expertise. Glencore believes that it is the most diversified and globally active physical commodity sourcing and marketing company. Glencore believes that the majority of its competitors by segment are niche players that tend to focus on a specific commodity group or geographic area, or concentrate more heavily on commodity-related industrial activities such as mining, drilling, smelting, processing and refining. In view of Glencore's diversification in different commodity groups and global geographical presence and scale, Glencore does not believe that there is a precisely comparable company or peer group that can be defined as competing directly with Glencore. However, three types of physical commodity marketing companies compete with Glencore indirectly or directly in certain markets. These include:

- large participants active in specific commodity portfolios, such as Cargill in agricultural products and Vitol Group in oil;
- captive marketing vehicles of major oil and metals producers and processors, such as Total, BP and BHP Billiton (though these companies are less focused on third party marketing than Glencore); and
- smaller marketing companies whose operations are more limited to particular commodities and/or to geographic areas, such as Noble Group.

Industrial activities—group level

Glencore's ownership of controlled and non-controlled industrial assets is seen as both a source of potential and desirable stand-alone financial returns and overall business diversification, complemented by their very useful source of physical commodities into Glencore's marketing arm and access to further market insight and technical know-how. Glencore believes that its corresponding reduced reliance on third parties helps to ensure that suppliers and customers alike see Glencore as a very reliable, and therefore desirable, counterparty, given its integrated business model.

Glencore capitalises on investment opportunities created by, among other things, (i) the privatisation of natural resources producers primarily in emerging markets, (ii) the rebalancing of asset portfolios by other players in the natural resources industry and (iii) further industry consolidation as smaller producers sell out and/or seek capital to fund growth. Any decision to acquire or dispose of an industrial asset is based on the stand-alone potential of the asset and its potential contribution to Glencore's marketing activities and requires group level approval. Once acquired, an asset is held within one of the business segments (the only major exception to this is Xstrata, which is held between the Metals and Minerals and Energy Products business segments as it supplies commodities to both segments). The business segments manage the controlled and non-controlled industrial assets via hands-on "asset controllers" to interface between the asset and Glencore in respect of day-to-day operating, financial and commercial matters. Glencore's approach to the management of its industrial assets differs from some of its key competitors in that Glencore encourages its industrial assets to focus primarily on operating performance, which those businesses can largely control and influence, leaving Glencore to handle marketing and distribution activities as part of its integrated global system.

Principal business segments

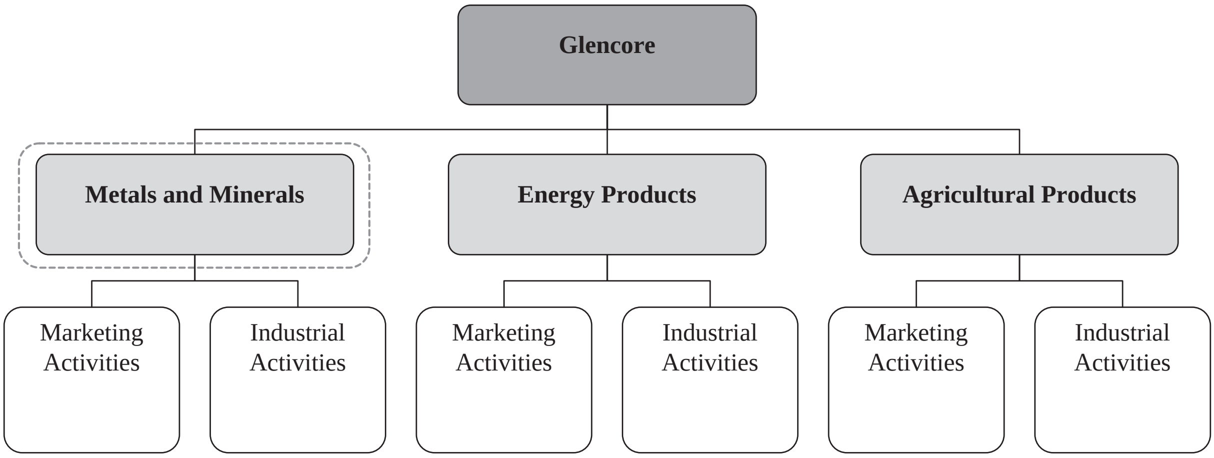
Glencore's three business segments focus on the following commodity departments.

- The Metals and Minerals business segment focuses on the following commodity departments: zinc/copper/lead, alumina/aluminium and ferroalloys/nickel/cobalt/iron ore. The business segment also markets some gold, silver, tin and other by-products such as sulphuric acid. The activities of Glencore's Metals and Minerals business segment are supported by ownership interests in controlled and non-controlled industrial assets such as mining, smelting, refining and warehousing operations.
- The Energy Products business segment focuses on the following commodity departments: oil/oil products and coal/coke. The activities of Glencore's Energy Products business segment are supported by ownership interests in controlled and non-controlled coal mining and oil production operations as well as investments in strategic handling, storage and freight equipment and facilities.
- The Agricultural Products business segment focuses on the following commodities: grains (including wheat, maize and barley, oils/oilseeds, cotton and sugar). The activities of Glencore's Agricultural Products business segment are supported by investments in controlled and non-controlled storage, handling, processing and port facilities in strategic locations.

Each of Glencore's business segments undertakes both marketing and industrial asset investment activities and is responsible for managing the marketing, sourcing, hedging, logistics and industrial investment activities relating to the relevant commodities in each business segment.

Metals and Minerals

Introduction (Metals and Minerals business segment)



The Metals and Minerals business segment focuses on the following commodity departments: zinc/copper/lead, alumina/aluminium and ferroalloys/nickel/cobalt/iron ore. The business segment also markets some gold, silver, tin and other by-products such as sulphuric acid. The activities of Glencore's Metals and Minerals business segment are supported by ownership interests in controlled and non-controlled industrial assets such as mining, smelting, refining and warehousing operations. The marketing of metals and minerals commodities is co-ordinated primarily through Glencore's Baar office.

Selected key financial information in relation to the Metals and Minerals business segment's marketing and industrial activities for the years ended 31 December 2008, 31 December 2009 and 31 December 2010 is set out below. This information has been extracted without material adjustment from Section VI: "Historical Financial Information" except where marked as unaudited. Unaudited information has been extracted without material adjustment from Glencore's accounting records.

	2008	2009	2010
		(U.S.$ million)	
Marketing Activities			
Revenue (unaudited)(1)	34,565	30,221	37,889
Adjusted EBITDA pre-exceptional items(2)	1,117	553	1,401
Adjusted EBIT pre-exceptional items(2)	1,117	553	1,401
Industrial Activities			
Revenue (unaudited)(1)	6,120	5,170	7,322
Adjusted EBITDA pre-exceptional items(2)(3)(4)	1,099	1,072	1,820
Adjusted EBIT pre-exceptional items(2)(3)(4)	658	551	1,112
Share of income from associates and dividends (excl. Xstrata)(4)	195	(53)	48
Capex	1,062	607	1,001
Total Metals & Minerals			
Revenue	40,685	35,391	45,211
Adjusted EBITDA pre-exceptional items(2)(5)	2,411	1,572	3,269
Adjusted EBIT pre-exceptional items(2)(5)	1,970	1,051	2,561

Notes:

(1) Revenue is not split between Marketing and Industrial activities in the audited Historical Financial Information set out in Section VI of this document and is therefore marked as unaudited. Total segment and total Group revenue is audited.

(2) Includes corporate selling, general and administrative expenses, but excluding variable pool bonus accrual, which is recorded at group/corporate level.

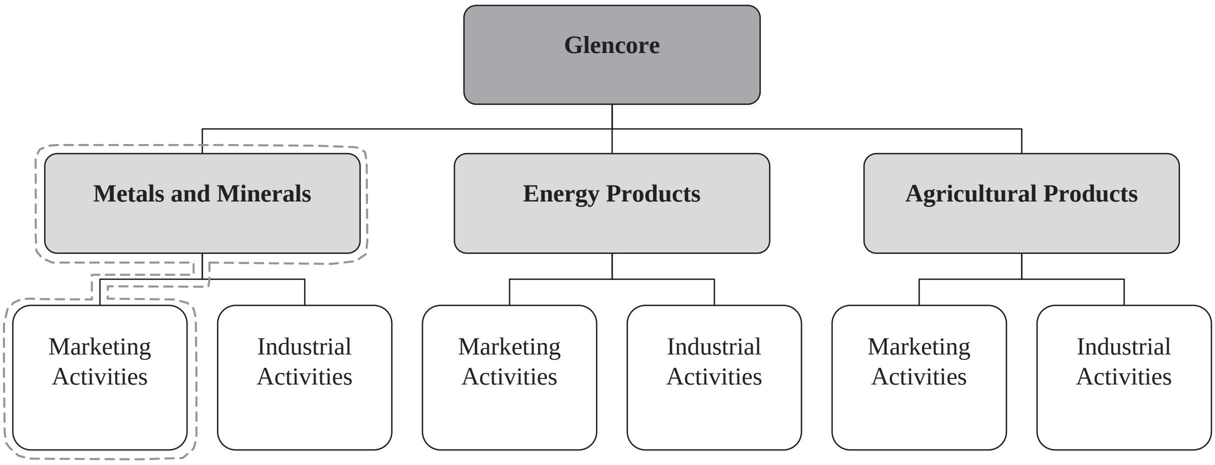
(3) Excludes share of income from associates and dividends.

(4) Adjusted EBITDA pre-exceptional items plus Share of income from associates and dividends and Adjusted EBIT pre-exceptional items plus Share of income from associates and dividends are audited.

(5) Includes share of income from associates and dividends.

The Metals and Minerals business segment currently has some 522 employees globally (excluding individuals employed within Glencore's industrial activities), with approximately 230 of these employees based in Baar, Switzerland. This business segment also employs some 43,000 individuals globally in its industrial activities.

Marketing activities (Metals and Minerals business segment)



The table below sets out the approximate marketing volumes sold to third parties of each main commodity handled by the Metals and Minerals business segment in the years ended 31 December 2008, 31 December 2009 and 31 December 2010:

Marketing volumes sold to third parties

		2008	2009	2010
Zinc metal	million MT	1.0	1.3	1.7
Zinc concentrates	million MT	2.6	2.5	2.4
Copper metal	million MT	1.4	1.4	1.4
Copper concentrates	million MT	2.2	2.0	1.8
Lead metal	million MT	0.2	0.4	0.3
Lead concentrates	million MT	0.5	0.5	0.6
Gold	'000 ounces	447	578	589
Silver	'000 ounces	13,604	11,422	8,527
Alumina	million MT	6.5	5.8	6.7
Aluminium	million MT	2.4	3.2	3.9
Ferroalloys (incl. agency)	million MT	1.8	2.2	2.6
Nickel	'000 MT	156.9	175.3	193.9
Cobalt	'000 MT	25.5	23.7	17.9
Iron ore	million MT	0.9	4.8	9.3

Glencore acquired the LME accredited Pacorini metals warehousing business in the third quarter of 2010, which operates warehousing facilities in Europe, the U.S., the Middle East and Asia, including China. The acquisition of the metal warehousing business of the Pacorini Group reinforces and broadens Glencore's worldwide distribution capabilities, allowing further direct access to storage capacity across a range of important geographic locations which enhances and supports its global marketing operations, thereby providing increased optionality.

Examples of marketing strategies for metals and minerals business segment include:

- Due to obsolescence risk, alumina is typically moved on a first-in, first-out basis and needs to be stored in optimum conditions in order to maintain levels of quality. However, Glencore has a greater capacity than many of its competitors for storing and/or transporting alumina, which allows it to take advantage of geographic and time arbitrage opportunities and logistics differentials. In particular, Glencore believes that its willingness and flexibility to store larger amounts of alumina in China than its competitors represents a competitive advantage in this growing market.

- Glencore also seeks to exploit geographic and time arbitrage opportunities and logistics differentials in relation to alumina through the use of physical swap arrangements and through optimising delivery allocations.
- Glencore uses its established presence in the Chinese market to exploit arbitrage opportunities between the LME and the SHFE in the aluminium market.
- Glencore uses its global presence and ability to trade on several exchanges and geographical markets to exploit arbitrage opportunities between the various exchanges on which each of zinc, copper, lead, silver and gold are traded. This was particularly important in 2009 and 2010 when Asian markets led the recovery in commodity prices.
- Glencore uses its ability to warehouse zinc, copper and lead at either its own production facilities, free of charge, or at warehouses, owned (Pacorini Group) or subject to long-term leases, to benefit from carry trades, that is, to sell metal at higher future prices in a contango market and to exploit such time arbitrage opportunities as they present themselves.
- Glencore uses its access to a wide range of qualities of concentrates and its blending facilities to exploit product arbitrage opportunities, that is, to convert lower priced concentrates through the blending process into higher value concentrates.
- Glencore uses its knowledge of supply and demand dynamics, obtained through its physical marketing activities, to take advantage of expected movements in underlying commodity prices and supply and demand curves.

Zinc/copper/lead commodity department (marketing activities, Metals and Minerals business segment)

Overview

The zinc/copper/lead commodity department is run as an integrated business managing the production and global marketing of refined metals and concentrates. In addition to zinc, copper and lead, the commodity department also markets tin, silver and gold, which are typically mined in conjunction with zinc, copper and lead ores, as well as sulphuric acid, a by-product of the smelting process. The commodity department has a global presence, sources commodities from all key producing regions and has relationships with consumers in the key consuming countries.

Market

Glencore believes that it has a substantial share of the relevant addressable markets, amounting to approximately 60 per cent. for zinc metal, approximately 50 per cent. for copper metal and approximately 45 per cent. for lead metal. Glencore also believes that it has leading positions in the addressable concentrates markets of approximately 50 per cent. for zinc concentrates, approximately 30 per cent. for copper concentrates and approximately 45 per cent. for lead concentrates.

Suppliers

The zinc, copper and lead operations benefit from a geographically diverse portfolio of industrial assets, located across five continents, in each of the key producing regions for these commodities. In the year ended 31 December 2010, the zinc, copper and lead operations sourced approximately 22 per cent. of material from their stakes in controlled industrial assets. Approximately 65 per cent. of volumes marketed (in value terms) in the year ended 31 December 2010 were sourced from the top ten suppliers, and nine of the top ten suppliers in the year ended 31 December 2010 were also top ten suppliers in the year ended 31 December 2009, reflecting long-term relationships, a stable supplier base and the importance of a secure long-term supply chain to Glencore. Nine of these top ten suppliers operate under predominantly long-term contracts. One top ten supplier operates under short-term contracts; however, it is effectively a long-term agreement due to the length of relationship and significant volumes supplied. Glencore believes that approximately 80 per cent. of volumes marketed, including those which are sourced through industrial assets, are secured through long-term agreements ranging from one year contracts to 15-year agreements and "evergreen" contracts (which automatically renew each year unless notice of termination is given). Long-term supply agreements with third parties, combined with supply from industrial assets, enhance Glencore's reputation as a reliable supplier, which is important for customers who are reliant on both timeliness and quality of supply for the continuation of their operations.

Glencore's main own sources of supply for zinc metal are Kazzinc, Portovesme and AR Zinc and, together, Glencore's controlled industrial assets accounted for some 28 per cent. of the zinc metal marketed during the year ended 31 December 2010. Glencore's main own sources of supply for the zinc concentrates are Los Quenuales and Sinchi Wayra and, together, Glencore's controlled industrial assets accounted for some 17 per cent. of the zinc concentrates marketed during the year ended 31 December 2010. The balance of metal and concentrate is sourced from third parties and associate industrial assets.

Glencore's main own sources of supply for copper metal are Mopani, Katanga and Pasar, and together Glencore's controlled industrial assets accounted for some 20 per cent. of the copper metal marketed during the year ended 31 December 2010. Glencore's main own sources of supply for the copper concentrates are Kazzinc and Cobar and, together, Glencore's controlled industrial assets accounted for some 25 per cent. of the copper concentrates marketed during the year ended 31 December 2010. The balance of metal and concentrate is sourced from third parties and associate industrial assets.

Glencore's main own sources of supply for lead metal are Kazzinc, Portovesme and AR Zinc and, together, Glencore's controlled industrial assets accounted for some 36 per cent. of the lead metal marketed during the year ended 31 December 2010. Glencore's main own sources of supply for the lead concentrates are Los Quenuales and Sinchi Wayra and, together, Glencore's controlled industrial assets accounted for some 9 per cent. of the lead concentrates marketed during the year ended 31 December 2010. The balance of metal and concentrate is sourced from third parties and associate industrial assets.

The zinc, copper and lead operations' large number of industrial assets provides Glencore with access to an integrated production and marketing system.

Customers

Across the zinc, copper and lead operations, there is a diversified customer base, including galvanisers, alloy producers, steel and brass mills, rod and wire producers and other fabricators, with the top ten customers by value representing around 25 per cent. of sales in the year ended 31 December 2010. Seven of the top ten customers in the year ended 31 December 2010 were also in the top ten customers in the year ended 31 December 2009. The concentrates market has fewer customers (smelters) than the refined metals market. The diversification is larger for customers than for suppliers, reflecting a greater number of end users for metals and concentrates relative to the number of mines, smelters and refineries which produce concentrates and metals, respectively. Glencore believes that the zinc, copper and lead operations generally enter into long-term agreements with customers in order to secure sales of metals and concentrates, with approximately 60 per cent. of sales volumes being sold under long-term agreements in the year ended 31 December 2010, though the trend is towards a larger proportion of spot contracts as these are more prevalent in India and China, which are growth markets.

In respect of the individual commodities:

- Glencore sells its zinc products to various industrial customers, with zinc used primarily in the construction and automotive industries. Glencore's top ten customers accounted for 36 per cent. of the zinc metal and 63 per cent. of the zinc concentrates sold during the year ended 31 December 2010;
- Glencore sells its copper products to various industrial customers. Glencore's top ten customers accounted for 42 per cent. of the copper metal and 75 per cent. of the copper concentrates sold during the year ended 31 December 2010; and
- Glencore sells its lead products predominantly to producers of lead acid batteries for the automotive industry and industrial capacitors. Glencore's top ten customers accounted for 53 per cent. of the lead metal and 77 per cent. of the lead concentrates sold during the year ended 31 December 2010.

Features of the market

The physical metal trades are based on an exchange price plus/minus a premium/discount. A highly liquid paper futures market exists for zinc, copper, lead and tin metals, which are traded on the LME (zinc, copper, lead and tin), the SHFE (copper and zinc) and the COMEX (copper). Silver and gold are traded on the LBMA and the COMEX. These exchanges allow Glencore's underlying commodity price exposures on physical transactions to be hedged, whether the price is based on an exchange price or a fixed price. If desired, and subject to group risk limits and policies, they also allow Glencore to gain exposure to price risk and spread positions through the use of long and short paper transactions, and to take advantage of arbitrage opportunities.

Concentrates are non-fungible products and, consequently, are not directly tradable on an exchange. Glencore hedges physical concentrate positions using future contracts for the estimated payable metal contained in the concentrate.

Logistics

The marketing team for zinc, copper and lead are supported by a traffic team of 48 people who are responsible for executing transactions following the negotiation of the key contractual terms and for managing metals along the supply chain through inventory, financing and transportation from source to end customers. The department also benefits from storage and blending facilities in Peru and has access to other warehousing facilities, including those at Glencore's industrial assets.

Although important, the freight component of price is not as critical for metals as for bulk cargoes and crude oil. All freight relating to the commodities marketed is chartered through third party freight brokers on competitive terms, taking into account Glencore's scale of activities, both on the spot market and through the longer-term contracts of affreightment.

Competitors

Glencore has few major marketing competitors for zinc, copper and lead, with Noble Group and Trafigura Group trading smaller zinc, copper and lead quantities as part of their core businesses, neither of which has significant production assets.

Alumina/aluminium commodity department (marketing activities, Metals and Minerals business segment)

Overview

The alumina/aluminium commodity department is involved in the marketing and processing of bauxite, alumina and primary aluminium. Through the sourcing and physical exchange of alumina and aluminium of different origins, the alumina/aluminium commodity department has been able to create a global position in its market.

Market

Glencore is a leading supplier in the global third party alumina market, with an estimated share of the addressable market of approximately 38 per cent., supplying a physical volume (excluding physical swaps) of 6.7 million MT and 5.8 million MT during the years ended 31 December 2010 and 31 December 2009, respectively.

Glencore is a leading physical supplier of third party aluminium, with an estimated share of the addressable market of approximately 22 per cent., marketing physical volumes of 3.9 million MT and 3.2 million MT during the years ended 31 December 2010 and 31 December 2009, respectively.

Suppliers

The alumina market is a wholesale market with only a limited number of suppliers and customers operating in the market. Glencore has a guaranteed supply source as it is involved in the production of alumina through its industrial assets. In addition, Glencore purchases alumina from many of the world's leading alumina producers, mostly under long-term contracts. A significant portion of Glencore's alumina supply is sourced from a few key suppliers with the top ten alumina suppliers accounting for approximately 78 per cent. of supply in the year ended 31 December 2010. In the year ended 31 December 2010, some 23 per cent. of alumina purchased originated from Glencore's stakes in industrial assets, namely Sherwin Alumina and UC Rusal. Glencore believes that it currently operates with a mixture of approximately 65 per cent. long-term and 35 per cent. short-term alumina contracts. Eight of the top ten suppliers in the year ended 31 December 2010 were under predominantly long-term contracts. Prices under alumina supply contracts are typically linked to the LME price of aluminium for long-term contracts and are fixed for short-term contracts.

Glencore's supply sources for aluminium are fairly concentrated as well, with its top ten suppliers accounting for some 74 per cent. of supply in the year ended 31 December 2010. Five of the top ten suppliers in the year ended 31 December 2010 were also top ten suppliers in the year ended 31 December 2009, reflecting a stable supplier base. Seven of the top ten suppliers in the year ended 31 December 2010 were under long-term contracts. Glencore's supply sources also include its industrial assets. In the year ended 31 December 2010, approximately 50 per cent. of aluminium purchased originated from Glencore's partially owned industrial assets, UC Rusal and Century Aluminum. In the year ended 31 December 2010, Glencore believes that around 44 per cent. of Glencore's supplier contracts were short-term. However, these contracts are typically renegotiated so that the contract is replaced with a new one upon expiry. Glencore is focused on obtaining a larger proportion of its aluminium under long-term contracts.

Customers

Glencore's alumina customer base is diverse and geographically dispersed and includes Century Aluminum as well as many of the world's other major alumina consumers. The top ten alumina customers accounted for some 61 per cent. of the sales in the year ended 31 December 2010. Seven of the top ten customers in the year ended 31 December 2010 were also top ten customers in the year ended 31 December 2009, reflecting a stable alumina customer base. In the year ended 31 December 2010, approximately 5 per cent. of total sales of alumina were to associates. Glencore believes that approximately 59 per cent. of Glencore's alumina sales are made pursuant to long-term contracts under which (similarly to alumina purchase contracts) prices are linked to the LME price of aluminium for long-term contracts and are fixed for short-term contracts. Contracts are usually entered into on a "take or pay" arrangement, meaning volumes are fixed, which offsets Glencore's own risk of accepting similar terms from its suppliers.

Since there is a much larger market for aluminium than for alumina, Glencore's customer base for aluminium is somewhat broader than for alumina, with the top ten customers representing some 50 per cent. of the sales in the year ended 31 December 2010. The largest customers include most of the aluminium consuming industrial groups in the construction, packaging, transport and electronics industries. Aluminium customers can have multiple contracts with Glencore with different terms, contract durations and geographical locations and are typically priced on the LME price plus premium.

Features of the market

Alumina can only be stored for limited time periods in optimum conditions in order to maintain levels of quality. There is no derivatives exchange for alumina, which restricts the ability to hedge. As such, Glencore is unable to adjust its position through a deliverable paper market and the great majority of near-term alumina forward purchase and sale contracts are physically matched. Short-term contracts are mostly based on a fixed price and long-term contracts are normally priced as a percentage of LME aluminium prices. Many of the LME linked contracts have put/call features. Additionally, there are nascent efforts to establish an alumina index pricing system. Where possible, Glencore hedges its exposure by contracting on a back-to-back basis or taking hedges against LME aluminium prices.

Primary aluminium is mainly traded on the LME, allowing paper and physical marketing contracts to be entered into with reference to a market price. Aluminium is also traded on the SHFE. This allows positions to be hedged and marked to market, as well as providing a purchaser of last resort. The LME provides information on forward curves as well as a standardised contract that determines purity levels, delivery dates, weights and forms of the metal. Almost all of Glencore's physical aluminium transactions are priced based on the LME price plus/minus a premium/discount. These are hedged when originated or priced. The existence of the LME allows Glencore to enter into immediate and effective, price risk hedges against its positions in physical aluminium. The existence and use of LME approved warehouses allow marketers to manage supply and store the metal while they lock in future prices on the LME. If desired, and subject to group risk limits and policies, it also allows Glencore to gain exposure to price risk and spread positions through the use of long and short paper transactions.

Logistics

68 employees form the alumina/aluminium traffic team and are responsible for producing information to enable the marketers to make informed transactions as well as executing the transactions after the marketers have negotiated the key terms.

Competitors

Glencore has few major competitors trading in its addressable markets for alumina and aluminium; however, its competitors do market significant volumes of their own alumina and aluminium production. Alumina and aluminium production utilised by the aluminium smelters and downstream facilities of integrated companies such as Rio Tinto plc, Alcoa Inc. and Norsk Hydro ASA are outside Glencore's addressable markets, but are noteworthy as these volumes are very large and therefore may affect pricing and customer relationships within the addressable markets.

Ferroalloys/nickel/cobalt commodity department (marketing activities, Metals and Minerals business segment)

Overview

The ferroalloys/nickel/cobalt commodity department markets bulk ferroalloys (including ferrochrome and chrome ore, ferromanganese, siliconmanganese, manganese ore and ferrosilicon), noble ferroalloys (vanadium and molybdenum products), nickel, cobalt, steel and iron ore.

Market

Glencore has a significant presence in the market for ferrochrome, nickel and cobalt, with estimated shares of the addressable market of approximately 16 per cent., 14 per cent. and 23 per cent., respectively. Glencore is currently, and has for the last few years been, the largest physical supplier of ferrochrome and cobalt products.

Suppliers

Ferroalloys, nickel and cobalt products are sourced through some of the key industrial assets Glencore has stakes in, including Xstrata by way of long-term off-take, agency and distribution agreements as well as from third party suppliers. In the year ended 31 December 2010, the ferroalloys/nickel/cobalt department sourced approximately 61 per cent. of its products in this commodity department via its stakes in industrial assets (Murrin Murrin, Mopani, Mutanda and Katanga for nickel and cobalt) and off-take and agency agreements with Xstrata for nickel, ferronickel, cobalt, ferrochrome and vanadium.

Glencore's main source of supply for ferrochrome products is Xstrata, which supplied approximately 85 per cent. of the ferrochrome products marketed during the year ended 31 December 2010, under an exclusive agency agreement.

With regards to nickel, the top ten suppliers represented more than 95 per cent. of Glencore's total physical supplies by value in the year ended 31 December 2010. Nine of the top ten suppliers in the year ended 31 December 2010 were also in the top ten suppliers in the year ended 31 December 2009, reflecting long-term relationships. Seven of the top ten suppliers in the year ended 31 December 2010 were under long-term contracts. During the year ended 31 December 2010, Glencore's industrial assets (controlled and non-controlled) provided approximately 75 per cent. of the total nickel supply, largely from Murrin Murrin and Xstrata. Glencore believes that nickel supply arrangements are primarily under long-term contracts of three to five years, priced by reference to LME prices. Approximately 97 per cent. of the volumes purchased (in value terms) from the top ten nickel suppliers in the year ended 31 December 2010 are under long-term contracts.

Cobalt is purchased as either cobalt intermediates, concentrates or cobalt metal, which are sourced from different suppliers, including from companies which form part of Glencore's industrial assets. The top ten suppliers represented approximately 94 per cent. of purchases of cobalt in the year ended 31 December 2010. Seven of the top ten suppliers in the year ended 31 December 2010 were also in the top ten suppliers in the year ended 31 December 2009, reflecting long-term relationships. Approximately 65 per cent. of cobalt is supplied by Glencore's industrial assets. Glencore believes that almost all cobalt agreements are long-term off-take agreements of up to five years with prices typically agreed annually by reference to London Metals Bulletin prices. Approximately 92 per cent. of the volumes purchased (in value terms) from the top ten cobalt suppliers in the year ended 31 December 2010 are under long-term contracts.

Glencore has monitored the development of the iron ore market for a number of years, prior to entering the market and began to actively market the product in the year ended 31 December 2008, initially sourcing from small suppliers, then increasing its focus on supply from major miners in the years ended 31 December 2009 and 2010. Volumes sold increased significantly from 0.9 million MT in the year ended 31 December 2008 and to 4.8 million MT in the year ended 31 December 2009 to 9.3 million MT in the year ended 31 December 2010. The opportunity to trade on a spot price basis reflects demand/supply imbalances across the major miners and steel mills and related pricing mechanism preferences which have moved away from annual price agreements. All iron ore volumes are sourced from third parties under spot and long-term contracts with Glencore's main suppliers. On an aggregate basis, the top ten iron ore suppliers accounted for approximately 94 per cent. of the volumes purchased (in value terms). This high concentration is largely due to the limited numbers of iron ore suppliers globally.

Customers

Glencore's ferroalloys, nickel and cobalt customer base is geographically diverse and consists of large multinational European, American and Asian businesses across the carbon, stainless steel and other special steel industries. Most products are sold to end users, but a small portion are sold to intermediaries. Glencore has also recently developed its chrome, iron and manganese ore businesses, supplying mostly large ferroalloys smelters (chrome and manganese) and carbon steel mills (iron). Contracts for the bulk ores are both spot and long-term (typically one year) with prices negotiated based on prevailing market prices.

Glencore's customers for ferroalloys are typically large carbon steel, stainless steel and special steel mills. During the year ended 31 December 2010, the top ten customers represented some 50 per cent. of ferroalloys sales (approximately 85 per cent. of ferrochrome sales). Excluding iron ore and steel customers, eight of Glencore's top ten customers in the year ended 31 December 2010 were also in the top ten customers of Glencore in the year ended 31 December 2009. Contracts are usually one to three years in duration with pricing terms either linked to industry publication prices or negotiated on a quarterly basis.

Glencore markets a range of nickel products in ore, concentrates, matte forms and refined products, with its sales of refined products accounting for some 93 per cent. of total physical volumes supplied during the year ended 31 December 2010. The nickel customer base is well established, with the top ten customers representing approximately 49 per cent. of sales during the year ended 31 December 2010. Historically, the top customers have been European stainless steel producers, but recently Chinese stainless steel producers have become more important customers as the steel market has recovered more quickly in China than in Europe. In the year ended 31 December 2010, however, demand from European customers recovered, resulting in a mix of Chinese and European customers being the top customers. Glencore believes that, typically, sales are approximately 70 per cent. made under long-term arrangements of one to five years and 30 per cent. are made in the spot market. Apart from nickel ore, which has its own market prices due to the variability of the grade, all nickel related products are priced by reference to LME prices.

Glencore's customers for cobalt are typically large processors. Cobalt is sold in many forms, including ore, concentrates, intermediates, salts and metal. The top ten customers represented approximately 53 per cent. of sales in the year ended 31 December 2010. Cobalt contracts are approximately 12 months long on average, but can be up to five years, while contract pricing terms are set using the London Metals Bulletin price.

Features of the market

Ferroalloys, nickel and cobalt marketing operations principally involve marketing these commodities through physical, as opposed to paper, transactions.

An active futures market exists for nickel on the LME, which allows the marketing team to hedge sales and purchases for nickel products; typically, physical positions are fully hedged using futures on the LME.

Whilst the LME launched trading platforms for cobalt and molybdenum in February 2010, volumes are currently low, and these exchanges are therefore still relatively illiquid and, as a result, there is limited possibility to achieve effective paper hedging through a metals exchange. However, Glencore has developed and offers financial products, such as cash settled swaps, for cobalt and molybdenum as a means of managing the risk in respect of its physical exposures in these commodities.

In 2008 the LME and Singapore Exchange Ltd. each launched an exchange for iron ore. Volumes traded on these exchanges are currently low and, as such, these exchanges are relatively illiquid.

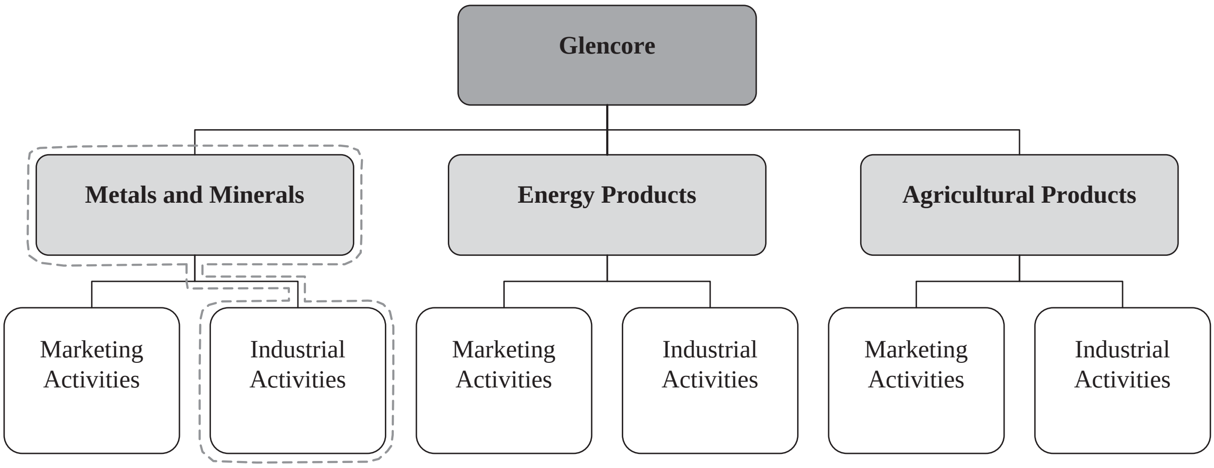
Logistics

Marketers of ferroalloys, nickel and cobalt are supported by a traffic team of 68 people who provide the marketers with data, such as prices for freight and logistics, before sales are agreed with customers. The traffic team also manage the logistics of product delivery once a deal has been agreed, where freight requirements are generally outsourced to third parties.

Competitors

Glencore has few major competitors trading in its addressable markets for ferroalloys, nickel and cobalt and the majority of its competitors compete primarily in upstream production, although some also have significant end product capabilities.

Industrial activities (Metals and Minerals business segment)



Zinc/copper/lead commodity department (industrial activities, Metals and Minerals business segment)

Overview

The table below summarises information about the key zinc/copper/lead producing industrial assets as at 31 December 2010:

Company	Country	Commodity	Current annual production capacity	Glencore's ownership interest	Remaining ownership interest	Any contractual relationship with Glencore
Controlled:						
Kazzinc	Kazakhstan	Zinc metal Lead metal Copper concentrates Copper metal Gold Silver	300k MT 130k MT[2] 240k MT[3] 70k MT 1.5 million toz 45 million toz	50.7%	49.3% privately held[1]	Supply and purchase agreements
Katanga	DRC	Copper metal Cobalt	130k MT[4] 5.5k MT[4]	74.4%	25.6% publicly traded on Toronto Stock Exchange	Purchase agreements
Mopani	Zambia	Copper metal Cobalt	300k MT 2.8k MT	73.1%	16.9% First Quantum Minerals Ltd., 10% ZCCM	Supply and purchase agreements
AR Zinc	Argentina	Zinc metal Lead metal	44k MT 14k MT	100%	—	Purchase agreements
Cobar	Australia	Copper concentrates	180k MT	100%	—	Purchase agreements
Los Quenuales .	Peru	Zinc concentrates Lead concentrates	330k MT 40k MT	97.1%	2.9% indirectly listed on Lima Stock Exchange	Purchase agreements
Pasar	Philippines	Copper metal	215k MT	78.2%	21.8% local investors	Supply and purchase agreements
Portovesme . . .	Italy	Zinc metal Lead metal Waelz oxide	120k MT 80k MT 60k MT	100%	—	Supply and purchase agreements
Punitaqui	Chile	Copper concentrates[5]	40k MT	100%	—	Purchase agreements
Sinchi Wayra . . .	Bolivia	Zinc concentrates Lead concentrates Tin concentrates	205k MT 15k MT 6k MT	100%	—	Purchase agreements
Non-controlled:						
Xstrata	UK/ Switzerland	Zinc metal Lead metal Copper metal	1,061k MT 487k MT 1,676k MT	34.5%	65.5% publicly traded on London Stock Exchange and SIX	Purchase agreements, agency agreements, marketing agreements, distribution agreements
Mutanda[6]	DRC	Copper metal Cobalt	110k MT by 2012 23k MT by 2012[8]	40%	60% privately held[7]	Purchase agreements
Kansuki	DRC	Copper metal Cobalt	N/A[9]	37.5%	62.5% privately held[10]	Purchase agreements
Nyrstar	Belgium	Zinc metal Lead metal	1,120k MT 235k MT	7.8%	92.2% publicly traded on Euronext Brussels	Supply and purchase agreements
Perkoa[11]	Burkina Faso	Zinc concentrates	170k DMT[12]	50.1%	39.9% held by Blackthorn, 10% Burkina Faso government	Purchase agreements
Recylex	France	Lead metal Battery recycling EAF dust recycling	135k MT 10 million units 180k MT	32.2%	67.8% publicly traded on Euronext Paris	Purchase agreements

Company	Country	Commodity	Current annual production capacity	Glencore's ownership interest	Remaining ownership interest	Any contractual relationship with Glencore
Volcan	Peru	Zinc concentrates Lead concentrates	655k MT 123k MT	4.1%	95.9% publicly traded on the Lima Stock Exchange	Purchase agreements
Polymet	Canada	Copper concentrates Nickel concentrates	N/A	6.3%	93.7% publicly listed on NYSE and TSX	Purchase agreements

Notes:

(1) Glencore has agreed with Verny to acquire additional stakes in Kazzinc thereby increasing its ownership from 50.7 per cent. to 93.0 per cent. See Section X: "Additional Information" for further details of these purchases and the terms of the Kazzinc SPAs.

(2) After commissioning of its lead smelter capacity will increase to 168k MT.

(3) Copper metal production to replace copper concentrate production with new smelter.

(4) Expansion to 310k MT of copper metal, 8k MT of cobalt and 22k MT of cobalt contained in cobalt hydroxide by 2015.

(5) Operation forecast for 2011.

(6) Mutanda is not a controlled asset as Glencore has only a 40 per cent. stake; however, Glencore is the operator.

(7) 20 per cent. interest in Mutanda Mining Sprl was recently acquired by Rowny Assets Limited (an entity associated with Dan Gertler) from Gécamines.

(8) Cobalt contained in cobalt hydroxide.

(9) Exploration stage.

(10) 25 per cent interest in Kansuki was recently acquired by Biko Invest Corp (an entity associated with Dan Gertler) from Gécamines.

(11) Ownership interest on completion of earn-in by 2012.

(12) Operation forecast for first half 2013.

Financial information

The table below sets out selected financial information on the controlled zinc/copper/lead industrial activities for the years ended 31 December 2008, 31 December 2009 and 31 December 2010. The information in this table has been extracted without material adjustment from Glencore's accounting books and records, which are unaudited:

	2008	2009	2010
		(U.S.$ million) *(Unaudited)*	
ZINC			
Kazzinc			
Revenue	1,384	1,330	1,855
Adjusted EBITDA pre-exceptional items(1)	473	637	815
Adjusted EBIT pre-exceptional items(1)	357	490	579
Statutory tax rate	30%	20%	20%
Capex	568	367	350
Other Zinc			
Revenue	1,085	665	901
Adjusted EBITDA pre-exceptional items(1)	97	62	225
Adjusted EBIT pre-exceptional items(1)	(34)	(28)	115
Capex	166	48	110
Total Zinc			
Revenue	2,469	1,995	2,756
Adjusted EBITDA pre-exceptional items(1)	570	699	1,040
Adjusted EBIT pre-exceptional items(1)	323	462	694

Note:

(1) Excludes share of income from associates and dividends.

	2008	2009	2010
	(U.S.$ million)		
	(Unaudited)		
COPPER			
Katanga			
Revenue	0	178	496
Adjusted EBITDA pre-exceptional items[(1)]	0	48	168
Adjusted EBIT pre-exceptional items[(1)]	0	39	109
Statutory tax rate	0	30%	30%
Capex	0	62	221
Mopani			
Revenue	865	594	863
Adjusted EBITDA pre-exceptional items[(1)]	94	118	218
Adjusted EBIT pre-exceptional items[(1)]	44	(21)	68
Statutory tax rate	30%	30%	30%
Capex	137	58	130
Other Copper			
Revenue	1,874	1,559	2,072
Adjusted EBITDA pre-exceptional items[(1)]	288	205	214
Adjusted EBIT pre-exceptional items[(1)]	256	175	179
Capex	40	43	92
Total Copper			
Revenue	2,739	2,331	3,431
Adjusted EBITDA pre-exceptional items[(1)]	382	371	600
Adjusted EBIT pre-exceptional items[(1)]	300	193	356

Note:

(1) Excludes share of income from associates and dividends.

Production

The table below sets out the production of the controlled zinc/copper/lead assets for the years ended 31 December 2008, 31 December 2009 and 31 December 2010:

	Year ended 31 December								
	2008			2009			2010		
	Production	Production using feed from own sources	Production using feed from third party sources	Production	Production using feed from own sources	Production using feed from third party sources	Production	Production using feed from own sources	Producing using feed from third party sources
	('000 MT)	*('000 MT)*	*('000 MT)*	*('000 MT)*	*('000 MT)*	*('000 MT)*	*('000 MT)*	*('000 MT)*	*('000 MT)*
Kazzinc									
Zinc metal	299	262	38	301	227	74	301	239	62
Lead metal	90	43	47	79	46	33	101	33	68
Copper metal(1)	56	56	0	59	57	2	50	48	2
Gold ('000 toz)	183	179	4	238	233	6	348	326	21
Silver ('000 toz)	7,618	5,313	2,305	6,286	5,335	951	6,731	5,182	1,549
Katanga									
Copper metal	22.1	22.1	0.0	42.0	42.0	0.0	52.2	52.2	0.0
Copper concentrates	0.0	0.0	0.0	1.8	1.8	0.0	6.1	6.1	0.0
Cobalt	0.7	0.7	0.0	2.5	2.5	0.0	3.4	3.4	0.0
Mopani									
Copper metal	165.4	110.3	55.2	184.7	98.3	86.4	197.4	94.4	103.0
Cobalt	1.5	1.5	0.0	1.3	1.3	0.0	1.1	0.8	0.3
AR Zinc									
Zinc metal	40	26	15	32	28	4	41	28	13
Lead metal	13	13	0	13	13	0	14	14	0
Cobar									
Copper concentrates	155	155	0	182	182	0	179	179	0
Los Quenuales									
Zinc concentrates	377	377	0	90	90	0	237	237	0
Lead concentrates	45	45	0	25	25	0	35	35	0
Pasar									
Copper metal	175	0	175	178	0	178	176	0	176
Portovesme									
Zinc metal	107	0	107	104	0	104	104	0	104
Lead metal	76	0	76	29	0	29	0	0	0
Sinchi Wayra									
Zinc concentrates	188	161	27	137	133	4	153	153	0
Lead concentrates	15	13	2	8.7	8.5	0.2	11	11	0
Tin concentrates	5	5	0	4	4	0	4	4	0
Total production									
Zinc concentrates	565	538	27	227	223	4	390	390	—
Zinc metal	446	288	160	437	255	182	446	267	179
Lead concentrates	60	58	2	34	34	—	46	46	—
Lead metal	179	56	123	121	59	62	115	47	68
Copper concentrates	155	155	—	184	184	—	185	185	—
Copper metal	419	188	230	464	197	266	476	195	281
Cobalt	2.2	2.2	—	3.8	3.8	—	4.5	4.2	0.3
Tin concentrates	5	5	—	4	4	—	4	4	—
Gold ('000 toz)	183	179	4	238	233	6	348	326	21
Silver ('000 toz)	7,618	5,313	2,305	6,286	5,335	951	6,731	5,182	1,549

(1) Copper contained is copper concentrates and blister copper.

Reserves and resources

The table below sets out the total mine reserves and resources summary for the zinc/copper/lead industrial assets:

Kazzinc[(1)(2)]			**Reserves**			**Resources**			
			Proved	**Probable**	**Total**	**Measured**	**Indicated**	**Inferred**	**Total**
OPERATING MINES									
Vasilkovskoje									
	Ore	'000 MT	33,300	90,700	124,000	45,230	141,560	99,080	285,870
	Gold (Au)	Content, g/t	1.95	1.94	1.94	1.75	1.72	1.77	1.74
	Gold (Au)	Amount, ounces	2,088	5,657	7,745	2,551	7,840	5,650	16,041
Maleevsky									
	Ore	'000 MT	5,040	7,060	12,100	12,920	11,030	4,870	28,830
	Gold (Au)	Content, g/t	0.56	0.51	0.53	0.62	0.56	0.25	0.53
	Silver (Ag)	Content, g/t	68.13	56.23	61.19	77.74	64.82	47.79	67.73
	Copper (Cu)	Content, %	1.92	1.69	1.79	2.39	1.95	0.97	1.98
	Lead (Pb)	Content, %	1.00	1.04	1.02	1.13	1.15	1.58	1.21
	Zinc (Zn)	Content, %	6.46	6.29	6.36	6.92	6.82	4.99	6.56
Ridder-Sokolny									
	Ore	'000 MT	8,950	12,050	21,000	30,210	67,910	6,640	104,760
	Gold (Au)	Content, g/t	0.91	1.03	0.98	1.11	1.55	0.83	1.38
	Silver (Ag)	Content, g/t	12.85	8.44	10.32	11.73	10.74	9.09	10.92
	Copper (Cu)	Content, %	0.43	0.22	0.31	0.64	0.38	0.29	0.45
	Lead (Pb)	Content, %	0.32	0.37	0.35	0.40	0.40	0.59	0.41
	Zinc (Zn)	Content, %	0.73	0.7	0.71	0.91	0.95	1.12	0.95
Tishinsky									
	Ore	'000 MT	18,890	4,930	23,810	21,230	7,010	5,190	33,430
	Gold (Au)	Content, g/t	0.54	0.47	0.53	0.60	0.46	0.33	0.53
	Silver (Ag)	Content, g/t	8.12	9.36	8.38	9.02	9.75	11.94	9.87
	Copper (Cu)	Content, %	0.52	0.40	0.50	0.59	0.45	0.55	0.55
	Lead (Pb)	Content, %	0.91	0.88	0.90	1.00	0.95	1.36	1.04
	Zinc (Zn)	Content, %	4.22	4.13	4.20	4.71	4.35	4.46	4.60
Staroye Tailings Dam									
	Ore	'000 MT		790	790		820	5,900	6,720
	Gold (Au)	Content, g/t		2.00	2.00		2.01	0.91	1.04
	Silver (Ag)	Content, g/t		18.69	18.69		18.78	11.16	12.09
	Copper (Cu)	Content, %		0.05	0.05		0.05	0.04	0.04
	Lead (Pb)	Content, %		0.48	0.48		0.48	0.30	0.32
	Zinc (Zn)	Content, %		1.10	1.10		1.11	0.63	0.69
Shaimerden Stockpiles									
	Ore	'000 MT		2,480	2,480		2,480		2,480
	Zinc (Zn)	Content, %		21.71	21.71		21.71		21.71
Novoshirokinskoe									
	Ore	'000 MT	2,440	4,430	6,870	2,430	4,640	1,510	8,580
	Gold (Au)	Content, g/t	3.89	3.89	3.89	4.43	4.30	2.08	3.94
	Silver (Ag)	Content, g/t	77.0	84.3	81.70	87.74	94.82	57.02	86.18
	Lead (Pb)	Content, %	2.98	2.69	2.79	3.43	3.07	2.44	3.06
	Zinc (Zn)	Content, %	1.28	0.99	1.09	1.47	1.15	1.81	1.36
DEVELOPMENT PROJECTS									
Dolinnoe									
	Ore	'000 MT	3,660	960	4,620	5,040	2,700	6,907	14,647
	Gold (Au)	Content, g/t	3.93	2.38	3.61	3.85	2.32	1.59	2.50
	Silver (Ag)	Content, g/t	53.76	29.82	48.77	50.47	28.05	15.88	30.03
	Copper (Cu)	Content, %	0.20	0.14	0.19	0.20	0.14	0.12	0.15
	Lead (Pb)	Content, %	0.75	0.50	0.70	0.74	0.48	0.48	0.57
	Zinc (Zn)	Content, %	1.41	1.02	1.33	1.39	1.00	0.86	1.07
Obruchevskoe									
	Ore	'000 MT	890	3,250	4,140	1,154	7,783	5,500	14,437
	Gold (Au)	Content, g/t	1.73	0.90	1.08	1.62	0.67	0.50	0.68
	Silver (Ag)	Content, g/t	42.80	33.21	35.26	40.68	25.36	24.97	26.44
	Copper (Cu)	Content, %	0.81	0.83	0.82	0.88	0.73	0.41	0.62
	Lead (Pb)	Content, %	4.27	2.66	3.01	4.02	1.78	0.64	1.53
	Zinc (Zn)	Content, %	8.98	6.50	7.03	8.87	4.64	1.75	3.87

Kazzinc(1)(2)			Reserves			Resources			
			Proved	Probable	Total	Measured	Indicated	Inferred	Total
Chashinskoye Tailing Dam									
	Ore	'000 MT		55,530	55,530		57,800	30,000	87,800
	Gold (Au)	Content, g/t		0.7	0.7		0.67	0.50	0.61
	Silver (Ag)	Content, g/t		5.37	5.37		5.16	4.57	4.96
	Copper (Cu)	Content, %		0.05	0.05		0.05	0.06	0.05
	Lead (Pb)	Content, %		0.16	0.16		0.15	0.19	0.16
	Zinc (Zn)	Content, %		0.40	0.40		0.38	0.45	0.40
Tishinsky Tailing Dam									
	Ore	'000 MT		320	320		330	40	380
	Gold (Au)	Content, g/t		0.33	0.33		0.33	0.58	0.36
	Silver (Ag)	Content, g/t		9.89	9.89		9.96	8.73	9.79
	Copper (Cu)	Content, %		0.22	0.22		0.22	0.23	0.22
	Lead (Pb)	Content, %		0.76	0.76		0.76	0.56	0.74
	Zinc (Zn)	Content, %		2.44	2.44		2.46	2.64	2.48

Notes:

(1) As at 1 January 2011. The information in the table above, in relation to mineral reserves and resources, is in compliance with the JORC Code and has been extracted without material adjustment from the Kazzinc Report in Section XIV: "Independent Technical Reports".

(2) Remaining mine life: different for each mine, ranging from eight to 21 years. Expiry date of relevant mining/concession licences: different for each mine, ranging from 19 May 2013 to 7 November 2030.

Competent Persons: the mineral reserves and resources estimates set out above were reviewed and approved by Phil Newall of WAI. The reserves and resources estimates have been prepared in accordance with the JORC Code. Mr Newall is a Competent Person as defined by JORC and has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking.

Katanga(1)(2)	Commodity	Reserves			Resources			
		Proved	Probable	Total	Measured	Indicated	Inferred	Total
Kamoto	Ore ('000 MT)	14,589	19,400	33,989	30,700	35,700	10,600	77,000
	Copper (%)	3.47	3.70	3.60	4.54	4.69	5.11	4.69
	Cobalt (%)	0.51	0.53	0.52	0.54	0.60	0.59	0.57
T17	Ore ('000 MT)	0	1,470	1,470	0	8,500	15,300	23,800
	Copper (%)	0	2.61	2.61	0	2.75	1.91	2.21
	Cobalt (%)	0	0.46	0.46	0	0.87	0.61	0.70
Mashamba East . .	Ore ('000 MT)	0	5,914	5,914	0	75,000	65,300	140,300
	Copper (%)	0	3.00	3.00	0	1.80	0.76	1.32
	Cobalt (%)	0	0.37	0.37	0	0.38	0.10	0.25
KOV	Ore ('000 MT)	0	55,666	55,666	0	123,900	71,200	195,100
	Copper (%)	0	4.73	4.73	0	5.37	3.56	4.71
	Cobalt (%)	0	0.45	0.45	0	0.40	0.32	0.37
Kananga	Ore ('000 MT)	0	0	0	0	4,100	4,000	8,100
	Copper (%)	0	0	0	0	1.61	2.00	1.80
	Cobalt (%)	0	0	0	0	0.79	0.98	0.88
Tilwezembe	Ore ('000 MT)	0	0	0	0	9,500	13,800	23,300
	Copper (%)	0	0	0	0	1.89	1.75	1.81
	Cobalt (%)	0	0	0	0	0.60	0.60	0.60

Notes:

(1) As at 31 December 2010. The information in the table above, in relation to mineral reserves and resources, is in compliance with the JORC Code and has been extracted without material adjustment from the Katanga Report in Section XIV: "Independent Technical Reports".

(2) Remaining mine life: in excess of 25 years. Expiry date of relevant mining/concession licences: 7 May 2022 for the extension of Katanga and 3 April 2024 for all remaining operations.

Competent Persons: the mineral reserves and resources estimates set out above were reviewed and approved by Willem van der Schyff of Golders. The reserve and resources estimates have been prepared in accordance with the JORC Code. Mr Van der Schyff is a Competent Person as defined by JORC and has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking.

Mopani[(1)(2)]	Commodity	Reserves			Resources			
		Proved	Probable	Total	Measured	Indicated	Inferred	Total
Nkana Sulphides . . .	Ore ('000 MT)	92,300	15,900	108,200	136,600	34,300	35,300	206,200
	Copper (%)	1.84	1.80	1.83	1.94	1.79	1.65	1.86
	Cobalt (%)	0.10	0.23	0.12	0.10	0.14	0.14	0.12
Nkana Oxides	Ore ('000 MT)	1,800	800	2,600	8,400	210	80	8,690
	Copper (%)	4.02	2.84	3.66	2.93	4.12	3.31	2.96
	Cobalt (%)	0.14	0.10	0.13	0.11	0.16	0.14	0.11
Mufulira	Ore ('000 MT)	8,100	2,500	10,600	28,200	9,900	37,600	75,700
	Copper (%)	2.51	2.96	2.62	2.18	2.62	2.62	2.46

Notes:

(1) As at 31 October 2010. The information in the table above, in relation to mineral reserves and resources, is in compliance with the JORC Code and has been extracted without material adjustment from the Mopani Report in Section XIV: "Independent Technical Reports".

(2) Remaining mine life: 25 years for Nkana and 11 years for Mufulira. Expiry date of relevant mining/concession licences: 31 March 2025 for both of these mines.

Competent Persons: the mineral reserve and resource estimates set out above were reviewed and approved by Willem van der Schyff of Golders. The reserves and resources estimates have been prepared in accordance with the JORC Code. Mr Van der Schyff is a Competent Person as defined by JORC and has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking.

AR Zinc[(1)(2)]	Commodity	Reserves			Resources			
		Proved	Probable	Total	Measured	Indicated	Inferred	Total
Aguilar	Ore ('000 MT)	1,574	1,541	3,115	2,132	3,132	1,856	7,120
	Zinc (%)	8.49	4.91	6.72	7.59	3.89	7.52	5.95
	Lead (%)	8.28	5.49	6.90	6.85	3.91	6.66	5.51
	Silver (toz/MT)	6.00	3.71	4.87	5.04	2.80	4.33	3.87

Notes:

(1) As at 31 December 2010.

(2) Remaining mine life: approximately four years based on reserves and ten years based on resources. AR Zinc plans to continue exploration with the aim of extending the life of mine. Expiry date of relevant mining/concession licences: permanent.

Competent Person: the mineral reserves and resources estimates set out above were reviewed and approved by Glencore Competent Person, Chris Emerson, and have been prepared in accordance with the JORC Code. Mr Emerson is a Competent Person as defined by the JORC Code. Mr Emerson is a fellow of the Geological Society of London and a member of AusIMM—The Minerals Institute and has more than ten years experience in underground pollymetallic deposits, predominantly in Latin America.

Cobar[(1)(2)]	Commodity	Reserves			Resources			
		Proved	Probable	Total	Measured	Indicated	Inferred	Total
Cobar	Ore ('000 MT)	1,370	4,879	6,249	1,992	3,775	6,147	11,914
	Copper (%)	4.17	4.95	4.8	5.80	6.30	5.90	6.00
	Silver (g/t)	15	19	18	20	24	20	21

Notes:

(1) As at 31 December 2010.

(2) Remaining mine life: current expected life of mine is approximately five years based on reserves and approximately 11 years based on resources, although Cobar has previously been able to extend its expected life of mine through exploratory drilling in the area covered by its concession. Expiry date of relevant mining/concession licences: 5 December 2028.

Competent Person: the mineral reserves estimates set out above were reviewed and approved by Glencore Competent Person, Tom Simpson. The mineral resources estimates set out above were reviewed and approved by Glencore Competent Person, Jason Hosken. The mineral reserves and resources estimate have been prepared in accordance with the JORC Code. Mr Simpson has been a member of AusIMM—the Minerals Institute for more than 20 years and has more than 15 years' of experience in underground pollymetallic deposits in Australia. Mr Hosken has been a member of AusIMM-the Minerals Institute for more than 12 years and has more than 16 years of experience in underground pollymetallic deposits in Australia.

Los Quenuales(1)(2)	Commodity	Reserves Proved	Reserves Probable	Reserves Total	Resources Measured	Resources Indicated	Resources Inferred	Resources Total
Iscaycruz	Ore ('000 MT)	2,820	1,250	4,070	3,661	4,705	7,379	15,746
	Zinc (%)	11.68	8.03	10.56	13.33	7.12	3.87	7.04
	Lead (%)	0.79	0.34	0.65	1.02	0.68	0.33	0.59
	Silver (toz/MT)	0.55	0.42	0.51	0.76	1.01	0.74	0.83
Yauliyacu	Ore ('000 MT)	1,265	2,096	3,360	5,675	7,617	14,468	27,760
	Zinc (%)	2.2	2.2	2.17	2.58	2.66	3.48	3.07
	Lead (%)	0.98	1.10	1.06	0.43	0.83	1.62	1.16
	Silver (toz/MT)	3.33	4.03	3.77	2.11	3.80	7.14	5.20

Notes:

(1) As at 31 December 2010.

(2) Remaining mine life: the expected life of Iscaycruz is three years based on reserves and ten years based on resources. The expected life of Yauliyacu is two years based on reserves and 19 years based on resources. Expiry date of relevant mining/concession licences: permanent.

Competent Person: the mineral reserves and resources estimates set out above were reviewed and approved by Glencore Competent Person, Chris Emerson, and have been prepared in accordance with the JORC Code. Mr Emerson is a Competent Person as defined by the JORC Code. Mr Emerson is a fellow of the Geological Society of London and a member of AusIMM—the Minerals Institute and has more than ten years' experience in underground pollymetallic deposits in Latin America.

Sinchi Wayra(1)(2)	Commodity	Reserves Proved	Reserves Probable	Reserves Total	Resources Measured	Resources Indicated	Resources Inferred	Resources Total
Bolivar	Ore ('000 MT)	195	252	447	218	1,052	2,530	3,799
	Zinc (%)	11.40	10.69	11.00	13.52	12.24	10.28	11.01
	Lead (%)	1.43	1.20	1.30	1.69	1.45	0.83	1.05
	Silver (toz/MT)	7.61	9.61	8.73	9.30	13.37	10.45	11.19
Porco	Ore ('000 MT)	553	240	793	443	851	992	2,286
	Zinc (%)	10.35	10.89	10.51	12.75	12.12	10.43	11.51
	Lead (%)	0.71	0.61	0.68	0.89	0.83	1.11	0.96
	Silver (toz/MT)	4.14	4.46	4.24	5.30	4.82	4.42	4.74
Colquiri	Ore ('000 MT)	859	714	1,573	768	1,682	1,462	3,911
	Zinc (%)	8.41	7.75	8.11	10.10	9.31	8.60	9.20
	Tin (%)	1.59	1.35	1.48	1.92	1.84	1.94	1.89
Poopo	Ore ('000 MT)	127	70	197	113	272	844	1,229
	Zinc (%)	8.80	9.41	9.01	10.58	10.48	9.24	9.64
	Lead (%)	0.48	0.73	0.57	0.57	0.89	0.86	0.84
	Silver (toz/MT)	4.99	6.62	5.57	6.02	8.68	9.00	8.66
Caballo Blanco	Ore ('000 MT)	60	337	396	55	808	210	1,072
	Zinc (%)	12.10	9.52	9.91	15.04	12.30	12.88	12.55
	Lead (%)	0.70	2.38	2.13	0.82	2.99	2.95	2.87
	Silver (toz/MT)	3.04	6.94	6.35	3.66	8.64	8.60	8.38

Notes:

(1) As at 31 December 2010.

(2) Remaining mine life: the expected life of the mines as a group, considering current production capacities, is an average of two years based on reserves and seven years based on resources. Expiry date of relevant mining/concession licenses: different for each mine, ranging from 30 June 2014 to 16 January 2027 in respect of Porco, Colquiri and Poopo and permanent in respect of Bolivar and Caballo Blanco.

Competent Person: the mineral reserves and resources estimates set out above were reviewed and approved by Glencore Competent Person, Chris Emerson, and have been prepared in accordance with the JORC Code. Mr Emerson is a Competent Person as defined by the JORC Code. Mr Emerson is a fellow of the Geological Society of London and a member of AusIMM—The Minerals Institute and has more than ten years' experience in underground pollymetallic deposits, predominantly in Latin America.

Mutanda(1)	Commodity	Resources Measured	Indicated	Inferred	Total
Central orebody	Ore ('000 MT)	7,800	5,300	7,600	20,700
	Copper (%)	1.62	1.16	0.95	1.28
	Cobalt (%)	0.81	0.67	0.91	0.81
East orebody	Ore ('000 MT)	29,000	18,400	164,600	212,000
	Copper (%)	2.67	1.65	1.03	1.34
	Cobalt (%)	1.13	0.87	0.45	0.60
Central North West orebody	Ore ('000 MT)	66,800	20	—	66,820
	Copper (%)	2.10	0.17	—	2.10
	Cobalt (%)	0.55	0.05	—	0.55
Total	Ore ('000 MT)	103,600	23,720	172,200	299,520
	Copper (%)	2.22	1.54	1.03	1.48
	Cobalt (%)	0.73	0.82	0.47	0.59

Note:

(1) As at 31 December 2010. The information in the table above in relation to mineral reserves and resources is in compliance with the JORC Code and has been extracted without material adjustment from the Mutanda Report in Section XIV: "Independent Technical Reports".

Competent Persons: the mineral reserves and resources estimates set out above were reviewed and approved by Willem van der Schyff of Golders. The reserves and resources estimates have been prepared in accordance with the JORC Code. Mr Van der Schyff is a Competent Person as defined by JORC and has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking.

Mutanda(1)(2)	Commodity	Proved	Reserves Probable	Total
Mutanda pits	Ore ('000 tonnes)	47,176	6,570	53,746
	Copper (%)	3.4	3.1	3.4
	Cobalt (%)	0.9	1.2	0.9
Stockpiles	Ore ('000 tonnes)	2,227	—	2,227
	Copper (%)	3.4	—	3.4
	Cobalt (%)	2.3	—	2.3
Total	Ore ('000 tonnes)	49,403	6,570	55,973
	Copper (%)	3.4	3.1	3.4
	Cobalt (%)	1.0	1.2	1.0

Notes:

(1) As at 31 December 2010. The information in the table above in relation to mineral reserves and resources is in compliance with the JORC Code and has been extracted without material adjustment from the Mutanda Report in Section XIV: "Independent Technical Reports".

(2) Remaining mine life: 20 years. Expiry date of relevant mining/concession licenses: 26 May 2022 for Mutanda. This is renewable in accordance with the DRC mining code for periods of 15 years.

Competent Persons: the mineral reserves and resources estimates set out above were reviewed and approved by Willem van der Schyff of Golders. The reserves and resources estimates have been prepared in accordance with the JORC Code. Mr Van der Schyff is a Competent Person as defined by JORC and has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking.

Kansuki[1][2]	Commodity	Measured	Resources Indicated	Inferred	Total
Area 3	Ore ('000 MT)	16,700	400	0	17,100
	Copper (%)	1.72	0.93	0.82	1.7
	Cobalt (%)	0.17	0.14	0.35	0.17
Area 1	Ore ('000 MT)	—	33,600	—	33,600
	Copper (%)	—	1.08	—	1.08
	Cobalt (%)	—	0.38	—	0.38
Total	Ore ('000 MT)	16,700	33,900	0	50,700
	Copper (%)	1.72	1.08	0.82	1.29
	Cobalt (%)	0.17	0.38	0.35	0.31

Notes:

(1) As at 31 December 2010. The mineral resource estimates set out above were reviewed and approved by Willem Van der Schyff of Golders. The resource estimates have been prepared in accordance with the JORC Code. Mr Van der Schyff is a Competent Person as defined by JORC and has sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking.

(2) Expiry date of relevant mining/concession licences: 5 May 2022. This is renewable in accordance with the DRC mining code for periods of 15 years.

KAZZINC:

Glencore owns 50.7 per cent. of Kazzinc, a fully integrated zinc producer with significant copper, precious metals and lead resources in Kazakhstan. The remainder of the business is currently owned by Verny Capital JSC (48.73 per cent.), a Kazakh investment fund unrelated to Glencore, with certain small shareholders accounting for the remaining 0.58 per cent.

Glencore has agreed with Verny to acquire additional stakes in Kazzinc. These purchases will increase Glencore's ownership from 50.7 per cent. to 93.0 per cent. for a total transaction consideration of U.S.$3.2 billion. Subject to satisfaction of certain conditions, which include receipt of applicable regulatory approvals and the occurrence of UK Admission, consideration for these purchases will be settled through the issuance of U.S.$1 billion of Ordinary Shares at the Offer Price (such issuance is expected to occur at the earlier of UK Admission and satisfaction of applicable conditions precedent) and U.S.$2.2 billion in cash (to be paid in tranches between October and December 2011). Assuming that the Offer Price is set at the mid-point of the Offer Price Range and the Over-Allotment Option is not exercised, the issuance of U.S.$1 billion of Ordinary Shares is expected to result in Verny holding 1.6 per cent. of the Ordinary Shares in issue following the Global Offer. The acquisition of these additional stakes is expected to be completed by the end of December 2011. The terms of the acquisition have been negotiated on an arm's length basis and the price and structuring of the consideration in respect of these purchases is based on Glencore's detailed valuation of Kazzinc. In addition, Glencore's stake in Kazzinc may be further increased to 99.4 per cent. through the exercise of a put or call option in respect of Verny Investments' remaining 6.4 per cent. interest in Kazzinc, which is conditional on amongst other things, an initial public offering of Kazzinc's gold assets. See Section X: "Additional Information" for further details of these purchases and the terms of the Kazzinc SPAs.

Kazzinc owns three major polymetallic facilities, Zyrianovsk, Ridder and Ust-Kamenogorsk, as well as a gold mining operation, VasGold in Kokshetau and 48.3 per cent. interest in the Novoshirokinskoe gold mine in Russia. Kazzinc's major operations are located primarily in Eastern Kazakhstan, spread over seven towns and employing approximately 24,300 staff, including 2,284 VasGold employees. Kazzinc in total operates eight mines, four concentrators, two zinc smelters, a gold recovery plant, a copper smelter (which is under construction, with planned cold commissioning in the second quarter of 2011), a lead smelter (which is being significantly upgraded) and a precious metals refinery. Kazzinc also owns and operates a variety of auxiliary units which support its mining, smelting and refining operations, including:

- a long-term concession over the Bukhtarma Hydro-Electric Power Station which provides more than 80 per cent. of Kazzinc's electricity needs either directly through the company's own power lines or through swapping of energy production from the plant for electricity from the relevant local grids;
- Kazzinc-Mash, an industrial entity which produces a wide variety of parts and machinery related to mining and metallurgy, providing Kazzinc with necessary spare parts and customised mechanical solutions; and

- a transportation division with more than 100 kilometres of rail track, 1,000 rail tank cars and open-top wagons, 29 locomotives and 700 vehicles.

Zyrianovsk:

The Zyrianovsk mining and concentrating complex mines and processes polymetallic ores and produces zinc, copper, lead and gravity gold concentrates and copper sulphate reagent. The complex consists of three assets:

- Maleevsky mine: The Maleevsky mine is Kazzinc's largest underground operation, accounting for the majority of Kazzinc's zinc and copper production. The mine was commissioned in June 2000 and had an initial production rate of 1.5 million MT of ore per annum, which was expanded in 2001 to its current level of 2.25 million MT per annum. In the year ended 31 December 2010, ore mined at Maleevsky contained more than 50 per cent. of total zinc produced from Kazzinc's own mines and accounted for approximately three quarters of total Kazzinc copper concentrate production. Ore is transported from the Maleevsky mine to the Zyrianovsk concentrator by truck.
- Grekhovsky mine: The Grekhovsky mine is a small underground mining operation (the Aleksandrovsky area is the only operational part of the mine) producing 70k MT of primarily copper ore per annum, which is transported to the Zyrianovsk concentrator. The majority of the reserves at Grekhovsky have now been mined and reserves are expected to be depleted by the year ending 31 December 2013 following additional development work to expand underground operations to lower levels.
- Zyrianovsk concentrator: The Zyrianovsk concentrator primarily treats ore from the Maleevsky and Grekhovsky deposits, as well as third party ore (the majority from Kazakhmys PLC under a tolling arrangement) and Kazzinc industrial residues. The concentrator uses a flotation process to separate the ore into different metal concentrates. The concentrating process includes a heavy media separation process to deal with the dilution inherent in large-scale mining, crushing, grinding, flotation, thickening and filtering facilities. Free gold is recovered using gravity tables and centrifugal concentrators. Metal concentrates are transported by rail to the Ust-Kamenogorsk metallurgical complex and to third party copper smelters until the new copper smelter is commissioned in the first half of 2011.

Ridder:

The Ridder mining and concentrating complex mines and processes ores and produces zinc, copper, lead and gold concentrates. The complex consists of five assets:

- Tishinsky mine: The Tishinsky mine is an underground operation located 15 kilometres from the Ridder concentrator, adjacent to the Ust-Kamenogorsk-Ridder road and railway. The mine produces approximately 1.3 million MT of polymetallic ore per annum. A heavy media plant is located on the surface, removing up to 20 per cent. of waste rock prior to the upgraded ore being transported by rail to the Ridder concentrator for further processing.
- Ridder-Sokolniy mine: The Ridder-Sokolniy mine is an underground mine located three kilometres from the centre of the city of Ridder and is adjacent to the Ridder concentrator. The mine produces approximately 2 million MT of polymetallic ore per annum and is to remain in operation until at least 2040.
- Shubinsky mine: The Shubinsky mine, located 15 kilometres from the Ridder concentrator, is a small underground operation producing approximately 200k MT of zinc-copper ore per annum. Mining is undertaken through sub-level stoping methods with backfill. The Shubinsky mine is expected to remain in operation until 2027.
- Ridder concentrator: All ores mined at the Tishinsky, Ridder-Sokolniy and Shubinsky mines together with gold bearing-tailings are treated at the Ridder concentrator. Zinc concentrates are typically further processed at the Ridder zinc refinery, while lead and gold concentrates are shipped to the Ust-Kamenogorsk lead smelter for pyrometallurgical treatment. Copper concentrates produced at the concentrator are currently sold to third party copper smelters, until the commissioning of Kazzinc's Ust-Kamenogorsk copper smelter in 2011.

- Ridder zinc refinery: The Ridder zinc refinery produces approximately 110k MT of high grade zinc metal and alloys per annum. The refinery's sulphuric acid output is either sold locally by Kazzinc or neutralised into gypsum in the absence of demand for acid.

Ust-Kamenogorsk:

The Ust-Kamenogorsk metallurgical facility is fully integrated and will ensure the full and complex recovery of the maximum amount of valuable polymetallic components into marketable products. The facility produces zinc, lead, copper (from 2011), gold, silver, bismuth, cadmium, indium, selenium, thallium, tellurium, mercury, sulphuric acid and sodium antimonate. The intention is for it to also produce antimony and tin in the future, thereby bringing its entire complex metallurgical output to refined metal level. The complex consists of three assets:

- Zinc refinery: Originally constructed in the 1960s and substantially rebuilt over the past 12 years, the refinery produces 190k MT of zinc and metal alloy per annum. In addition to refined zinc metal, the refinery also produces zinc alloys, sulphuric acid and refined cadmium metal.
- Lead smelter: The current lead smelter employs a standard process of sintering-smelting-pyrometallurgical refinement. However, the process has certain modifications allowing the smelter to work in conjunction with the zinc plant and, in the future, the copper plant to enhance metal recoveries through the cross-treatment of residues and by-products from the two processes. The Ust-Kamenogorsk smelter produces up to 130k MT of refined LME-grade lead and 7k MT of blister copper per annum, as well as smaller amounts of selenium, bismuth, indium, tellurium, thallium, mercury and sodium antimonate. Kazzinc purchases lead concentrates from Kazakhmys PLC, Gorevsky mine in Russia, the Chelyabinsk zinc plant owned by Akzhal mine in Kazakhstan and a number of smaller producers as lead collector feed for use in gold production. In addition to this, Kazzinc purchases lead-bearing smelter residues and lead scrap from Russian and Kazakh secondary feed suppliers, as well as gold and silver concentrates from several suppliers in Russia, Kazakhstan, Tajikistan and Kyrgyzstan.
- Precious metals refinery: The precious metals refinery processes silver crust from the lead refinery and will also process copper anode slimes following the commissioning of the company's copper smelter and refinery. The refinery is currently producing approximately 110 MT of refined silver and 9 MT of refined gold per annum, both products LBMA registered, which is expected to increase significantly following the ramp-up in VasGold production described below.

Kazzinc is finalising the completion of a major new metallurgical project in which it will have invested a total of U.S.$870 million to construct a fully integrated processing facility designed to treat a wide range of polymetallic and gold raw materials. As part of the new metallurgical complex, the following projects are nearing completion and commissioning is scheduled for the first half of 2011:

- Construction of a new copper smelter which will be able to refine up to 370k MT of copper concentrate and produce 70k MT (and subsequently 87.5k MT) of cathode copper per annum. Glencore estimates that it will purchase 25 to 30 per cent. of the copper concentrate from third parties. Once the new copper smelter is operational, a portion of the gold-bearing concentrates will be processed through the copper smelter to optimise the economics of third party lead feed purchases and take advantage of the tax benefits of producing copper metal in Kazakhstan (commissioning is scheduled for the second quarter of 2011).
- Reconstruction of the lead smelter to accommodate more varied feed and to re-engineer the process flow at Ust-Kamenogorsk metallurgical complex. The current concentrates sintering stage at the lead smelter is to be replaced by smelting in an ISASMELT furnace. This is expected to result in greater feed composition flexibility, increased recoveries from polymetallic concentrates and significantly lower emissions.
- Construction of a sulphuric acid plant at the Ust-Kamenogorsk metallurgical complex designed using a dual contact absorption process, which is expected to meet all high sulphur off-gases produced by the ISASMELT copper furnace. The new acid plant underwent cold commissioning at the end of 2010 and is designed to become operational in 2011 once the copper ISASMELT furnace commences operation.

- Construction of auxiliary operations equipment associated with the new copper smelter and lead smelter, such as the modern electrolytic tank house (which should be operational in the first quarter of 2011).

Altyntau:

Kazzinc's gold assets consist of its 100 per cent. interest in VasGold together with its 48.3 per cent. interest in the Novoshirokinskoe gold mine and concentrator (which is held through a 50:50 joint venture with Highland Gold Mining Limited, the joint venture holding in total a 96.6 per cent. stake in Novoshirokinskoe) and a gold and silver stream provided from Kazzinc's other mining activities described above. VasGold is located in the Akmola region, 17 kilometres to the north of the city of Kokshetau. The region has well-developed infrastructure, including motor roads, railways, electricity and water supplies. It is the largest gold mining and processing operation in Kazakhstan. It is an open pit mine with a width of 1,200 metres, a length of 1,300 metres and a current depth of 70 metres. With a very conservative cut-off grade the final depth of the pit is expected to reach 450 metres. VasGold is currently evaluating several options involving optimisation of the open pit or using underground methods to access ore at further depth.

VasGold is a new mine which started producing gold in 2010. As at January 2011 VasGold was producing 6.6 million MT on an annualised basis, is capable of processing 8 million MT of ore per annum and is expected to recover 450k to 500k toz of gold per annum. Kazzinc has incurred capital expenditure for VasGold of approximately U.S.$514 million in developing and bringing this mine on stream.

WAI provided the following in relation to the VasGold mine:

	Resources			
	Measured	**Indicated**	**Inferred**	**Total**
Vasilkovskoje				
('000 MT)	45,230	141,560	99,080	285,870
Au (g/t)	1.75	1.72	1.77	1.74

Plans are also in place to expand the mine design capacity of Novoshirokinskoe from 450k MT per annum to 550k MT per annum by 2013.

Kazzinc's production of gold and silver from its mining operations in Ridder, Zyrianovsk and Novoshirokinskoe is the equivalent of 350k toz of gold per annum.

Kazzinc's gold assets have provided it with an opportunity to consolidate its gold activities within one gold-producing company and to potentially spin off that company or seek a listing for it on an international stock exchange. Such a company, on its own, would employ approximately 5,500 people and would operate two hubs in Kazakhstan and a mine in Russia and have the advantage of a diversified portfolio of operated assets producing 249k toz in 2010, expected to increase to 800k toz, including silver in gold equivalents by 2013. Kazzinc is currently reorganising this gold business into a new corporate structure to be known as Altyntau Gold, which will be the largest gold mining and processing operation in Kazakhstan. Pursuant to the terms of the Kazzinc SPAs (details of which are set out in Section X: "Additional Information"), Glencore will, subject to its commercial decision based on prevailing market conditions, use reasonable commercial endeavors to seek a listing of Altyntau to the premium listing segment of the Official List of the FSA, subject to Altyntau's eligibility for a listing.

Glencore believes that Altyntau has a number of significant competitive advantages which make it a highly attractive growth prospect. One of Altyntau's key competitive advantages is having access to excellent operational experience as a result of its history and relationships as part of Kazzinc. Altyntau's other major competitive advantage is its access to sophisticated processing operations, allowing Altyntau to process gold deposits that are challenging to process. Such refractory gold deposits account for most of the undeveloped gold deposits in Central Asia, and will, in time, account for a significant proportion of undeveloped gold deposits worldwide as gold deposits which can be processed using conventional methods are depleted.

Other:

Glencore purchases, through an off-take agreement, on average approximately 80 per cent. of Kazzinc's annual output of zinc at LME-based prices. Glencore also occasionally purchases concentrates from third parties and sells them to Kazzinc for processing. Whilst the volume of concentrates which Glencore sells to

Kazzinc have not historically been material, they are expected to increase in the future once the Company's metallurgical processing facilities for complex feed have been expanded.

Due to the geographic remoteness of the majority of the mining and processing facilities situated in Kazakhstan, Kazzinc, as an integrated operator, enjoys a competitive advantage over other Kazakh mining operations due to its ability to process and transport finished metal products. For similar geographic reasons, Kazzinc is also able to acquire concentrates from local producers for its smelters at a lower cost base than its Russian or Chinese competitors.

Kazzinc's operating expenses were impacted during the financial year ended 31 December 2009 by a new levy introduced by the Kazakh government. This new mineral extraction tax is linked to the royalties payable to the LME price of the relevant metal. At the same time, the profit tax rate was reduced from 30 per cent. to 20 per cent.

KATANGA:

Glencore owns 74.4 per cent. of Katanga, a company listed on the Toronto Stock Exchange, which is developing and operating high grade copper and cobalt mines with integrated metallurgical facilities in the Kolwezi region of the DRC through its 75 per cent. shareholding in Kamoto Copper Company SARL ("KCC"). Substantial high grade resources indicate a potential mine life for KCC in excess of 25 years and a potential to produce 310k MT per annum of copper and 8k MT per annum of cobalt and 22k MT of cobalt contained in cobalt hydroxide by 2015. As at 29 April 2011, the last practicable date prior to the publication of this Prospectus, Katanga had a market capitalisation of U.S.$3.6 billion. As at 31 December 2010, Katanga had approximately 3,175 employees and 3,313 contractors (including projects staff).

Katanga's assets were originally held through two joint ventures, KCC and DRC Copper and Cobalt Project SARL ("DCP"), the latter acquired by Katanga as part of a merger with Nikanor in January 2008. On 25 July 2009, an amended joint venture agreement was signed with Gécamines, pursuant to which it was agreed that, subject to Presidential approval, KCC and DCP would be merged into a single entity. On 27 April 2010, the merger of KCC and DCP was approved by Presidential decree.

KCC's integrated mine complex contains both underground and open pit mines, providing both sulphide and oxide ores. A concentrator and metallurgical plant enable the production of refined copper and cobalt metal on-site. The complex will be a mix of existing assets being progressively refurbished and new processing facilities which are being engineered and are under construction.

KCC's material assets are located in the Kolwezi District of the Katanga Province in the DRC and are as follows:

Mining assets:

- Kamoto Underground Mine ("KTO"), an operating underground mine: KTO is KCC's primary sulphide ore source and has twin six and a half by six metre ramp declines, a service shaft and a 11k MT per day capacity production shaft. Mining is currently a combination of room and pillar methods and cut and fill methods with sub-level caving being considered for future production. Ore from production chambers/stopes is taken to the underground crusher before being hoisted up the shaft to the surface in skips. Ore from development ends is taken to the underground grizzly and conveying system before being hoisted up the shaft to the surface in skips. KTO is scheduled to produce 37.8 million MT of ore at 3.9 per cent. copper grade through Life-of-Mine ("LOM") to 2030.
- T-17, an operating open pit mine: T-17 Open Pit is a cobalt-rich mine. T-17 Open Pit commenced production in 2008 and the reserves were scheduled to be depleted in 2011. However, exploration drilling conducted in 2009 and 2010 has identified (1) an extension of the resource in an easterly direction along strike near surface which will allow a continuation of open pit mining to 2012 with 1.5 million MT of ore being mined at 2.7 per cent. copper grade in 2011 and 2012; and (2) an extension of the reserve below the bottom of the current pit which will allow an additional 13.7 million MT of ore to be mined from underground at 2.6 per cent. copper grade from 2018 onwards.
- KOV Open Pit, an operating open pit mine: KOV Open Pit is considered to be the world's highest grade significant copper resource. KOV Open Pit is the primary development project within KCC's mining assets (see below) and is scheduled to produce 83.2 million MT of ore at 4.1 per cent. copper grade through LOM to 2030.
- Mashamba East Open Pit, a development project: Mashamba East Open Pit will commence production in 2015 and will produce 12.8 million MT of ore at 2.8 per cent. copper grade through LOM.

- Kamoto East Underground Mine ("KTE"), a development project: KTE will commence production in 2019 and will produce 20.5 million MT of ore at 4.4 per cent. copper grade through LOM.

Processing assets:

- Kamoto Concentrator ("KTC"), an operating concentrator: KTC consists of crushing facilities and four milling and flotation sections constructed between 1968 and 1982 and was recently completely refurbished back to its historical nameplate capacity of 7.6 million MT of ore per annum. Recent engineering has identified that the 32' DIMA mills, which have conventionally being operated as autogenous mills, can be converted to semi-autogenous mills which will result in the nameplate capacity increasing to in excess of 9 million MT of ore per annum. It is currently being refurbished to capacity of 150k MT of copper metal and 8k MT of cobalt to be completed by second quarter of 2011.
- Luilu Refinery ("Luilu"), an operating metallurgical plant: Luilu has concentrate dewatering facilities, sulphide concentrate roasters, atmospheric leaching circuits and an electro-winning tank house for production of both copper and cobalt metal.
- KCC is currently working on a front end design and scoping study which includes plans for the conversion of the existing unused electro-refinery to a 200k MT per annum electro-winning facility along with the installation of a 200k MT per annum solvent extraction plant. This new plant along with Luilu will enable KCC to increase copper production capacity to 310k MT of copper by 2015.

KCC also has a number of other mines and plants that may be operated initially or at a later stage in KCC's development.

Pursuant to its development plan, Katanga intends to accelerate pre-existing plans to ramp up production from 70k MT per annum to 150k MT per annum of copper by the end of the second quarter of 2011.

The primary development within the mining assets has been the dewatering and optimisation of KOV Open Pit, with a view to achieving the following:

- Accelerated ramp-up of ore production.
- Reduce the pre-strip requirement and the initial operational open pit strip ratio to provide a positive impact on the cash flow of the projects.
- Kamoto East and Oliveira ore body to be mined using KTO mine underground infrastructure.
- Mine planning to remain robust and flexible to meet ore requirements to achieve the Accelerated Development Plan to 150k MT per annum of copper whilst:
  - optimising future production and recoverability of resources; and
  - allowing for a further expansion of mining activities to support future production increases to 310k MT per annum of copper.

The primary development on the process side has been the refurbishment of existing facilities and infrastructure at KTC and Luilu, to be completed by the end of the second quarter of 2011 (compared with an original completion date of the end of the first quarter of 2013).

Based on current copper and cobalt spot prices and current operating cost assumptions in the development plan, it is expected that capital expenditures relating to the plan will be funded by existing cash balances and cash generated from operations.

At the time of the merger between Katanga and Nikanor, Glencore agreed to modify existing off-take agreements such that Glencore would purchase 100 per cent. of the quantity of copper and cobalt produced during the life of all mines owned or subsequently acquired by Katanga, with pricing linked to the LME.

MOPANI:

Mopani is an integrated mining and processing operation in the Copperbelt region of Zambia, producing copper and cobalt metal. In 2011, Mopani is expected to produce approximately 236k MT copper cathodes, of which approximately 111k MT will come from Mopani's mines while the rest will come from custom-treatment of copper concentrates from other mines, mainly Katanga, Mutanda and tolled third party sources. Mopani is also expected to produce approximately 2,200 MT cobalt metal in 2011.

Mopani is an integral part of Glencore's operations in Southern Africa. It can process oxide and sulphide copper-cobalt concentrates produced by Katanga and Mutanda. Mopani also produces sulphuric acid, which is used in the leaching operations at Katanga and Mutanda. In the long term, once Mutanda and Kansuki reach full production levels, the sulphide concentrate produced at these minesis also expected to be processed at Mopani.

The operations are located in the cities of Kitwe and Mufulira and, as at 31 December 2010, the operations had approximately 7,500 permanent employees and approximately 6,400 contractors. Glencore owns 73.1 per cent. of Mopani, with the remainder of the business owned by First Quantum Minerals Ltd. (16.9 per cent.) and Zambia Consolidated Copper Mines Investment Holdings Plc (10 per cent.).

Nkana:

Nkana operations are located in Kitwe and consist of four underground mines, namely the Central Shaft, the South Ore Body Shaft, the Mindola Sub-vertical Shaft and the Mindola North Shaft. There are also four open pit mines (Mindola, Area A, Area D and Area J), a sulphide copper-cobalt concentrator, an oxide copper agitation leach-solvent extraction plant and a cobalt plant including a copper solvent extraction plant and an electro-winning tank house.

Nkana's mines contain copper-cobalt ore and have a mining capacity of approximately 3.9 million MT of ore per annum. Vertical crater retreat, sub-level caving longitudinal room and pillar and open stoping techniques are the predominant mining method used at the Nkana mines.

Mopani has started the construction of a new shaft at Nkana (the "Synclinorium Project") in order to mine an untapped ore resource containing approximately 115 million MT of copper ore. This project is expected to increase ore production at Nkana by 4.0 million MT per annum by 2018 and to extend the life of Nkana mining operations to at least 25 years. The total cost of the Synclinorium Project is estimated at U.S.$295 million and be funded from internally generated cashflows.

Open pit mining is currently undertaken in four areas (Mindola, Area A, Area D and Area J). Production has recently commenced in Area J while two new areas (Area K and Nose) are being drilled to define reserves and to develop a mining plan. The oxide ore produced from the open pits is processed in the agitation-leach plant.

The Nkana concentrator processes the sulphide ore mined in Nkana's underground and open pit mines and has a capacity of 12,000 MT per day. Separate copper and cobalt concentrates are produced from a bulk-flotation concentrate using a segregation process. The copper concentrate contains an average of 30 per cent. copper, whilst the cobalt concentrate typically contains an average of 10 per cent. copper and 1.8 per cent. cobalt. The copper concentrates produced at Nkana are then transported by road to Mufulira for smelting and refining.

Cobalt concentrates from Mopani's Nkana mine, Katanga and Mutanda, are processed directly at the Nkana cobalt plant. This plant has the flexibility to treat both sulphide and oxide concentrates. The current production capacity is 2,800 MT of cobalt metal per annum. This capacity is planned to be increased to 3,500 MT of cobalt metal per annum by 2020, or earlier if needed. The cobalt metal produced is at least 99.65 per cent. purity and its brands are listed with the LME. It also has a copper solvent extraction facility which recovers the copper contained in the cobalt concentrate.

Nkana has two other solvent extraction plants, which process copper from oxide ores from the Nkana open pit and in-situ leaching within the Central Shaft.

The copper electro-winning tank house at Nkana produces copper cathodes containing 99.95 per cent. copper purity from the solution streams produced by the solvent extraction plants. The cobalt electro-winning tank house produces drummed cobalt products in a similar manner to the copper electro-winning tank house.

Mopani has also begun construction of the TD52 project at Nkana, which involves leaching of an old tailings dam to extract the contained copper using solvent extraction and electro-winning. Production is expected to start in the third quarter of 2011.

Mufulira:

Mufulira operations consist of one main underground mine (Mufulira) and two portal mines (East and West), an oxide copper agitation leach solvent extraction plant, in-situ leaching, a sulphide copper concentrator, an Isasmelt smelter and a refinery.

Mufulira's mines have a mining capacity of approximately 1.9 million MT of ore per annum. The estimated life of mine is 11 years. Exploration is being performed in and around the current mining areas with the aim of increasing the mine's resources.

The Mufulira mine and West portal predominantly use the mechanised continuous retreat mining method. East portal uses the room and pillar with waste rock backfill. In-situ leaching of old underground stopes is also carried out.

The Mufulira concentrator treats all of the sulphide ore produced in the Mufulira mines, producing a copper concentrate containing an average of 41 per cent. copper. The concentrator has a capacity to process 8,350 MT of ore per day. In addition, there are three solvent extraction plants and the vat-leach plant, which recover copper from oxide ores mined at East and West portals, sourced from in-situ leaching or purchased from local miners.

The Mufulira smelter was commissioned in 2006 and uses Xstrata's ISASMELT technology to process sulphide copper concentrates. It processes all of the copper concentrate produced in the Mufulira and Nkana mines and also treats sulphide copper concentrates produced by other mines in the region as custom feed. The copper anodes coming from the smelter are then electro-refined in the Mufulira copper refinery to produce high quality copper cathodes ("MCM" LME brand) with a copper purity of 99.99 per cent.

The sulphuric acid produced as a by-product of the smelting operations is either used in Mopani's oxide copper leaching operations or sold to other copper mines in the area, including Glencore's operations in the DRC. The acid plant has a production capacity of 1,150 MT per day.

The capacity of the smelter (620k DMT of concentrate per annum as at December 2010) is being expanded in a phased approach to 720k DMT of concentrate per annum by the end of 2012. This would include installation of new Peirce-Smith converters and building a new acid plant. The total cost of this project is estimated to be U.S.$112 million and it is expected to be funded by internally generated cashflows.

Glencore has a 100 per cent. off-take agreement with Mopani for the life of the mines, with ownership transferred to Glencore at the mine gate and pricing based on LME prices.

Mopani's metal production is exported and either trucked or transported by rail to the ports of Durban in South Africa or to Dar es Salaam in Tanzania, where it is shipped worldwide.

AR ZINC:

Glencore owns 100 per cent. of AR Zinc, an integrated zinc and lead mining operation in Argentina. AR Zinc's operations are at three locations and comprise the Aguilar underground and open pit mine and concentrator plant, the Palpala lead smelter (both located in Jujuy province), and the AR Zinc smelter, located in Rosario, Argentina. The current smelting capacities are 44k MT per annum of zinc metal and 14k MT per annum of lead metal. Lead/silver concentrates from the Aguilar mine are mainly treated at the Palpala smelter, with approximately 10k to 15k MT per annum of lead concentrates in excess of Palpala's capacity being exported to Glencore at spot prices on arm's length terms. The life of the mine is approximately four years based on reserves and ten years based on resources. AR Zinc plans to continue exploration with the aim of extending the life of the mine.

The zinc concentrate from the Aguilar mine is treated at the AR Zinc smelter. The zinc metal produced is shipped to consumers primarily in Argentina and Brazil. Approximately 70 per cent. to 75 per cent. of feed for the AR Zinc smelter is supplied by the concentrate from the Aguilar mine, with the remaining capacity being sourced from third party mines in Bolivia and Los Quenuales. AR Zinc also produces sulphuric acid as a by-product of its processing operations and sells this locally for the production of fertilisers and the chemical and paper industry. AR Zinc employs approximately 1,400 people.

To the extent that metal is not sold to local customers, the balance is purchased by Glencore at spot prices on arm's length terms. In 2010 Glencore purchased 47 per cent. of Aguilar mine lead concentrate output and 65 per cent. of the silver metal output. All zinc sold by AR Zinc in 2010 was sold to third parties. Lead metal and sulphuric acid produced is sold to third parties in Argentina and Brazil. In total, 77 per cent. of gross revenues were generated from third parties and 23 per cent. from Glencore in the year ended 31 December 2010.

COBAR:

Glencore owns 100 per cent. of Cobar, based in Australia, comprising a high grade underground copper mine and a concentrate plant. The plant throughput is approximately 1.1 million MT of ore per annum and Cobar produces approximately 180k DMT of copper concentrate per annum.

Cobar's current expected life of mine is approximately five years based on reserves and approximately 11 years based on resources, although Cobar has previously been able to extend its expected life of mine through exploratory drilling in the area covered by its concession. Cobar is currently finalising a feasibility study for a hoisting shaft extension, which will allow lower cost access to deeper resource in the mine by the beginning of 2013 for an estimated capital cost of U.S.$139 million. The shaft will also have potential to allow an increase in annual production by approximately 90k DMT. In addition, Cobar has entered into two joint ventures to explore tenements in the area.

Glencore is Cobar's sole customer through a 100 per cent. off-take agreement over the life of the mine. Glencore buys all of the concentrate via a profit sharing agreement with treatment charge and refining charge expressed as a percentage of contained metal.

LOS QUENUALES:

Glencore owns 97.1 per cent. of Los Quenuales, a zinc and lead producer in Peru with mining operations at Iscaycruz and Yauliyacu. The remaining 3 per cent. is indirectly listed on the Lima Stock Exchange. The Iscaycruz operations consist of underground and open pit mines and concentrator, producing zinc and lead concentrates and Los Quenuales is in the process of negotiating surface access rights to mine 5 million MT of zinc-bearing resource (it currently holds only sub-surface rights). The expected life of Iscaycruz is three years based on reserves and ten years based on resources. Yauliyacu consists of an underground mine and a concentrator plant, producing zinc and lead/silver concentrates. The expected life of Yauliyacu is two years based on reserves and 19 years based on resources. Current capacity of Los Quenuales is 330k MT of zinc concentrate and 40k MT of lead concentrate per annum. In order to preserve the value of high grade ore during a period of low prevailing zinc prices, the Iscaycruz mine was placed on care and maintenance in March 2009, and operations were restarted in April 2010. The Yauliyacu mine operated at full capacity throughout this period. Due to a high level of silver in its concentrates, the operation remained profitable at the then prevailing low prices. Los Quenuales employs approximately 3,100 full time staff and contractors.

Glencore has a life of mine off-take agreement covering 100 per cent. of production from both mines with pricing on arm's length terms.

PASAR:

Glencore owns 78.2 per cent. of Pasar, the sole copper smelter and refinery in the Philippines, with the remaining 22 per cent. owned by local investors. Pasar is located on the coast of Leyte Island, and owns its own port, which can accommodate vessels with a displacement of up to 50k dead weight tonnage, from which production is shipped mainly to south east Asian markets. In addition, the assets also include an auxiliary sulphuric acid plant and a dore plant which produces an alloy of gold and silver. Pasar also produces as by-products selenium, slag, iron concentrates and gypsum. Pasar's current smelter capacity is 720k MT per annum of concentrate and its current refinery capacity is 215k MT per annum of cathodes.

Glencore supplies Pasar with a proportion of its copper concentrate and purchases 100 per cent. of Pasar's copper cathode exports through an off-take agreement based on LME prices.

PORTOVESME:

Glencore owns 100 per cent. of Portovesme, a zinc and lead smelter located in Sardinia, Italy. Portovesme is Italy's only primary zinc and lead smelter and comprises a metallurgical integrated smelting complex, with both primary and secondary smelting activities, including an electrolytic plant, a lead smelter, waelz kilns and a lead and precious metals refinery. Due to market conditions, the waelz kilns, lead smelter and lead refinery were placed on care and maintenance in 2009. The waelz line restarted operations later that year but the lead smelter and refinery are still on care and maintenance. However, should market conditions allow, Glencore would consider reopening the plant.

The plant has a production capacity of 120k MT per annum of zinc metal, 60k DMT per annum of waelz oxides and 80k MT per annum of lead metal. Portovesme plans to invest U.S.$40 million in a new solvent extraction plant, which began construction in December 2010 and is expected to be completed in the third quarter of 2012 resulting in an increase of zinc metal production to 140k MT. The solvent extraction plant will treat all the waelz oxide produced from EAF dust recycling, which will make Portovesme vertically integrated for 30k MT per annum of zinc.

In addition to its smelting complex, Glencore also intends to invest approximately U.S.$200 million in an adjoining wind farm power facility to provide low cost power to Portovesme. For this purpose, Portovesme also rents some 10,000 hectares of land surrounding its operations.

PUNITAQUI:

Glencore owns 100 per cent. of Punitaqui, a copper mine and concentrator in Chile, acquired by Glencore as a brownfield development in early 2010. Following rehabilitation works, commercial production commenced in late 2010 with the operation forecast to produce around 40k DMT of copper concentrates in 2011. Work is underway to complete JORC certification of resources, currently estimated to give a mine life of approximately five years.

SINCHI WAYRA:

Glencore owns 100 per cent. of Sinchi Wayra, a company which operates five mining units and concentrating facilities in the Oruro and Potosi regions of Bolivia and which employs approximately 2,600 people. One of these five mines, Bolivar, is operated as a 50:50 joint venture with the Bolivian state mining company, Comibol. Two of the mines, Porco and Colquiri, are run under a lease contract with Comibol. The fourth mine, Poopo, is run under a lease agreement with a local co-operative. The fifth mining unit, the Caballo Blanco group, consists of the wholly owned San Lorenzo/Colquechaquita and its operations are expected to end in the near future. In early 2010, Sinchi Wayra acquired into the Caballo Blanco group, two additional mines, Reserva and Tres Amigos. Both mines became operative in May 2010 and it is intended that these mines will replace the declining production levels at San Lorenzo/Colquechaquita. Collectively, the mines have a current capacity of 205k MT of zinc concentrate, 15k MT of lead concentrate and 6k MT of tin concentrate per annum. The expected life of the mines as a group, considering current production capacities, on average is two years based on reserves and seven years based on resources. Further to a capital expenditure estimated at approximately U.S.$65 million, management believes that annual output can potentially be increased to approximately 300k MT of zinc concentrate and 30k MT of lead concentrate by 2013. The plan is currently being considered further by management, but such a plan is expected to include a project to reprocess old tailings containing significant levels of zinc and tin at the Colquiri mine, together with works to remove processing and hoisting bottlenecks.

Glencore has a 100 per cent. off-take agreement for the life of the mine which is priced on an arm's length basis. Historically, a proportion of Sinchi Wayra's tin concentrates was sold locally to take advantage of lower costs of transportation but, since the fourth quarter of 2009, for commercial reasons, all sales have been made to Glencore.

XSTRATA:

The zinc/copper/lead commodity department benefits from Glencore's relationship with Xstrata. Please refer to Section I: "Information on Glencore—Relationship and commercial arrangements with Xstrata" for further information on Xstrata.

MUTANDA:

Glencore holds a 50 per cent. interest in Samref Congo Sprl which in turn holds an 80 per cent. interest in Mutanda Mining Sprl, the owner of the Mutanda concession. The remaining 20 per cent. in Mutanda Mining Sprl was recently acquired by Rowny Assets Limited from Gécamines. Glencore is the operator.

Mutanda Mining Sprl was granted its rights to the Mutanda concession under its incorporation in May 2001. As part of the mining review process in the DRC, Samref Congo and Gécamines agreed to amend the creation agreement which confirmed Mutanda's exploitation permit. Mutanda is a newly developed high grade copper and cobalt producer, with its operations located in the province of Katanga in the DRC. Mutanda is being developed to produce 110k MT per annum of copper and 23k MT per annum of cobalt contained in cobalt hydroxide as of 2012. Based on current oxide reserves and resources the life of Mutanda's mines collectively are expected to be at least 20 years. A further extension of the ore body in the form of sulphides lies below these reserves which is expected to significantly extend the economic life of the operations. As at 31 December 2010, Mutanda has 929 employees.

Mutanda's licence was granted in accordance with the DRC mining code. As such Mutanda has the right to automatically renew its licence for several further 15-year periods (the licence is first due for renewal in 2022). This will allow Mutanda sufficient time to exploit all available reserves, which is consistent with the concession agreement and the joint venture agreement originally concluded with Gécamines (to which Rowny Assets Limited has acceded in lieu of Gécamines).

Mutanda's updated resource indicates 299 MT of ore grading 1.48 per cent. copper and 0.59 per cent. cobalt. As mentioned above, significant high grade sulphide extensions have been intersected which are not included in these numbers. This, together with competent host rock, indicates the suitability for large-scale underground mining operations beyond the current 20-year mine plan.

Mutanda's existing and planned operations consist of:

- Three open pit mines (Central Open Pit, East Open Pit and Central North West Open Pit). It is expected that these three pits will be consolidated into one large open pit.
- A 20k MT SXEW copper plant was commissioned in the fourth quarter of 2010 at a cost of approximately U.S.$165 million. By 31 December 2010, Mutanda produced 1,851 MT of copper cathodes and as at January 2011 the plant was ramping up production in accordance with the planned commissioning schedule.
- A 40k MT SXEW plant which is expected to be commissioned during the third quarter of 2011, at an estimated cost of U.S.$321 million.

Both the 20k and 40k MT SXEW plants will include the following processes: crushing, screening, milling, pre-leaching, leaching, clarification and SXEW.

Mutanda is currently completing engineering and design works to expand the combined 60k MT per annum SXEW operations to 110k MT per annum. The initial cost estimate for the expansion is U.S.$103.8 million with an expected completion schedule of 15 months (the first quarter of 2012).

- A concentrate operation, which consists of a crusher, small dense medium separation and spiral plant. This operation produces an approximately 25 per cent. copper concentrate, which is onsold to Mopani for refining into copper cathodes, and a high grade cobalt concentrate (more than 6 per cent. Co) for export.
- An acid plant due to be commissioned in August 2011, at an estimated cost of U.S.$69 million. The acid plant is expected to have a daily capacity of 390 MT of sulphuric acid and 73 MT of liquid SO_2. Liquid SO_2 production will replace SMBS, a reagent used in cobalt leaching. This will enable significant cost savings of approximately U.S.$30 million per annum in reduced costs.

Glencore has a life of mine off-take agreement for all copper and cobalt product produced by Mutanda with pricing based to LME.

KANSUKI:

Glencore holds a 50 per cent. interest in Kansuki Investments Sprl which in turn holds a 75 per cent. interest in Kansuki Sprl, the owner of the Kansuki concession (thereby giving Glencore an effective interest of 37.5 per cent. in Kansuki). The remaining 25 per cent. in Kansuki was recently acquired by Biko Invest Corp. from Gécamines. Glencore is the operator.

Kansuki Sprl was granted its rights in the Kansuki concession under its incorporation in July 2010. Kansuki is a 185 square kilometre copper and cobalt pre-development project which borders the Mutanda concession.

Kansuki's licence was granted in accordance with the DRC mining code. As such Kansuki has the right to automatically renew its licence for several further 15-year periods (the licence is first due for renewal in 2022). This will allow Kansuki sufficient time to exploit all available reserves, which is consistent with the concession agreement and the joint venture agreement originally concluded with Gécamines (to which Biko Invest. Corp has acceded in lieu of Gécamines).

Exploration of the Kansuki concession by Kansuki Sprl has commenced and is ongoing (currently a total U.S.$4.5 million has been spent). Kansuki's updated resource model as at 31 December 2010 indicated 50.7 million MT of ore grading, 1.29 per cent. copper and 0.31 per cent. cobalt.

There is significant potential along a recognised 12 kilometre anomaly of which less than four kilometres has been drilled. No results from this drilling programme have been included in the above resource numbers. Based on the drilling results to date, it is expected that the existing resource numbers will double once infill drilling along these four kilometres is completed. Regional exploration, such as induced polarisation surveys, has delineated a second anomaly of approximately six kilometres along a known mineralised zone bordering the eastern boundary of Mutanda.

Kansuki is currently completing its initial feasibility study for submission by June 2011 under the terms of its creation agreement. As operator of both the Mutanda and Kansuki concessions and due to their close proximity (adjacent to each other) the development of Kansuki to a currently estimated 100k MT per annum of copper production by Glencore is expected to be accelerated. Significant synergies are available to the operations, including shared management, power, tailings, infrastructure and the joint mining of the shared high grade copper ore body and preliminary discussions have begun with respect to a potential combination of the Mutanda and Kansuki operations.

Glencore has a life of mine off-take agreement for all copper and cobalt product produced by Kansuki. Pursuant to the off-take agreements, all terms are arm's length and pricing for copper prices is LME based.

NYRSTAR:

As at 31 December 2010, Glencore owned 7.8 per cent. of Nyrstar, a leading global multi-metals business producing significant quantities of zinc and lead as well as other products including silver, gold and copper. Nyrstar is listed on NYSE Euronext Brussels. On 25 February 2011, Nyrstar launched a rights offering at a ratio of seven new shares for ten rights. Glencore has participated in the rights offering as a result of which, as at 29 April 2011, the last practicable date prior to publication of the Prospectus, Glencore held 7.8 per cent. of Nystar. As at 29 April 2011 Nyrstar had a market capitalisation of U.S.$2.3 billion.

PERKOA:

The Perkoa project is a zinc mine under construction in Burkina Faso. Glencore's ownership interest in Perkoa will increase to 50.1 per cent. by 2012 through its joint venture with Blackthorn Resources. The project has a JORC reserve of 6.3 million MT at 13.9 per cent. zinc, and expected mine life of nine years and is managed by Glencore. Commercial production is expected to commence in the first half of 2012.

In addition, on 23 March 2011, it was announced that Glencore had acquired a stake of 13 per cent. in Blackthorn Resources (its joint venture partner in Perkoa). Provided Glencore's shareholding remains above 9.99 per cent., Glencore will have the support of Blackthorn Resources to nominate a representative to sit on its board. Any such appointment will be subject to the usual shareholder approvals.

RECYLEX:

Recylex is the third largest lead producer in Europe, expected to produce approximately 135k MT lead metal in 2011. The Company recycles more than 10 million lead batteries per annum to produce secondary lead and plastic. It also recycles approximately 180k MT of waste steel dust from electric arc furnaces and produces waelz oxides containing approximately 45k MT of secondary zinc metal. It has eight production sites and employs more than 650 people in France, Germany and Belgium. As at 29 April 2011, Recylex had a market capitalisation of U.S.$0.2 billion.

Glencore purchases lead metal from Recylex under a short- to medium-term off-take agreement. Glencore also purchases lead metal, lead intermediate products and waelz oxides from Recylex under spot arrangements based on LME prices. Glencore accounted for 17.8 per cent. of Recylex's sales in the year ended 31 December 2010.

VOLCAN:

Glencore currently owns 5.94 per cent. of Volcan, the second largest zinc producer in Peru. An agreement is in place between Glencore and Volcan for the purchase of zinc and lead concentrates under a multi-year contract. As at 29 April 2011, Volcan had a market capitalisation of U.S.$3.8 billion.

POLYMET:

Glencore currently owns an aggregate of 14,433,962 common shares of Polymet, representing 9.3 per cent. of the 154,525,791 common shares outstanding. In addition, Glencore has the right to exchange U.S.$27.6 million in debentures into an additional 6,887,783 common shares of Polymet, to exercise outstanding warrants for an additional three million common shares of Polymet at U.S.$2.00 per share, and to acquire an additional ten million common shares of Polymet pursuant to a private placement announced by Polymet, for a total of 34,321,745 common shares representing approximately 19.7 per cent. of Polymet's partially diluted common shares based on capitalised interest as at 31 December 2010.

Polymet, which plans to mine and process copper, nickel, cobalt, platinum and palladium and gold, is listed on the NYSE and the Toronto Stock Exchange and its operational headquarters are located in Hoyt Lakes, Minnesota. As at 29 April 2011, the last practicable date prior to publication of this Prospectus, Polymet had a market capitalisation of approximately U.S.$0.3 billion.

Alumina/aluminium commodity department (industrial activities, Metals and Minerals business segment)

Overview

The table below summarises information about the key alumina/aluminium producing industrial assets as at 31 December 2010:

Company	Country	Commodity	Annual production capacity	Glencore's ownership interest	Remaining ownership interest	Any contractual relationship with Glencore
Controlled:						
Columbia Falls	U.S.	Aluminium	168k MT	100%	—	Supply and purchase agreements
Sherwin Alumina	U.S.	Alumina	1.6 million MT	100%	—	Supply and purchase agreements
Non-controlled:						
Century Aluminum	U.S.	Aluminium	896k MT	44.0% (39.1% voting common stock)	Publicly traded on NASDAQ	Supply and purchase agreements
UC Rusal	Russia	Alumina	11.3 million MT	8.75%	Publicly traded on HKSE, Euronext Paris, MICEX and RTS	Purchase agreements
		Aluminium	4.5 million MT	—		Purchase agreements

Financial information

The table below sets out selected financial information on the controlled aluminium/alumina industrial activities for the years ended 31 December 2008, 31 December 2009 and 31 December 2010. The information in this table has been extracted without material adjustment from Glencore's accounting books and records, which are unaudited:

	2008	2009	2010
	(U.S.$ million) (Unaudited)		
Alumina/aluminium			
Revenue	263	235	422
Adjusted EBITDA pre-exceptional items(1)(2)	34	(117)	(9)
Adjusted EBIT pre-exceptional items(1)(2)	22	(125)	(17)
Capex	13	19	31

Notes:

(1) Excludes share of income from associates and dividends.

(2) 2009 negatively impacted by a U.S.$82 million charge related to natural gas hedges entered into by Sherwin Alumina to lock-in natural gas prices.

Production

The table below sets out the production of the controlled alumina/aluminium assets for the years ended 31 December 2008, 31 December 2009 and 31 December 2010:

	Year ended 31 December								
	2008			2009			2010		
	Production	Production using feed from own sources	Production using feed from third party sources	Production	Production using feed from own sources	Production using feed from third party sources	Production	Production using feed from own sources	Production using feed from third party sources
					('000 MT)				
Columbia Falls *Aluminum* . . .	74.9	N/A	74.9	16.5	N/A	16.5	—	N/A	—
Sherwin Alumina *Alumina*	1,455	N/A	1,455	1,206	N/A	1,206	1,259	N/A	1,259

COLUMBIA FALLS:

Glencore owns 100 per cent. of Columbia Falls. Columbia Falls is an aluminium smelter in Montana in the U.S., which has a production capacity of 168k MT of primary aluminium per annum. The plant is currently idle.

SHERWIN ALUMINA:

Glencore owns 100 per cent. of an alumina refinery processing plant, Sherwin Alumina, which is located near Corpus Christi, Texas, in the U.S. The plant produces two main classes of products: smelter grade alumina (capacity of 1.4 million MT per annum) and hydrate chemical grade alumina (capacity of 0.2 million MT per annum). Glencore provides all of the bauxite Sherwin Alumina requires for its refinery and processing operations. Glencore also purchases and markets all of the alumina that Sherwin Alumina produces.

Alumina refining is a very energy intensive process. Given Sherwin Alumina's location on the U.S. Gulf coast, it utilises U.S. natural gas as its energy source. The competitive position of Sherwin Alumina has dramatically improved recently given the relatively low price of U.S. natural gas in comparison to other fuels used in the worldwide alumina refining industry. This development in conjunction with contractual arrangement for other raw materials that are linked to LME prices for aluminium (effectively creating a natural hedge) has allowed Sherwin Alumina to substantially improve its position on the global cost curve. In addition to this, Sherwin Alumina has made significant investments in its port infrastructure in 2010 in order to reduce fixed operating costs going forward.

CENTURY ALUMINUM:

Glencore owns a 44.0 per cent. stake in Century Aluminum, a company listed on the NASDAQ with aluminium smelting and refining operations in the U.S. and Iceland. As at 29 April 2011, the last practicable date prior to the publication of this Prospectus, Century Aluminum had a market capitalisation of U.S.$1.9 billion. Century Aluminum's smelting operations include three wholly owned smelters: Nordural in Iceland; Hawesville in Kentucky, U.S.; and Ravenswood in West Virginia, U.S., which have production capacities of 260k MT, 244k MT and 170k MT per annum, respectively. Century Aluminum also owns a 49.67 per cent. stake in the Mount Holly smelter in South Carolina, U.S., which has a production capacity of 222k MT per annum. Century Aluminum is currently constructing a greenfield aluminium plant, the Helguvik Project, in Iceland which is expected to have a production capacity in the range of 250k MT to 360k MT upon its completion.

Glencore provides alumina to Century Aluminum at prices which are referenced to the price of aluminium on the LME. Century Aluminum sells aluminium to Glencore on both a spot and long-term contract basis, with reference to LME prices. Century Aluminum is also party to separate ten-year and seven-year alumina tolling agreements in Iceland with Glencore for 90k MT and 40k MT, expiring in 2016 and 2014, respectively.

In addition, Glencore has entered into two cash-settled total return swaps over 9.8 per cent. of Century Aluminum's common shares. The swaps provide Glencore with additional economic exposure to changes in Century Aluminum's share price. The swaps have been entered into at prices of U.S.$9.72 and

U.S.$16.66 per common share and terminate in two years from September 2010 and March 2011, respectively. The counterparty to both swaps is a highly rated financial institution.

Glencore currently has two directors on the board of Century Aluminum (being Willy Strothotte and Daniel Goldberg) and has also designated an independent director (being Andrew Michelmore) as its appointee on the Century Aluminum board. In addition, Glencore has designated for nomination by the board of Century Aluminum a further independent director (being Terrence Wilkinson) and two directors (being Steven Kalmin and Steven Blumgart), each of whom will be standing for election at the Century Aluminum 2011 annual general meeting expected to be held in June 2011. Century Aluminum has agreed to publicly support and recommend the election of Mr Wilkinson, Mr Kalmin and Mr Blumgart at such annual general meeting.

UC RUSAL:

Glencore owns 8.75 per cent. of UC Rusal, a vertically-integrated upstream aluminium company listed on the HKSE, Euronext Paris and the Russian stock exchanges MICEX and RTS. As at 29 April 2011, the last practicable date prior to the publication of this Prospectus, UC Rusal had a market capitalisation of U.S.$23.2 billion. UC Rusal operates eight bauxite and nepheline ore mines, 12 alumina refineries (of which nine were in operation in the year ended 31 December 2010), 16 aluminium smelters, three foil mills, one cathode plant and packaging production centres along with power-generating facilities. UC Rusal employs more than 75,000 people, working in 19 countries, spanning five continents. UC Rusal's production capacities are 4.5 million MT of aluminium and 11.3 million MT of alumina per annum.

In addition to its mining and refining operations, UC Rusal also holds a 25 per cent. stake in Norilsk Nickel, the largest global producer of nickel and palladium.

UC Rusal supplies Glencore with alumina and aluminium through long-term supply contracts, pursuant to which, Glencore is UC Rusal's single largest purchaser of alumina and aluminium. Glencore is entitled to appoint one nominee to the UC Rusal board of directors, currently Ivan Glasenberg. In addition, Glencore has representation on the UC Rusal marketing committee, providing Glencore with visibility over global alumina and aluminium production and supply trends and a strong position from which to compete for business within the global markets for these products.

OTHER:

The alumina/aluminium commodity department is in discussions to acquire a stake in an alumina refinery. Should this proceed, it would not be a material acquisition.

Ferroalloys/nickel/cobalt commodity department (industrial activities, Metals and Minerals business segment)

Overview

The table below summarises information about the key ferroalloys/nickel/cobalt producing industrial assets as at 31 December 2010:

Company	Country	Commodity	Annual production capacity	Glencore's ownership interest	Remaining ownership interest	Any contractual relationship with Glencore
Controlled:						
Murrin Murrin[(1)] . .	Australia	Nickel Cobalt	40k MT 3.5k MT	82.4%	17.6% publicly traded	Purchase agreements
Non-controlled:						
Xstrata	UK/Switzerland	Nickel Ferroalloys	121KT 1,979 KT	34.5%	65.5% publicly traded on London Stock Exchange and SIX	Purchase agreements, agency agreements, marketing agreements, distribution agreements

Note:

(1) Glencore holds its interest in Murrin Murrin via a direct 40 per cent. interest in Murrin Murrin and an indirect 70.6 per cent. interest in Minara, which holds the remaining 60 per cent. interest in Murrin Murrin. On 24 February 2011, Minara issued additional shares to employees, reducing Glencore's shareholding in Minara to 70.5 per cent. Effective ownership in Murrin Murrin consequently reduced to 82.3 per cent.

Financial information

The table below sets out selected financial information on the controlled ferroalloys/nickel/cobalt industrial activities for the years ended 31 December 2008, 31 December 2009 and 31 December 2010. The information in this table has been extracted without material adjustment from Glencore's accounting books and records, which are unaudited:

	2008	2009	2010
	(U.S.$ million) *(Unaudited)*		
Ferroalloys/Nickel/Cobalt			
Revenue	649	609	713
Adjusted EBITDA pre-exceptional items[(1)]	113	119	189
Adjusted EBIT pre-exceptional items[(1)]	13	21	79
Capex	138	10	67

Note:

(1) Excludes share of income from associates and dividends.

Production

The table below sets out production of the controlled ferroalloys/nickel/cobalt assets for the years ended 31 December 2008, 31 December 2009 and 31 December 2010:

	Year ended 31 December								
	2008			2009			2010		
Murrin Murrin	Production	Production using feed from own sources	Production using feed from third party sources	Production	Production using feed from own sources	Production using feed from third party sources	Production	Production using feed from own sources	Production using feed from third party sources
	(MT)	*(MT)*	*(MT)*	*(MT)*	*(MT)*	*(MT)*	*(MT)*	*(MT)*	*(MT)*
Nickel	30,514	27,674	2,840	32,977	31,761	1,216	28,378	27,679	698
Cobalt	2,018	1,906	111	2,350	2,262	88	1,976	1,881	94

Reserves and resources

The table below sets out the total mine reserves and resources summary for the ferroalloys/nickel/cobalt commodity department:

		Reserves			Resources			
Minara[(1)(2)]	Commodity	Proved	Probable	Total	Measured	Indicated	Inferred	Total
Murrin Murrin[(1)(2)]	Ore ('000 MT)	131,183	64,948	196,131	152,068	105,966	10,283	268,318
	Nickel (%)	1.05	1.04	1.05	1.03	0.99	0.9	1.01
	Cobalt (%)	0.078	0.079	0.078	0.074	0.076	0.058	0.074
	Nickel Cut off grade				0.8%	0.8%	0.8%	

Notes:

(1) As at 31 December 2010.

(2) Remaining mine life: at the current nameplate capacity of 40k MT per annum, the project's operation life is in excess of 50 years. Expiry date of relevant tenement: different tenure for each tenement, ranging from 13 February 2012 to 5 October 2031.

Competent Persons: the information relating to mineral resources is based on information compiled by Mr Stephen King and Mr David Selfe and has been prepared in accordance with the JORC Code. The information relating to ore reserves is based on information compiled by Mr Brett Fowler and has been prepared in accordance with the JORC Code. The information relating to metallurgical results is based on information compiled by Mr John O'Callaghan and has been prepared in accordance with the JORC Code. Mr Selfe, Mr King, Mr Fowler and Mr O'Callaghan all have sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which they are undertaking.

MURRIN MURRIN:

Glencore owns 70.6 per cent. of Minara, a nickel producer listed on the Australian Securities Exchange. Minara holds a 60 per cent. interest in the Murrin Murrin joint venture, which owns the Murrin Murrin nickel/cobalt project and which it also operates. As at 29 April 2011, the last practicable date prior to publication of this Prospectus, Minara had a market capitalisation of U.S.$1.0 billion. Glencore also owns 100 per cent. of Glenmurrin Pty Ltd., which holds the remaining 40 per cent. interest in the Murrin Murrin joint venture. Glencore, therefore, effectively owns 82.4 per cent. of Murrin Murrin through its interests in Minara and Glenmurrin Pty Ltd. Murrin Murrin is one of Australia's largest nickel producers and is one of the top ten producers of nickel in the world. The Murrin Murrin plant is projected to produce 33k MT to 37k MT of nickel and a quantity of cobalt proportionate to historic production in 2011. Its integrated operations include open pit mining and ore processing at the plant.

Glencore has off-take agreements with Minara and Glenmurrin Pty Ltd. for 100 per cent. of metal production which mature on 1 December 2011 and 30 June 2018, respectively. The off-take agreements supply Glencore with nickel produced by Murrin Murrin based on LME prices and cobalt produced by Murrin Murrin based on market sales prices. Glencore has taken steps to renew its off-take arrangements with Minara ahead of the expiry of the off-take agreement on 1 December 2011 and has agreed to renew its off-take agreement with effect from 1 December 2011 subject to approval from the independent shareholders of Minara at the Minara annual general meeting to be held on 13 May 2011.

XSTRATA:

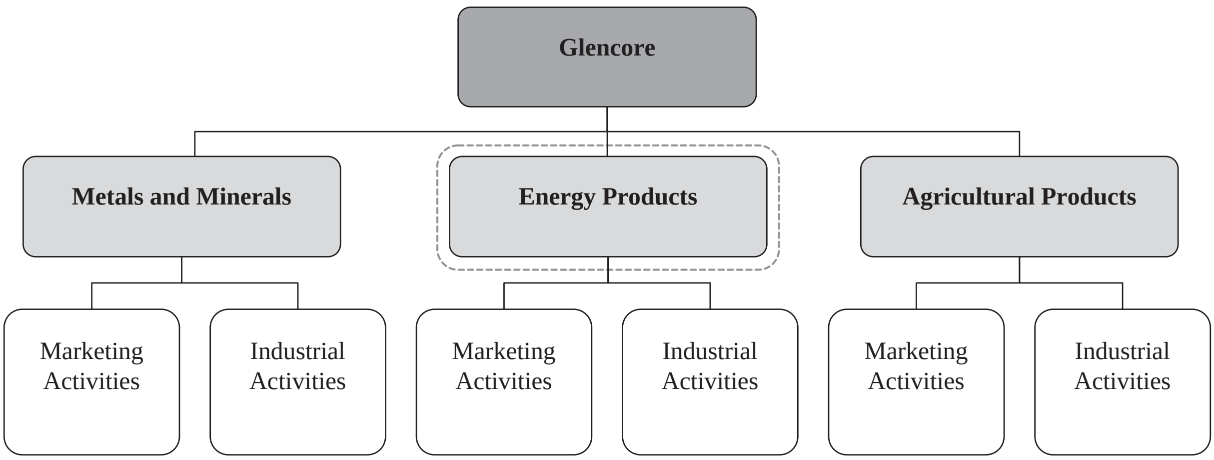
The ferroalloys/nickel/cobalt commodity department benefits from Glencore's relationship with Xstrata. Please refer to Section I: "Information on Glencore—Relationship and commercial arrangements with Xstrata" for further information on Xstrata.

OTHER:

The ferroalloy/nickel/cobalt commodity department is in discussions, along with a joint venture partner, to acquire certain manganese mining operations and production facilities, along with a long term marketing agreement and ore offtake contract. Should this proceed, it would not be a material acquisition.

Energy Products

Introduction (Energy Products business segment)



Glencore's Energy Products business segment markets crude oil and oil products (such as fuel oil, heating oil, gasoline, naphtha, jet fuel, diesel and liquefied petroleum gas), coal and coke. These commodities are marketed primarily through Glencore's offices in London, Baar, Stamford and Singapore, with key support from a number of other locations.

Selected key financial information in relation to the Energy Products business segment's marketing and industrial activities for the years ended 31 December 2008, 31 December 2009 and 31 December 2010 is set out below. This information has been extracted without material adjustment from Section VI: "Historical

Financial Information" except where marked as unaudited. Unaudited information has been extracted without material adjustment from Glencore's accounting records.

	2008	2009	2010
		(U.S.$ million)	
Marketing Activities			
Revenue (unaudited)(1)	95,254	60,790	87,850
Adjusted EBITDA pre-exceptional items(2)	1,609	945	470
Adjusted EBIT pre-exceptional items(2)	1,609	945	450
Industrial Activities			
Revenue (unaudited)(1)	2,903	1,601	1,499
Adjusted EBITDA pre-exceptional items(2)(3)(4)	659	371	313
Adjusted EBIT pre-exceptional items(2)(3)(4)	549	322	189
Share of income from associates and dividends (excl. Xstrata)(4)	(27)	91	46
Capex	698	393	818
Total Energy			
Revenue	98,157	62,391	89,349
Adjusted EBITDA pre-exceptional items(2)(5)	2,241	1,407	829
Adjusted EBIT pre-exceptional items(2)(5)	2,131	1,358	685

Notes:

(1) Revenue is not split between Marketing and Industrial activities in the audited Historical Financial Information set out in Section VI of this document and is therefore marked as unaudited. Total segment and total Group revenue is audited.

(2) Includes corporate selling, general and administrative expenses, but excluding variable pool bonus accrual, which is recorded at group/corporate level.

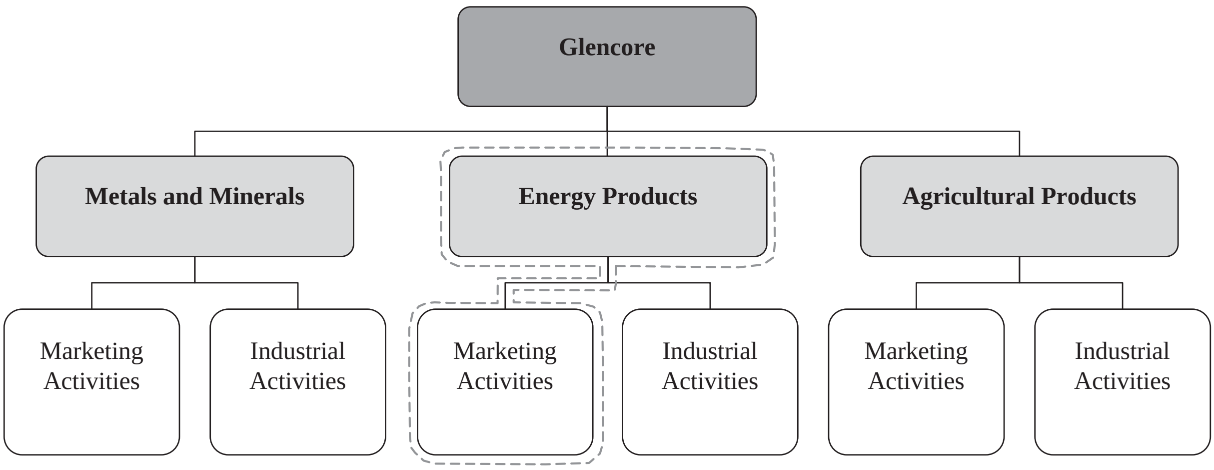
(3) Excludes share of income from associates and dividends.

(4) Adjusted EBITDA pre-exceptional items plus Share of income from associates and dividends and Adjusted EBIT pre-exceptional items plus Share of income from associates and dividends are audited.

(5) Includes share of income from associates and dividends.

The Energy Products business segment currently has some 800 direct employees globally (excluding individuals employed within Glencore's industrial activities), with approximately 340 based in London, 86 in Stamford, 107 in Singapore and 39 in Baar, with the remaining approximately 230 spread across 23 global office locations. This business segment also employs some 4,600 individuals globally in its industrial activities.

Marketing activities (Energy Products business segment)



The Energy Products business segment focuses on the following commodity departments: oil and coal/coke. The activities of Glencore's Energy Products business segment are supported by ownership interests in controlled and non-controlled coal mining and oil production operations as well as investments in strategic handling, storage and freight equipment and facilities. Glencore's energy products are marketed primarily through Glencore's offices in London, Baar, Stamford and Singapore, with key support from a number of other locations, including Beijing and Moscow, in order to take advantage of geographical opportunities. The global teams operate in an integrated manner.

The table below sets out the marketing volumes sold to third parties of each main commodity category handled by the Energy Products business segment for the years ended 31 December 2008, 31 December 2009 and 31 December 2010:

Marketing volumes sold to third parties	2008	2009	2010
		(million MT)	
Crude oil	39.7	39.7	51.9
Oil products	68.7	69.3	66.9
Thermal coal	90.1	98.0	92.2
Metallurgical coal	5.6	7.7	8.0
Coke	1.5	0.3	0.7

Examples of marketing strategies for the Energy Products business segment include:

- Glencore uses its ability to store significant quantities of oil and oil products either on vessels or in on-land storage facilities to exploit time-dependent arbitrage opportunities created by higher forward prices (so-called carry trades in a contango-shaped market).
- Glencore uses its infrastructure and global information network to exploit arbitrage opportunities created by geographic price dislocations.
- Glencore leverages its blending capabilities in order to meet customers' product specifications in ways that maximise income, for example by blending cheaper products to create more valuable products or products that are demanded by more specific customers.
- Glencore uses its storage assets to ensure that it has physical oil available for delivery against its marketing obligations, limiting the economic downside risk that Glencore takes on sales of physical oil.
- Glencore uses its established relationships with significant players and the handling of significant volumes in geographically diverse regions to provide it with insight into local and global supply and demand dynamics, enabling Glencore rapidly to identify market trends or specific arbitrage opportunities.
- Glencore manages the source of supply of coal and coke from all key origins in order to maximise geographic arbitrage opportunities. Prodeco's supply of high-quality coal provides Glencore with the opportunity to export directly to specific markets in Europe and North America. Access to freight at competitive rates represents a key component in being able to seize geographic arbitrage opportunities.

Oil commodity department (marketing activities, Energy Products business segment)

Overview

The oil commodity department comprises marketing operations in crude oil, refined products, natural gas and freight, supported by access to a wide range of logistics, storage and industrial assets investments. Crude oil represents the most significant product supplied by physical volume. Oil products primarily include mid-distillates, gasoline, residuals, naphtha, natural gas and liquid petroleum gas.

Market

Glencore believes it is among the world's largest non-integrated physical suppliers of crude oil and oil products, supplying a physical volume of approximately 2.5 million bbls per day in 2010. This is a volume equivalent to some 3 per cent. of the world's oil consumption.

Suppliers

Glencore sources crude oil and oil products from a variety of supplier types. Its diverse supplier base includes the major integrated oil companies, NOCs, independent oil companies, other marketing companies and refineries. No off-take arrangement (other than that with its affiliate OAO RussNeft which accounted for some 4 per cent. of purchases in the year ended 31 December 2010) accounts for a significant proportion of total purchases. The top ten suppliers accounted for approximately 30 per cent. of the total purchases in the year ended 31 December 2010. Eight of the top ten suppliers in the year ended 31 December 2010 were also in the top ten suppliers in the year ended 31 December 2009.

Customers

There is a high degree of overlap between the crude oil and oil products customer and supplier base, particularly in respect of the major integrated oil companies. Five of the top ten suppliers in the year ended 31 December 2010 are also amongst the top ten customers. The top ten customers accounted for approximately 24 per cent. of sales in the year ended 31 December 2010. Seven of the top ten customers in the year ended 31 December 2010 were also in the top ten customers in the year ended 31 December 2009. Glencore's significant customers are the major integrated oil companies such as Shell, BP and ExxonMobil, as well as NOCs such as Indian Oil Corporation Ltd, Nigerian National Petroleum Company and Petróleos Mexicanos. In addition to the major integrated oil companies and NOCs, crude oil and oil products are sold to a diverse customer base, including utilities and oil refineries. While the percentage of term contracts is relatively small, this is largely consistent with the structure of the oil market and spot contracts are primarily with customers with whom relationships have been established and developed over a long time and are therefore considered similar in nature to term contracts due to their expected renewal. Glencore is also active in supplying natural gas to industrial consumers, with the gas delivered via pipeline in the U.S., the United Kingdom and other parts of Europe.

Features of the market

The marketing operations principally involve physical sourcing, storage, blending and distribution of oil. Paper transactions are also entered into for the purposes of hedging and/or taking or increasing exposures, within group limits and policies, where a physically-backed position exists. The availability of liquid electronic trading markets, covering the majority of the products marketed by the crude oil and oil products operations, enables marketers to hedge their physical oil activities as well as provide profit enhancing opportunities in relation to physical marketing strategies.

Logistics

Glencore's crude oil and oil products operations source their freight requirements through arrangements with Glencore's internal oil freight desk. Such voyages make up approximately 35 per cent. of voyages by revenue procured by the freight desk, with the balance undertaken for third parties. Glencore has a large and diversified fleet of 203 vessels as at 31 December 2010 operated under various short and long-term time charters and commercial management arrangements; of which 176 vessels are held under time charter, both from third party owners and from Glencore's own joint-venture and 100 per cent. equity interests, and another 27 vessels are commercially managed for third party owners (not leased or owned). The average remaining fixed charge hire period for the majority of 176 vessels under time charter was approximately two years at such date. In total, Glencore has equity interests in 41 vessels, which are delivered or currently under construction, with expected progressive delivery until March 2012. The majority of these vessels service Glencore's Energy Products business segment. Where Glencore part owns vessels through joint venture arrangements, its joint venture partners are typically responsible for the technical management of these vessels, while Glencore is typically responsible for the commercial management of these vessels under charter arrangements. Many vessels are flexible and can also handle vegetable and palm oils.

Glencore's logistical operations also include Chemoil, a leading supplier of marine fuels listed on the Singapore Stock Exchange. Glencore completed its acquisition of a 51.54 per cent. stake in March 2010. Chemoil's primary business is the marketing and supply of bunker fuel and fuel oil and it operates in major shipping ports around the globe and owns or leases key storage terminals amounting to a total of 1.5 million cubic metres.

Finally, Glencore's logistical operations are supported by its access to some 9.0 million cubic metres of storage capacity that it holds through a network of storage tanks and terminals that it owns interests in (including Chemoil) or leases from third parties. The portion of storage capacity in which Glencore has equity interests amounts to some 3.9 million cubic metres, comprised of a number of facilities in strategic locations around the world.

Competitors

Glencore's main competitors are Vitol Group, Trafigura Group, Mercuria Energy and Gunvor, all of which are largely asset-light (little, if any, upstream production) business models. Glencore also faces marketing competition from banks such as Morgan Stanley and Goldman Sachs, which have some infrastructure and no current oil production, although the large majority of their business activities involve derivatives and not the physical sourcing and distribution of oil. Volumes captured by oil majors such as BP and Shell are also in direct competition with Glencore's marketing volumes, although their participation in the market increases overall volume and liquidity.

Coal/coke commodity department (marketing activities, Energy Products business segment)

Overview

The coal/coke commodity department is involved in the production and marketing of coal products. The marketing activities are supported by the industrial asset stakes, which provide both access to supply and market information.

Market

Glencore believes that it is the largest marketer of seaborne coal globally, supplying 100.9 million MT or approximately 11 per cent. of the seaborne coal market in the year ended 31 December 2010. Of the 100.9 million MT marketed, Glencore supplied 8.0 million MT of seaborne metallurgical coal or approximately 3 per cent. of the market and 92.2 million MT of thermal coal or approximately 13 per cent. of the market in the year ended 31 December 2010. Glencore also provided advisory and agency services in respect of a further 125.9 million MT of coal in the year ended 31 December 2010. The coal/coke commodity department's market share of principal, advisory and agency seaborne thermal coal for 2010 was approximately 28 per cent. while for seaborne metallurgical coal it was approximately 12 per cent. The department's share of principal, advisory and agency seaborne coal marketed was approximately 24 per cent. in the same year. In the coke market, Glencore believes that it has a significant position in China with approximately 17 per cent. share of Chinese coke exports.

Suppliers

In the year ended 31 December 2010, the coal/coke commodity department sourced approximately 25 per cent. of sales from its stakes in industrial assets. Glencore has maintained a relatively consistent and broad mix of key suppliers. The top ten suppliers accounted for approximately 52 per cent. of total purchases by volume in the year ended 31 December 2010. Eight of the top ten suppliers in the year ended 31 December 2010 were also in the top ten suppliers in the year ended 31 December 2009, reflecting long-term relationships.

Approximately 40 per cent. of the volumes purchased from the top ten suppliers in the year ended 31 December 2010 were under long-term contracts. Six of the top ten suppliers in the year ended 31 December 2010 were under long-term contracts.

Glencore also currently owns 34.5 per cent. of Xstrata, which has substantial coal mining operations in Australia, South Africa, Canada and Colombia, in respect of whose coal exports, Glencore provides advisory services. The main sources of Glencore's principal steam coal purchases are the coal mining companies in South Africa, Russia, Australia, Colombia, the U.S., Canada and Indonesia, accounting for most of the strategically important producing regions. Glencore's diversified supply base allows it to better manage the changing nature of coal demand and supply dynamics.

Customers

Glencore supplies thermal coal to a diverse geographic and industrial customer base, including major utilities in Spain, France, Italy, the United Kingdom, Hong Kong, China, Japan, Taiwan and South Korea. Glencore also sells coal to major cement producers, steel mills, chemical plants and other industrial users throughout the world. The top ten customers represented approximately 40 per cent. of sales in the year ended 31 December 2010. Six of the top ten customers in the year ended 31 December 2010 were also in the top ten customers in the year ended 31 December 2009. Glencore markets coal either on a principal basis, where it takes ownership of the coal, or on an agency/advisory basis, pursuant to a marketing agreement. The three primary marketing agreements are with Xstrata, which is a market advisory agreement until 2022, PT Kaltim Prima, the largest coal producer in Indonesia, which is a marketing agreement until 2021 and PT Arutmin Indonesia, which is a marketing agreement from November 2011 to September 2019. Approximately 20 per cent. of the volumes sold to the top ten customers in the year ended 31 December 2010 are under long-term sales agreements.

Features of the market

Whilst traditionally coal has been sold on a physical bilateral basis, without a supporting commodity exchange, in recent years, a sizeable coal paper derivatives market has developed, providing a spot and forward market for certain standard coal specifications. Glencore is able to transact in these markets in order to manage risks in relation to its physical supply of coal products.

Logistics

Glencore's coal operations employ a specialist freight team located in Baar and Singapore. This team uses its considerable immersion in the seaborne bulk freight market to source competitive freight from third party owners and carriers. The coal freight business operates four cape and two panamax size vessels on long-term time charter (between five and 15 years' duration) and owns two supramax vessels through joint ventures. In addition, the coal/coke department has access to 28 sets of paired tugs/barges on long-term time charter servicing Glencore's Indonesian coal transhipment operations.

The timing of procuring freight for coal operations is dictated primarily by physical coal sales activities, but also by global freight market dynamics at a point in time and/or forward expectations. Furthermore, geographic and time spreads are taken in order to allow the coal team to fully arbitrage relative value opportunities between the various origins and destinations of the underlying commodity. Maximum flexibility and optionality is thus sought to be maintained at all times. The operation manages freight from a combination of voyage and time charter based contracts, spot market bookings and derivative contracts which are primarily used to hedge physical freight exposure inherent in the overall position. Freight services are also supplied to third parties and are often sourced via joint venture agreements to enhance volume and gain timely market information in relation to industry trade patterns and rate developments.

Glencore's coal freight business has experienced significant growth from 1994 (3.3 million MT carried with 70 vessels) to 2010 (35.4 million MT carried with 485 vessels).

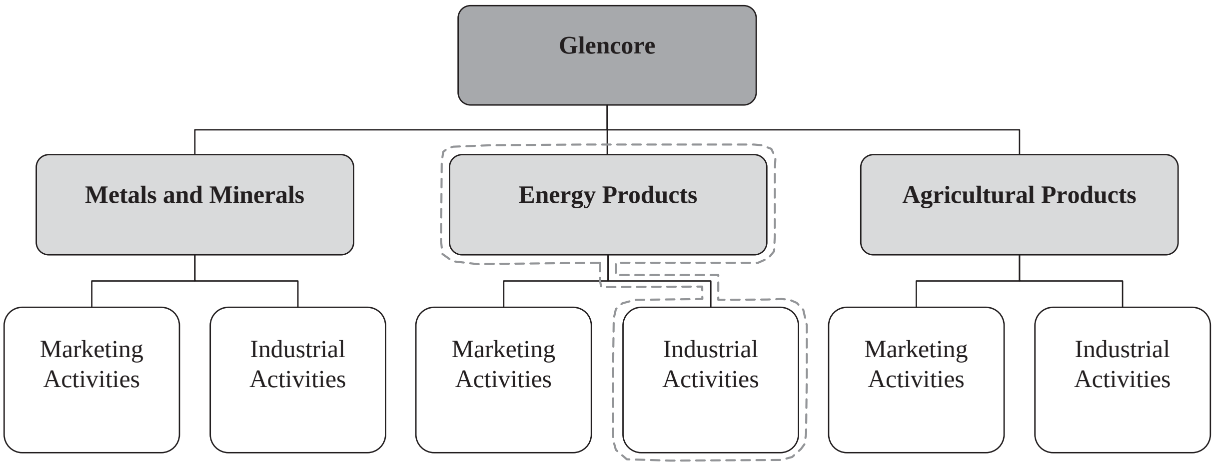
The coal/coke group logistical operations are further supported by access to the following storage/blending capacity that enable Glencore to meet specific customer requirements and optimise earnings:

- Calenturitas handling facility with capacity to crush 15 to 17 million MT per annum and a train loading and blending capacity of 22 to 23 million MT per annum.
- Richards Bay Coal Terminal and Maputo Port: Through its investment in Xstrata and Shanduka, Glencore has direct access to Richards Bay Coal Terminal in South Africa. Glencore also directly exports through the Maputo Port in Mozambique. Both of these terminals are natural blending facilities. Richards Bay Coal Terminal with approximately 9 million MT of stockpile capacity and Maputo with approximately 500k MT provide flexibility to stockpile material separately or alternatively on a single stockpile with increased capacity.
- Glencore also has access to facilities in ARA (Antwerp, Rotterdam and Amsterdam) and Russian ports.

Competitors

Glencore has no major competitors which share its integrated business model and operate worldwide and on its scale. Instead, its competitors are either producers which largely market their own product and have less geographic market depth and visibility, for example BHP Billiton or Anglo American plc, or companies that have relatively little production capacity and focus mainly on less integrated trading and/or consumer activities, for example Noble Group or power/utility companies.

Industrial activities (Energy Products business segment)



Oil commodity department (industrial activities, Energy Products business segment)

Overview

The table below summarises information about the key oil producing industrial assets as at 31 December 2010:

Company	Country	Commodity	Annual production capacity	Glencore's ownership interest	Remaining ownership interest	Any contractual relationship with Glencore
Controlled:						
Block I[1]	Equatorial Guinea	Oil and gas	—[2]	23.75%[3]	38% Noble Energy Inc. 27.55% Atlas Petroleum 5% GEPetrol 5.66% Osborne Resources Limited	Purchase agreements[4]
Block O[1]	Equatorial Guinea	Oil and gas	—[5]	25%[3]	45% Noble Energy Inc. 30% GEPetrol	Purchase agreements[4]
Non-controlled:						
Various oil producing subsidiaries of RussNeft . .	Russia	Oil	250,000 bbls/day	40-49%	51-60% RussNeft	Purchase agreements

Notes:

(1) Blocks I and O are both parts of The West African Oil Assets' portfolio. These investments are structured as unincorporated joint ventures, in which each partner receives and markets its share of production.

(2) First production is scheduled for January 2012 at an estimated rate of 50,000 barrels per day.

(3) Glencore is entitled to a greater share of oil production than its percentage ownership of the joint venture as it recovers the carried interest/loans in relation to some of its partners.

(4) To be entered into not less than three months prior to first production.

(5) First production scheduled for the first quarter of 2014 at an estimated rate of 37,500 barrels per day.

Financial information

The table below sets out selected financial information on the controlled industrial activities of the oil industrial assets for the years ended 31 December 2008, 31 December 2009 and 31 December 2010. The information in this table has been extracted without material adjustment from Glencore's accounting books and records, which are unaudited:

	2008	2009	2010
	(U.S.$ million)		
	(Unaudited)		
Oil/oil products			
Revenue	1,672	534	253
Adjusted EBITDA pre-exceptional items[1][2]	32	57	(12)
Adjusted EBIT pre-exceptional items[1][2]	28	49	(24)
Capex	350	144	514

Notes:

(1) Excludes share of income from associates and dividends.

(2) 2009 and 2010 includes U.S.$18 million and U.S.$40 million, respectively, of oil related exploration expenditures which were not able to be capitalised.

THE WEST AFRICAN OIL ASSETS:

Glencore has equity stakes in two oil and gas production sharing contracts offshore Equatorial Guinea, West Africa (Block I and Block O (the "Blocks")). Significant oil and gas reserves have been discovered in these Blocks following the initial discovery made in Block O in 2005. Two of the discoveries in the Blocks (Aseng and Alen) are under development and are adjacent fields that will benefit from shared infrastructure. In addition to the two development projects, there have been five other discoveries in the Blocks (Carmen, Diega (A-sand), Diega (B-sand), Felicita and Yolanda) and several similar prospects that remain to be drilled. To date, of the 11 exploration or appraisal wells drilled, ten have been successful. First oil is expected from the Block I Aseng field in the first quarter of 2012. Production in the Block O Alen field is expected to commence in the first quarter of 2014.

Blocks I and O form a key part of the Glencore exploration and production portfolio which also includes equity stakes in a further two blocks in Equatorial Guinea, two blocks in Cameroon, two blocks in Mali and one block in the Democratic Republic of Congo. The latest estimated reserves and resources for the Block O and I licences are as follows:

	Reserves (MMstb)(1)								
	Gross field			Glencore working interest(2)			Glencore net entitlement(3)		
	1P	2P	3P	1P	2P	3P	1P	2P	3P
Aseng field(4)	97	113	131	23	27	31	27	30	32
Alen field	45	82	128	11	20	32	10	17	26

Notes:

(1) As at 31 December 2010. The reserves and resources information set out above were reviewed and approved by Gordon R Taylor of RPS, has been prepared in accordance with PRMS and has been extracted without material adjustment from the RPS Report in Section XIV: "Independent Technical Reports".

(2) Glencore working interest in Block O is 25 per cent. and Glencore working interest in Block I is 23.75 per cent.

(3) Glencore's net entitlement is its share of cost oil and profit oil calculated using the product sharing agreement terms.

(4) Includes oil and condensate.

	Block I and Block O contingent resources (on-block)(1)					
	Gross field			Glencore working interest(2)		
	1C	2C	3C	1C	2C	3C
Liquids (MMstb)(3)						
Yolanda(4)	3.3	5.2	7.5	0.8	1.2	1.8
Felicita(4)	1.8	3.2	5.5	0.4	0.8	1.4
Diega (A-Sand)(4)	3.3	6	10	0.8	1.4	2.4
Diega (B-Sand)(4)(5)	24	52	99	5.7	12	24
Carmen (B-Sand)(4)	5.1	10	20	1.3	42	4.9
Gas (bscf)						
Aseng	419	519	640	100	123	152
Alen	471	850	1,326	118	213	332
Yolanda	393	506	640	93	120	152
Felicita	49	71	104	12	18	26
Diega (A-Sand)	122	176	249	29	42	59
Diega (B-Sand)(5)	46	94	193	11	22	46
Carmen (B-Sand)	24	39	64	6	10	16

Notes:

(1) As at 31 December 2010. The reserves and resources information set out above were reviewed and approved by Gordon R Taylor of RPS, has been prepared in accordance with PRMS and has been extracted without material adjustment from the RPS Report in Section XIV: "Independent Technical Reports".

(2) Glencore working interest in Block O is 25 per cent. and Glencore working interest in Block I is 23.75 per cent.

(3) Includes oil and condensate.

(4) Yolanda and Diega (A-Sand) are 100 per cent. in Block I: Felicita and Carmen (B-Sand) 100 per cent. in Block O: Diega (B-Sand) is 90 per cent. in Block I and 10 per cent. in Block O.

(5) Glencore working interest assumes a 90/10 split between Block I and Block O.

	Block I and Block O prospective resources (on-block)(Unrisked)[1]									
	In-place			Recoverable						
	Gross			Gross			Glencore working interest[2]			
	P90	P50	P10	P90	P50	P10	P90	P50	P10	GpoS (%)
STOIIP (MMstb)										
Arabella[3][4]	0	0	0	0	0	0	0	0	0	0
Adriana NE[3]	0	0	0	0	0	0	0	0	0	0
Sarah A[3]	53	78	111	16	31	56	3.8	7.4	13.3	29
Isidora[3]	33	58	99	10	23	50	2.4	5.5	11.9	33
Regina A[3]	24	49	97	7	20	49	1.7	4.8	11.6	42
Sofia[3]	26	58	126	8	23	63	1.9	5.5	15	47
Carla[3][4]	210	400	749	63	160	375	15.4	39	91	23
CIIP (MMstb)										
Arabella	13	23	39	3.9	9.2	20	1	2.3	5	44
Adriana NE	5.2	14	36	1.6	5.6	18	0.4	1.4	4.5	47
Sarah A	6.7	10	15	2.0	4.0	7.5	0.5	1.0	1.8	29
Isidora	4.6	8.1	14	1.4	3.2	7.0	0.3	0.8	1.7	33
Regina A	3.3	6.8	14	1.0	2.7	7.0	0.2	0.6	1.7	42
Sofia	3.6	8.2	18	1.1	3.3	9.0	0.3	0.8	2.1	47
Carla	29	56	107	8.7	22	54	2.1	5.4	13.2	23
Gas (bscf)[5]										
Arabella	189	325	553	142	260	470	35	65	117	44
Adriana NE	76	198	514	57	158	437	14	40	109	47
Sarah A	118	173	245	89	138	208	21	33	49	29
Isidora	58	102	175	44	82	149	10	19	35	33
Regina A	42	86	172	32	69	146	8	16	35	42
Sofia	46	103	224	35	82	190	8	19	45	47
Carla	369	707	1,327	277	566	1,128	68	138	275	23

Notes:

(1) As at 31 December 2010. The reserves and resources information set out above were reviewed and approved by Gordon R Taylor of RPS, has been prepared in accordance with PRMS and has been extracted without material adjustment from the RPS Report in Section XIV: "Independent Technical Reports".

(2) Glencore working interest in Block O is 25 per cent. and in Block I is 23.75 per cent.

(3) Sarah A, Isidora, Regina A and Sofia are 100 per cent. in Block I: Adriana NE 100 per cent. in Block O: Arabella 90/10 Block O/Block I, Carla 50/50 Block O/Block I.

(4) Glencore interest for Arabella and Carla are weighted averages of block working interests.

(5) Gas volumes include inerts.

RPS Energy Limited has carried out an independent verification of Glencore's economic valuation of the West African Oil Assets. Further details of this economic valuation are set out in the RPS Report in Section XIV: "Independent Technical Reports".

Block I:

The Block I licence area holds the Aseng oil field and the Yolanda gas condensate field, in addition to part of the Alen gas condensate field (shared 95 per cent./5 per cent. between Block O and Block I, respectively) and the Diega oil and gas discovery (shared approximately 10 per cent./90 per cent. between Block O and Block I, respectively). Numerous prospects have also been identified from 3D seismic data, which are analogous to the existing discoveries and fields and have a combined P10 estimated prospective resource of 464 million bbls of liquids and 1,281 bscf of wet gas.

Block I is operated by Noble Energy EG Ltd. ("Noble Energy"), which is part of the Noble Houston group of companies. Noble Houston is an U.S.-based independent energy company listed on the New York Stock Exchange.

The Aseng field was originally discovered in 2007 and appraised in 2008. Latest independent estimates of recoverable reserves on a 3P basis are 131 million bbls of oil and condensate liquids with a further 640 bcf of natural gas as contingent resources on a 3C basis. The Plan of Development ("POD") was approved in

June 2009 and development drilling on the field completed in September 2010. All completion operations are expected to be finished by early April 2011. The final development will comprise a sub-sea tie-back of the production wells via a fixed Floating Production, Storage and Off-take vessel ("FPSO") with gas and water re-injection for enhanced recovery from the reservoir.

First oil is expected from Block I in the first quarter of 2012, with daily production of 50,000 bbls per day from five production wells for the first two years, with production slowly declining thereafter. The FPSO is scheduled for arrival in September 2011. The total development costs of Aseng are estimated at U.S.$1.33 billion, with U.S.$819 million (gross) incurred to 31 December 2010 and the balance to be spent during 2011. Pursuant to the Farmout Agreement, Glencore's share (54 per cent.) of the remaining development capex is expected to be U.S.$276 million. Under the Block I production sharing agreement, each party has the right to lift their own share of the oil. The terms and process for the off-take of the oil produced will be governed by a lifting agreement which will be finalised between the equity partners not less than three months prior to first production.

Glencore has a 23.75 per cent. equity stake in Block I, which was acquired through a farm-out agreement (the "Farmout Agreement") with Atlas Petroleum International Limited ("Atlas"). The remaining equity interests are held by Noble Energy (38 per cent.), Atlas (27.6 per cent.), Osborne Resources Limited (5.7 per cent.) and the National Oil Company of the Republic of Equatorial Guinea (the Compañía Nacional De Petróleos de Guinea Ecuatorial or "GEPetrol") (5 per cent.). Under the terms of the Farmout Agreement, Glencore agreed to fund Atlas's share of costs to first oil in return for a 25 per cent. equity interest in Block I (of which a 1.25 per cent. revenue interest was subsequently assigned to GEPetrol) and the rights to market and recover such costs from Atlas's share of oil.

Glencore's exploration spending of U.S.$170 million has been incurred on Block I to 31 December 2010.

The full amount of the loan to Atlas Petroleum and accrued interest thereon will be repaid from Atlas Petroleum's 27.6 per cent. share of oil following commencement of production. As at 31 December 2010, the outstanding loan balance to Atlas Petroleum, including accrued interest, was U.S.$476 million.

Block O:

The Block O licence area holds 95 per cent. of the Alen gas condensate field, as well as an estimated 10 per cent. of the Diega oil and gas discovery, and 100 per cent. of the Felicita gas condensate and Carmen gas and oil discoveries. As with Block I, there are numerous prospects identified from 3D seismic data, which are analogous to the existing discoveries and fields and have a combined P10 prospective resource of 252 million bbls of liquids and 1,448 bscf of wet gas.

The Alen field was discovered in 2005 and appraised in 2007 with independently estimated reserves on a 3P basis of 128 million bbls of condensate and further contingent resources of 1,326 bcf of natural gas on a 3C basis.

The POD for the Alen field was approved by the Equatorial Guinea Ministry of Mines Industry and Energy on 11 January 2011. The field will have two bridge-linked platforms, which will be connected via sub-sea umbilicals to three production wells. Gas will initially be delivered to the platform where it will be stripped of condensate and re-injected back into the field via three sub-sea injection wells. The condensate liquids will be sent via a separate sub-sea pipeline to the Aseng FPSO for storage and off-take. First production is scheduled for the first quarter of 2014 with daily production anticipated to be 37,500 bbls per day for three years, with production declining slowly thereafter. Total development costs for Block O are estimated at U.S.$1.37 billion, to be incurred between 2010 and 2013, with U.S.$26 million incurred to 31 December 2010.

Glencore has a 25 per cent. equity stake in Block O, with the remaining equity being held by Noble Energy (45 per cent.) and GEPetrol (30 per cent.). In addition to its 25 per cent. equity stake, Glencore is carrying 3.6 per cent. of the share of costs of GEPetrol throughout the life of the project by way of an advance to GEPetrol. The costs of exploring and developing the asset are shared between Glencore (28.6 per cent.), Noble Energy (51.4 per cent.) and GEPetrol (20 per cent.).

Glencore's exploration spend on Block O to 31 December 2010 on a gross basis has been U.S.$71 million. Further exploratory drilling will continue in 2011 and 2012 to evaluate additional prospects and prove the reserves at the Carmen, Diega and Felicita fields.

As the Alen field straddles Block O and Block I, the equity interest holders in Block I will be compensated for gas condensate extracted from reserves within the Block I boundary under the terms of a unitisation agreement which has been agreed between the partners. An FPSO cost-sharing agreement has also been finalised between the partners to cover the cost-sharing benefits resulting from the Alen field development utilising the Aseng FPSO and associated facilities for condensate storage and off-take.

As with Block I, the Block O production sharing agreement provides that each party has the right to lift their own share of the condensate. This process will be captured in a lifting agreement to be signed by the equity partners.

Block O is also operated by Noble Energy.

OAO RUSSNEFT:

Glencore has invested in the Russian upstream market with its partner OAO RussNeft, taking ownership interests in a diversified portfolio of oil producing assets. OAO RussNeft owns and operates a number of oil licences stretching from the Volga river in the west to the Siberian plains in the east. Glencore has acquired between 40 and 49 per cent. of the equity in a number of oil production subsidiaries of OAO RussNeft. OAO RussNeft is currently owned as to 49 per cent. by a number of associated companies of Mikhail Gutseriev, 49 per cent. by Sistema JSFC and 2 per cent. held by Sberbank of Russia, through its subsidiary.

The current aggregate production capacities of 100 per cent. of OAO RussNeft's operating subsidiaries comprise approximately 250,000 bbls per day (equivalent to 12.9 million MT per annum).

OAO RussNeft Production	**No of fields**	**2008**	**2009**	**2010**
			('000 MT)	
West Siberian Group	23	7,837	6,970	6,872
Urals Group	44	3,931	3,765	3,956
Volga Group	67	2,080	1,763	1,773
Central Siberian Group	8	397	189	288
Total	**142**	**14,246**	**12,687**	**12,889**

As at 1 January 2010, the latest independently assessed 2P reserves of OAO RussNeft production subsidiaries amounted to 2,030 million bbls. Assets in the subsidiaries include producing properties with an oil refining capacity of 4.8 million MT per annum.

At the end of 2010, OAO RussNeft's entire debt position (comprising U.S.$6.1 billion of debt owed to Glencore and Sberbank of Russia) was restructured, extending the loan periods out to 2020 and lowering the interest rates for both lenders, which will assist OAO RussNeft to free up additional cash flows for investment projects aimed at increasing its production. Glencore's loan portfolio was restated into one secured loan facility of U.S.$2,080 million, bearing an interest of nine per cent. per annum, with three per cent. paid quarterly and the remaining six per cent. payable along with the principal. Repayment is expected in monthly instalments over a three year period commencing in the fourth quarter of 2017, but in any event not before repayment of the debt owing to Sberbank of Russia. The facility is secured by various pledges of shares of members of the OAO RussNeft group. See paragraph 18.13 of Section X: "Additional Information" for further details in this respect.

Glencore also benefits from a renewable one year off-take agreement pursuant to which Glencore is entitled to 100 per cent. of the crude oil and oil products produced by these assets destined for export markets.

Coal/coke commodity department (industrial activities, Energy Products business segment)

Overview

The table below summarises information about the key coal producing industrial assets as at 31 December 2010:

Company	Country	Commodity	Annual production capacity	Glencore's ownership interest	Remaining ownership interest	Any contractual relationship with Glencore
Controlled:						
Prodeco	Colombia	Coal	14.5 million MT[1]	100%	—	Marketing agreement
Shanduka Coal	South Africa	Coal	9 million run of mine MT	70%	30% Shanduka Resources (Pty) Limited[2]	Purchase agreements, marketing agreements
Non-controlled:						
Xstrata	UK/Switzerland	Coal	136,900 KT	34.5%	65.5% publicly traded on London Stock Exchange and SIX	Purchase agreements, agency agreements, marketing agreements, distribution agreements
Umcebo[3]	South Africa	Coal	7.2 million run of mine MT	43.66%[4]	56.34% privately held	Marketing agreement

Notes:

(1) Planned expansion to 20.7 million MT by 2015.

(2) Shanduka Resources recently announced its plans to acquire 51.9 per cent. of coal mining and services group Sentula Mining Limited in exchange for its 30 per cent. stakes in each of Kangra Coal and Shanduka Coal. The transaction is subject to various conditions precedent and is expected to be concluded towards the end of July 2011.

(3) Completion of the acquisition of this investment will not occur earlier than July 2011.

(4) Pending completion and subject to working capital and other adjustments which could potentially increase Glencore's ownership interest.

Financial information

The table below sets out selected financial information on the key controlled coal industrial activities for the years ended 31 December 2008, 31 December 2009 and 31 December 2010. The information in this table has been extracted without material adjustment from Glencore's accounting books and records, which are unaudited:

	2008	2009	2010
	(U.S.$ million) *(Unaudited)*		
Prodeco			
Revenue	804	790	954
Adjusted EBITDA pre-exceptional items	426	218	278
Adjusted EBIT pre-exceptional items	349	206	199
Statutory tax rate	33%	33%	33%
Capex	309	242	277
Other			
Revenue	427	277	292
Adjusted EBITDA pre-exceptional items[1]	201	96	47
Adjusted EBIT pre-exceptional items[1]	172	67	14
Capex	39	7	27
Total			
Revenue	1,231	1,067	1,246
Adjusted EBITDA pre-exceptional items[1]	627	314	325
Adjusted EBIT pre-exceptional items[1]	521	273	213

Note:

(1) Excludes share of income from associates and dividends.

Production

The tables below set out the production of the controlled coal industrial assets for the years ended 31 December 2008, 31 December 2009 and 31 December 2010:

	Year ended 31 December								
	2008			2009			2010		
Production	**Production and buy-in coal**	**Production**	**Buy-in coal**	**Production and buy-in coal**	**Production**	**Buy-in coal**	**Production and buy-in coal**	**Production**	**Buy-in coal**
					('000 MT)				
Prodeco	10,500	9,100	1,400	11,500	10,500	1,000	10,200	10,000	200
Shanduka Coal	12,260	11,719	541	12,114	11,761	353	9,474	9,052	422
Total production	22,760	20,819	1,941	23,614	22,261	1,353	19,674	19,052	622

Reserves and resources

The table below sets out the total attributable mine reserves and resources summary for the coal industrial assets as extracted from the Prodeco Report set out in Section XIV: "Independent Technical Reports":

		Coal reserves			Coal resources			
Prodeco[(1)]	**Commodity**	**Proved**	**Probable**	**Total**	**Measured**	**Indicated**	**Inferred**	**Total**
					('000 MT)			
Calenturitas[(2)]	Coal	113,000	96,000	209,000	170,000	160.000	70,000	400,000
La Jagua[(3)]	Coal	106,000	22,000	128,000	117,000	23,000	—	140,000
Total	Coal	219,000	118,000	337,000	287,000	183,000	70,000	540,000

Notes:

(1) As at 31 December 2010. The information in the table above in relation to mineral reserves and resources is in compliance with the JORC Code and has been extracted without material adjustment from the Prodeco Report in Section XIV: "Independent Technical Reports".

(2) Remaining mine life: expected to be 20 years. Expiry date of relevant mining/concession licences: 2035.

(3) Remaining mine life: expected to be approximately 20 years. Expiry date of relevant mining/concession licences: CET and CDJ expiring between 2027 and 2038 and CMU expiring in 2014.

Competent Persons: The mineral reserves estimates set out above were reviewed and approved by Grant Walker of MMC. The mineral resources estimates set out above were reviewed and approved by Kerry Whitby of MBGS. The mineral reserves and resources estimates have been prepared in accordance with the JORC Code. Mr Walker and Mr Whitby are each Competent Persons as defined by JORC and have sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which they are undertaking.

		Coal reserves			Coal resources			
Shanduka Coal[(1)(2)]	**Commodity**	**Proved**	**Probable**	**Total**	**Measured**	**Indicated**	**Inferred**	**Total**
					('000 MT)			
Graspan	Coal	24,010	0	24,010	26,410	0	0	26,410
Townlands	Coal	14,630	0	14,630	16,090	0	0	16,090
Steelcoal reserve	Coal	9,010	0	9,010	22,680	0	0	22,680
Lakeside	Coal	4,490	0	4,490	7,980	0	0	7,980
Leeuwfontein	Coal	2,610	0	2,610	6,040	0	0	6,040
Springlake	Coal	14,100	0	14,100	5,679	2,772	6,539	14,990
Springboklaagte	Coal	0	0	0	39,905	51,970	2,765	94,640

Notes:

(1) As at 31 December 2010.

(2) Remaining mine life: individual mining operations have expected lifes ranging from five to 12 years, based on their reserves. However, the Springboklaagte deposit extends Shanduka Coal's expected life by approximately 20 to 25 years. Expiry date of relevant mining/concession licenses: different for each mine, ranging from January 2017 to December 2021 in respect of Graspan, Townlands, Steelcoal reserve, Lakeside and Springlake. Leeuwfontein is still what is known as an "old order right" or mining license, with applications pending for conversion into a "new order right" or mining license (only upon conversion will the expiry date be known). Springboklaagte is still a prospecting right, which are granted for five year periods and are renewable for a further three year period. The main prospecting right expires on 3 August 2011 and another smaller prospecting right (Kromdraai South) expires on 23 January 2012. Both are expected to be renewed.

Competent Persons: the mineral reserves and resources estimates set out above were reviewed and approved by NJ Denner and K Dippenaar of Gemecs (Pty) Ltd. The reserves and resources estimates have been prepared in accordance with SAMREC. Mr Denner and Mr Dippenaar are both Competent Persons as defined by SAMREC and each have sufficient experience which is relevant to the style of mineralisation and type of deposit under consideration and to the activity which they are undertaking.

PRODECO:

Prodeco, a wholly owned subsidiary of Glencore, comprises Glencore's Colombian export thermal and metallurgical coal mining operations and associated infrastructure. It is involved in the exploration, production, transportation and shipment of high grade thermal and metallurgical coal from its mines to markets principally in Europe and the Americas. Prodeco consists of two open pit coal mining operations (the Calenturitas mine and the La Jagua complex), export port facilities (Puerto Zuñiga, which is fully operational, and Puerto Nuevo, which is under construction) and a 39.76 per cent. share in a company which holds the concession to the railway linking Prodeco's mines to the export ports.

Prodeco has a low-cost structure as it operates open cut mines and benefits from a superior quality coal which requires no washing. As at 31 December 2010, Prodeco had a saleable reserve base in excess of 337 million MT, with resources (measured, indicated and inferred) in excess of 540 million MT. Prodeco is currently the third largest producer of export thermal coal in Colombia, behind Cerrejón and Drummond Company, Inc.

Prodeco is going through a period of significant expansion, as coal production is planned to increase from 10 million MT per annum in 2010 to 19.9 million MT in 2013 and to 20.7 million MT per annum by 2015. This expansion, at an estimated capital cost of approximately U.S.$2.6 billion (of which approximately U.S.$1.5 billion has been spent on mining concessions, mining equipment, transport, port and other infrastructure as at 31 December 2010), is aimed at exploiting Prodeco's existing extensive reserve base to take advantage of demand for import coal in Europe and the Americas. The planned expansion is expected to have a significant positive impact on Prodeco's future revenues, cost structure and earnings. The ramp-up of production is dependent on fleet delivery, staffing and training and Glencore has been informed by the suppliers of certain items of equipment ordered as part of the ramp-up that delivery of those items will be delayed due to the infrastructure damage caused by the recent earthquake and tsunami in Japan. Glencore does not believe that these delays will have a material impact.

Prodeco has operational advantages in owning all its key operational infrastructure, including a railway (through its part ownership of the rail infrastructure concession and full ownership of rolling stock) and all mining equipment and facilities at its mine sites. Prodeco also owns Puerto Nuevo S.A., which is currently building a new public port in the area replacing Puerto Zuñiga when completed. Glencore's investment in such infrastructure has laid the foundation for Prodeco's low-cost mining operations.

Calenturitas:

The Calenturitas open pit coal mine is near the town of La Loma, in the Cesar State, northern Colombia, approximately 200 kilometres south of the Caribbean coast town of Santa Marta.

Prodeco was granted a 15-year mining concession licence for the Calenturitas mine in 2001 for a concession area of 6,677 hectares. In July 2004, Prodeco commenced production, extracting high-quality export thermal coal at the Calenturitas mine. In 2007, the mining concession was extended to 2035.

Calenturitas is an open cut mine from which low sulphur, high energy steam coal is extracted. The coal handling facility, which was completed in March 2009 at a cost of U.S.$65.2 million, has the capacity to crush 15 to 17 million MT per annum and a train loading and blending capacity of 22 to 23 million MT per annum. The blending capability of the coal handling facility enables Prodeco to blend coal to meet specific customer requirements, which enables it to optimise revenue streams.

Production of high-quality export thermal coal at the Calenturitas mine increased from 4.7 million MT in 2008 to 5.7 million MT in 2009. Production for the year ended 31 December 2010 was 5.2 million MT, hampered during the year mainly by extreme rain events (more than double average annual rainfall). An expansion of production of export thermal coal to 13.6 million MT per annum is planned to be completed by 2015. All the required infrastructure at the mine site is expected to be in place by the first half of 2011, with the ramp-up of production dependent on fleet delivery, staffing and training.

The Calenturitas mine's resource base as at 31 December 2010 was 400 million MT. The life of mine is currently expected to be 20 years.

La Jagua Complex:

The La Jagua open pit coal mining complex is located 20 kilometres east of Calenturitas in the Cesar State, northern Colombia. The complex is governed by five coal mining concessions held by separate companies, namely Carbones de La Jagua, S.A. ("CDJ"), Consorcio Minero Unido, S.A. ("CMU") and Carbones el Tesoro, S.A. ("CET"), all of which are wholly owned by Glencore.

The CDJ mine commenced operations in 1995 under the ownership of CI Carbones del Caribe, S.A. and Glencore purchased the mine in January 2005. The CMU mine commenced operations in 1990 under private ownership and was acquired by Glencore in August 2006. The CET mine commenced operations in 1997 under private ownership and was purchased by Glencore in May 2007.

The mining licences held by CDJ and CET expire between 2027 and 2038, while CMU's concession expires in 2014. Management expects that CMU's licence will be extended as it was included in the mine plan for the La Jagua complex approved by the Colombian government's mining agency ("Ingeominas"), which is valid until 2025.

The operations of CDJ, CMU and CET have been consolidated into one operation, with the approval of Ingeominas. This consolidation provides the La Jagua complex with operational efficiencies and allows for the complete reserve base to be mined, which would otherwise not have been possible if the five concessions had been mined separately. Through this consolidation, Prodeco has increased the minable reserves at this site by approximately 50 per cent.

Similar to the Calenturitas mine, the La Jagua complex is an open cut operation. However, in addition to low sulphur and high energy steam coal, high volatile metallurgical coal is also extracted at this site. Crushed coal is typically transported by truck to the new coal handling facility at the Calenturitas mine site where it is loaded into rail wagons and transported by rail to the port facility at Santa Marta. However, some coal is transported directly by truck to the port facilities at Santa Marta, but this is less common since the commissioning of the coal handling facility at Calenturitas in 2009.

Combined production of high-quality export thermal coal of the three mines comprising the La Jagua complex increased from 4.4 million MT in 2008 to 4.8 million MT in 2009. Production for the year ended 31 December 2010 was 4.8 million MT. Production in 2010 was also negatively affected by the extreme rainfalls in the country. As with Calenturitas, all the required mine site equipment and infrastructure is expected to be in place by the first half of 2011, with the ramp-up of production dependent on fleet delivery, staffing and training. The La Jagua complex is expected to be operating at a capacity of 7.1 million MT per annum by 2011.

The La Jagua resource base as at 31 December 2010 was 140 million MT. The life of mine is currently expected to be approximately 20 years.

Fenoco Railway:

In 2006, Prodeco, together with four other Colombian coal producing companies (Drummond Company, Inc., Carbones del César, S.A., Carbones del Caribe, S.A., and Carbones de los Andes, S.A.), acquired Fenoco S.A. ("Fenoco"). Prodeco's current shareholding in Fenoco is 39.76 per cent.

Fenoco is the holder of a 30-year railway concession (expiring in 2029) which links Santa Marta and the city of Chiriguana in the Cesar State. The railway passes within close proximity of Prodeco's mining operations and is used primarily for coal transportation, with the intention that it will be available for transporting other commodities in the future. Fenoco has entered into take or pay commitments with its shareholders in return for guaranteed availability and volume of annual rail capacity. The term of such commitment is ten years, but can be extended or reduced in connection with a mine's expected life.

Rolling stock for the railway is provided by Fenoco users according to their individual requirements. As at 31 December 2010, Prodeco owned 18 locomotive engines and 700 heavy haul wagons providing 14.5 million MT per annum of rail capacity between Calenturitas and Santa Marta, with anticipated capacity of 15.9 million MT per annum in 2011 (based of existing and expected operating conditions). Each train load between the mine and the port replaces 180 highway trucks a day, reducing costs and increasing capacity, whilst also improving safety and the local environment. The railway's coal transporting capacity is currently 45-50 million MT per annum.

The Fenoco shareholders have committed to expanding the railway to increase capacity to at least 80 million MT per annum, with the majority estimated to be completed by the end of 2011, subject to government approvals. The total cost of the expansion is expected to be approximately U.S.$250 million (to be funded *pro rata* by the Fenoco shareholders between March 2006 and completion of the expansion, of which approximately U.S.$120 million had been spent as at 31 December 2010).

Prodeco has entered into a shareholders' agreement in relation to the management of Fenoco. Prodeco is entitled to appoint two out of five board members. It has a take or pay agreement with Fenoco with guaranteed capacity of 14.5 million MT for the year ended 31 December 2010.

Port facilities:

The two port facilities used by Prodeco for exporting coal are located near the city of Santa Marta on the Caribbean coast of Colombia; Puerto Zuñiga (owned by Prodeco) and Carbosan (independently owned). Prodeco is building a new port, Puerto Nuevo (wholly owned by Prodeco), to replace Puerto Zuñiga, with increased capacity.

Puerto Zuñiga is adjacent to the Simón Bolívar airport in Santa Marta and was historically operated under a private concession awarded by the Colombian government; this expired in March 2009, meaning that the fixed marine assets (principally the pier) reverted to the Colombian government. Prodeco was granted a temporary concession to operate Puerto Zuñiga, which was subsequently renewed in March 2010 and again in March 2011, each time for a year. The renewal of such temporary concession by the Colombian government is subject to Prodeco's compliance with the timetable submitted for the construction of a new port facility, Puerto Nuevo, and is expected to be granted annually until Puerto Nuevo is operational.

Puerto Nuevo, which will have an estimated design capacity of approximately 27 million MT per annum, is being constructed adjacent to the existing Drummond port to comply with the new government regulations on loading methods, which became effective from July 2010. Given the time required to construct a new port and install new infrastructure, Prodeco and all other Colombian coal port operators have been unable to fully comply with the new regulation. However, Glencore considers it extremely unlikely that the new regulation will be enforced before Puerto Nuevo is commissioned, on the basis that it has already received three extensions to its permission to use Puerto Zuñiga (which is not compliant with the new regulations and is to be replaced with Puerto Nuevo) from the Colombian government. Puerto Nuevo will lower Prodeco's costs due to its new direct loading system compared to the crane and barge operations used at Puerto Zuñiga today. It will be an all weather port, which is expected to result in additional savings for Prodeco.

In the year ended 31 December 2010, Prodeco had total port capacity of 19.7 million MT, comprising 17 million MT at Puerto Zuñiga and 2.7 million MT at the independently owned port, Carbosan in Santa Marta. Prodeco's contractual port facility arrangements with the Carbosan port are on a take or pay basis, the terms of which expire in 2013. Once Puerto Nuevo is commissioned (expected in the first half of 2013), Prodeco's total port capacity will increase to approximately 27 million MT per annum.

Other:

Prodeco has been impacted by some industrial activity in recent years, including a 38-day strike by employees at one of La Jagua's concessions in 2010. The level of union membership amongst Prodeco's employees, however, is generally low (except at CDJ, where 82 per cent. of the total direct workers are unionised). The strike at La Jagua was by the employees of CDJ and impacted this concession only. Management foresees an increasing level of membership in future years and it is likely that strike action will remain a key business risk. See "The maintenance of positive employee relations and the ability to attract and retain skilled workers is key to the successful operation of Glencore's industrial activities" in the Risk Factors in Section I: "Information Glencore", for further risks in this respect.

In addition, with Puerto Nuevo being constructed adjacent to the Drummond Port, discussions are ongoing concerning the common use of the access channel and turning basin for the ports. Opposition has been recently lodged with respect to some of Prodeco's requested amendments to its port concession. Prodeco does not consider that this opposition will have a material impact upon its construction timetable.

SHANDUKA COAL:

Glencore owns 70 per cent. of Shanduka Coal. The remaining 30 per cent. of Shanduka Coal is owned by Shanduka Resources (Pty) Limited, a South African Black Economic Empowerment entity. Shanduka Resources recently announced it plans to acquire 51.9 per cent. of coal mining and services group Sentula Mining Limited in exchange for its 30 per cent. stakes in each of Kangra Coal and Shanduka Coal. The transaction is subject to various conditions precedent and is expected to be concluded towards the end of July 2011.

Shanduka Coal owns 100 per cent. of the Graspan Colliery and the Middelburg Townlands Colliery and Extension, located near Middelburg, South Africa, as well as the Springlake Colliery located near Newcastle, South Africa. These operating mines have an aggregate annual production capacity of 9 million run of mine MT. Shanduka Coal also owns 100 per cent. of the Leeuwfontein and Lakeside Collieries located near Kendal, South Africa, which are under care and maintenance pending further exploration, and the Bankfontein Colliery, the reserves of which have been exhausted and which is being prepared for closure. During 2009, Shanduka Coal acquired a 50 per cent. interest in the Springboklaagte deposit in South Africa, providing Shanduka Coal with an additional 95 million MT of attributable resources. The total reserves and resources (as at 31 December 2010) of Shanduka Coal (including attributable resources of Springboklaagte) are 69 million MT of reserves and 189 million MT of resources. Shanduka Coal's individual mining operations have expected lives ranging from five to 12 years, based on their existing reserves. However, the Springboklaagte deposit extends Shanduka Coal's expected life by approximately 20 to 25 years. In addition, Shanduka Coal is currently evaluating a number of other potential acquisitions to expand its resource base.

Shanduka Coal produces both higher quality thermal and anthracite coal suitable for the export market and lower quality thermal coal sold largely to Eskom, the South African parastatal electric utility entity.

Under the terms of a long-term marketing agreement, Glencore purchases Shanduka Coal's coal destined for the export market on a principal basis. In the year ended 31 December 2009 and 2010, Shanduka Coal sold 2.5 million MT and 1.5 million MT to Glencore, respectively. Glencore sells the coal both to domestic customers in South Africa and to the export market through the Richards Bay Coal Terminal, the largest export coal terminal in South Africa, the Port of Durban in South Africa and the Maputo port and Matola Coal Terminal located in Mozambique. Shanduka Coal currently has 439k MT per annum of committed export entitlement at Richards Bay Coal Terminal. In addition, during 2010, Glencore entered into a five-year commitment to export 1.7 million MT of coal per annum through the Maputo port and the Matola Coal Terminal.

Glencore also acts as marketing agent for Shanduka Coal's third party domestic coal sales, including its sales of lower quality coal to Eskom. In the years ended 31 December 2009 and 2010, Shanduka Coal sold 6.5 million MT and 6.0 million MT to third parties, respectively. Shanduka Coal is finalising an eight-year agreement with Eskom, against which Shanduka Coal is currently delivering 300k to 400k MT of coal per month to Eskom.

XSTRATA:

The coal/coke commodity department benefits from Glencore's relationship with Xstrata. Please refer to Section I: "Information on Glencore—Relationship and commercial arrangements with Xstrata" for further information on Xstrata.

UMCEBO:

In July 2010, Glencore agreed to acquire an effective 43.66 per cent. equity interest in Umcebo for an aggregate purchase price of ZAR908 million. The transaction is subject to certain conditions precedent, including the approval of the requisite regulatory authorities (the Department of Mineral Resources, the South African Competition Authorities and the South African Reserve Bank) and consent from certain third parties. Glencore's effective interest in Umcebo may increase due to certain purchase price adjustments included in the transaction agreements. In addition, Glencore has concluded an agreement with certain minority shareholders of a subsidiary of Umcebo to acquire their interests on closing of the transaction.

In recognition of its commitment to Umcebo, Glencore has, pending closing of the transaction and in order to facilitate Umcebo's funding needs, cash collateralised ZAR250 million of Umcebo's existing indebtedness. If the transaction is successfully implemented, the ZAR250 million will form part of the ZAR908 million purchase price and be converted into equity, with the result that Umcebo will be debt free. Should the transaction fail to close, the cash collateralised deposit will accrue interest and be repaid through a combination of coal deliveries by Umcebo to Glencore and proceeds realised from the sale of assets by Umcebo.

Subject to certain conditions precedent, Glencore will after the closing of the transaction be required to fund up to an additional ZAR646 million in the form of shareholder loans accruing interest at market related rates for the purposes of working capital, resource development and acquisitions, including the acquisition of the 47 per cent. interest in the Wonderfontein and Belfast projects that is held by a joint venture partner of Umcebo (Umcebo holds the other 53 per cent.). Glencore has also agreed with Umcebo that if Umcebo is able to purchase the abovementioned 47 per cent. interest in the Wonderfontein and Belfast projects from Umcebo's joint venture partner before the closing of the broader transaction, Glencore will fund that acquisition. If the broader transaction proceeds, this funding will be converted into a shareholders loan. If the broader transaction fails, the funding will either be applied to settle the purchase price for the 47 per cent. interest which Glencore will acquire from Umcebo or will be repaid by Umcebo to Glencore. The agreements with the vendors also provide that if the broader transaction fails, Glencore will, subject to certain conditions precedent, acquire from Umcebo its existing 53 per cent. interest in the Wonderfontein and Belfast projects.

A newly formed wholly owned and broad-based South African Black Economic Empowerment company has agreed to purchase an effective 26 per cent. equity interest in Umcebo. In order to facilitate this participation, including an amount of required third party bank funding, Glencore intends to provide a guarantee of up to ZAR250 million to such bank.

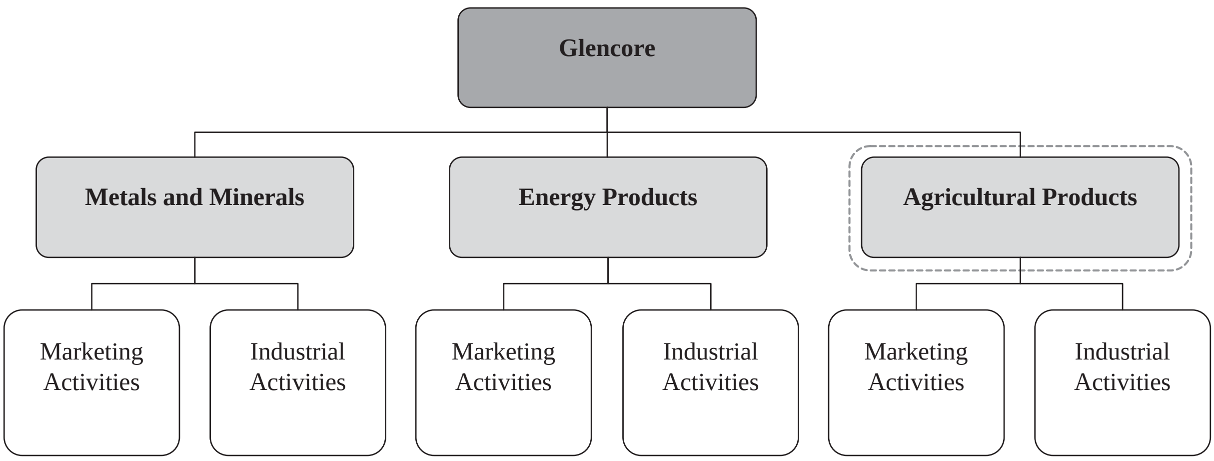
The transaction would secure access to an eventual 1.5 million MT of Richards Bay Coal Terminal Phase V export allocation and to long-life resources from South Africa's principal coal field in Mpumalanga, which has established infrastructure for the transport of export quality thermal coal. Glencore estimates attributable resources at Umcebo to be at least 860 million MT. Umcebo currently has three thermal complexes in operation (Middelkraal, Kleinfontein and Klippan), with an aggregate annual production capacity of 7.2 million run of mine MT. In addition, the Wonderfontein mine is scheduled to begin production in 2013, with a long-term annual production capacity of 3.6 million run of mine MT.

GLOBAL COAL LIMITED:

Glencore owns 19.7 per cent. of Global Coal Limited, which was founded by leading members of the world coal industry to promote the development of the coal markets through screen trading of standardised coal products via the globalCOAL trading platform. More than 80 million tonnes of physical thermal coal are traded annually on the globalCOAL trading platform by approximately 100 leading coal market participants.

Agricultural Products

Introduction (Agricultural Products business segment)



The Agricultural Products business segment focuses on the following commodities: grains (including wheat, maize and barley), oils/oilseeds, cotton and sugar. The activities of Glencore's Agricultural Products business segment are supported by investments in controlled and non-controlled storage, handling, processing and port facilities in strategic locations.

Selected key financial information in relation to the Agricultural Products business segment's marketing and industrial activities for the years ended 31 December 2008, 31 December 2009 and 31 December 2010 is set out below. This information has been extracted without material adjustment from Section VI: "Historical Financial Information" except where marked as unaudited. Unaudited information has been extracted without material adjustment from Glencore's accounting records.

	2008	2009	2010
	(U.S.$ million)		
Marketing Activities			
Revenue (unaudited)(1)	12,057	6,793	8,238
Adjusted EBITDA pre-exceptional items(2)	579	304	659
Adjusted EBIT pre-exceptional items(2)	579	304	659
Industrial Activities			
Revenue (unaudited)(1)	1,337	1,789	2,180
Adjusted EBITDA pre-exceptional items(2)(3)(4)	95	85	88
Adjusted EBIT pre-exceptional items(2)(3)(4)	84	48	39
Share of income from associates and dividends (excl. Xstrata)(4)	15	(7)	19
Capex	102	116	71
Total Agricultural			
Revenue	13,394	8,582	10,418
Adjusted EBITDA pre-exceptional items(2)(5)	689	382	766
Adjusted EBIT pre-exceptional items(2)(5)	678	345	717

Notes:

(1) Revenue is not split between Marketing and Industrial activities in the audited Historical Financial Information set out in Section VI of this document and is therefore marked as unaudited. Total segment and total Group revenue is audited.

(2) Includes corporate selling, general and administrative expenses, but excluding variable pool bonus accrual, which is recorded at group/corporate level.

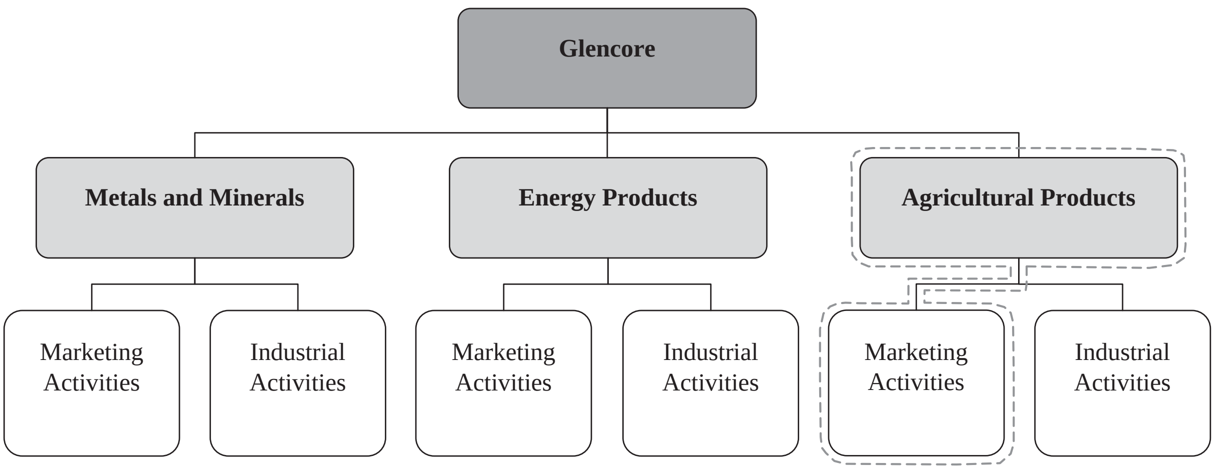
(3) Excludes share of income from associates and dividends.

(4) Adjusted EBITDA pre-exceptional items plus Share of income from associates and dividends and Adjusted EBIT pre-exceptional items plus Share of income from associates and dividends are audited.

(5) Includes share of income from associates and dividends.

The Agricultural Products business segment has approximately 946 employees globally (excluding individuals employed within Glencore's industrial or farming activities) with some 158 staff located at Glencore's Rotterdam office and a further approximately 788 employees spread across 16 main offices in key global procurement locations, with particularly large staff numbers present in Russia and Ukraine. This business segment also employs approximately 7,200 individuals globally in its industrial activities.

Marketing Activities (Agricultural Products business segment)



The table below sets out the marketing volumes sold to third parties of each main commodity category handled by the Agricultural Products business segment for the years ended 31 December 2008, 31 December 2009 and 31 December 2010:

	Marketing volumes sold to third parties		
	2008	**2009**	**2010**
		(million MT)	
Grains	20.5	19.8	20.9
Oil/oilseeds	8.6	8.1	9.4
Cotton	0	0	0.2
Sugar	0.9	1.0	0.5

Examples of Glencore's marketing strategies for the Agricultural Products business segment include:

- Glencore's access to in-land and port elevators and silos enables Glencore to procure and store sizeable quantities of commodities and seek to exploit time, product and geographic arbitrage opportunities as they present themselves. This access also enables volumes, supplied by a large number of small local suppliers, to be aggregated in storage facilities in order to optimise origination margin. In addition, this access provides capacity and reliability in supply to Glencore's end customers without dependence on third party logistics.
- With respect to grains, Glencore leverages its long-term relationships with suppliers and its access to the infrastructure needed to access local markets to exploit geographic arbitrage opportunities, that is, by sourcing grains in a lower cost geographic area, using its skill and network to handle all logistics, financing and risk managements aspects, and then selling the product into a higher margin geographic area.
- With respect to oil and oilseeds, Glencore leverages its ownership of processing facilities and relationships with key processors, which enable Glencore to operate in correlated commodities and market their price differentials, that is, to determine whether Glencore can make a greater margin by selling an unprocessed commodity or by processing a commodity and then selling the processed commodity, and acting accordingly.
- With respect to sugar, Glencore leverages its global statistical research and analysis and local knowledge (for example, Glencore has been active in local Russian and Indian markets for 15 to 20 years marketing domestic sugar as well as processing and marketing imported sugar) into marketing strategies covering flat price, origin basis, raws spreads, whites spreads and white sugar arbitrage.

Overview

The Agricultural Products business segment originates and markets grains (including wheat, barley and corn), oil/oilseeds (including most edible oils, biodiesel and their source seeds/beans), cotton and sugar.

Market

The Agricultural Products business segment is estimated to have accounted for approximately 8.7 per cent. of the addressable market for grains in 2010, with significant market share in Europe, the CIS and Australia. In oils/oilseeds, Glencore believes that the Agricultural Products business segment accounted for approximately 4.5 per cent. of the addressable market in 2010, with significant market share in South America for oil/oilseed and in Europe for rapeseed and biodiesel.

Suppliers

The suppliers to the Agricultural Products business segment are farmers, farming co-operatives, processing plants, local exporters and global merchants. Individual commodity traders such as Cargill are the largest suppliers, representing in aggregate approximately 20 per cent. of the physical volumes that Glencore marketed during the year ended 31 December 2010. Glencore typically transacts with these third party commodity merchants as liquidity providers on a spot basis and generally does not have long-term supply contracts with them. The only top five supplier which is not a commodity merchant is Vicentin, Argentina's largest soybean crusher and producer of soy oil most of which is supplied under long-term contract. The remaining supply base (including farmers) is very diversified and fragmented. The Agricultural Products business segment generally enters into commitments to buy agricultural products only as part of specific marketing strategies within the course of a crop season. The segment's owned or partly owned farming operations produce approximately 0.7 million MT of commodities annually and therefore constitute a minor part of the business segment's throughput of 31 million MT in 2010.

With respect to grains, Glencore typically buys grain from farmers at local spot prices for delivery to silos. Whilst occasionally grain from Australian or European farmers is procured pursuant to forward agreements, the business segment does not generally have long-term supply contracts in place with farmers, though it does have long-term relationships with important suppliers. Global markets, particularly on the supply side, are highly fragmented and, in many countries, Glencore procures grain directly from the farmer. North Africa, the Middle East and Asia are the prime importers.

With respect to oils/oilseeds, Glencore originates and physically ships approximately 25 per cent. of the physical volumes of oils/oilseed that it markets. Glencore processes, handles and markets oils (including most edible oils and biodiesel) and their source seeds/beans with sourcing primarily from Argentina, Brazil, Australia, EU and Ukraine.

Glencore entered the cotton business at a time when numerous traditional and single commodity players were exiting the industry due to the market disruptions of 2008. This lack of competition was seen as an opportunity for another major player. Another attraction was the fact that both the supplier and customer bases in cotton were highly fragmented. Finally, the cotton business fitted well within the existing office network where Glencore could leverage off its existing marketing expertise.

With respect to cotton, Glencore markets mainly unprocessed product, with sourcing primarily from West Africa, the U.S., India and Brazil.

With respect to sugar, Glencore markets both raw sugar and white sugar, and processes raw sugar into white sugar. Glencore is supplied a small portion of its sugar by farming operations which Glencore owns or in which it has an interest with sourcing primarily from Thailand, Brazil and Guatemala.

The top ten suppliers of agricultural products accounted for approximately 22 per cent. of the total agricultural products purchased in the year ended 31 December 2010. Seven of the top ten suppliers in the year ended 31 December 2010 were also in the top ten suppliers for the year ended 31 December 2009. Three of the top ten suppliers in the year ended 31 December 2010 were under long-term contracts consistent with the structure of the market.

Customers

Glencore's customers are the processing industry (food, consumer goods and animal feed), local importers, government purchasing entities and competing global marketers. The Agricultural Products business segment's top ten customers accounted for around 28 per cent. of total sales volumes by value during the year ended 31 December 2010. Contracts with customers in the food industry are negotiated bilaterally on a case-by-case basis, whilst contracts with governmental purchase bodies are usually tendered. Glencore estimates that it is awarded at least part of the tender in at least half of the agricultural tenders in which it participates and, where it is unsuccessful, it is sometimes able to supply part of the tender to the successful applicant. The Agricultural Products business segment does not enter into long-term contracts with these customers.

Features of the market

Liquid derivatives markets exist for the majority of the key commodities that the business segment markets, such as wheat, corn, soyoil, rapeseed and cotton, for example CBOT (Chicago), MATIF (Paris) and NYMEX (New York). These key products are also used as relative proxies for other products which the segment markets, such as barley and sunflower oil, in respect of which a liquid derivatives market does not currently exist, and Glencore is accordingly able to hedge, albeit imperfectly and/or partially, the risk on these physical commodities' positions using such proxy forward agreements and exchange traded futures. Glencore is also very active in ICE (New York) for global sugar futures trading and hedging as well as in local futures exchanges for sugar in India, Russia and, more recently, China.

Logistics

Physical flows of product are shipped via trucks, trains and vessels. Glencore owns approximately 250 train wagons in the CIS and partially owns 80 train wagons in the EU. In addition, Glencore ships product by vessel, including having approximately 30 short- and 60 medium-term charters with a maximum duration of two years. Logistical planning and chartering of dry-bulk seaborne trade is performed in-house by a freight desk which provides initial quotes for the freight associated with each shipment. The in-house freight desk trades and hedges freight and shipping capacity positions for both the department's dry-bulk shipping needs and for third parties (approximately 50 per cent. is for third parties). Glencore's logistical assets also include in-land and port elevators and silos and train wagons. The elevators and silos are located in Argentina, Australia, Brazil, Estonia, Hungary, Kazakhstan, Paraguay, Poland, Romania, Russia, Ukraine and Uruguay. Logistics assets are particularly important in the CIS as third party logistics assets typically have insufficient capacity and are not sufficiently reliable. Glencore's elevators have a combined storage capacity of around 1 million MT per annum and its silos have a combined storage capacity of 3.8 million MT per annum. The table below sets out the total in-land and port elevators and silo capacity held by the Agricultural Products business segment for the years ended 31 December 2008, 31 December 2009 and 31 December 2010:

	Year ended 31 December		
Aggregate capacity[1]	**2008**	**2009**	**2010**
		('000 MT)	
Port elevators	970	970	1,000
Silos	3,800	3,800	3,800
Total	4,770	4,770	4,800

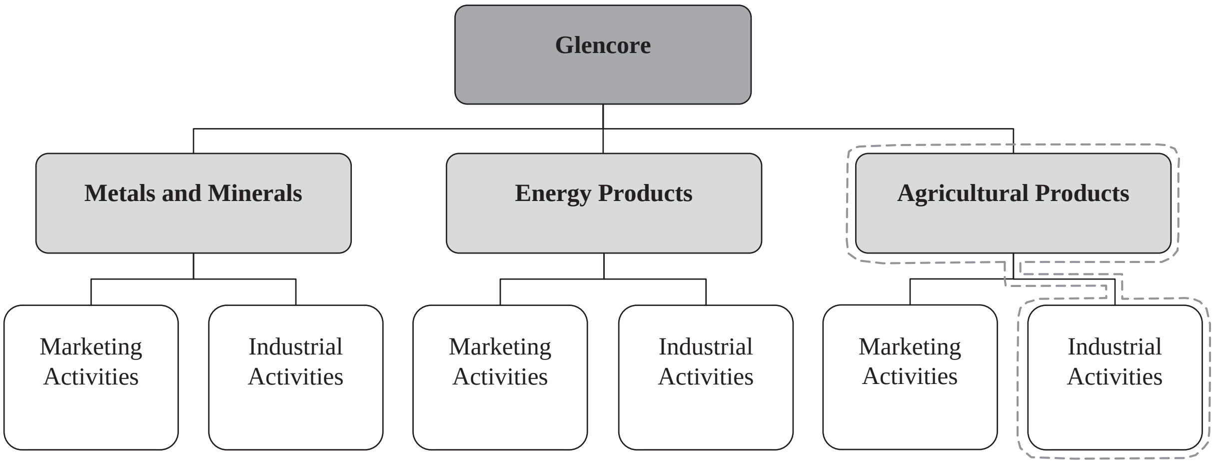
Note:

(1) These figures represent the capacity across the aggregate portfolio of some 90 elevators and silos held by the Agricultural Products business segment.

Competitors

Glencore has three categories of competitors: large multinational merchants (Cargill, ADM, Bunge and Louis Dreyfus Group), smaller, more regionally focused merchants (includes Noble Group and Nidera) and local companies with a single country focus, primarily in Russia, Ukraine, Argentina and Australia.

Industrial activities (Agricultural Products business segment)



Overview

The table below summarises information about key Agricultural Products producing industrial assets as at 31 December 2010:

Company	Country	Commodity	Annual production capacity	Glencore's ownership interest	Remaining ownership interest	Any contractual relationship with Glencore
Controlled:						
Moreno	Argentina	Oilseed crushing	1.9 million MT	100%	—	N/A
Ponta Pora	Brazil	Oilseed crushing	350,000 MT	100%	—	Toll agreement
OMEZ	Ukraine	Sunseed crushing	250,000 MT	80%	20% privately held	Toll agreement
Lubmin	Germany	Rapeseed crushing	140,000 MT	100%	—	Toll agreement
		Biodiesel production	60,000 MT			
Biopetrol	Germany and Netherlands	Biodiesel production	1,000,000 MT	60.3%	Publicly traded on Frankfurt Stock Exchange	N/A
Advanced Organic Materials	Argentina	Biodiesel production	50,000 MT	50%	50% privately held	N/A
Mills	Argentina, Brazil and Uruguay	Flour/rice production	1,500,000 MT	50-100%	—	N/A
Farming	Australia, Argentina, Kazakhstan, Paraguay, Russia and Ukraine	Farming activities on owned and leased land	270,000 hectares	50-100%	Any minority ownership is privately held	N/A
Rio Vermelho	Brazil	Ethanol and sugar cane crushing	1.2 million MT	76%	24% privately held	N/A
Non-controlled:						
Renova	Argentina	Biodiesel	480,000 MT	33.3%	33.3% Vicentin and 33.3% Molinos	Toll agreement

Financial information

The table below sets out selected financial information on the controlled industrial activities of the Agricultural Products business segment for the years ended 31 December 2008, 31 December 2009 and 31 December 2010. The information in this table has been extracted without material adjustment from Glencore's accounting books and records, which are unaudited:

	2008	2009	2010
	(U.S.$ million) *(Unaudited)*		
Agricultural			
Revenue	1,337	1,789	2,180
Adjusted EBITDA pre-exceptional items(1)	95	85	88
Adjusted EBIT pre-exceptional items(1)	84	48	39
Capex	102	116	71

Note:

(1) Excludes share of income from associates and dividends.

Farming production

The tables below sets out farming production of the controlled assets of the Agricultural Products business segment for the years ended 31 December 2008, 31 December 2009 and 31 December 2010:

Total Farming Production of Major Commodities by Country/Commodity MT

	Australia			Argentina			Paraguay			Russia			Ukraine			Kazakhstan		
	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010	2008	2009	2010
Wheat	37,116	49,426	100,739	22,131	26,857	7,243	4,406	4,058	3,722	109,262	114,298	124,096	85,625	91,215	81,782	N/A	41,498	17,725
Barley	20,385	17,793	2,801	1,437	3,591	477	N/A	N/A	N/A	15,439	10,588	6,350	47,544	66,274	49,268	N/A	6,454	729
Corn	N/A	N/A	N/A	60,930	34,067	53,836	7,487	9,609	5,689	10,506	12,287	8,935	56,167	7,884	43,288	N/A	N/A	N/A
Rapeseeds	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	421	2,812	6,149	16,701	13,922	N/A	N/A	N/A
Sunflower seeds	N/A	N/A	N/A	69,320	48,228	34,943	N/A	N/A	N/A	9,838	6,929	7,516	7,952	7,313	11,729	N/A	N/A	N/A
Soybeans	N/A	N/A	N/A	73,419	39,742	81,083	20,315	19,627	26,976	322	355	205	9,746	22,213	13,737	N/A	N/A	N/A
Total	**57,501**	**67,219**	**103,540**	**227,238**	**152,484**	**177,582**	**32,208**	**33,294**	**36,387**	**145,367**	**144,878**	**149,915**	**213,183**	**211,600**	**213,726**	**N/A**	**47,952**	**18,454**

Total Production MT

	Crushed/Estered/ Milled Volumes		
Production MT	**2008**	**2009**	**2010**
	(million MT)		
Crushing			
Moreno	1.32	1.28	1.19
Ponta Pora	N/A	0.11	0.22
OMEZ	0.16	0.21	0.19
Lubmin	N/A	N/A	0.16
Biodiesel			
Biopetrol	N/A	N/A	0.27
Renova	0.22	0.38	0.49
Advanced Organic Materials	N/A	N/A	0.03
Rice Milling			
Argentina	0.15	0.14	0.10
Uruguay	0.11	0.12	0.08
Wheat Milling			
Agua Branca	0.37	0.34	0.36
Moinhos Cruzeiro	N/A	N/A	0.68
Sugarcane Processing			
Rio Vermelho	0.40	0.90	1.12

Farming Assets:

Glencore's farming assets are mainly concentrated in the CIS, Australia, Paraguay and Argentina. Glencore owns or part owns the land as full owner or on long-term leases. These activities enable the department to source its products at local prices, provide valuable information on the expected crop yields and enable Glencore to build closer relationships with other farmers in the respective regions.

Processing Assets:

Access to or ownership of processing assets enables Glencore to take advantage of the various price differentials for agricultural commodities. The largest of these assets is Moreno in Argentina, of which Glencore owns 100 per cent. Moreno's main activity is to produce and export edible oils and meal. Moreno's facilities include three sunseed/soybean crushing plants in Necochea, Daireaux and Villegas in Argentina with a combined capacity of 1.9 million MT per annum. In 2007, Moreno started a biodiesel facility as a joint venture. The plant became fully operational in 2008 and its current capacity is 0.5 million MT per annum. In addition, Glencore owns, or part owns, crushing facilities with a combined capacity of 740k MT per annum in Brazil, Ukraine and Germany, including:

- a 100 per cent. interest in Ponta Pora, a Brazilian oilseed crushing plant with production capacity of 350k MT per annum;
- a 100 per cent. interest in Lubmin, a German rapeseed crushing plant with capacity of 140k MT per annum;

- an 80 per cent. interest in OMEZ, a Ukrainian sunseed crushing plant with capacity of 250k MT per annum;
- a 40 per cent. share of production rights in a crushing plant through its stake in a joint venture with Vicentin and Molinos in Argentina which is expected to be operational in 2012 and which will have a capacity of 5 million MT per annum;
- a 76 per cent. stake in Rio Vermelho, a stand-alone distillery located in state of Sao Paulo (Brazil), with a sugarcane crushing capacity of 1.2 million per annum. Currently only produces hydrous fuel ethanol (approximately 95,000 m^3/season); and
- a soft seed crushing facility with a capacity of 500k MT is currently under construction in Hungary with an expected start-up date in the fourth quarter of 2011.

Glencore has the following other production interests outside the crushing business:

- a 60.3 per cent. stake in the Swiss company Biopetrol Industries AG owning four biodiesel production facilities;
- a 33.3 per cent. stake in Renova, an Argentinean biodiesel producer;
- rice/wheat mills with a combined capacity of 1,500k MT per annum in Argentina, Brazil and Uruguay; and
- a share in two biodiesel production facilities in Argentina with a combined capacity of 530k MT per annum.

The Agricultural Products business segment's medium-term investment is focused on increasing processing capacity in oil/oilseeds at origin, which is mainly in South America.

Relationship and commercial arrangements with Xstrata

Overview of Xstrata

Glencore owns 34.5 per cent. of Xstrata, is its largest shareholder. As at 29 April 2011 (being the last practicable date prior to publication of the Prospectus), Glencore currently has two directors on the board of Xstrata (being Willy Strothotte and Ivan Glasenberg). Willy Strothotte will resign from the board of directors of Xstrata with effect from the date of the Xstrata Annual General Meeting (expected to be held on 4 May 2011) and Ivan Glasenberg will stand for re-election as a director at this meeting. In accordance with the Relationship Agreement (as described below), Glencore has also nominated Aristotelis Mistakidis and Tor Peterson as directors to the Xstrata board (who are subject to election by the shareholders of Xstrata at the Xstrata Annual General Meeting).

Shares in Xstrata are listed on the Official List of the FSA, admitted to trading on the London Stock Exchange's market for listed securities and admitted to listing on the SIX. As at 29 April 2011, being the last practicable date prior to the publication of this Prospectus, the market capitalisation of Xstrata was approximately U.S.$75.4 billion. Xstrata is a member of the FTSE 100, an index that comprises the 100 "most highly capitalised UK-domiciled blue chip companies".

Xstrata is the fourth largest diversified mining group in the world by revenue with top five industry positions in copper, export thermal coal, export coking coal, ferrochrome, zinc, nickel and vanadium. In addition, Xstrata has recycling facilities, additional exposures to platinum, gold, cobalt, lead and silver and a suite of global technologies, many of which are industry leaders. Xstrata's operations and projects span 19 countries: Argentina, Australia, Brazil, Canada, Chile, Colombia, the Dominican Republic, Germany, Ireland, New Caledonia, Norway, Papua New Guinea, Peru, the Philippines, South Africa, Spain, Tanzania, the United Kingdom and the U.S.

Xstrata mines and processes physical commodities that are marketed by Glencore's Metals and Minerals and Energy Products business segments. Its business is organised in the following five principal business units:

Xstrata Alloys: Xstrata is the world's largest producer of ferrochrome and one of the world's leading producers of primary vanadium, with integrated mining and smelting facilities in South Africa. In South Africa, Xstrata also mines and concentrates platinum group metals.

Xstrata Coal: On a managed basis, Xstrata is the world's largest producer of export thermal coal, one of the largest producers of export semi-soft/pulverised coal injection coal and among the top five producers of export coking coal. It has interests in 30 operating coal mines in Australia, South Africa and Colombia.

Xstrata Copper: Xstrata is a fully-integrated producer of copper metal and concentrate and is one of the world's five largest producers of mined copper, with mining and mineral processing operations in Argentina, Australia, Canada, Chile and Peru. Xstrata also has a portfolio of mine development projects at various stages of evaluation in Argentina, Australia, Chile, the Philippines, Papua New Guinea and Peru.

Xstrata Nickel: Xstrata is one of the world's five largest producers of nickel and one of the largest recyclers and processors of nickel and cobalt-bearing materials. Its operations include mines and processing facilities in Australia, Canada, Norway and the Dominican Republic.

Xstrata Zinc: Xstrata is one of the world's largest producers of zinc and also produces lead and silver. Xstrata Zinc incorporates zinc smelting operations in Spain, Germany and Canada, interests in four operating mines, a mine project and a lead smelter in Australia, a lead refining plant in the United Kingdom, interests in the Antamina copper and zinc mine in Peru, two zinc mines, a lead smelter and refinery and a minority interest in a zinc smelter in Canada.

In addition to its five principal business units, Xstrata also operates Xstrata Process Support and Xstrata Technology, mining and processing technology businesses with operations in Australia, Canada, Chile and South Africa.

Financial information

The table below sets out certain financial information relating to Xstrata for the years ended 31 December 2008, 2009 and 2010. Such information has been extracted without material adjustment from Xstrata's Annual Report 2010.

	2008	2009	2010
	(U.S.$ million, except per share amounts)		
Revenue	27,952	22,732	30,499
Operating profit (before exceptional items)	7,249	4,369	7,654
Attributable profit	3,595	661	4,688
Dividends per share (U.S.$)	.10	.08	.25
Total assets	55,314	63,824	69,709
Net assets	24,399	34,919	42,021
Cash and cash equivalents as at 31 December	1,156	1,177	1,722

The Relationship Agreement

Xstrata is party to the Relationship Agreement with Glencore dated 20 March 2002. The Relationship Agreement regulates the continuing relationship between the parties. In particular, it ensures that:

- Xstrata is capable of carrying on its business independently of Glencore as a controlling shareholder (as such term is defined in the Relationship Agreement);
- transactions and relationships between Glencore (or any of its subsidiaries or affiliates) and Xstrata are at an arm's length and on normal commercial terms;
- Glencore shall be entitled to nominate up to three directors or (if lower or higher) such number of directors equal to one less than the number of directors who are independent directors (which means a director who is not a director, officer or employee of any member of Glencore and is free from any business or other relationship with Glencore or any of its associates, which could materially interfere with the exercise of his independent judgment in matters concerning Glencore); and
- directors of Xstrata nominated by Glencore shall not be permitted to vote on any board resolution, unless otherwise agreed by the independent directors, to approve any aspect of Xstrata's involvement in or enforcement of any arrangements, agreements or transactions with Glencore or any of its subsidiaries or affiliates.

It is expressed that the Relationship Agreement terminates in the event that Glencore ceases to be a controlling shareholder of Xstrata following a sale or disposal of shares in Xstrata or if Xstrata ceases to be listed on the Official List and traded on the London Stock Exchange.

Operational agreements between Glencore and Xstrata

Alloys

Xstrata Alloys entered into a ferrochrome marketing agreement with Glencore on 21 April 1995, appointing Glencore as its exclusive worldwide marketing agent for the sale of Xstrata Alloys and Merafe's entire production of ferrochrome, other than ferrochrome sold into the U.S., Canada and certain Asian countries. The agreement continues for as long as Xstrata Alloys and Merafe produces ferrochrome. Glencore is obliged to use its best endeavours to arrange sales at prevailing market rates, subject to initial agreement and approval by Xstrata Alloys and Merafe prior to effecting the sale. Glencore assists Xstrata Alloys in negotiating sales contracts with third parties. Glencore is entitled to receive an agency fee of 3.5 per cent. on FOB sales revenues and an additional fee of 0.75 per cent. on FOB sales revenues for assuming the risk of non-payment by customers on this material. Glencore assumes 60 per cent. of the risk of non-payment by customers in relation to ferrochrome sales.

If, at any time, Xstrata Alloys and Merafe notifies Glencore that it is able to find purchasers for its production at prices higher than those generally obtainable by Glencore, Xstrata Alloys may, unless Glencore is able to obtain similar prices, sell its products in the market. Glencore is nevertheless entitled to an agency fee of 3.5 per cent. of FOB sales revenue in respect of such sales. Glencore is also entitled to receive a U.S.$50,000 monthly fee in connection with market analysis and certain administrative tasks it performs for Xstrata Alloys. Interest is charged by Xstrata Alloys on single monthly settlements made by Glencore, and Glencore charges interest on any selling expenses incurred on behalf of Xstrata Alloys at LIBOR and a margin of 150 basis points.

Ferrochrome sold into the U.S. and Canada is distributed by Glencore Ltd and Glencore Canada Inc., respectively, under two distribution agreements. These agreements continue indefinitely, with both parties having the right to terminate the agreement on 12 months' notice. The percentage of distribution fees payable by Xstrata in respect of ferrochrome sold under the distribution agreement is substantially the same as the commission paid in respect of ferrochrome sold under the marketing agreement.

Mitsui & Co. Ltd is the appointed distributing agent for ferrochrome sales into China, Japan and South Korea up to a maximum of 105,000 tonnes per annum. A change in distributing agent for sales into these countries must be done with the consent of Glencore.

Xstrata Alloys entered into a chrome ore marketing agreement with Glencore in July 2010, appointing Glencore as its exclusive worldwide marketing agent for the sale of Xstrata Alloys and Merafe entire production of chrome ore. The agreement is for a fixed term ending 20 May 2011. Glencore is entitled to receive an agency fee of 2 per cent. on FOB sales revenues loading port value, Glencore assumes 100 per cent. of the risk of non-payment by customers in relation to chrome ore sales. Interest is charged by Xstrata Alloys on single monthly settlements by Glencore at LIBOR and a margin of 150 basis points.

In December 1997, Xstrata entered into a 20-year marketing agreement with Glencore in respect of Rhovan's and Vantech's (closed in 2004) entire production of vanadium, other than vanadium sold into the U.S. and Canada.

Glencore is obliged to use its best endeavours to arrange sales of vanadium pentoxide and ferrovanadium to customers at prevailing market rates, subject to initial agreement and approval by Xstrata Alloys prior to effecting the sale. Xstrata Alloys is obliged to pay to Glencore an agency fee of 3.5 per cent. on FOB sales revenues and an additional fee of 1.5 per cent. on FOB sales revenues for assuming the risk of non-payment by customers on this material. Glencore assumes 100 per cent. of the risk of non-payment by customers in relation to vanadium sales.

If, at any time, Xstrata Alloys notifies Glencore that it is able to find purchasers for its production at prices higher than those generally obtainable by Glencore, Xstrata Alloys may, unless Glencore is able to obtain similar prices, sell its products in the market. Glencore is nevertheless entitled to the 3.5 per cent. agency fees described above in respect of such sales. Interest is charged by Xstrata Alloys on single monthly settlements made by Glencore, and Glencore charges interest on any selling expenses incurred on behalf of Xstrata Alloys at LIBOR and a margin of 150 basis points.

Vanadium pentoxide and ferrovanadium sold into the U.S. and Canada is distributed by Glencore Ltd and Glencore Canada Inc., respectively, under two distribution agreements. The distribution agreements have the same term as the marketing agreement and, consequently, the percentage of distribution fees payable by Xstrata in respect of vanadium pentoxide and ferrovanadium is substantially the same as the commission paid in respect of vanadium pentoxide and ferrovanadium sold under the marketing agreement.

Coal

In 2002, Xstrata entered into a 20-year market advisory agreement with Glencore with fee reviews at the end of every fifth year of the agreement. Pursuant to this agreement, Glencore acts as Xstrata's market adviser with respect to its export production of coal (other than for Xstrata Coal's share of production from the Cerrejón thermal coal operation in Colombia). The fee payable to Glencore is U.S.$0.50 per attributable tonne of coal exported by Xstrata from Australia or South Africa.

In 2010, Xstrata entered into market standard forward commodity price derivatives for 1,070,000 tonnes (2009: 4,455,000 tonnes) and bought market standard forward commodity price derivatives for 385,000 tonnes (2009: nil tonnes) with Glencore as counterparty. During the year ended 31 December 2010, 3,360,000 sold tonnes and 385,000 bought tonnes were delivered (2009: 3,180,000 tonnes were sold). At 31 December 2010, 965,000 tonnes (2009: 3,255,000 tonnes) were contracted with Glencore for delivery in 2011 and 2012. These derivatives are on arm's length terms and conditions and are included within derivative financial assets and liabilities.

During the year ended 31 December 2010, nil tonnes were borrowed from Glencore (2009: 2,550 tonnes) and nil tonnes owed to Glencore at 31 December 2010 (2009 nil tonnes) on arm's length terms and conditions.

In April 2010, Xstrata entered into a five-year fuel supply agreement with Glencore to supply diesel fuels to coal mines and cattle stations in New South Wales and Queensland. Under this supply agreement U.S.$147 million (2009: U.S.$111 million) worth of fuel was delivered during the year ended 31 December 2010. The supply agreement is on arm's length terms and prices change monthly according to the world market price per barrel (U.S.$/BBL).

In February 2010, Cerrejón entered into a five-year fuel supply agreement with Glencore to supply diesel fuels. The Group's share of the fuel purchases for the year ended 31 December 2010 was U.S.$65 million (2009: U.S.$44 million). The supply agreement is on arm's length terms and prices change for each shipment according to the world market price per barrel (U.S.$/BBL).

All coal purchases and sales with Glencore are on arm's length terms and conditions.

Copper

Xstrata Copper has entered into an "evergreen" service agreement with Glencore with a 12-month cancellation notice for the supply of advice, support and assistance with regard to its marketing and operational hedging activities.

Copper cathode sales agreements were entered into between Xstrata Copper Canada/Xstrata Copper North Chile/Xstrata Commodities Middle East and Glencore for the period 1 January to 31 December 2010. All sales were based on either spot or benchmark terms in accordance with prevailing market conditions. These agreements have been replaced with new annual contracts for 2011, based on either spot or benchmark terms in line with prevailing market conditions.

Xstrata Copper (Minera Alumbrera Limited) has entered into a five-year frame contract with Glencore on an "evergreen" basis. The sales terms for the copper concentrate are negotiated annually on arm's length terms and conditions. Minera Alumbrera Limited, on occasions, sells concentrate to Glencore at prevailing spot market prices.

Copper concentrate purchase agreements were entered into between Xstrata Copper North Chile and Glencore for a four-year frame contract commencing 1 January 2007. All purchases are based on benchmark terms in accordance with prevailing market conditions. This is an "evergreen" contract after 2010 and therefore continues to be in place.

Copper concentrate sales agreements were entered into between Xstrata Copper Tintaya and Glencore for the period 1 January to 31 December 2010. All sales are based on either spot or benchmark terms in accordance with prevailing market conditions. As these sales agreements are spot contracts Glencore expects to replace these for 2011 based on prevailing market conditions.

A copper concentrate sales agreement was entered into between Xstrata Commodities Middle East and Glencore for a three-year period effective from 1 June 2008 and "evergreen" thereafter on benchmark terms. Xstrata Commodities Middle East also sells concentrate to Glencore based on a spot basis on occasions throughout the year at prevailing market terms.

Xstrata Copper North Queensland has entered into a sales agreement with Glencore for copper concentrate for a three-year period effective from 1 June 2008 and "evergreen" thereafter. This agreement is based on annual benchmark terms.

Copper blister and anode sales agreements were entered into between Xstrata Commodities Middle East and Glencore between April and December 2010 at benchmark or spot terms. These agreements have been replaced with a copper blister annual contract for 2011 on benchmark terms.

A molybdenum concentrate spot sales contract was entered into between Mineral Alumbrera Limited and Glencore in 2010 on market-related terms.

A molybdenum concentrate contract was entered into between Xstrata Norte Exploraciones y Servicios Limitada and Minerales del Sur S.A. for 2010 off-take Collahuasi tonnes on market-related terms. Glencore is in the process of renewing this contract for 2011.

All sales transactions with Glencore are on arm's length terms and conditions.

Nickel/Cobalt

Xstrata Nickel has entered into long-term purchase agreements with Glencore for copper-cobalt white alloy raw material feeds to the Sudbury smelter in Canada and Nikkelverk refinery in Norway. Contracts include both a metal purchase and a sale component for cobalt. The term of the contracts are to the end of 2011, continuing indefinitely thereafter unless terminated by either party with six months' notice given not earlier than 1 July 2011. Pricing terms are based on prevailing market rates. Other short-term or one-time feed purchase agreements were entered into with Glencore, with pricing terms based on prevailing market rates. During 2010, Xstrata Nickel purchased from Glencore 102 tonnes of nickel, 109 tonnes of copper, 15 tonnes of cobalt and 66 kilograms of PGM's (2009: 287 tonnes, 563 tonnes, 250 tonnes, and nil kilograms, respectively). In addition, during 2010, Xstrata Nickel sold to Glencore 64 tonnes of cobalt (2009: 297 tonnes)(1).

In March 2007, Xstrata Nickel entered into sole distributorship agreements with Glencore, for its nickel, cobalt and ferronickel production. These agreements continue until 31 December 2012 and are automatically renewed for successive three year periods unless terminated by either party with not less than 12 months' notice prior to the end of the original term or any renewal terms, or unless Xstrata Nickel permanently ceases production of these metals. The nickel and cobalt distribution agreement was extended, only in respect of nickel, for a further five year term on 15 April 2011 and a revised premia structure will take effect only in respect of nickel as of 1 January 2013. These amendments with respect to nickel are subject to board approval by Xstrata. Xstrata Nickel, at its sole discretion, may cease, suspend or reduce production at any time. Glencore is obliged to distribute the products with all due care and diligence and shall cultivate and maintain good relations with purchasers and potential purchasers in accordance with sound commercial principles and taking into account Xstrata Nickel's business principles. All sales terms and conditions are set on an arm's length basis. For nickel and cobalt sales, the price basis is the month following the month of delivery. For ferronickel sales, the price basis is the quotational period provided for in customer contracts. Accordingly, provisionally priced nickel, cobalt and ferronickel revenues are subject to final price adjustments due to future price changes. During 2010, Xstrata Nickel sold to Glencore 92,139 tonnes of nickel (2009: 88,457 tonnes), 3,104 tonnes of cobalt (2009: 3,066 tonnes) and nil tonnes of ferronickel (2009: 236 tonnes). In addition, Glencore prepays monthly to Xstrata Nickel in two equal instalments 100 per cent. of the value of the month's planned production. The prepayment balance as at 31 December 2010 amounted to U.S.$36 million (2009: U.S.$49 million).

Xstrata Nickel sells refined copper to Glencore on arm's length terms and conditions under spot arrangements, which are based on prevailing market rates. During 2010, Xstrata Nickel sold to Glencore 3,698 tonnes of copper (2009: 1,547 tonnes). Effective for the period 1 January to 31 December 2011,

(1) The contract with Xstrata Nickel for the sale of cobalt is a toll conversion and sale contract. Under the terms of such contract Glencore is able to sell excess cobalt concentrate which it might not otherwise have the capacity to process to a subsidiary of Xstrata and then buy back a portion of the processed cobalt metal. 50 per cent. of the material purchased by Xstrata Nickel is sold onto its subsidiary production operations and the remaining 50 per cent. is toll converted into cobalt metal by such subsidiary. The converted metal is then returned to the Glencore Group in accordance with the terms and conditions of the agreement between the Glencore Group and Xstrata Nickel. All transactions are completed in accordance with contracted terms and on an arm's length basis. The sale of cobalt to Xstrata Nickel is treated as a normal sale in the Group's accounts and the metal returned is treated as a normal purchase.

Glencore has agreed to purchase, on a monthly basis, all copper production not otherwise sold by Xstrata Nickel under long-term contracts.

In April 2011, Xstrata Nickel and Glencore agreed the principal terms of a sole sub-distributorship arrangement in relation to 100 per cent. of the ferronickel production from the Koniambo ore body in New Caledonia, a project owned jointly by Xstrata Nickel and Société Minière du Sud Pacifique, the development arm of the North Province of New Caledonia, where Xstrata Nickel holds the exclusive marketing rights for all products. The terms agreed are binding on the parties subject to the satisfaction of certain conditions, which are expected to be satisfied during 2011. The sub-distributorship arrangement is expected to continue until 31 December 2017 and will be automatically renewed for successive three-year periods, unless and until terminated by either party by written notice no less than one year prior to the end of the initial term or any renewal term. In addition, the arrangement will be capable of earlier termination due to, among other things, material breach by, or the insolvency of, either party. Xstrata Nickel will also have the right to temporarily cease, suspend or reduce delivery of ferronickel at any time following the provision of reasonable notice to Glencore and for whatever reason. All sales terms and conditions between Xstrata Nickel and Glencore are on an arm's length basis.

Zinc

On 1 January 2007, Xstrata Zinc renewed a service agreement for a period of three years which shall continue in effect thereafter unless terminated by any of the parties giving the other prior written notice of no less than 12 calendar months with Glencore (the Xstrata Zinc Service Agreement), under the terms of which Glencore provides advice and assistance with respect to pricing and structural issues regarding hedging and the optimisation of internal flows of raw materials. The fees to be paid by Asturiana under the Asturiana Service Agreement are U.S.$2 million per annum.

In 2010, Xstrata Zinc agreed to supply Glencore with 255,000 tonnes (2009: 315,000 tonnes) of SHG zinc slabs and CGG ingots from San Juan de Nieva and Nordenham smelters based on market prices plus the respective FOB/CPT market premium. The terms for the replacement 2011 annual contract are currently being finalised—shipments continue to be made as normal under this arrangement.

In 2010, Xstrata Zinc Canada agreed to supply Glencore with approximately 14,600 tonnes (2009: 63,700 tonnes) of SHG zinc slabs and jumbos based on market prices plus the respective delivery duty paid (DDP) premium. This contract has been replaced with an annual contract for 2011 based on market terms.

In 2010, Britannia Refined Metals agreed to supply Glencore with between 12,000 and 18,000 tonnes of lead metal ingots. The agreement is "evergreen" in nature. In addition, Britannia Refined Metals agreed to supply Glencore with a separate additional 7,500 tonnes of lead metal ingots. Both agreements are based on market prices plus the respective ex-works market premium.

In 2010, Xstrata Zinc Canada made agreements to supply Glencore with approximately 18,300 tonnes (2009: 32,000 tonnes) of lead metal ingots and jumbos. All agreements are based on market prices plus the respective DDP premium. These agreements have been replaced with an annual contract for 2011 based on market terms.

In 2010, Mt Isa Mine had an evergreen contract to supply 80,000 tonnes to Glencore (2003: 80,000 tonnes).

In 2010 Xstrata Zinc sold 300,000 tonnes of zinc concentrate to Glencore under an evergreen swap contract. In return, Xstrata Zinc purchased from Glencore 300,000 tonnes of various zinc concentrate qualities delivered to Xstrata Zinc smelters (2009: 300,000 tonnes). In addition, Xstrata Zinc sold 50,000 tonnes to Glencore under a time swap agreement.

In 2010, Xstrata Zinc sold to Glencore 158,000 tonnes of zinc concentrate under various spot sales contracts from Mt Isa Mine, Antamina, McArthur River and other zinc concentrate qualities.

In 2010, Xstrata Zinc had an agreement to supply Glencore 247,000 tonnes of McArthur River bulk concentrate on an evergreen basis (2009: 245,000 tonnes). Further to the aforementioned agreement, an additional 65,000 tonnes of McArthur River and Brunswick Mine bulk concentrate were sold under annual contracts.

During 2010, Xstrata Zinc Canada purchased 25,000 tonnes of lead concentrates from Glencore for delivery to the Belledune lead smelter under various spot contracts.

All evergreen and annual zinc concentrate and bulk concentrate contracts are based on recognised annual industry benchmark treatment charges and related terms for price participation and silver payables. Spot contracts are negotiated at prevailing market terms.

Technology

In 2006, Xstrata Technology was contracted to install a copper ISASMELT furnace, a lead ISASMELT furnace and an IsaProcess copper refinery at Kazzinc, a Glencore subsidiary for U.S.$99 million. The project commenced in May 2006 and will be commissioned late 2011. This transaction with Kazzinc is on arm's length terms and conditions.

Approximately 6.5 per cent. of Glencore's total purchases were attributable to purchases from Xstrata for the year ended 31 December 2010.

Worldwide office network

Organisation

The three business segments described above report to management at the corporate level and are supported by the finance, legal, risk, human resource and compliance departments. All activities related to a specific commodity, including physical marketing activities, hedging, logistics and industrial investments, are managed by the business segment that covers the particular commodity.

Glencore's finance department is headed by the Chief Financial Officer based at Glencore's head office in Baar. Finance and accounting staff in each principal location (Baar, London, Rotterdam, Stamford, Singapore and Beijing) handle the day-to-day finance and accounting tasks related to the business activities conducted out of that location. The proximity of local finance and accounting staff to Glencore's marketing and logistics activities is important in order to ensure prompt and professional handling of the finance and accounting activities related to the specific commodity. The head office finance staff handle (i) funding activities based on Glencore's corporate credit, such as syndicated loan facilities and debt capital market transactions, (ii) co-ordination of the worldwide treasury, hedging and credit and exposure management activities, (iii) presentation of Glencore's financial statements to investors and rating agencies, (iv) relationships with its investors and with rating agencies and (v) assets and liabilities management of its consolidated balance sheet and compliance with covenants. The head office accounting staff are responsible for (a) financial accounting, including the preparation of the financial statements of the legal entities, (b) preparation of Glencore's consolidated financial statements, (c) management information related to the performance of each individual business segment, (d) reporting throughout the entire group, (e) tax issues and (f) the worldwide relationship with its independent auditors.

Office network

Relationships with producers and consumers of raw materials are the responsibility of senior employees who receive support from Glencore's global network of more than 50 offices in more than 40 countries. As shown below, these offices are located in major American, European, Asian, African and Middle Eastern natural resources producing and consuming markets. Some of these offices also oversee local logistics, including supervision of shipments, initial quality control, local authority liaison and shipping documentation. As at 31 December 2010, Glencore's global marketing network comprised the following offices:

Europe	CIS	Asia/Australia	Americas	Middle East and Africa
Avon	Baku	Beijing	Asuncion	Casablanca
Baar	Kiev	Brisbane	Bogota	Dubai
Bucharest	Moscow	Ho Chi Minh City	Buenos Aires	Johannesburg
Budapest	Odessa	Jakarta	Calgary	Maputo
Gdansk		Kolkata	Cancun	
Istanbul		Manila	Clarksville	
London		Melbourne	Hamilton	
Madrid		Mumbai	Houston	
Milan		New Delhi	La Paz	
Rotterdam		Seoul	Lima	
Sofia		Shanghai	Los Olivos	
Thame		Singapore	Mexico City	
Zagreb		Sydney	Montevideo	
		Taipei	Pittsburgh	
		Tokyo	Quito	
			Rio De Janeiro	
			Santiago	
			Sao Paulo	
			Stamford	

Glencore believes its global office network significantly enhances its worldwide sourcing and distribution capabilities. It also secures key competitive advantages by enabling Glencore to penetrate and maintain a presence in local markets, identify strategic investment opportunities, develop excellent knowledge of trading conditions and counterparty quality, and respond quickly to changes in market practices and characteristics. Glencore's close proximity to its suppliers and customers is one of its key strengths.

Tax residency

The Company is incorporated and registered in Jersey as a public company limited by shares under the Jersey Companies Law. The Company is headquartered in Baar, Switzerland and the Swiss tax authorities have confirmed that, on the assumption that the affairs of the Company are conducted as the Directors intend, they will regard the Company as a resident of Switzerland for the purposes of Swiss taxation law. Further, as set out in Note (4) of Section VII: "Unaudited Pro Forma Financial Information", the Restructuring will crystallise Swiss tax deductions of U.S.$4,785 million and will result in a deferred tax asset in Glencore International with a value of U.S.$444 million (net of other tax adjustments). Glencore's effective tax rate results primarily from the location of the Glencore Group's individual operations in differing tax jurisdictions relative to Glencore's historic corporate tax jurisdiction, Switzerland. Glencore's industrial operations are taxed at local rates in the jurisdictions where the relevant operating subsidiaries are located. It is not intended that the Company will be tax resident in any other jurisdiction.

Employees, employee relations and employee benefits

As at 31 December 2010, Glencore employed 2,772 people worldwide, excluding employees in the operations of its industrial assets. The employees include managers, support staff and employees in the offices. The following table indicates the distribution of Glencore's employees by geographic region:

Employees by geographic region

	As at 31 December 2010
Region	
Europe	1,241
U.S.	260
Latin America	176
Africa	59
Asia	400
Australia	56
CIS	580
Total	**2,772**

As at 31 December 2010, 54,884 people were employed by Glencore's industrial assets.

Employee relations

Generally, the Directors believe that Glencore enjoys good labour relations across its group. Glencore's direct employees are not unionised. Some employees in the operations of Glencore's industrial assets are unionised. Glencore believes that it and its industrial assets have a positive and constructive relationship with these unions. However, as in any business in which there is union involvement, there is a risk that Glencore's operations could be affected by disputes with unions (see "Risk Factors—Other risks relating to Glencore—The maintenance of positive employee relations and the ability to attract and retain skilled workers is key to the successful operation of Glencore's industrial activities"). Glencore minimises the risk of such disputes by ensuring that the management of Glencore and of the industrial assets maintains a frequent and open dialogue with the unions.

Employee benefits

Glencore's remuneration to employees includes salaries, bonuses and selective equity participation. Bonuses are generally discretionary based on the individual performance of the employee and the overall performance of Glencore. Benefits may include pensions, health insurance, life insurance and other allowances depending on the role of the employee and applicable law.

Please refer to Section X: "Additional Information" for further information on pensions and employee share plans.

Properties

Glencore leases its headquarters in Baar, Switzerland, as well as offices in major locations such as London, Rotterdam, Stamford and Singapore under long-term lease agreements.

Environment, health and safety

Glencore is committed to conducting its business activities in a manner that will safeguard the health and safety of all employees and protect the environment. Glencore's industrial assets, as well as marketing and logistics activities, are subject to a range of EHS laws and regulations. For its operations (industrial assets and marketing logistics), Glencore has EHS policies and management programmes in place to manage and ensure compliance as well as to track and improve overall performance with the applicable local and international EHS laws and regulations. Glencore's EHS policies, management programmes and reporting schemes seek to identify areas of non-compliance or areas for general improvement. These measures are also used to identify deficiencies by providing appropriate information and specialist advice to determine appropriate corrective actions.

Glencore's EHS policies and management systems are embedded into Glencore Corporate Practice programme ("GCP"). The GCP principles apply to Glencore's marketing activities and to all controlled industrial assets. GCP was designed to address the key non-financial aspects of Glencore's business activities that are important to its success and are indirectly linked to its overall financial performance, which are:

- health and safety;
- environment;
- community relations;
- human resources;
- impact on society and economies; and
- compliance.

These points are addressed in the form of commitments (a) to employees, the environment, communities in which Glencore operates, customers and investors; and (b) to adhere to good practice in compliance, communication and reporting. GCP meets internationally accepted good practice standards for corporate governance and management of non-financial activities.

In practice, GCP adds non-financial aspects to internal corporate reporting requirements, covering performance on societal, environmental and compliance indicators. Depending on the report subject matter, GCP may require annual or monthly internal reporting or, for critical incidents, reporting within 24 hours. Glencore will also make annual public reports on GCP itself, which will follow the latest guidelines of the Global Reporting Initiative, an initiative which aims to create conditions for the transparent and reliable exchange of sustainability information.

Glencore encourages employees to ensure that customers, suppliers, agents, service providers and contractors comply with GCP where possible. Glencore also uses its influence to raise awareness and consideration of the basic principles within its joint ventures and entities in which its has non-controlling stakes.

Where GCP applies, employees are required to understand and comply with the principles. Glencore's managers are responsible for ensuring compliance, carrying out periodic assessments, management reviews and reviews of corrective action plans. Glencore applies appropriate controls, scaled for different levels of materiality in different areas of the group, and regularly benchmarks its achievements against targets and expectations, taking corrective action where necessary.

Environmental impact

In order to manage and limit the environmental impact of its controlled-extractive activities, the Glencore Group has established environmental management systems which are used to monitor environmental aspects of the operations undertaken by Glencore Group. Glencore's controlled-extractive assets carry out internal and external environmental audits from time to time. See the Prodeco MER, Mopani MER, Katanga MER and Kazzinc MER in Section XIV: "Independent Technical Reports" for further details of the environmental assessments carried out on Glencore's key industrial assets.

In common with other natural resources and mineral processing companies, despite its best efforts, Glencore's operations cannot always prevent adverse effects on the environment and surrounding communities. Such unfortunate situations may occur even though Glencore's controlled-extractive assets are managed in compliance with local laws, regulations and project-specific permits and environmental management plans. Typical issues in this regard include sulphur dioxide emissions caused by installations such as smelter furnaces or converter units, dust emissions from smelters, tailings dams or traffic on unpaved roads. Mining and ore processing always have a high demand for water which creates a challenge of ensuring a sufficient water supply (sometimes in arid regions) and managing effluents to preserve the quality of surface or ground waters. Project development may make land-clearing necessary, which can negatively impact biodiversity and change landscapes. Waste rocks and tailings usually occur on a large-scale and, if not used for backfill, they need to be disposed in a safe and environmentally friendly manner.

Glencore also looks to promote environmental awareness in its non-controlled industrial activities and works in partnership with its customers, suppliers and service providers to limit the overall impact along the entire supply chain. Glencore's marketing and logistics operations also need to actively manage certain issues to seek to prevent damage to the environment and surrounding communities.

Besides the environmental aspects of industrial assets, Glencore's marketing and logistics operations also need to actively manage certain issues to prevent damage to the environment and surrounding communities. For example, failure in the logistics of crude oil or petroleum products can result in major environmental impact with huge reputational and financial damages. Therefore, Glencore's time charter fleet for crude oil and petroleum products is regularly inspected according to international maritime standards and has to meet certain technical criteria (for example, double hull) before being qualified to transport Glencore's products. All of this ensures sea- and cargo-worthiness and reduces the risk of failure to a tolerable minimum.

Glencore's products placed in the market are in many cases covered by national and international product safety and dangerous goods regulations. Any failure in complying with these obligations could result in a delay of Glencore's product delivery, loss of insurance coverage, business interruption for Glencore's customers, administrative or criminal sanctions and in extreme cases (temporarily) banning from a marketplace. Glencore has management systems in place to ensure compliance with applicable product safety and dangerous goods regulations. For example, Glencore provides service providers within the supply chain as well as its customers with supporting product information and documentation to allow them to take appropriate steps in relation to safe transportation, handling and use of Glencore's products.

Glencore acknowledges that managing the environmental compliance and impact of Glencore's operations is a dynamic process as the international and local regulatory environment is changing regularly.

Health and safety

Glencore is committed to the health and safety of Glencore employees and contractors and surrounding communities. Glencore's operations developed, implemented and maintain health and safety management systems and programmes which meet international standards and applicable regulatory requirements. These are tailored to the specific needs of Glencore's operations and activities. Performance is regularly monitored by tracking injuries, lost days, fatalities and near-miss events. This information is used as the basis for continuous improvement programmes, training and improvement of the integrity and safety of work places as well as mobile or stationary equipment.

Communities

Glencore believes that its business activities, and in particular its mining operations, contribute in the medium and long term to local development of communities. In addition to monetary distribution of wealth (e.g. direct employment, taxes or royalties), Glencore adds value by procurement of products and services, investments in infrastructure and involvement in local social and development projects.

Initiatives are usually adapted to local situations and needs. They can either be single projects or programmes with long-term commitments. Areas of activity include, for example, education, sports, child care, medical care, culture, environment or even public provision of utilities for the surrounding communities. Glencore works in partnership with local authorities and communities to ensure effectiveness, efficiency and acceptance of each of these programmes.

Glencore seeks to maximise the share of its locally hired staff, to the extent possible, which results in positive employment opportunities in the surrounding communities. Glencore believes that, besides all the accompanying community programmes and projects, creating employment opportunities for the community is one of the major contributions to local development and wealth. This is especially relevant when Glencore operates in remote areas with limited employment opportunities and development challenges.

Although Glencore seeks to prevent local communities from adverse social impact caused by its activities, these cannot always be completely mitigated. In such an event and whenever possible, Glencore strives at least to minimise these effects and seeks to find fair compensation.

Insurance

Glencore maintains a number of key insurance policies that it believes are commercially appropriate to cover the risks associated with its business operations. All of Glencore's insurance policies are placed in external insurance markets with global and local insurers as appropriate and have bespoke terms to reflect Glencore's requirements. Deductibles are generally kept at a low level, ranging from zero to approximately U.S.$1 million (except for one of the industrial assets, which has a deductible of U.S.$20 million). The vast majority of Glencore's insurance policies are underwritten through Lloyd's and other major European and international insurance companies. Glencore maintains an insurance portfolio that covers both physical assets and liability exposures.

Glencore's global insurance policies cover its subsidiaries and its industrial assets (subject to some local insurance cover), and are purchased centrally by the Glencore Group. Glencore's principal global insurance policies include property damage and business interruption (specific to certain copper and zinc assets), charterer's legal liability, marine cargo, excess oil pollution liability, political risk (in respect of oil in storage and/or in transit only), offshore liabilities, piracy, general third party liability and directors' and officers' liability insurance. In addition, Glencore provides insurance and assistance in relation to its shipping subsidiaries and arranges coverage in respect of various owned vessels for relevant shipping risks such as hull and machinery losses or damage, loss of hire and third party liability and expenses claims from owning or operating ships as principal. Insurance for the majority of co-owned vessels is arranged by Glencore's joint venture partner/co-owner, such terms and conditions and underwriter's security ratings subject to approval by Glencore. Insurance policies for its industrial assets are typically purchased locally on an individual asset basis, with Glencore covering material losses in excess of local limits. All material and locally purchased policies are held centrally by the Glencore Group. These policies include property damage and business interruption, general third party liability and directors' and officers' liability, charterer's legal liability and marine cargo liability, where applicable. However, many of Glencore's material industrial assets, such as Mopani, Prodeco, Kazzinc, Mutanda and Katanga rely on the Glencore Group's global coverage for certain risks as opposed to effecting its own local insurance cover placed in each local territory. Where local coverage is currently in place in respect of an industrial asset, such as the property damage and business interruption cover for Prodeco, Kazzinc and Mutanda, Glencore considers whether to cover such asset under the global policy, and it is intended that these three assets will be covered by the relevant global policy in 2011.

Glencore has relationships with a number of insurance brokers that have been selected for their better market representation in particular classes of insurance or relationships with either local or international underwriters. By using different brokers, Glencore believes that it receives better service in respect of policy placements, premium costs, advice and assistance on claims. Brokers are generally remunerated on a commission basis. Although Glencore does not set its own minimum financial security ratings in respect of insurers or brokers, it verifies and confirms ratings and suitability during the course of renewal discussions.

Legal and compliance

Glencore has policies and procedures to manage legal risks and address regulatory requirements and other compliance obligations. Glencore has a centralised group legal department that sets legal policy for the Glencore group, supervises the Glencore Group's overall legal function and provides legal services to all areas of the Glencore Group's business activities. In addition, there are some smaller legal teams that support specific business activities and offices, such as the freight and oil legal team in London and the agricultural legal team in Rotterdam. Furthermore, many of the larger Glencore local operating units, such as Kazzinc by way of example, have a local legal function.

Glencore also has a group compliance department that sets compliance policy for the Glencore Group and seeks to supervise the group's overall compliance function. The group compliance department ensures adherence with relevant laws and regulations through an awareness and review process. In addition, the compliance department has put in place a number of manuals to give the business guidance in a number of areas, including money laundering, conflicts of interest, sanctions, bribery and corrupt payments and confidentiality. Many of Glencore's local operating units also have dedicated compliance personnel to address applicable regulatory requirements and these report to the group compliance department.

While Glencore believes that its internal policies and procedures have been effective in the past, in preparing to become a publicly listed company, Glencore has reviewed and updated its internal policies and procedures to ensure it continues to have an appropriately high level of corporate governance, accountability and risk management and that such policies and procedures are properly documented and communicated. The UK Corporate Governance Code sets out the standards of good practice in relation to board leadership and effectiveness, remuneration, accountability and relationship with shareholders. Glencore has in place all the applicable UK requirements under the UK Corporate Governance Code, including the establishment of independent, effective audit and remuneration committees and the formal documentation of the terms of responsibility and scope of its internal audit procedures.

The Glencore Group's legal and compliance departments assist the Glencore Group in monitoring its overall liability profile associated with legal and regulatory matters, including liabilities that may be associated with the Glencore Group's historical activities.

Glencore is of the view that, in the context of the Glencore Group taken as a whole, there have been no material breaches of any material applicable laws and regulations.

Risk management and financial risk management

Risk management and control spans across Glencore's organisational structure. Glencore's Board has been and will further be involved in the risk management of the Glencore Group at a strategic level. Glencore's CEO engages in an ongoing interrogatory exchange with the management team as a primary oversight of group risk, supported in this function by the Group Risk Management team, multi-sourced risk reporting and the Chief Risk officer. This support, amongst other things, relates to consolidated risk reporting, co-ordination of group and departmental VaR, stress, scenario and other testing, reviewing and challenging the evaluation models and, in conjunction with departmental teams, input parameters used by commodity departments. The departments and Group Risk team further engage in a dialogue concerning general aspects of risk management policy and reporting. The internal audit and compliance and business ethics committees also play key roles in managing group operational risk and verifying process controls.

Glencore's business could be impacted by various external factors, for example political events and unfavourable actions by governments, natural catastrophes and operational disruptions. In addition, Glencore's activities expose it to a variety of financial risks: market risk (including commodity price risk, interest rate risk and currency risk), credit risk (including performance risk) and liquidity risk. Glencore's overall risk management programme focuses on the unpredictability of financial markets and seeks to protect its financial security and flexibility by using derivative financial instruments substantially to hedge these risks. Among others, Glencore monitors its commodity price risk exposure using a VaR computation and assesses the open positions, which are those subject to price risks, including inventories of these commodities. Glencore's finance and risk professionals, working in co-ordination with the commodity departments, monitor, manage and report regularly to management on the financial risks and exposures Glencore is facing. Responsibility for reviewing the overall effectiveness of Glencore's system of internal controls and risk management systems lies with the audit committee.

Please refer to Section II: "Directors and Corporate Governance" for further information on the audit committee and to Section IV: "Operating and Financial Review" for further information on financial risk management.

IT Systems

Glencore's IT systems environment is based on the three primary elements of its organisation: the Glencore Group; the marketing operations; and the industrial assets. The Glencore IT department is structured so that it is vertically aligned to the marketing operations of the commodity departments, with horizontal coordination of the IT functions across the Glencore Group. The support and management of the IT systems within the industrial assets is performed by the relevant local teams, with the support and advice from the Glencore IT department based in Baar, London, Rotterdam, Singapore and Stamford. Glencore believes this structure enables it to react more quickly to market changes and enhances Glencore's ability to manage its activities in an efficient, reliable and timely fashion.

Glencore's business-critical software applications such as traffic/marketing, accounting and finance are based on integrated standard components. Glencore's core business processes are supported by a combination of in-house developed and off-shelf purchased applications and are continuously adapted to the newest business needs. All of these applications are managed from Glencore's headquarters in Baar and are available to all the major locations, but some commodity-specific applications are supported by the applicable marketing site, such as agriculture in Rotterdam. The Glencore Global Accounting Programme ("GGAP") is a new programme intended to provide Glencore with improved facilities over decision making, assembling resources and financial control. The implementation of a third party specialist, SAP AG, as enabler for GGAP is intended to provide greater reliability and accuracy of financial information and better support for the diverse information requirements from across the Glencore Group. The programme will be managed centrally in Baar and will replace the current local accounting application used by Glencore's main marketing sites in Baar, London, Singapore, Rotterdam and Stamford. Glencore has sought to establish structures and process to ensure GGAP is delivered on time and to budget and GGAP is scheduled to be released in three separate phases: Baar is due to go live in mid-2011; London, Singapore and Stamford in the third quarter of 2011; and Rotterdam in the first quarter of 2012.

In addition to GGAP, a number of other key IT projects are currently underway within the Glencore Group, such as the replacement of the current systems and operational processes supporting the oil commodity department and the new IT system to be implemented in the Energy Products business segment by 2013. Glencore is continuously expanding and upgrading its communications network in response to the growing need to link its worldwide staff electronically and to store, organise and make available to its staff the increasing volume of data transmitted within the global network.

Glencore's IT network architecture is based on a wide area network that interconnects three of its main marketing sites, namely Baar, London and Stamford, and is designed with built-in resilience through the use of dual connections operated by two separate suppliers. This configuration allows Glencore to provide an efficient and highly available service to its employees. Mechanisms which facilitate the restoration of Glencore systems in the event that they become unavailable are also in place. Glencore has its own IT department with approximately 170 employees worldwide, which excludes people employed in the operations of its industrial assets, focused on providing customised business solutions to the changing needs of Glencore's business and providing smooth operation of IT systems.

Dividend policy

Glencore will adopt a progressive dividend policy with the intention of maintaining or increasing its total ordinary dividend each year.

Glencore's earnings come from a diverse range of consolidated marketing and industrial activities, as well as from its ownership of stakes in other companies such as Xstrata, where the Company receives cash flow in the form of dividends. The Board expects that its dividend policy will reflect this diversity as well as the various growth opportunities open to the Company.

The Board intends to maintain a strong balance sheet to ensure Glencore can continue to invest in organic growth and take advantage of strategic opportunities as they arise. The Board will monitor Glencore's future investment activities against alternative uses of capital, which could include ordinary dividends, special dividends or share buy-backs.

Dividends are expected to be declared by the Board semi-annually, with interim dividends announced with Glencore's half-year results and final dividends announced with Glencore's preliminary full year results. Interim dividends are expected to represent approximately one-third of the total dividend for any year. Dividends will be declared and paid in U.S. dollars, although Shareholders will be able to elect to receive their dividend payments in pounds sterling, Euros or Swiss Francs based on the exchange rates in effect at the date of payment. Shareholders on the Hong Kong branch register will receive their dividends in Hong Kong dollars.

The Directors currently expect to declare an interim dividend of U.S.$350 million in August 2011 concurrent with publication of the interim results for the six months to 30 June 2011.

As described more fully in Section IX: "Taxation", once cumulative dividends and other distributions paid by the Company exceed the aggregate of its nominal capital and Qualifying Reserves (as described in Section IX: "Taxation"), dividends and other distributions paid by the Company will be subject to Swiss federal withholding tax on the cash amount of the distribution at the then prevailing rate. The current rate of Swiss federal withholding tax is 35 per cent..

FTSE eligibility

Following discussions with FTSE, it is anticipated that Glencore will be included in the FTSE 100 under the fast entry rule (that is, at close of business on the first day of official trading).

Reasons for the Global Offer and use of proceeds

The net proceeds from the Global Offer receivable by the Company are estimated to be pounds sterling, U.S. dollar and Hong Kong dollar amounts equivalent in aggregate to U.S.$7,456 million after deduction of estimated underwriting commissions and estimated expenses of the Global Offer (assuming the maximum amount of the Underwriter's incentive commission and the discretionary elements of the fees of the Company's other advisers will be paid and including applicable VAT), assuming the Over-Allotment Option is not exercised and the Offer Price is set at the mid-point of the Offer Price Range and exchange rates as at 29 April 2011 (being the last practicable date prior to the publication of this Prospectus). If the Over-Allotment Option were to be exercised in full, the estimated net proceeds from the Global Offer receivable by the Company would increase to U.S.$8,439 million (estimated U.S. dollar equivalent of proceeds to be received in pounds sterling and Hong Kong dollars and assuming the Offer Price is set at mid-point of the Offer Price Range). The Company will not receive any portion of the proceeds resulting from the sale of the Sale Shares by the Selling Shareholder in the Global Offer (other than where proceeds are paid to Glencore International in respect of tax liabilities settled by the Company on behalf of certain Existing Shareholders where the Glencore group has a withholding tax or other legal obligation to do so and in certain cases to repay a small tranche of outstanding loans extended by companies within the Glencore Group).

The Directors believe that the Global Offer, together with Admission, will assist in positioning Glencore for the next stage of its development, as they will (in equal order of priority):

- provide further resources to invest in future organic and acquisition growth opportunities and improve the financial flexibility of the Company;
- enhance the profile of the Company with existing and potential suppliers and customers; and
- provide the Company with a permanent equity capital base and existing shareholders with a market for their Ordinary Shares going forward.

The Company currently intends to apply the proceeds from the Global Offer in the following order of priority:

- use of approximately U.S.$2.2 billion of the net proceeds from the Global Offer towards meeting the cash portion of the consideration payable to Verny, pursuant to the Kazzinc SPAs (further details of which are set out in Section X: "Additional Information") in respect of Glencore's proposed acquisition of additional stakes in Kazzinc;

- use of approximately U.S.$5 billion of the net proceeds from the Global Offer towards meeting its budgeted total aggregate capital expenditure for the next three calendar years (ending 31 December 2013). Items falling within this include funding of significant expansion projects in respect of Kazzinc (estimated capital expenditure of: U.S.$834 million), Mopani (estimated capital expenditure of: U.S.$512 million), Prodeco (estimated capital expenditure of: U.S.$919 million), the West African Oil Assets (estimated capital expenditure of: U.S.$791 million) and Glencore's other industrial assets (estimated capital expenditure of: U.S.$900 million), further information in relation to which is set out in the Prospectus (Section I: "Information on Glencore"). Glencore will continue to assess its capital expenditure plans on an annual basis; and
- in order to reduce its cost of borrowing and improve financial flexibility, use of a portion of any proceeds that are not applicable to, or immediately required, for these purposes to reduce drawings under the U.S.$11,905 million revolving credit facilities and repay various other debt obligations of the Glencore Group. Should growth opportunities arise in the future, Glencore could either draw down any remaining facilities or put in place new facilities.

Current Trading and Prospects

Introduction

Glencore's operating and financial performance over the first quarter of 2011 continued to benefit from improved market conditions as also experienced in the final months of 2010.

Marketing

Marketing operations began 2011 strongly with performance for the first quarter of 2011 in line with management expectations. In particular, following a challenging 2010, the oil division reported substantially improved results, more in line with 2009 performance, due to increased arbitrage opportunities as a result of market volatility and tighter supply conditions.

Industrial

Glencore's consolidated industrial activities and associates delivered a substantially improved performance over the first quarter of 2011, primarily on the back of a strong commodity price environment but also assisted by year-on-year production increases at many operations. Operating costs and capital expenditures, including expansion related capital expenditures, were broadly in-line with management expectations.

Summary and outlook

Overall, Glencore's businesses performed in line with management's expectations over the first quarter of 2011. Strong market conditions experienced in the first quarter are continuing into the second quarter of 2011. Despite recent events in Japan and the Middle East, the Directors remain confident that economic activity and commodity demand remain robust and Glencore remains well positioned for 2011. In this regard, the Directors reconfirm Glencore's previously announced intention to declare an interim dividend of U.S.$350 million in August 2011 concurrent with publication of the interim results for the six months to 30 June 2011.

SECTION II: DIRECTORS AND CORPORATE GOVERNANCE

Board of Directors

The Directors of the Company are as follows:

Name	Age	Position
Simon Murray	71	Independent Chairman
Ivan Glasenberg	54	Chief Executive Officer
Steven Kalmin	40	Chief Financial Officer
Peter Coates	65	Independent Non-Executive Director
Leonhard Fischer	48	Independent Non-Executive Director
Anthony Hayward	53	Senior Independent Non-Executive Director
William Macaulay	65	Independent Non-Executive Director
Li Ning	54	Independent Non-Executive Director

Chairman

Simon Murray, aged 71 (Independent Non-Executive Chairman)

Simon Murray was appointed to the Board with effect from 28 April 2011. Mr Murray is currently the chairman of GEMS Limited, a private equity investment group operating across Asia, which he founded in 1998. Mr Murray worked for Jardine Matheson from 1966 to 1980, where he was responsible for their engineering business and trading operations, after which he set up his own company, Davenham Investments, a project advisory company. In 1984, Mr Murray joined Hutchison Whampoa as the group managing director, a post in which he served until 1993 and during which period he led the group's entry into the mobile telecommunication business, developed the group's energy business and expanded its container and port operations. Mr Murray continued to serve as a member of the board of Hutchison Whampoa until May 2007. From 1994 to 1997, Mr Murray was the executive chairman of Deutsche Bank Group for the Asia Pacific region with responsibility for the supervision of operations of 80 offices in 17 countries in the region. Mr Murray is a member of the board of directors of a number of public companies including IRC Limited, Essar Energy plc, Cheung Kong (Holdings) Limited, Orient Overseas (International) Ltd., Wing Tai Properties Limited, Greenheat Group Limited, Compagnie Financière Richemont SA, and Sino Forest Corporation. Mr Murray was a non-executive director of Vodafone Group Plc between July 2007 and July 2010. In 1993, Mr Murray was appointed a CBE in honour of his contribution to the Hong Kong community. Mr Murray has also been awarded the Order of Merit of the French Republic and is a Chevalier de la Légion d'honneur. He holds an honorary B.A. degree in law from Bath University and attended the Stanford Executive Programme (SEP) in the U.S.

Executive Directors

Ivan Glasenberg, aged 54 (Chief Executive Officer)

Ivan Glasenberg joined Glencore in April 1984 and has been Chief Executive Officer of Glencore since January 2002. Mr Glasenberg was appointed to the Board on 14 March 2011. Mr Glasenberg first worked in the coal/coke commodity department in South Africa for three years as a marketer, responsible for sourcing coal in South Africa and then in Australia for two years as head of the coal/coke commodity division, Asia, responsible for sourcing and marketing coal in regions including Australia, Asia and South Africa. Between 1988 and 1989, he was based in Hong Kong as manager and head of Glencore's Hong Kong and Beijing offices, as well as head of coal marketing in Asia, where his responsibilities included overseeing the Asian coal marketing business of Glencore and managing the administrative functions of the Hong Kong and Beijing offices. In January 1990, he became director of the coal/coke commodity department, responsible for the worldwide coal business of Glencore for both marketing and industrial assets, and remained in this role until he became Chief Executive Officer in January 2002. Mr Glasenberg is a Chartered Accountant of South Africa and holds a Bachelor of Accountancy from the University of Witwatersrand. Mr Glasenberg also graduated in 1983 from the University of Southern California with an M.B.A. degree. He is currently a director of Minara as well as Xstrata and UC Rusal. Before joining Glencore, he worked for five years at Levitt Kirson Chartered Accountants in South Africa.

Steven Kalmin, aged 40 (Chief Financial Officer)

Steven Kalmin joined Glencore in September 1999, starting in the Sydney office in Glencore's coal industrial unit, which was subsequently sold to Xstrata, as general manager of finance and treasury functions. Mr Kalmin was appointed to the Board on 14 March 2011. Mr Kalmin moved to Glencore's Baar head office in October 2003 to oversee Glencore's accounting and reporting functions and became Chief Financial Officer as of the end of June 2005. Mr Kalmin holds a Bachelor of Business from the University of Technology, Sydney and is a member of the Institute of Chartered Accountants of Australia and the Financial Services Institute of Australasia. He is also currently a director of various companies within the Glencore Group. Before joining Glencore, he worked for nine years at Horwath Chartered Accountants in Sydney, leaving the firm as a director.

Independent Non-Executive Directors

Peter Coates, aged 65 (Independent Non-Executive Director)

Peter Coates was appointed to the Board with effect from 14 April 2011. He is currently a non-executive director and chairman of Santos Ltd., and a non-executive director of Amalgamated Holdings Limited. Until recently, he was a non-executive director and chairman of Minara Resources Limited, having been appointed to the chair on 9 May 2008. During his executive career in the resource industry spanning more than 40 years, Mr Coates occupied many senior positions in resource companies associated with the mining of a cross section of commodities including silver, lead, zinc, nickel, iron ore, bauxite and coal. Prior to his retirement as an executive in December 2007, Mr Coates was the chief executive of Xstrata's coal business. He joined Xstrata in 2002 when Glencore sold its Australian and South African coal assets to Xstrata for cash and shares simultaneous with Xstrata's primary listing and capital raising in London. From January 2008 to June 2009 Mr Coates was non-executive chairman of Xstrata Australia. Mr Coates is a past chairman of the Minerals Council of Australia, the NSW Minerals Council and the Australian Coal Association. He was appointed to the Office of the Order of Australia in June 2009 and was recently awarded the Australasian Institute of Mining and Metallurgy Medal for 2010. He holds a Bachelor of Science degree in Mining Engineering from the University of New South Wales.

Leonhard Fischer, aged 48 (Independent Non-Executive Director)

Leonhard Fischer was appointed to the Board with effect from 14 April 2011. He was appointed the chief executive officer of RHJ International S.A. in January 2009, having been the co-chief executive officer from May 2007. He has been a member of the board of directors of RHJ International S.A. since 18 September, 2007. He is also chief executive officer of the Kleinwort Benson Group and is a member of the board of directors at Julius Baer Gruppe AG (formerly Julius Bär Holding AG), as well as at AXA Konzern AG, Germany and Arecon AG (vice president of the board) and was previously a non-executive director and member of the audit committee at 3W Power Solutions S.A. (formerly Germany 1 Acquisition Limited, the holding company of AEG Power Solutions). Mr Fischer was chief executive officer of Winterthur Group from 2003 to 2006 and a member of the executive board of Credit Suisse Group from 2003 to March 2007. He joined Credit Suisse Group from Allianz AG, where he had been a member of the management board and head of the Corporates and Markets Division. Prior to this, he had been a member of the executive board of Dresdner Bank AG in Frankfurt. He holds an M.A. in Finance from the University of Georgia.

Anthony Hayward, aged 53 (Senior Independent Non-Executive Director)

Anthony Hayward was appointed to the Board with effect from 14 April 2011. He was group chief executive of BP plc from 2007 to 2010 having joined BP in 1982 as a rig geologist in the North Sea. Following a series of technical and commercial roles in Europe, Asia and South America, he returned to London in 1997 as a member of the upstream executive committee. He became group treasurer in 2000, chief executive for BP upstream activities and member of the main board of BP in 2003. Tony is a board member of TNK-BP and a partner of AEA Investors. Mr Hayward is also a fellow of the Royal Society of Edinburgh and holds honorary doctorates from the University of Edinburgh, Aston University and the University of Birmingham. He studied geology at Aston University in Birmingham and completed a PhD at Edinburgh University.

William Macaulay, aged 65 (Independent Non-Executive Director)

William E. Macaulay was appointed to the Board with effect from 14 April 2011. He is the chairman and chief executive officer of First Reserve Corporation, a private equity investment firm focused on the energy industry, and has been with First Reserve since its founding in 1983. Prior to joining First Reserve he was a co-founder of Meridien Capital Company, a private equity buyout firm. From 1972 to 1982, he was with Oppenheimer & Co., Inc., where he served as director of corporate finance with responsibility for managing Oppenheimer's buyout business. He also served as general partner and member of the management committee, as well as president of Oppenheimer Energy Corporation. Mr Macaulay is chairman of the board of Dresser-Rand, Inc. and also is a director of Weatherford International Ltd., as well as serving on numerous private energy company boards. In addition, he serves as chairman of the board of the Rogosin Medical Institute and chairman of the advisory board of the City University of New York. Mr Macaulay holds a B.B.A. degree, Magna Cum Laude in Economics from City College of New York and an M.B.A. from the Wharton School of the University of Pennsylvania. He also has received an Honorary Doctor of Humane Letters degree from Baruch College.

Li Ning, aged 54 (Independent Non-Executive Director)

Li Ning was appointed to the Board with effect from 14 April 2011. He has been an executive director of Henderson Land Development Company Limited since 1992. He was also an executive director of Henderson Investment Company Limited from 1990 to 2010. He has also been an executive director of Hong Kong (Ferry) Holdings Company Limited since 1989. Prior to joining the Henderson Group, he began his career in the banking industry with Chekiang First Bank Limited. Mr Li holds a B.Sc. degree from Babson College. Mr Ning also graduated in 1983 from the University of Southern California with an M.B.A. degree.

Key employees

The other key employees of the Glencore group are as follows:

Name	Age	Position
Alex Beard	43	Director oil
Steven Blumgart	37	Co-director alumina/aluminium
Stuart Cutler	51	Co-director ferroalloys/nickel/cobalt
Gary Fegel	37	Co-director alumina/aluminium
Giles Jones	43	Chief Risk Officer
Chris Mahoney	52	Director agricultural products
Richard Marshall	56	General Counsel
Daniel Francisco Maté Badenes	47	Co-director zinc/copper/lead
Aristotelis Mistakidis	49	Co-director zinc/copper/lead
Tor Peterson	46	Director coal/coke
Christian Wolfensberger	40	Co-director ferroalloys/nickel/cobalt

Alex Beard, aged 43 (director oil commodity department), joined Glencore in May 1995 working in the oil commodity department as a marketer, responsible primarily for the CIS region and gaining expertise in high sulphur crudes. He was appointed director of the oil commodity department in February 2007, overseeing all of Glencore's crude oil and oil products marketing, shipping, exploration and production and other oil-related investments, as well as being a director of Chemoil and various other Glencore Group companies. Mr Beard holds an MA degree in biochemistry from Oxford University. Before Glencore, he worked for five years for BP in its crude oil department.

Steven Blumgart, aged 37 (co-director alumina/aluminium commodity department), joined Glencore in Baar, Switzerland in October 1998, where he worked until April 2002 in the coal/coke commodity department, responsible for its industrial assets, before moving on to the alumina/aluminium commodity department. Since January 2006, Mr Blumgart has been co-director of Glencore's alumina/aluminium commodity department, overseeing alumina and industrial asset activities, which involves managing the department's alumina marketing operations and industrial asset acquisition and operating activities. He completed his Bachelor of Commerce (Tax Honours) degree from the University of Witwatersrand, and is a South African Chartered Accountant. In addition, Mr Blumgart holds the Chartered Financial Analyst designation. Prior to joining Glencore, Steven worked for three years at Grant Thornton Kessel Feinstein in Johannesburg.

Stuart Cutler, aged 51 (co-director ferroalloys/nickel/cobalt commodity department), joined Glencore in April 1995. He started in the Johannesburg office where he worked on the South African base metals and ferroalloys desk. From January 1997 to July 1999, he managed the Johannesburg office with overall responsibility for managing the South African base metals and ferroalloys marketing desk and the administrative functions of the office. In August 1999, Mr Cutler joined the nickel/cobalt commodity department in Baar, which merged with the ferroalloys department in 2001, gaining expertise in the bulk alloys industry, including chrome and extensive experience in its marketing operations. He became co-director of the department in November 2005, jointly overseeing the marketing business and industrial assets of the department, including strategy and operations. Mr Cutler holds a B. Proc degree from the University of Witwatersrand. Prior to joining Glencore, Mr Cutler was an attorney and notary public of the Supreme Court of South Africa and a barrister and solicitor of the High Court of New Zealand, and worked as a litigation partner at South African law firm, Werksmans.

Gary Fegel, aged 37 (co-director alumina/aluminium commodity department), joined Glencore in January 2001 in the alumina/aluminium commodity department gaining expertise in logistics, LME and physical marketing. In January 2006, he was appointed as co-director of Glencore's alumina/aluminium commodity department, overseeing the worldwide aluminium business, which involves the buying, marketing and logistics of the metal as well as hedging and risk management. Mr Fegel holds an M.B.A. degree from the University of St. Gallen. Before Glencore, he worked for UBS for four years and Credit Suisse for one year in their respective derivatives departments, being based in Zurich, London and New York.

Giles Jones, aged 43 (Chief Risk Officer), joined Glencore in February 1990 in the oil commodity department, with responsibility for crude oil and products futures and swaps hedging until mid-1994, and then worked as a physical fuel oil marketer, where his responsibilities included negotiating supply contracts and arbitrage strategies. Mr Jones became head of global oil derivatives marketing in January 2007, gaining further expertise in across-the-barrel futures, swaps and options marketing, and his overall responsibilities included price curve setting and market exposure monitoring within the department. Between January 2010 and January 2011, he was chief risk officer of the oil commodity department, leading a team of more than 40 people globally. Mr Jones was appointed as the Chief Risk Officer of Glencore Group in February 2011. As Chief Risk Officer, Mr Jones is responsible for the Glencore Group's overall risk management function. Mr Jones holds an LLB (Honours) in law from University College London.

Chris Mahoney, aged 52 (director Agricultural Products business segment), joined Glencore in September 1998. From September 1998 until November 2002, he was responsible for Glencore's agricultural product activities in the CIS, South Africa and South America. In November 2002, he became director of the Agricultural Products business segment, overseeing all global farming, logistics, processing and marketing businesses, responsible for both strategy and operations. Mr Mahoney holds an MA degree from Oxford University. Before Glencore, he spent 17 years with Cargill, being based in the UK, the U.S., Singapore and Switzerland, and held various management positions in sugar and grain, gaining expertise in the agricultural products industry and marketing operations.

Richard Marshall, aged 56 (General Counsel), joined Glencore as General Counsel in April 2005. As General Counsel, Mr Marshall has responsibilities for overseeing the Glencore Group's overall legal and compliance function. Prior to joining Glencore, Mr Marshall was a partner at Cadwalader Wickersham & Taft LLP in London between September 2003 and March 2005 and a partner at Mallesons Stephen Jaques in Sydney between 1984 and July 2003. Prior to becoming a partner at Mallesons Stephen Jaques, he was an associate in the firm's Sydney office between 1979 and 1984. Mr Marshall completed his law society finals at the College of Law in London in 1978 and was admitted as a solicitor in England and Wales in the same year. He was also admitted as a solicitor in New South Wales, Australia in 1979. He has been an associate member of the Law Society of New South Wales, Australia since 2003.

Daniel Francisco Maté Badenes, aged 47 (co-director zinc/copper/lead commodity department), joined Glencore in October 1988, starting in Glencore's Madrid office, gaining expertise in metals transactions and logistics in Spain and North Africa. After three years in Madrid, he joined the zinc/lead commodity department in Switzerland in August 1991, which merged with the copper department in February 2002, where he was responsible for the zinc and lead concentrates desk for Spain, North Africa and South America, before being appointed in charge of worldwide zinc and lead concentrates marketing. Mr Maté has been co-director of the zinc/copper/lead commodity department since February 2000, jointly overseeing the marketing business and industrial assets of the department, including strategy and operations. He is also a director of Volcan. Mr Maté holds a Bachelors degree in economics from Universidad Comercial de Deusto, Spain and a Bachelors degree in law from Deusto University of Spain.

Aristotelis Mistakidis, aged 49 (co-director zinc/copper/lead commodity department), joined Glencore in March 1993 in the zinc/lead commodity department, which merged with the copper department in February 2002, where he was responsible for, and gained expertise in, price and risk management and zinc and lead marketing. He has been co-director of the zinc/copper/lead commodity department since February 2000, jointly overseeing the marketing business and industrial assets of the department, including strategy and operations. He is also a director of Katanga and Recylex and is chairman of Mopani. Mr Mistakidis holds a B.Sc. Economics degree from London School of Economics. Before Glencore, he worked at Cargill for six years, where he worked in and gained experience in the non-ferrous metals industry.

Tor Peterson, aged 46 (director coal/coke commodity department), joined Glencore in January 1992 as a marketer and has been working in the coal/coke commodity department ever since, gaining expertise in marketing and coal assets, responsible for various regions including Colombia, Russia and Europe. In January 2002, he was appointed as director of the coal/coke commodity department, succeeding Ivan Glasenberg who moved into the Chief Executive Officer role, and he is responsible for overseeing the global marketing business and industrial assets of the department, including strategy and operations. Mr Peterson holds a Bachelor degree in political science and French from Duke University. Before Glencore, he worked for five years for Phibro-Salomon Inc. as a marketer, being based in New York, London and the Ivory Coast.

Christian Wolfensberger, aged 40 (co-director ferroalloys/nickel/cobalt commodity department), joined Glencore in December 1994, starting in the trade finance department in Switzerland, where he was responsible for arranging financing for global trades. In January 1996, Mr Wolfensberger joined the ferroalloys/nickel/cobalt commodity department in its traffic team, responsible for managing marketing data and logistics, before becoming in charge of the nickel desk, gaining expertise in physical marketing operations. He became co-director of the ferroalloys/nickel/cobalt commodity department in November 2005, jointly overseeing the marketing business and industrial assets of the department, including strategy and operations. He holds an MBA degree from the University of St. Gallen.

Description of ownership structure

Glencore has historically been entirely owned by its employees. Glencore believes that this ownership structure has been an important element of its successful growth since inception. Additionally, assuming no conversion of the Convertible Bonds the Over-Allotment Option is not exercised, the Kazzinc Consideration Shares have not been issued and the Offer Price is set at the mid-point of the Offer Price Range, the number of Ordinary Shares in issue following the Global Offer will be 6,893,292,886, and of these 83.6 per cent. will be held by Existing Shareholders. Consequently, the Company will continue to be primarily owned by Existing Shareholders upon Admission. This ownership structure aligns the interests of Shareholders and employees and has fostered a culture of excellence, teamwork and accountability. In addition, employee ownership helps Glencore to attract new employees of the highest calibre and to retain and motivate existing employees. The fact that Glencore's employees have a significant amount of capital invested in Glencore, with overall compensation structured in favour of longer-term incentives, motivates it to take a long-term view of Glencore's overall performance and to protect the capital of Glencore. Glencore believes that its consistent profitability, the long-term tenure of its management team and its prudent risk management policies have been a direct result of its employee ownership structure.

To continue the strong culture within Glencore based on employee ownership, the Company has put in place two new employee share plans – the Glencore Performance Share Plan and the Glencore Deferred Bonus Plan. These plans are in addition to the annual short-term bonus arrangements in place for the Glencore employees.

No awards have been granted under these plans to date. It is not proposed to make any awards in calendar year 2011 other than awards to new hires and any top-up awards to existing employees necessary to reflect their level of seniority and/or performance in line with their peers (where such top-up awards, if any, are not expected to be material).

Under the Glencore Performance Share Plan, awards of Ordinary Shares will be granted to employees who have already demonstrated excellent performance over a sustained period. It is currently intended that awards granted to Executive Directors will vest after a three-year period subject to the satisfaction of the agreed performance condition(s), continued employment and clawback and that awards granted to other employees will vest in annual tranches over a five-year period subject only to continued employment and clawback.

Under the Glencore Deferred Bonus Plan, a proportion of annual bonus payable to the Executive Directors will be deferred as an award of shares. It is currently intended that such award will vest over three years subject to continued employment and clawback.

The number of shares which may be issued, or committed to be issued under the Glencore Performance Share Plan and Glencore Deferred Bonus Plan in any 10 year period will not exceed (i) 10 per cent. of the Company's issued ordinary share capital, in respect of any employee share plans operated by the Company; and (ii) 5 per cent. of the Company's issued ordinary share capital, in respect of discretionary employee share plans adopted by the Company. As at the date of Admission, the Company will only have discretionary employee share plans in existence. Shares issued, or committed to be issued, before Admission will not be counted for either of these limits.

The principal features of the Glencore Performance Share Plan and the Glencore Deferred Bonus Plan are summarised under "Glencore employee share plans" in Section X: "Additional Information".

Corporate governance

The Board structure

At Admission, the Board will consist of the Non-Executive Chairman, two Executive Directors and five Non-Executive Directors. The Company regards this as an appropriate Board structure.

The Company regards all of its Non-Executive Directors as independent Non-Executive Directors within the meaning of "independent" as defined in the Code and free from any business or other relationship which could materially interfere with the exercise of their independent judgement. This view was taken having regard to all facts including those below. William Macaulay is chairman and chief executive of First Reserve Corporation ("First Reserve"). First Reserve is the holder of a tranche of the U.S.$2.3 billion Convertible Bonds due 2014 issued by Glencore Finance (Europe) S.A.. Peter Coates was until recently the independent non-executive chairman of Minara, a company listed on the Australian Securities Exchange and 70.6 per cent. owned by Glencore, and was previously a non-executive chairman of Xstrata Australia and a former chief executive of Xstrata Coal, part of Xstrata plc, a listed entity in which Glencore holds a 34.5 per cent. interest. Mr Coates joined Xstrata in 2002 with Glencore's coal assets in Australia and South Africa when they were sold to Xstrata for cash and shares simultaneous with Xstrata's primary listing and capital raising in London.

The Directors support high standards of corporate governance. Following Admission, the Company will comply with the Code. The Company is compliant, as at the date of this document and will continue to comply with the standards expected of them as directors of a Jersey company.

The Directors have established an audit committee, a remuneration committee, a nominations committee, and an environment, health and safety committee.

Audit committee

The audit committee will be chaired by Leonhard Fischer and its other members are Peter Coates and William Macaulay. The audit committee will meet not less than twice a year and will have responsibility for, among other things, monitoring the integrity of Glencore's financial statements and reviewing its summary financial statements. It will oversee Glencore's relationship with its external auditors and review the effectiveness of the external audit process. The committee will give due consideration to laws and regulations, the provisions of the Code and the requirements of the Listing Rules. It will also have responsibility for reviewing the effectiveness of Glencore's system of internal controls and risk management systems. The ultimate responsibility for reviewing and approving the interim and annual financial statements remains with the Directors. The Directors consider that Leonhard Fischer has recent and relevant financial experience. Further details are set out in his biography under the heading "Board of Directors". The audit committee will also be responsible for reviewing, updating and presenting to the Board Glencore's policies on risk management in relation to Glencore's marketing and operational activities.

Remuneration committee

The remuneration committee is chaired by William Macaulay and its other members are Leonhard Fischer and Anthony Hayward. The remuneration committee will meet not less than once a year and will have responsibility for making recommendations to the Board (i) on Glencore's policy on the remuneration of management and (ii) for the determination, within agreed terms of reference, of the remuneration of the Chairman and of specific remuneration packages for each of the Executive Directors and the members of management, including pension rights and any compensation payments. The remuneration committee will also ensure compliance with the Code in this respect.

Nominations committee

The nominations committee is chaired by Anthony Hayward and its other members are Simon Murray, Ivan Glasenberg and Li Ning. The committee will meet not less than once a year and will, with effect from Admission, have responsibility for making recommendations to the Board on the composition of the Board and its committees and on retirements and appointments of additional and replacement Directors and ensuring compliance with the Code.

Environment, health and safety committee

The environment, health and safety committee is chaired by Peter Coates and its other members are Ivan Glasenberg, Anthony Hayward and Michael Fahrbach (the Glencore employee currently responsible for Glencore's environmental, health and safety issues). The committee will meet not less than once a year and will be responsible for formulating and recommending to the Board Glencore's policy on health and safety as well as environmental, security and local community issues as they affect Glencore's operations.

SECTION III: SELECTED HISTORICAL FINANCIAL AND OTHER INFORMATION

Historical financial information

The following selected historical financial data at 31 December 2008, 2009 and 2010 and for each of the three years in the period ended 31 December 2010 has been extracted without material adjustment from the historical consolidated financial information contained in Section VI: "Historical Financial Information" that has been prepared on the basis described in the footnotes to the historical financial information, except for the Non-IFRS Measures, which are defined as explained in "Presentation of Information" and have each been calculated as set out in this Section III. The information in this Section III should be read in conjunction with Section IV: "Operating and Financial Review" and Section VI: "Historical Financial Information" all appearing elsewhere in this Prospectus. Investors should read the whole of this Prospectus before making an investment decision and not rely solely on the summarised information in this Section III.

Income statement data

	2008	2009	2010
		(U.S.$ million)	
Revenue	152,236	106,364	144,978
Cost of goods sold	(147,565)	(103,133)	(140,467)
Selling and administrative expenses	(850)	(839)	(1,063)
Share of income from associates and jointly controlled entities	1,067	82	1,829
(Loss)/gain on sale of investments—net	7	33	(6)
Other (expense)/income—net	(2,960)	35	(8)
Dividend income	238	12	13
Interest income	298	267	281
Interest expense	(1,135)	(854)	(1,217)
Income before income taxes and attribution	1,336	1,967	4,340
Income tax expense	(268)	(238)	(234)
Income before attribution	1,068	1,729	4,106
Attribution to profit participation shareholders	(677)	(650)	(2,460)
Income for the year	391	1,079	1,646
Attributable to:			
Equity holders	367	983	1,291
Non-controlling interests	24	96	355

Balance sheet data

	2008	2009	2010
		(U.S.$ million)	
Non-current assets	24,803	27,551	35,491
Current assets	36,508	38,725	44,296
Total assets	61,311	66,276	79,787
Share capital, reserves and retained earnings, and amounts attributed to profit participation shareholders	15,405	16,686	19,613
Non-controlling interests	906	1,258	2,894
Invested capital	16,311	17,944	22,507
Other non-current liabilities	14,294	17,751	20,442
Total assets net of current liabilities	30,605	35,695	42,949
Current liabilities	30,706	30,581	36,838
Total equity and liabilities	61,311	66,276	79,787

Cash flow data

	2008	2009	2010
		(U.S.$ million)	
Cash generated by operating activities before working capital changes	4,587	3,095	4,234
Net cash generated/(used) by operating activities after working capital and net interest and income tax payments	5,960	(3,010)	111
Net cash used by investing activities	(2,950)	(1,164)	(4,755)
Net cash generated/(used) by financing activities	(2,842)	4,208	5,247
Increase in cash and cash equivalents	168	34	603
Cash and cash equivalents, beginning of year	658	826	860
Cash and cash equivalents, end of year	826	860	1,463

Other financial data and ratios

	2008	2009	2010
		(U.S.$ million)	
Adjusted EBITDA[(1)(5)] (unaudited)	5,701	3,108	6,201
Marketing activities	2,874	1,576	2,367
Industrial activities	2,827	1,532	3,834
Adjusted EBITDA pre-exceptional items[(2)(5)]	6,787	3,929	6,201
Marketing activities	3,215	1,606	2,367
Industrial activities[(9)]	3,572	2,323	3,834
Kazzinc (unaudited)	473	637	815
Other Zinc (unaudited)	97	62	225
Katanga (unaudited)	—	48	168
Mopani (unaudited)	94	118	218
Other Copper (unaudited)	288	205	214
Aluminium/Alumina (unaudited)	34	(117)	(9)
Ferroalloys/Nickel/Cobalt (unaudited)	113	119	189
Oil (unaudited)	32	57	(12)
Prodeco (unaudited)	426	218	278
Other Coal (unaudited)	201	96	47
Agricultural Products (unaudited)	95	85	88
Corporate and other (incl. Xstrata) (unaudited)	1,536	764	1,500
Share of income from associates and dividends (excl. Xstrata) (unaudited)	183	31	113
Adjusted EBIT[(3)(5)]	5,126	2,486	5,290
Marketing activities	2,861	1,561	2,337
Industrial activities	2,265	925	2,953
Adjusted EBIT pre-exceptional items[(4)(5)]	6,212	3,307	5,290
Marketing activities	3,202	1,591	2,337
Industrial activities[(9)]	3,010	1,716	2,953
Kazzinc (unaudited)	357	490	579
Other Zinc (unaudited)	(34)	(28)	115
Katanga (unaudited)	—	39	109
Mopani (unaudited)	44	(21)	68
Other Copper (unaudited)	256	175	179
Aluminium/Alumina (unaudited)	22	(125)	(17)
Ferroalloys/Nickel/Cobalt (unaudited)	13	21	79
Oil (unaudited)	28	49	(24)
Prodeco (unaudited)	349	206	199
Other Coal (unaudited)	172	67	14
Agricultural Products (unaudited)	84	48	39
Corporate and other (incl. Xstrata) (unaudited)	1,536	764	1,500
Share of income from associates and dividends (excl. Xstrata) (unaudited)	183	31	113

	2008	2009	2010
		(U.S.$ million)	
Gross debt (unaudited)(6)	18,316	24,066	30,616
Marketing activities	N/A	10,197	12,835
Industrial activities	N/A	13,869	17,781
Interest expense pre-exceptional items—net (unaudited)(7)	(837)	(587)	(897)
Marketing activities (unaudited)	N/A	N/A	(299)
Industrial activities (unaudited)	N/A	N/A	(598)
Capital expenditure	(1,875)	(1,116)	(1,890)
Kazzinc (unaudited)	(568)	(367)	(350)
Other Zinc (unaudited)	(166)	(48)	(110)
Katanga (unaudited)	—	(62)	(221)
Mopani (unaudited)	(137)	(58)	(130)
Other Copper (unaudited)	(40)	(43)	(92)
Aluminium/Alumina (unaudited)	(13)	(19)	(31)
Ferroalloys/Nickel/Cobalt (unaudited)	(138)	(10)	(67)
Oil (unaudited)	(350)	(144)	(514)
Prodeco (unaudited)	(309)	(242)	(277)
Other Coal (unaudited)	(39)	(7)	(27)
Agricultural Products (unaudited)	(102)	(116)	(71)
Other (unaudited)	(13)	0	0
Current ratio (x) (unaudited)	1.19	1.27	1.20
Current capital employed(10) plus listed associates (at carrying value) to Gross debt(6) (x) (unaudited)	1.22	1.26	1.15
Net debt (unaudited)(6)	11,500	10,186	14,756
FFO(8)/Net debt(6) (%) (unaudited)	31.6	22.9	22.6
Adjusted EBITDA pre-exceptional items(2)/Net interest (x) (unaudited)	8.11	6.69	6.91
Income before attribution—pre-exceptional items	4,824	2,820	4,007
Income before attribution	1,068	1,729	4,106

Notes:

(1) Adjusted EBITDA consists of revenue less cost of goods sold and selling and administrative expenses plus share of income from associates and jointly controlled entities and dividends as disclosed on the face of the consolidated statement of income plus depreciation and amortization.

(2) Adjusted EBITDA pre-exceptional items consists of Adjusted EBITDA as defined above, excluding exceptional items. Exceptional items represent significant items of income and expense which, due to their financial impacts, nature or the expected infrequency of the events giving rise to them, have been separated for internal reporting and analysis of Glencore's results. Exceptional items mainly include impairment charges on inventories and other assets.

(3) Adjusted EBIT consists of revenue less cost of goods sold and selling and administrative expenses plus share of income from associates and jointly controlled entities and dividends as disclosed on the face of the consolidated statements of income.

(4) Adjusted EBIT pre-exceptional items consists of Adjusted EBIT as defined above, excluding exceptional items. Exceptional items represent items of income and expense, which, due to their financial impacts, nature or the expected infrequency of the events giving rise to them, have been separated for internal reporting and analysis of Glencore's results. Exceptional items mainly include impairment charges on inventories and other assets.

(5) Adjusted EBITDA, Adjusted EBIT, Adjusted EBITDA pre-exceptional items and Adjusted EBIT pre-exceptional items are not typically measures of operating income, operating performance or liquidity under IFRS; however, Glencore has presented these measures in this Prospectus as Glencore understands that some investors use these measures to determine a company's ability to service indebtedness and fund ongoing capital expenditure and dividends. Investors should not consider these measures in isolation, or as a substitute for income from operations, income for the year, cash flows from operating activities, as determined in accordance with IFRS, as an indicator of operating performance.

The following table is a composition of the key line items on the face of the consolidated statement of income that comprises Adjusted EBIT and reconciles Adjusted EBIT pre exceptional items, Adjusted EBITDA and Adjusted EBITDA pre-exceptional items for the periods indicated. A reconciliation to net income before attribution is provided in the Adjusted financial information by business segment section of Section III:

	2008	2009	2010
	(U.S.$ million)		
Revenue	152,236	106,364	144,978
Cost of goods sold	(147,565)	(103,133)	(140,467)
Selling and administrative expenses	(850)	(839)	(1,063)
Share of income from associates and jointly controlled entities	1,067	82	1,829
Dividend income	238	12	13
Adjusted EBIT	5,126	2,486	5,290
Addback exceptional items	1,086	821	0
Adjusted EBIT pre-exceptional items	6,212	3,307	5,290
Addback depreciation and amortisation	575	622	911
Adjusted EBITDA pre-exceptional items	6,787	3,929	6,201
Deduct exceptional items excluded above	(1,086)	(821)	0
Adjusted EBITDA	5,701	3,108	6,201

(6) Gross debt includes Current borrowings, Non-current borrowings and commodities sold with agreements to repurchase. It excludes amounts owing under the Prodeco call option arrangement and other financial liabilities. Net debt is gross debt less cash and cash equivalents, marketable securities and Glencore's assessment of readily marketable inventories. In calculating the illustrative allocation of borrowings to the marketing activities, Glencore has estimated what it believes to be the reasonable amount of borrowings attributable to funding the marketing activities' working capital requirements at the relevant period end date, with particular reference to the level of inventories, net cash margining and other accounts receivable and payable. The balance of group borrowings is allocated to industrial activities. See "—Notional allocation of debt and interest expense—Total gross debt outstanding".

(7) In calculating the illustrative allocation of interest expense to the marketing activities, Glencore has taken into consideration the average amount of borrowings illustratively allocated to marketing activities as described in the preceding paragraph for the relevant period, what Glencore believes to be the appropriate distribution of funding tenors for the categories of funded assets within the marketing activities, and the average rate of interest incurred by the group during the relevant period on borrowings of the relevant tenor and interest basis. The balance of group interest expense is allocated to industrial activities. See "—Notional allocation of debt and interest expense—Illustrative gross interest expense allocation between Marketing and Industrial activities".

(8) Funds From Operations ("FFO") equals cash provided by operating activities before working capital changes less tax and net interest payments plus dividends received.

(9)

	2008							
	Kazzinc	**Other Zinc**	**Mopani**	**Other Copper**	**Ferroalloys/ nickel/ cobalt**	**Corporate other (incl Xstrata)**	**Share of income from associates and dividends (excl Xstrata)**	**Total**
	(U.S.$ million)							
Inventory impairments	6	20	59	0	9	0	0	94
Provisional pricing adjustments	42	66	0	56	47	0	0	211
Severance and related costs	0	17	2	0	6	0	0	25
Asset impairment charges	0	0	0	0	0	389	26	415
Total	48	103	61	56	62	389	26	745

	2009							
	Kazzinc	**Other Zinc**	**Mopani**	**Other Copper**	**Ferroalloys/ nickel/ cobalt**	**Corporate other (incl Xstrata)**	**Share of income from associates and dividends (excl Xstrata)**	**Total**
	(U.S.$ million)							
Inventory impairments	0	0	6	0	0	0	0	6
Provisional pricing adjustments	0	0	0	24	0	0	0	24
Severance and related costs	0	0	0	0	0	0	0	0
Asset impairment charges	0	0	0	0	0	736	25	761
Total	0	0	6	24	0	736	25	791

(10) Current capital employed is current assets, presented before assets held for sale, less accounts payable, other financial liabilities and income tax payable.

Additional financial information

In the following three sections (non-current assets summary, notional allocation of debt and interest expense, and non-controlling interests' share of gross debt), additional information is provided, which Glencore considers relevant to assist in the understanding of overall performance and underlying value contributors of its integrated business model.

1. Non-current assets summary as at 31 December 2010

The following table provides a summary of the carrying value of non-current assets in the Group's balance sheet, comprising the assets disclosed and detailed in this Prospectus and the remaining being primarily, investments and loans extended in support of Glencore's growth in marketing and industrial activities of the respective segment.

	Book value as at 31 December 2010
	(U.S.$ million) (unaudited, except total lines)
Property, plant and equipment	
Industrial assets covered by MERs(1)	7,877
Other core industrial assets(2)	1,712
Listed subsidiaries(3)	1,672
Various agricultural assets(4)	550
Various smaller energy assets(5)	222
Various smaller mineral and metal assets(6)	55
Total property, plant and equipment (audited)	**12,088**
Investments in associates and jointly controlled entities	
Listed assets(7)	15,511
Selected core associates(8)	431
Other energy associates(9)	514
Other metal and mineral associates(10)	156
Other agricultural associates(11)	154
Total associates and jointly controlled entities (audited)	**16,766**
Other investments	
Listed assets(12)	2,376
Other metal and mineral investments	26
Other energy investments	36
Total other investments (audited)	**2,438**
Long-term loans	
Loans related to selected core assets(13)	843
RussNeft loan(14)	2,082
Secured long-term trade advances(15)	530
Other long-term loans	375
Total long-term loans (audited)	**3,830**

Notes:

(1) Kazzinc, Mopani, Katanga and Prodeco.

(2) E&P Portfolio, Sherwin, Shanduka, Los Quenuales, Portovesme, Sinchi Wayra, A R Zinc, Pasar, Cobar and Punitaqui.

(3) Murrin Murrin, Chemoil and Biopetrol.

(4) Includes farming, crushing and storage operations.

(5) Majority oil vessels plus storage facilities.

(6) Includes Columbia Falls.

(7) Xstrata, Century Aluminum and Recylex.

(8) Including Novoshirokinskoe (within Kazzinc), Mutanda and Fenoco (within Prodeco).

(9) Mainly shipping assets (U.S.$357 million) and various logistics operations. Due to the staggered delivery schedule of vessels up to 2012, no meaningful earnings have been reported in the historical period.

(10) Primarily operations and exploration/development projects in Africa.

(11) Various agricultural operations.

(12) Including UC Rusal, Volcan, Nyrstar and Polymet. Earnings from investment in UC Rusal only recognised via dividends, which last occurred in 2008.

(13) Comprising project loans/loans to equity partners in Mutanda and E&P Portfolio, which will be repaid from the future expected cashflows generated by these projects.

(14) Interest bearing at 9 per cent. (3 per cent. cash, 6 per cent. delayed payment terms). Please see Section I: "Information on Glencore" for further details. Russneft interest has comprised the largest individual component of interest received during the historical period.

(15) Including U.S.$200 million secured loan to PT Bakrie & Brothers Tbk.

2. Notional allocation of debt and interest expense

Most of Glencore's indebtedness is incurred centrally with the proceeds then applied to marketing or industrial activities as required.

Glencore does not allocate borrowings or interest to its three operating segments or its marketing and industrial activities. However, to assist investors in assessing the profitability of its marketing and industrial activities separately, Glencore has prepared an illustrative allocation of its borrowings and interest expense between the marketing and industrial activities based on the methodology described below. Notwithstanding Glencore's belief in its reasonableness, the allocation of borrowings and interest expense between Glencore's marketing and industrial activities shown below is illustrative only and should not be considered representative of the level of indebtedness or interest expense such activities had, in the past, or would have had, if they were stand-alone businesses or that Glencore will have in the future.

In calculating the illustrative allocation of borrowings to the marketing activities, Glencore has estimated what it believes to be the reasonable amount of borrowing capacity attributable to marketing activities at the relevant period end date, with particular reference to the level of inventories, net cash margining and other accounts receivable and payable. The balance of group borrowings is allocated to industrial activities.

In calculating the illustrative allocation of interest expense to the marketing activities, Glencore has taken into consideration the average amount of borrowings illustratively allocated to marketing activities as described in the preceding paragraph for the relevant period, what Glencore believes to be the appropriate distribution of funding tenors for the categories of funded assets within the marketing activities, and the average rate of interest incurred by the group during the relevant period on borrowings of the relevant tenor and interest basis. The balance of group interest expense is allocated to industrial activities.

Illustrative debt funding allocation between Marketing and Industrial activities

	Group As at 31 December 2010	Allocated to		As at 31 December 2010	Illustrative Marketing		
		Marketing Activities	Industrial Activities		% Debt funding[3]	Debt funded	Equity funded
			(U.S.$ million) (unaudited)				
Cash, cash equivalents and marketable securities	1,529		X				
Production inventories	2,805		X				
Readily marketable inventories	14,331	X		14,331	85%	12,181	2,150
Other inventories	257	X		257	20%	51	206
Net receivables/(payables) excluding cash margining	(172)	X		(172)	80%	(137)	(35)
Net brokers (cash margin only)	2,753	X		2,753	90%	2,478	275
Net fair value of trade related financial instruments	(2,084)	X		(2,084)	85%	(1,771)	(313)
Other net assets/liabilities[1][2]	404	X	X	165	20%	33	132
Current capital employed[2]	19,823			15,250		12,835	2,415

Notes:

(1) Allocated between marketing activities and industrial assets based on percentage split per underlying accounting records and nature of the balance.

(2) Includes assets and liabilities held for sale.

(3) Based on the terms of Glencore's existing dedicated facilities which finance a portion of its receivables and marketing inventory.

Total gross debt outstanding

	As at 31 December 2009[2]	As at 31 December 2010	2010 average[1]
		(U.S.$ million) (unaudited)	
Marketing activities	10,197	12,835	10,460
Industrial activities[3]	13,869	17,781	15,663
Total gross debt	**24,066**	**30,616**	**26,123**

Notes:

(1) Based on quarterly averages.

(2) The gross debt amounts allocated to marketing and industrial activities as at 31 December 2009 is based upon the same methodologies as the calculation of gross debt for such activities as at 31 December 2010. See "Illustrative debt funding allocation between Marketing and Industrial activities" above.

(3) Including Glencore's stake in Xstrata.

Illustrative gross interest expense allocation between Marketing and Industrial activities

	2010
	(U.S.$ million) *(unaudited)*
Average variable funding rate(1)— Marketing	2.86%
Blended residual funding rate(2)—Industrial	6.51%
Variable rate interest expenses	
Allocated to Marketing activities(3)	299
Allocated to Industrial activities(3)	252
Total variable rate interest expense(4)	**551**
Fixed-rate interest expense	
Allocated to Marketing activities(5)	—
Allocated to Industrial activities(5)	627
Total fixed-rate interest expense	**627**
Interest expense	
Allocated to Marketing activities	299
Allocated to Industrial activities	879
Total interest expenses(4)	**1,178**

Notes:

(1) The average variable funding rate was calculated based on the actual weekly average variable rate incurred during 2010.

(2) The blended residual funding rate is the average rate attributable to industrial activities, representing the residual interest expense allocated to industrial activities as a percentage of its average gross debt allocation.

(3) The allocation of variable rate interest was done based upon the 2010 average variable gross debt outstanding for marketing and industrial activities at the average variable funding rate.

(4) Excluding U.S.$39 million of capitalised borrowing costs written off.

(5) The allocation of fixed rate interest expense was entirely to Glencore's industrial activities, as Glencore does not utilise fixed-rate borrowings in its marketing activities. Such borrowings are typically long-term public bonds to better match the maturity profile of Glencore's industrial assets.

3. Non-controlling interests' share of gross debt

Certain subsidiaries in which Glencore does not hold a 100 per cent. interest in are funded either directly with third party debt or indirectly from Glencore and its third party debt. Glencore's gross consolidated debt is reported below, before any adjustment for the non-controlling interests' share of the gross debt. The table below sets out the debt of the main industrial subsidiaries in which Glencore holds a less than 100 per cent. interest and Glencore's attribution of such debt to the non-controlling interests in proportion to their shareholdings.

	Total(1)	Non-controlling interest in subsidiary	Non-controlling interests' share of gross debt
		(U.S.$ million) *(unaudited)*	
Mopani Group	601	27%	162
Katanga Mining Limited	120	26%	31
Kazzinc(2)	1,071	49%	525
Minara Resources Ltd	23	29%	7
Shanduka Coal (Pty) Limited	48	30%	14
Biopetrol Industries AG	72	40%	29
Rio Vermelho Acucar e Alcool SA	20	24%	5
Total	1,955		773

Notes:

(1) Includes external debt and group funding.

(2) Glencore has agreed with Verny to acquire additional stakes in Kazzinc. These purchases will increase its ownership from 50.7 per cent. to 93.0 per cent. for a total transaction consideration of $3.2 billion. Subject to the satisfaction of certain conditions, the consideration will be settled through the issuance of U.S.$1 billion of Ordinary Shares at the Offer Price (such issuance expected to occur at the earlier of UK Admission and satisfaction of applicable conditions precedent) and U.S.$2.2 billion in cash (to be paid in tranches between October and December 2011). See Section X: "Additional Information" for further details of these purchases and the terms of the Kazzinc SPAs.

Adjusted financial information

Glencore believes that its overall business performance cannot be judged solely on its historical financial information contained in Section VI: "Historical Financial Information", which has been prepared in accordance with IFRS. Glencore looks at the performance of its business on an adjusted basis, or before exceptional items. Exceptional items represent significant items of income and expense which, due to their nature or the expected infrequency of the events giving rise to them, are separated for internal reporting and analysis of Glencore's results. Glencore believes this provides the entity and investors with a better understanding and comparative basis of its underlying financial performance.

Exceptional items

The table below sets forth, for the year ended 31 December 2008, certain selected line items extracted without material adjustment from the historical financial information contained in Section VI: "Historical Financial Information", and the aggregate effect of certain exceptional items on such historical financial information, and on the non-IFRS measures of Adjusted EBITDA and Adjusted EBIT as defined in "Presentation of Information".

2008	Historical financial information (audited)	Exceptional items (unaudited)	Pre-exceptional financials (unaudited)
		(U.S.$ million)	
Revenue	152,236	0	152,236
Cost of goods sold	(147,565)	672[(1)]	(146,893)
Selling and administrative expenses	(850)	0	(850)
Share of income from associates and jointly controlled entities	1,067	415[(2)]	1,482
Gain/(loss) on sale of investments—net	7	(7)[(3)]	0
Other income/(expense)—net	(2,960)	2,763[(4)]	(197)
Dividend income	238	0	238
Interest income	298	0	298
Interest expense	(1,135)	0	(1,135)
Income before income taxes and attribution	1,336	3,843	5,179
Income tax expense	(268)	(87)[(5)]	(355)
Income before attribution	1,068	3,756	4,824
Attribution to profit participation shareholders	(677)	0	(677)
Income for the year	391	3,756	4,147
Adjusted EBITDA (audited)	5,701	1,086	6,787
Adjusted EBIT (audited)	5,126	1,086	6,212

Notes:

(1) Inventory net realisable value adjustments of U.S.$435 million and severance and other adjustments of U.S.$237 million recognised in the Metals and Minerals business segment.

(2) Glencore's share of asset impairment charges booked directly by Xstrata (U.S.$389 million) and Century Aluminum (U.S.$26 million).

(3) Net gain realised in relation to a number of immaterial disposals of investments.

(4) Impairment charges in relation to investments in associates and other investments and property, plant and equipment.

(5) Tax-related adjustments related to the above exceptional charges.

In 2008, Glencore recognised U.S.$3,756 million of exceptional items, including U.S.$2,763 million related to asset impairments, following Glencore's regular review of asset carrying values. These recorded impairments were brought on by the rapid and severe impacts arising from the global financial crisis, which ultimately resulted in substantially lower commodity prices. Specifically, U.S.$1.7 billion of the impairment expense was booked against the Xstrata and Century Aluminum carrying values, with the remaining balance relating to the various other cumulative impairments arising primarily from decisions taken to curtail and/or suspend various mining or expansion activities.

Also in 2008, Glencore recognised negative provisional pricing adjustments of U.S.$211 million at Glencore's industrial operations and inventory net realisable value adjustments of U.S.$435 million, as a result of the severe and rapid decrease in commodity prices in the final quarter of 2008. While the vast majority of Glencore's marketing inventories are contractually sold or hedged, the remaining inventory, primarily relating to those commodities where terminal hedging markets do not exist or are very limited, was subject to inventory net realisable value adjustments of U.S.$341 million (included in the U.S.$435 million above).

In addition, Glencore's share of income from its associate Xstrata included various impairment charges booked directly by Xstrata totalling U.S.$415 million.

The table below sets forth, for the year ended 31 December 2009, certain selected line items extracted without material adjustment from the historical financial information contained in Section VI: "Historical Financial Information" and the aggregate effect on such historical financial information and on the non-IFRS measures of Adjusted EBITDA and Adjusted EBIT as defined in "Presentation of Information".

2009	Historical financial information (audited)	Exceptional items (unaudited)	Pre-exceptional financials (unaudited)
		(U.S.$ million)	
Revenue	106,364	0	106,364
Cost of goods sold	(103,133)	60[(1)]	(103,073)
Selling and administrative expenses	(839)	0	(839)
Share of income from associates and jointly controlled entities	82	761[(2)]	843
Gain/(loss) on sale of investments—net	33	(33)[(3)]	0
Other income/(expense)—net	35	303[(4)]	338
Dividend income	12	0	12
Interest income	267	0	267
Interest expense	(854)	0	(854)
Income before income taxes and attribution	1,967	1,091	3,058
Income tax expense	(238)	0	(238)
Income before attribution	1,729	1,091	2,820
Attribution to profit participation shareholders	(650)	0	(650)
Income for the year	1,079	1,091	2,170
Adjusted EBITDA (audited)	3,108	821	3,929
Adjusted EBIT (audited)	2,486	821	3,307

Notes:

(1) Inventory net realisable value adjustments of U.S.$30 million and severance and other adjustments of U.S.$30 million recognised in the Metals and Minerals business segment.

(2) Glencore's share of asset impairment charges booked directly by Xstrata (U.S.$736 million) and Century Aluminum (U.S.$25 million).

(3) Gain on the disposal of the East Tennessee Zinc operations (U.S.$97 million) offset by a loss on disposal of the 51 per cent. interest in Refineria de Cartagena S.A. and a dilution loss, following Xstrata's 2009 capital raising, which saw Glencore's effective ownership in Xstrata reduce from 35.2 per cent. to 34.9 per cent.

(4) Expenses associated with the Prodeco call option arrangement with Xstrata.

In 2009, Glencore recognised U.S.$1,091 million of exceptional items, which consisted primarily of its share of asset impairment charges booked directly by Xstrata (U.S.$736 million) and Century Aluminum (U.S.$25 million) and costs related to the Prodeco call option (U.S.$303 million). In March 2009, Xstrata acquired Glencore's Colombian Coal Group (Prodeco) for U.S.$2 billion and concurrently granted an option to Glencore to repurchase Prodeco within 12 months for U.S.$2.25 billion plus profits accrued during the option period and the net balance of any cash invested. Given the repurchase option, the Prodeco business, consolidated by Glencore, was not de-recognised and the fair value of the proceeds was accounted for as a liability. As at 31 December 2009, U.S.$303 million of expenses were accrued under this option arrangement.

The table below sets forth for the year ended 31 December 2010 certain selected line items extracted from the historical financial information contained in Section VI: "Historical Financial Information", and the aggregate effect of certain exceptional items on such historical financial information, and on the non-IFRS measures of Adjusted EBITDA and Adjusted EBIT as defined in "Presentation of Information".

2010	Historical financial information (audited)	Exceptional items (unaudited)	Pre-exceptional financials (unaudited)
		(U.S.$ million)	
Revenue	144,978	0	144,978
Cost of goods sold	(140,467)	0	(140,467)
Selling and administrative expenses	(1,063)	0	(1,063)
Share of income from associates and jointly controlled entities	1,829	0	1,829
Gain/(loss) on sale of investments—net	(6)	6	0
Other income/(expense)—net	(8)	(144)(1)	(152)
Dividend income	13	0	13
Interest income	281	0	281
Interest expense	(1,217)	39(2)	(1,178)
Income before income taxes and attribution	4,340	(99)	4,241
Income tax expense	(234)	0	(234)
Income before attribution	4,106	(99)	4,007
Attribution to profit participation shareholders	(2,460)	0	(2,460)
Income for the year	1,646	(99)	1,547
Adjusted EBITDA (audited)	6,201	0	6,201
Adjusted EBIT (audited)	5,290	0	5,290

Notes:

(1) Net of exceptional expenses of U.S.$1,038 million and exceptional income of U.S.$1,182 million as detailed below.

(2) U.S.$39 million write-off of capitalised borrowing costs.

In 2010, Glencore recognised a net U.S.$99 million of exceptional items. Exceptional expenses of U.S.$1,038 million primarily arose from negative mark to market fair value movements on certain fixed price forward coal sale contracts relating to Prodeco's future production that will be physically delivered that did not qualify for "own use" or cash flow hedge treatment (U.S.$790 million) and U.S.$225 million from the Prodeco call option transaction entered into in 2009 described above. The expenses were offset with exceptional income of U.S.$1,182 million resulting from the reversal of impairments incurred in 2008 against Glencore's interest in Xstrata following an upward revision of long-term base metals and coal price assumptions (U.S.$674 million), a net gain of U.S.$462 million arising from the revaluation of previously held interests in Vasilkovskoje Gold following the acquisition of the remaining 60 per cent. interest not previously owned and a net gain of U.S.$46 million arising from the debt amendment and restatement and impairment of Russneft related loans and investment, respectively.

Adjusted financial information by business segment

Glencore is organised and operated on a worldwide basis in three major business segments—Metals and Minerals, Energy Products and Agricultural Products, reflecting the structure used by Glencore's management to assess the performance of Glencore. The following selected historical financial data as at 31 December 2008, 2009 and 2010 and for each of the three years in the period ended 31 December 2010 have been extracted without material adjustment from the historical financial information contained in Section VI: "Historical Financial Information" that has been prepared on the basis described in the footnotes to the historical financial information, with the exception of the Non-IFRS Measures, which are defined in "Presentation of Information" and calculated in Section VI: "Historical Financial Information".

2008	Metals and Minerals	Energy Products	Agricultural Products	Corporate and other	Total
			(U.S.$ million)		
Revenue					
Revenue from third parties	40,685	98,157	13,394	0	152,236
Marketing activities					
Adjusted EBIT[3]	776	1,609	579	(103)	2,861
Exceptional items included above	341	0	0	0	341
Adjusted EBIT pre-exceptional items	1,117	1,609	579	(103)	3,202
Depreciation and amortisation	0	0	0	13	13
Adjusted EBITDA pre-exceptional items	1,117	1,609	579	(90)	3,215
Industrial activities					
Adjusted EBIT[3]	497	522	99	1,147	2,265
Exceptional items included above	356	0	0	389	745
Adjusted EBIT pre-exceptional items	853	522	99	1,536	3,010
Depreciation and amortisation	441	110	11	0	562
Adjusted EBITDA pre-exceptional items	1,294	632	110	1,536	3,572
Total adjusted EBITDA pre-exceptional items[4]	2,411	2,241	689	1,446	6,787
Depreciation and amortisation excluded above	(441)	(110)	(11)	(13)	(575)
Total Adjusted EBIT pre-exceptional items	1,970	2,131	678	1,433	6,212
Exceptional items excluded above					(1,086)
Interest expense—net					(837)
(Loss)/gain on sale of investments—net					7
Other (expense)/income—net					(2,960)
Income tax expense					(268)
Income before attribution					1,068
Current assets	16,257	14,746	2,315	2,251	35,569
Current liabilities	(10,538)	(10,900)	(1,331)	(2,692)	(25,461)
Allocatable current capital employed	5,719	3,846	984	(441)	10,108
Property, plant and equipment	4,859	1,587	413	0	6,859
Investments in associates and other investments	2,421	1,453	95	12,060	16,029
Non-current advances and loans	494	1,243	25	64	1,826
Allocatable non-current capital employed	7,774	4,283	533	12,124	24,714
Other assets[1]	0	0	0	1,028	1,028
Other liabilities[2]	0	0	0	(19,539)	(19,539)
Total net assets	13,493	8,129	1,517	(6,828)	16,311
Included in property, plant and equipment are:					
Additions	1,062	698	102	13	1,875

Notes:

(1) Other assets include deferred tax assets, cash and cash equivalents, marketable securities and assets held for sale.

(2) Other liabilities include borrowings, deferred income, deferred tax liabilities, provisions, commodities sold with agreements to repurchase and Prodeco call option arrangement.

(3) Adjusted EBIT of U.S.$5,126 million represents Adjusted EBIT pre-exceptional items of U.S.$6,212 million less exceptional items of U.S.$1,086 million.

(4) Adjusted EBITDA OF U.S.$5,701 million represents Adjusted EBITDA pre-exceptional items of U.S.$6,787 million less exceptional items of U.S.$1,086 million.

2009	Metals and Minerals	Energy Products	Agricultural Products	Corporate and other	Total
			(U.S.$ million)		
Revenue					
Revenue from third parties	35,391	62,391	8,582	0	106,364
Marketing activities					
Adjusted EBIT[3]	523	945	304	(211)	1,561
Exceptional items included above	30	0	0	0	30
Adjusted EBIT pre-exceptional items	553	945	304	(211)	1,591
Depreciation and amortisation	0	0	0	15	15
Adjusted EBITDA pre-exceptional items	553	945	304	(196)	1,606
Industrial activities					
Adjusted EBIT[3]	443	413	41	28	925
Exceptional items included above	55	0	0	736	791
Adjusted EBIT pre-exceptional items	498	413	41	764	1,716
Depreciation and amortisation	521	49	37	0	607
Adjusted EBITDA pre-exceptional items	1,019	462	78	764	2,323
Total adjusted EBITDA pre-exceptional items[4]	1,572	1,407	382	568	3,929
Depreciation and amortisation excluded above	(521)	(49)	(37)	(15)	(622)
Total Adjusted EBIT pre-exceptional items	1,051	1,358	345	553	3,307
Exceptional items excluded above					(821)
Interest expense—net					(587)
(Loss)/gain on sale of investments—net					33
Other (expense)/income—net					35
Income tax expense					(238)
Income before attribution					1,729
Current assets	18,244	13,860	2,294	2,043	36,441
Current liabilities	(9,759)	(6,844)	(882)	(2,894)	(20,379)
Allocatable current capital employed	8,485	7,016	1,412	(851)	16,062
Property, plant and equipment	5,672	679	494	0	6,845
Investments in associates and other investments	2,129	924	41	14,989	18,083
Non-current advances and loans	1,054	1,382	34	65	2,535
Allocatable non-current capital employed	8,855	2,985	569	15,054	27,463
Other assets[1]	0	0	0	2,372	2,372
Other liabilities[2]	0	0	0	(27,953)	(27,953)
Total net assets	17,340	10,001	1,981	(11,378)	17,944
Included in property, plant and equipment are:					
Additions	607	393	116	0	1,116

Notes:

(1) Other assets include deferred tax assets, cash and cash equivalents, marketable securities and assets held for sale.

(2) Other liabilities include borrowings, deferred income, deferred tax liabilities, provisions, commodities sold with agreements to repurchase, Prodeco call option arrangement and liabilities held for sale.

(3) Adjusted EBIT of U.S.$2,486 million represents Adjusted EBIT pre-exceptional items of U.S.$3,307 million less exceptional items of U.S.$821 million.

(4) Adjusted EBITDA of U.S.$3,108 million represents Adjusted EBITDA pre-exceptional items of U.S.$3,929 million less exceptional items of U.S.$821 million.

2010	Metals and Minerals	Energy Products	Agricultural Products	Corporate and other	Total
			(U.S.$ million)		
Revenue					
Revenue from third parties	45,211	89,349	10,418	0	144,978
Marketing activities					
Adjusted EBIT(3)	1,401	450	659	(173)	2,337
Depreciation and amortisation	0	20	0	10	30
Adjusted EBITDA	1,401	470	659	(163)	2,367
Industrial activities					
Adjusted EBIT(3)	1,160	235	58	1,500	2,953
Depreciation and amortisation	708	124	49	0	881
Adjusted EBITDA	1,868	359	107	1,500	3,834
Total adjusted EBITDA(4)	3,269	829	766	1,337	6,201
Depreciation and amortisation excluded above	(708)	(144)	(49)	(10)	(911)
Total Adjusted EBIT pre-exceptional items	2,561	685	717	1,327	5,290
Interest expense—net					(936)
(Loss)/gain on sale of investments—net					(6)
Other (expense)/income/—net					(8)
Income tax expense					(234)
Income before attribution					4,106
Current assets	17,901	15,759	5,958	2,869	42,487
Current liabilities	(8,597)	(11,237)	(2,000)	(2,594)	(24,428)
Allocatable current capital employed	9,304	4,522	3,958	275	18,059
Property, plant and equipment	8,860	2,489	739	0	12,088
Investments in associates and other investments	2,134	1,108	157	15,805	19,204
Non-current advances and loans	813	2,832	113	72	3,830
Allocatable non-current capital employed	11,807	6,429	1,009	15,877	35,122
Other assets(1)	0	0	0	2,178	2,178
Other liabilities(2)	0	0	0	(32,852)	(32,852)
Total net assets	21,111	10,951	4,967	(14,522)	22,507
Included in property, plant and equipment are:					
Additions	1,001	818	71	0	1,890

Notes:

(1) Other assets include deferred tax assets, cash and cash equivalents, marketable securities and assets held for sale.

(2) Other liabilities include borrowings, deferred income, deferred tax liabilities, provisions, commodities sold with agreements to repurchase, Prodeco call option arrangement and liabilities held for sale.

(3) Adjusted EBIT of U.S.$5,290 million equals Adjusted EBIT pre-exceptionals.

(4) Adjusted EBITDA of U.S.$6,201 million equals Adjusted EBITDA pre-exceptionals.

Other operating and industry data

Average market prices

The following table sets out the indicative average market prices in U.S. dollars for the main commodities which Glencore produces and/or markets for the periods indicated:

		Six months ended						One month ended	
	Units	30 June 2008	31 December 2008	30 June 2009	31 December 2009	30 June 2010	31 December 2010	31 January 2011	28 February 2011
Metals and Minerals									
Zinc[1]	U.S.$/MT	2,283	1,487	1,330	1,986	2,156	2,165	2,376	2,473
Copper[1]	U.S.$/MT	8,136	5,791	4,067	6,261	7,129	7,947	9,553	9,881
Lead[1]	U.S.$/MT	2,606	1,581	1,333	2,105	2,083	2,214	2,584	2,596
Gold[2]	U.S.$/oz	911	832	915	1,031	1,152	1,297	1,356	1,373
Silver[2]	U.S.$/oz	17	13	13	16	18	23	28	31
Aluminium[1]	U.S.$/MT	2,850	2,306	1,429	1,908	2,130	2,216	2,440	2,515
Nickel[1]	U.S.$/MT	27,321	14,961	11,780	17,553	21,217	22,403	25,621	28,412
Cobalt[3]	U.S.$/lb	48.1	28.8	15.3	19.4	21.7	19.4	19.9	20.0
Ferro-Chrome[3]	U.S.$/lb	2.2	2.0	0.8	0.9	1.3	1.3	1.4	1.4
Molybdenum[3]	U.S.$/lb	32.9	26.9	9.5	13.2	16.3	15.5	16.8	17.6
Vanadium[3]	U.S.$/lb	14.4	12.7	5.2	6.9	7.1	6.8	6.9	7.1
Iron ore[3]	U.S.$/t	186	120	73	97	150	155	185	194
Energy Products									
Crude WTI[7]	U.S.$/bbl	111	88	51	72	78	81	90	81
RBOB Gasoline[5]	U.S.$/Gal	283	214	148	190	213	211	244	211
Henry Hub Natural Gas[5]	U.S.$/MMBtu	10.1	7.7	4.1	4.2	4.7	4.1	4.5	5.8
Thermal coal (API4)[4]	U.S.$/t	116	125	64	65	87	96	123	118
Agricultural Products									
Wheat[6]	U.S.¢/BUSHEL	931	665	556	504	482	679	804	640
Soya bean meal[6]	U.S.¢/short ton	353	315	329	323	280	321	374	322
Corn[6]	U.S.¢/BUSHEL	574	480	391	356	363	492	635	448
Sugar No. 11[7]	U.S.¢/lb	12	12	14	22	20	25	32	18
Cotton No. 2[7]	U.S.¢/lb	71	56	50	64	79	109	152	74

Sources:

(1) Average price for the period as provided by the London Metal Exchange.

(2) Average price of the period as provided by London Bullion Market Association.

(3) Average price for the period as provided by Metal Bulletin Inc. For Iron ore: Steel China Iron Ore Fines cfr China port (63.5% fe).

(4) Average price for the period as provided by the Angus McCloskey's Coal Price Index Report. For Coal: Richards Bay.

(5) Average price for the period as provided by NYMEX.

(6) Average price for the period as provided by Chicago Board of Trade.

(7) Average price for the period as provided by InterContinental Exchange.

Discussion of market price trends

Metals and Minerals

Zinc

Global zinc demand surged to 12.7 million MT in 2010 after being severely depressed in 2009 by weak macroeconomic conditions and significant de-stocking as manufacturers reduced inventories in response to weak demand. Global vehicle production rebounded strongly in 2010, up by more than 20 per cent. compared to the previous year, led by China where vehicle output rose by approximately 30 per cent. during 2009, exceeding U.S. output levels. Chinese construction and infrastructure growth continued, providing support for zinc demand in that region, while construction activity in Europe and the U.S. was much more muted.

Against this background, LME zinc prices traded in the range of U.S.$2,000 to U.S.$2,500/MT for most of 2010, though dipping below U.S.$2,000/MT from May to July, reflecting a sell-off in global markets. The average LME price for 2010 was U.S.$2,160/MT compared with an average price of U.S.$1,658/MT in 2009.

Copper

Global copper demand grew rapidly during 2010 on the back of a rebound in economic growth. China continued to lead global copper demand growth as stimulus measures first introduced by the government in 2009 continued throughout the year, driving strong end-use demand for copper. Global copper mine supply failed to keep pace with demand growth during 2010, despite mine restarts encouraged by high copper prices. As a result of these drivers, copper price averaged U.S.$7,947/MT in the six months ended 31 December 2010 and closed the year at a high of U.S.$9,650/MT on a cash basis, having risen significantly from its low point in mid-2010. In the first two months of 2011, copper prices continued to rise, averaging U.S.$9,533/MT and U.S.$9,881/MT, in January and February, respectively. These increases were due to the continued shortages of supply in the market.

Lead

Global demand for lead rose to 8.8 million MT in 2010, as strong Chinese consumption continued to drive global demand growth. Lead consumption throughout the rest of Asia benefitted from China's strength, though this was partly offset by declining demand in Western Europe. Chinese consumption was fuelled by demand for both automotive batteries and stationary batteries used in backup power supply systems, telecommunication networks and renewal energy storage applications. In this context, LME lead prices traded between U.S.$2,000/MT and U.S.$2,600/MT for most of 2010, though prices dropped below this range between May and July as a result of a sell-off in global markets. The average LME price for 2010 was U.S.$2,148/MT, 24 per cent. higher than an average of U.S.$1,719/MT in 2009.

Gold

Gold price volatility remained high in 2010, with the price ranging from U.S.$1,045/oz to U.S.$1,431/oz during the year. The average market price for the year of U.S.$1,225/oz was an all-time high. The financial crisis of 2008, the subsequent slow pace of the economic recovery and government stimulus measures adopted in response by the largest developed economies, including the United States, the Eurozone and Japan, has resulted in large fiscal deficits in these jurisdictions. These deficits have triggered concerns of sovereign debt defaults, particularly in the Eurozone. Furthermore, the monetary policies put in place by the world's most prominent central banks remain very accommodative in an attempt to increase the rate of economic growth and reduce unemployment levels, with short-term U.S. interest rates at historic lows. Gold has historically played an important role as a constant measure of value. The continuing uncertain macroeconomic environment and loose monetary policies have resulted in gold performing its traditional role as a store of value. Consequently, gold has continued to be viewed as a safe haven investment, which has resulted in a strong increase in investment demand.

Aluminium

Demand for aluminium has continued to improve throughout 2010, driven by strong economic activity in Asia, South America and both Central and Eastern Europe. Demand in the U.S. and Japan stabilised in the third quarter following a run-up in consumption driven by the automotive and engineered products sectors. Underlying demand for consumer products, including packaging and beverage cans, has continued to support the rolled products segment. As a result of a more balanced market, aluminium prices continued their recovery during 2010: the average price in the six months ended 31 December 2010 was 4 per cent. higher. at U.S.$2,216/MT than an average of U.S.$2,130/MT in the six months ended 30 June 2010. The yearly average in 2010 was U.S.$2,173/MT – up 30 per cent. from U.S.$1,668/MT in 2009.

Nickel

Global demand for nickel improved during 2010 due to continuing growth in China and economic recovery in developed markets. The increasing intensity of nickel usage in China helped to mitigate the impact of the financial crisis on demand and continues to favourably impact global consumption of nickel. In developed markets, economic recovery, together with restocking by stainless steel processors and consumers during the year, also contributed to the recovery in nickel demand from the stainless steel sector. The LME cash settlement nickel was volatile during 2010 ranging between U.S.$17,200/MT and U.S.$27,900/MT to average U.S.$21,800/MT, which is 49 per cent. higher than the average in 2009. The overall positive price trend over 2010 could also be partially attributed to the year-long strike at Vale's nickel operations. Nickel prices continued to rise in early 2011, with average prices reaching

U.S.$25,621/MT and U.S.$28,412/MT in January and February, respectively, following the increase in demand caused by improving economic conditions.

Energy Products

Oil

Dated Brent crude for 2010 averaged U.S.$78.50/bbl, approximately 28 per cent. above 2009's average of U.S.$61.50/bbl. Prices traded in a relatively narrow band of U.S.$70-80/bbl for most of the year before rising in the fourth quarter. Prices exceeded U.S.$90/bbl per barrel in December 2010, the highest level since October 2008.

The price pattern was dominated by the supply and storage overhang that existed from the prior year. However, as the year progressed, this overhang diminished as global oil consumption rebounded due to the recovery in the global economy and several one-time factors. Growth was more pronounced in China. The relative stability in crude oil prices for much of the year also reflected the stability of OPEC crude oil supply and its ability to manage prices through quota fixing throughout 2010. Commercial oil inventories in the OECD remained high for much of the year, creating an environment of low European refinery margins, which caused lower refinery utilisation, before falling in the fourth quarter as the global supply-balance began to tighten.

Thermal coal

The tightening global supply-demand balance during 2010 resulted in strengthening thermal coal prices in the second half of 2010 in both the Pacific and Atlantic markets, as well as the Chinese domestic market. Spot coal prices in the Pacific market largely traded in the range of U.S.$90 to U.S.$100/MT FOB for most of the year, before strengthening in mid-November and reaching a high of U.S.$129/MT at the end of December 2010. Benchmark contract prices for the 2010 Japanese Financial Year and mid-year contracts negotiated in March and September, respectively, were both settled at U.S.$97.75/MT, while 2011 contracts negotiated in December settled at U.S.$115/MT. On a global basis, the McCloskey's Coal Price Index Report averaged U.S.$87/MT in the six months ended 30 June 2010 and U.S.$96/t in the six months ended 31 December 2010, reflecting the above-mentioned pattern of progressively tightening supply-demand balance. Prices have continued to rise, reaching U.S.$123/t and U.S.$118/t in January and February of 2011, respectively, caused by continued tightness in the market.

Agricultural Products

Prices of key agricultural products rose sharply in the six months ended 31 December 2010 as a result of continued strong demand from the PRC for oil seeds, the Middle East for grains and a number of weather-related supply problems, notably from drought in Russia in the summer of 2010. The Chicago Board of Trade wheat price increased by 36 per cent. from an average of U.S.¢482/bushel in the six months ended 30 June 2010 to an average of U.S.¢658/bushel in the six months ended 31 December 2010, while the Chicago Board of Trade soya bean price increased by 15 per cent. from an average of U.S.¢956/bushel in the six months ended 30 June 2010 to an average of U.S.¢1,103/bushel in the six months ended 31 December 2010. Early 2011 saw significant fluctuations in the price of wheat, corn and cotton due to concerns about regional weather conditions and supply in the market.

Marketing volumes sold to third parties

The following table sets out the approximate volumes of each of Glencore's main commodities that were sold to third parties through Glencore's marketing business in each of the years ended 31 December 2008, 2009 and 2010.

	Unit	2008	2009	2010
Metals and Minerals				
Zinc metal	m MT	1.0	1.3	1.7
Zinc concentrates	m MT	2.6	2.5	2.4
Copper metal	m MT	1.4	1.4	1.4
Copper concentrates	m MT	2.2	2.0	1.8
Lead metal	m MT	0.2	0.4	0.3
Lead concentrates	m MT	0.5	0.5	0.6
Gold	000 oz	447	578	589
Silver	000 oz	13,604	11,422	8,527
Alumina	m MT	6.5	5.8	6.7
Aluminium	m MT	2.4	3.2	3.9
Ferroalloys (including agency)	m MT	1.8	2.2	2.6
Nickel	000 MT	156.9	175.3	193.9
Cobalt	000 MT	25.5	23.7	17.9
Iron ore	m MT	0.9	4.8	9.3
Energy Products				
Crude oil	m MT	39.7	39.7	51.9
Oil products	m MT	68.7	69.3	66.9
Thermal coal	m MT	90.1	98.0	92.2
Metallurgical coal	m MT	5.6	7.7	8.0
Coke	m MT	1.5	0.3	0.7
Agricultural Products				
Grains	m MT	20.5	19.8	20.9
Oil/oilseeds	m MT	8.6	8.1	9.4
Cotton	m MT	0	0	0.2
Sugar	m MT	0.9	1.0	0.5

Total industrial asset production

The following table sets out the total production in each of Glencore's key commodities for which Glencore has production assets.

	Year ended 31 December[1]		
	2008 Production	2009 Production	2010 Production
		('000 MT)	
Metals and Minerals			
Zinc metal	446	437	446
Zinc concentrates	565	227	390
Copper metal	419	464	476
Copper concentrates	155	184	185
Lead metal	179	121	115
Lead concentrates	60	34	46
Gold ('000 toz)	183	238	348
Silver ('000 toz)	7,618	6,286	6,731
Aluminium	74.9	16.5	—
Alumina	1,455	1,206	1,259
Cobalt	2.2	3.8	4.5
Tin concentrates	5	4	4
Nickel	30.5	33.0	28.4
Energy Products			
Coal	22,761	23,600	19,746
Agricultural Products			
Wheat	258.5	327.4	335.3
Barley	84.8	104.7	59.6
Corn	135.1	63.8	111.7
Rapeseeds	6.1	17.1	16.7
Sunflower seeds	87.1	62.5	54.2
Soybeans	103.8	81.9	122.0

Note:

(1) Production figures represent the total production from a particular mine or operation for the entire year of operation, regardless of Glencore's percentage ownership of that mine or operation.

SECTION IV: OPERATING AND FINANCIAL REVIEW

The following discussion of Glencore's financial condition and results of operations should be read in conjunction with Section I: "Information on Glencore", Section XIII: "Information on Commodities" and Glencore's historical financial information as of and for the years ended 31 December 2008, 31 December 2009 and 31 December 2010, including the schedules and notes thereto and the reports thereon, which appear in Section VI: "Historical Financial Information". The historical financial information referred to in this discussion has been prepared in accordance with IFRS as explained in Section VI: "Historical Financial Information". The financial information considered below has been extracted from Section VI: "Historical Financial Information".

The following discussion of Glencore's results of operations and financial conditions contains forward-looking statements. Glencore's actual results could differ materially from those that it discusses in these forward-looking statements. Factors that could cause or contribute to such differences include those discussed below and elsewhere in this Prospectus, particularly in "Risk Factors" and "Information regarding forward-looking statements" in "Presentation of Information".

Overview

Glencore is a leading integrated producer and marketer of natural resources, with worldwide activities in the marketing of metals and minerals, energy products and agricultural products and the production, refinement, processing, storage and transport of these products. Glencore operates on a global scale, marketing and distributing physical commodities sourced from third party producers and own production to industrial consumers, such as those in the automotive, steel, power generation, oil and food processing industries. Glencore also provides financing, logistics and other services to producers and consumers of commodities. Glencore's long experience as a commodity merchant has allowed it to develop and build upon its expertise in the commodities which it markets and cultivate long-term relationships with a broad supplier and customer base across diverse industries and in multiple geographic regions. Glencore's marketing activities are supported by investments in industrial assets operating in Glencore's core commodities. Glencore's industrial, geographical, commodity, supplier and customer diversity, in combination with its long-term supplier and customer relationships, has enabled Glencore to operate profitably even during periods in which a particular commodity, industry, customer or geographic region may be experiencing some weakness. In addition, Glencore's marketing operations are less correlated to commodity prices than its industrial operations, which makes Glencore's earnings less volatile than those of producers of metals and mining products and energy products that do not also have marketing and logistics operations.

As a marketer, Glencore is able to differentiate itself from other production entities as, in addition to focusing on minimising costs and maximising operational efficiencies, Glencore focuses on maximising returns from the entire supply chain, taking into account its extensive and global third party supply base, its logistics, risk management and working capital financing capabilities, extensive market insight, business optionality, its extensive customer base, strong market position and penetration in more commodities and economies of scale. In contrast, this is not the business model of Glencore's mainly industrial competitors who are generally not set up to exploit the full range of value added margin and arbitrage opportunities which exist throughout the commodity supply chain.

Glencore's consolidated revenues for the years ended 31 December 2009 and 31 December 2010 were U.S.$106,364 million and U.S.$144,978 million, and its income before attribution for the years ended 31 December 2009 and 31 December 2010 were U.S.$1,729 million and U.S.$4,106 million. As at 31 December 2010, Glencore's total assets amounted to U.S.$79,787 million. Measured by revenues, Glencore believes it was one of the world's largest privately held companies during this period.

In relation to its addressable market, Glencore believes it is one of the world's largest physical suppliers of third party sourced commodities in respect of the majority of the metals and minerals which it markets, among the world's largest non-integrated physical suppliers of crude oil and oil products, as well as the world's largest participant in the supply of seaborne steam coal, including attribution of the volumes under a number of exclusive advisory and agency arrangements with, amongst others, its associate company Xstrata. Glencore believes it is among the world's leading suppliers of sugar and one of the leading exporters of grain from Europe, the CIS and Australia.

Prior to UK Admission, Glencore will complete the Restructuring whereby the holding companies of the Glencore Group will be reorganised for the purposes of listing on the London and Hong Kong Stock Exchanges.

Basis of presentation

Unless indicated otherwise, financial information in this Prospectus has been prepared in accordance with IFRS issued by the International Accounting Standards Board (the "IASB") and as adopted for use in the EU. Glencore has adopted all of the new and revised Standards and Interpretations issued by the IASB and the International Financial Reporting Interpretations Committee (the "IFRIC") and as adopted by the EU that are relevant to its operations and effective for accounting periods beginning on 1 January 2010 and that are expected to be applied for the accounting period beginning on 1 January 2011. In addition, Glencore adopted IFRS 8 "Operating Segments" which requires disclosure of certain information relating to Glencore's operating segments pending the filing of its financial statements with a securities commission for the purpose of issuing shares to the public. The adoption of these new and revised Standards and Interpretations did not have a material impact on the recognition and measurement of reported amounts.

Segmental reporting

Glencore conducts its operations through three business segments: Metals and Minerals, Energy Products and Agricultural Products. For further details on each business segment, see Section I: "Information on Glencore".

- The Metals and Minerals business segment focuses on the following commodity departments: zinc/copper/lead, alumina/aluminium and ferroalloys/nickel/cobalt/iron ore. In addition, the business segment also markets some gold, silver, tin and other by-products such as sulphuric acid. The activities of Glencore's Metals and Minerals business segment are supported by ownership interests in controlled and non-controlled industrial assets such as mining, smelting, refining and warehousing operations.
- The Energy Products business segment focuses on the following commodity departments: oil and coal/coke. The activities of Glencore's Energy Products business segment are supported by ownership interests in controlled and non-controlled coal mining and oil production operations as well as investments in strategic handling, storage and freight equipment and facilities.
- The Agricultural Products business segment focuses on the following commodities: grains (including wheat, maize and barley), oils/oilseeds, cotton and sugar. The activities of Glencore's Agricultural Products business segment are supported by investments in controlled and non-controlled storage, handling, processing and port facilities in strategic locations.

Recent developments

In January 2011, Glencore issued CHF225 million (U.S.$235 million) 3.625 per cent. bonds due April 2016, increasing the size of its CHF bond series to CHF825 million. The proceeds from this bond issue were used to redeem U.S.$300 million out of U.S.$700 million 8 per cent. perpetual notes on 6 February 2011. In February 2011, Glencore concluded a new one year committed U.S.$600 million European oil receivables borrowing base facility, now fully drawn. Recently, Glencore replaced the previous 364 day U.S.$1,375 million and the U.S.$515 million Asian focused tranche revolving credit facilities with two new 364 day revolving credit facilities for U.S.$2,925 million and U.S.$610 million, both with a one year term extension option at the borrower's discretion. In addition, Glencore extended the final maturity of U.S.$8,340 million out of the U.S.$8,370 million medium term revolver for a further year to May 2014. In aggregate, the three tranches represent an increase in committed available liquidity of U.S.$1,645 million. All of these transactions form part of Glencore's ordinary course financing activities.

Glencore has agreed with Verny to acquire additional stakes in Kazzinc. These purchases will increase its ownership from 50.7 per cent. to 93.0 per cent. for a total transaction consideration of U.S.$3.2 billion. Subject to satisfaction of certain conditions, which include receipt of applicable regulatory approvals and the occurrence of UK Admission, consideration for these purchases will be settled through the issuance of U.S.$1 billion of Ordinary Shares at the Offer Price (such issuance expected to occur at the earlier of UK Admission and satisfaction of applicable conditions precedent) and U.S.$2.2 billion in cash (to be paid in tranches between October and December 2011). The acquisition of these additional stakes is expected to be completed by the end of December 2011. The terms of the acquisition have been negotiated on an arm's length basis and the price and structuring of the consideration in respect of these purchases is based on Glencore's detailed valuation of Kazzinc. In addition, Glencore's stake in Kazzinc may be further increased to 99.4 per cent. through the exercise of a put or call option in respect of Verny Investments' remaining 6.4 per cent. interest in Kazzinc, which is conditional on amongst other things, an initial public offering of Kazzinc's gold assets. Glencore will, subject to its commercial decision based on prevailing market conditions, use reasonable commercial endeavours to seek listing for the appropriate entity subject to such entity's eligibility for listing. See Section X: "Additional Information" for further details of these purchases and the terms of the Kazzinc SPAs. Glencore believes its increased stakes in Kazzinc will simplify the ownership structure as Kazzinc seeks to complete the expansion across its base metals mining and processing operations and its Altyntau gold division. This consolidation of Glencore's interests in Kazzinc will provide an enhanced platform for regional expansion and growth opportunities.

The acquisition, if completed, will be accounted for under IAS 27 *Consolidated and Separate Financial Statements* as an equity transaction (a transaction with owners in their capacity as owners) and on the date of completion will result in a net decrease in total equity on Glencore's consolidated statement of financial position of U.S.$2.2 billion equating to the cash component of the consideration. There will be no change to the underlying assets and liabilities of Kazzinc in Glencore's consolidated statement of financial position. Following the date of closing, an additional 42.3 percent of Kazzinc's income thereafter will be attributable to equity holders of Glencore with the remaining 7.0 per cent. being attributed to the non controlling interests in Kazzinc.

Factors affecting results of operations and financial condition of Glencore

Glencore is primarily engaged in the physical marketing and production of commodities on a worldwide basis. Glencore's results of operations are primarily affected by global macroeconomic trends, commodity prices, impact of freight rates, marketing volumes, production volumes, the financial performance of associates and other investments, production costs and efficiency and exceptional items. Each of these key factors is discussed below.

Identifying and responding to global macroeconomic trends and exploiting physical commodity arbitrage opportunities as they arise

Glencore's long-term experience in the commodities markets has allowed it to build up extensive market knowledge and insight. Glencore believes that being a major global physical marketer of commodities with leading market positions in its key commodities enables it to, among other things, maintain knowledge of local market supply and demand dynamics and respond quickly to changes in market conditions and characteristics and gain significant insight into trade flows and marketing requirements. This enables Glencore to have continuous price discovery of the commodities it produces and/or markets and rapid identification and investigation of arbitrage opportunities in respect of those commodities. In addition, Glencore's industrial assets are strategically important to, among other things, generate additional market information, including local information in the countries and regions in which the industrial assets are based.

Many of the physical commodity markets in which Glencore operates are fragmented or periodically volatile. As a result, discrepancies generally arise in respect of the prices at which the commodities can be bought or sold in different forms, geographic locations or time periods, taking into account the numerous relevant pricing factors, including freight and product quality. These pricing discrepancies can present Glencore with arbitrage opportunities whereby Glencore is able to generate profit by sourcing, transporting, blending, storing or otherwise processing the relevant commodities. Whilst the strategies used by Glencore's business segments to generate such margin vary from commodity to commodity, the main arbitrage strategies can be generally described as being geographic, product and time-related. See Section I: "Information on Glencore" for information related to these strategies. Glencore's ability to successfully identify and implement marketing strategies to take advantage of potential arbitrage opportunities throughout the physical commodity supply chain will impact its results of operations. Failure of such opportunities to present themselves or Glencore's inability to exploit such opportunities will negatively impact its results of operations.

Arbitrage opportunities are generally enhanced by global and regional price volatility and instability in the various commodities markets resulting in market disequilibrium. Glencore believes that, in periods where price components for a particular commodity or group of commodities display relative volatility and, therefore, uncertainty, the number of arbitrage opportunities in such commodities tends to increase, and, in particular, during periods of market tightness (e.g. when inventory levels are low). These market conditions offer additional opportunities to take advantage of the resulting decoupling in premium and discount structures. Conversely, in periods of reduced volatility in commodity prices, Glencore's marketing business tends to have fewer profitable arbitrage opportunities. A relatively flat marketing environment generally reduces price dislocation and, in turn, the number of arbitrage opportunities. Glencore also, from time to time, takes unhedged positions in a particular commodity (within Group limits and policies), based on its understanding of market dynamics and expectation of future price and/or spread movements. For further discussion of Group policies regarding hedging and risk management, please see "—Financial risk management".

Glencore's marketing activities engage in base supply chain activities that generally provide regular generation of income. These base supply chain activities tend to have a balancing effect against the potential volatility in results as Glencore seeks to take advantage of event-driven arbitrage and/or price risk activities. In addition to the informational advantages Glencore enjoys via its global network, its significant market share and logistics capabilities in many commodities allows it to move quickly in response to arbitrage opportunities, exploiting not only the opportunities afforded by fluctuations and disequilibrium in commodity prices, but the underlying supply and demand dynamics as well.

The results of operations of Glencore's marketing activities for 2008, 2009 and 2010 were impacted by, among other things, the individual business segments' arbitrage opportunities, which are dependent, in part, on the strength of the markets, the price of the relevant commodities and the overall marketing environment (contango or backwardation) that existed at any given time during that period.

Commodity prices

Commodity prices are influenced by many factors, including the supply of and demand for commodities, speculative activities by market participants, global political and economic conditions and related industry cycles and production costs in major producing countries. While producers are clearly unable to dictate market prices directly, events such as the withdrawal of commodity production capacity (as was seen in relation to supply to the carbon and stainless steel industries in 2009 when end user demand reduced significantly) and various attempts to capture market share by individual producers could have an effect on market prices. Commodity prices may move in response to changes in production capacity in a particular market, for example, as a new asset comes online or when a large producer experiences difficult operational issues or is impacted by a natural disaster. Furthermore, the producers' actual average realised prices can be affected by contractual arrangements, production levels and hedging strategies. Prices of Glencore's main commodity products, including zinc, copper, lead, ferroalloys, nickel, cobalt, crude oil/oil products, coal, grains, sugar and edible oils can vary significantly as actual and anticipated supply and demand fluctuates. Price variations and market cycles have historically influenced the financial performance of Glencore and are expected to continue to do so in the future.

There are clearly commodity specific fundamentals and events which affect the demand and supply dynamics and pricing outlook for each individual commodity; however, the prices of most metals and energy commodities which Glencore produces and markets have generally followed macroeconomic trends and tend to be relatively closely correlated. Commodity prices were broadly strong during the first half of 2008, falling significantly in the final quarter of 2008, as the global financial crisis took hold. Prices were generally subdued in the first half of 2009 and then, following a brief period of stabilisation, started to progressively increase throughout 2010, as a result of a strengthening and stimulated global economy which drove increased demand for many commodities, particularly in Asia. During the lower points of the cycle, when market conditions were at their most difficult, production capacity was reduced in many commodities, together with significant deferral of capital expenditure. During such time, Glencore also reduced its production levels and delayed capital expenditure at certain of its industrial assets, including placing its Iscaycruz zinc mine (part of Los Quenuales) on care and maintenance during 2009 in response to the unfavourable price environment.

Prices of commodities marketed and produced in Glencore's Agricultural Products business segment similarly experienced a very difficult pricing environment from the second half of 2008 and continuing into the first half of 2009. Increases in prices in the second half of 2009 were not universally sustained into the first half of 2010, with average prices of rice, soya, corn, cotton and soya bean oil reducing in the first half of 2010. For additional detail on average market prices for the main commodities that Glencore markets, please see Section III: "Selected Historical Financial and Other Information."

The impacts that fluctuating commodity prices have on Glencore's business differ between its marketing activities and industrial activities.

- Marketing activities: In a market environment in which prices for a particular commodity are higher on average, the premiums/margins that Glencore generates in its physical marketing operations relating to such commodity as a result of geographical, time and quality imbalances tend to be higher. Glencore also generally benefits from fluctuating market prices, rather than long periods of stable prices, as it seeks to physically arbitrage such resulting price differentials. As prices of commodities rise, Glencore has higher working capital financing requirements over the same quantity of commodities in question. During periods of falling commodity prices, the opposite applies in that Glencore will require less working capital financing for its marketing activities.

- Industrial activities: Higher prices will be particularly favourable to the profitability of Glencore in respect of such commodities which Glencore produces at its industrial assets or are produced by its associated companies and other investees. Similarly, low prices will negatively impact Glencore's industrial activities and could result in such activities incurring losses.

A significant downturn in the price of commodities, as was the case during the fourth quarter of 2008 and much of 2009, generally results in a decline in Glencore's profitability during such a period and could potentially result in a devaluation of inventories and impairments. See "—Exceptional Items". Although the impact of a downturn on commodity prices affects Glencore's marketing and industrial activities, the impact on its industrial activities is generally greater, as the profitability in the industrial activities is more directly exposed to price risk due to its higher level of fixed costs, while Glencore's marketing activities are ordinarily substantially hedged in respect of price risk and principally operate a margin-based model.

Impact of freight rates

Glencore's oil freight desk has a large and diversified fleet of 203 vessels as at 31 December 2010, operated under various short-term and long-term time charters and commercial management arrangements, with an average remaining fixed charge hire period of approximately three years at such date. In total, Glencore has equity interests in 41 vessels, which are delivered or currently under construction and are expected to be progressively delivered by March 2012. Glencore's freight desk contributes to the marketing results of its business segments, providing immediate access to vessels, which can represent a significant time advantage in exploiting short-term marketing opportunities. Having its own freight desk also gives Glencore greater visibility over world trade flows at a particular moment. Due to its internal requirements and the Directors' belief in Glencore's ability to achieve vessel utilisation above average industry levels, Glencore generally has a long position in fleet time chartering, thereby creating a significant exposure to fluctuations in spot freight rates. However, given the nature of the freight market and limited opportunities to hedge all freight price risk, Glencore is generally exposed to some degree of future freight price movements on its long-term time charters, not otherwise subject to hedge, re-let with a third party or to satisfy its own marketing needs.

The combination of a decline in demand for energy products towards the end of 2008 and surplus capacity in the market led to a significant decline in wet freight rates, which reached a low point in the middle of 2009. While rates recovered to some extent towards the end of 2009, there has yet to be a sustained improvement and rates in 2010 remained suppressed relative to historical levels. As a result, Glencore's freight desk experienced losses in 2008, 2009 and 2010, which adversely affected the Energy Products business segment.

Marketing volumes

The volume of commodities marketed by Glencore is a key driver of the results of operations of Glencore's marketing activities. The volume of commodities Glencore markets is dependent on its ability to source and finance the purchase of commodities and its ability to then sell these commodities to new and existing customers.

For further details on the volumes of each of Glencore's key commodities that were sold to third parties through Glencore's marketing business in each of the years ended 31 December 2008, 31 December 2009 and 31 December 2010, please see Section III: "Selected Historical Financial and Other Information."

Although volumes of commodities sold is a key factor in understanding the scale of Glencore's marketing activities and resulting market position and base earnings potential, as noted above, it is also important to assess the potential of additional value added services and arbitrage opportunities at various times and Glencore's ability to capitalise on such opportunities, on the back of its market presence. There may also be a lag effect in the relationship between earnings and sale volume; for example, by storing oil and selling forward at a higher price in a future period, Glencore is able to generate profits without increasing the volumes sold in the current period.

Production volumes

Production volume has a substantial effect on the results of operations of Glencore's industrial activities. Glencore can sell all of its production, so its industrial asset revenue generally fluctuates as a result of changes in realised prices and production volumes. Production volume is dependent on Glencore's production capacity, which is expected to increase for certain commodities, based on Glencore's expansion and development project plans. Per unit production costs are also significantly affected by changes in production volume as, prima facie, higher volumes reduce per unit production costs, given the generally high fixed cost mix in Glencore's industrial activities business. Therefore, Glencore's production levels are a key factor in determining its overall competitiveness and profitability.

For more detail on the total production of the controlled industrial assets in each of Glencore's key commodities, please see Section III: "Selected Historical Financial and Other Information".

Average commodity prices for most of the commodities Glencore produces were significantly lower during 2009 compared to 2008, resulting in lower earnings for Glencore's industrial assets. In this environment, Glencore scaled back production at certain industrial assets, resulting in lower production volumes during 2009. In addition, Glencore's production facilities are periodically stopped for planned repairs and maintenance, as well as unplanned repairs and maintenance due to power outages, flooding, equipment failures, accidents and other reasons, which temporarily reduces Glencore's production volume. See "Risk Factors—Risks relating to Glencore's industrial activities—Glencore's industrial activities involve a number of operating risks and hazards, many of which are outside Glencore's control".

Glencore has planned capital expenditures for significant expansion projects to increase the production volumes of its industrial asset portfolio, which are further described in Section I: "Information on Glencore".

Financial performance of associates and other investments

Glencore's results of operations are affected by the financial performance of its associates and other investments, with Glencore's share of income from associates and jointly controlled entities and dividends received from interests in other investments contributing directly to Glencore's income before income taxes and attribution. Glencore has investments in both listed and non-listed associates, as well as other investments primarily comprising of its 8.8 per cent. interest in UC Rusal, which has at certain times in the past been a significant contributor to Glencore's dividend income. For the years ended 31 December 2008, 31 December 2009 and 31 December 2010, Glencore's share of income from associates and jointly controlled entities and dividends received from other investments was U.S.$1,305 million, U.S.$94 million and U.S.$1,842 million, respectively. The table below sets forth, for the years ended 31 December, Xstrata's and others' contribution to Glencore's income for the year indicated. For further details on Glencore's associates and other investments, please see notes 7 and 8 to Section VI: "Historical Financial Information."

Selected Associate income and dividends	**2008**	**2009**	**2010**
	(U.S.$ million) (unaudited)		
Xstrata[1]	1,147	88	1,729
Other share of income from associates and jointly controlled entities	(80)	(6)	100
Dividends from UC Rusal	232	0	0
Other dividend income	6	12	13
	1,305	94	1,842

Note:

(1) Glencore held a 35.2 per cent., 34.9 per cent. and 34.5 per cent. effective interest in Xstrata as at 31 December 2008, 2009 and 2010, respectively.

The carrying value of Glencore's interest in Xstrata on its balance sheet as at 31 December 2008, 2009 and 2010 was U.S.$10,305 million, U.S.$12,380 million and U.S.$14,616 million, respectively. Carrying value represents the initial cost of Glencore's investment in Xstrata, adjusted for Glencore's share of movements in Xstrata's net income and other equity related items less any impairment in the value of the investment. For additional information on Xstrata and its relationship with Glencore, please see Section I: "Information on Glencore."

Exceptional items

During the period under review, management has identified exceptional items that due to their financial impact nature or expected infrequency of the events giving rise to them, such as gains on sale of investments and impairments of the carrying value of assets, are separated for internal reporting and analysis of Glencore's results to provide a better understanding and comparative basis of the underlying financial performance. These items had a significant impact on Glencore's reported results from operations during the period under review and similar items could have a significant impact on Glencore's reported income in future periods. Many of these exceptional items appear in Glencore's financial statements under "Other income/(expense)—net". The most significant exceptional items identified by management were as follows:

- In 2010, Glencore recognised U.S.$99 million of exceptional expenses, including U.S.$790 million of negative mark to market adjustments associated with fixed price forward coal sales contracts that did not qualify for "own use" or cash flow hedge accounting, U.S.$225 million of Prodeco call option expenses (see below) offset by U.S.$674 million of impairment reversals following the rebound in market conditions and underlying valuation assumptions associated with Glencore's investment in Xstrata and U.S.$462 million related to the revaluation of the initial 40 per cent. interest in Vasilkovskoje Gold immediately prior to the acquisition of the remaining 60 per cent. interest.
- In March 2009, Xstrata acquired Glencore's Colombian Coal Group (Prodeco) for U.S.$2 billion, and concurrently granted Glencore an option to repurchase Prodeco within 12 months for U.S.$2.25 billion plus profits accrued during the option period and the net balance of any cash invested. The sale of Prodeco to Xstrata with the option for Glencore to repurchase at a specified price was undertaken in connection with Xstrata's 2009 rights issue. The transaction allowed Glencore to participate in Xstrata's rights issue by paying with assets rather than cash, thus ensuring the maintenance of Glencore's investment grade credit rating. Glencore's directors considered this transaction to be in the interests of Glencore and in line with its stated strategies and Xstrata's reasoning for the transaction is fully documented in its shareholder circular published in connection with shareholder approval required for such transaction. Since Glencore held a fixed price repurchase option over Prodeco, the conditions for de-recognition or disposal of Prodeco were not met under IFRS and, as a consequence, Prodeco's operations continued to be reflected in the Consolidated Financial Statements, while the proceeds were deferred and recognised as a liability. In March 2010, Glencore exercised its option to repurchase Prodeco from Xstrata. In the year ended 31 December 2010, U.S.$225 million (2009: U.S.$303 million) of option and related expense has been recognised under this arrangement.
- In 2009, Glencore recognised U.S.$1,091 million of exceptional expenses, including U.S.$736 million and U.S.$25 million related to Glencore's share of asset impairment charges booked directly by Xstrata and Century Aluminum, respectively, and U.S.$303 million related to the Prodeco call option as described in the prior paragraph.
- The rapid and severe impacts arising from the global financial crisis in the latter part of 2008 resulted in a substantial fall in commodity prices, which, together with the increased uncertainty in financial and credit markets, led Glencore to defer various projects and curtail or shut some production output. This backdrop led to impairments being recorded against the carrying value of certain assets and investments. Glencore recognised U.S.$3,756 million of exceptional expenses in the year ended 31 December 2008, including inventory net realisable value adjustments of U.S.$435 million and impairment charges of U.S.$2,763 million. Of this amount, U.S.$2,161 million was attributable to impairments related to Glencore's interest in Xstrata, Century Aluminum and UC Rusal, with the balance related to various other cumulative impairments arising primarily from decisions taken to curtail and/or suspend various mining or expansion activities.

For more details on the impact of exceptional items on Glencore's financial results, please see Part III: "Selected Historical Financial and Other Information" and Section VI: "Historical Financial Information".

Please see the financial table in Section III: "Selected Historical Financial and Other Information" setting forth for the three years ended 31 December 2010 certain selected line items extracted without material adjustment from the historical financial information contained in Section VI: "Historical Financial Information", certain items which Glencore considers exceptional (as described therein) and the aggregate effect on such historical financial information of such exceptional items.

Production costs and efficiency

As commodity prices themselves are outside of Glencore's control, the competitiveness and sustainable long-term profitability of its industrial asset portfolio depends significantly on its ability to closely manage costs and maintain a broad spectrum of low-cost, efficient operations. Costs associated with the operation of Glencore's industrial assets can be broadly categorised into labour costs and other on-site expenses, including power and equipment costs. Production costs are heavily influenced by the extent of ongoing development required, ore grades, mine planning, processing technology, logistics, energy and supply costs and the impact of exchange rate fluctuations on costs of operations. All of Glencore's industrial assets are, to varying degrees, affected by increases in costs for labour and fuel. Unit production costs are also significantly affected by production volumes and therefore production levels are frequently a key factor in determining the overall cost competitiveness of Glencore's industrial activities.

Glencore's industrial assets experienced higher mining and processing costs during the third quarter of 2008, particularly in connection with labour and energy, which continued to rise throughout 2008. As production costs continued to increase and commodity prices collapsed in the fourth quarter of 2008, Glencore's industrial assets incurred a loss, post-exceptional items, for this quarter. In response, management initiated a number of cost-saving measures, including putting some assets into care and maintenance, curtailing production at others and seeking efficiencies and synergy opportunities with nearby operations. These measures led to reduced production costs in 2009 compared to 2008.

Description of key income statement line items

Revenues

Glencore generates revenue from the sale of physical commodities and marketing advisory and related services. In most instances, sales revenue is recognised when title to the product passes to the customer, which could be delivery into the vessel on which it is shipped, a destination port or the customer's premises. As commodity prices are often volatile, Glencore believes that overall revenues are neither a reliable nor a relevant indicator of the performance of Glencore or of the individual business segments. Instead, Glencore believes that Adjusted EBIT/EBITDA (revenue less costs of goods sold and selling and administrative expenses plus share of income from associates and jointly controlled entities and dividends as disclosed on the face of the statement of income plus, in the case of Adjusted EBITDA, depreciation and amortisation) are key measures to evaluate the operating performance of Glencore and, to a lesser extent, Adjusted EBIT/EBITDA margin percentage in respect of only Glencore's industrial activities.

For certain commodities, the sales price is determined on a provisional basis at the date of sale, as the final selling price is subject to movements in market prices up to the date of final pricing, normally ranging from 30 to 180 days after initial booking. Revenue on provisionally priced sales is recognised based on the estimated fair value of the total consideration receivable. The revenue adjustment mechanism embedded within provisionally priced sales arrangements has the character of a commodity derivative. Accordingly, the fair value of the final sales price adjustment is re-estimated continuously and changes in fair value are recognised as an adjustment to revenue. In all cases, fair value is estimated by reference to forward market prices.

Glencore records revenues in its physical commodity marketing business on a gross basis, rather than on the basis of the net margin or premiums received. Revenue earned from marketing advisory and related services represented less than 0.1 per cent. of total revenues in 2008, 2009 and 2010, respectively and the remaining 99.9 per cent. of the Group's revenue in each period was attributable to purchase and off take agreements.

Cost of goods sold

Cost of goods sold primarily includes the following:

- cost of marketing inventories sold and related distribution and storage costs;
- cost of extracting, refining and processing products related to the consolidated industrial assets, including personnel costs and depreciation and amortisation of property, plant and equipment and reserves;
- unrealised gains and losses from changes in the fair value of marketing inventories;
- unrealised gains and losses from changes in the fair value of derivatives held to hedge movements in commodity prices; and
- other operating expenses.

Cost of goods sold also includes, as required, write-downs of inventories where such inventories are carried at the lower of cost or net realisable value.

Selling and administrative expenses

Selling and administrative expenses represent costs that are primarily semi-fixed in nature and attributable to Glencore's marketing activities, with the exception of the variable bonus pool. Payroll expenditure is the largest component of this line item, with the variable bonus pool constituting a significant part of the payroll expenditure. The variable bonus pool is correlated with the profitability of Glencore's marketing operations and certain of its industrial activities comprising 10 per cent. of profits before tax from Glencore's marketing activities and 10 per cent. of profits after tax from certain of its industrial activities. Following the Restructuring, non cash expenses associated with share awards under the Glencore Performance Share Plan and Glencore Deferred Bonus Plan will also be included in Selling and administrative expenses. PSP Awards and Bonus Awards may be satisfied using new issued shares, treasury shares or shares purchased in the market. However, the number of shares which may be issued, or committed to be issued, in any 10 year period will not exceed (i) 10 per cent. of the Company's issued ordinary share capital, in respect of any employee share plans operated by the Company; and (ii) 5 per cent. of the Company's issued ordinary share capital, in respect of discretionary employee share plans adopted by the Company. As at the date of Admission, the Company will only have discretionary employee share plans in existence. Shares issued, or committed to be issued, before Admission will not be counted for either of these limits.

Share of income from associates and jointly controlled entities

Share of income from associates and jointly controlled entities represents income from associates and jointly controlled entities in which Glencore exercises significant influence or joint control that are accounted for using the equity method. Significant influence is the power to participate in the financial and operating policy decisions of the investee but is not control over those policies. Significant influence is presumed if Glencore holds between 20 per cent. and 50 per cent. of the voting rights, unless evidence exists to the contrary. Joint control is the contractually agreed sharing of control over an economic entity where strategic and operating decisions require unanimous decision making.

Equity accounting involves Glencore recording its share of the entity's net income and equity. Glencore's interest is initially recorded at cost and is subsequently adjusted for Glencore's share of changes in net assets of the entity less any impairment in the value of individual investments.

Gain/(loss) on sale of investments—net

Gain/(loss) on sale of investments—net comprises the net gain/loss on the sale of subsidiaries and other investments.

Other income/(expense)—net

Other income/(expenses)—net includes impairments, gains/losses on movements in fair value on interests in investments classified as held for trading, foreign exchange gains/losses, and gains/losses on disposals of property, plant and equipment and other non-operational related income or expenses.

Dividend income

Dividend income reflects distributions of earnings in respect of Glencore's stakes in non-controlled and non-equity accounted entities. Dividend income is recognised when a right to receive a payment has been established, it is probable that the economic benefits will flow to Glencore and the amount of income can be measured reliably. Historically, dividends from UC Rusal have been the largest contributor to dividend income.

Interest income

Interest income reflects interest received from cash deposits and loans extended by Glencore. Interest income is recognised when a right to receive a payment has been established, it is probable that the economic benefits will flow to Glencore and the amount of income can be measured reliably. Interest income is accrued on a time basis, by reference to the principal outstanding and at the applicable effective interest rate.

Interest expense

Interest expense comprises interest incurred on Glencore's fixed- and floating-rate borrowings.

Income tax expense

Income tax expense consists of current and deferred income taxes. Current taxes represent income taxes expected to be payable based on enacted or substantively enacted tax rates at the balance sheet date and expected current taxable income and any adjustment to tax payable in respect of previous years. Deferred taxes are recognised for temporary differences between the carrying amounts of assets and liabilities in the financial statements and the corresponding tax base is used in the computation of taxable profit, using enacted or substantively enacted income tax rates. For further detail on deferred tax accounting, see Section VI: "Historical Financial Information".

The difference between Glencore's statutory tax rate and the Group's effective tax rate results primarily from the location of the Group's operations in differing tax jurisdictions relative to Glencore's tax jurisdiction, Switzerland. The Group's effective tax rate excludes income from associates and dividend income, which are recorded post tax. Intergroup transactions are conducted on an arm's length basis and incorporate all relevant terms and conditions such as reference price and applicable adjustments for quality, logistical and related services consistent with similar transactions conducted with third parties. While the Group, in the past, has been reviewed regarding compliance with tax and transfer pricing regulations, any resulting disputes were satisfactorily resolved with no material adverse impact on the Group and it currently has no material outstanding tax or transfer pricing disputes. There have been certain matters (e.g. overestimated production costs and transfer pricing issues) raised in relation to the amount of tax payable by Mopani (73.1 per cent. owned by Glencore) in a draft provisional report prepared by advisers for the Zambian Revenue Authority. Mopani is confident that the amount of tax that it has paid has been correctly calculated and discussions continue with the Zambian Revenue Authority and all other interested parties to clarify and resolve these matters whether or not any assessments are issued. However, even if these matters are not resolved satisfactorily as Mopani expects, the Directors believe this would not have a material adverse impact on the Glencore Group.

Attribution to profit participation shareholders

Prior to the Restructuring, Glencore had issued to employees Glencore non-voting profit participation certificates ("PPCs") with no nominal value, enabling the employees to participate in a portion of the attributable income accumulated during the period that such employees held the PPCs. The PPCs attribute Glencore's net income pro rata based on the 150,000 shares issued. As described in note 14 to Section VI: "Historical Financial Information", on cessation of employment the accumulated amounts attributed to an Ordinary PPC holder are reclassified into non-current borrowings, as Ordinary profit participation certificates and paid in instalments over a period of five years. Following the Restructuring, all outstanding PPCs including profit entitlements accumulated thereunder will have been converted to Ordinary Shares and attribution will no longer be made to employee shareholders through the PPCs. Where the employment of a PPC holder has ceased prior to the Restructuring, the relevant Ordinary profit participation certificates will have been reclassified in this way and will not participate in the Restructuring. The borrowings into which they have been reclassified will remain payable in accordance with this five-year payment schedule.

Results of operations

Adjusted EBIT

Adjusted EBIT is the net result of revenue less cost of goods sold and selling and administrative expenses plus share of income from associates and jointly controlled entities and dividends as disclosed on the face of the consolidated statement of income. Adjusted EBIT is used by management as the key measure to assess the performance of the business segments as it reflects the net margin earned by the marketing and industrial activities of the business segment. Although Adjusted EBIT is not typically a measure of operating income, operating performance or liquidity under IFRS, the Directors have presented Adjusted EBIT in this Prospectus because they believe Adjusted EBIT is used by some investors to determine a company's ability to service indebtedness and fund ongoing capital expenditure and dividends. Adjusted EBIT should not, however, be considered in isolation or as a substitute for income from operations as determined in accordance with IFRS, or for cash flows from operating activities as determined in accordance with IFRS, or as an indicator of operating performance. The following table sets forth a reconciliation of Adjusted EBIT to income for the year for the periods indicated:

	2008	2009	2010
		(U.S.$ million)	
Revenue	152,236	106,364	144,978
Cost of goods sold	(147,565)	(103,133)	(140,467)
Selling and administrative expenses	(850)	(839)	(1,063)
Share of income from associates and jointly controlled entities	1,067	82	1,829
Dividend income	238	12	13
Adjusted EBIT	5,126	2,486	5,290
Interest expense—net	(837)	(587)	(936)
(Loss)/gain on sale of investments—net	7	33	(6)
Other (expense)/income—net	(2,960)	35	(8)
Income before income taxes and attribution	1,336	1,967	4,340
Income tax expense	(268)	(238)	(234)
Income before attribution	**1,068**	**1,729**	**4,106**
Attribution to profit participation shareholders	(677)	(650)	(2,460)
Income for the year	**391**	**1,079**	**1,646**

Adjusted EBIT for the year ended 31 December 2010 was U.S.$5,290 million, a 113 per cent. increase from U.S.$2,486 million, including exceptional items, in the year ended 31 December 2009. This increase was primarily due to the stronger contributions from both our industrial activities and our marketing activities. Contributions from our industrial asset activities were up 219 per cent. to U.S.$2,953 million over 2009. Average prices for our key metals produced (in particular, copper, zinc and nickel) were approximately 30 per cent. to 45 per cent. higher over the year. The contribution from our marketing activities was up approximately 50 per cent. to U.S.$2,337 million over 2009.

Adjusted EBIT for the Metals and Minerals business segment was U.S.$2,561 million for the year ended 31 December 2010, a 165 per cent. increase from U.S.$966 million, including exceptional items, for the year ended 31 December 2009. The contribution of the sizeable industrial asset portfolio of this segment benefited from stronger metals prices. Improving market sentiment and conditions in the important automotive and construction industries resulted in substantially increased volumes and corresponding income generated within the ferroalloys, nickel and aluminium commodity groups' marketing activities compared to the challenging conditions of 2009.

Adjusted EBIT for the Energy Products business segment was U.S.$685 million for the year ended 31 December 2010, a 49 per cent. decrease from U.S.$1,358 million, including exceptional items, for the year ended 31 December 2009. This decrease was primarily due to the relatively stable oil price environment and a poor wet freight market which prevailed for most of the year. In addition, the contribution of coal industrial assets was affected by certain infrequent events, most notably a lengthy strike at one of the coal mines in Colombia and extreme wet weather conditions that affected operations at both our Colombian and South African operations. These impacts on 2010 earnings within the energy products segment are expected to recede in 2011 with a return to more "normal" market and operating conditions. The contribution from industrial activities was further impacted by U.S.$40 million of oil exploration expenses (2009: U.S.$26 million), incurred as part of the ongoing build-up of the promising West African E&P portfolio, which was not able to be capitalised. Production and earnings from the portfolio are expected from the first quarter of 2012.

Adjusted EBIT for the Agricultural Products business segment was U.S.$717 million for the year ended 31 December 2010, a 108 per cent. increase from U.S.$345 million, including exceptional items, for the year ended 31 December 2009. This increase was primarily due to tight and dislocated market conditions. These resulted primarily from severe weather conditions which severely affected supply from the traditionally strong export markets such as Russia, Ukraine and Australia.

Corporate primarily relates to Glencore's equity accounted interest in Xstrata and the variable pool bonus accrual, the net result of which was up U.S.$1,510 million to U.S.$1,327 million compared to 2009. This was mainly owing to an increase in Xstrata's earnings, which reflected higher commodity prices.

Adjusted EBIT for the year ended 31 December 2009, including exceptional items, was U.S.$2,486 million, a 51 per cent. decrease from U.S.$5,126 million in the year ended 31 December 2008, due to lower contributions from each business segment, owing to the weak prevailing global economic backdrop, particularly during the first half of 2009. This decrease was primarily due to lower contributions from the Energy Products business segment, which benefited from strong market conditions during most of 2008 and significantly lower contributions from investments in associates and other investments, which, in addition to lower core earnings in 2009, recorded sizeable impairment charges. Glencore's share of such impairments amounted to U.S.$736 million.

Adjusted EBIT from the Metals and Minerals business segment, including exceptional items, was U.S.$966 million for the year ended 31 December 2009, a 24 per cent. decrease from U.S.$1,273 million for the year ended 31 December 2008. This decrease was due to a U.S.$253 million reduction in marketing activities' contribution and lower earnings from industrial activities (including the significantly lower contributions from investments in associates and other investments), each as a result of lower overall market sentiment and demand brought on by the global financial crisis. In particular, metals (aluminium, chrome, nickel, etc.) supplying the automotive, construction and steel industries, amid severe production cutbacks, generally suffered lower sales volumes and prices in the first half of 2009. Customer performance issues on certain coal related contracts also had an adverse impact on the financial results of that department during 2009.

Adjusted EBIT for the Energy Products business segment, including exceptional items, was U.S.$1,358 million for the year ended 31 December 2009, a 36 per cent. decrease from U.S.$2,131 million for the year ended 31 December 2008. This decrease was due to a U.S.$664 million (41 per cent.) lower contribution from marketing activities and a U.S.$109 million (21 per cent.) lower contribution from industrial activities. The marketing activities were supported by volatility and contango structures that were particularly strong during most of 2008 and only in the earlier part of 2009, where after volatility and arbitrage opportunities substantially reduced. Glencore also suffered significant loss of profits during 2009, mainly in its coal business, due to a number of instances of contract non-performance by various counterparties. While these instances of non-performance impacted the results of the coal business during the period, each of the relevant contracts was subsequently renegotiated on satisfactory terms and Glencore continues to do business with each of the counterparties. The oil marketing results were further hampered in 2009 by the poor performance of its freight division, which, due to its generally long overall position in time charters, suffered in an environment of sharply lower spot freight rates. The decrease in industrial asset contribution was due primarily to the impact of lower coal prices on the earnings of Prodeco and Shanduka.

Adjusted EBIT for the Agricultural Products business segment, including exceptional items, was U.S.$345 million for the year ended 31 December 2009, a 49 per cent. decrease from U.S.$678 million for the year ended 31 December 2008. This decrease was due to a U.S.$275 million (47 per cent.) lower contribution from marketing activities and a U.S.$58 million (59 per cent.) lower contribution from industrial activities. In 2009, grain volatility and prices were substantially lower than 2008, which reduced the number of arbitrage opportunities. In addition, lower processing volumes were not fully offset by cost deductions due to the semi-fixed nature of the cost base for Glencore's processing operations, which has adversely impacted the segment's industrial results.

Corporate primarily relates to Glencore's equity accounted interest in Xstrata and the variable pool bonus accrual, the net result of which was down U.S.$1,227 million from U.S.$1,044 million in 2008 to U.S.$(183) million in 2009, primarily due to lower average commodity prices during the period and recognition of Glencore's share of impairment charges booked directly by Xstrata.

Year ended 31 December 2010 compared with year ended 31 December 2009

Revenue

Glencore's revenue for the year ended 31 December 2010 was U.S.$144,978 million, a 36 per cent. increase from revenues of U.S.$106,364 million in the year ended 31 December 2009. This increase was primarily due to significantly higher average commodity prices for most of the commodities Glencore marketed during 2010 compared to 2009. Higher year-on-year average prices were most notable in nickel (49 per cent.), copper (46 per cent.), thermal coal (42 per cent.), aluminium (30 per cent.), zinc (30 per cent.) and crude oil (29 per cent.), contributing to an overall increase in revenues of U.S.$38,614 million. In addition, Glencore saw increases in the volumes of several of its key commodities including crude oil (31 per cent.) and alumina (15 per cent.). Given the relatively high revenue proportion of Glencore's oil business, the increase in average oil prices was the largest driver of the total revenue increase in 2010.

Cost of goods sold

Cost of goods sold for the year ended 31 December 2010 was U.S.$140,467 million, a 36 per cent. increase from U.S.$103,133 million in the year ended 31 December 2009. This increase was primarily due to the higher commodity prices noted above and the resulting impact on the purchases of the respective commodities.

Selling and administrative expenses

Selling and administrative expenses for the year ended 31 December 2010 were U.S.$1,063 million, a 27 per cent. increase from U.S.$839 million in the year ended 31 December 2009. This increase was primarily due to higher variable payroll costs, consistent with the increased earnings in 2010.

Share of income from associates and jointly controlled entities

Share of income from associates for the year ended 31 December 2010 was U.S.$1,829 million, up from U.S.$82 million in the year ended 31 December 2009. The 2009 balance was negatively impacted by impairment charges recorded by the underlying associates, Glencore's share being U.S.$761 million. Adjusting for these exceptional items, there was still a greater than twofold increase over the prior year mainly due to higher earnings at Xstrata, which in turn reflected improved commodity prices.

Gain/(loss) on sale of investments—net

Loss on sale of investments for the year ended 31 December 2010 was U.S.$6 million, compared to a gain of U.S.$33 million in the year ended 31 December 2009. The loss in 2010 was due to the disposal of certain non-core investments.

Other income/(expense)—net

Net other expense for the year ended 31 December 2010 was U.S.$8 million, compared to a net other income of U.S.$35 million in the year ended 31 December 2009. The net amount primarily comprised U.S.$790 million negative mark to market adjustments related to certain fixed price forward coal sales contracts of Prodeco's future production. These forward contracts did not qualify for "own use" or cash flow hedge accounting. The net amount for 2010 also included U.S.$225 million of Prodeco call option expenses, offset by U.S.$674 million of impairment reversals associated with Glencore's investment in Xstrata following the rebound in market conditions and underlying valuation assumptions. It also included U.S.$462 million revaluation adjustment on the initial 40 per cent. interest in Vasilkovskoje Gold immediately prior to the acquisition of the remaining 60 per cent. interest in February 2010.

Dividend income

Dividend income for the year ended 31 December 2010 was U.S.$13 million, an 8 per cent. increase from U.S.$12 million in the year ended 31 December 2009.

Interest Income

Interest income for the year ended 31 December 2010 was U.S.$281 million, a 5 per cent. increase from U.S.$267 million in the year ended 31 December 2009. This increase was primarily due to the impact on the interest received from higher average cash balances on hand and various loans extended, including to companies within the RussNeft Group.

Interest expense

Interest expense for the year ended 31 December 2010 was U.S.$1,217 million, a 43 per cent. increase from U.S.$854 million in the year ended 31 December 2009, or up 38 per cent., pre-exceptional items, taking into account U.S.$39 million of capitalised borrowing costs written off in 2010. This increase was primarily due to higher average debt levels and, to a lesser extent, the incremental cost impact of a higher long-term, fixed-rate funding mix.

Excluding exceptional items, interest expense on floating-rate debt increased by U.S.$93 million to U.S.$551 million from U.S.$458 million in 2009. Floating-rate debt is predominantly used to fund fast turning and liquid working capital, the funding cost of which is taken into account in transactional pricing and terms and accordingly "recovered" in adjusted marketing EBIT.

Interest expense on fixed-rate funding was U.S.$627 million in 2010, an increase of U.S.$231 million over 2009. The net increase is due to the Convertible, Euro and Swiss Franc/Perpetual bond issuances in December 2009, March 2010 and October 2010, respectively.

Income before income taxes and attribution

Income before income taxes and attribution for the year ended 31 December 2010 was U.S.$4,340 million, a 121 per cent. increase from U.S.$1,967 million for the year ended 31 December 2009. This increase was primarily due to increased contributions from industrial asset activities which increased more than threefold following price increases in the respective commodities along with increased contributions from the marketing activities that increased 50 per cent. compared to 2009 following improvements in global demand and market sentiment.

Income tax expense

Income tax expense for the year ended 31 December 2010 was U.S.$234 million, largely in line with U.S.$238 million incurred over the year ended 31 December 2009. The effective tax rate, excluding share of income from associates which is recorded post-tax, was 9.3 per cent. compared to 12.6 per cent. for 2009. The lower rate is due to the recognition of unrecognised tax losses following a review of business plans, primarily at Katanga, partly offset by the recognition of additional deferred tax expense in relation to the corporate tax rate increase in Kazakhstan from 15 per cent. to 20 per cent.

Attribution to profit participation shareholders

Attribution to profit participation shareholders for the year ended 31 December 2010 was U.S.$2,460 million compared to U.S.$650 million, an increase of 278 per cent. This increase was consistent with the increased allocatable income in 2010.

Income for the year

Income for the year ended 31 December 2010 was U.S.$1,646 million, a 53 per cent. increase from U.S.$1,079 million for the year ended 31 December 2009. This increase was primarily due to a recovery in worldwide commodity prices and market sentiment over 2010 which led to improved conditions from most of our business segments as well as our share of income from associates.

Year ended 31 December 2009 compared with year ended 31 December 2008

Revenue

Glencore's revenue for the year ended 31 December 2009 was U.S.$106,364 million, a 30 per cent. decrease from revenues of U.S.$152,236 million in the year ended 31 December 2008. This decrease was primarily due to significantly lower average commodity prices for most of the commodities Glencore marketed during 2009 compared to 2008. While worldwide commodity prices generally saw a recovery in the second half of 2009, the very weak start to the year lead to an overall decline in the average price of commodities from 2008 to 2009. Lower year-on-year average prices were most notable in thermal coal (approximately 42 per cent.), oil (approximately 36 per cent.), aluminium (approximately 35 per cent.), wheat (approximately 33 per cent.), nickel (approximately 31 per cent.) and copper (approximately 26 per cent.), contributing to an overall decrease in revenues of U.S.$45,872 million. Commodity volumes remained largely stagnant over the period and, as a result, the decrease in the average price of oil, the largest contributor to revenue, and any associated movements, over 2009 were the primary drivers of the decrease in revenue compared to 2008.

Cost of goods sold

Cost of goods sold for the year ended 31 December 2009 was U.S.$103,133 million, a 30 per cent. decrease from U.S.$147,565 million in the year ended 31 December 2008. This decrease was primarily due to the lower commodity prices noted above and the resulting impact on the purchases of the respective commodities. To a much lesser extent, the decrease was also attributable to lower production costs at Glencore's industrial activities resulting from cost cutting measures across the group, including scaling back production at certain industrial assets.

Selling and administrative expenses

Selling and administrative expenses for the year ended 31 December 2009 were U.S.$839 million, a 1 per cent. decrease from U.S.$850 million in the year ended 31 December 2008. The variable bonus pool accrual, one of the significant components of selling and administrative expenses, decreased by U.S.$27 million for the year ended 31 December 2009 from 2008.

Share of income from associates and jointly controlled entities

Share of income from associates for the year ended 31 December 2009 was U.S.$82 million, a 92 per cent. decrease from U.S.$1,067 million in the year ended 31 December 2008. This decrease was primarily due to lower earnings at Xstrata and Century Aluminum which were primarily driven by a fall in commodity prices, volumes of commodities sold and impairment charges recorded by these entities.

Gain/(loss) on sale of investments—net

Gain on sale of investments for the year ended 31 December 2009 was U.S.$33 million and U.S.$7 million in the year ended 31 December 2008. The gain in 2009 related to the disposal of the East Tennessee Zinc operations (U.S.$97 million), offset by a dilution loss, following Xstrata's 2009 capital raising, which saw Glencore's effective ownership in Xstrata reduce from 35.2 per cent. to 34.9 per cent.

Other income/(expense)—net

Net other income for the year ended 31 December 2009 was U.S.$35 million, compared to net other expense of U.S.$2,960 million in the year ended 31 December 2008. The net other expense in 2008 related primarily to impairments booked against the carrying value of assets and investments. Specifically, U.S.$1.7 billion of the impairment expense was booked against the Xstrata and Century Aluminum carrying values, with the remaining balance relating to the various other cumulative impairments arising primarily from decisions taken to curtail and/or suspend various mining or expansion activities.

The net other income in 2009 comprised primarily a net increase in the fair value of other investments accounted for at fair value offset by U.S.$303 million of expenses incurred in relation to the Prodeco call option arrangement. In March 2009, Xstrata acquired Glencore's Columbian Coal Group (Prodeco) for U.S.$2 billion and concurrently granted Glencore an option to repurchase Prodeco within 12 months for U.S.$2.25 billion plus profits accrued during the option period and the net balance of any cash invested. Since Glencore held a fixed repurchase option over Prodeco, the conditions for de-recognition or disposal of Prodeco were not met under IFRS and, as a consequence, Prodeco's operations continued to be reflected in the consolidated financial statements, while the proceeds were deferred and recognised as a liability. As at 31 December 2009, U.S.$303 million of option and related expense had been accrued under this arrangement.

Dividend income

Dividend income for the year ended 31 December 2009 was U.S.$12 million, a 94 per cent. decrease from U.S.$238 million in the year ended 31 December 2008. This decrease was primarily due to the cessation of dividends from UC Rusal, which had previously been the primary contributor to dividend income.

Interest income

Interest income for the year ended 31 December 2009 was U.S.$267 million, a 10 per cent. decrease from U.S.$298 million in the year ended 31 December 2008. This decrease was primarily due to lower average short-term rates noted below and their impact on the interest received on cash and various loans extended.

Interest expense

Interest expense for the year ended 31 December 2009 was U.S.$854 million, a 25 per cent. decrease from U.S.$1,135 million in the year ended 31 December 2008. This decrease was primarily due to lower average short term U.S. dollar interest rates over 2009 compared to 2008 as prime lending rates were cut in response to the global financial crisis. One-month U.S. dollar LIBOR averaged 0.33 per cent. during 2009, compared to 2.68 per cent. in 2008.

The lower base interest rate, partially offset by a general increase in corporate credit spreads, resulted in a net decrease in interest expense on floating rate debt of U.S.$307 million to U.S.$458 million in 2009 from

U.S.$765 in 2008. Floating-rate debt is predominantly used to fund relatively fast turning and liquid working capital, the funding cost of which is generally taken into account in transactional pricing and terms and accordingly "recovered" in adjusted marketing EBIT.

Interest expense on fixed rate funding was U.S.$396 million in 2009, an increase of U.S.$26 million over 2008. The net increase was primarily due to the full year impact of the Eurobonds issued during 2008, partly offset by interest "savings" on bonds repurchased during the year.

Income before income taxes and attribution

Income before income taxes and attribution for the year ended 31 December 2009 was U.S.$1,967 million, a 47 per cent. increase from U.S.$1,336 million for the year ended 31 December 2008. This increase was primarily due to the presence of "Other income" for 2009 as opposed to the large "Other expense" in 2008.

Income tax expense

Income tax expense for the year ended 31 December 2009 was U.S.$238 million, an 11 per cent. decrease from U.S.$268 million in the year ended 31 December 2008. This decrease was primarily due to the relative contribution of Glencore's foreign operations to its effective tax rate. The effective tax rate was affected by the significant impairments taken in 2008 that did not carry any tax benefits.

Attribution to profit participation shareholders

Attribution to profit participation shareholders for the year ended 31 December 2009 was U.S.$650 million compared to U.S.$677 million in 2008, a decrease of 4 per cent. This decrease was primarily due to a net lower allocatable income over the period.

Income for the year

Income for the year ended 31 December 2009 was U.S.$1,079 million, a 176 per cent. increase from U.S.$391 million for the year ended 31 December 2008. This increase was primarily due to the adverse impact on income in 2008 caused by the exceptional items recognised in relation to Glencore's interests in Xstrata and Century Aluminum. Please see "Other income/(expense)—net" above. Glencore also benefited from a general recovery in worldwide commodity prices over the second half of 2009 as well as the realisation of cost savings from the cost cutting measures implemented by management during the global financial crisis.

Liquidity and capital resources

Overview

Glencore's businesses are capital intensive (capital expenditure for industrial activities and working capital for marketing activities). To date, Glencore has funded its operations through borrowings and equity growth via retention of profits. Glencore's funding requirements are generally correlated with movements in commodity prices and the extent of business opportunities. Increasing commodity prices primarily lead to increased funding requirements for Glencore's marketing activities, but may also lead to increased cash flow from its industrial activities along with acquisitions and/or capital expenditures in Glencore's industrial activities as Glencore looks to increase production in a higher commodity price environment. In a falling commodity price environment, Glencore will generally generate less cash flow from its industrial activities but will also require lower working capital funding in its marketing activities. In these circumstances, it may choose to also defer discretionary capital expenditure and shut or curtail production of certain assets.

Cash flows

The following table summarises Glencore's cash flows for the periods indicated:

	Year ended 31 December		
	2008	2009	2010
	(U.S.$ million)		
Cash generated/in operating activities before working capital changes	4,587	3,095	4,234
Total working capital changes	2,560	(5,279)	(2,998)
Net income tax and interest paid	(1,187)	(826)	(1,125)
Net cash generated/(used) by operating activities after working capital changes, net interest and income tax	5,960	(3,010)	111
Net cash used by investing activities	(2,950)	(1,164)	(4,755)
Net cash generated/(used) by financing activities	(2,842)	4,208	5,247
Net increase in cash and cash equivalents	168	34	603
Cash and cash equivalents at beginning of period	658	826	860
Cash and cash equivalents at end of period	826	860	1,463

Net cash generated by operating activities before working capital changes

Net cash generated by operating activities before working capital changes was U.S.$4,234 million in 2010, U.S.$3,095 million in 2009 and U.S.$4,587 million in 2008.

Total working capital changes

Amounts invested in working capital were U.S.$(2,998) million in 2010 compared to an investment of U.S.$(5,279) million in 2009 and a release of U.S.$2,560 million in 2008. Working capital requirements in 2010 included the payment of U.S.$303 million in relation to the exercise of the Prodeco call option. The remaining investment was primarily due to movements in commodity prices affecting the carrying value of inventory, trade receivables and margin calls with copper, zinc, oil and wheat prices increasing by 21 per cent., 13 per cent., 14 per cent., and 18 per cent., respectively, over the final quarter of 2010. The primary drivers of the recent working capital investment by Glencore, namely higher prices, are generally beneficial for Glencore's trends in future profit and debt coverage, most clearly identifiable in the industrial asset portfolio. In a flat or declining price environment, such as in 2008, the cash margining component of working capital will reduce as inventory is sold and any corresponding hedges closed out.

Net cash generated/(used) by operating activities after working capital changes, net interest and income tax

Net cash generated/(used) by operating activities after working capital changes, net interest income and income tax was U.S.$111 million in 2010, U.S.$(3,010) million in 2009 and U.S.$5,960 million in 2008.

Net cash (used) by investing activities

Net cash (used) by investing activities was U.S.$(4,755) million, U.S.$(1,164) million and U.S.$(2,950) million in 2010, 2009 and 2008, respectively. Net cash flows used by investing activities relate to capital expenditures at Glencore's industrial activities, as well as the acquisition and sale of investments and the movement in long-term loans. Capital expenditures in 2008, 2009 and 2010 mainly included coal expansion activities at Prodeco, building a new copper smelter at Kazzinc, the procurement of various new oil freight vessels, as well as funding extended to Vasilkovskoje Gold to develop the largest known gold deposit in Kazakhstan. In addition, cash flows used by investing activities in 2009 reflected Glencore's participation in a capital raising by Katanga, Century Aluminum partially offset by the sale of Glencore's 51 per cent. interest in the Cartagena oil refinery. The level of cash flows used by investing activities reduced in the year ended 31 December 2009, as compared to the year ended 31 December 2008, as management was more cautious in deploying capital and prioritised higher return projects in light of the global economic downturn. The net outflow in 2010 primarily related to the U.S.$2,000 million base settlement of the 2009 Xstrata rights issue via exercise of the Prodeco call option, the acquisition of a 51.5 per cent. stake in Chemoil and a 100 per cent. stake in Pacorini Metals, the provision of a U.S.$200 million secured loan to PT Bakrie Group (secured by a 4.7 per cent. equity ownership interest in PT Bumi Resources); and the continued capital expenditure programs in respect of Vasilkovskoje Gold's start up, upstream oil development projects in West Africa, the development of the Mutanda copper/cobalt mine and production expansions at Katanga and Prodeco. The production growth initiatives (primarily coal, copper, gold and oil) are all expected to progressively result in substantially enhanced income and cashflow generating potential in future periods.

Net cash generated/(used) by financing activities

Net cash generated/(used) by financing activities was U.S.$5,247 million, U.S.$4,208 million and U.S.$(2,842) million in 2010, 2009 and 2008, respectively. In 2009 and 2010, financing requirements increased primarily as a result of the increase in commodity prices and resulting impacts on working capital funding and to fund the ongoing capital expenditure and investments noted above. Over 2008, cash inflows resulted from the sharp decrease in commodity prices over the fourth quarter which in turn was used to repay debt.

Discussion of balance sheet items

Total assets were U.S.$79,787 million as at 31 December 2010, representing an increase of 20 per cent. from U.S.$66,276 million as at 31 December 2009. Current assets increased from U.S.$38,725 million in 2009 to U.S.$44,296 million in 2010. The adjusted current ratio (current assets over current liabilities, both adjusted to exclude other financial liabilities) at 31 December 2010 was 1.26 compared to 1.37 at 31 December 2009. This reduction is primarily attributable to the Xstrata secured bank loans (U.S.$2,292 million) and the 2011 Eurobond (U.S.$765 million) moving from non-current borrowings to current borrowings. Excluding the Xstrata secured bank loans from current borrowings, which Glencore is currently in discussion with banks regarding extension/refinancing with a new long-term tenor, results in an adjusted current ratio of 1.37, consistent with the corresponding prior year period. Non-current assets increased from U.S.$27,551 million in 2009 to U.S.$35,491 million as at 31 December 2010, primarily due to the first time consolidation of Vasilkovskoje Gold, following its full acquisition by Kazzinc, the reclassification of Prodeco from "assets held for sale" and the capital expenditure and project funding programmes noted above.

Production inventories consist of materials, spare parts, work in process and finished goods held by the production entities. Marketing inventories comprise inventories sourced and held for marketing activity purposes. Glencore has a number of dedicated facilities which finance a portion of its marketing inventories. In each case, the inventory has been retained on our balance sheet with the proceeds received recognised as either short-term debt, commodities sold with agreements to repurchase or trade advances from buyers, depending upon its funding nature.

As at 31 December 2010, 98 per cent., or U.S.$14,331 million, of total trading inventories were contractually sold or hedged (readily marketable inventories), compared to 98 per cent., or U.S.$12,945 million, at 31 December 2009. Readily marketable inventories are inventories that Glencore considers to be readily convertible into cash, due to their liquid nature, widely available markets, and the fact that any associated price risk is covered either by a physical sale transaction, or a hedge transaction on a commodity exchange or with a highly rated counterparty. Given the highly liquid nature of these inventories, which represent a significant share of current assets, Glencore believes it is appropriate to consider them together with cash equivalents in analysing net debt levels and trends and computing certain debt coverage ratios.

In addition, accounts receivable form a significant portion of Glencore's assets. Glencore has entered into certain arrangements to finance a portion of its receivables. In each case, the receivable has been retained on our balance sheet with the proceeds received recognised as current borrowings (see Section VI: "Historical Financial Information").

After taking into account these readily marketable inventories, net debt was U.S.$14,756 million as at 31 December 2010, an increase of U.S.$4,570 million from U.S.$10,186 million as at 31 December 2009 with the exercise of the Prodeco call option accounting for a substantial part of the increase, some U.S.$2.4 billion including all cash components in 2010. The ratio of net debt to Adjusted EBITDA pre-exceptional items improved from 2.59 in 2009 to 2.38 in 2010. Current capital employed, together with listed investments (at carrying value), exceeded total debt by U.S.$4,483 million in 2010 compared to U.S.$6,198 million in 2009.

Equity, reserves and amounts attributable to profit participation shareholders as at 31 December 2010 were U.S.$19,613 million, an increase of U.S.$2,927 million (18 per cent.) compared with U.S.$16,686 million as at 31 December 2009.

Capital resources and financing initiatives

Glencore's business requires high levels of working capital funding and significant liquidity. Glencore's primary financial objective is to maintain a strong financial profile in line with an investment grade rating, including having access to sufficient amounts of liquidity to finance its operations and planned growth. Glencore believes that the current level of its cash flow from operations, its existing credit facilities, the liquidity and quality of its current trading assets, the high level of readily marketable inventories and the self-liquidating nature of its physical marketing activities, together with its ability to access international bank and debt capital markets allow Glencore to finance all of its existing and currently planned business needs, including working capital requirements and payments due on its outstanding indebtedness and contractual obligations. Glencore expects to repay its long-term debt obligations through cash from operations and/or future financings.

Glencore's short-term debt generally finances its current assets, comprising inventories and trade receivables, which are either self-liquidating or otherwise subject to a high rate of turnover. Glencore meets these financing requirements by maintaining appropriate levels of cash reserves and ensuring that it has sufficient headroom under its committed revolving credit facilities. It is Glencore's policy to maintain a minimum level of committed liquidity headroom of U.S.$3 billion to meet all expected and unexpected cash requirements of its business. The liquidity headroom is provided in the form of cash, undrawn committed revolving credit facilities and marketable securities. Of the U.S.$4,220 million headroom as at 31 December 2010, U.S.$2,691 million was provided by the undrawn committed revolving credit facilities. Glencore has alternative sources of headroom which are not included in these figures, e.g. liquidity can be raised quickly through Glencore's listed investments, either by using them as security for loans or by selling them and Glencore has undrawn uncommitted facilities which are not included in the reported headroom.

For additional detail on the indebtedness of the Group, including the position as at 28 February 2011, please see Section V: "Capitalisation and Indebtedness Statement".

Indebtedness

As at 31 December 2010, Glencore had the following principal indebtedness outstanding:

Facility/Programme	Initial issue/ current rollover	Amount issued or outstanding 31 December 2010
		(U.S.$ million)
2014 144A Notes	950	946
2011 Eurobonds (€600 million)	739	765
2013 Eurobonds (€850 million)	1,078	1,080
2015 Eurobonds (€750 million)	1,200	968
2017 Eurobonds (€1,250 million)	1,708	1,677
2019 Sterling Bond (GBP 650 million)	1,266	999
2016 Swiss Bond (CHF 600 million)	593	639
2014 Convertible bonds	2,300	2,132
Xstrata secured bank loan	2,800	2,292
Perpetual Notes	1,050	1,027
Purchase of profit participation certificates	1,855	1,855
Committed syndicated revolving credit facilities	10,260	7,259
U.S. commercial paper	1,000	310
Committed secured inventory/receivables facility	1,700	1,700
Committed secured receivables facilities	700	700
Bilateral inventory repurchase agreements	888	888
Other bank loans	4,895	4,895
Total		30,132
Commodities sold with agreements to repurchase	484	484
Total borrowings		30,616
Less: cash and cash equivalents and marketable securities		1,529
Net funding		29,087

Description of principal indebtedness

144A Notes

The 144A Notes consist of U.S.$950 million 6 per cent. coupon Notes due 2014. The Notes are recognised at amortised cost at an effective interest rate of 6.15 per cent. per annum.

Xstrata secured bank loans

The Xstrata secured bank loans comprise two facilities with a total amount of U.S.$2,800 million, with U.S.$2,300 million outstanding at 31 December 2010 and 2009. Both facilities mature in September 2011. The facilities have been accounted for as secured bank loans which bear interest at a rate of U.S.$ LIBOR plus a margin. As at 31 December 2010, U.S.$4,199 million (2009: U.S.$4,188 million; 2008: U.S.$2,739 million) of the carrying value of Glencore's investment in Xstrata was pledged as security.

Convertible bonds

In December 2009, Glencore issued U.S.$2 billion 5 per cent. coupon convertible bonds due December 2014. The bonds are convertible at the option of investors into a certain percentage of Glencore's equity upon a qualifying IPO or upon other pre-determined qualifying events. The bonds contain several embedded derivatives which IFRS requires be accounted for separately, the most significant of these being that if the bonds have not been converted and no qualifying event occurs, they will be redeemed at maturity at 108.1 per cent. of their nominal amount. In addition, if a qualifying IPO or other pre-determined qualifying events have not occurred prior to December 2012, bondholders may, subject to Glencore having achieved a "pre-exceptional" consolidated net income of U.S.$3.5 billion in the preceding 12 months or in the event that Glencore is acquired for cash consideration, put the bonds back to Glencore at an amount which achieves a cumulative annualised return of 20 per cent. Payment in this regard could occur from mid-2013 at the earliest.

The bonds consist of a liability component and an equity component. The fair values of the liability component (U.S.$1,923 million) and the equity component (U.S.$77 million) were determined, using the residual method, at issuance of the bonds. The liability component is measured at amortised cost at an effective interest rate of 6.69 per cent. per annum. At issuance and each subsequent period end, the embedded derivatives were concluded to have a fair value of U.S.$ nil due to the probability weighting attributed to the related conditions. During the first half of 2010, U.S.$300 million of additional convertible bonds, convertible into 0.84 per cent. of the Company's equity, were issued under the same terms and conditions as those issued in December 2009 with the equity component equalling U.S.$12 million and the liability component equalling U.S.$288 million. The Global Offering is a qualifying IPO which will allow holders of the bonds to convert. Conversion by all holders would amount to 6.25 per cent. of the Company's pre-Offering equity as at 31 December 2010.

Euro, sterling and Swiss Franc bonds

Glencore has issued bonds denominated in Euro, Sterling and Swiss Francs where, upon issuance, the principal amounts and the future interest payments were swapped into their U.S. dollar equivalent. The details of amounts issued and outstanding are as follows:

	Maturity	Initial U.S.$ equivalent	U.S.$ fixed interest rate in %	2008	2009	2010
€600 million 5.375% coupon bonds	Sep 2011	739	5.78	834	817	765
€850 million 5.250% coupon bonds	Oct 2013	1,078	6.60	1,171	1,154	1,080
€750 million 7.125% coupon bonds	April 2015	1,200	6.86	1,031	1,030	968
€1,250 million 5.250% coupon bonds	March 2017	1,708	6.07	0	0	1,677
Eurobonds total		4,725		3,036	3,001	4,490
GBP 650 million 6.5% coupon bonds	Feb 2019	1,266	6.58	920	1,013	999
CHF 600 million 3.625% coupon bonds	April 2016	593	4.87	0	0	639
Total		6,584		3,956	4,014	6,128

Perpetual notes

The perpetual notes consisted of U.S.$700 million 8 per cent. perpetual notes, callable after February 2011 at par. In December 2010, Glencore announced its intention to call U.S.$300 million of the outstanding notes. This partial redemption was subsequently completed on 6 February 2011.

In October 2010, Glencore issued U.S.$350 million 7.5 per cent. perpetual notes, callable after October 2015 at par.

Ordinary profit participation certificates

Profit participation certificates ("PPC") bear interest at six-month U.S.$ LIBOR and in the event of certain triggering events (see Section VI: "Historical Financial Information"), all PPCs would be subordinated to unsecured lenders. From 1 January 2011 to the date of the Restructuring, in accordance with existing agreements and past practice, Glencore redeemed and reclassified as borrowings a certain number of PPCs from profit participation shareholders representing an aggregate amount of approximately U.S.$268 million. These interests were held by employees who ceased employment with Glencore during this period. The amounts will be paid in installments over a period of five years with interest payable at six month U.S.$ LIBOR. See Note 14 to Section VI: "Historical Financial Information".

Committed revolving credit facilities

In May 2010, Glencore replaced the previous 364-day U.S.$815 million revolving credit facility with a new 364-day U.S.$1,375 million facility with a one year term out option at Glencore's discretion as well as a 364-day U.S.$515 million Asian focused tranche. In addition, Glencore replaced the U.S.$8,180 million medium-term revolving credit facility with a new three-year revolving credit facility of U.S.$8,370 million and cancelled the U.S.$6,650 million forward start facility concluded in 2009. Funds drawn under the medium-term revolving credit facility which are used to finance current working capital are classified as current debt, while the portion drawn to fund non-current assets is classified as non-current debt. Up to U.S.$1 billion of the medium-term tranche may be used as liquidity back up for Glencore's corporate U.S. commercial paper programme.

Liquidity

Glencore maintains adequate liquidity through its committed credit facilities, diversified funding sources and fast-turning, liquid working capital. As at 31 December 2010, Glencore had available headroom (in the form of cash, undrawn committed facilities and marketable securities) exceeding U.S.$4,220 million, which, is above its U.S.$3,000 million internal target. Glencore reflects two further sources of liquidity in its internal definition of net debt, namely marketable securities and readily marketable inventory. Readily marketable inventory comprises inventory that is readily convertible into cash due to their liquid nature, widely available markets and the fact that any associated price risk is covered. This includes, for example, LME-approved inventory (such as copper or aluminium) held at LME warehouses.

Certain debt arrangements require compliance with specific financial covenants related to current ratio and a maximum long-term debt to tangible net worth ratio. As at 31 December 2010, there was adequate headroom available under both of these covenants. No credit facilities or funding programmes include rating triggers which would accelerate repayment obligations in the event of a credit rating downgrade.

In light of Glencore's extensive funding activities in the public debt capital markets, maintaining its investment grade ratings is a priority for Glencore. Glencore promotes an ongoing dialogue with both its rating agencies with a view to maintaining its investment grade ratings. On 18 April 2011, Moody's confirmed Glencore's issuer rating of Baa2 (negative) and, on 14 April 2011, Standard & Poor's confirmed Glencore's long-term corporate rating of BBB− (stable).

The following table shows Glencore's gearing ratio as at 31 December 2010:

	As at 31 December 2010
	(U.S.$ million) (unaudited)
Interest-bearing loans and borrowings	30,132
Commodities sold with agreements to repurchase	484
Less: cash and cash equivalents and marketable securities	(1,529)
Less: readily marketable inventories[(1)]	(14,331)
Net debt	14,756
Invested capital[(2)]	22,507
Equity and net debt	37,263
Gearing ratio (Invested capital[(2)]/Invested capital[(2)] and net debt)	.60

Notes:

(1) Readily marketable inventories comprises inventory that is readily convertible into cash due to their liquid nature, widely available markets and the fact that any associated price risk is covered.

(2) Invested capital is the sum of equity capital, non-controlling interests, reserves and amounts attributable to profit participation shareholders.

Inventories

Production inventories consist of materials, spare parts, work in process and finished goods held by the production entities, whereas marketing inventories are commodities held by the marketing entities. Marketing inventories were U.S.$14,588 million, U.S.$13,179 million and U.S.$6,294 million for the years ended 31 December 2010, 2009 and 2008, respectively. The increase in inventories over the track record period, in particular the significant movement between 2008 and 2009, was due to the large fluctuation in commodity prices as a result of the onset of the financial crisis. Marketing inventories include readily marketable inventories of U.S.$14,331 million (2009: U.S.$12,945; 2008: U.S.$5,877 million). Movements in these inventories were largely driven by the movement in commodity prices. Readily marketable inventories are inventories that Glencore considers to be readily convertible into cash due to their very liquid nature, widely available markets and the fact that the price risk is covered either by a physical sale transaction or hedge transaction on a commodity exchange or with a highly rated counterparty.

Glencore utilises a number of dedicated financing facilities to finance portions of its marketing inventories, further diversifying its funding sources and providing it with cost effective funding. In each case, the inventory has not been derecognised as the Group retains the principal risks and rewards of ownership. The proceeds received are recognised as either current borrowings, commodities sold with agreements to repurchase or trade advances from buyers, depending upon their funding nature.

Capital expenditure and contractual obligations

Capital expenditure for the acquisition of property, plant and equipment is generally funded through the cash flow generated by the respective industrial entities. As at 31 December 2010, U.S.$787 million (2009: U.S.$815 million; 2008: U.S.$967 million), 100 per cent. of which relates to expenditure to be incurred over the next year, was contractually committed for the acquisition of property, plant and equipment. Glencore has also expanded its operations and production through acquisitions.

Certain of Glencore's exploration tenements and licences require it to spend a minimum amount per year on development activities, a significant portion of which would have been incurred in the ordinary course of operations. As at 31 December 2010, U.S.$404 million (2009: U.S.$284 million; 2008: U.S.$262 million) of such development expenditures are to be incurred, of which 36 per cent. are for commitments to be settled over the next year.

Glencore procures seagoing vessel/chartering services to meet its overall marketing objectives and commitments. At year-end, Glencore has committed to future hire costs to meet future physical delivery and sale obligations and expectations of U.S.$2,608 million (2009: U.S.$2,185 million; 2008: U.S.$2,880 million), 50 per cent. of which are for services to be received over the next two years.

The following table shows a breakdown of the capital expenditures for Glencore for the years ended 31 December 2008, 31 December 2009 and 31 December 2010 and projected capital expenditure through 2015:

	2008	2009	2010	Projected total capital expenditure through 2013	Projected total capital expenditure through 2015
			(U.S.$ million) (unaudited)		
Kazzinc	568	367	350	834	1,320
Katanga	N/A	62	221	1,044	1,298
Mopani	137	58	130	512	744
Prodeco	309	242	277	919	1,152
West African Oil Assets	54	37	238	791	813
Other	807	350	674	900	N/A
Total	**1,875**	**1,116**	**1,890**		

In addition to capital expenditure at Glencore's existing industrial assets, Glencore made acquisitions in 2010 to expand its activities, including increasing its effective ownership interest in Vasilkovskoje Gold and finalising the purchase of a majority stake in Chemoil.

As shown in the table above, Glencore has significant expansion projects in progress which are further described in Section I: "Information on Glencore".

Contractual obligations

As part of Glencore's ordinary sourcing and procurement of physical commodities and other ordinary marketing obligations, the selling party may request that a financial institution act as either (i) the paying party upon the delivery of product and qualifying documents through the issuance of a letter of credit or (ii) the guarantor by way of issuing a bank guarantee accepting responsibility for Glencore's contractual obligations. As at 31 December 2010, U.S.$8,956 million (2009: U.S.$7,178 million; 2008: U.S.$5,450 million) of such commitments have been issued on behalf of Glencore, which will be settled simultaneously upon physical delivery of the commodity.

The following table sets out Glencore's total future commitments to settle contractual obligations as at 31 December 2010:

		Payment due by period			
	Total	Less than 1 Year	1–2 Years	2–5 Years	More than 5 Years
			(U.S.$ million)		
Capital expenditure for acquisition of property, plant and equipments	787	787	0	0	0
Exploration tenements and licences	404	147	41	27	189
Seagoing vessels/chartering services	2,608	743	553	867	445
Letters of credit	8,956	8,956	0	0	0
Operating office and warehouse/storage lease obligations	473	97	74	151	151
Total	13,228	10,730	668	1,045	785

In addition to the future commitments illustrated in the table above, Glencore also has the potential future obligations described below, which are dependent upon the evaluation and final approval for each development.

Prodeco currently exports the majority of its coal through Puerto Zuñiga, which operates under a private concession awarded by the Columbian government. The concession expired in March 2009; however, the Colombian government has continued to grant Prodeco the right to use the port under annual lease agreements. To comply with new government regulations on loading methods, which became effective from July 2010, and to alleviate the uncertainty of the annual concession renewal process associated with Puerto Zuñiga, Prodeco has initiated the construction of a new, wholly owned, port facility ("Puerto Nuevo") which has been contracted at a cost of U.S.$528 million and is expected to be commissioned over the first half of 2013. If the concession does not continue to be extended, Prodeco's export capability would be curtailed, which could significantly impact operations until Puerto Nuevo is operational. As at 31 December 2010, U.S.$55 million of the estimated initial investment has been incurred.

In August 2010, Glencore acquired an ultimate 37.5 per cent. interest in the Kansuki concession, a 180 square kilometre copper and cobalt pre-development project which borders Glencore's partly owned Mutanda concession in the DRC. In exchange, Glencore has (i) an obligation to finance the first U.S.$400 million of development related expenditures, if any, as and when such expenditure is incurred, (ii) the right to operate the operations, and (iii) a life of mine off-take agreement for all copper and cobalt produced by Kansuki. In addition, one of the partners in Kansuki has the right to sell an additional 18.75 per cent. ultimate interest to Glencore at the then calculated equity value of the operation, at the earlier of the date the operation produces a minimum annual 70,000 metric tonnes of copper and August 2013. Kansuki is currently completing its initial feasibility study for submission by June 2011. As at 31 December 2010, U.S.$11 million of development expenditure had been incurred.

In November 2010, Glencore and Blackthorn Resources Limited completed a joint venture agreement to develop the Perkoa Zinc Project ("Perkoa") located in Burkina Faso, Africa. Under the terms of the agreement, Glencore will obtain a 50.1 per cent. effective ownership in Perkoa in exchange for (i) an obligation to finance the first U.S.$80 million of development-related expenditures, if any, as and when such expenditure is incurred, (ii) the right to operate the operations, and (iii) a life of mine off-take agreement for all zinc produced by Perkoa. As at 31 December 2010, U.S.$ nil million of development expenditure had been incurred.

Glencore has agreed with Verny to acquire additional stakes in Kazzinc. These purchases will increase its ownership from 50.7 per cent. to 93.0 per cent. for a total transaction consideration of U.S.$3.2 billion. Subject to satisfaction of certain conditions, which include receipt of applicable regulatory approvals and the occurrence of UK Admission, consideration for these purchases will be settled through the issuance of U.S.$1 billion of Ordinary Shares at the Offer Price (such issuance expected to occur at the earlier of UK Admission and satisfaction of applicable conditions precedent) and U.S.$2.2 billion in cash (to be paid in tranches between October and December 2011). The acquisition of these additional stakes is expected to be completed by the end of December 2011. The terms of the acquisition have been negotiated on an arm's length basis and the price and structuring of the consideration in respect of these purchases is based on Glencore's detailed valuation of Kazzinc. In addition, Glencore's stake in Kazzinc may be further increased to 99.4 per cent. through the exercise of a put or call option in respect of Verny Investments' remaining 6.4 per cent. interest in Kazzinc, which is conditional on amongst other things, an initial public offering of Kazzinc's gold assets. See Section X: "Additional Information" for further details of these purchases and the terms of the Kazzinc SPAs.

Off-balance sheet arrangements

Glencore has no off-balance sheet entities or off-balance sheet arrangements.

Contingent liabilities

The amount of corporate guarantees in favour of associated and third parties as at 31 December 2010, was U.S.$69 million (2009: U.S.$73 million; 2008: U.S.$66 million). Glencore has also pledged U.S.$113 million of its investment in UC Rusal as a guarantee against certain borrowings of UC Rusal.

Litigation

Glencore deals with over 7,200 suppliers and customers. In the ordinary course of its business, Glencore is from time to time involved in commercial disputes as both claimant and defendant. Certain legal actions, other claims and unresolved disputes are pending against Glencore. Whilst Glencore cannot predict the results of any litigation, it believes that it has meritorious defences against those actions or claims. Glencore believes the likelihood of any liability arising from these claims to be remote and that the liability, if any, resulting from any litigation will not have a material adverse effect on its consolidated income, financial position or cash flows.

Environmental contingencies

Glencore's operations, predominantly those arising from the ownership in industrial assets, are subject to various environmental laws and regulations. Glencore is in compliance with those laws and regulations.

Glencore accrues for environmental contingencies when such contingencies are probable and reasonably estimable. Such accruals are adjusted as new information develops or circumstances change. Recoveries of environmental remediation costs from insurance companies and other parties are recorded as assets when the recoveries are virtually certain. At this time, Glencore is unaware of any material environmental incidents at its locations.

Financial risk management

Overview

Glencore's business could be impacted by various external factors, including a major global economic downturn which would in turn result in significantly lower commodity prices and demand, as well as political events and unfavourable actions by governments, natural catastrophes, operational disruptions and financial risks. It is Glencore's policy and practice to identify and, where appropriate and practical, to actively manage such risks. Glencore has in place the appropriate commodity trading risk management systems and believes that these, together with its VaR computation, are the most appropriate measure of its marketing risk management analysis. Glencore does not engage in any material speculative trading activities.

Glencore's objectives in managing its capital base include preserving its overall financial health and strength for the benefit of all stakeholders and safeguarding its ability to continue as a going concern, while generating sustainable long-term profitability.

Glencore's activities expose it to a variety of financial risks: market risk (including commodity price risk, interest rate risk and currency risk), credit risk, performance risk and liquidity risk. Glencore's overall risk management programme focuses on the unpredictability of financial markets and seeks to protect its financial security and flexibility by using derivative financial instruments to substantially hedge these risks. Glencore's finance and risk professionals, working in co-ordination with the commodity departments, monitor, manage and report regularly to management on the financial risks and exposures facing Glencore. There have been no material changes during this year in the exposures to the financial risks faced by Glencore or the manner in which Glencore manages and measures them. Certain debt arrangements require compliance with specific financial covenants related to working capital and current ratio and a maximum long-term debt to tangible net worth ratio. During the period under review, Glencore has complied with these requirements.

Market risks

Glencore is exposed to price movements for the inventory it holds and for the products it produces, which are not held to meet priced-forward contract obligations. Glencore manages a significant portion of this exposure through futures and options transactions on worldwide commodity exchanges, or in OTC markets, to the extent available. For further details please see Section VI: "Historical Financial Information".

Glencore has entered into futures transactions to hedge the price risk of future-specific operating expenditures. These transactions were identified as cash flow hedges. The fair value of these derivatives is as follows:

	Notional amounts		Recognised fair values		Average maturity
	Buy	Sell	Assets	Liabilities	
			(U.S.$ million)		
Commodity futures—2008	0	391	0	75	2010
Commodity futures—2009	0	195	0	41	2011
Commodity futures—2010	0	187	0	75	2012

To the extent Glencore purchases commodities or related assets for delivery to a customer, a downturn in the price of those assets could result in losses to Glencore. To the extent Glencore agrees to sell commodities to a customer, an increase in the price of those assets could result in losses to Glencore, as Glencore seeks to acquire the underlying commodities in a rising market. In order for Glencore to mitigate the risks associated with commodity price fluctuations and the potential losses associated therewith, Glencore has implemented marketing policies designed to substantially hedge these risks. Glencore's marketing activities involve a significant number of purchase and sale transactions involving various commodities. The vast majority of Glencore's long positions (where it has physical commodities or has agreed to buy physical commodities) are offset by short positions (where Glencore has agreed to sell physical commodities). Similarly, Glencore's short positions are typically offset by long positions. Glencore may also take some long or short positions which are not offset or which are not completely offset by short or long positions, as the case may be (such positions are called open positions). It does this when it thinks it has sufficient visibility over trends in the market and when the position has been approved through the required risk management channels.

For additional information about Glencore's commodity price risk management, see Section I: "Information on Glencore".

One of the tools used by Glencore to monitor its open position and limit its primary market risk exposure, namely commodity price risk related to its physical marketing activities, is the use of a value at risk ("VaR") computation. VaR is a risk measurement technique, which estimates the potential loss that could occur on risk positions as a result of movements in risk factors over a specified time horizon, given a specific level of confidence. The VaR methodology is a statistically defined, probability based approach that takes into account market volatilities, as well as risk diversification by recognising offsetting positions and correlations between commodities and markets. In this way, risks can be measured consistently across all markets and commodities and risk measures can be aggregated to derive a single risk value. Glencore has set a consolidated VaR limit (one day 95 per cent.) of U.S.$100 million representing 0.55 per cent. of Glencore shareholders' funds.

Glencore's VaR computation currently covers its business in the key base metals (aluminium, nickel, zinc, copper, lead, etc), coal, oil/natural gas and the main risks in the Agricultural Products business segment (grain, oilseeds, sugar and cotton) and assesses the open-priced positions which are those subject to price risk, including inventories of these commodities. Due to the lack of a liquid terminal market, Glencore previously did not include a VaR calculation for alumina or ferroalloy commodities, however, it monitored the market risk in respect of these commodities via the regular reporting of net open volumetric positions. For further detail see Section VI: "Historical Financial Information".

During 2009, certain commodities, such as coal, which Glencore markets and accounts for at fair value were not included in the VaR calculation, as well established and liquid price points were not available. The positions are reported on the daily position sheets and, assuming the net position as at the balance sheet date was outstanding for the whole year, market prices were 5 per cent. higher/lower and all other variables held constant, Glencore's profit and equity for the year ended 31 December 2009 would decrease/increase by U.S.$30.0 million (2008 increase/decrease by U.S.$14.0 million).

The Group has a one day, 95 per cent. VaR limit of U.S.$100 million and during the year ended 31 December 2010, the actual one day 95 per cent. VaR level was approximately U.S.$43 million. This means that the Group manages its open positions in its marketing operations such that it does not put itself at risk of losing more than U.S.$100 million over the course of one day, to a 95 per cent. statistical level of certainty, and during the year ended 31 December 2010, the Group's marketing operations' open positions, based upon a statistical certainty of 95 per cent., never exceeded potential losses of U.S.$43 million on any given day, on average for the year. In addition, Glencore conducts regular stress testing on its marketing portfolio. Daily position sheets are distributed and monitored and weekly VaR simulations are run to determine potential future exposure. The table below shows 95 per cent. and 99 per cent. VaR levels at year end and averaged for each of the years ended 31 December 2008, 2009 and 2010.

	Year end		Average	
	95%	**99%**	**95%**	**99%**
	(U.S.$ million)			
2008	53.1	79.3	50.1	70.7
2009	27.6	39.2	26.4	37.3
2010	58.1	79.7	42.5	60.1

VaR does not purport to represent actual gains or losses in fair value on earnings to be incurred by Glencore, nor does Glencore claim that these VaR results are indicative of future market movements or representative of any actual impact on its future results. VaR should always be viewed in the context of its limitations; notably, the use of historical data as a proxy for estimating future events, market illiquidity risks and tail risks. Glencore recognises these limitations, and thus complements and continuously refines its VaR analysis by analyzing forward looking stress scenarios and back testing calculated VaR against actual movements arising in the next business week. Glencore regularly backtests its VaR to establish that it is a statistically adequate reflection of realised gains and losses and the inherent "riskiness" of the marketing portfolio as a whole.

Glencore's future cash flows related to its forecast energy and minerals production are also exposed to commodity price movements. Glencore manages this exposure through a combination of portfolio diversification, occasional shorter-term hedging via futures and options transactions and insurance products and the continuous internal monitoring, reporting and quantification of the underlying operations' estimated valuations.

Interest rate risk

Glencore is exposed to various risks associated with the effects of fluctuations in the prevailing levels of market interest rates on its assets and liabilities and cash flows. Matching of assets and liabilities is utilised as the dominant method to hedge interest rate risks. Floating-rate debt is predominantly used to fund fast-turning working capital and interest internally charged on the funding of this working capital and is based on U.S.$ LIBOR and, accordingly, prevailing market interest rates are continuously factored into transactional pricing and terms.

Assuming the amount of floating-rate liabilities at the balance sheet date were outstanding for the whole year, interest rates were 50 basis points higher/lower and all other variables held constant, Glencore's profit and equity for the year ended 31 December 2010 would decrease/increase by U.S.$91 million (2009: decrease/increase by U.S.$71 million; 2008: increase/decrease by U.S.$64 million).

Currency risk

Glencore's reporting currency and the functional currency of the majority of Glencore's operations is the U.S. dollar, as this is assessed to be the principal currency of the economic environment in which Glencore operates. Transactions in foreign currencies are converted into the functional currency of each entity using the exchange rate prevailing at the transaction date. Monetary assets and liabilities outstanding at year end are converted at year-end rates. The resulting exchange differences are recorded in the consolidated statement of income. The exchange rates between relevant local currencies and the U.S. dollar have historically fluctuated, and the translation effect of such fluctuations could affect Glencore's results and financial condition. However, Glencore does not believe that it is materially exposed to non-U.S. dollar currency risk.

Glencore's debt-related payments (both principal and interest) are denominated in or swapped into U.S. dollars. The majority of Glencore's operating expenses are incurred in U.S. dollars, with the remainder being incurred in a mix of currencies, of which the Swiss Franc, pounds sterling, Australian dollar and Euro are the predominant non-U.S. dollar currencies.

Glencore has issued Euro-denominated, Swiss Franc-denominated and pounds sterling-denominated bonds (see Section VI: "Historical Financial Information"). Cross-currency swaps were taken out to hedge the currency risk on the principle and related interest payments of these bonds. These contracts were designated as cash flow hedges of the foreign currency risks associated with the bonds. The fair value of these derivatives is as follows:

	Notional amounts		Recognised fair values		Average maturity
	Buy	Sell	Assets	Liabilities	
			(U.S.$ million)		
Cross currency swap agreements—2008	0	4,283	0	384	2015
Cross currency swap agreements—2009	0	4,283	0	48	2015
Cross currency swap agreements—2010	0	6,584	0	185	2015

Credit risk

Financial assets which potentially expose Glencore to concentrations of credit risk consist principally of cash and cash equivalents, marketable securities, receivables and advances, derivative instruments and long-term advances and loans.

Glencore actively and continuously monitors the credit quality of its counterparties through internal reviews and a credit scoring process which includes, where available, public credit ratings. Balances with counterparties not having a public investment grade or equivalent internal rating are typically enhanced to investment grade through the extensive use of credit enhancement products, such as letters of credit or insurance products. Glencore has a diverse customer base, with no customer representing more than 3.4 per cent. (2009: 2.3 per cent.; 2008: 2.8 per cent.) of its trade receivables or accounting for more than 3.0 per cent. of its revenues over the year ended 31 December 2010 (2009: 2.8 per cent.; 2008: 3.7 per cent.).

Performance risk

Performance risk arises from the possibility that physical industrial counterparties may not be willing or able to meet their future contractual sale or purchase obligations to or from Glencore. Glencore undertakes the assessment, monitoring and reporting of performance risk within its overall credit management process. Glencore's market breadth and diversified customer base as well as the standard pricing mechanism in the majority of Glencore's commodity portfolio, which does not fix prices beyond three months (with the exception of coal which is marketed under annual pricing agreements) ensure that performance risk is adequately mitigated. The commodity industry is continuing a trend towards shorter fixed price contract periods, in part to mitigate against such potential performance risk, but also due to the development of more transparent and liquid spot markets, e.g. coal and iron ore and associated derivative products and indexes.

Liquidity risk

Liquidity risk is the risk that Glencore is unable to meet its payment obligations when due, or that Glencore is unable, on an ongoing basis, to borrow funds in the market on an unsecured, or even secured, basis at an acceptable price to fund actual or proposed commitments. Prudent liquidity risk management implies maintaining sufficient cash and cash equivalents through the availability of adequate committed funding facilities. Glencore has set itself a minimum liquidity target of U.S.$3 billion to be maintained at all times. Glencore's credit profile, diversified funding sources and committed credit facilities ensure that sufficient liquid funds are maintained to meet its liquidity requirements. As part of its liquidity management, Glencore closely monitors and plans for its future capital expenditure and proposed investments, as well as credit facility refinancing/extension requirements.

As at 31 December 2010, Glencore had available committed undrawn credit facilities, cash and cash equivalents and marketable securities exceeding U.S.$4,220 million (2009: U.S.$3,826 million; 2008: U.S.$5,255 million). The maturity profile of Glencore's financial liabilities based on the contractual terms is as follows:

2010	After 5 years	Due 3–5 years	Due 2–3 years	Due 1–2 years	Due 0–1 years	Total
			(U.S.$ million)			
Borrowings	4,152	4,974	7,094	2,031	11,881	30,132
Expected future interest payments	668	949	766	800	834	4,017
Commodities sold with agreements to repurchase	0	0	0	0	484	484
Accounts payable	0	0	0	0	16,145	16,145
Other financial liabilities	0	739	288	955	6,084	8,066
Liabilities held for sale	0	0	0	0	45	45
Total	4,820	6,662	8,148	3,786	35,473	58,889
Current assets					44,296	44,296

Critical accounting policies, key judgements and estimates

The preparation of the financial information contained in this Prospectus requires the Directors to make estimates and assumptions that affect the reported amounts of assets and liabilities as well as the disclosure of contingent assets and liabilities as at the date of the financial statements and the reported amounts of revenues and expenses during the reporting period. The estimates and associated assumptions are based on historical experience and other factors that are considered to be relevant. Actual outcomes could differ from those estimates.

Glencore has identified the following areas as being critical to understanding Glencore's financial position, as they require the Directors to make complex and/or subjective judgements and estimates about matters that are inherently uncertain.

Valuation of derivative instruments

Derivative instruments are carried at fair value and Glencore evaluates the quality and reliability of the assumptions and data used to measure fair value in the three hierarchy levels, as prescribed by IFRS 7. Fair values are determined in the following ways: externally verified via comparison to quoted market prices (level 1); by using models with externally verifiable model inputs (level 2); or by using alternative procedures such as comparison to comparable instruments and using models with unobservable market inputs requiring Glencore to make market-based assumptions. At 31 December 2008, 2009 and 2010, the majority of these financial instruments were verified externally. Where the model was not validated and/or the inputs were not verified due to the lack of appropriate market quotations, the fair values were actively reviewed by management. For additional information regarding fair value, see Section VI: "Historical Financial Information".

Depreciation and amortisation of mineral and petroleum rights and project development costs

Mineral and petroleum rights and project development costs are amortised using the units of production method ("UOP"). The calculation of the UOP rate of amortisation, and therefore the annual amortisation charge to operations, can fluctuate from initial estimates. This could generally result when there are significant changes in any of the factors or assumptions used in estimating mineral or petroleum reserves, notably changes in the geology of the reserves and assumptions used in determining the economic feasibility of the reserves. Such changes in reserves could similarly impact the useful lives of assets depreciated on a straight-line basis, where those lives are limited to the life of the project, which in turn is limited to the life of the proven and probable mineral or petroleum reserves. Estimates of proven and probable reserves are prepared by independent experts in extraction, geology and reserve determination. Assessments of UOP rates against the estimated reserve base and the operating and development plan are performed regularly.

Impairments

Investments in associates, jointly controlled entities and other investments, long-term advances and loans and property, plant and equipment, goodwill and other intangible assets are reviewed for impairment whenever events or changes in circumstances indicate that the carrying value may not be fully recoverable or at least annually for goodwill or other intangible assets of indefinite life. If an asset's recoverable amount is less than the asset's carrying amount, an impairment loss is recognised. Future cash flow estimates which are used to calculate the asset's value in use are based on expectations about future operations primarily comprising estimates about production and sales volumes, commodity prices, reserves, operating, rehabilitation and restoration costs and capital expenditures. Changes in such estimates could impact recoverable values of these assets. Estimates are reviewed regularly by management.

Restoration, rehabilitation and decommissioning costs

A provision for future restoration, rehabilitation and decommissioning costs requires estimates and assumptions to be made around the relevant regulatory framework, the magnitude of the possible disturbance and the timing, extent and costs of the required closure and rehabilitation activities. To the extent that the actual future costs differ from these estimates, adjustments will be recorded and the income statement could be impacted. The provisions including the estimates and assumptions contained therein are reviewed regularly by management.

Provisions

The amount recognised as a provision, including tax, legal, contractual and other exposures or obligations, is the best estimate of the consideration required to settle the related liability, including any related interest charges, and taking into account the risks and uncertainties surrounding the obligation. Glencore assesses its liabilities and contingencies based upon the latest information available, relevant tax laws and other appropriate requirements.

Fair value

In addition to recognising derivative instruments at fair value, as discussed above, an assessment of fair value of assets and liabilities is also required in accounting for other transactions most, notably business combinations and disclosures related to fair values of financial assets and liabilities. In such instances, fair value measurements are estimated based on the amounts for which the assets and liabilities could be exchanged at the relevant transaction date or reporting period end, and are therefore not necessarily reflective of the likely cashflow upon actual settlements. Where fair value measurements cannot be derived from publicly available information, they are estimated using models and other valuation methods. To the extent possible, the assumptions and inputs used take into account externally verifiable inputs. However, such information is by nature subject to uncertainty, particularly where comparable market-based transactions rarely exist.

SECTION V: CAPITALISATION AND INDEBTEDNESS STATEMENT

The following table shows the capitalisation of Glencore as at 31 December 2010.

	As of 31 December 2010
	(U.S.$ million)
Current debt	
Guaranteed	0
Secured	6,064
Unguaranteed/unsecured	5,505
Subordinated and unsecured	796
Non-current debt	
Guaranteed	0
Secured	0
Unguaranteed/unsecured	17,192
Subordinated and unsecured	1,059
Total debt	30,616
Equity and invested capital	
Share capital	46
Reserves and retained earnings	5,378
Non controlling interests	2,894
Total equity	8,318
Amounts attributable to profit participation shareholders	14,189
Total equity and invested capital	22,507
Total capitalisation	51,123

This statement of capitalisation has been prepared under IFRS using policies that are consistent with those used in preparing Glencore's combined historical financial information for the year ended 31 December 2010.

The following table shows the net indebtedness of Glencore as at 28 February 2011.

	As of 28 February 2011
	(U.S.$ million)
Cash	1,387
Deposits and Treasury Bills	1,605
Trading/Marketable securities	44
Liquidity	3,036
Current bank debt	9,448
Current portion of non-current debt	3,991
Current financial debt	13,439
Net current financial indebtedness	10,403
Non-current bank loans	9,676
Bonds issued	9,586
Other non-current loans	1,149
Non-current financial indebtedness	20,411
Net financial indebtedness	30,814

There is no indirect or contingent indebtedness.

SUB-SECTION A: ACCOUNTANT'S REPORT ON HISTORICAL FINANCIAL INFORMATION

Deloitte.

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Morgan Stanley Asia Limited
46th Floor, International Commerce Centre
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4 May 2011

Dear Sirs

Glencore International plc

We report on the financial information relating to Glencore International AG (the "Operating Company") and its subsidiaries (together with the Operating Company, the "Operating Group") set out in Section VI: "Historical Financial Information" of the prospectus dated 4 May 2011 of Glencore International plc (the "Company" and, together with its subsidiaries, the "Group") prepared in connection with the Company's admission to listing on the premium segment of the Official List of the Financial Services Authority and admission to trading on the London Stock Exchange of the ordinary shares of the Company (the "UK Listing") (the "UK Prospectus") and having regard to the waivers granted by the Stock Exchange of Hong Kong Limited (the "HKSE") in connection with the secondary listing of the ordinary shares of the Company on the Main Board of the HKSE (the "HK Listing") (the "HK Prospectus"), (the UK Prospectus and HK Prospectus together being the "Investment Circular"). It is intended that the Company will acquire the entire issued share capital of the Operating Company prior to the implementation of the UK Listing. This financial information has been prepared for inclusion in the

UK Prospectus on the basis of the accounting policies set out in note 1 to the Historical Financial Information. This report is required by Annex I item 20.1 of Commission Regulation (EC) No 809/2004 (the "Prospectus Directive Regulation"), and is given for the purpose of complying with that requirement and for no other purpose.

Responsibilities

The Directors of the Company are responsible for preparing the Historical Financial Information on the basis of preparation set out in Note 1 to the Historical Financial Information and in accordance with the International Financial Reporting Standards (the "IFRS") as issued by the International Accounting Standards Board (the "IASB") and adopted for use in the EU.

It is our responsibility to form an opinion as to whether the Historical Financial Information gives a true and fair view, for the purposes of the UK Prospectus, and to report our opinion to you.

Save for any responsibility arising under Prospectus Rule 5.5.3R(2)(f), Chapter 4 of the Rules Governing the Listing of Securities of the Stock Exchange of Hong Kong Limited (the "HK Listing Rules") and the Companies Ordinance (Cap. 32) of the Laws of Hong Kong (the "Companies Ordinance"), except where waivers have been granted by the HKSE, to any person as and to the extent there provided, to the fullest extent permitted by law, we do not assume any responsibility and will not accept any liability to any other person for any loss suffered by any such other person as a result of, arising out of, or in accordance with this report or our statement, required by and given solely for the purposes of complying with Annex I item 23.1 of the Prospectus Directive Regulation, consenting to its inclusion in the Investment Circular.

Our responsibilities in relation to the UK Prospectus relate only to the UK Listing and our responsibilities in relation to the HK Prospectus relate only to the HK Listing.

Basis of opinion

We conducted our work in accordance with the Standards for Investment Reporting issued by the Auditing Practices Board in the United Kingdom. Our work included an assessment of evidence relevant to the amounts and disclosures in the Historical Financial Information. It also included an assessment of significant estimates and judgements made by those responsible for the preparation of the Historical Financial Information and whether the accounting policies are appropriate to the entity's circumstances, consistently applied and adequately disclosed.

We planned and performed our work so as to obtain all the information and explanations which we considered necessary in order to provide us with sufficient evidence to give reasonable assurance that the Historical Financial Information is free from material misstatement, whether caused by fraud or other irregularity or error.

Our work has not been carried out in accordance with auditing or other standards and practices generally accepted in jurisdictions outside the United Kingdom, including the United States of America, and accordingly, should not be relied upon as if it had been carried out in accordance with those standards and practices.

In connection with the use of this report in the HK Listing, it should be noted that this report has been provided with regard to the waivers granted by the HKSE.

Opinion

In our opinion, the Historical Financial Information gives, for the purposes of the Investment Circular, a true and fair view of the state of affairs of the Group as at the dates stated and of its profits, cash flows and changes in equity for the periods then ended in accordance with the basis of preparation set out in Note 1 and in accordance with IFRS issued by the IASB and adopted for use in the EU.

Declaration

For the purposes of Prospectus Rule 5.5.3R(2)(f), we are responsible for this report as part of the UK Prospectus and declare that we have taken all reasonable care to ensure that the information contained in this report is, to the best of our knowledge, in accordance with the facts and contains no omission likely to affect its import. This declaration is included in the UK Prospectus in compliance with Annex I item 1.2 and Annex III item 1.2 of the Prospectus Directive Regulation.

Yours faithfully

Deloitte LLP
Chartered Accountants

Deloitte LLP is a limited liability partnership registered in England and Wales with registered number OC303675 and its registered office at 2 New Street Square, London EC4A 3BZ, United Kingdom. Deloitte LLP is the United Kingdom member firm of Deloitte Touche Tohmatsu Limited ("DTTL"), a UK private company limited by guarantee, whose member firms are legally separate and independent entities. Please see www.deloitte.co.uk/about for a detailed description of the legal structure of DTTL and its member firms.

Member of Deloitte Touche Tohmatsu Limited

SUB-SECTION B: HISTORICAL FINANCIAL INFORMATION

Consolidated Statement of Income
For the years ended 31 December 2008, 2009 and 2010

	Notes	2008	2009	2010
			(U.S.$ million)	
Revenue		152,236	106,364	144,978
Cost of goods sold		(147,565)	(103,133)	(140,467)
Selling and administrative expenses		(850)	(839)	(1,063)
Share of income from associates and jointly controlled entities		1,067	82	1,829
(Loss)/gain on sale of investments—net	3	7	33	(6)
Other (expense)/income—net	4	(2,960)	35	(8)
Dividend income		238	12	13
Interest income		298	267	281
Interest expense		(1,135)	(854)	(1,217)
Income before income taxes and attribution		**1,336**	**1,967**	**4,340**
Income tax expense	5	(268)	(238)	(234)
Income before attribution		**1,068**	**1,729**	**4,106**
Attribution to profit participation shareholders	14	(677)	(650)	(2,460)
Income for the year		**391**	**1,079**	**1,646**
Attributable to:				
Equity holders		367	983	1,291
Non-controlling interests		24	96	355

The accompanying Notes are an integral part of the Historical Financial Information.

Consolidated Statement of Comprehensive Income
For the years ended 31 December 2008, 2009 and 2010

	2008	2009	2010
		(U.S.$ million)	
Income for the year	**391**	**1,079**	**1,646**
Exchange (loss)/gain on translation of foreign operations	(41)	37	26
(Loss)/gain on cash flow hedges	(309)	293	(182)
Gain on available for sale financial instruments	0	0	25
Share of comprehensive (loss)/income from associates and jointly controlled entities	(229)	175	(43)
Income tax relating to components of other comprehensive income	1	(7)	2
Net (loss)/income recognised directly in equity	(578)	498	(172)
Cash flow hedges transferred to the statement of income, net of tax	66	82	6
Other comprehensive (loss)/income	(512)	580	(166)
Total comprehensive (loss)/income	(121)	1,659	1,480
Attributable to:			
Equity holders	(145)	1,563	1,107
Non-controlling interests	24	96	373

The accompanying Notes are an integral part of the Historical Financial Information.

Consolidated Statement of Financial Position
As at 31 December 2008, 2009 and 2010

	Notes	2008	2009	2010
			(U.S.$ million)	
Assets				
Non-current assets				
Property, plant and equipment	6	6,859	6,845	12,088
Investments in associates and jointly controlled entities	7	13,221	14,881	16,766
Other investments	7	2,808	3,202	2,438
Advances and loans	8	1,826	2,535	3,830
Deferred tax assets	5	89	88	369
		24,803	27,551	35,491
Current assets				
Inventories	9	7,805	15,073	17,393
Accounts receivable	10	13,956	15,189	18,994
Other financial assets	11	13,762	6,125	5,982
Prepaid expenses and other assets		46	54	118
Marketable securities		113	75	66
Cash and cash equivalents	12	826	860	1,463
Assets held for sale	13	0	1,349	280
		36,508	38,725	44,296
Total assets		61,311	66,276	79,787
Equity and liabilities				
Invested capital				
Share capital	14	46	46	46
Reserves and retained earnings		2,755	4,395	5,378
Non-controlling interests		906	1,258	2,894
		3,707	5,699	8,318
Amounts attributed to profit participation shareholders	14	12,604	12,245	14,189
Invested capital		16,311	17,944	22,507
Other non-current liabilities				
Borrowings	15	13,071	16,403	18,251
Deferred income	16	191	177	164
Deferred tax liabilities	5	630	626	1,308
Provisions	17	402	545	719
		14,294	17,751	20,442
Current liabilities				
Borrowings	15	5,245	7,186	11,881
Commodities sold with agreements to repurchase	9	0	477	484
Prodeco call option arrangement	4	0	2,303	0
Accounts payable	19	11,614	11,482	16,145
Other financial liabilities	20	13,591	8,643	8,066
Income tax payable		256	254	217
Liabilities held for sale	13	0	236	45
		30,706	30,581	36,838
Total equity and liabilities		61,311	66,276	79,787

The accompanying Notes are an integral part of the Historical Financial Information.

Consolidated Statement of Cash Flows
For the years ended 31 December 2008, 2009 and 2010

	Notes	2008	2009	2010
			(U.S.$ million)	
Operating activities				
Income before income taxes and attribution		1,336	1,967	4,340
Adjustments for:				
Depreciation and amortisation		575	622	1,026
Share of income from associates and jointly controlled entities		(1,067)	(82)	(1,829)
Increase/(decrease) in non-current provisions		(112)	42	11
(Loss)/gain on sale of investments—net		(7)	(33)	6
Unrealised mark to market movements on other investments		182	(222)	178
Impairments and other non-cash items—net		2,843	214	(434)
Interest expense—net		837	587	936
Cash generated by operating activities before working capital changes		4,587	3,095	4,234
Working capital changes				
Decrease in marketable securities		131	38	28
(Increase)/decrease in accounts receivable[1]		(5,353)	6,729	(4,170)
(Increase)/decrease in inventories		4,318	(7,334)	(1,724)
Increase/(decrease) in accounts payable[2]		3,464	(4,712)	2,868
Total working capital changes		2,560	(5,279)	(2,998)
Income tax paid		(486)	(217)	(323)
Interest received		353	218	229
Interest paid		(1,054)	(827)	(1,031)
Net cash generated/(used) by operating activities after working capital and net interest and income tax payments		5,960	(3,010)	111
Investing activities				
Payments of non-current advances and loans		(350)	(624)	(825)
Acquisition of subsidiaries	21	(99)	(27)	(624)
Disposal of subsidiaries	21	0	136	0
Purchase of investments		(1,278)	(251)	(191)
Xstrata rights issue settlement via exercise of Prodeco call option	4	0	0	(2,000)
Purchase of property, plant and equipment		(1,823)	(1,088)	(1,657)
Payments for exploration and evaluation		(52)	(28)	(233)
Proceeds from sale of property, plant and equipment		47	85	420
Proceeds from sale of investments		291	569	131
Return of capital		83	0	0
Dividends received from associates		231	64	224
Net cash (used) by investing activities		(2,950)	(1,164)	(4,755)

Notes:

(1) Includes movements in other financial assets and prepaid expenses and other assets.

(2) Includes movements in other financial liabilities.

The accompanying Notes are an integral part of the Historical Financial Information.

Consolidated Statement of Cash Flows
For the years ended 31 December 2008, 2009 and 2010 (Continued)

	Notes	2008	2009	2010
			(U.S.$ million)	
Financing activities				
Proceeds from issuance/(repurchase) of Euro, Swiss Franc and Sterling bonds		1,183	(90)	2,317
Proceeds from Perpetual bonds net of repurchases of U.S.$20 million (2009: U.S.$ nil million)		0	0	327
Proceeds from Convertible bonds		0	1,915	283
Proceeds from other non-current borrowings		317	40	776
Repayment of other non-current borrowings		0	0	(413)
Net proceeds from/(repayment of) current borrowings		(1,867)	2,495	2,945
Proceeds from/(repayment of) Xstrata secured bank loans		(1,060)	642	0
Acquisition of additional interest in subsidiaries		0	0	(75)
Payment of profit participation certificates		(799)	(792)	(883)
Repayment of exchangeable bonds		(591)	0	0
Return of capital to non-controlling interests		(23)	0	(28)
Dividend		(2)	(2)	(2)
Net cash generated/(used) by financing activities		(2,842)	4,208	5,247
Increase in cash and cash equivalents		168	34	603
Cash and cash equivalents, beginning of year		658	826	860
Cash and cash equivalents, end of year		826	860	1,463

The accompanying Notes are an integral part of the Historical Financial Information.

Consolidated Statement of Changes in Equity
For the years ended 31 December 2008, 2009 and 2010

	Retained earnings	Reserves[1]	Reserves and retained earnings	Share capital	Total equity attributable to equity holders	Non-controlling interests	Total equity
Balance 1 January 2008	3,120	(219)	2,901	46	2,947	900	3,847
Income for the year	367	0	367	0	367	24	391
Other comprehensive (loss)	(229)	(283)	(512)	0	(512)	0	(512)
Dividend[2]	(2)	0	(2)	0	(2)	(23)	(25)
Other	(1)	2	1	0	1	5	6
Balance 31 December 2008	3,255	(500)	2,755	46	2,801	906	3,707
Balance 1 January 2009	3,255	(500)	2,755	46	2,801	906	3,707
Income for the year	983	0	983	0	983	96	1,079
Other comprehensive income	175	405	580	0	580	0	580
Dividend[2]	(2)	0	(2)	0	(2)	0	(2)
Acquisition of subsidiaries	0	0	0	0	0	256	256
Equity portion of convertible bonds	0	77	77	0	77	0	77
Other	2	0	2	0	2	0	2
Balance 31 December 2009	4,413	(18)	4,395	46	4,441	1,258	5,699
Balance 1 January 2010	4,413	(18)	4,395	46	4,441	1,258	5,699
Income for the year	1,291	0	1,291	0	1,291	355	1,646
Other comprehensive (loss)/income	(43)	(141)	(184)	0	(184)	18	(166)
Dividend[2]	(2)	0	(2)	0	(2)	0	(2)
Return of capital to non-controlling interests	0	0	0	0	0	(28)	(28)
Change in ownership interest in subsidiaries	0	(134)	(134)	0	(134)	59	(75)
Acquisition of subsidiaries	0	0	0	0	0	1,232	1,232
Equity portion of convertible bonds	0	12	12	0	12	0	12
Balance 31 December 2010	5,659	(281)	5,378	46	5,424	2,894	8,318

Notes:

(1) See Note 14.

(2) During 2010, a dividend of U.S.$13.33 per share (2009 and 2008: U.S.$13.33) was declared and paid.

The accompanying Notes are an integral part of the Historical Financial Information.

NOTES TO THE HISTORICAL FINANCIAL INFORMATION

1 Basis of Preparation and Accounting Policies

Basis of preparation

The Historical Financial Information presents the consolidated financial results, cash flows and financial position of Glencore International AG (the "Company") and its subsidiaries (together "Glencore", the "Group") for the three years ended 31 December 2010, prepared in accordance with the accounting policies set out below. It excludes the current shareholder parent entities of the Company, being Glencore Holding AG and Glencore LTE AG (the "Parents"), the operations, assets and liabilities of which are limited solely to their holdings of shares in the Company and are therefore considered immaterial to the presentation of the Historical Financial Information. The operations, assets and liabilities of Glencore International plc, the entity that will be inserted as the new holding company and ultimate parent entity of the Group on completion of the transaction, are not taken into account in the Historical Financial Information.

The Historical Financial Information is prepared under the historical cost convention, except for the revaluation to fair value of certain financial assets, liabilities and marketing inventories. All amounts are expressed in millions of U.S. dollars, unless otherwise stated, consistent with the predominant functional currency of Glencore's operations.

The accounting policies adopted are in accordance with International Financial Reporting Standards (the "IFRS") issued by the International Accounting Standards Board (the "IASB") and interpretations of the International Financial Reporting Interpretations Committee ("IFRIC") and as adopted by the EU, effective for Glencore's reporting for the year ended 31 December 2010.

Changes in accounting policies and comparability

Glencore has adopted all of the new and revised standards and interpretations issued by the IASB and IFRIC and as adopted by the EU that are relevant to its operations and effective for accounting periods beginning on 1 January 2010 and that are expected to be applied for the accounting period beginning on 1 January 2011. In addition, Glencore adopted IFRS 8 "Operating Segments" which requires disclosure of certain information relating to Glencore's operating segments pending the filing of its financial statements with a securities commission for the purpose of issuing shares to the public. The adoption of these new and revised standards and interpretations did not have a material impact on the recognition and measurement of reported amounts. Glencore early adopted the requirements of IFRS 3 (Revised) "Business Combinations" and Amendments to IAS 27 "Consolidated and Separate Financial Statements" and consequently there were no significant changes in accounting policies in 2010, other than disclosures and presentation standards.

At the date of authorisation of the Historical Financial Information, the following standards and interpretations applicable to Glencore were issued but not yet effective:

IFRS 9 Financial Instruments (as amended in 2010)

IAS 24 Related Party Disclosures (revised 2009)

IFRIC 19 Extinguishing Financial Liabilities with Equity Instruments

Amendment to IFRS 3 (2008)—Business Combinations

Amendment to IFRS 7—Transfers of Financial Assets

Amendment to IAS 32—Classification of Rights Issues

Amendment to IFRIC 13—Customer Loyalty Programmes

Amendment to IFRIC 14—IAS 19: The Limit on a Defined Benefit Asset, Minimum Funding Requirements and their Interaction—November 2009 Amendment with respect to Voluntary Prepaid Contributions

Amendment to IAS 12—Income Taxes: Recovery of Underlying Assets

The Directors anticipate that the adoption of these standards and interpretations in future periods will not have a material impact on the financial information of Glencore, other than additional note disclosures.

Principles of consolidation

The consolidated Historical Financial Information of Glencore includes the accounts of Glencore International AG, a Swiss domiciled company with its registered office at Baarermattstrasse 3, CH-6341 Baar, (the "Company and parent entity") and its subsidiaries. A subsidiary is an entity that is ultimately controlled by the Company. Control is the power to govern the financial and operating policies of an entity so as to obtain benefits from its activities. Control is usually assumed where Glencore ultimately owns or controls more than 50 per cent. of the voting rights, unless evidence exists to the contrary. The results of subsidiaries acquired or disposed of during the year are consolidated from the effective date of acquisition or up to the effective date of disposal, as appropriate. All intercompany balances, transactions and unrealised profits are eliminated.

Non-controlling interests in subsidiaries are identified separately from Glencore's equity and are initially measured either at fair value or at the non-controlling interests' proportionate share of the fair value of the acquiree's identifiable net assets. Subsequent to acquisition, the carrying amount of non-controlling interests is the amount of those interests at initial recognition plus the non-controlling interests' share of subsequent changes in equity. Total comprehensive income is attributed to non-controlling interests even if this results in the non-controlling interests having a deficit balance.

Changes in Glencore's interests in subsidiaries that do not result in a loss of control are accounted for as equity transactions with any difference between the amount by which the non-controlling interests are adjusted and the fair value of the consideration paid or received being recognised directly in equity and attributed to owners of Glencore.

Investments in associates, jointly controlled entities and joint venture operations

Associates and jointly controlled entities (together "Associates") in which Glencore exercises significant influence or joint control are accounted for using the equity method. Significant influence is the power to participate in the financial and operating policy decisions of the investee, but is not control over those policies. Significant influence is presumed if Glencore holds between 20 per cent. and 50 per cent. of the voting rights, unless evidence exists to the contrary. Joint control is the contractually agreed sharing of control over an economic entity where strategic and operating decisions require unanimous decision making.

Equity accounting involves Glencore recording its share of the Associate's net income and equity. Glencore's interest in an Associate is initially recorded at cost and is subsequently adjusted for Glencore's share of changes in net assets of the Associate, less any impairment in the value of individual investments. Where Glencore transacts with an Associate, unrealised profits and losses are eliminated to the extent of Glencore's interest in that Associate.

Changes in Glencore's interests in Associates are accounted for as a gain or loss on disposal with any difference between the amount by which the carrying value of the Associate is adjusted and the fair value of the consideration received being recognised directly in the statement of income.

Where Glencore undertakes activities under joint venture operation or asset arrangements, Glencore reports such interests using the proportionate consolidation method. Glencore's share of the assets, liabilities, income, expenses and cash flows of jointly controlled operations or asset arrangements are consolidated with the equivalent items in the Historical Financial Information on a line-by-line basis.

Business combinations

Acquisitions of subsidiaries and businesses are accounted for using the acquisition method of accounting, whereby the identifiable assets, liabilities and contingent liabilities (identifiable net assets) are measured on the basis of fair value at the date of acquisition. Acquisition-related costs are recognised in the statement of income as incurred.

Where a business combination is achieved in stages, Glencore's previously held interests in the acquired entity are remeasured to fair value at the acquisition date (i.e. the date Glencore attains control) and the resulting gain or loss, if any, is recognised in the statement of income.

Where the fair value of consideration transferred for a business combination exceeds the fair values attributable to Glencore's share of the identifiable net assets, the difference is treated as purchased goodwill, which is not amortised, but is reviewed annually for impairment and when there is an indication of impairment. Any impairment identified is immediately recognised in the statement of income. If the fair value attributable to Glencore's share of the identifiable net assets exceeds the consideration transferred, the difference is immediately recognised in the statement of income.

Similar procedures are applied in accounting for the purchases of interests in Associates. Any goodwill arising from such purchases is included within the carrying amount of the investment in Associates, but not amortised thereafter. Any excess of Glencore's share of the net fair value of the Associate's identifiable net assets over the cost of the investment is included in the statement of income in the period of the purchase.

The main operating and finance subsidiaries and industrial investments of Glencore are listed in Note 28.

Non-current assets held for sale and disposal groups

Non-current assets and assets and liabilities included in disposal groups are classified as held for sale if their carrying amount will be recovered principally through a sale transaction rather than through continuing use, they are available for immediate disposal and the sale is highly probable. Non-current assets held for sale are measured at the lower of their carrying amount or fair value less costs to sell.

Revenue recognition

Revenue is recognised when the seller has transferred to the buyer all significant risks and rewards of ownership of the assets sold. Revenue excludes any applicable sales taxes and is recognised at the fair value of the consideration received or receivable to the extent that it is probable that economic benefits will flow to Glencore and the revenues and costs can be reliably measured. In most instances, sales revenue is recognised when the product is delivered to the destination specified by the customer, which is typically the vessel on which it is shipped, the destination port or the customer's premises.

For certain commodities, the sales price is determined on a provisional basis at the date of sale, as the final selling price is subject to movements in market prices up to the date of final pricing, normally ranging from 30 to 180 days after initial booking. Revenue on provisionally priced sales is recognised based on the estimated fair value of the total consideration receivable. The revenue adjustment mechanism embedded within provisionally priced sales arrangements has the character of a commodity derivative. Accordingly, the fair value of the final sales price adjustment is re-estimated continuously and changes in fair value are recognised as an adjustment to revenue. In all cases, fair value is estimated by reference to forward market prices.

Interest and dividend income is recognised when the right to receive payment has been established; it is probable that the economic benefits will flow to Glencore and the amount of income can be measured reliably. Interest income is accrued on a time basis, by reference to the principal outstanding and at the applicable effective interest rate.

Foreign currency translation

Glencore's reporting currency and the functional currency of the majority of its operations is the U.S. dollar as this is assessed to be the principal currency of the economic environment in which they operate.

Foreign currency transactions

Transactions in foreign currencies are converted into the functional currency of each entity using the exchange rate prevailing at the transaction date. Monetary assets and liabilities outstanding at year end are converted at year-end rates. The resulting exchange differences are recorded in the consolidated statement of income.

Translation of financial information

For the purposes of consolidation, assets and liabilities of group companies whose functional currency is in a currency other than the U.S. dollar are translated into U.S. dollars using year-end exchange rates, while their statements of income are translated using average rates of exchange for the year. Goodwill and fair value adjustments arising from the acquisition of a foreign operation are treated as assets and liabilities of the foreign operation and are translated at the closing rate. Translation adjustments are included as a separate component of shareholders' equity and have no statement of income impact to the extent that no disposal of the foreign operation has occurred.

Securitisations

Glencore may obtain sources of liquidity by securitising certain of its receivables which generally result in the legal sale of these assets to special purpose entities (the "SPEs") which, in turn, issue securities to investors. After securitisation, Glencore continues to maintain customer relationships and provide servicing for the receivables transferred to the SPEs.

In accounting for such securitisations, two key accounting determinations are made:

An evaluation is made as to whether the securitisation entity should be considered a subsidiary of Glencore and be included in Glencore's consolidated financial information or whether the entity is sufficiently independent that it does not need to be consolidated. For all securitisations in which Glencore participates, an evaluation is made of whether Glencore controls the entity.

Where the securitisation entity is not considered a subsidiary, an evaluation is then made as to whether Glencore has transferred the rights to the cash flows, risks and rewards of ownership and control of the underlying assets, thus qualifying it for derecognition and a sale under IFRS. If a transfer of assets meets the derecognition and sale requirements, the assets are removed from Glencore's consolidated financial information. If the conditions for derecognition and sale are not met, the transfer is considered to be a secured borrowing, the assets remain in the consolidated financial information and the proceeds are recognised as a liability.

Repurchase agreements

Glencore enters into repurchase transactions where it sells certain marketing inventories, but retains all or a significant portion of the risks and rewards relating to the transferred inventory. Repurchase transactions are treated as collateralised borrowings, whereby the inventories are not derecognised from the statement of financial position and the cash received is recorded as a corresponding obligation within the statement of financial position as "commodities sold with agreements to repurchase" or, if the repurchase obligation is optional, within "trade advances from buyers".

Borrowing costs

Borrowing costs are generally expensed as incurred, except where they relate to the financing of construction or development of qualifying assets, in which case they are capitalised up to the date when the qualifying asset is ready for its intended use.

Retirement benefits

Glencore operates various pension schemes in accordance with local requirements and practices of the respective countries. The annual costs for defined contribution plans that are funded by payments to separate trustee administered funds or insurance companies equal the contributions that are required under the plans and are accounted for as an expense. Glencore uses the projected unit credit actuarial method to determine the present value of its defined benefit obligations and the related current service cost and, where applicable, past service cost. Actuarial gains and losses are recognised in the statement of income over the average remaining service lives of employees. Past service cost is recognised immediately to the extent that the benefits are already vested, and otherwise is amortised on a straight-line basis over the average period until the benefits become vested.

Income taxes

Income taxes consist of current and deferred income taxes. Current taxes represent income taxes expected to be payable based on enacted or substantively enacted tax rates at the period end and expected current taxable income, and any adjustment to tax payable in respect of previous years. Deferred taxes are recognised for temporary differences between the carrying amounts of assets and liabilities in the financial information and the corresponding tax bases used in the computation of taxable profit, using enacted or substantively enacted income tax rates. Deferred tax assets and unused tax losses are only recognised to the extent that their recoverability is probable. Deferred tax assets are reviewed at each reporting period end and amended to the extent that it is no longer probable that the related benefit will be realised. To the extent that a deferred tax asset not previously recognised fulfils the criteria for recognition, an asset is recognised. Deferred tax assets and liabilities are offset when they relate to income taxes levied by the same authority and Glencore has both the right and the intention to settle its current tax assets and liabilities on a net or simultaneous basis. The tax effect of certain temporary differences is not recognised principally with respect to the initial recognition of an asset or liability (other than those arising in a business combination or in a manner that initially impacted accounting or taxable profit) and temporary differences relating to investments in subsidiaries and associates to the extent that Glencore can control the timing of the reversal of the temporary difference and it is probable the temporary difference will not reverse in the foreseeable future. Deferred tax is provided in respect of fair value adjustments on acquisitions. These adjustments may relate to assets such as extraction rights that, in general, are not eligible for income tax allowances.

Royalties, extraction taxes and other levies/taxes are treated as taxation arrangements when they have the characteristics of an income tax, including being imposed and determined in accordance with regulations established by the respective government's taxation authority.

Current and deferred tax are recognised as an expense or income in the statement of income, except when they relate to items that are recognised outside the statement of income (whether in other comprehensive income or directly in equity) or where they arise from the initial accounting for a business combination.

Exploration and evaluation expenditure

Exploration and evaluation expenditure relates to costs incurred on the exploration and evaluation of potential mineral and petroleum resources and includes costs such as researching and analysing historical exploration data, exploratory drilling, trenching, sampling and the costs of pre-feasibility studies. Exploration and evaluation expenditure for each area of interest, other than that acquired from the purchase of another company, is charged to the statement of income as incurred, except when the expenditure will be recouped from future exploitation or sale of the area of interest and it is planned to continue with active and significant operations in relation to the area, or at the reporting period end, the activity has not reached a stage which permits a reasonable assessment of the existence of commercially recoverable reserves, in which case the expenditure is capitalised. Purchased exploration and evaluation assets are recognised at their fair value at acquisition if purchased as part of a business combination.

Capitalised exploration and evaluation expenditure is recorded as a component of mineral and petroleum rights in property, plant and equipment.

All capitalised exploration and evaluation expenditure is monitored for indications of impairment. Where a potential impairment is indicated, an assessment is performed for each area of interest or at the cash generating unit level. To the extent that capitalised expenditure is not expected to be recovered, it is charged to the statement of income.

Development expenditure

When commercially recoverable reserves are determined and such development receives the appropriate approvals, capitalised exploration and evaluation expenditure is transferred to construction in progress. Upon completion of development and commencement of production, capitalised development costs are transferred to deferred mining costs and depreciated using the unit of production method.

Property, plant and equipment

Property, plant and equipment are stated at cost, being the fair value of the consideration given to acquire or construct the asset, including directly attributable costs required to bring the asset to the location or to a condition necessary for operation and the direct cost of dismantling and removing the asset, less accumulated depreciation and any accumulated impairment losses.

Property, plant and equipment is depreciated to its estimated residual value over the estimated useful life of the specific asset concerned, or the estimated remaining life of the associated mine, field or lease, if shorter. Depreciation commences when the asset is available for use.

The major categories of property, plant and equipment are depreciated on a unit of production and/or straight-line basis as follows:

Buildings	10-45 years
Land	not depreciated
Plant and equipment	3-20 years
Mineral rights and development costs	unit of production

Assets under finance leases, where substantially all the risks and rewards of ownership transfer to the Group as lessee, are capitalised and amortised over their expected useful lives on the same basis as owned assets or, where shorter, the term of the relevant lease. All other leases are classified as operating leases, the expenditures for which, are charged against income over the accounting periods covered by the lease term.

Deferred stripping costs

Stripping costs incurred in the development of a mine (or pit) before production commences are capitalised as part of the cost of constructing the mine (or pit) and subsequently amortised over the life of the mine (or pit) on a unit of production basis. Production stripping costs are deferred when the actual stripping ratio incurred significantly exceeds the expected long-term average stripping ratio and are subsequently amortised when the actual stripping ratio falls below the long-term average stripping ratio. Where the ore is expected to be evenly distributed, waste removal is expensed as incurred.

Mineral and petroleum rights

Mineral and petroleum reserves, resources and rights (together "Mineral Rights") which can be reasonably valued, are recognised in the assessment of fair values on acquisition. Mineral Rights for which values cannot be reasonably determined are not recognised. Exploitable Mineral Rights are amortised using the unit of production method over the commercially recoverable reserves.

Restoration, rehabilitation and decommissioning

Restoration, rehabilitation and decommissioning costs arising from the installation of plant and other site preparation work, discounted to their present value, are provided for and capitalised at the time such an obligation arises. The costs are charged to the statement of income over the life of the operation through depreciation of the asset and the unwinding of the discount on the provision.

Costs for restoration of subsequent site disturbance, which is created on an ongoing basis during production, are provided for at their net present values and charged to the statement of income as extraction progresses.

Other investments

Equity investments, other than investments in Associates, are recorded at fair value unless such fair value is not reliably determinable, in which case they are carried at cost. Changes in fair value are recorded in the statement of income unless they are classified as available for sale, in which case fair value movements are recognised in other comprehensive income and are subsequently recognised in the statement of income when realised by sale or redemption, or when a reduction in fair value is judged to be a significant or prolonged decline.

Impairment

Investments in Associates and other investments, advances and loans and property, plant and equipment are reviewed for impairment whenever events or changes in circumstances indicate the carrying value may not be recoverable. If there are indicators of impairment, a review is undertaken to determine whether the carrying amounts are in excess of their recoverable amounts. An asset's recoverable amount is determined as the higher of its fair value less costs to sell and its value in use. Such reviews are undertaken on an asset-by-asset basis, except where assets do not generate cash flows independent of other assets, in which case the review is undertaken at the cash generating unit level.

Where a cash generating unit, or group of cash generating units, has goodwill allocated to it, or includes intangible assets which are either not available for use or which have an indefinite useful life (and which can only be tested as part of a cash generating unit), an impairment test is performed at least annually or whenever there is an indication that the carrying amounts of such assets may be impaired.

If the carrying amount of an asset exceeds its recoverable amount, an impairment loss is recorded in the income statement to reflect the asset at the lower amount.

An impairment loss is reversed in the statement of income if there is a change in the estimates used to determine the recoverable amount since the prior impairment loss was recognised. The carrying amount is increased to the recoverable amount, but not beyond the carrying amount net of depreciation or amortisation which would have arisen if the prior impairment loss had not been recognised. Goodwill impairments and impairments of available for sale equity investments are not reversed.

Provisions

Provisions are recognised when Glencore has a present obligation, as a result of past events, and it is probable that an outflow of resources embodying economic benefits that can be reliably estimated will be required to settle the liability.

Inventories

The majority of marketing inventories are valued at fair value less costs to sell with the remainder valued at the lower of cost or net realisable value. Unrealised gains and losses from changes in fair value are reported in cost of goods sold.

Production inventories are valued at the lower of cost or net realisable value. Cost is determined using the first-in first-out ("FIFO") or the weighted average method and comprises material costs, labour costs and allocated production related overhead costs. Financing and storage costs related to inventory are expensed as incurred.

Financial instruments

Financial assets are classified as either financial assets at fair value through profit or loss, loans and receivables, held-to-maturity investments or available for sale financial assets, depending upon the purpose for which the financial assets were acquired. Financial assets are initially recognised at fair value on the trade date, including, in the case of instruments not recorded at fair value through profit or loss, directly attributable transaction costs. Subsequently, financial assets are carried at fair value (other investments, derivatives and marketable securities) or amortised cost less impairment (accounts receivable and advances and loans). Financial liabilities, other than derivatives, are initially recognised at fair value of consideration received net of transaction costs, as appropriate, and subsequently carried at amortised cost.

Convertible bonds

At the date of issue, the fair value of the liability component is determined by discounting the contractual future cash flows using a market rate for a similar non-convertible instrument. The liability component is recorded as a liability on an amortised cost basis using the effective interest method. The equity component is recognised as the difference between the fair value of the proceeds as a whole and the fair value of the liability component and it is not subsequently remeasured.

Derivatives and hedging activities

Derivative instruments, which include contracts to sell or purchase commodities that do not meet the own use exemption, are initially recognised at fair value when Glencore becomes a party to the contractual provisions of the instrument and are subsequently remeasured to fair value at the end of each reporting period. Fair values are determined using quoted market prices, dealer price quotations or using models and other valuation techniques, the key inputs for which include current market and contractual prices for the underlying instrument, time to expiry, yield curves, volatility of the underlying instrument and counterparty risk.

Gains and losses on derivative instruments for which hedge accounting is not applied, other than the revenue adjustment mechanism embedded within provisionally priced sales, are recognised in cost of goods sold.

Those derivatives qualifying and designated as hedges are either (i) a Fair Value Hedge of the change in fair value of a recognised asset or liability or an unrecognised firm commitment, or (ii) a Cash Flow Hedge of the change in cashflows to be received or paid relating to a recognised asset or liability or a highly probable transaction.

A change in the fair value of derivatives designated as a "Fair Value Hedge" is reflected together with the change in the fair value of the hedged item in the statement of income.

A change in the fair value of derivatives designated as "Cash Flow Hedge" is initially recognised as a Cash Flow Hedge reserve in shareholders' equity. The deferred amount is then released to the statement of income in the same periods during which the hedged transaction affects the statement of income. Hedge ineffectiveness is recorded in the statement of income when it occurs.

When a hedging instrument expires or is sold, or when a hedge no longer meets the criteria for hedge accounting, any cumulative gain or loss existing in equity at that time remains in shareholders' equity and is recognised in the statement of income when the committed or forecast transaction is ultimately recognised in the statement of income. However, if a forecast or committed transaction is no longer expected to occur, the cumulative gain or loss that was recognised in equity is immediately transferred to the statement of income.

A derivative may be embedded in a "host contract". Such combinations are known as hybrid instruments and, at the date of issuance, the embedded derivative is separated from the host contract and accounted for as a stand-alone derivative if the criteria for separation are met. The host contract is accounted for in accordance with its relevant accounting policy.

Critical accounting policies, key judgements and estimates

The preparation of the Historical Financial Information requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities as well as the disclosure of contingent assets and liabilities at the date of the financial information and the reported amounts of revenues and expenses during the reporting period. The estimates and associated assumptions are based on historical experience and other factors that are considered to be relevant. Actual outcomes could differ from those estimates.

Glencore has identified the following areas as being critical to understanding Glencore's financial position as they require management to make complex and/or subjective judgements and estimates about matters that are inherently uncertain:

Valuation of derivative instruments

Derivative instruments are carried at fair value and Glencore evaluates the quality and reliability of the assumptions and data used to measure fair value in the three hierarchy levels, Level 1, 2 and 3, as prescribed by IFRS 7. Fair values are determined in the following ways: externally verified via comparison to quoted market prices in active markets ("Level 1"); by using models with externally verifiable inputs ("Level 2"); or by using alternative procedures such as comparison to comparable instruments and/or using models with unobservable market inputs requiring Glencore to make market-based assumptions ("Level 3"). For more details, refer to Note 23.

Depreciation and amortisation of mineral and petroleum rights and project development costs

Mineral and petroleum rights and project development costs are amortised using the unit of production method (the "UOP"). The calculation of the UOP rate of amortisation, and therefore the annual amortisation charge to operations, can fluctuate from initial estimates. This could generally result when there are significant changes in any of the factors or assumptions used in estimating mineral or petroleum reserves, notably changes in the geology of the reserves and assumptions used in determining the economic feasibility of the reserves. Such changes in reserves could similarly impact the useful lives of assets depreciated on a straight-line basis, where those lives are limited to the life of the project, which, in turn is, limited to the life of the proven and probable mineral or petroleum reserves. Estimates of proven and probable reserves are prepared by experts in extraction, geology and reserve determination. Assessments of UOP rates against the estimated reserve base and the operating and development plan are performed regularly.

Impairments

Investments in Associates and other investments, advances and loans and property, plant and equipment, goodwill and other intangible assets are reviewed for impairment whenever events or changes in circumstances indicate that the carrying value may not be fully recoverable or at least annually for goodwill and other indefinite life intangible assets. If an asset's recoverable amount is less than the asset's carrying amount, an impairment loss is recognised. Future cash flow estimates which are used to calculate the asset's fair value are based on expectations about future operations primarily comprising estimates about production and sales volumes, commodity prices, reserves, operating, rehabilitation and restoration costs and capital expenditures. Changes in such estimates could impact recoverable values of these assets. Estimates are reviewed regularly by management.

Restoration, rehabilitation and decommissioning costs

A provision for future restoration, rehabilitation and decommissioning costs requires estimates and assumptions to be made around the relevant regulatory framework, the magnitude of the possible disturbance and the timing, extent and costs of the required closure and rehabilitation activities. To the extent that the actual future costs differ from these estimates, adjustments will be recorded and the statement of income could be impacted. The provisions, including the estimates and assumptions contained therein are reviewed regularly by management.

Provisions

The amount recognised as a provision, including tax, legal, contractual and other exposures or obligations, is the best estimate of the consideration required to settle the related liability, including any related interest charges, taking into account the risks and uncertainties surrounding the obligation. The Group assesses its liabilities and contingencies based upon the best information available, relevant tax laws and other appropriate requirements.

Fair value

In addition to recognising derivative instruments at fair value, as discussed above, an assessment of fair value of assets and liabilities is also required in accounting for other transactions, most notably business combinations and disclosures related to fair values of financial assets and liabilities. In such instances, fair value measurements are estimated based on the amounts for which the assets and liabilities could be exchanged at the relevant transaction date or reporting period end, and are therefore not necessarily reflective of the likely cashflow upon actual settlements. Where fair value measurements cannot be derived from publicly available information, they are estimated using models and other valuation methods. To the extent possible, the assumptions and inputs used take into account externally verifiable inputs. However, such information is by nature subject to uncertainty, particularly where comparable market-based transactions rarely exist.

2 Segment Information

Glencore is organised and operates on a worldwide basis in three core business segments—metals and minerals, energy products and agricultural products, with each business segment responsible for the marketing, sourcing, hedging, logistics and industrial investment activities of their respective markets and reflecting the structure used by Glencore's management to assess the performance of Glencore.

The business segments' contributions to the Group are primarily derived from the net margin or premium earned from physical marketing activities (net sale and purchase of physical commodities), provision of marketing and related value added services and the margin earned from industrial asset activities (net resulting from the sale of physical commodities over the cost of production and/or other cost of sales) and comprise the following underlying key commodities:

- Metals and minerals: Zinc, copper, lead, alumina, aluminium, ferro alloys, nickel, cobalt and iron ore, including smelting, refining, mining, processing and storage-related operations of the relevant commodities.
- Energy products: Crude oil, oil products, steam coal and metallurgical coal supported by investments in coal mining and oil production operations, ports, vessels and storage facilities.
- Agriculture products: Wheat, corn, barley, rice, oilseeds, meals, edible oils, biodiesel, cotton and sugar supported by investments in storage, handling, processing and port facilities.
- Corporate and other: Statement of income amounts represent Glencore's share of income related to Xstrata and other unallocated Group related expenses (mainly variable pool bonus accrual). Balance sheet amounts represent Group related balances.

The financial performance of the segments is principally evaluated with reference to Adjusted EBIT/EBITDA which is the net result of revenue less cost of goods sold and selling and administrative expenses plus share of income from associates and jointly controlled entities and dividends as disclosed on the face of the consolidated statement of income. Furthermore, given that funding costs in relation to working capital employed in the marketing activities are sought to be "recovered" via transactional terms, the performance of marketing activities is also assessed at a net income level.

The accounting policies of the operating segments are the same as those described in the summary of significant accounting policies. Glencore accounts for inter-segment sales and transfers as if the sales or transfers were to third parties, i.e. at current market prices. Exceptional items represent significant items of income and expense which, due to their financial impact, nature or the expected infrequency of the events giving rise to them, have been separated for internal reporting and analysis of Glencore's results.

2008	Metals and Minerals	Energy Products	Agricultural Products	Corporate and other	Total
			(U.S.$ million)		
Revenue					
Revenue from third parties	40,685	98,157	13,394	0	152,236
Marketing activities					
Adjusted EBIT	776	1,609	579	(103)	2,861
Exceptional items included above(1)	341	0	0	0	341
Adjusted EBIT pre-exceptional items	1,117	1,609	579	(103)	3,202
Depreciation and amortisation	0	0	0	13	13
Adjusted EBITDA pre-exceptional items	1,117	1,609	579	(90)	3,215
Industrial activities					
Adjusted EBIT	497	522	99	1,147	2,265
Exceptional items included above(1)	356	0	0	389	745
Adjusted EBIT pre-exceptional items	853	522	99	1,536	3,010
Depreciation and amortisation	441	110	11	0	562
Adjusted EBITDA pre-exceptional items	1,294	632	110	1,536	3,572
Total Adjusted EBITDA pre-exceptional items	2,411	2,241	689	1,446	6,787
Depreciation and amortisation excluded above	(441)	(110)	(11)	(13)	(575)
Total Adjusted EBIT pre-exceptional items	1,970	2,131	678	1,433	6,212
Exceptional items excluded above					(1,086)
Interest expense—net					(837)
(Loss)/gain on sale of investments—net					7
Other (expense)/income/—net					(2,960)
Income tax expense					(268)
Income before attribution					1,068

Note:

(1) U.S.$341 million of marketing activities exceptional items related primarily to inventory net realisable value adjustments and U.S.$745 million of industrial activities exceptional items related primarily to U.S.$330 million of inventory net realisable value adjustments, severance and other related expenses and Glencore's share of asset impairment charges booked directly by Xstrata (U.S.$415 million).

2008	Metals and Minerals	Energy Products	Agricultural Products	Corporate and other	Total
			(U.S.$ million)		
Current assets	16,257	14,746	2,315	2,251	35,569
Current liabilities	(10,538)	(10,900)	(1,331)	(2,692)	(25,461)
Allocatable current capital employed	5,719	3,846	984	(441)	10,108
Property, plant and equipment	4,859	1,587	413	0	6,859
Investments in Associates and other investments	2,421	1,453	95	12,060	16,029
Non-current advances and loans	494	1,243	25	64	1,826
Allocatable non-current capital employed	7,774	4,283	533	12,124	24,714
Other assets(1)	0	0	0	1,028	1,028
Other liabilities(2)	0	0	0	(19,539)	(19,539)
Total net assets	13,493	8,129	1,517	(6,828)	16,311
Included in property, plant and equipment are:					
Additions	1,062	698	102	13	1,875

Notes:

(1) Other assets include deferred tax assets, cash and cash equivalents, marketable securities and assets held for sale.

(2) Other liabilities include borrowings, deferred income, deferred tax liabilities, provisions and commodities sold with agreements to repurchase.

2009	Metals and Minerals	Energy Products	Agricultural Products	Corporate and other	Total
			(U.S.$ million)		
Revenue					
Revenue from third parties	35,391	62,391	8,582	0	106,364
Marketing activities					
Adjusted EBIT	523	945	304	(211)	1,561
Exceptional items included above(1)	30	0	0	0	30
Adjusted EBIT pre-exceptional items	553	945	304	(211)	1,591
Depreciation and amortisation	0	0	0	15	15
Adjusted EBITDA pre-exceptional items	553	945	304	(196)	1,606
Industrial activities					
Adjusted EBIT	443	413	41	28	925
Exceptional items included above(1)	55	0	0	736	791
Adjusted EBIT pre-exceptional items	498	413	41	764	1,716
Depreciation and amortisation	521	49	37	0	607
Adjusted EBITDA pre-exceptional items	1,019	462	78	764	2,323
Total Adjusted EBITDA pre-exceptional items	1,572	1,407	382	568	3,929
Depreciation and amortisation excluded above	(521)	(49)	(37)	(15)	(622)
Total Adjusted EBIT pre-exceptional items	1,051	1,358	345	553	3,307
Exceptional items excluded above					(821)
Interest expense—net					(587)
(Loss)/gain on sale of investments—net					33
Other (expense)/income—net					35
Income tax expense					(238)
Income before attribution					1,729

Note:

(1) U.S.$30 million of marketing activities exceptional items related primarily to inventory net realisable value adjustments and $791 million of industrial activities exceptional items related to severance and other related expenses (U.S.$30 million) and Glencore's share of asset impairment charges booked directly by Xstrata (U.S.$736 million) and Century (U.S.$25 million).

2009	Metals and Minerals	Energy Products	Agricultural Products	Corporate and other	Total
			(U.S.$ million)		
Current assets	18,244	13,860	2,294	2,043	36,441
Current liabilities	(9,759)	(6,844)	(882)	(2,894)	(20,379)
Allocatable current capital employed	8,485	7,016	1,412	(851)	16,062
Property, plant and equipment	5,672	679	494	0	6,845
Investments in Associates and other investments	2,129	924	41	14,989	18,083
Non-current advances and loans	1,054	1,382	34	65	2,535
Allocatable non-current capital employed	8,855	2,985	569	15,054	27,463
Other assets(1)	0	0	0	2,372	2,372
Other liabilities(2)	0	0	0	(27,953)	(27,953)
Total net assets	17,340	10,001	1,981	(11,378)	17,944
Included in property, plant and equipment are:					
Additions	607	393	116	0	1,116

Notes:

(1) Other assets include deferred tax assets, cash and cash equivalents, marketable securities and assets held for sale.

(2) Other liabilities include borrowings, deferred income, deferred tax liabilities, provisions, commodities sold with agreements to repurchase, Prodeco call option arrangement and liabilities held for sale.

2010	Metals and Minerals	Energy Products	Agricultural Products	Corporate and other	Total
			(U.S.$ million)		
Revenue					
Revenue from third parties	45,211	89,349	10,418	0	144,978
Marketing activities					
Adjusted EBIT	1,401	450	659	(173)	2,337
Depreciation and amortisation	0	20	0	10	30
Adjusted EBITDA pre-exceptional items	1,401	470	659	(163)	2,367
Industrial activities					
Adjusted EBIT	1,160	235	58	1,500	2,953
Depreciation and amortisation	708	124	49	0	881
Adjusted EBITDA pre-exceptional items	1,868	359	107	1,500	3,834
Total Adjusted EBITDA pre-exceptional items	3,269	829	766	1,337	6,201
Depreciation and amortisation excluded above	(708)	(144)	(49)	(10)	(911)
Total Adjusted EBIT pre-exceptional items	2,561	685	717	1,327	5,290
Interest expense—net					(936)
(Loss)/gain on sale of investments—net					(6)
Other (expense)/income—net					(8)
Income tax expense					(234)
Income before attribution					4,106

2010	Metals and Minerals	Energy Products	Agricultural Products	Corporate and other	Total
			(U.S.$ million)		
Current assets	17,901	15,759	5,958	2,869	42,487
Current liabilities	(8,597)	(11,237)	(2,000)	(2,594)	(24,428)
Allocatable current capital employed	9,304	4,522	3,958	275	18,059
Property, plant and equipment	8,860	2,489	739	0	12,088
Investments in Associates and other investments	2,134	1,108	157	15,805	19,204
Non-current advances and loans	813	2,832	113	72	3,830
Allocatable non-current capital employed	11,807	6,429	1,009	15,877	35,122
Other assets[1]	0	0	0	2,178	2,178
Other liabilities[2]	0	0	0	(32,852)	(32,852)
Total net assets	21,111	10,951	4,967	(14,522)	22,507
Included in property, plant and equipment are:					
Additions	1,001	818	71	0	1,890

Notes:

(1) Other assets include deferred tax assets, cash and cash equivalents, marketable securities and assets held for sale.

(2) Other liabilities include borrowings, deferred income, deferred tax liabilities, provisions, commodities sold with agreements to repurchase and liabilities held for sale.

Geographical information

	2008	2009	2010
		(U.S.$ million)	
Revenue from third parties[1]			
The Americas	41,262	27,736	39,183
Europe	61,056	37,647	47,724
Asia	31,553	31,081	42,820
Africa	16,913	9,089	13,975
Oceania	1,452	811	1,276
	152,236	106,364	144,978
Non-Current assets[2]			
The Americas	4,120	2,554	3,755
Europe	10,911	12,858	15,224
Asia	2,506	2,730	5,880
Africa	1,221	2,252	2,702
Oceania	1,322	1,332	1,293
	20,080	21,726	28,854

Notes:

(1) Revenue by geographical destination is based on the country of incorporation of the sales counterparty.

(2) Non-current assets are non-current operating assets other than financial instruments and deferred tax assets.

3 (Loss)/Gain on Sale of Investments

	2008	2009	2010
		(U.S.$ million)	
Gain on sale of subsidiaries	7	97	0
Loss on sale of investments in associates	0	(64)	(6)
Total	7	33	(6)

The net gain on sale of subsidiaries and investments in 2009 comprised primarily a gain of U.S.$97 million relating to the disposal of East Tennessee Zinc Company LLC in December 2009 (see Note 21) and a gain on the disposal of Refineria de Cartagena S.A. (see Note 7), offset by a dilution loss following Xstrata's capital raising in March 2009, which resulted in Glencore's effective ownership reducing from 35.2 per cent. to 34.9 per cent.

4 Other (Expense)/Income—Net

	Notes	2008	2009	2010
		(U.S.$ million)		
Changes in mark to market valuation—net[1]		(137)	222	(178)
Impairment[2]		(2,763)	0	(336)
Prodeco transaction and related expenses[3]	13	0	(303)	(225)
Changes in mark to market valuation of forward contracts[4]		0	0	(790)
Gain on settlement of restructured Russneft loans	8	0	0	382
Impairment reversal[5]		0	0	674
Revaluation of previously held interest in newly acquired businesses	21	0	161	462
Impairment on Katanga related goodwill	21	0	(161)	0
Foreign exchange gain/(loss)		(80)	26	31
Other		20	90	(28)
Total		(2,960)	35	(8)

In addition to foreign exchange gains/(losses) and mark to market movements on investments held for trading, other (expense)/income—net includes significant items of income and expense which due to their non-operational nature or expected infrequency of the events giving rise to them are reported separately from operating segment results. Other (expense)/income—net includes, but is not limited to, impairment charges/reversals, gains/losses on restructured loans, revaluation of previously held interests in business combinations and restructuring and closure costs.

Notes:

(1) Changes in mark to market valuation—net primarily relates to movements on interests in other investments classified as held for trading and carried at fair value, with Glencore's stake in Volcan Compania Minera S.A.A. accounting for the majority of the movement in 2010 and 2009.

(2) In 2010, an impairment was recognised following the Russneft debt amendment and restatement (see Note 8). In 2008, the rapid and severe impacts arising from the global financial crisis in the latter part of that year, resulting in a substantial fall in commodity prices, increased uncertainty in the credit markets and an increase in political risk, led to the deferral of a number of expansion projects, cutbacks in production output and mine closures, leading to impairments to the carrying value of property, plant and equipment (U.S.$97 million), investments in Associates (U.S.$1,883 million), other investments (U.S.$500 million), non-current loans (U.S.$217 million) and other current assets (U.S.$66 million). The recoverable amounts were determined on the basis of the assets' fair value less cost to sell, determined using discounted cash flow techniques which incorporated discount rates commensurate with the nature of the underlying forecast cash flows ranging from 6.4 per cent. to 12.5 per cent.

(3) In March 2009, Xstrata acquired Glencore's Colombian Coal Group ("Prodeco") for U.S.$2 billion and concurrently granted Glencore an option to repurchase Prodeco within 12 months for U.S.$2.25 billion plus profits accrued during the option period and the net balance of any cash invested. Given the fixed price repurchase option, the conditions for derecognition/disposal of Prodeco were not met under IFRS and, as a consequence, Prodeco's operations remained in the consolidated financial statements, while the "proceeds" were deferred and recognised as a liability. In March 2010, the option was exercised (see Note 13). Following the exercise of the option, in addition to the option repurchase expenses (including the option premium and profit entitlement) incurred during the year, U.S.$115 million of additional depreciation expense was recognised to reflect the depreciation that would have been charged if the related assets had not previously been classified as held for sale.

(4) Changes in mark to market valuation of forward contracts represents movements in the fair value of certain fixed price forward coal sales contracts relating to Prodeco's future production, into which it plans to physically deliver. Following the legal reacquisition of Prodeco in March 2010, from an accounting perspective, these forward sales contracts could not technically be classified as "own use" or as cashflow hedges, which would have deferred the income statement effect until performance of the underlying future sale transactions. As at year end, approximately 19.3 million tonnes of such coal had been sold forward at a fixed price in respect of quarterly periods to the end of 2013.

(5) During the regular assessment of whether there is an indication of an asset impairment or whether a previously recorded impairment may no longer be required, an upward revision of long-term base metals and coal price assumptions resulted in an impairment reversal of U.S.$674 million against Glencore's interest in Xstrata. The recoverable amount of Glencore's share of the underlying net assets have been determined on the basis of its fair value less costs to sell using discounted cash flow techniques.

5 Income Taxes

Income taxes consist of the following:

	2008	2009	2010
	(U.S.$ million)		
Current income tax expense	(314)	(259)	(292)
Deferred income tax credit	46	21	58
Total	(268)	(238)	(234)

The effective Group tax rate is different from the statutory Swiss income tax rate applicable to the Company for the following reasons:

	2008	2009	2010
	(U.S.$ million)		
Income before income taxes and attribution	1,336	1,967	4,340
Less: share of income from Associates	(1,067)	(82)	(1,829)
Parent company's and subsidiaries' income before income tax and attribution	269	1,885	2,511
Income tax expense calculated at the Swiss income tax rate	(43)	(297)	(401)
Effect of different tax rates of subsidiaries operating in other jurisdictions	(160)	(19)	(78)
Tax-exempt income, net of non-deductible expenses and other permanent differences	26	56	254
Effect of use of tax losses and other deferred tax assets, not previously recognised(1)	(26)	15	135
Effect of change in tax rate on temporary differences	(23)	0	(145)
Other	(42)	7	1
Income tax expense	(268)	(238)	(234)

Note:

(1) Following the regular assessment and review of business plans related to Katanga Mining Limited, it was determined that a substantial portion of the previously unrecognised tax losses could be recognised.

Deferred taxes as at 31 December 2008, 31 December 2009 and 31 December 2010 are attributable to the items detailed in the table below:

	2008	2009	2010
	(U.S.$ million)		
Deferred tax assets(1)			
Tax losses carried forward	25	29	274
Mark to market valuations	64	59	95
Total	89	88	369
Deferred tax liabilities(1)			
Depreciation and amortisation	(167)	(257)	(926)
Mark to market valuations	(417)	(328)	(320)
Other	(46)	(41)	(62)
Total	(630)	(626)	(1,308)
Deferred tax—net	(541)	(538)	(939)
Reconciliation of deferred tax—net			
Opening balance	(573)	(541)	(538)
Recognised in income for the year	46	21	58
Recognised in other comprehensive income/(loss)	1	(7)	2
Acquisitions	(15)	(11)	(461)
Closing balance	(541)	(538)	(939)

Note:

(1) Asset and liability positions in the same category reflect the impact of tax assets and liabilities arising in local tax jurisdictions that cannot be offset against tax assets and liabilities arising in other tax jurisdictions.

Deferred tax assets are recognised for tax losses carried forward only to the extent that realisation of the related tax benefit is probable. As at 31 December 2010, U.S.$562 million (2009: U.S.$312 million; 2008: U.S.$208 million) of deferred tax assets related to available loss carry forwards have been brought to account, of which U.S.$274 million (2009: U.S.$29 million; 2008: U.S.$25 million) are disclosed as deferred tax assets with the remaining balance being offset against deferred tax liabilities arising in the same respective entity. For the following gross tax losses carried forward, no deferred tax assets have been recognised in the consolidated Historical Financial Information and will expire as follows:

	2008	2009	2010
	(U.S.$ million)		
1 year	70	85	75
2 years	21	48	56
3 years	72	8	38
Thereafter	222	904	394
Total	385	1,045	563

As at 31 December 2010, unremitted earnings of U.S.$12,255 million (2009: U.S.$10,263 million; 2008: U.S.$9,329 million) have been retained by subsidiaries and associates for reinvestment. No provision is made for income taxes that would be payable upon the distribution of such earnings. If earnings were remitted, an immaterial tax charge would result based on the tax statutes currently in effect.

6 Property, Plant and Equipment

	Land and buildings	Plant and equipment	Mineral and petroleum rights	Deferred mining costs	Total
			(U.S.$ million)		
Gross carrying amount:					
1 January 2008	725	5,136	1,030	256	7,147
Business combination	29	65	(36)	0	58
Additions	51	1,624	132	68	1,875
Disposals	(13)	(69)	(4)	(5)	(91)
Other movements	254	(238)	(47)	0	(31)
31 December 2008	1,046	6,518	1,075	319	8,958
Accumulated depreciation and impairment:					
1 January 2008	135	1,064	205	1	1,405
Depreciation	42	433	86	14	575
Impairment	6	50	39	2	97
Disposals	(3)	(32)	0	0	(35)
Other movements	(1)	65	(5)	(2)	57
31 December 2008	179	1,580	325	15	2,099
Net book value 31 December 2008	867	4,938	750	304	6,859

Plant and equipment includes expenditure for construction in progress of U.S.$1,381 million and a net book value of U.S.$80 million of obligations recognised under finance lease agreements. Mineral and petroleum rights include expenditures for exploration and evaluation of U.S.$118 million. Depreciation expenses included in cost of goods sold are U.S.$562 million and in selling and administrative expenses U.S.$13 million.

	Notes	Land and buildings	Plant and equipment	Mineral and petroleum rights	Deferred mining costs	Total
				(U.S.$ million)		
Gross carrying amount:						
1 January 2009		1,046	6,518	1,075	319	8,958
Business combination	21	1	257	598	0	856
Additions		40	960	62	54	1,116
Business divestment		(31)	(135)	(51)	0	(217)
Disposals		(9)	(230)	(7)	(8)	(254)
Held for sale	13	(112)	(908)	(73)	(155)	(1,248)
Other movements		131	(207)	114	19	57
31 December 2009		1,066	6,255	1,718	229	9,268
Accumulated depreciation and impairment:						
1 January 2009		179	1,580	325	15	2,099
Business divestment		(2)	(96)	(47)	0	(145)
Depreciation		63	466	82	11	622
Disposals		(2)	(75)	0	(2)	(79)
Held for sale	13	(7)	(128)	(7)	(10)	(152)
Other movements		4	63	11	0	78
31 December 2009		235	1,810	364	14	2,423
Net book value 31 December 2009		831	4,445	1,354	215	6,845

Plant and equipment includes expenditure for construction in progress of U.S.$1,233 million and a net book value of U.S.$72 million of obligations recognised under finance lease agreements. Mineral and petroleum rights include expenditures for exploration and evaluation of U.S.$146 million. Depreciation expenses included in cost of goods sold are U.S.$607 million and in selling and administrative expenses U.S.$15 million.

	Notes	Land and buildings	Plant and equipment	Mineral and petroleum rights	Deferred mining costs	Total
				(U.S.$ million)		
Gross carrying amount:						
1 January 2010		1,066	6,255	1,718	229	9,268
Business combination	21	370	910	2,283	91	3,654
Additions		26	1,346	422	96	1,890
Disposals		(35)	(525)	(38)	(2)	(600)
Reclassified from held for sale	13	112	908	73	155	1,248
Other movements		(258)	293	26	(27)	34
31 December 2010		1,281	9,187	4,484	542	15,494
Accumulated depreciation and impairment:						
1 January 2010		235	1,810	364	14	2,423
Depreciation		77	752	171	26	1,026
Disposals		(15)	(177)	(12)	0	(204)
Reclassified from held for sale	13	7	128	7	10	152
Other movements		(65)	43	18	13	9
31 December 2010		239	2,556	548	63	3,406
Net book value 31 December 2010		1,042	6,631	3,936	479	12,088

Plant and equipment includes expenditure for construction in progress of U.S.$1,343 million and a net book value of U.S.$64 million of obligations recognised under finance lease agreements. Mineral and petroleum rights include expenditures for exploration and evaluation of U.S.$379 million. Depreciation expenses included in cost of goods sold are U.S.$893 million, in selling and administrative expenses U.S.$18 million and in other income/(expense)—net, Prodeco transaction related expenses U.S.$115 million.

7 Investments in Associates and Other Investments

	2008	2009	2010
		(U.S.$ million)	
Listed Associates	11,345	13,267	15,511
Non-listed Associates	1,876	1,614	1,255
Investments in Associates	13,221	14,881	16,766
Other investments	2,808	3,202	2,438
Total	16,029	18,083	19,204

A list of the principal operating, finance and industrial subsidiaries and Associates and other investments is included in Note 28. As at 31 December 2010, the fair value of listed Associates using price published quotations was U.S.$24,511 million (2009: U.S.$19,090 million; 2008: U.S.$3,454 million).

Listed Associates

In March 2009, Glencore participated in Xstrata's rights issue for U.S.$2,023 million.

In June 2009, following the conversion of a Katanga Mining Limited ("Katanga") convertible loan, Glencore acquired a controlling interest and its initial equity interest was therefore included and considered as part of the cost of acquisition (see Note 21).

Non-listed Associates

In May 2009, Glencore disposed of its 51 per cent. interest in Refineria de Cartagena for cash proceeds of U.S.$549 million (see Note 3).

Other investments

Other investments primarily include a 8.8 per cent. interest in United Company Rusal Plc ("UCR") (U.S.$2,048 million; 2009: U.S.$2,003 million; 2008: U.S.$2,003 million) which, following its listing on the Hong Kong Stock Exchange in January 2010, is carried at fair value with associated movements recognised within a related equity reserve (see Note 14). As at 31 December 2010, U.S.$113 million (2009 and 2008: U.S.$ nil million) of Glencore's investment in UCR was pledged as a guarantee against certain borrowings of UCR.

Summarised financial information in respect of Glencore's Associates, reflecting 100 per cent. of the underlying Associate's relevant figures, are set out below. Glencore's share of the joint venture's capital commitments for which the joint venture already has contractually committed financing in place, amounts to U.S.$831 million (2009: U.S.$346 million; 2008: U.S.$319 million).

	2008	2009	2010
		(U.S.$ million)	
Total assets	59,731	66,522	77,247
Total liabilities	32,965	30,136	32,506
Revenue	33,787	25,337	48,116
Net profit	3,125	826	4,941

8 Advances and Loans

	2008	2009	2010
		(U.S.$ million)	
Loans to Parents	64	66	72
Loans to Associates	378	832	426
Other non-current receivables and loans	1,384	1,637	3,332
Total	1,826	2,535	3,830

Loans to Parents (see Note 14) and Associates bear interest at applicable floating market rates plus a premium.

Other non-current receivables and loans comprise the following:

	2008	2009	2010
	(U.S.$ million)		
Counterparty			
OAO Russneft			
Interest-bearing loan at 9 per cent. per annum (see note below)	1,033	1,033	2,082
Atlas Petroleum International Limited ("Atlas")			
Interest-bearing loans at LIBOR plus 3 per cent.(1)	210	270	477
PT Bakrie & Brothers Tbk			
Interest-bearing secured loans at LIBOR plus 9 per cent.(2)	0	0	200
Secured marketing related financing arrangements(3)	0	148	330
Other	141	186	243
Total	1,384	1,637	3,332

Notes:

(1) Primarily relates to carried interest loans associated with the development of the Aseng oil project in Equatorial Guinea, where Atlas is one of the equity partners. The operator of the field and project is Noble Energy, based in Houston. The Aseng project is expected to commence oil production in the first quarter of 2012, with loans subsequently repaid from oil proceeds.

(2) The principal under this loan is payable in five equal semi-annual instalments from June 2012 to June 2014. The loan is secured by 968,442,000 shares (equivalent to 4.66 per cent.) in PT Bumi Resources Tbk., which as at 31 December 2010 were valued at U.S.$323 million.

(3) Various marketing-related financing facilities, generally secured against certain assets and/or payable from the future sale of production of the counterpart. The weighted average interest rate of the loans is 10 per cent. and on average are to be repaid over a three-year period.

Russneft loans

In December 2010, OAO Russneft ("Russneft") completed a significant debt amendment and restatement with its major lender, whereby Glencore's previously existing facilities, including some amounts which had been advanced for conversion into Russneft equity, were consolidated into a single facility. The consolidated facility, with a principal amount of U.S.$2,080 million, bears interest at 9 per cent. per annum, with 3 per cent. paid quarterly and the remaining 6 per cent. payable along with the principal. Repayment is expected in monthly instalments over a three-year period commencing in the fourth quarter of 2017, but in any event, not before repayment of the debt owing to the other major lender. The facility is secured by various pledges of shares of members of the Russneft group.

Glencore has accounted for this amendment and restatement as a substantial modification, which resulted in derecognition of all amounts carried under the existing facilities, including principal, accrued interest and equity conversion advances and recognition, at fair value, of the consolidated facility. The transaction resulted in a gain (after taking into account the carrying value of the principal, net of allowance for doubtful accounts, and accrued interest (U.S.$1,413 million) and equity conversion advances (U.S.$285 million)) of U.S.$382 million.

The loan amendment also constituted a loss event with respect to Glencore's equity holdings in certain Russneft subsidiaries due to the increased leverage, amended repayment profile and the enhancement of prioritised security of the consolidated loans and, as a consequence, an impairment charge of U.S.$336 million was recognised against other investments.

9 Inventories

	2008	2009	2010
	(U.S.$ million)		
Production inventories	1,511	1,894	2,805
Marketing inventories	6,294	13,179	14,588
Total	7,805	15,073	17,393

Production inventories consist of materials, spare parts, work in process and finished goods held by the production entities, whereas marketing inventories are commodities held by the marketing entities. Marketing inventories include readily marketable inventories of U.S.$14,331 million (2009: U.S.$12,945;

2008: U.S.$5,877 million). Readily marketable inventories are inventories that Glencore considers to be readily convertible into cash due to their very liquid nature, widely available markets and the fact that the price risk is covered either by a physical sale transaction or hedge transaction on a commodity exchange or with a highly rated counterparty.

Glencore has a number of dedicated financing facilities, which finance a portion of its marketing inventories. In each case, the inventory has not been derecognised as the Group retains the principal risks and rewards of ownership. The proceeds received are recognised as either current borrowings, commodities sold with agreements to repurchase or trade advances from buyers, depending upon their funding nature. As at 31 December 2010, the total amount of inventory securitised under such facilities was U.S.$2,426 million (2009: U.S.$3,192 million; 2008: U.S.$659 million). The proceeds received recognised as current borrowings were U.S.$1,338 million (2009: U.S.$1,663 million; 2008: U.S.$369 million), as commodities sold with agreements to repurchase, U.S.$484 million (2009: U.S.$477 million; 2008: U.S.$ nil million) and as trade advances from buyers, U.S.$67 million (2009: U.S.$419 million; 2008: U.S.$261 million).

10 Accounts Receivable

	2008	2009	2010
		(U.S.$ million)	
Trade receivables[1]	9,617	9,156	12,663
Trade advances and deposits[1]	2,526	4,415	4,297
Associated companies[1]	487	315	494
Other receivables	1,326	1,303	1,540
Total	13,956	15,189	18,994

Note:

(1) Collectively referred to as receivables.

The average credit period on sales of goods is 28 days (2009: 33 days; 2008: 26 days).

As at 31 December 2010, 5 per cent. of receivables were between 1 and 60 days overdue, and 2 per cent. were greater than 60 days overdue (2009: 6 per cent. were between 1 and 60 days overdue and 2 per cent. were greater than 60 days overdue; 2008: 9 per cent. were between 1 and 60 days overdue and 2 per cent. were greater than 60 days overdue). Such receivables, although contractually past their due dates, are not considered impaired as there has not been a significant change in credit quality of the relevant counterparty, and the amounts are still considered recoverable, taking into account customary payment patterns and, in many cases, offsetting accounts payable balances. Receivables are net of allowances for doubtful accounts of U.S.$155 million (2009: U.S.$302 million; 2008: U.S.$312 million), which take into consideration the diverse geographic and industrial composition of the accounts receivable portfolio. The decrease in allowance for doubtful accounts over 2010 is primarily attributable to the Russneft loan amendment and restatement described in Note 8.

Glencore has a number of dedicated financing facilities, which finance a portion of its receivables. In each case, the receivables have not been derecognised, as the Group retains the principal risks and rewards of ownership. The proceeds received are recognised as current borrowings (see Note 15). As at 31 December 2010, the total amount of trade receivables securitised was U.S.$2,349 million (2009: U.S.$1,590 million; 2008: U.S.$1,822 million) and proceeds received and classified as current borrowings amounted to U.S.$1,950 million (2009: U.S.$1,300 million; 2008: U.S.$1,600 million).

11 Other Financial Assets

	Notes	2008	2009	2010
		(U.S.$ million)		
Commodity-related contracts	23			
Futures		8,537	2,785	1,796
Options		300	409	149
Swaps		875	587	645
Physical forwards		3,874	2,049	3,118
Financial contracts	23			
Cross currency swaps		95	246	149
Foreign currency and interest rate contracts		81	49	125
Total		13,762	6,125	5,982

12 Cash and Cash Equivalents

	2008	2009	2010
	(U.S.$ million)		
Banks and cash on hand	776	738	1,090
Deposits and treasury bills	50	122	373
Total	826	860	1,463

U.S.$23 million (2009: U.S.$10 million; 2008: U.S.$83 million) was restricted.

13 Assets and Liabilities held for Sale

Following Glencore's acquisition in September 2010 of the Pacorini metals warehousing division ("Pacorini"), Glencore commenced a review of the strategic alternatives to strengthen Glencore's participation in the metals warehousing business, which is expected to result in a merger involving the acquired business and a third party. As a result, the corresponding assets (U.S.$161 million non-current and U.S.$119 million current) and liabilities (U.S.$1 million non-current and U.S.$44 million current) at 31 December 2010 were classified as held for sale.

Following the exercise of the call option to repurchase Prodeco from Xstrata in March 2010 and the subsequent decision not to partially or fully dispose of it, following a review of divestment options, the net assets previously classified as held for sale in 2009 were reclassified to the respective line items in the statement of financial position at depreciated cost. As a result of this change in accounting classification, a one time depreciation charge of U.S.$115 million was recognised within the total costs associated with the Prodeco option exercise (see Note 4), to reflect the additional depreciation that would have been charged if the related assets had not previously been classified as held for sale.

The major classes of assets and liabilities of Prodeco were as follows as at 31 December 2009:

	2009
	(U.S.$ million)
Property, plant and equipment	1,096
Investments in associates	37
Long term advances and loans	18
Deferred tax assets	2
Inventories	138
Accounts receivable	55
Cash and cash equivalents	3
Assets held for sale	1,349
Non-current provisions	29
Current borrowings	3
Accounts payable	203
Income tax payable	1
Liabilities held for sale	236

14 Share Capital and Reserves

The share capital of the Company consists of 150,000 registered shares with a nominal value of CHF 500 each, a restriction on transferability and carry the right to a preferred dividend at the Company's discretion of up to a maximum of 10 per cent. of nominal value per annum. Glencore Holding AG and Glencore L.T.E. AG (together the "Parents"), both wholly owned by the management and employees of Glencore, own 85 per cent. and 15 per cent., respectively, of the Company.

The Company is authorised by its articles of incorporation to issue to employees of Glencore, non-voting profit participation certificates ("PPC") with no nominal value, enabling the employees to participate in four profit sharing arrangements. The profit sharing arrangements entitle the participating employees to a portion of Glencore shareholders' funds accumulated during the period that such employees hold the PPCs. The PPCs attribute Glencore's net income pro rata based on the 150,000 (2009 and 2008: 150,000) shares issued. The amounts attributed out of net income for the year to profit participation shareholders are presented within Invested Capital, comprising equity share capital, reserves, accumulated amounts attributed to profit participation shareholders and non-controlling interests. All amounts attributed to profit participation shareholders are to convert to ordinary shares in the new parent company on the Global Offer.

On cessation of employment, the accumulated amounts attributed to an ordinary profit participation shareholder are reclassified into non-current borrowings as "Ordinary Profit Participation Certificates" and paid in instalments over a period of five years with interest accruing at six month U.S.$ LIBOR, with the portion falling due within 12 months included in current borrowings.

Earnings Per Share information is not presented on the grounds that the historical number of ordinary shares will have no relevance on completion of the Global Offer, the conversion of amounts attributable to profit participation shareholders to ordinary shares of the new parent company and the issuance of new share capital raised.

Reserves

	Notes	Translation adjustment	Equity portion of Convertible bonds	Cash Flow Hedge reserve	Net unrealised gain/ (loss)	Net ownership changes in subsidiaries	Reserves restricted	Total
				(U.S.$ million)				
Balance 1 January 2008		(5)	0	(215)	0	0	1	(219)
Exchange gain/(loss) on translation of foreign operations		(41)	0	0	0	0	0	(41)
Gain/(loss) on cash flow hedges, net of tax	22	0	0	(309)	0	0	0	(309)
Deferred taxes on hedges		0	0	1	0	0	0	1
Cash flow hedges transferred to the statement of income, net of tax		0	0	66	0	0	0	66
Equity related movements in Associates and other		2	0	0	0	0	0	2
Balance 31 December 2008		(44)	0	(457)	0	0	1	(500)
Balance 1 January 2009		(44)	0	(457)	0	0	1	(500)
Exchange gain/(loss) on translation of foreign operations		37	0	0	0	0	0	37
Gain/(loss) on cash flow hedges, net of tax	22	0	0	286	0	0	0	286
Cash flow hedges transferred to the statement of income, net of tax		0	0	82	0	0	0	82
Equity portion of convertible bonds	15	0	77	0	0	0	0	77
Balance 31 December 2009		(7)	77	(89)	0	0	1	(18)
Balance 1 January 2010		(7)	77	(89)	0	0	1	(18)
Exchange gain/(loss) on translation of foreign operations		8	0	0	0	0	0	8
Gain/(loss) on cash flow hedges, net of tax	22	0	0	(180)	0	0	0	(180)
Gain/(loss) on available for sale financial instruments	7	0	0	0	25	0	0	25
Cash flow hedges transferred to the statement of income, net of tax		0	0	6	0	0	0	6
Change in ownership interest in subsidiaries	21	0	0	0	0	(134)	0	(134)
Equity portion of convertible bonds	15	0	12	0	0	0	0	12
Balance 31 December 2010		1	89	(263)	25	(134)	1	(281)

15 Borrowings

	Notes	2008	2009	2010
			(U.S.$ million)	
Non-current borrowings				
144A Notes		944	945	946
Xstrata secured bank loans		740	2,282	0
Convertible bonds		0	1,838	2,132
Eurobonds		3,036	3,001	3,725
Swiss franc bonds		0	0	639
Sterling bonds		920	1,013	999
Perpetual notes		700	700	735
Ordinary profit participation certificates	14	1,341	1,392	1,059
Committed syndicated revolving credit facility		4,819	4,734	6,744
Other bank loans(1)		571	498	1,272
Total non-current borrowings		13,071	16,403	18,251
Current borrowings				
Committed syndicated revolving credit facility		0	1,156	515
Committed secured inventory/receivables facility	9/10	0	0	1,700
Committed secured inventory facility	9	369	310	0
Committed secured receivables facilities	10	0	0	700
Committed asset-backed (receivables) commercial paper programme	10	1,600	1,300	0
Bilateral uncommitted secured inventory facilities	9	0	1,353	888
U.S. commercial paper		0	214	310
Xstrata secured bank loans		900	0	2,292
Eurobonds		0	0	765
Perpetual notes		0	0	292
Ordinary profit participation certificates	14	706	830	796
Other bank loans(1)(2)		1,670	2,023	3,623
Total current borrowings		5,245	7,186	11,881

Notes:

(1) Includes U.S.$63 million (2009: U.S.$65 million; 2008: U.S.$69 million) of obligations under financial leases of which U.S.$4 million (2009: U.S.$6 million; 2008: U.S.$7 million) was current as at the year end.

(2) Comprises various uncommitted bilateral bank credit facilities and other financings.

144A Notes

U.S.$950 million 6 per cent. coupon Notes due 2014. The Notes are recognised at amortised cost at an effective interest rate of 6.15 per cent. per annum.

Xstrata secured bank loans

Comprising two facilities with a total amount of U.S.$2,800 million, with U.S.$2,300 million outstanding as at 31 December 2010 and 31 December 2009. Both facilities mature in September 2011. The facilities have been accounted for as secured bank loans which bear interest at a rate of U.S.$ LIBOR plus a margin. As at 31 December 2010, U.S.$4,199 million (2009: U.S.$4,188 million; 2008: U.S.$2,739 million) of the carrying value of Glencore's investment in Xstrata was pledged as security.

Convertible bonds

In December 2009, the Group issued U.S.$2,000 million 5 per cent. coupon convertible bonds due December 2014. The bonds are convertible at the option of investors into a certain percentage of Glencore's equity upon a qualifying IPO or upon other pre-determined qualifying events. The bonds contain several embedded derivatives which IFRS requires be accounted for separately, the most significant of these being that if the bonds have not been converted and no qualifying event occurs, they will be redeemed at maturity at 108.1 per cent. of their nominal amount. In addition, if a qualifying IPO or other pre-determined qualifying events have not occurred prior to December 2012, bondholders may, subject to Glencore having achieved a "pre-exceptional" net income of U.S.$3.5 billion in the preceding

12 months or in the event that Glencore is acquired for cash consideration, put the bonds back to Glencore at an amount which achieves a cumulative annualised return of 20 per cent. Payment in this regard could occur from mid-2013 at the earliest.

The bonds consist of a liability component and an equity component. The fair values of the liability component (U.S.$1,923 million) and the equity component (U.S.$77 million) were determined, using the residual method, at issuance of the bonds. The liability component is measured at amortised cost at an effective interest rate of 5.90 per cent. per annum. At issuance and each subsequent period end, the embedded derivatives were concluded to have a fair value of U.S.$ nil due to the probability weighting attributed to the related conditions. Over the first half of 2010, U.S.$300 million of additional Convertible bonds, convertible into 0.84 per cent. of Glencore's equity were issued under the same terms and conditions as those issued in December 2009, with the equity component equalling U.S.$12 million and the liability component equalling U.S.$288 million. In relation to the potential conversion, the terms of the bonds enable a conversion into 6.25 per cent. of Glencore's equity as at 31 December 2010.

Euro, Sterling and Swiss Franc bonds

The Group has issued bonds denominated in Euro, Sterling and Swiss Franc where, upon issuance, the principal amounts and the future interest payments were swapped into their U.S. dollar equivalent. The details of amounts issued and outstanding are as follows:

	Maturity	Initial U.S.$ equivalent	U.S.$ fixed interest rate in %	2008	2009	2010
					(U.S.$ million)	
Euro 600 million 5.375 per cent. coupon bonds	September 2011	739	5.78	834	817	765
Euro 850 million 5.250 per cent. coupon bonds	October 2013	1,078	6.60	1,171	1,154	1,080
Euro 750 million 7.125 per cent. coupon bonds	April 2015	1,200	6.86	1,031	1,030	968
Euro 1,250 million 5.250 per cent. coupon bonds	March 2017	1,708	6.07	0	0	1,677
Total		4,725		3,036	3,001	4,490
GBP 650 million 6.50 per cent. coupon bonds	February 2019	1,266	6.58	920	1,013	999
CHF 600 million 3.625 per cent. coupon bonds	April 2016	593	4.87	0	0	639
		6,584		3,956	4,014	6,128

Perpetual notes

U.S.$700 million 8 per cent. notes, callable after February 2011 at par. In December 2010, Glencore announced its intention to call U.S.$300 million of the outstanding notes. This partial redemption was subsequently completed on 6 February 2011. In October 2010, Glencore issued U.S.$350 million 7.5 per cent. notes, callable after October 2015 at par.

Ordinary profit participation certificates

Profit participation certificates ("PPC") bear interest at six month U.S.$ LIBOR and in the event of certain triggering events (see Note 14), all PPC would be subordinated to unsecured lenders.

Committed revolving credit facilities

In May 2010, Glencore replaced the previous 364 day U.S.$815 million revolving credit facility with a new 364-day U.S.$1,375 million facility with a one-year term out option at Glencore's discretion as well as a 364-day U.S.$515 million Asian focused tranche. In addition, Glencore replaced the U.S.$8,180 million medium-term revolving credit facility with a new three-year revolving credit facility of U.S.$8,370 million and cancelled the U.S.$6,650 million forward start facility concluded in 2009. Up to U.S.$1,000 million of the medium-term tranche may be used as liquidity back up for Glencore's corporate U.S. commercial paper programme.

Committed secured inventory/receivables facility

In November 2010, the Company and Glencore AG entered into a 364-day committed U.S.$1.7 billion secured inventory and receivables borrowing base facility. Under the programme, Glencore has the option to pledge up to U.S.$750 million of eligible base metals inventory or up to U.S.$1.7 billion of eligible receivables. Funds drawn under the facility bear interest at U.S.$ LIBOR plus a margin.

Committed secured receivables facilities

In April 2010, Glencore entered into a six-month U.S.$550 million committed secured receivables financing programme, which was extended for a further year and increased to U.S.$700 million in December 2010. Funds drawn under the facility bear interest at U.S.$ LIBOR plus a margin.

U.S. commercial paper

Glencore has in place a stand-alone U.S. commercial paper programme for U.S.$1,000 million rated A3 and P2, respectively, by Standard & Poor's and Moody's rating agencies. The notes issued under this programme carry interest at floating market rates and mature not more than 270 days from the date of issue.

16 Deferred Income

During 2006, Glencore entered into an agreement to deliver a fixed quantity of silver concentrate, a by-product from its mining operations, for a period of 15 years at a fixed price for which Glencore received an upfront payment of U.S.$285 million. The outstanding balance represents the remaining non-current portion of the upfront payment. The upfront payment is released to revenue at a rate consistent with the implied forward price curve at the time of the transaction and the actual quantities delivered.

17 Provisions

	Post retirement benefits(1)	Employee entitlement(2)	Rehabilitation costs(3)	Exchange feature(4)	Other(5)	Total
			(U.S.$ million)			
1 January 2008	72	80	199	506	142	999
Provision utilised in the year	(24)	(9)	(6)	(506)	(82)	(627)
Additional provision in the year	10	0	4	0	16	30
31 December 2008	58	71	197	0	76	402
1 January 2009	58	71	197	0	76	402
Provision utilised in the year	(2)	(4)	0	0	(26)	(32)
Provisions assumed in business combination	2	0	10	0	40	52
Additional provision in the year	1	18	29	0	75	123
31 December 2009	59	85	236	0	165	545
1 January 2010	59	85	236	0	165	545
Provision utilised in the year	(4)	(2)	(5)	0	(22)	(33)
Provisions assumed in business combination	4	0	3	0	0	7
Additional provision in the year	1	15	145	0	39	200
31 December 2010	60	98	379	0	182	719

Notes:

(1) See Note 18.

(2) The employee entitlement provision represents the value of state-governed employee entitlements due to employees upon their termination of employment.

(3) Rehabilitation provision represents the accrued cost required to provide adequate restoration and rehabilitation upon the completion of extraction activities. These amounts will be settled when rehabilitation is undertaken, generally at the end of a project's life, which ranges from 2 to 50 years. The Group makes contributions to rehabilitation trusts to meet some of the costs of rehabilitation liabilities in South Africa.

(4) In 2008, Glencore repurchased and cancelled all the remaining Exchangeable bonds it had previously issued and simultaneously settled the embedded derivative (exchange feature) contained therein.

(5) Other includes primarily provisions in respect of mine concession obligations of U.S.$54 million (2009: U.S.$56 million; 2008: U.S.$nil million) and construction-related contractual provisions of U.S.$29 million (2009: U.S.$45 million; 2008: U.S.$nil million).

18 Personnel Costs and Retirement Benefits

Total personnel costs, which includes salaries, wages, social security and other personnel costs and excludes attribution to profit participation shareholders, incurred for the year ended 31 December 2010 were U.S.$1,677 million (2009: U.S.$1,281 million; 2008: U.S.$1,363 million). Personnel costs related to consolidated industrial subsidiaries of U.S.$885 million (2009: U.S.$672 million; 2008: U.S.$791 million) are included in cost of goods sold. Other personnel costs are included in selling and administrative expenses.

The Company and certain subsidiaries sponsor various pension schemes in accordance with local regulations and practices. Eligibility for participation in the various plans is either based on completion of a specified period of continuous service, or date of hire. The plans provide for certain employee and employer contributions, ranging from 5 per cent. to 16 per cent. of annual salaries, depending on the employee's years of service. Among these schemes are defined contribution plans as well as defined benefit plans. The main locations with defined benefit plans are Switzerland, the UK and the U.S.

Defined contribution plans

Glencore's contributions under these plans amounted to U.S.$11 million in 2010 and to U.S.$6 million in 2009 and 2008.

Defined benefit plans

The total present value of the Group's defined benefit obligation amounted to U.S.$422 million at 31 December 2010 (2009: U.S.$363 million; 2008: U.S.$324 million) compared to the total fair value of plan assets of U.S.$267 million (2009: U.S.$232 million; 2008: U.S.$190 million). Further details of the Group's defined benefit plans are not disclosed on the basis that they are not material to the Group's financial position.

19 Accounts Payable

	2008	2009	2010
		(U.S.$ million)	
Trade payables	7,445	8,162	12,450
Trade advances from buyers[1]	2,118	946	634
Associated companies	1,074	1,371	1,788
Other payables and accrued liabilities	977	1,003	1,273
Total	11,614	11,482	16,145

Note:

(1) See Note 9.

20 Other Financial Liabilities

	Notes	2008	2009	2010
			(U.S.$ million)	
Commodity-related contracts	23			
Futures		8,409	5,747	4,142
Options		904	565	194
Swaps		568	657	784
Physical forwards		2,868	1,274	2,218
Financial contracts	23			
Cross currency swaps		764	371	660
Foreign currency and interest rate contracts		78	29	68
Total		13,591	8,643	8,066

21 Acquisition and Disposal of Subsidiaries

2008 Acquisitions

During 2008, Glencore completed a few smaller acquisitions which have been accounted for as business combinations. The acquisitions are not individually significant to the Historical Financial Information and are therefore presented in aggregate. The fair value of the assets acquired and liabilities assumed at the date of acquisition were:

	2008
	(U.S.$ million)
Property, plant and equipment	58
Inventories	49
Accounts receivable	77
Cash and cash equivalents	11
Non-controlling interest	114
Deferred tax liabilities	(15)
Accounts payable	(156)
Total fair value of net assets acquired	138
Less: amounts previously recognised through investments and loans	28
Less: cash and cash equivalents acquired	11
Net cash used in acquisition of subsidiaries	99

For the period post-acquisition, these operations contributed net income of a loss of U.S.$10 million to Glencore.

2009 Acquisitions

During 2009, the net cash used in the acquisition of subsidiaries related mainly to Katanga Mining Limited ("Katanga"). The fair value of the assets acquired and liabilities assumed at the date of acquisition were:

	2009
	(U.S.$ million)
Property, plant and equipment	856
Goodwill	161
Inventories	83
Accounts receivable	61
Cash and cash equivalents	242
Non-controlling interest	(240)
Non-current borrowings	(102)
Provisions and other non-current borrowings	(52)
Deferred tax liability	(11)
Accounts payable	(192)
Total fair value of net assets acquired	806
Less: amounts previously recognised through investments and loans	537
Less: cash and cash equivalents acquired	242
Net cash used in acquisition of subsidiaries	27

In January 2009, Glencore participated in a Katanga convertible loan issue via a combination of existing and new loans which, when converted on 2 June 2009, resulted in Glencore holding a 68 per cent. interest in Katanga. Shortly thereafter, Glencore acquired an additional 1.2 per cent. interest, bringing its ownership to 69.2 per cent. The acquisition has been accounted for as a business combination with the non-controlling interest being measured at fair value using discounted cash flow techniques. The total cash consideration of the acquisition, including the amounts paid prior to 2009, was U.S.$619 million. However, under IFRS, the consideration, for acquisition purposes, is deemed to be fair value of the previously held equity interests and the convertible loan determined by reference to the quoted share price on the date of acquisition. In this regard, Glencore realised a net, non-cash gain of U.S.$161 million comprising a gain on conversion of the convertible loan, offset by a loss on its original 8.5 per cent. interest in Katanga. The total consideration measured under IFRS 3 was therefore U.S.$780 million and a goodwill impairment of U.S.$161 million was recognised forthright, based on a detailed fair value assessment of the acquired assets and liabilities, using discounted cash flow techniques with a discount rate of 12 per cent.

2010 Acquisitions

During 2010, Glencore acquired controlling interests in various businesses, the most significant being Vasilkovskoje Gold, Chemoil Energy Limited ("Chemoil") and Pacorini. The net cash used in the acquisition of subsidiaries and the fair value of the assets acquired and liabilities assumed at the date of acquisition are detailed below:

	Vasilkovskoje	Chemoil	Pacorini[1]	Other[2]	Total
		(U.S.$ million)			
Property, plant and equipment	2,855	519	0	280	3,654
Investments in Associates	0	69	0	0	69
Inventories	44	317	0	93	454
Accounts receivable	103	703	0	76	882
Cash and cash equivalents	13	108	0	11	132
Assets held for sale	0	0	277	0	277
Non-controlling interest	(947)	(230)	0	(55)	(1,232)
Non-current liabilities/borrowings	(14)	(166)	0	(61)	(241)
Deferred tax liabilities	(365)	(96)	0	0	(461)
Accounts payable	(81)	(493)	0	(212)	(786)
Current borrowings	0	(494)	0	(10)	(504)
Liabilities held for sale	0	(0)	(68)	0	(68)
Total fair value of net assets acquired	1,608	237	209	122	2,176
Less: amounts previously recognised through investments and loans	1,403	0	0	17	1,420
Less: cash and cash equivalents acquired	13	108	0	11	132
Net cash used in acquisition of subsidiaries	192	129	209	94	624

Notes:

(1) Acquisition accounting determined on a provisional basis.

(2) Includes the acquisition of a 76 per cent. interest in Rio Vermelho, a 60 per cent. interest in Biopetrol Industries AG and a 100 per cent. interest in Minera Altos de Punitaqui.

Vasilkovskoje

In February 2010, Kazzinc purchased the remaining 60 per cent. of Vasilkovskoje Gold, a gold development company, that it did not previously own for U.S.$1,140 million to enhance its existing gold production base. The acquisition was funded through the payment of U.S.$204 million and the issuance of new Kazzinc shares, which resulted in Glencore's ultimate ownership in Kazzinc being diluted from 69 per cent. to 50.7 per cent. (without a loss of control). The dilution resulted in a loss of U.S.$99 million which has been recognised in reserves (see Note 14). Prior to acquisition, Kazzinc owned a 40 per cent. interest in Vasilkovskoje Gold which, at the date of acquisition, was revalued to its fair value of U.S.$760 million and as a result, a net gain of U.S.$462 million was recognised in other income (see Note 4). The acquisition has been accounted for as a business combination with the non-controlling interest being measured at its percentage of net assets acquired determined by using discounted cash flow techniques with a discount rate of 8.5 per cent.

For the period post-acquisition, Vasilkovskoje Gold contributed revenue of U.S.$130 million and a loss before attribution of U.S.$15 million. If the acquisition had taken place effective 1 January 2010, the operation would have contributed revenue of U.S.$131 million and a loss before attribution of U.S.$22 million.

Chemoil

In April 2010, Glencore completed the acquisition of a 51.5 per cent. stake in Chemoil, a Singapore-listed fuel oil storage and supply company, for U.S.$237 million cash consideration. The acquisition has been accounted for as a business combination with the non-controlling interest being measured at its percentage of net assets acquired.

For the period post-acquisition, Chemoil contributed revenue of U.S.$6,089 million and income before attribution of U.S.$4 million. If the acquisition had taken place effective 1 January 2010, the operation would have contributed revenue of U.S.$7,175 million and a loss before attribution of U.S.$3 million.

Pacorini

In September 2010, Glencore acquired the metals warehousing division of Italy's Pacorini Group ("Pacorini") for U.S.$209 million in cash. As contemplated at the time of the acquisition, Glencore commenced a review of the strategic alternatives to strengthen Glencore's participation in the metals warehousing business, which is expected to result in a merger involving the acquired business and a third party. As a result, the assets and liabilities have been classified as held for sale (see Note 13).

For the period post-acquisition, Pacorini contributed revenue of U.S.$64 million and income before attribution of U.S.$5 million. If the acquisition had taken place effective 1 January 2010, the operation would have contributed revenue of U.S.$220 million and an income before attribution of U.S.$31 million.

Disposals

In 2008, there were no material disposals of subsidiaries.

In 2009, Glencore disposed of its interests in the East Tennessee Zinc Company LLC operations.

	2009
	(U.S.$ million)
Property, plant and equipment	72
Inventories	12
Accounts receivable	52
Cash and cash equivalents	6
Accounts payable	(119)
Total net assets disposed	23
Net gain on disposal	97
Net cash proceeds	120

In 2010, there were no material disposals of subsidiaries.

22 Financial and Capital Risk Management

Components of Glencore's business could be impacted by various external factors, such as a major global economic downturn, which could result in significantly lower commodity prices and demand, political events, unfavourable actions by governments, natural catastrophes, operational disruptions or financial risks such as market risk (including commodity price risk, interest rate risk and currency risk), credit risk (including performance risk) and liquidity risk. It is Glencore's policy and practice to identify and, where appropriate and practical, actively manage such risks to support its objectives in managing its capital and future financial security and flexibility.

Glencore's objectives in managing its capital base (see table below) include preserving its overall financial health and strength for the benefit of all stakeholders and safeguarding its ability to continue as a going concern, while generating sustainable long-term profitability.

	2008	2009	2010
		(U.S.$ million)	
Invested capital	16,311	17,944	22,507
Less: non-controlling interests	906	1,258	2,894
Shareholders' funds	15,405	16,686	19,613

Glencore believes that effective, proactive and transparent risk management supports its objective of protecting its current and future financial security, and is of primary importance to its success. An important component of this process is Glencore's employee ownership structure, which aligns the interests of shareholders and management, and fosters a culture of excellence, teamwork and accountability. As management has significant amounts of capital invested in Glencore, with overall compensation skewed in favour of longer term incentives, it is strongly motivated to take a long-term view of overall business performance and to protect Glencore's capital base. Glencore believes that its consistent profitability, the long-term tenure of its management and its prudent risk management policies can in part be attributed to its employee ownership structure. Furthermore, Glencore operates a number of centralised financial, operational, compliance and legal risk management functions in order to monitor, manage and mitigate overall risk exposure, within approved guidelines.

Glencore's overall risk management programme focuses on the unpredictability of financial markets and seeks to protect its financial security and flexibility by using derivative financial instruments, where possible, to substantially hedge these financial risks. Glencore's finance and risk professionals, working in co-ordination with the commodity departments, monitor, manage and report regularly to management on the financial risks and exposures facing the Group.

Certain borrowing arrangements require compliance with specific financial covenants related to working capital, minimum current ratio and a maximum non-current debt to tangible net worth ratio. During the period, the Company has complied with these requirements.

Commodity price risk

Glencore is exposed to price movements for the inventory it holds and the products it produces which are not held to meet priced forward contract obligations and forward priced purchase or sale contracts which are not hedged. Glencore manages a significant portion of this exposure through futures and options transactions on worldwide commodity exchanges or in OTC markets, to the extent available. Commodity price risk management activities are considered an integral part of Glencore's physical commodity marketing activities and the related assets and liabilities are included in other financial assets from and other financial liabilities to derivative counterparties, including clearing brokers and exchanges.

Glencore has entered into futures transactions to hedge the price risk of specific future operating expenditures. These transactions were identified as cash flow hedges. The fair value of these derivatives is as follows:

	Notional amounts		Recognised fair values		
	Buy	**Sell**	**Assets**	**Liabilities**	**Maturity**
			(U.S.$ million)		
Commodity futures—2008	0	391	0	75	2010
Commodity futures—2009	0	195	0	41	2011
Commodity futures—2010	0	187	0	75	2012

Value at risk

One of the tools used by Glencore to monitor and limit its primary market risk exposure, namely commodity price risk related to its physical marketing activities, is the use of a value at risk ("VaR") computation. VaR is a risk measurement technique, which estimates the potential loss that could occur on risk positions as a result of movements in risk factors over a specified time horizon, given a specific level of confidence. The VaR methodology is a statistically defined, probability based approach that takes into account market volatilities, as well as risk diversification by recognising offsetting positions and correlations between commodities and markets. In this way, risks can be measured consistently across all markets and commodities and risk measures can be aggregated to derive a single risk value. Glencore has set a consolidated VaR limit (one day 95 per cent.) of U.S.$100 million representing less than 1 per cent. of Glencore shareholders' funds.

Glencore uses a VaR approach based on Monte Carlo simulations and is either a one-day or one-week time horizon computed at a 95 per cent. confidence level with a weighted data history.

Daily position sheets are distributed and monitored, and weekly Monte Carlo simulations are applied to the various business groups' net marketing positions to determine potential future exposures. As at 31 December 2010, Glencore's 95 per cent., one-day market risk VaR was U.S.$58 million (2009: U.S.$28 million; 2008: U.S.$53 million). Average market risk VaR (one-day 95 per cent.) during 2010 was U.S.$43 million compared to U.S.$27 million during 2009 and to U.S.$50 million in 2008.

VaR does not purport to represent actual gains or losses in fair value on earnings to be incurred by Glencore, nor does Glencore claim that these VaR results are indicative of future market movements or representative of any actual impact on its future results. VaR should always be viewed in the context of its limitations; notably, the use of historical data as a proxy for estimating future events, market illiquidity risks and tail risks. Glencore recognises these limitations, and thus complements and continuously refines its VaR analysis by analysing forward-looking stress scenarios and back-testing calculated VaR against actual movements arising in the next business week. During 2009 and 2008, certain commodities that Glencore markets and accounts for at fair value were not included in the VaR calculation as well established and liquid price points were not available. These positions are nonetheless reported on the daily position sheets and assuming the net year end positions had been outstanding for the whole year, and market prices were 5 per cent. higher/lower and all other variables held constant, Glencore's income and shareholders' funds for the year ended 31 December 2009, would have decreased/increased by U.S.$30 million (2008: decrease/increase by U.S.$14 million). During 2010, all key commodities which Glencore markets have been included in the VaR analysis.

Net present value at risk

Glencore's future cash flows related to its forecast energy, minerals and agricultural production activities are also exposed to commodity price movements. Glencore manages this exposure through a combination of portfolio diversification, occasional shorter term hedging via futures and options transactions, insurance products and continuous internal monitoring, reporting and quantification of the underlying operations' estimated valuations.

Interest rate risk

Glencore is exposed to various risks associated with the effects of fluctuations in the prevailing levels of market interest rates on its assets and liabilities and cash flows. Matching of assets and liabilities is utilised as the dominant method to hedge interest rate risks. Floating-rate debt which is predominantly used to fund fast turning working capital (interest is internally charged on the funding of this working capital) is primarily based on U.S.$ LIBOR plus an appropriate premium. Accordingly, prevailing market interest rates are continuously factored into transactional pricing and terms.

Assuming the amount of floating-rate liabilities at the reporting period end were outstanding for the whole year, interest rates were 50 basis points higher/lower and all other variables held constant, Glencore's income and shareholders' funds for the year ended 31 December 2010 would decrease/increase by U.S.$91 million (2009: decrease/increase by U.S.$71 million; 2008: decrease/increase by U.S.$64 million).

Currency risk

The U.S. dollar is the predominant functional currency of the Group. Currency risk is the risk of loss from movements in exchange rates related to transactions and balances in currencies other than the U.S. dollar. Such transactions include operating expenditure, capital expenditure and, to a lesser extent, purchases and sales in currencies other than the functional currency. Purchases or sales of commodities concluded in currencies other than the functional currency, apart from certain limited domestic sales at industrial operations which act as a hedge against local operating costs, are promptly hedged through forward exchange contracts. Consequently, foreign exchange movements against the U.S. dollar on recognised transactions would have a negligible financial impact. Glencore enters into currency hedging transactions with leading financial institutions.

Glencore's debt related payments (both principal and interest) are denominated in or swapped using hedging instruments into U.S. dollars. Glencore's operating expenses, being a small portion of its revenue base, are incurred in a mix of currencies of which the U.S. dollar, Swiss Franc, Pound Sterling, Australian Dollar and Euro are the predominant currencies.

Glencore has issued Euro-, Swiss Franc- and Sterling-denominated bonds (see Note 15). Cross currency swaps were concluded to hedge the currency risk on the principal and related interest payments of these bonds. These contracts were designated as cash flow hedges of the foreign currency risks associated with the bonds. The fair value of these derivatives is as follows:

	Notional amounts		Recognised fair values		
	Buy	**Sell**	**Assets**	**Liabilities**	**Average maturity[1]**
			(U.S.$ million)		
Cross currency swap agreements—2008	0	4,283	0	384	2015
Cross currency swap agreements—2009	0	4,283	0	48	2015
Cross currency swap agreements—2010	0	6,584	0	185	2015

Note:

(1) Refer to Note 15 for details.

Credit risk

Credit risk arises from the possibility that counterparties may not be able to settle obligations due to Glencore within their agreed payment terms. Financial assets which potentially expose Glencore to credit risk consist principally of cash and cash equivalents, marketable securities, receivables and advances, derivative instruments and non-current advances and loans. Glencore's credit management process includes the assessment, monitoring and reporting of counterparty exposure on a regular basis. Glencore's cash equivalents are placed overnight with a diverse group of highly credit rated financial institutions. Credit risk with respect to receivables and advances is mitigated by the large number of customers comprising Glencore's customer base, their diversity across various industries and geographical areas, as well as Glencore's policy to mitigate these risks through letters of credit, netting, collateral and insurance arrangements, where appropriate. Additionally, it is Glencore's policy that transactions and activities in trade-related financial instruments be concluded under master netting agreements or long-form confirmations to enable offsetting of balances due to/from a common counterparty in the event of default by the counterparty.

Glencore actively and continuously monitors the credit quality of its counterparties through internal reviews and a credit scoring process, which includes, where available, public credit ratings. Balances with counterparties not having a public investment grade or equivalent internal rating are typically enhanced to investment grade through the extensive use of credit enhancement products, such as letters of credit or insurance products. Glencore has a diverse customer base, with no customer representing more than 3.4 per cent. (2009: 2.3 per cent.; 2008: 2.8 per cent.) of its trade receivables or accounting for more than 3 per cent. of its revenues over the year ended 2010 (2.8 per cent. in 2009 and 2008).

The maximum exposure to credit risk, without considering netting agreements or without taking account of any collateral held or other credit enhancements, is equal to the carrying amount of Glencore's financial assets plus guarantees to third parties and Associates (see Note 25).

Performance risk

Performance risk arises from the possibility that counterparties may not be willing or able to meet their future contractual physical sale or purchase obligations to/from Glencore. Glencore undertakes the assessment, monitoring and reporting of performance risk within its overall credit management process. Glencore's market breadth, diversified customer base as well as the standard pricing mechanism in the majority of Glencore's commodity portfolio which does not fix prices beyond three months, with the main exception being coal where longer-term fixed price contracts are common, ensure that performance risk is adequately mitigated. The commodity industry is continuing a trend towards shorter fixed price contract periods, in part to mitigate against such potential performance risk, but also due to the development of more transparent and liquid spot markets, e.g. coal and iron ore and associated derivative products and indexes.

Liquidity risk

Liquidity risk is the risk that Glencore is unable to meet its payment obligations when due, or that it is unable, on an ongoing basis, to borrow funds in the market on an unsecured or secured basis at an acceptable price to fund actual or proposed commitments. Prudent liquidity risk management implies maintaining sufficient cash and cash equivalents through the availability of adequate committed funding facilities. Glencore has set itself an internal minimum liquidity target to maintain at all times, available committed undrawn credit facilities of U.S.$3 billion. Glencore's credit profile, diversified funding sources and committed credit facilities, ensure that sufficient liquid funds are maintained to meet its liquidity requirements. As part of its liquidity management, Glencore closely monitors and plans for its future capital expenditure and proposed investments, as well as credit facility refinancing/extension requirements, well ahead of time.

Glencore's financial forecasts and projections, taking into account reasonably possible changes in performance, indicate it is appropriate to adopt the going concern basis in preparing these financial statements.

As at 31 December 2010, Glencore had available committed undrawn credit facilities, cash and marketable securities amounting to U.S.$4,220 million (2009: U.S.$3,826 million; 2008: U.S.$5,255 million).

The maturity profile of Glencore's financial liabilities, excluding amounts attributed to profit participation shareholders, based on the contractual terms is as follows:

	2008					
	After 5 years	Due 3–5 years	Due 2–3 years	Due 1–2 years	Due 0–1 years	Total
			(U.S.$ million)			
Borrowings[(1)]	3,684	1,505	7,048	834	5,245	18,316
Expected future interest payments	882	623	516	527	527	3,075
Accounts payable	0	0	0	0	11,614	11,614
Other financial liabilities	0	0	2,119	3,139	8,333	13,591
Total	4,566	2,128	9,683	4,500	25,719	46,596
Current assets					36,508	36,508

	2009					
	After 5 years	Due 3–5 years	Due 2–3 years	Due 1–2 years	Due 0–1 years	Total
			(U.S.$ million)			
Borrowings[(1)]	2,943	4,344	5,507	3,950	6,845	23,589
Expected future interest payments	602	842	554	697	689	3,384
Commodities sold with agreements to repurchase	0	0	0	0	477	477
Prodeco call option arrangement	0	0	0	0	2,303	2,303
Accounts payable	0	0	0	0	11,482	11,482
Other financial liabilities	0	0	627	2,163	5,853	8,643
Liabilities held for sale	0	0	0	0	236	236
Total	3,545	5,186	6,688	6,810	27,885	50,114
Current assets					38,725	38,725

	2010					
	After 5 years	Due 3–5 years	Due 2–3 years	Due 1–2 years	Due 0–1 years	Total
			(U.S.$ million)			
Borrowings[(1)]	4,152	4,974	7,094	2,031	11,881	30,132
Expected future interest payments	668	949	766	800	834	4,017
Commodities sold with agreements to repurchase	0	0	0	0	484	484
Accounts payable	0	0	0	0	16,145	16,145
Other financial liabilities	0	739	288	955	6,084	8,066
Liabilities held for sale	0	0	0	0	45	45
Total	4,820	6,662	8,148	3,786	35,473	58,889
Current assets					44,296	44,296

Note:

(1) 2008: U.S.$ nil million; 2009: U.S.$341 million; 2010: U.S.$ nil million of reported short-term debt is drawn under a three-year committed facility.

23 Financial Instruments

Fair value of financial instruments

The following table presents the carrying values and fair values of Glencore's financial instruments. Fair value is the amount at which a financial instrument could be exchanged in an arm's length transaction between informed and willing parties, other than in a forced or liquidated sale. Where available, market values have been used to determine fair values. When market values are not available, fair values have been calculated by discounting expected cash flows at prevailing interest and exchange rates. The estimated fair values have been determined using market information and appropriate valuation methodologies, but are not necessarily indicative of the amounts that Glencore could realise in the normal course of business.

	2008				
	Carrying value(1)	Available for sale	FVtPL(2)	Total	Fair value
	(U.S.$ million)				
Assets					
Other investments	0	2,623	185	2,808	2,808
Advances and loans	1,826	0	0	1,826	1,826
Accounts receivable	13,956	0	0	13,956	13,956
Other financial assets	0	0	13,762	13,762	13,762
Cash and cash equivalents and marketable securities	0	0	939	939	939
Total financial assets	15,782	2,623	14,886	33,291	33,291
Liabilities					
Amounts attributed to profit participation shareholders	12,604	0	0	12,604	12,604
Borrowings	18,316	0	0	18,316	15,392
Accounts payable	11,614	0	0	11,614	11,614
Other financial liabilities	0	0	13,591	13,591	13,591
Total financial liabilities	42,534	0	13,591	56,125	53,201

Notes:

(1) Carrying value comprises investments, loans, accounts receivable, accounts payable and other liabilities measured at amortised cost.

(2) FVtPL—Fair value through profit and loss—held for trading.

	2009				
	Carrying value(1)	Available for sale	FVtPL(2)	Total	Fair value
	(U.S.$ million)				
Assets					
Other investments(3)	0	2,624	578	3,202	3,202
Advances and loans	2,535	0	0	2,535	2,535
Accounts receivable	15,189	0	0	15,189	15,189
Other financial assets	0	0	6,125	6,125	6,125
Cash and cash equivalents and marketable securities	0	0	935	935	935
Total financial assets	17,724	2,624	7,638	27,986	27,986
Liabilities					
Amounts attributed to profit participation shareholders	12,245	0	0	12,245	12,245
Borrowings	23,589	0	0	23,589	23,641
Commodities sold with agreements to repurchase	477	0	0	477	477
Prodeco call option arrangement	0	0	2,303	2,303	2,303
Accounts payable	11,482	0	0	11,482	11,482
Other financial liabilities	0	0	8,643	8,643	8,643
Total financial liabilities	47,793	0	10,946	58,739	58,791

Notes:

(1) Carrying value comprises investments, loans, accounts receivable, accounts payable and other liabilities measured at amortised cost.

(2) FVtPL—Fair value through profit and loss—held for trading.

(3) Other investments contain U.S.$578 million in Level 1 and U.S.$2,624 million in Level 3. There were no changes in Level 3 for the year.

	2010				
	Carrying value[1]	Available for sale	FVtPL[2]	Total	Fair value
	(U.S.$ million)				
Assets					
Other investments[3]	0	2,048	390	2,438	2,438
Advances and loans	3,830	0	0	3,830	3,830
Accounts receivable	18,994	0	0	18,994	18,994
Other financial assets	0	0	5,982	5,982	5,982
Cash and cash equivalents and marketable securities	0	0	1,529	1,529	1,529
Total financial assets	22,824	2,048	7,901	32,773	32,773
Liabilities					
Amounts attributed to profit participation shareholders	14,189	0	0	14,189	14,189
Borrowings	30,132	0	0	30,132	31,476
Commodities sold with agreements to repurchase	484	0	0	484	484
Accounts payable	16,145	0	0	16,145	16,145
Other financial liabilities	0	0	8,066	8,066	8,066
Total financial liabilities	60,950	0	8,066	69,016	70,360

Notes:

(1) Carrying value comprises investments, loans, accounts receivable, accounts payable and other liabilities measured at amortised cost.

(2) FVtPL—Fair value through profit and loss—held for trading.

(3) Other investments contain U.S.$2,438 million in Level 1. As at 31 December 2009, U.S.$2,624 million of other investments were considered Level 3 valuations, which during 2010 U.S.$2,003 million were reclassified to Level 1 following UCR's listing on the Hong Kong Stock Exchange in January 2010 (see Note 7) and as a result of the Russneft debt amendment and restatement (see Note 8), U.S.$285 million of equity conversion advances were reclassified from other investments to non-current advances (a Level 2 fair value measurement) and the balance of the Russneft investment and the opening Level 3 valuation amount (U.S.$336 million) was impaired.

The following tables show the fair values of the derivative financial instruments including trade financial and physical forward purchase and sale commitments by type of contract as at 31 December 2008, 2009 and 2010. Fair values are primarily determined using quoted market prices or standard pricing models using observable market inputs where available and are presented to reflect the expected gross future cash in/outflows. Glencore classifies the fair values of its financial instruments into a three-level hierarchy based on the degree of the source and observability of the inputs that are used to derive the fair value of the financial asset or liability as follows:

Level 1: unadjusted quoted inputs in active markets for identical assets or liabilities; or

Level 2: inputs other than quoted inputs included in Level 1 that are directly or indirectly observable in the market; or

Level 3: unobservable market inputs or observable but cannot be market corroborated, requiring Glencore to make market-based assumptions.

Level 1 classifications primarily include futures with a tenor of less than one year and options that are exchange traded. Level 2 classifications primarily include futures with a tenor greater than one year, OTC options, swaps and physical forward transactions which derive their fair value primarily from exchange quotes and readily observable broker quotes. Level 3 classifications primarily include physical forward transactions which derive their fair value predominately from models that use broker quotes and applicable market-based estimates surrounding location, quality and credit differentials. In circumstances where Glencore cannot verify fair value with observable market inputs (Level 3 fair values), it is possible that a different valuation model could produce a materially different estimate of fair value.

It is Glencore's policy that transactions and activities in trade-related financial instruments be concluded under master netting agreements or long-form confirmations to enable balances due to/from a common counterparty to be offset in the event of default by the counterparty.

Other financial assets

2008	Level 1	Level 2	Level 3	Total
		(U.S.$ million)		
Commodity-related contracts				
Futures	1,218	7,319	0	8,537
Options	3	297	0	300
Swaps	0	875	0	875
Physical forwards	0	862	3,012	3,874
Financial contracts				
Cross currency swaps	0	95	0	95
Foreign currency and interest rate contracts	0	81	0	81
Total	1,221	9,529	3,012	13,762

2009	Level 1	Level 2	Level 3	Total
		(U.S.$ million)		
Commodity-related contracts				
Futures	1,838	947	0	2,785
Options	132	277	0	409
Swaps	193	394	0	587
Physical forwards	0	343	1,706	2,049
Financial contracts				
Cross currency swaps	0	246	0	246
Foreign currency and interest rate contracts	21	28	0	49
Total	2,184	2,235	1,706	6,125

2010	Level 1	Level 2	Level 3	Total
		(U.S.$ million)		
Commodity-related contracts				
Futures	1,168	628	0	1,796
Options	106	43	0	149
Swaps	174	471	0	645
Physical forwards	0	1,744	1,374	3,118
Financial contracts				
Cross currency swaps	0	149	0	149
Foreign currency and interest rate contracts	45	80	0	125
Total	1,493	3,115	1,374	5,982

Other financial liabilities

2008	Level 1	Level 2	Level 3	Total
		(U.S.$ million)		
Commodity-related contracts				
Futures	911	7,498	0	8,409
Options	0	848	56	904
Swaps	0	568	0	568
Physical forwards	0	358	2,510	2,868
Financial contracts				
Cross currency swaps	0	764	0	764
Foreign currency and interest rate contracts	0	78	0	78
Total	911	10,114	2,566	13,591

2009	Level 1	Level 2	Level 3	Total
		(U.S.$ million)		
Commodity-related contracts				
Futures	3,463	2,284	0	5,747
Options	144	333	88	565
Swaps	241	415	1	657
Physical forwards	0	249	1,025	1,274
Financial contracts				
Cross currency swaps	0	371	0	371
Foreign currency and interest rate contracts	19	10	0	29
Total	3,867	3,662	1,114	8,643

2010	Level 1	Level 2	Level 3	Total
		(U.S.$ million)		
Commodity-related contracts				
Futures	2,786	1,356	0	4,142
Options	25	70	99	194
Swaps	295	489	0	784
Physical forwards	0	1,199	1,019	2,218
Financial contracts				
Cross currency swaps	0	660	0	660
Foreign currency and interest rate contracts	37	31	0	68
Total	3,143	3,805	1,118	8,066

The following table shows the net changes in fair value of Level 3 other financial assets and other financial liabilities:

	Swaps	Physical forwards	Options	Total Level 3
		(U.S.$ million)		
1 January 2008	0	710	(12)	698
Total gain/(loss) recognised in cost of goods sold	0	(208)	(44)	(252)
31 December 2008	0	502	(56)	446
1 January 2009	0	502	(56)	446
Total gain/(loss) recognised in cost of goods sold	0	1,164	13	1,177
Sales	(1)	0	(101)	(102)
Realised	0	(985)	56	(929)
31 December 2009	(1)	681	(88)	592
1 January 2010	(1)	681	(88)	592
Total gain/(loss) recognised in cost of goods sold	2	(209)	(58)	(265)
Sales	0	0	(41)	(41)
Realised	(1)	(117)	88	(30)
31 December 2010	0	355	(99)	256

24 Future Commitments

Capital expenditure for the acquisition of property, plant and equipment is generally funded through the cash flow generated by the respective industrial entities. As at 31 December 2010, U.S.$787 million (2009: U.S.$815 million; 2008: U.S.$967 million), 100 per cent. of which relates to expenditure to be incurred over the next year (2009: 63 per cent.; 2008: 42 per cent.), was contractually committed for the acquisition of property, plant and equipment.

Certain of Glencore's exploration tenements and licences require it to spend a minimum amount per year on development activities, a significant portion of which would have been incurred in the ordinary course of operations. As at 31 December 2010, U.S.$404 million (2009: U.S.$284 million; 2008: U.S.$262 million) of such development expenditures are to be incurred, of which 36 per cent. are for commitments to be settled over the next year.

Glencore procures seagoing vessel/chartering services to meet its overall marketing objectives and commitments. At year end, Glencore has committed to future hire costs to meet future physical delivery and sale obligations and expectations of U.S.$2,608 million (2009: U.S.$2,185 million; 2008: U.S.$2,880 million) of which U.S.$325 million (2009: U.S.$272 million; 2008: U.S.$nil million) are with associated companies. 50 per cent. of these charters are for services to be received over the next two years.

As part of Glencore's ordinary sourcing and procurement of physical commodities and other ordinary marketing obligations, the selling party may request that a financial institution act as either (a) the paying party upon the delivery of product and qualifying documents through the issuance of a letter of credit or (b) the guarantor by way of issuing a bank guarantee accepting responsibility for Glencore's contractual obligations. As at 31 December 2010, U.S.$8,956 million (2009: U.S.$7,178 million; 2008: U.S.$5,450 million) of such commitments have been issued on behalf of Glencore, which will generally be settled with the payment for such commodity.

Glencore has entered into various operating leases mainly as lessee for office and warehouse/storage facilities. Rental expenses for these leases totalled, respectively, U.S.$62 million, U.S.$53 million and U.S.$66 million for the years ended 31 December 2008, 2009 and 2010. Future net minimum lease payments under non-cancellable operating leases are as follows:

	2008	2009	2010
	(U.S.$ million)		
Within one year	15	26	97
Between two and five years	47	51	225
After five years	110	93	151
Total	172	170	473

Future development and related commitments

Prodeco currently exports the majority of its coal through Puerto Zuñiga which operates under a private concession awarded by the Colombian government. The concession expired in March 2009; however, the Colombian government has continued to grant Prodeco the right to use the port under annual lease agreements. To comply with new government regulations on loading methods, which became effective from July 2010 and to alleviate itself from the uncertainty of the annual concession renewal process associated with Puerto Zuñiga, Prodeco has initiated the construction of a new, wholly owned, port facility (Puerto Nuevo) which is estimated to cost U.S.$520 million and be commissioned during the first half of 2013. If the concession does not continue to be extended, Prodeco's export capability would be curtailed, which could significantly impact operations until Puerto Nuevo is operational. As at 31 December 2010, U.S.$55 million of the estimated initial investment has been incurred.

In August 2010, Glencore acquired an ultimate 37.5 per cent. interest in the Kansuki concession ("Kansuki"), a 180 square kilometre copper and cobalt pre-development project which borders Glencore's partly-owned Mutanda concession in the DRC. In exchange, Glencore has (a) an obligation to finance the first U.S.$400 million of development related expenditures, if any, as and when such expenditure gets incurred, (b) the right to operate the operations and (c), a life of mine off-take agreement for all copper and cobalt produced by Kansuki. In addition, one of the partners in Kansuki has the right to sell an additional 18.75 per cent. ultimate interest to Glencore at the then calculated equity value of the operation, at the earlier of the date the operation produces a minimum annual 70,000 metric tonnes of copper and August 2013. Kansuki is currently completing its initial feasibility study for submission by June 2011. As at 31 December 2010, U.S.$11 million of development expenditure had been incurred.

In November 2010, Glencore and Blackthorn Resources Limited completed a joint venture agreement to develop the Perkoa Zinc Project ("Perkoa") located in Burkina Faso, West Africa. Under the terms of the agreement, Glencore will obtain a 50.1 per cent. effective ownership in Perkoa in exchange for (a) an obligation to finance the first U.S.$80 million of development related expenditures, if any, as and when such expenditure gets incurred, (b) the right to operate the operations and (c) a life of mine off-take agreement for all zinc produced by Perkoa. As at 31 December, 2010, U.S.$ nil million of development expenditure had been incurred.

25 Contingent Liabilities

The amount of corporate guarantees in favour of associated and third parties as at 31 December 2010, was U.S.$69 million (2009: U.S.$73 million and 2008: U.S.$66 million). Also see Note 7.

Litigation

Certain legal actions, other claims and unresolved disputes are pending against Glencore. Whilst Glencore cannot predict the results of any litigation, it believes that it has meritorious defenses against those actions or claims. Glencore believes the likelihood of any liability arising from these claims to be remote and that the liability, if any, resulting from any litigation will not have a material adverse effect on its consolidated income, financial position or cash flows.

Environmental contingencies

Glencore's operations, predominantly those arising from the ownership in industrial investments, are subject to various environmental laws and regulations. Glencore is in material compliance with those laws and regulations. Glencore accrues for environmental contingencies when such contingencies are probable and reasonably estimable. Such accruals are adjusted as new information develops or circumstances change. Recoveries of environmental remediation costs from insurance companies and other parties are recorded as assets when the recoveries are virtually certain. At this time, Glencore is unaware of any material environmental incidents at its locations.

Bolivian constitution

In 2009, the Government of Bolivia enacted a new constitution. One of the principles of the constitution requires mining entities to form joint ventures with the government. Glencore, through its subsidiary Sinchi Wayra, has, in good faith, entered into negotiations with the Bolivian government regarding this requirement. Whilst progress has been made, the final outcome and the timing thereof cannot be determined at this stage.

26 Related Party Transactions

In the normal course of business, Glencore enters into various arm's length transactions with related parties (primarily Xstrata), including fixed price commitments to sell and to purchase commodities, forward sale and purchase contracts, agency agreements and management service agreements. Outstanding balances at period end are unsecured and settlement occurs in cash (see Notes 8, 10, 13 and 19). There have been no guarantees provided or received for any related party receivables or payables.

Related party transactions, unless discussed elsewhere in the notes to the Historical Financial Information, are summarised below. The principal related parties are included in Notes 14 and 28. All transactions between Glencore and its subsidiaries are eliminated on consolidation along with any unrealised profits and losses between its subsidiaries and Associates.

2008	Associated companies	Parent companies	Total
		(U.S.$ million)	
Sales	786	0	786
Purchases	(9,153)	0	(9,153)
Interest income	16	2	18
Interest expense	(3)	0	(3)
Agency income	117	0	117
Agency expense	(4)	0	(4)

2009	Associated companies	Parent companies	Total
		(U.S.$ million)	
Sales	907	0	907
Purchases	(7,423)	0	(7,423)
Interest income	20	2	22
Interest expense	(2)	0	(2)
Agency income	51	0	51
Agency expense	(4)	0	(4)

2010	Associated companies	Parent companies	Total
		(U.S.$ million)	
Sales	1,086	0	1,086
Purchases	(9,472)	0	(9,472)
Interest income	32	2	34
Interest expense	(1)	0	(1)
Agency income	82	0	82
Agency expense	(5)	0	(5)

Remuneration of key management personnel

The remuneration of directors and other members of key management personnel recognised in the statement of income, including salaries and other current employee benefits amounted to U.S.$146 million (2009: U.S.$148 million; 2008: U.S.$149 million) and amounts attributable to profit participation amounts are U.S.$938 million (2009: U.S.$291 million; 2008: U.S.$242 million). As at 31 December 2010, included in the amounts attributable to profit participation shareholders are U.S.$6,130 million (2009: U.S.$5,192 million; 2008: U.S.$4,901 million).

27 Subsequent Events

Subsequent to year end, the following significant events occurred:

In January, Glencore issued CHF 225 million (U.S.$235 million) 3.625 per cent. interest-bearing bonds due April 2016, increasing the size of this CHF bond series to CHF 825 million. The proceeds from this bond issue (plus U.S.$65 million in cash on hand) were used to redeem U.S.$300 million of the U.S.$700 million 8 per cent. perpetual notes.

In February 2011, Glencore concluded a new one year committed U.S.$600 million European oil receivables borrowing base facility.

In April 2011, Glencore agreed with Verny to acquire additional stakes in Kazzinc. These purchases will increase its ownership from 50.7 per cent. to 93.0 per cent. for a total transaction consideration of $3.2 billion. Subject to the satisfaction of certain conditions (including Glencore completing the International Offer and obtaining applicable regulatory approvals), the consideration will be settled through the issuance of U.S.$1 billion of Ordinary Shares at the Offer Price and U.S.$2.2 billion in cash (to be paid in tranches between October and December 2011). The acquisition, if completed, will be accounted for under IAS 27 *Consolidated and Separate Financial Statements* as an equity transaction (a transaction with owners in their capacity as owners) and on the date of completion will result in a net decrease in total equity on Glencore's consolidated statement of financial position of U.S.$2.2 billion equating to the cash component of the consideration. There will be no change to the underlying assets and liabilities of Kazzinc in Glencore's consolidated statement of financial position. Following the date of closing an additional 42.3 per cent. of Kazzinc's income thereafter will be attributable to equity holders of Glencore with the remaining 7 per cent. being attributed to the non controlling interests in Kazzinc.

On 3 May 2011, Glencore replaced the previous 364 day U.S.$1,375 million and the U.S.$515 million Asian focused tranche revolving credit facilities with two new 364 day revolving credit facilities for U.S.$2,925 million and U.S.$610 million, both with a one year extension option at the borrower's discretion. In addition, Glencore extended the final maturity of U.S.$8,340 million of the U.S.$8,370 million medium term revolver for a further year to May 2014. In aggregate, the three tranches represent an increase in committed available liquidity of U.S.$1,645 million.

28 List of Principal Operating, Finance and Industrial Subsidiaries and Investments

	Method of Consolidation in 2010[1]	Country of incorporation	% interest 2008	% interest 2009	% interest 2010	Main activity
Glencore International AG	P	Switzerland				Operating
Glencore AG	F	Switzerland	100.0	100.0	100.0	Operating
Allied Alumina Inc. (Sherwin Alumina)	F	United States	100.0	100.0	100.0	Alumina production
Columbia Falls Aluminum Company	F	United States	100.0	100.0	100.0	Aluminium production
Century Aluminum Company	E	United States	47.0[2]	44.1[2]	44.0[2]	Aluminium production
Glencore Funding LLC	F	United States	100.0	100.0	100.0	Finance
East Tennessee Zinc Company LLC	F	United States	100.0	0.0	0.0	Zinc production
Glencore UK Ltd	F	U.K.	100.0	100.0	100.0	Operating
Glencore Commodities Ltd	F	U.K.	100.0	100.0	100.0	Operating
Glencore Energy UK Ltd	F	U.K.	100.0	100.0	100.0	Operating
Glencore Group Funding Limited . .	F	UAE	100.0	100.0	100.0	Finance
Glencore Finance (Bermuda) Ltd . .	F	Bermuda	100.0	100.0	100.0	Finance
AR Zinc Group	F	Argentina	100.0	100.0	100.0	Zinc/Lead production
Empresa Minera Los Quenuales S.A.	F	Peru	97.1	97.1	97.1	Zinc/Lead production
Glencore Exploration (EG) Ltd. . .	F	Bermuda	100.0	100.0	100.0	Oil exploration/development
Glencore Finance (Europe) S.A. . .	F	Luxembourg	100.0	100.0	100.0	Finance
Kansuki Group	E	DRC	0.0	0.0	37.5	Copper production
Minera Altos de Punitaqui	F	Chile	0.0	0.0	100.0	Copper production
Mopani Copper Mines PLC	F	Zambia	73.1	73.1	73.1	Copper production
Mutanda Group	E	DRC	40.0	40.0	40.0	Copper production
Prodeco Group	F	Colombia	100.0	100.0	100.0	Coal production
Recylex S.A.	E	France	32.2	32.2	32.2	Zinc/Lead production
Sinchi Wayra	F	Bolivia	100.0	100.0	100.0	Zinc/Tin production
Refineria de Cartagena S.A.	E	Colombia	51.0	0.0	0.0	Oil refining
United Company Rusal Plc	O	Jersey	10.3	9.7	8.8	Aluminum production
Finges Investment B.V.	F	Netherlands	100.0	100.0	100.0	Finance
Biopetrol Industries AG[3]	F	Switzerland	0.0	0.0	60.3	Biodiesel production
Glencore Grain B.V	F	Netherlands	100.0	100.0	100.0	Operating
Nyrstar N.V.	O	Belgium	0.0	7.8	7.8	Zinc production
Rio Vermelho	F	Brazil	0.0	0.0	76.0	Sugar cane/ethanol production
Xstrata plc	E	U.K.	35.2	34.9	34.5	Diversified production
Chemoil Energy Limited[4]	F	Singapore	0.0	0.0	51.5	Oil storage
Cobar Group	F	Australia	100.0	100.0	100.0	Copper production
Glencore Singapore Pte Ltd	F	Singapore	100.0	100.0	100.0	Operating
Kazzinc Ltd.	F	Kazakhstan	69.0	69.0	50.7	Zinc/Lead production
Vasilkovskoje Gold	F	Kazakhstan	40.0	40.0	100.0	Gold production
Katanga Mining Limited[5]	F	Bermuda	8.5	69.2	74.4	Copper production
Murrin Murrin Joint Venture[6] . . .	F	Australia	40.0	40.0	40.0	Nickel production
Minara Resources Ltd[6]	F	Australia	70.6	70.6	70.6	Nickel production
Moreno Group	F	Argentina	100.0	100.0	100.0	Edible oils production
Pacorini Group	F	Switzerland	0.0	0.0	100.0	Metals warehousing
Pasar Group	F	Philippines	78.2	78.2	78.2	Copper production
Polymet Mining Corp.	O	Canada	0.0	2.6	6.3	Copper production
Portovesme S.r.L.	F	Italy	100.0	100.0	100.0	Zinc/Lead production
Russneft Group (various companies)[7]	O	Russia	40.0-49.0	40.0-49.0	40.0-49.0	Oil production
Shanduka Coal (Pty) Ltd	F	South Africa	70.0	70.0	70.0	Coal production
ST Shipping & Transport Pte Ltd . .	F	Singapore	100.0	100.0	100.0	Operating
Topley Corporation	F	B.V.I.	100.0	100.0	100.0	Ship owner
Volcan Compania Minera S.A.A. . .	O	Peru	4.1	4.1	4.1	Zinc production

Notes:

(1) P = Parent; F = Full consolidation; E = Equity method; O = Other investment.

(2) Represents Glencore's economic interest in Century, comprising 39.1 per cent. (2009: 39.1 per cent.; 2008: 28.5 per cent.) voting interest and 4.9 per cent. (2009: 5 per cent.; 2008: 18.5 per cent.) non-voting interest.

(3) Publicly traded on the Frankfurt Stock Exchange under the symbol A0HNQ5. Glencore owns 46,812,601 shares.

(4) Publicly traded on the Singapore Exchange under the symbol CHEL.SI. Glencore owns 666,204,594 shares.

(5) Publicly traded on the Toronto Stock Exchange under the symbol KAT.TO. Glencore owns 1,419,031,161 shares.

(6) The balance of the joint venture is held by Minara Resources Ltd, giving Glencore an effective interest of 82.4 per cent. in the joint venture.

(7) Publicly traded on the Australian Stock Exchange under symbol MER.AX. Glencore owns 824,829,760 shares.

(8) Although Glencore holds more than 20 per cent. of the voting rights, it has limited key management influence and thus does not exercise significant influence.

SUB-SECTION A: ACCOUNTANT'S REPORT ON UNAUDITED PRO FORMA FINANCIAL INFORMATION

Deloitte.

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The Board of Directors
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The Board of Directors
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Citigroup Global Markets Asia Limited
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Citibank Plaza
3 Garden Road
Central
Hong Kong

Morgan Stanley Asia Limited
46th Floor, International Commerce Centre
1 Austin Road West
Kowloon
Hong Kong

4 May 2011

Dear Sirs

Glencore International plc (the "Company")

We report on the pro forma financial information (the "Pro forma financial information") in respect of Glencore International AG (the "Operating Company") and its subsidiaries (together with the Operating Company, the "Operating Group") set out in Section VII: "Unaudited Pro-Forma Financial Information" of the prospectus dated 4 May 2011 of Glencore International plc (the "Company") prepared in connection with the Company's admission to listing on the premium segment of the Official List of the Financial Services Authority and admission to trading on the London Stock Exchange of the ordinary shares of the Company (the "UK Listing") (the "UK Prospectus") and having regard to the waivers granted by the Stock Exchange of Hong Kong Limited ("HKSE") in connection with the secondary listing of the ordinary shares of the Company on the Main Board of the HKSE (the "HK Listing") (the "HK Prospectus"), (the UK Prospectus and HK Prospectus together being the "Investment Circular") which has been prepared on the basis described in notes 1 to 5, for illustrative purposes only, to provide information about how the transaction might have affected the financial information presented on the basis of the accounting policies to be adopted by the Company in preparing the financial statements for the period ended 31 December 2011. It is intended that the Company will acquire the entire issued share capital of the Operating Company prior to the implementation of the UK Listing. The Pro Forma Financial Information is therefore based on the consolidated audited historical financial information of the Operating Group at 31 December 2010 contained in Section VI: "Historical Financial Information" of the Investment Circular. No adjustments have been made to reflect the results or any other activity of the Operating Group since 31 December 2010. This report is required by Annex I item 20.2 of Commission Regulation (EC) No 809/2004 (the "Prospectus Directive Regulation"), and is given for the purpose of complying with that requirement and for no other purpose.

Responsibilities

It is the responsibility of the directors of the Company (the "Directors") to prepare the pro forma financial information in accordance with Annex I item 20.2 and Annex II items 1 to 6 of the Prospectus Directive Regulation.

It is our responsibility to form an opinion, in accordance with Annex I item 20.2 of the Prospectus Directive Regulation, as to the proper compilation of the pro forma financial information and to report that opinion to you in accordance with Annex II item 7 of the Prospectus Directive Regulation.

Save for any responsibility arising under Prospectus Rule 5.5.3R (2)(f), Chapter 4 of the HKSE Rules Governing the Listing of Securities on the Stock Exchange of Hong Kong Limited (the "HK Listing Rules") and the Companies Ordinance (Cap. 32) of the Laws of Hong Kong (the "Companies Ordinance"), except where waivers have been granted by the HKSE to any person as and to the extent there provided, to the fullest extent permitted by law we do not assume any responsibility and will not accept any liability to any other person for any loss suffered by any such other person as a result of, arising out of, or in accordance with this report or our statement, required by and given solely for the purposes of complying with Annex I item 23.1 of the Prospectus Directive Regulation, and consenting to its inclusion in the Prospectus.

Our responsibilities in relation to the UK Prospectus relate only to the UK Listing and our responsibilities in relation to the Hong Kong Prospectus relate only to the Hong Kong Listing.

In providing this opinion we are not updating or refreshing any reports or opinions previously made by us on any financial information used in the compilation of the pro forma financial information, nor do we accept responsibility for such reports or opinions beyond that owed to those to whom those reports or opinions were addressed by us at the dates of their issue.

Basis of Opinion

We conducted our work in accordance with the Standards for Investment Reporting issued by the Auditing Practices Board in the United Kingdom. The work that we performed for the purpose of making this report, which involved no independent examination of any of the underlying financial information, consisted primarily of comparing the unadjusted financial information with the source documents, considering the evidence supporting the adjustments and discussing the pro forma financial information with the Directors.

We planned and performed our work so as to obtain the information and explanations we considered necessary in order to provide us with reasonable assurance that the pro forma financial information has been properly compiled on the basis stated and that such basis is consistent with the accounting policies of the Company.

Our work has not been carried out in accordance with auditing or other standards and practices generally accepted in jurisdictions outside the United Kingdom, including the United States of America, and accordingly should not be relied upon as if it had been carried out in accordance with those standards or practices.

Opinion

In our opinion:

(a) the pro forma financial information has been properly compiled on the basis stated; and

(b) such basis is consistent with the accounting policies of the Company.

Declaration

For the purposes of Prospectus Rule 5.5.3R(2)(f), we are responsible for this report as part of the UK Prospectus and declare that we have taken all reasonable care to ensure that the information contained in this report is, to the best of our knowledge, in accordance with the facts and contains no omission likely to affect its import. This declaration is included in the UK Prospectus in compliance with Annex I item 1.2 of the Prospectus Directive Regulation.

Yours faithfully

Deloitte LLP
Chartered Accountants

Deloitte LLP is a limited liability partnership registered in England and Wales with registered number OC303675 and its registered office at 2 New Street Square, London EC4A 3BZ, United Kingdom. Deloitte LLP is the United Kingdom member firm of Deloitte Touche Tohmatsu Limited ("DTTL"), a UK private company limited by guarantee, whose member firms are legally separate and independent entities. Please see www.deloitte.co.uk/about for a detailed description of the legal structure of DTTL and its member firms.

Member of Deloitte Touche Tohmatsu Limited

SUB-SECTION B: UNAUDITED PRO FORMA NET ASSETS STATEMENT

The unaudited pro forma statement of net assets has been prepared to illustrate the effect of the Global Offer on the net assets of the Company as if the Global Offer had taken place on 31 December 2010. The unaudited pro forma statement of net assets has been prepared for illustrative purposes only and, because of its nature, addresses a hypothetical situation and therefore does not reflect the Glencore Group's actual financial position or results.

The unaudited pro forma statement of net assets is based on the consolidated audited historical balance sheet of the Glencore Group at 31 December 2010 contained in Section VI: "Historical Financial Information" of the Prospectus and has been prepared in a manner consistent with the accounting policies adopted by the Company in preparing such information. The unaudited pro forma statement of net assets is complied on the basis set out in the notes below and in accordance with the requirements of item 20.2 of Annex I and items 1 to 6 of Annex II to the Prospectus Rules. No adjustment has been made to reflect the results or any other activity of the Glencore Group since 31 December 2010.

		Adjustments			
	Glencore International Plc unaudited net assets as at 14 March 2011(1)	Glencore audited net assets as at 31 December 2010(2)	Global Offer proceeds(3)	Crystallisation of tax items(4)	Pro forma net assets as at 31 December 2010(6)
			(U.S.$ million)		
Assets					
Non-current assets					
Property, plant and equipment	0	12,088	0	0	12,088
Investments in associates and jointly controlled entities	0	16,766	0	0	16,766
Other investments	0	2,438	0	0	2,438
Advances and loans	0	3,830	0	0	3,830
Deferred tax assets	0	369	0	444	813
Total non-current assets	0	35,491	0	444	35,935
Current assets					
Inventories	0	17,393	0	0	17,393
Accounts receivable	0	18,994	0	0	18,994
Other financial assets	0	5,982	0	0	5,982
Prepaid expenses and other assets	0	118	0	0	118
Marketable securities	0	66	0	0	66
Cash and cash equivalents	0	1,463	7,456	0	8,919
Assets held for sale	0	280	0	0	280
Total current assets	0	44,296	7,456	0	51,752
Total assets	0	79,787	7,456	444	87,687

	Glencore International Plc unaudited net assets as at 14 March 2011(1)	Adjustments: Glencore audited net assets as at 31 December 2010(2)	Adjustments: Global Offer proceeds(3)	Adjustments: Crystallisation of tax items(4)	Pro forma net assets as at 31 December 2010(6)
			(U.S.$ million)		
Non-current liabilities					
Borrowings	0	18,251	0	0	18,251
Deferred income	0	164	0	0	164
Deferred tax liabilities	0	1,308	0	0	1,308
Provisions	0	719	0	0	719
Total non-current liabilities	0	20,442	0	0	20,442
Current liabilities					
Borrowings	0	11,881	0	0	11,881
Commodities sold with agreements to repurchase	0	484	0	0	484
Accounts payable	0	16,145	0	0	16,145
Other financial liabilities	0	8,066	0	0	8,066
Income tax payable	0	217	0	0	217
Liabilities held for sale	0	45	0	0	45
Total current liabilities	0	36,838	0	0	36,838
Total liabilities	0	57,280	0	0	57,280
Net assets	0	22,507	7,456	444	30,407

Notes:

(1) Glencore International plc was incorporated on 14 March 2011 and will be the new holding company for the Glencore Group at UK Admission. Since incorporation, it has not traded, has not entered into any transactions and has no material equity or reserves. No financial information for Glencore International plc has been audited.

(2) The consolidated net assets of Glencore International AG as at 31 December 2010 have been extracted without material adjustment from the audited historical financial information of the Glencore Group, as set out in Section VI: "Historical Financial Information".

(3) The estimated net proceeds of the Global Offer are calculated based on an assumed Offer Price of U.S.$8.83 (being the U.S.$ equivalent of the mid-point of the Offer Price Range), after deduction of underwriting fees and other related costs and expenses, and takes no account of any Ordinary Shares which may be issued upon exercise of the Over-Allotment Option, as follows:

Gross proceeds from the Global Offer	U.S.$7,891 million
Costs and expenses (including taxes) of the Global Offer	U.S.$435 million
Net proceeds from the Global Offer	U.S.$7,456 million

(4) Prior to the Restructuring, Glencore International was entitled to Swiss tax deductions in respect of the profit participating certificates held by employees. As a result of the Restructuring, employees will cease to hold the profit participating certificates. The Restructuring will crystallise Swiss tax deductions of U.S.$4,785 million and will result in a deferred tax asset in Glencore International with a value of U.S.$444 million (net of other tax adjustments).

(5) The consideration for the Kazzinc Tranche 1 Acquisition and the Kazzinc Tranche 2 Acquisition (respectively U.S$1.0 billion of Ordinary Shares at the Offer Price and US$2.2 billion of cash) have not been included in the pro forma statement of net assets as they are subject to certain conditions including receipt of applicable regulatory approvals. The acquisition, if completed, will result in a net decrease in net assets of U.S.$2.2 billion equating to the cash component of the consideration. There would be no impact on pro forma net assets arising from the consideration to be satisfied by the issuance of the U.S.$1 billion of Ordinary Shares at the Offer Price.

(6) Save for the adjustment for the net proceeds of the Global Offer and for the deferred tax assets arising from the Restructiring as described in Notes 3 and 4 above respectively, no adjustment has been made to reflect the trading results or any other transaction of the Glencore Group since 31 December 2010.

SECTION VIII: DETAILS OF THE GLOBAL OFFER

1 Structure of the Global Offer

This Prospectus is published in connection with the Global Offer. Citi and Morgan Stanley are the Joint Sponsors in relation to UK Admission. Citigroup Global Markets U.K. Equity Limited, Morgan Stanley and Credit Suisse are the Joint Global Co-ordinators of the Global Offer. BNP Paribas, Citigroup Global Markets U.K. Equity Limited, Credit Suisse, Merrill Lynch and MSSL have been appointed as Joint Bookrunners in relation to the International Offer. Citi Asia and Morgan Stanley Asia are the Joint Sponsors in relation to HK Admission. BNP Paribas, Citi Asia, Credit Suisse Asia, Merrill Lynch Asia and Morgan Stanley Asia are the HK Joint Bookrunners of the Hong Kong Offer. The Global Offer comprises:

(a) the International Offer: the making available of up to 1,218,750,000 Ordinary Shares (subject to adjustment as described below and assuming that the Over-Allotment Option is not exercised), being the International Offer Shares, to qualified investors in certain Member States, including to institutional investors in the United Kingdom and Hong Kong and to certain other institutional investors outside the U.S. in reliance on Rule 144A or another exemption from, or transaction not subject to, the registration requirements of the Securities Act; and

(b) the Hong Kong Offer: the making available of 31,250,000 Ordinary Shares (subject to adjustment as described below), being the Hong Kong Offer Shares, to the public and professional investors in Hong Kong.

Based on the assumptions referred to below, the Offer Shares which are the subject of the Global Offer are expected to comprise:

- an issue by the Company of 893,292,886 new Ordinary Shares, representing 12.9 per cent. of the expected issued Ordinary Share capital of the Company immediately following Admission, based on an Offer Price at the mid-point of the Offer Price Range and assuming the Over-Allotment Option is not exercised and no Kazzinc Consideration Shares have been issued; and
- the sale by the Selling Shareholder of 238,782,586 existing Ordinary Shares (such Ordinary Shares to be sold in the International Offer only, representing 3.5 per cent. of the expected issued Ordinary Share capital of the Company immediately following Admission, based on an Offer Price at the mid-point of the Offer Price Range and assuming the Over-Allotment Option is not exercised and no Kazzinc Consideration Shares have been issued.

Pursuant to the Global Offer, the Company intends to raise net proceeds of approximately U.S.$7,456 million, net of underwriting commissions, other estimated fees and expenses and Swiss federal issuance stamp tax payable in connection with Restructuring and the Global Offer, by the issue of 893,292,886 new Ordinary Shares (assuming that the Offer Price is at the mid-point of the Offer Price Range and the Over-Allotment Option is not exercised).

Prior to UK Admission, the Sale Shares will be sold to the Selling Shareholder in order to facilitate the sale of the Sale Shares in the Global Offer. The net proceeds of sale of the Sale Shares in the Global Offer will be received by the Selling Shareholder and paid to Existing Shareholders to enable those Existing Shareholders to meet their tax liabilities and to repay a small tranche of outstanding loans extended by companies within the Glencore Group.

In certain jurisdictions, the Group has a primary obligation to settle tax liabilities on behalf of Existing Shareholders in connection with the Global Offer. The Company will recover amounts paid or to be paid by companies within the Glencore Group under these obligations, as well as amounts owed to companies within the Glencore Group under the small tranche of loans as referred to above, from the proceeds of sale of the Sale Shares.

An aggregate amount of approximately U.S.$2,072 million, net of underwriting commissions, will be raised in the Global Offer by the sale of the Sale Shares by the Selling Shareholder in the International Offer (assuming that the Offer Price is at the mid-point of the Offer Price Range). Save as set out above, the Company will not receive any portion of net proceeds from the sale of the Sale Shares by the Selling Shareholder.

The Selling Shareholder has been incorporated for the purpose of aggregating the Sale Shares and selling them in the International Offer. The Selling Shareholder is expected to have fulfilled its obligations in respect of the Sale Shares and their sale in the International Offer at or immediately after UK Admission.

The Global Offer will be fully underwritten by the Underwriters in accordance with the terms of the Underwriting Agreement, including the satisfaction of the conditions set out therein (including UK Admission becoming effective by no later than 8.00 a.m. on 24 May 2011 or such later time and/or date as the Company and the Joint Global Co-ordinators may agree, the Restructuring having been completed in accordance with all material terms, and the Company, the Selling Shareholder and the Underwriters agreeing to enter into a Pricing Agreement) and in accordance with their respective commitments as set out in the Underwriting Agreement. The International Managers may arrange sub-underwriting for some, all or none of the Offer Shares. See paragraph 4 of this Section VIII below.

Certain restrictions that apply to the distribution of this Prospectus and the Ordinary Shares being issued and sold under the Global Offer in jurisdictions outside the United Kingdom are described in paragraph 12 of this Section VIII below.

The terms of the Global Offer are subject to change, and any terms to be varied shall be agreed between the Company (through its Board), the Selling Shareholder and the Joint Global Co-ordinators (on behalf of the Banks).

In particular, in the event that the Company, the Selling Shareholder and the Joint Global Co-ordinators (on behalf of the Banks) decide following the date of this Prospectus not to proceed with the Hong Kong Offer, the parties reserve the right to proceed with the International Offer only and the Hong Kong Offer Shares may be made available in the International Offer on the basis of the information contained in this Prospectus as described below.

The Company, in consultation with the Joint Global Co-ordinators, reserves the right at any stage from the date of this Prospectus up until mid-day (Hong Kong time) on the business day before the publication of the Hong Kong Prospectus, not to proceed with HK Admission and/or the Hong Kong Offer. Should the Company decide not to proceed with HK Admission and/or the Hong Kong Offer, no supplemental prospectus will be issued by the Company and the Global Offer will proceed on the basis of the International Offer and UK Admission only. In addition, the Company and the Joint Global Co-ordinators will consider the ability to upsize the International Offer with some or all of the Ordinary Shares which the Company was reserving for the Hong Kong Offer. If applicable, the Company will communicate this proposed upsizing of the International Offer to each applicant who has applied for Ordinary Shares in the International Offer. Such applicants will be able to apply for such additional Ordinary Shares up until the Price Determination Date. The Company would then announce the final size of the International Offer in the Pricing Statement which is expected to be published on or around 19 May 2011.

In this situation, all references in this document to HK Admission, the Hong Kong Offer and/or Hong Kong Offer Shares, Hong Kong Offer Price and HK Sponsors (and the times and dates relating thereto) should be disregarded.

1.1 The International Offer

1.1.1 Allocation

The Underwriters will solicit from prospective investors indications of interest in acquiring Ordinary Shares under the International Offer. Prospective investors will be required to specify the number of International Offer Shares which they would be prepared to acquire either at specified prices or at the Offer Price (as finally determined). Subject to the Joint Global Co-ordinators and the Company determining allocations, there is no minimum or maximum number of International Offer Shares which can be applied for. The Company and the Joint Global Co-ordinators shall together discuss and agree the final book of demand for, and allocations of, the International Offer Shares.

1.1.2 Reallocation of Offer Shares between the International Offer and the Hong Kong Offer

The total number of International Offer Shares to be made available pursuant to the International Offer may change as a result of the clawback arrangement and/or any reallocation of unsubscribed Hong Kong Offer Shares as described in paragraph 1.2.2 below. As set out in paragraph 1.2.2 below, the Company has received approval from the

HKSE for a claw back mechanism for the Hong Kong Offer that limits the number of Ordinary Shares that can be allocated to investors in the Hong Kong Offer to 10 per cent. of the maximum number of Ordinary Shares to be issued and sold in the Global Offer.

1.2 **The Hong Kong Offer**

The Hong Kong Offer forms part of the Global Offer, and comprises an aggregate of 31,250,000 Hong Kong Offer Shares (subject to adjustment as described below) being made available to the public and professional investors in Hong Kong at the Hong Kong Offer Price, representing approximately 2.5 per cent. of the maximum number of Offer Shares initially available under the Global Offer (assuming the Over-Allotment Option is not exercised). Subject to the reallocation of Offer Shares between the International Offer and the Hong Kong Offer as described below, the Hong Kong Offer Shares are expected to represent (i) approximately 0.45 per cent. of the Company's enlarged issued share capital immediately after completion of the Global Offer, without taking into account the exercise of the Over-Allotment Option, or (ii) if the Over-Allotment Option is exercised in full, approximately 0.45 per cent. of the enlarged issued share capital immediately after the completion of the Global Offer and the exercise of the Over-Allotment Option, in each case based on an Offer Price at the mid-point of the Offer Price Range.

The Hong Kong Offer is open to members of the public in Hong Kong and professional investors. Professional investors generally include brokers, dealers, companies (including fund managers), whose ordinary business involves dealing in shares and other securities, and corporate entities that regularly invest in shares and other securities.

1.2.1 **Allocation**

Allocation of Hong Kong Offer Shares to investors under the Hong Kong Offer will be based solely on the level of valid applications received under the Hong Kong Offer.

The basis of allocation may vary, depending on the number of Hong Kong Offer Shares validly applied for by applicants. Such allocation could, where appropriate, consist of balloting, which could mean that some applicants may receive a higher allocation than others who have applied for the same number of Hong Kong Offer Shares, and those applicants who are not successful in the ballot may not receive any Hong Kong Offer Shares.

1.2.2 **Reallocation of Offer Shares between the Hong Kong Offer and the International Offer**

The allocation of the Hong Kong Offer Shares between the Hong Kong Offer and the International Offer is subject to adjustment under the Hong Kong Listing Rules. The Company has applied for, and the Hong Kong Stock Exchange has granted, a waiver from strict compliance with the clawback requirements set out in paragraph 4.2 of Practice Note 18 to the Hong Kong Listing Rules on the following basis. If the number of Offer Shares validly applied for under the Hong Kong Offer represents (i) 15 times or more but less than 50 times, (ii) 50 times or more but less than 100 times, and (iii) 100 times or more of the number of Offer Shares initially available under the Hong Kong Offer, then Offer Shares will be reallocated to the Hong Kong Offer from the International Offer. As a result of such reallocation, the total number of Offer Shares available under the Hong Kong Offer will be increased to 46,875,000 Offer Shares (in the case of (i)), 62,500,000 Offer Shares (in the case of (ii)) and 125,000,000 Offer Shares (in the case of (iii)), representing approximately 3.75 per cent., 5 per cent. and 10 per cent. of the maximum number of Offer Shares initially available under the Global Offer assuming the Over-Allotment Option is not exercised). In addition to the foregoing, the Joint Global Co-ordinators and the Company may together discuss and agree that International Offer Shares be reallocated to the Hong Kong Offer to satisfy valid applications thereunder.

In addition, if the Hong Kong Offer is not fully subscribed for, the Joint Global Co-ordinators and the Company may together discuss and agree that the unsubscribed Hong Kong Offer Shares be reallocated to the International Offer, in such proportions as they deem appropriate.

As mentioned above, should the Company decide not to proceed with HK Admission and/or the Hong Kong Offer it may, in consultation with the Joint Global Co-ordinators, upsize the International Offer with some or all of the Ordinary Shares which it is reserving for the Hong Kong Offer.

In this situation, all references in this document to HK Admission, the Hong Kong Offer and/or Hong Kong Offer Shares, Hong Kong Offer Price and HK Sponsors (and the times and dates relating thereto) should be disregarded and the Hong Kong Offer Shares will be made available in the International Offer on the basis of the information contained in this Prospectus.

2 Stabilisation and over-allotment

In connection with the Global Offer, MSSL, as Stabilising Manager, or any of its affiliates, delegates or agents, may (but will be under no obligation to), to the extent permitted by applicable law, over-allot Ordinary Shares or effect other stabilisation transactions with a view to supporting the market price of the Ordinary Shares at a higher level than that which might otherwise prevail in the open market. The Stabilising Manager is not required to enter into such transactions and such stabilisation transactions may be effected on any securities market, over-the-counter market, stock exchange or otherwise and may be undertaken at any time during the period commencing on the date of the commencement of conditional dealings in the Ordinary Shares on the London Stock Exchange and ending no later than 30 calendar days thereafter (or in respect of any stabilisation action undertaken in Hong Kong, ending at such time in accordance with applicable laws and regulatory requirements). However, there will be no obligation on the Stabilising Manager or any of its affiliates, delegates or agents to effect such transactions and there is no assurance that such transactions will be undertaken. Such stabilisation, if commenced, may be discontinued at any time without prior notice. In no event will measures be taken to stabilise the market price of the Ordinary Shares above the Offer Price. The details of any intended stabilisation to be undertaken in Hong Kong and how it will be regulated under the Securities and Futures Ordinance (Cap. 571 of the Laws of Hong Kong) will be contained in a prospectus expected to be published in relation to the Hong Kong Offer. Except as required by law or regulation, neither the Stabilising Manager nor any of its affiliates, delegates or agents intends to disclose the extent of any over-allotments made and/or stabilisation transactions conducted in relation to the Global Offer.

In connection with the Global Offer, the Stabilising Manager may, for stabilisation purposes, over-allot the Ordinary Shares up to a maximum of ten per cent. of the Offer Shares at the Offer Price. For the purposes of allowing the Stabilising Manager to cover short positions resulting from any such over-allotments and/or from sales of Ordinary Shares effected by it during the stabilising period, the Company has granted to it the Over-Allotment Option. Any Over-Allotment Shares made available pursuant to the Over-Allotment Option will rank *pari passu* in all respects with the Ordinary Shares, including for all dividends, and other distributions declared, made or paid on the Ordinary Shares will be subscribed for on the same terms and conditions as the Ordinary Shares being issued or sold in the Global Offer and will form a single class for all purposes with the other Ordinary Shares.

3 Pricing

Pricing for the Offer Shares will be fixed on the Price Determination Date, which is expected to be on or around 18 May 2011 by agreement between the Joint Global Co-ordinators (on behalf of the Underwriters) and the Company, and the number of Offer Shares to be allocated under the International Offer and the Hong Kong Offer will be determined shortly thereafter at the discretion of the Joint Global Co-ordinators, following consultation with the Company. A Pricing Statement, which will contain the Offer Price, is expected to be published by the Company on or around 19 May 2011.

It is currently expected that the Offer Price will be within the Offer Price Range, but this range is indicative only and the Offer Price may be set within, above or below it. A number of factors will be considered in deciding the Offer Price including the level and the nature of the demand for Ordinary Shares and the objective of encouraging the development of an orderly and liquid after-market in the Ordinary Shares. The Offer Price will be established at a level determined in accordance with these arrangements, taking into account indications of interest received (whether before or after the times and/or dates stated) from persons (including market-makers and fund managers) connected with the Banks. If the Offer Price Range changes prior to the announcement of the final Offer Price, the revised Offer Price Range will be announced and advertised as soon as possible and the Company will publish a supplementary prospectus and each applicant may exercise their withdrawal rights as set out in "Withdrawal Rights" below.

The Company will determine the aggregate number of Offer Shares, the number of New Offer Shares and the number of Sale Shares in light of the determination of the Offer Price on the Price Determination Date. In the Global Offer, the Company and the Selling Shareholder together intend to raise aggregate gross proceeds equivalent to approximately U.S.$10 billion at exchange rates prevailing at the Price Determination Date. The number of Sale Shares will be determined by the Company and the Selling Shareholder by reference to the Offer Price, exchange rates prevailing at the Price Determination Date, and the aggregate amount of the expected tax liabilities and loan repayments of Existing Shareholders. The number of New Offer Shares will be determined so as to provide the balance of the intended aggregate gross proceeds of the Global Offer. The Company and the Selling Shareholder also reserve the right to increase or decrease the intended aggregate gross proceeds amount, subject to no more than 1,250,000,000 Ordinary Shares being issued and/or sold in the Global Offer. The aggregate number of Offer Shares, the number of Sale Shares and the number of New Offer Shares will each be set out in the Pricing Statement.

4 Underwriting Agreement

On 4 May 2011, the Company, Glencore International, the Directors, the Selling Shareholder and the Banks entered into an underwriting agreement (the "Underwriting Agreement") relating to the Global Offer. Pursuant to the Underwriting Agreement, subject to, inter alia, execution of the Pricing Agreement by 18 May 2011 (or such later time and date as the Company, the Selling Shareholder and the Joint Global Co-ordinators (on behalf of the Banks) may agree being no later than 15 July 2011) and UK Admission becoming effective no later than 8.00 a.m. on 24 May 2011 (or such later time and date as the Company, the Selling Shareholder and the Joint Global Co-ordinators (on behalf of the Banks) may agree being no later than 31 July 2011) and the satisfaction of certain other conditions, including completion of the Restructuring in all material respects:

4.1 the International Managers have severally agreed to procure subscribers or purchasers for, failing which to subscribe or purchase the International Offer Shares from the Company and the Selling Shareholder at the Offer Price and in such proportions set out in the Underwriting Agreement; and

4.2 the HK Managers have severally agreed to procure subscribers, failing which to subscribe themselves, for all of the Hong Kong Offer Shares at the Offer Price and in such proportions as set out in the Underwriting Agreement;

The Underwriting Agreement also provides for the following (in each case, together with any applicable VAT thereon) to be payable by: (i) the Company to the Underwriters, comprising a commission, in aggregate, of 1.75 per cent. of an amount equal to the product of the Offer Price and the aggregate number of New Offer Shares issued pursuant to the Global Offer and any Over-Allotment Shares issued and delivered following exercise of the Over-Allotment Option; and (ii) the Selling Shareholder to the Underwriters, comprising a commission, in aggregate, of 1.75 per cent. of an amount equal to the product of the Offer Price and the aggregate number of Sale Shares sold pursuant to the International Offer. The Company may also in its absolute discretion pay to the Underwriters (in such proportions as the Company may, in its sole discretion, direct) a further commission of up to U.S.$82.5 million. Any commissions received by the Underwriters may be retained, and any Ordinary Shares acquired by any Underwriter may be retained or dealt in by it, for its own benefit. In addition to these commissions, the Company has agreed to pay, or cause to be paid (together with, in each case, any related VAT) (whether or not the Banks' obligations under the Underwriting Agreement become unconditional or are terminated) certain reasonably incurred costs, charges, fees and expenses in connection with or incidental to the Global Offer, Admission and arrangements contemplated by the Underwriting Agreement including certain taxes payable by the Company pursuant to the Underwriting Agreement.

UK Admission is expected to take place and unconditional dealing in the Ordinary Shares are expected to commence on the London Stock Exchange at 8.00 a.m. on 24 May 2011. HK Admission is expected to become effective and unconditional dealings in the Ordinary Shares are expected to commence on the Main Board of the Hong Kong Stock Exchange at 9.00 a.m. on 25 May 2011. Due to the time difference between Hong Kong and the UK, it is not possible for HK Admission and UK Admission to occur simultaneously.

However, so as to ensure equality between subscribers and purchasers in the International Offer and the Hong Kong Offer, the Banks will have no termination rights in respect of the Underwriting Agreement in the period between UK Admission and HK Admission.

The Hong Kong Managers have also agreed, on behalf of the Company, to arrange for payment of the brokerage, the SFC transaction levy and the Hong Kong Stock Exchange trading fee payable in respect of the Hong Kong Offer, such amounts to be paid out of the application monies received in respect of the Hong Kong Offer to the relevant payees by a nominee on behalf of all successful applicants under the Hong Kong Offer.

Further details of the terms of the Underwriting Agreement are set out in paragraph 16 of Section X: "Additional Information".

5 Dealings and Admission

Application has been made to the FSA for the Ordinary Shares to be admitted to the premium listing segment of the Official List and to the London Stock Exchange and for such Ordinary Shares to be admitted to trading on the London Stock Exchange's main market for listed securities. Application has been made to the Listing Committee of the Hong Kong Stock Exchange for listing of, and permission to deal in, all of the Ordinary Shares on the Main Board of the Hong Kong Stock Exchange.

Prior to UK Admission, it is expected that dealings in the Ordinary Shares will commence on a conditional basis on the London Stock Exchange at 8.00 a.m. on 19 May 2011. All dealings between the commencement of conditional dealings and the commencement of unconditional dealings will be on a "when issued" basis and at the risk of the parties concerned. If the Global Offer does not become unconditional, these dealings will be of no effect.

When admitted to trading on the London Stock Exchange, the Ordinary Shares will be registered with ISIN number JE00B4T3BW64 and SEDOL number B4T3BW6. The Ordinary Shares will be traded on the Hong Kong Stock Exchange in board lots of 100 Ordinary Shares each and with the stock code of 00805.

UK Admission is expected to take place and unconditional dealings in the Ordinary Shares are expected to commence on the London Stock Exchange at 8.00 a.m. on 24 May 2011. HK Admission is expected to become effective and unconditional dealings in the Ordinary Shares are expected to commence on the Main Board of the Hong Kong Stock Exchange at 9.00 a.m. on 25 May 2011.

It is expected that Ordinary Shares allocated to investors in the Global Offer will be delivered in certificated or uncertificated form and, for those delivered in uncertificated form, settlement will take place through CREST or CCASS on Admission. All Ordinary Shares issued or sold pursuant to the Global Offer will be issued or sold payable in full at the Offer Price. It is intended that, if applicable, definitive share certificates in respect of the International Offer will be distributed in the week commencing 6 June 2011 (or as soon thereafter as is practicable) and share certificates in respect of the Hong Kong Offer will be despatched on 24 May 2011. No temporary documents of title will be issued.

The International Offer Shares to be made available pursuant to the International Offer will, following UK Admission, rank *pari passu* in all respects with the other Ordinary Shares and will carry the right to receive all dividends and other distributions declared, made or paid on or in respect of the Ordinary Shares after UK Admission. The International Offer Shares will, immediately following UK Admission, be freely transferable under the Articles.

The Hong Kong Offer Shares to be made available pursuant to the Hong Kong Offer will, following HK Admission, rank *pari passu* in all respects with the other Ordinary Shares and will carry the right to receive all dividends and other distributions declared, made or paid on or in respect of the Ordinary Shares after HK Admission. The Hong Kong Offer Shares will, immediately following HK Admission, be freely transferable under the Articles.

Immediately following Admission, it is expected that a minimum of 25 per cent. of the Company's issued Ordinary Share capital will be held in public hands (within the meaning of paragraph 6.1.19R of the Listing Rules).

6 CREST and CCASS

CREST is a paperless settlement system in the UK enabling securities to be evidenced otherwise than by a certificate and to be transferred otherwise than by a written instrument. The Ordinary Shares are in registered form. With effect from UK Admission, the Articles will permit the holding of Ordinary Shares under the CREST system. The Company has applied for the Ordinary Shares to be admitted to CREST with effect from UK Admission. Accordingly, settlement of transactions in the Ordinary Shares following UK Admission may take place within the CREST system, if any Shareholder so wishes.

CREST is a voluntary system and holders of Ordinary Shares who wish to receive and retain share certificates will be able to do so. An investor applying for Ordinary Shares in the Global Offer may, however, elect to receive Ordinary Shares in uncertificated form if that investor is a system-member (as defined in the Uncertificated Securities Regulations) in relation to CREST.

CCASS is a securities settlement system in Hong Kong where securities are issued in paper form and deposited with a central depository which is electronically linked with a settlement system. Subject to the granting of the listing of, and permission to deal in, the Ordinary Shares on the Hong Kong Stock Exchange and compliance with the stock admission requirements of HKSCC, the Ordinary Shares will be accepted as eligible securities by HKSCC for deposit, clearance and settlement in CCASS with effect from the date of commencement of dealings in the Ordinary Shares on the Hong Kong Stock Exchange or on any other date HKSCC chooses.

Settlement of transactions between participants of the Hong Kong Stock Exchange is required to take place in CCASS on the second business day after any trading day. All activities under CCASS are subject to the General Rules of CCASS and CCASS Operational Procedures in effect from time to time. Investors should seek the advice of their stockbroker or other professional adviser for details of the settlement arrangements as such arrangements may affect their rights and interests. All necessary arrangements have been made enabling the Ordinary Shares to be admitted into CCASS.

7 Transfer of shares between principal share register and branch share register in Hong Kong

Any shareholder whose Ordinary Shares are registered on the principal register may at any time obtain a removal request form from the principal share register for a transfer of Ordinary Shares to the branch share register in Hong Kong. A removal request form when completed should be returned together with the corresponding share certificates and administration fee to the principal registrar, who will arrange for the transfer of such Ordinary Shares to the branch share register in Hong Kong provided that the shareholder concerned provides a registered address in Hong Kong.

Similarly, any shareholder whose Ordinary Shares are registered on the branch share register in Hong Kong can at any time obtain a removal request form from the Hong Kong share registrar for a transfer of Ordinary Shares to the principal share register. On the return of such form, duly completed, together with the corresponding share certificates and administration fee to the Hong Kong share registrar it will arrange for the transfer of such Ordinary Shares to the principal share register.

8 Lock-up arrangements

The Company has entered into a lock-up arrangement in favour of the Joint Global Co-ordinators for a period of six months from the date of UK Admission. In addition, each Existing Shareholder has entered into a lock-up arrangement in favour of the Joint Global Co-ordinators and the Company for various periods from the date of Admission. These lock-up arrangements apply in the case of the Executive Directors until five years after Admission (with a staggered release after the first year of that period) and in the case of the other Existing Shareholders for a period of time of between one year and four years from Admission (with a staggered release after the first year of that period, if applicable). Furthermore, each Cornerstone Investor has entered into a lock-up arrangement in favour of the Joint Global Co-ordinators and the Company for a period of six months from the date of UK Admission. The lock-up arrangements are subject to certain exceptions.

Further details of the terms of these arrangements are set out in paragraph 17 of Section X: "Additional Information".

9 Withdrawal rights

In the event that the Company is required to publish any supplementary prospectus, applicants who have applied for Ordinary Shares in the International Offer shall have at least two clear business days following the publication of the relevant supplementary prospectus within which to withdraw their offer to subscribe for Ordinary Shares in the International Offer in its entirety. The right to withdraw an application to subscribe for Ordinary Shares in the International Offer in these circumstances will be available to all investors in the International Offer. If the application is not withdrawn within the stipulated period, any offer to apply for Ordinary Shares in the International Offer will remain valid and binding.

Investors wishing to exercise statutory withdrawal rights after the publication of any supplementary prospectus must do so by lodging a written notice of withdrawal by hand (during normal business hours only) at Computershare Investor Services (Jersey) Limited, Queensway House, Hilgrove Street, St. Helier, Jersey JE1 1ES, or by facsimile (during normal business hours only) on +44(0)870 873 5851 so as to be received no later than two business days after the date on which the supplementary prospectus is published. Notice of withdrawal given by any other means or which is deposited with or received by the Company after expiry of such period will not constitute a valid withdrawal.

10 Cornerstone investors

On 4 May 2011, in connection with the International Offer, the Company entered into subscription agreements with certain Cornerstone investors (including, in the case of the cornerstone investors that are private banks, the ultimate beneficial owners of the International Offer Shares subscribed for under the relevant Cornerstone Investment Agreements) (the "Cornerstone Investors") who have agreed to subscribe for International Offer Shares at the Offer Price (the "Cornerstone Investment Agreements"). The terms of the arrangements between each of the Cornerstone Investors and the Company are summarised in paragraph 10.2 below.

Certain of the Banks have made, or may enter into, arrangements with one or more Cornerstone Investors and certain other investors to provide financing in connection with the subscription by such investors for the International Offer Shares as described above.

Based on an Offer Price at the mid-point of the Offer Price Range, the total number of International Offer Shares subscribed for by the Cornerstone Investors would be approximately 350,943,389 International Offer Shares, which represent approximately (i) 31.9 per cent. of the International Offer Shares, and (ii) 5.1 per cent. of the Ordinary Shares in issue following the Global Offer, in each case, assuming that the Over-Allotment Option is not exercised and that the Kazzinc Consideration Shares are not issued.

The International Offer Shares to be subscribed for by the Cornerstone Investors pursuant to the Cornerstone Investment Agreements will rank *pari passu* in all respects with the other Ordinary Shares, and the International Offer Shares to be subscribed for by the Cornerstone Investors will be held in public hands (within the meaning of paragraph 6.1.19R of the Listing Rules).

The Cornerstone Investors are independent third parties and none of them is an existing shareholder or a connected person of the Company (as defined in the Hong Kong Listing Rules), save to the extent that any such Cornerstone Investors hold Convertible Bonds. The International Offer Shares to be acquired by the Cornerstone Investors will not be affected by any reallocation of the Offer Shares between the International Offer and the Hong Kong Offer or by any exercise of the Over Allotment Option.

10.1 **Cornerstone Investors**

A brief description of each of the Cornerstone Investors is as follows. The information set out below in respect of each of the Cornerstone Investors has been provided by each relevant Cornerstone Investor.

Aabar

Aabar Investments PJS ("Aabar") is an investment company headquartered in Abu Dhabi, United Arab Emirates with investments around the world. It invests in various sectors, including financial services, automotive, real estate, energy, manufacturing and technology and aerospace, with many of its investments being made by way of international partnerships and alliances. Its largest stakeholder is the International Petroleum Investment Company, which is wholly owned by the Government of the Emirate of Abu Dhabi.

Aabar has agreed to acquire, directly or indirectly, such number of Offer Shares which may be acquired with the sterling equivalent of U.S.$850 million at the Offer Price. Following UK Admission, such Offer Shares will be held, directly or indirectly, by Aabar on the Company's principal share register. Although no formal arrangements have been entered into between Glencore and Aabar, the two organisations intend to explore areas of co-operation between themselves in the future.

BlackRock

BlackRock Advisors (UK) Limited and BlackRock Investment Management (UK) Limited are companies incorporated in England (the "BlackRock Entities"). The BlackRock Entities are indirect wholly owned subsidiaries of BlackRock, Inc ("BlackRock"), which is a Delaware corporation listed on the New York Stock Exchange (NYSE:BLK). BlackRock is one of the world's preeminent asset management firms and a provider of global investment management, risk management and advisory services to institutional, intermediary and individual investors around the world.

The BlackRock Entities have agreed to acquire such number of Offer Shares which may be acquired with the sterling equivalent of U.S.$360 million[(1)] at the Offer Price. Following UK Admission, such Offer Shares will be held by the BlackRock Entities on the Company's principal share register.

Brookside Capital

Brookside Capital Trading Fund, L.P. (the "Brookside Fund") is a limited partnership formed under the laws of Delaware, United States of America, which, as of 31 March 2011, had approximately U.S.$11 billion in assets. The investment advisor to the Brookside Fund is Brookside Capital, LLC ("Brookside Capital"), the public equity affiliate of Bain Capital, LLC. Brookside Capital's investment process involves in-depth strategic and financial analysis, with an emphasis on the analysis of industry dynamics, competitive position and management capability and identification of operational improvements to determine the "intrinsic value" of potential investments.

The Brookside Fund has agreed to acquire such number of Offer Shares which may be acquired with the sterling equivalent of U.S.$225 million at the Offer Price. Following UK Admission, such Offer Shares will be held by the Brookside Fund on the Company's principal share register.

Credit Suisse AG

Credit Suisse AG is domiciled in Switzerland and is a wholly owned subsidiary of Credit Suisse Group AG which is listed on the SIX Swiss Exchange (ISIN: CH0012138530). Credit Suisse AG's business consists of the three divisions Private Banking, Investment Banking and Asset Management. Credit Suisse AG's Private Banking division offers comprehensive advice and a broad range of wealth management solutions, which are tailored to the needs of high-net-worth and ultra-high-net-worth individuals worldwide. In Switzerland, it supplies banking products and services to individual clients, including affluent, high-net-worth and ultra-high-net-worth clients, and corporates and institutions.

(1) BlackRock Advisors (UK) Limited has agreed to acquire such number of Offer Shares which may be acquired with £95 million, which has been converted into U.S.$158 million based on the pounds sterling/U.S.$ exchange rate of £1.00 = U.S.$1.667 quoted by Bloomberg on 29 April 2011.

Credit Suisse AG has agreed to acquire, as agent, and on behalf of eight underlying clients, such number of Offer Shares which may be acquired with the pounds sterling equivalent of U.S.$175 million at the Offer Price. No single underlying client of Credit Suisse AG has agreed to subscribe for more than U.S.$60 million. All the subscription monies are provided by the underlying clients of Credit Suisse AG. The underlying clients are neither directors, nor hold or control more than 10 per cent. of the issued share capital, of Credit Suisse AG or any of it associates. Following UK Admission, such Offer Shares will be held by the underlying clients on the Company's principal share register.

Eton Park

Eton Park Master Fund, Ltd. and EP Cayman, Ltd. are exempted companies incorporated in the Cayman Islands (the "Eton Park Funds"). The investment manager of the Eton Park Funds is Eton Park Capital Management, L.P. ("Eton Park"). Eton Park is a global, multi-disciplinary investment management firm with offices in New York, London and Hong Kong. As at 31 March 2011, Eton Park had in excess of U.S.$14 billion of assets under management.

The Eton Park Funds have agreed to acquire such number of Offer Shares which may be acquired with the sterling equivalent of U.S.$200 million at the Offer Price. Following UK Admission, such Offer Shares will be held by or on behalf of the Eton Park Funds on the Company's principal share register.

Fidelity

FIL Investment Services (UK) Limited, FIL Investments International and FIL Pensions Management (the "Fidelity Entities") are all ultimately owned and controlled by Fidelity. Fidelity is one of the UK's largest investment fund managers with over 660,000 customers in the UK. Fidelity looks after assets worth U.S.$255.5 billion (as at 31 March 2011).

The Fidelity Entities have agreed to acquire such number of Offer Shares which may be acquired with the sterling equivalent of U.S.$215 million at the Offer Price. Following UK Admission, such Offer Shares will be held by the Fidelity Entities on the Company's principal share register.

GIC

The Government of Singapore Investment Corporation Pte Ltd ("GIC") is a global investment management company established in 1981 to manage Singapore's foreign reserves. GIC invests internationally in equities, fixed income, foreign exchange, commodities, money markets, alternative investments, real estate and private equity. With its current portfolio size of more than U.S.$100 billion, GIC is amongst the world's largest fund management companies.

GIC has agreed to acquire such number of Offer Shares which may be acquired with the sterling equivalent of U.S.$400 million at the Offer Price. Following UK Admission, such Offer Shares will be held by GIC on the Company's principal share register.

Och-Ziff

Certain affiliated investment funds of Och-Ziff Capital Management Group (the "Och-Ziff Funds") have agreed to acquire such number of Offer Shares which may be acquired with the sterling equivalent of U.S.$175 million at the Offer Price. Following UK Admission, such Offer Shares will be held by the Och-Ziff Funds on the Company's principal share register.

Pictet

Founded in 1805 in Geneva, Pictet & Cie ("Pictet") is today among Switzerland's largest private banks, and one of the leading independent asset management specialists in Europe, with CHF 372 billion in assets under management and custody as at 31 December 2010. Pictet is a partnership, owned and managed by eight general partners with unlimited liability for the bank's commitments. Specialising in asset and wealth management Pictet also offers, as stand-alone products, global custody and fund administration.

Pictet has agreed to acquire, as agent, and on behalf of 50 underlying clients, such number of Offer Shares which may be acquired with the pounds sterling equivalent of U.S.$100 million at the Offer Price. No single underlying client of Pictet has agreed to subscribe for more than U.S.$25 million. All the subscription monies are provided by the underlying clients of Pictet. The underlying clients are neither directors, nor hold or control more than 10 per cent. of the partnership, of Pictet or any of it associates. Following UK Admission, such Offer Shares will be held by the underlying clients on the Company's principal share register.

UBS AG

UBS AG is a bank incorporated and domiciled in Switzerland and is listed on the SIX Swiss Exchange and the New York Stock Exchange (Valor symbol: UBSN; ISIN: CH0024899483). It operates under the Swiss Code of Obligations and Swiss Federal Banking Law as an Aktiengesellschaft, a corporation that has issued shares of common stock. UBS AG has its two headquarters in Zurich and Basel, Switzerland. Its scope of operations extends to all types of banking, financial, advisory, trading and service activities in Switzerland and abroad.

UBS AG has agreed to acquire, as agent, and on behalf of four underlying clients, such number of Offer Shares which may be acquired with the pounds sterling equivalent of U.S.$100 million at the Offer Price. No single underlying client of UBS AG has agreed to subscribe for more than U.S.$25 million. All the subscription monies are provided by the underlying clients of UBS AG. The underlying clients are neither directors, nor hold or control more than 10 per cent. of the issued share capital, of UBS AG or any of it associates. Following UK Admission, such Offer Shares will be held by the underlying clients on the Company's principal share register.

York Capital

York Capital Management was founded in 1991 and has offices located in New York, London and Hong Kong. York Capital Management manages over U.S.$16 billion dollars worth of assets on behalf of institutions, endowments, foundations, fund of funds, wealthy individuals and their families. York Capital Management's investment strategy is to provide consistent, superior risk-adjusted investment returns relatively independent of the overall market, and it pursues this strategy through a combination of focused research, investment selection, and disciplined risk management.

Investment funds and accounts managed by York Capital Management Global Advisors, LLC (the "York Capital Funds"), have agreed to acquire such number of Offer Shares which may be acquired with the sterling equivalent of U.S.$200 million at the Offer Price. Following UK Admission, such Offer Shares will be held by the York Capital Funds on the Company's principal share register.

Zijin

Zijin Mining Group Co. Ltd ("Zijin") is registered in China, with its head office in Shanghang County, Fujian province. Zijin's gold production is ranked No. 1 in China and it also mines other metals including copper, lead, zinc, tungsten, tin, silver and iron. Zijin's offshore operations are still at an early stage but it has a strong potential for growth in the years to come. Zijin is dual listed on the Hong Kong Stock Exchange and the Shanghai Stock Exchange, with a market capitalisation of over U.S.$17 billion.

Zijin has agreed to acquire such number of Offer Shares which may be acquired with the sterling equivalent of U.S.$100 million at the Offer Price. Following UK Admission, such Offer Shares will be held by Zijin on the Company's principal share register.

10.2 **Cornerstone Investment Agreements**

The subscription obligation of each Cornerstone Investor is conditional upon, amongst others, the Underwriting Agreement being entered into and having become unconditional in respect of the International Offer by no later than UK Admission (or such later time and date as the Company and Joint Global Co-ordinators may agree and notify to the Cornerstone Investor, being no later than 31 July 2011) and not having been terminated on or prior to UK Admission and the Offer Price being within the Offer Price Range.

Each of the Cornerstone Investors has agreed that (subject to certain customary exceptions more particularly described in paragraph 17.7 of Section X: "Additional Information"), without the prior written consent of the Company and the Joint Global Co-ordinators (which are parties to the Cornerstone Investment Agreements), it will not, at any time during the period ending six months following UK Admission, directly or indirectly, dispose of any Offer Shares subscribed for by it pursuant to the Cornerstone Investment Agreement to which it is party.

Please refer to Section X: "Additional Information" for further information on the Cornerstone Investment Agreements.

11 Impact of the convertible bond

Following Admission, Convertible Bond investors will be eligible to convert their bonds into Ordinary Shares which will in total represent 5.5 per cent. of the total issued share capital of the Company following Admission and following conversion (assuming the Offer Price is set at the mid-point of the Offer Price Range, the Over-Allotment Option was not exercised and no Kazzinc Consideration Shares have been issued).

Please refer to Section X: "Additional Information" for further information on the Convertible Bonds.

12 Selling and transfer restrictions

The distribution of this Prospectus and the offer of Ordinary Shares in certain jurisdictions may be restricted by law and persons into whose possession this Prospectus comes should therefore inform themselves about and observe any such restrictions, including those in the paragraphs that follow. Any failure to comply with these restrictions may constitute a violation of the securities laws of any such jurisdiction.

No action has been taken or will be taken in any jurisdiction that would permit a public offering or sale of the Ordinary Shares, or possession or distribution of this Prospectus (or any other offering or publicity material relating to Ordinary Shares other than a separate prospectus to be issued by the Company in Hong Kong in connection with the Hong Kong Offer) in any country or jurisdiction where action for that purpose is required or doing so may be restricted by law.

None of the Ordinary Shares may be offered for subscription, sale or purchase or be delivered, and this Prospectus and any other offering material in relation to the Ordinary Shares may not be circulated, in any jurisdiction where to do so would breach any securities laws or regulations of any such jurisdiction or give rise to an obligation to obtain any consent, approval or permission or to make any application, filing or registration.

Persons into whose possession this Prospectus comes should inform themselves about and observe any restrictions on the distribution of this Prospectus and any offering of the Ordinary Shares. Any failure to comply with these restrictions may constitute a violation of the securities laws of any such jurisdiction. This Prospectus does not constitute an offer to subscribe for or purchase any of the Ordinary Shares to any person in any jurisdiction to whom it is unlawful to make such offer of solicitation in such jurisdiction.

No Ordinary Shares have been marketed to, nor are available for purchase in whole or in part by, the public in the United Kingdom or elsewhere in conjunction with the Global Offer. This Prospectus does not constitute a public offer or the solicitation of a public offer in the United Kingdom to subscribe for or buy any securities in the Company or any other entity.

12.1 **Offering restrictions relating to the U.S. and U.S. Persons**

As described more fully below, there are certain selling and transfer restrictions regarding the Ordinary Shares with respect to U.S. shareholders.

These restrictions include, among others, (i) prohibitions on participation in the Global Offer by persons in circumstances which might cause the Company to be required to be registered as an investment company under the Investment Company Act, and (ii) restrictions on the ownership and transfer of Ordinary Shares by such persons following the Global Offer.

The Ordinary Shares have not been and will not be registered under the Securities Act or the securities laws of any state of the U.S. and, therefore, the Ordinary Shares may not be directly or indirectly offered for subscription or purchase, sold, delivered or transferred to (or for the account or benefit of) any U.S. Person, or in or into the U.S. except pursuant to an applicable exemption from, or in a transaction not subject to, the registration requirements of the Securities Act and in compliance with any applicable securities laws of any state or other jurisdiction of the U.S. There will be no public offer of the Ordinary Shares in the U.S.

The Underwriters may arrange for the offer of Ordinary Shares only (a) outside the U.S., other than to U.S. Persons or persons acquiring for the account or benefit of a U.S. Person, in accordance with Rule 903 of Regulation S and (b) within the U.S. by U.S. broker-dealer affiliates of a Joint Global Coordinator to, or for the account or benefit of, U.S. Persons reasonably believed to be both QIBs, in reliance on the exemption from registration provided by Rule 144A under the Securities Act, and QPs. Any U.S. Person subscribing for or purchasing Ordinary Shares will be required to execute the U.S. Purchaser's Letter described below.

Restrictions on offering under the Securities Act and the Investment Company Act

Each subscriber and purchaser that is within the U.S. or that is a U.S. Person (or is subscribing or purchasing for the account or benefit of a U.S. Person) is notified that the offer and sale of Ordinary Shares to it is being made in reliance upon an exemption from the registration requirements of the Securities Act, and that the Company will not be registered under the Investment Company Act. Each subscriber and purchaser that is within the U.S., or that is a U.S. Person (or is subscribing or purchasing for the account or benefit of a U.S. Person), must be both a QIB and a QP.

In addition, each subscriber and purchaser that is located within the U.S. or that is a U.S. Person (or is subscribing or purchasing for the account or benefit of a U.S. Person), prior to any such transaction, will be required to execute a U.S. Purchaser's Letter in the form set out in Section XI: "U.S. Purchaser's Letter", and deliver the letter to the Underwriters and the Company. The U.S. Purchaser's Letter will require each such subscriber and purchaser to represent and agree that, amongst other things, (i) it is both a QIB and a QP and (ii) it will only offer, sell, transfer, assign, pledge or otherwise dispose of the Ordinary Shares in an offshore transaction complying with the provisions of Regulation S (including, for the avoidance of doubt, a *bona fide* sale on the London Stock Exchange's main market for listed securities and on the Main Board of the Hong Kong Stock Exchange) to a person not known to be a U.S. Person (by pre-arrangement or otherwise), and in compliance with applicable securities laws, provided that the transferor has executed an Offshore Transaction Letter in the form of Annex I to Section XI: "U.S. Purchaser's Letter" and promptly sends it to the Company. The transferor will notify any subsequent transferee or executing broker, as applicable, of the restrictions that are applicable to the Ordinary Shares being sold. The U.S. Purchaser's Letter and the Offshore Transaction Letter contain additional written representations, agreements and acknowledgements relating to the transfer restrictions applicable to the Ordinary Shares.

The Company has not been and does not intend to become registered as an investment company under the Investment Company Act and related rules. The Company and its agents may require any U.S. Person or any person within the U.S. that was required to be a QP but was not a QP at the time it acquired the Ordinary Shares or a beneficial interest therein to transfer its Ordinary Shares or such beneficial interest immediately to a non-U.S. Person in an offshore transaction pursuant to Regulation S under the Securities Act.

If any subscriber or purchaser of Ordinary Shares that was required to execute a U.S. Purchaser's Letter in connection with the acquisition of such Ordinary Shares receives them in certificated form, the certificate for the Ordinary Shares will bear an appropriate legend reflecting the transfer restrictions described in the U.S. Purchaser's Letter.

Restrictions on offering in reliance on Regulation S

Each purchaser to whom the Ordinary Shares are distributed, offered or sold outside the U.S. (other than U.S. Persons) will be deemed by its subscription for, or purchase of, the Ordinary Shares, to have represented and agreed as follows:

(a) it is not a U.S. Person and is not acquiring the Ordinary Shares for the account or benefit of a U.S. Person;

(b) it is acquiring the Ordinary Shares in an offshore transaction meeting the requirements of Regulation S;

(c) it is aware that the Ordinary Shares have not been and will not be registered under the Securities Act and may not be offered or sold in the U.S. or to, or for the account or benefit of, U.S. Persons, absent registration or an exemption from registration under the Securities Act;

(d) it is aware that the Company has not registered under the Investment Company Act and that the Company has put in place restrictions for transactions not involving any public offering in the U.S., and to ensure that the Company is not and will not be required to register under the Investment Company Act;

(e) if in the future it decides to offer, sell, transfer, assign or otherwise dispose of the Ordinary Shares, it will do so only in compliance with an exemption from the registration requirements of the Securities Act and under circumstances which will not require the Company to register under the Investment Company Act;

(f) it has carefully read and understands this Prospectus, and has not, directly or indirectly, distributed, forwarded, transferred or otherwise transmitted this Prospectus or any other presentation or offering materials concerning the Ordinary Shares to any persons within the U.S. or to any U.S. Persons, nor will it do any of the foregoing; and

(g) the Company, the Underwriters and their respective directors, officers, agents, employees, advisers and others will rely upon the truth and accuracy of the foregoing representations and agreements. If any of the representations or agreements made by it are no longer accurate or have not been complied with, it will immediately notify the Company, the Underwriters, and if it is acquiring any Ordinary Shares as a fiduciary or agent for one or more accounts, it has sole investment discretion with respect to each such account and it has full power to make such foregoing representations and agreements on behalf of each such account.

Restrictions on U.S. Persons

Each U.S. Person will be deemed to have represented and agreed for the benefit of the Company and its advisers that:

(a) it is a QIB and a QP;

(b) if it purchases Ordinary Shares, (i) it will be a QIB and a QP at the time of such purchase and subscription or it will be acting for the account or benefit of a QIB and a QP; and (ii) such Ordinary Shares will be offered, resold, transferred, assigned, pledged or otherwise disposed of by it in a transaction (a "disposal") executed solely in, on or through the facilities of the London Stock Exchange, the Hong Kong Stock Exchange or otherwise in an offshore transaction complying with the provisions of Regulation S, and neither it nor any person acting on its behalf will pre-arrange such disposal with a buyer in the U.S. or known to be a U.S. Person; and

(c) if it elects to subscribe for Ordinary Shares, such subscription will only be valid if it follows the procedures described in paragraph 12 of this Section VIII and such subscription is accompanied by an executed U.S. Purchaser's Letter attached in Section XI: "U.S. Purchaser's Letter".

12.2 **European Economic Area**

In relation to each Member State of the European Economic Area which has implemented the Prospectus Directive (each, a "Relevant Member State"), with effect from and including the date on which the Prospectus Directive is implemented in that Relevant Member State (the "Relevant Implementation Date") no offer of the Ordinary Shares which are the subject of the offering contemplated by the Prospectus to the public in that Relevant Member State has been or will be made other than the offers contemplated in the Prospectus in the United Kingdom from the time the Prospectus has been approved by the competent authority in the United Kingdom and published and notified to the relevant competent authority in accordance with the Prospectus Directive as implemented in the United Kingdom until UK Admission, and provided that the Company has consented in writing to use of the Prospectus for any such offers, except that with effect from and including the Relevant Implementation Date, an offer of such Ordinary Shares may be made to the public in that Relevant Member State:

- *Qualified investors:* to any legal entity which is a qualified investor as defined in the Prospectus Directive;
- *Fewer than 100 offerees:* to fewer than 100 or, if the Relevant Member State has implemented the relevant provision of the 2010 PD Amending Directive, 150, natural or legal persons (other than qualified investors as defined in the Prospectus Directive), as permitted under the Prospectus Directive, subject to obtaining the prior consent of the relevant Underwriters nominated by the Company for any such offer; or
- *No publication of a prospectus:* in any other circumstances falling within Article 3(2) of the Prospectus Directive,

provided that no such offer of Ordinary Shares shall require the Company or any of the Underwriters to publish a prospectus pursuant to Article 3 of the Prospectus Directive or supplement a prospectus pursuant to Article 16 of the Prospectus Directive.

For the purposes of this selling restriction, the expression an "offer of Ordinary Shares to the public" in relation to any Ordinary Shares in any Relevant Member State means the communication in any form and by any means of sufficient information on the terms of the offer and the Ordinary Shares to be offered so as to enable an investor to decide to purchase or subscribe the Ordinary Shares, as the same may be varied in that Relevant Member State by any measure implementing the Prospectus Directive in that Relevant Member State and the expression "Prospectus Directive" means Directive 2003/71/EC (and amendments thereto, including the 2010 PD Amending Directive, to the extent implemented in the Relevant Member State), and includes any relevant implementing measure in the Relevant Member State and the expression "2010 PD Amending Directive" means Directive 2010/73/EU.

12.3 **Japan**

The Ordinary Shares offered hereby have not been and will not be registered under the Financial Instruments and Exchange Act of Japan. Accordingly, no Ordinary Shares will be offered or sold, directly or indirectly, in Japan or to, or for the benefit of, any resident of Japan (which term as used herein means any person resident in Japan, including any corporation or other entity organised under the laws of Japan) or to others for re-offering or resale, directly or indirectly, in Japan or to, or for the benefit of, any resident of Japan, except pursuant to an exception from the registration requirements of, and otherwise in compliance with, the Financial Instruments and Exchange Law and other relevant laws and regulations of Japan.

12.4 **Australia**

This Prospectus has not been and will not be lodged with the Australian Securities and Investments Commission or the Australian Stock Exchange and is not a disclosure document for the purposes of Australian law. This Prospectus (whether in preliminary or definitive form) may not be issued or distributed in Australia and no offer or invitation may be made in relation to the issue, sale or purchase of any Ordinary Shares in Australia (including an offer or invitation received by a person in Australia) and no shares may be sold in Australia, unless the offer or invitation may be made to investors without a disclosure document under Part 6D 2 of the Corporations Act 2001 (the "Corporations Act").

Any person to whom Ordinary Shares are issued or sold pursuant to this Prospectus must not, within 12 months after the issue, offer (or transfer, assign or otherwise alienate) those Ordinary Shares to persons in Australia except in circumstances where disclosure is not required under the Corporations Act.

This Prospectus is not, and under no circumstances is to be construed as, an advertisement or a public offering of the Ordinary Shares in Australia.

This Prospectus has not been prepared for an Australian audience. Australian investors should therefore note that this Prospectus:

- may contain references to dollar amounts which are not Australian dollars;

- may contain financial information which is not prepared in accordance with Australian law or practices;
- may not address risks associated with investment in foreign currency denominated investments; and
- does not address Australian tax issues.

12.5 **United Arab Emirates**

This Prospectus is strictly private and confidential and is being distributed to a limited number of investors and must not be provided to any person other than the original recipient, and may not be reproduced or used for any other purpose.

By receiving this Prospectus, the person or entity to whom it has been issued understands, acknowledges and agrees that this Prospectus has not been approved by or filed with the UAE Central Bank, the Emirates Securities or Commodities Authority ("ESCA") or any other authorities in the UAE, nor has the placement agent, if any, received authorisation or licensing from the UAE Central Bank, ESCA or any other authorities in the UAE to market or sell securities or other investments within the UAE. No marketing of any financial products or services has been or will be made from within the UAE other than in compliance with the laws of the UAE and no subscription to any securities or other investments may or will be consummated within the UAE. It should not be assumed that the placement agent, if any, is a licensed broker, dealer or investment adviser under the laws applicable in the UAE, or that it advises individuals resident in the UAE as to the appropriateness of investing in or purchasing or selling securities or other financial products. The Ordinary Shares may not be offered or sold directly or indirectly to the public in the UAE. This does not constitute a public offer of securities in the UAE in accordance with the Commercial Companies Law, Federal Law No. 8 of 1984 (as amended) or otherwise.

12.6 **Dubai International Financial Centre**

This Prospectus relates to an Exempt Offer in accordance with the Offered Securities Rules of the Dubai Financial Services Authority (the "DFSA"). This Prospectus is intended for distribution only to persons of a type specified in those rules. It must not be delivered to, or relied on by, any other person.

The DFSA has no responsibility for reviewing or verifying any documents in connection with Exempt Offers. The DFSA has not approved the Ordinary Shares or the Prospectus nor taken steps to verify the information set out in the Prospectus, and has no responsibility for it.

The Ordinary Shares and interests therein to which this Prospectus relates may be illiquid and/or subject to restrictions on their resale. Prospective purchasers of the Ordinary Shares and interests therein should conduct their own due diligence on the Ordinary Shares. If you do not understand the contents of this Prospectus you should consult an authorised financial adviser.

In relation to its use in the DIFC, this Prospectus is strictly private and confidential and is being distributed to a limited number of investors and must not be provided to any person other than the original recipient, and may not be reproduced or used for any other purpose. The interests in the Ordinary Shares may not be offered or sold directly or indirectly to the public in the DIFC.

12.7 **South Africa**

This Prospectus will not be registered as a prospectus in terms of the Companies Act 1973 in South Africa and as such, any offer of Ordinary Shares in South Africa may only be made if it shall not be capable of being construed as an offer to the public as envisaged by section 144 of such Act. Furthermore, any offer or sale of the Ordinary Shares shall be subject to compliance with South African exchange control regulations.

12.8 **Hong Kong**

(a) No International Offer Shares have been offered or sold or will be offered or sold in Hong Kong, by means of any document, other than (a) to "professional investors" as defined in the Securities and Futures Ordinance (Chapter 571 of the Laws of Hong Kong) and any rules made under that Ordinance; or (b) in other circumstances which do not result in the document being a "prospectus" as defined in the Companies Ordinance of Hong Kong or which do not constitute an offer to the public within the meaning of that Ordinance; and

(b) No advertisement, invitation or document relating to the International Offer Shares has been issued or has been in the possession of any person for the purposes of issue, nor will any such advertisement, invitation or document be issued or be in the possession of any person for the purpose of issue, whether in Hong Kong or elsewhere, which is directed at, or the contents of which are likely to be accessed or read by, the public of Hong Kong (except if permitted to do so under the securities laws of Hong Kong) other than with respect to International Offer Shares which are or are intended to be disposed of only to persons outside Hong Kong or only to "professional investors" as defined in the Securities and Futures Ordinance (Chapter 571 of the Laws of Hong Kong) and any rules made under that Ordinance.

12.9 **Brazil**

The offering of the Ordinary Shares has not been, and will not be, submitted to, or registered with, the Brazilian Securities Commission (*Comissão de Valores Mobiliários*). Accordingly, the Ordinary Shares may not be offered or sold in Brazil in circumstances that constitute a public offering or distribution according to Brazilian laws and regulations. Documents relating to the offering of the Ordinary Shares, including this Prospectus, may not be supplied or made generally available to the public in Brazil or be used in connection with an offer for subscription or sale to the public in Brazil.

Therefore, no Ordinary Shares have been offered or sold or will be offered or sold in Brazil, except in circumstances which do not constitute a public offering, placement, distribution or negotiation of securities in the Brazilian capital markets regulated by Brazilian legislation.

Persons wishing to offer or acquire the Ordinary Shares within Brazil should consult with their own counsel as to the applicability of registration requirements or any exemption therefrom.

12.10 **Canada**

The Ordinary Shares will not be qualified for sale under the securities laws of any province or territory of Canada. The Offer Shares may not be offered or sold, directly or indirectly, in any province or territory of Canada or to or for the benefit of any resident of any province or territory of Canada, except pursuant to an exemption from the requirement to file a prospectus in the province or territory of Canada in which the offer or sale is made and only by a dealer duly registered under applicable laws in circumstances where an exemption from applicable registered dealer registration requirements is not available.

The Ordinary Shares will not be offered, sold or distributed directly or indirectly, in Canada or to or for the benefit of any resident of Canada, other than in compliance with applicable securities laws. Neither this Prospectus, nor any other offering material in connection with the offer of the Offer Shares under the Global Offering, will be distributed or delivered in Canada other than in compliance with applicable securities laws.

12.11 **India**

This Prospectus has not and will not be registered as a "prospectus" under the Indian Companies Act, 1956 with the Registrar of Companies (the "RoC"), nor has the Prospectus nor any amendment or supplement thereto been reviewed, approved, or recommended by the RoC or the Securities and Exchange Board of India or any other Indian regulatory authority. This Prospectus may not be distributed directly or indirectly in India or to residents of India and any Ordinary Shares may not be offered, sold, transferred or delivered directly or indirectly in India to, or for the account or benefit of, any resident of India, except as permitted by applicable Indian laws and regulations, under which an offer to eligible Indian residents is strictly on a private and confidential basis and is limited to select institutional investors (who are eligible to apply for such offering) and is not an offer to the public. This Prospectus is not a prospectus or an advertisement under applicable Indian laws and should not be circulated to any other person other than to whom the offer is made.

12.12 **Indonesia**

The Ordinary Shares will not be registered as public offering in Indonesia, and therefore the Ordinary Shares will not be offered to more than 100 parties or sold to more than 50 parties in Indonesia or to Indonesian nationals, corporations or to Indonesian citizens, wherever they are domiciled or to Indonesian residents. Neither this Prospectus nor any other offering materials relating to the Ordinary Shares have been distributed, or will be distributed, in Indonesia or to Indonesian nationals, corporations or residents in a manner which constitutes a public offering of the Ordinary Shares under the laws or regulations of the Republic of Indonesia.

12.13 **Kingdom of Saudi Arabia**

This Prospectus may not be distributed in the Kingdom of Saudi Arabia (the "Kingdom"), except to such persons as are permitted under the Offers of Securities Regulations issued by the Capital Market Authority of the Kingdom (the "Capital Market Authority").

The Capital Market Authority does not make any representations as to the accuracy or completeness of this Prospectus and expressly disclaims any liability whatsoever for any loss arising from, or incurred in reliance upon, any part of this Prospectus. Prospective purchasers of the Ordinary Shares offered hereby should conduct their own due diligence on the accuracy of the information relating to the Ordinary Shares. If a prospective purchaser does not understand the contents of this Prospectus, he or she should consult an authorised financial adviser.

12.14 **Kuwait**

By receiving this Prospectus, the person or entity to whom it has been issued understands, acknowledges and agrees that this Prospectus has not been approved by the Kuwait Central Bank, the Kuwait Ministry of Commerce and Industry or any other authority in Kuwait, nor have any authorisations or licences been granted by the Kuwait Central Bank, the Kuwait Ministry of Commerce and Industry or any other authority in Kuwait to market or sell the Ordinary Shares within Kuwait.

No marketing of any financial products or services has been or will be made from within Kuwait and no subscription to any securities, financial products or financial services may or will be consummated within Kuwait. The managers for Kuwait do not advise parties in Kuwait as to the appropriateness of investing in, purchasing or selling the Ordinary Shares or other financial products. Nothing contained in this Prospectus is intended to constitute investment, legal, tax, accounting or other professional advice. This Prospectus is for information only and nothing in this Prospectus is intended to endorse or recommend a particular course of action. Any person considering acquiring the Ordinary Shares should consult with an appropriate professional for specific advice rendered on the basis of their respective situation.

12.15 **Malaysia**

No offering for subscription or purchase and no invitation to subscribe for or purchase the Ordinary Shares may be made in Malaysia. This Prospectus or any document or other materials in connection therewith may not be distributed in Malaysia directly or indirectly for the purpose of any offering for subscription or purchase, invitation to subscribe for or purchase or for the sale of, the Ordinary Shares in Malaysia other than to persons falling within one of the categories specified under Schedule 6 or Section 229(1)(b) or Schedule 7 or Section 230(1)(b) of the Capital Markets and Services Act 2007 of Malaysia.

If you are a purchaser of Ordinary Shares, then you represent and warrant that you are a person falling within one of the categories of persons specified under Schedule 6 or Section 229(1)(b); or Schedule 7 (or Section 230(1)(b)) of the Capital Markets and Services Act 2007 of Malaysia, subject to any law, order, regulation or official directive of the Securities Commission of Malaysia, Bursa Malaysia Securities Berhad and/or any other regulatory authority from time to time.

12.16 **People's Republic of China**

This Prospectus and the information contained herein may not be circulated or distributed in the People's Republic of China (for such purposes, not including the Hong Kong and Macau Special Administrative Regions or Taiwan) and the Ordinary Shares are not being offered or sold and may not be offered or sold, directly or indirectly, to any resident of the People's

Republic of China, or offered or sold to any person for re-offering or resale, directly or indirectly, to any resident of the People's Republic of China, except pursuant to applicable laws and regulations of the People's Republic of China. PRC investors are responsible for obtaining all relevant government regulatory approvals/licences (if any) by themselves, including, but not limited to, any which may be required from the State Administration of Foreign Exchange and other competent regulatory authorities and complying with all relevant PRC regulations (if applicable), including, but not limited to, any relevant foreign exchange regulations and/or overseas investment regulations.

12.17 **Singapore**

This Prospectus has not been registered as a prospectus with the Monetary Authority of Singapore under the Securities and Futures Act, Cap. 289 of Singapore (the "SFA") and, accordingly, the Ordinary Shares may not be offered or sold, nor may the Ordinary Shares be the subject of an invitation for subscription or purchase, nor may this Prospectus or any other document or material in connection with the offer or sale, or invitation for subscription or purchase of the Ordinary Shares be circulated or distributed, whether directly or indirectly, to any person in Singapore other than (i) to an institutional investor (as defined in Section 4A of the SFA) pursuant to Section 274 of the SFA, (ii) to a relevant person (as defined in Section 275(2) of the SFA) pursuant to Section 275(1) of the SFA, or any person pursuant to an offer referred to in Section 275(1A) of the SFA, and in accordance with the conditions specified in Section 275 of the SFA or (iii) otherwise pursuant to, and in accordance with the conditions of, any other applicable provision of the SFA.

Where the Ordinary Shares are acquired by persons who are relevant persons specified in Section 276 of the SFA, namely:

(a) a corporation (which is not an accredited investor (as defined in Section 4A of the SFA)) the sole business of which is to hold investments and the entire share capital of which is owned by one or more individuals, each of whom is an accredited investor; or

(b) a trust (where the trustee is not an accredited investor) whose sole purpose is to hold investments and each beneficiary of the trust is an individual who is an accredited investor,

the shares, debentures and units of shares and debentures of that corporation or the beneficiaries' rights and interest (howsoever described) in that trust shall not be transferred within six months of that corporation or that trust acquiring the Ordinary Shares pursuant to an offer made under Section 275 of the SFA except:

(i) to an institutional investor (under Section 274 of the SFA) or to a relevant person as defined in Section 275(2) of the SFA, or any person pursuant to an offer that is made on terms that such shares, debentures and units of shares and debentures of that corporation or such rights or interest in that trust are acquired at a consideration of not less than 200,000 Singapore dollars (or its equivalent in a foreign currency) for each transaction, whether such amount is to be paid for in cash or by exchange of securities or other assets and further for corporations, in accordance with the conditions specified in Section 275(1A) of the SFA;

(ii) where no consideration is or will be given for the transfer;

(iii) where the transfer is by operation of law; or

(iv) as specified in Section 276(7) of the SFA.

12.18 **State of Israel**

No offer, placing, sale or transfer of the Ordinary Shares shall take place in Israel if such offer, placement, sale or transfer would constitute a public offering within the meaning of the Israeli Securities Law—1968 (the "Securities Law"). Any such offer, placement, sale or transfer shall be conducted only in a manner that would not require the publication of a prospectus or similar document in Israel. Such offer, placement, sale or transfer may be made in accordance with Section 15A(a)(1) or Section 15A(b) of the Securities Law, including to an investor of the type that is included in the list of investors set forth in the First Addendum to the Securities Law, with respect to Section 15a(b)(1) of the Law.

12.19 **State of Qatar**

The Ordinary Shares have not been offered, sold or delivered, and will not be offered, sold or delivered, at any time, directly or indirectly, in the State of Qatar in a manner that would constitute a public offering and only in circumstances that are (i) in compliance with all applicable laws and regulations of the State of Qatar and (ii) through persons or corporate entities authorised and licensed to provide investment advice and/or engage in brokerage activity and/or trade in respect of foreign securities in the State of Qatar. This Prospectus has not been reviewed or registered with or approved by the Qatari government authorities, the Qatari Financial Markets Authority or any other relevant State of Qatar regulatory body, whether under law no. 25 (2002) concerning investment funds, Central Bank Resolution no. 15 (1997), as amended, or any associated regulations. Therefore, this Prospectus is strictly private and confidential, and is being issued to a limited number of sophisticated investors, and may not be reproduced or used for any other purpose, nor provided to any person other than the recipient thereof. No general offering of the Ordinary Shares has been or will be made in the State of Qatar and the Ordinary Shares may only be offered, distributed or sold in the State of Qatar to a limited number of investors.

12.20 **Sultanate of Oman**

The information contained in this Prospectus neither constitutes a public offer of securities in the Sultanate of Oman as contemplated by the Commercial Companies Law of Oman (Royal Decree 4/74) or the Capital Market Law of Oman (Royal Decree 80/98), nor does it constitute an offer to sell, or the solicitation of any offer to buy Non-Omani securities in the Sultanate of Oman as contemplated by Article 139 of the Executive Regulations of the Capital Market Law (issued by Decision No. 1/2009). Additionally, this Prospectus is not intended to lead to the conclusion of a contract of any nature whatsoever within the territory of the Sultanate of Oman.

The recipient of this Prospectus represents that he/she is a sophisticated investor (as described in Article 139 of the Executive Regulations of the Capital Market Law) and has such experience in business and financial matters that he/she is capable of evaluating the merits and risks of an investment in securities. The investor acknowledges that he/she is aware that an investment in securities is speculative and involves a high degree of risk, which could include loss of the entire investment.

12.21 **Switzerland**

The Ordinary Shares may not be and will not be publicly offered, sold or advertised, directly or indirectly, in or from Switzerland. Neither this Prospectus nor any other offering or marketing material relating to the Ordinary Shares constitutes a prospectus as such term is understood pursuant to article 652a of the Swiss Federal Code of Obligations or a listing prospectus within the meaning of the listing rules of SIX, and neither this Prospectus nor any other offering or marketing material relating to the Ordinary Shares may be publicly distributed or otherwise made publicly available in Switzerland.

Neither this document nor any other offering or marketing material relating to the offering, the Issuer or the Ordinary Shares have been or will be filed with or approved by any Swiss regulatory authority. In particular, this document will not be filed with, and the Global Offer of Ordinary Shares will not be supervised by, the Swiss Financial Market Supervisory Authority FINMA (FINMA), and the Global Offer has not been and will not be authorized under the Swiss Federal Act on Collective Investment Schemes ("CISA"). The investor protection afforded to acquirers of interests in collective investment schemes under the CISA does not extend to acquirers of Ordinary Shares.

12.22 **Thailand**

The Ordinary Shares have not been offered or sold and will not be offered or sold, to persons in Thailand other than under circumstances which do not constitute an offer for sale of shares to the public for the purposes of the Securities and Exchange Act of 1992 of Thailand or require approval from or filing of a registration statement and draft prospectus with the office of the Securities and Exchange Commission of Thailand.

12.23 **Bahamas**

The Ordinary Shares shall not be offered or sold in the Bahamas except in circumstances that do not constitute an offer to the public. The Ordinary Shares may not be offered or sold or otherwise disposed of in any way to any person(s) deemed "resident" for exchange control purposes by the Central Bank of the Bahamas.

12.24 **Philippines**

The Ordinary Shares being offered or sold through this Prospectus have not been registered with the Philippines Securities and Exchange Commission under the Philippines Securities Regulation Code. Any future offer or sale of the Ordinary Shares is subject to registration requirement under the Philippines Securities Regulation Code unless such offer or sale qualifies as an exempt transaction.

12.25 **Monaco**

The Ordinary Shares may not be offered or sold, directly or indirectly, to the public in Monaco other than by a Monaco bank or a duly authorised Monegasque intermediary. Consequently, this Prospectus may only be communicated to Monaco banks duly licensed by the Autorité de Contrôle Prudentiel and fully licensed Monaco portfolio management companies by virtue of Law n° 1.144 of July 26, 1991 and Law 1.338, of September 7, 2007 duly licensed by the Commission de Contrôle des Activités Financières. Such regulated intermediaries may in turn communicate this Prospectus to potential investors.

SECTION IX: TAXATION

The following section is a summary guide only to certain aspects of tax in the UK, Switzerland, Jersey, the U.S. and Hong Kong. This is not a complete analysis of all the potential tax effects of acquiring, holding and disposing of Ordinary Shares, nor will it relate to the specific tax position of all Shareholders in all jurisdictions. This summary does not purport to be a legal opinion. Shareholders are advised to consult their own tax advisers.

The description of the taxation consequences is written on the basis that the Company will be solely resident in Switzerland for tax purposes and will therefore be subject to the Swiss tax regime and not (except as noted below) the Jersey tax regime. As a consequence, please refer to the section "Swiss taxation" below for information about withholding tax on dividends and similar cash or in-kind distributions.

1 UK taxation

The following summary is intended as a general guide only and relates only to certain limited aspects of UK tax consequences of holding and disposing of Ordinary Shares. It is based on current UK tax law and the current practice of HMRC, both of which are subject to change, possibly with retrospective effect. The summary applies only to Shareholders who are resident and, if individuals, ordinarily resident and domiciled in the UK for taxation purposes, who hold their Ordinary Shares as an investment (other than under a personal equity plan or an individual savings account), who are the absolute beneficial owners of their Ordinary Shares, who have not (and are not deemed to have) acquired their Ordinary Shares by virtue of an office or employment (whether current, historic or prospective) and are not officers or employees of any member of the Glencore Group. In addition, these comments may not apply to certain classes of Shareholders such as traders, brokers, dealers, banks, financial institutions, collective investment schemes, insurance companies, investment companies, tax-exempt organisations, persons connected with the Company or the Glencore Group, and persons who hold the Ordinary Shares as part of hedging or conversion transactions.

Any person who is in any doubt as to his or her tax position, or who is resident or otherwise subject to taxation in a jurisdiction outside the UK, should consult his or her tax advisers immediately.

1.1 UK taxation of dividends

Dividends paid on the Ordinary Shares

Shareholders who are individuals and who own less than a 10 per cent. shareholding in the Company

A Shareholder who is an individual who is resident in the UK for tax purposes (or who carries on a trade, profession or vocation in the UK through a branch or agency and has used, held or acquired Ordinary Shares for the purposes of such trade, profession or vocation, branch or agency in the UK) will, if he owns less than 10 per cent. of the issued share capital in the Company, be entitled to a tax credit in respect of a dividend paid by the Company which may be set off against the Shareholder's total income tax liability. The tax credit will be equal to 10 per cent. of the aggregate of the dividend and the tax credit (the "gross dividend"), which is also equal to one-ninth of the cash dividend received. Such an individual Shareholder who is liable to income tax at the basic rate will be subject to tax on the dividend at the rate of 10 per cent. of the gross dividend, so that the tax credit will satisfy in full such Shareholder's liability to income tax on the dividend. In the case of such an individual Shareholder who is liable to income tax at the higher rate, the tax credit will be set against but not fully match the Shareholder's tax liability on the gross dividend and such Shareholder will have to account for additional income tax equal to 22.5 per cent. of the gross dividend (which is also equal to 25 per cent. of the cash dividend received) to the extent that the gross dividend when treated as the top slice of the Shareholder's income falls above the threshold for higher rate income tax. In the case of such an individual Shareholder who is subject to income tax at the additional rate, the tax credit will also be set against but not fully match the Shareholder's liability on the gross dividend and such Shareholder will have to account for additional income tax equal to 32.5 per cent. of the gross dividend (which is also equal to approximately 36 per cent. of the cash dividend received) to the extent that the gross dividend when treated as the top slice of the Shareholder's income falls above the threshold for additional rate income tax.

Shareholders who are individuals who own a 10 per cent. or greater shareholding in the Company

In certain circumstances, individuals who own a 10 per cent. or greater shareholding in a company do not qualify for the 10 per cent. tax credit. However, as the Company should not be an offshore fund, and is a company resident in a territory with which the UK has a double tax convention which includes a non-discrimination article, any individuals holding a 10 per cent. or greater shareholding in the Company should also qualify for the 10 per cent. dividend tax credit.

Corporate Shareholders

Shareholders who are within the charge to corporation tax in respect of Ordinary Shares in the Company will be subject to corporation tax on the gross amount of any dividends paid by the Company, subject to any applicable credit for Swiss Withholding Tax (as defined below), unless (subject to special rules for such Shareholders that are small companies) the dividends fall within an exempt class and certain other conditions are met. It is expected that the dividends paid by the Company would generally be exempt for such Shareholders.

The statements contained under the heading "*Dividends paid on the Ordinary Shares*" in this paragraph 1.1 reflect the Company's understanding of the correct interpretation of current UK tax law. However, there is currently some doubt as to whether HMRC agrees with this interpretation in relation to distributions made out of share premium and, therefore, it is unclear how HMRC would interpret a distribution by the Company out of Qualifying Reserves (as described below), as is intended (see the discussion under "Swiss taxation" below). In such cases, there is a risk that HMRC may seek to argue, in relation to certain classes of Shareholders, that such a distribution should not be treated under the rules for income distributions, but is instead within the charge to tax on chargeable gains. In light of this uncertainty, Shareholders are advised to consult their own professional advisers in relation to the implications of distributions by the Company.

Impact of Swiss Withholding Tax

As described more fully under "Swiss taxation" below, dividends and other distributions paid by the Company out of other reserves than the Qualifying Reserves (as described below) will be subject to Swiss Withholding Tax on the cash amount of the distribution at the then prevailing rate (currently 35 per cent.). A UK resident Shareholder may be able to claim a partial refund of the Swiss Withholding Tax withheld under the UK-Switzerland double tax convention.

A UK resident individual Shareholder will generally be entitled to credit for any Swiss Withholding Tax withheld from a dividend or other distribution paid by the Company and not recoverable from the Swiss tax authorities against income tax payable by such Shareholder in respect of the dividend (having taken into account any benefits available under the UK-Switzerland double tax convention).

Under the dividend exemption rules of Part 9A of the Corporation Tax Act 2009, any Shareholder within the charge to corporation tax should generally not be subject to corporation tax on dividends paid by the Company. Where the dividend exemption applies, no credit for any Swiss Withholding Tax withheld from a dividend paid by the Company will be available to a UK resident corporate Shareholder. However, under the dividend exemption rules, an election can be made for a dividend to not be exempt from corporation tax. If such an election is made, HMRC will generally give credit against UK corporation tax on the dividend for any Swiss Withholding Tax withheld from a dividend paid by the Company and not recoverable from the Swiss tax authorities, applying the appropriate rate of withholding under the UK-Switzerland double tax convention.

If you are in any doubt about your tax position, you should consult your own professional adviser without delay.

1.2 **UK taxation consequences of disposing of Ordinary Shares**

A disposal of Ordinary Shares by a UK tax resident Shareholder may, depending on individual circumstances, give rise to a chargeable gain or allowable loss for UK tax purposes.

A disposal of Ordinary Shares by a Shareholder who is not resident in the UK for tax purposes but who carries on a trade, profession or vocation in the UK through a branch, agency or permanent establishment and has used, held or acquired the Ordinary Shares for the purposes of such trade, profession or vocation or such branch, agency or permanent establishment may, depending on individual circumstances, give rise to a chargeable gain or allowable loss for UK tax purposes.

A Shareholder who is an individual and who is temporarily non-resident in the UK for a period of less than five complete tax years may, under anti-avoidance legislation, still be liable to UK taxation on their return to the UK on a chargeable gain realised on the disposal or part disposal of Ordinary Shares during the period when he is non-resident.

For corporate Shareholders only, indexation allowance on the relevant proportion of the original allowable cost should be taken into account for the purposes of calculating a chargeable gain (but not an allowable loss) arising on a disposal or part disposal of Ordinary Shares.

1.3 **UK stamp duty and SDRT**

No UK stamp duty or SDRT will be payable on the issue of Ordinary Shares.

In practice, UK stamp duty should generally not need to be paid on an instrument transferring Ordinary Shares, provided that such transfer instruments are executed and retained outside of the UK.

No UK SDRT will be payable in respect of any agreement to transfer Ordinary Shares.

The statements in this paragraph 1.3 summarise the current position on stamp duty and SDRT and are intended as a general guide only. They assume that the Ordinary Shares will not be registered in a register kept in the UK by or on behalf of the Company. The Company has confirmed it does not intend to keep such a register in the UK.

1.4 **UK inheritance tax**

On the basis of the assumption contained in paragraph 1.3 above, the Ordinary Shares will be assets situated outside the United Kingdom for the purposes of United Kingdom inheritance tax. A gift of such assets by, or the death of, an individual holder of such assets who is domiciled or is deemed to be domiciled in the United Kingdom may (subject to certain exemptions and reliefs) give rise to a liability to United Kingdom inheritance tax. Generally, United Kingdom inheritance tax is not chargeable on outright gifts to individuals if the transfer is made more than seven complete years prior to the death of the donor. For inheritance tax purposes, a transfer of assets at less than full market value may be treated as a gift and particular rules apply to gifts where the donor reserves or retains some benefit. Since the Ordinary Shares will be assets situated outside the United Kingdom for the purposes of United Kingdom inheritance tax, where a holder is neither domiciled nor deemed domiciled in the United Kingdom (under certain rules relating to long residence or previous domicile), neither a gift of such assets by the holder nor the death of such holder will give rise to a liability to United Kingdom inheritance tax.

1.5 **Close Companies**

Shareholders who are resident or, in the case of individuals, resident or ordinarily resident in the UK, who hold, alone or together with associated persons, an interest of more than 10 per cent. in the Company could, under the provisions of Section 13 of the Taxation of Chargeable Gains Act 1992, in certain circumstances, be subject to United Kingdom tax in respect of a portion of capital gains made by non-UK resident subsidiaries of the Company if the Company itself is considered to be a "close" company for the purposes of these rules. The Company currently considers that it is not a "close" company for these purposes. "Close" company status is a question of fact which turns upon the extent of shareholders' holdings in the Company and the relationships between such shareholders. Accordingly, whether or not the Company is considered to be a "close" company currently or in the future may be determined by factors outside the Company's direct control.

2 Swiss taxation

The following paragraphs discuss Swiss Withholding Tax and the position on Swiss tax for Shareholders who are initial purchasers of Ordinary Shares. This is a general summary of certain tax consequences of the ownership of the Ordinary Shares. These discussions are based, as applicable, on the tax laws, regulations, decrees, rulings, income tax conventions (treaties), administrative practice and judicial decisions of Switzerland as in effect on the date of this Prospectus which are subject to change (or subject to changes in interpretations), possibly with retrospective effect. This is not a complete analysis of the potential tax effects relevant to owning Ordinary Shares, nor does the following summary take into account or discuss the tax laws of any jurisdiction other than Switzerland. It also does not take into account investors' individual circumstances. This summary does not purport to be a legal opinion or to address all tax aspects that may be relevant to a holder of Ordinary Shares. Investors are advised to consult their own tax advisers as to Swiss or other tax consequences of the acquisition, ownership and disposition of the Ordinary Shares. Tax consequences may differ according to the provisions of different double taxation treaties and the investor's particular circumstances. The statements and discussion of Swiss taxes set out below are of a general nature and do not relate to persons in the business of buying and selling shares or other securities.

Swiss Withholding Tax

Any dividends and similar cash or in-kind distributions of profit and reserves other than Qualifying Reserves made by the Company in respect of the Ordinary Shares, including stock dividends and the distribution of any liquidation proceeds in excess of nominal share capital and Qualifying Reserves, will be subject to Swiss Federal Withholding tax (*Verrechnungssteuer*) ("**Swiss Withholding Tax**") imposed on the gross amount at the then prevailing rate (currently 35 per cent.).

For distributions subject to Swiss Withholding Tax, the Company may only pay out 65 per cent. of the gross amount of any dividend and similar distributions to the holders of Ordinary Shares. A portion equal to 35 per cent. of the gross amount of such dividends and similar distributions must be paid to the Swiss Federal Tax Administration. The redemption of Ordinary Shares by the Company may under certain circumstances (in particular, if the Ordinary Shares are redeemed for subsequent cancellation) be taxed as a partial liquidation for Swiss Withholding Tax purposes, with the effect that Swiss Withholding Tax at the then prevailing rate (currently 35 per cent.) is due on the difference between the redemption price and nominal value plus proportionate Qualifying Reserves of the redeemed Ordinary Shares.

However, dividends and similar distributions out of Qualifying Reserves and repayments of the nominal share capital will not be subject to Swiss Withholding Tax. A ruling from the Swiss Federal Tax Administration signed 7 January 2011 confirmed that Qualifying Reserves of approximately U.S.$8.8 billion will be created on the Restructuring. The Global Offer will create additional Qualifying Reserves equal to the share premium of the Ordinary Shares issued. This ruling is binding on the Swiss Federal Tax Administration, provided that, among other things, full disclosure of the facts and circumstances of the Restructuring have been provided to the Swiss Federal Tax Administration (which the Company believes is the case), the terms of the ruling are complied with and the relevant facts and applicable laws, regulations and administrative practice remain unchanged. It is at the discretion of the Company's shareholders to decide (at a shareholders' meeting) whether to distribute a dividend out of Qualifying Reserves free of Swiss Withholding Tax and/or out of profit/retained earnings/non-qualifying reserves subject to Swiss Withholding Tax. Once cumulative distributions out of Qualifying Reserves exceed the value threshold described above, any distributions paid by the Company will be subject to Swiss Withholding Tax. To the extent that additional shares are issued by the Company in the future, the value of the distributions which can be made free of Swiss Withholding Tax will be increased by an amount corresponding to the total nominal share capital and paid-in capital/share premium of the shares issued.

Swiss resident beneficiaries of taxable dividends and similar distributions in respect of the Ordinary Shares are entitled to full subsequent relief of the Swiss Withholding Tax, either through a tax refund or tax credit against their income tax liability, if they duly report the underlying income in their tax returns or financial statements used for tax purposes, as the case may be, and if there is no tax avoidance. Non-Swiss resident beneficiaries of dividends and similar distributions in respect of Ordinary Shares may be entitled to a partial or full credit of the Swiss Withholding Tax in accordance with any applicable double taxation convention between Switzerland and the beneficiary's country of tax residence.

Income and profit tax

Income tax for individuals holding the shares as private assets: Individuals who are resident in Switzerland for tax purposes and hold Ordinary Shares as part of his or her private assets (*Privatvermögen*) who receive dividends and similar distributions (including stock dividends and liquidation proceeds in excess of nominal share capital and Qualifying Reserves) from the Company must include these distributions in his or her personal tax return and will be subject to federal, cantonal and communal income tax on any net taxable income for the relevant tax period. However, dividends and similar distributions out of Qualifying Reserves and repayments of the nominal share capital will not be subject to federal, cantonal and communal income tax. Stock dividends may be treated differently for cantonal and communal taxes depending on the canton of residency. The Direct Federal Tax on dividends and similar distributions (including stock dividends and liquidation proceeds in excess of nominal share capital and Qualifying Reserves) from the Company is reduced to 60 per cent. of regular taxation (*Teilbesteuerung*) if the investment amounts to at least 10 per cent. of nominal share capital of the Company. Most cantons have already introduced or will introduce a similar partial taxation on a cantonal and communal level.

Income tax for individuals holding the shares as business assets: Swiss resident individuals holding Ordinary Shares as business assets, as well as non-Swiss resident individuals holding the shares as part of a permanent establishment or a fixed place of business receiving dividends and similar distributions (including stock dividends and liquidation proceeds in excess of nominal share capital and Qualifying Reserves) from the Company, must include these distributions in his or her income statement and will be subject to federal, cantonal and communal income tax on any net taxable income for the relevant tax period. The Direct Federal Tax on dividends and similar distributions (including stock dividends and liquidation proceeds in excess of nominal share capital and Qualifying Reserves) from the Company is reduced to 50 per cent. of regular taxation (*Teilbesteuerung*), if the investment is held as a business asset in terms of Swiss tax law and amounts to at least 10 per cent. of the nominal share capital of the Company. Most cantons have already introduced or will introduce a similar partial taxation on a cantonal and communal level.

Profit tax for legal entities: Legal entities resident in Switzerland or non-Swiss resident entities holding Ordinary Shares as part of a Swiss permanent establishment are required to include all taxable distributions received on the Ordinary Shares in their profit and loss statement relevant for profit tax purposes and will be subject to federal, cantonal and communal corporate profit tax on any net taxable earnings for such period. A Swiss corporation or co-operative, or a non-Swiss corporation or co-operative holding Ordinary Shares as part of a Swiss permanent establishment, may under certain circumstances, benefit from taxation relief with respect to distributions (*Beteiligungsabzug*), provided such Ordinary Shares represent at the time of the distribution at least 10 per cent. of the share capital or 10 per cent. of the profit and reserves, respectively, or a fair market value of at least 1 million Swiss francs.

A holder of Ordinary Shares who is not a resident of Switzerland for tax purposes will not be liable for any Swiss income or profit taxes on dividends and similar distributions with respect to the Ordinary Shares, unless the Ordinary Shares are attributable to a permanent establishment or a fixed place of business maintained in Switzerland by such non-Swiss resident.

Net worth and capital taxes

An individual who is a Swiss resident for tax purposes, or a non-Swiss resident holding Ordinary Shares as part of a permanent establishment or fixed place of business situated in Switzerland, is required to include his or her Ordinary Shares in his or her assets which are subject to cantonal and communal net worth taxes. No net worth tax is levied at the federal level.

Legal entities resident in Switzerland or non-Swiss resident legal entities with a Swiss permanent establishment are subject to cantonal and communal capital tax. The cantonal and communal capital tax is levied on the basis of the taxable equity of the legal entities. Usually, the acquisition of Ordinary Shares should not influence the equity of a legal entity and should therefore have no or only limited influence on its capital tax charge. However, the acquisition of Ordinary Shares may change the basis for international or inter-cantonal allocation of the taxable equity of the legal entity. No capital tax is levied at the federal level.

Taxes on capital gains upon disposal of Ordinary Shares

Individuals: Individuals who are resident in Switzerland for tax purposes and hold Ordinary Shares as part of his or her private assets (*Privatvermögen*) generally are exempt from Swiss federal, cantonal and communal taxes with respect to capital gains realised upon the sale or other disposal of Ordinary Shares, unless such individuals are qualified as professional securities dealers (*Wertschriftenhändler*) for income tax purposes. Under certain circumstances, share sale proceeds of a private individual may be recharacterised into taxable investment income. Upon a repurchase of Ordinary Shares by the Company, the portion of the repurchase price in excess of the nominal amount and Qualifying Reserves may be classified as taxable investment income if the Ordinary Shares repurchased are not sold within a six-year period or if the Ordinary Shares are repurchased for a capital reduction. Capital gains realised by an individual on Ordinary Shares that are held as part of its business assets are subject to income taxation and social security contributions. Capital gains realised by individuals who, for income tax purposes, are classified as professional securities dealers are subject to income taxation and social security contributions. Certain reductions or partial taxation similar to those mentioned above for dividends (*Teilbesteuerung*) may be available for capital gains realised upon the sale of Ordinary Shares if certain conditions are met. The entitlement of shareholders to such reductions must be assessed on an individual basis and shareholders should consult their own legal, financial or tax advisers.

Legal entities: Capital gains upon the sale or other disposal of Ordinary Shares realised by legal entities resident in Switzerland for tax purposes or foreign legal entities holding Ordinary Shares as part of a Swiss permanent establishment are generally subject to ordinary profit taxation. A Swiss corporation or co-operative, or non-Swiss corporation or co-operative holding Ordinary Shares as part of a Swiss permanent establishment, may, under certain circumstances, benefit from taxation relief on capital gains realised upon the disposal of Ordinary Shares (*Beteiligungsabzug*), provided such Ordinary Shares were held for at least one year and the shareholder disposes at least 10 per cent. of the share capital or 10 per cent. of the profit and reserves, respectively. Subsequent sales can be less than 10 per cent. of the nominal share capital in order to qualify for the participation relief, provided the fair market value of the Ordinary Shares held as per the previous financial year end prior to this sale amounts to at least 1 million Swiss francs.

Non-resident individuals and legal entities: Individuals and legal entities which are not Swiss residents for tax purposes and do not hold Ordinary Shares as part of a Swiss business operation or a Swiss permanent establishment or fixed place of business situated in Switzerland are generally not subject to Swiss income or profit taxes on gains realised upon the disposal of the Ordinary Shares.

Gift and inheritance taxes

The transfer of Ordinary Shares may be subject to cantonal and/or communal gift, estate or inheritance taxes if the donor is, or the deceased was, resident for tax purposes in a canton levying such taxes.

Federal stamp tax upon issuance and transfer of Ordinary Shares

A one time federal insurance stamp tax (*Emissionsabgabe*) will be payable on the issue of new Ordinary Shares at the then prevailing rate (currently one per cent.). This tax will be payable by the Company.

The transfer of any Ordinary Shares may be subject to a federal transfer stamp tax (*Umsatzabgabe*) at a current rate of up to 0.30 per cent. if such transfer occurs through or with a Swiss or Liechtenstein bank or securities dealer as defined in the Swiss Federal Stamp Tax Act.

3 Jersey taxation

The following summary of the anticipated treatment of the Company and holders of Ordinary Shares (other than residents of Jersey) is based on Jersey taxation law and practice as it is understood to apply at the date of this Prospectus. It does not constitute legal or tax advice and does not address all aspects of Jersey tax law and practice. Shareholders should consult their professional advisers on the

implications of acquiring, buying, holding, selling or otherwise disposing of Ordinary Shares under the laws of the jurisdictions in which they may be liable to taxation. Shareholders should be aware that tax laws, rules and practice and their interpretation may change.

Taxation of the Company

Jersey taxation legislation provides that the general basic rate of income tax on the profits of companies regarded as resident in Jersey or having a permanent establishment in Jersey will be zero per cent. and that only a limited number of financial services companies shall be subject to income tax at a rate of ten per cent.

The Comptroller of Taxes has confirmed that the Company shall not be regarded as resident in Jersey so long as it satisfies the conditions set out in Article 123(1)(a) of the Income Tax (Jersey) Law 1961, and therefore the Company will not (except as noted below) be liable to Jersey income tax.

If the Company derives any income from the ownership, disposal or exploitation of land in Jersey, such income will be subject to Jersey income tax at the rate of 20 per cent. It is not expected that the Company will derive any such income.

A 3 per cent. (5 per cent. from 1 June 2011) goods and services tax is generally paid in Jersey on the sale or exchange of goods and services in Jersey. All businesses with a 12-month taxable turnover in excess of £300,000 must, by Jersey law, register for this tax unless they are an international services entity ("ISE"). For so long as the Company is an ISE within the meaning of the Goods and Services (Jersey) Law 2007, having satisfied the requirements of the Goods and Services Tax (International Services Entities) (Jersey) Regulations 2008, as amended, a supply of goods or services made by or to the Company shall not be a taxable supply for the purposes of Jersey law.

Taxation of holders of Ordinary Shares

The Company will be entitled to pay dividends to holders of Ordinary Shares without any withholding or deduction for, or on account of, Jersey tax. The holders of Ordinary Shares (other than residents of Jersey) will not be subject to any tax in Jersey in respect of the holding, sale or other disposition of such Ordinary Shares.

Stamp duty

No stamp duty is payable in Jersey on the issue or *inter vivos* transfer of the Ordinary Shares.

Upon the death of a holder of the Ordinary Shares, a grant of probate or letters of administration will be required to transfer the Ordinary Shares of the deceased person, except that where the deceased person was domiciled outside of Jersey at the time of death, the Company may (at its discretion) dispense with this requirement where the value of the deceased's movable estate in Jersey does not exceed £10,000.

Upon the death of a holder of the Ordinary Shares, Jersey stamp duty will be payable on the registration in Jersey of a grant of probate or letters of administration, which will be required in order to transfer or otherwise deal with:

(a) (where the deceased person was domiciled in Jersey at the time of death) the deceased person's personal estate wherever situated (including any Ordinary Shares) if the net value of such personal estate exceeds £10,000; or

(b) (if the deceased person was domiciled outside of Jersey at the time of death) the deceased person's personal estate situated in Jersey (including any Ordinary Shares) if the net value of such personal estate exceeds £10,000.

The rate of stamp duty payable is:

(i) (where the net value of the deceased person's relevant personal estate does not exceed £100,000) 0.5 per cent. of the net value of the deceased person's relevant personal estate; or

(ii) (where the net value of the deceased person's relevant personal estate exceeds £100,000) £500 for the first £100,000 plus 0.75 per cent. of the net value of the deceased person's relevant personal estate which exceeds £100,000.

In addition, application and other fees may be payable.

Jersey does not otherwise levy taxes upon capital, inheritances, capital gains or gifts, nor are there any other estate duties.

4 U.S. taxation

CERTAIN U.S. FEDERAL INCOME TAX CONSIDERATIONS

TO ENSURE COMPLIANCE WITH TREASURY DEPARTMENT CIRCULAR 230, HOLDERS ARE HEREBY NOTIFIED THAT: (A) ANY DISCUSSION OF FEDERAL TAX ISSUES IN THIS PROSPECTUS IS NOT INTENDED OR WRITTEN TO BE RELIED UPON, AND CANNOT BE RELIED UPON, BY HOLDERS FOR THE PURPOSE OF AVOIDING PENALTIES THAT MAY BE IMPOSED ON HOLDERS UNDER THE INTERNAL REVENUE CODE; (B) SUCH DISCUSSION IS INCLUDED HEREIN BY THE ISSUER IN CONNECTION WITH THE PROMOTION OR MARKETING (WITHIN THE MEANING OF CIRCULAR 230) BY THE ISSUER OF THE TRANSACTIONS OR MATTERS ADDRESSED HEREIN; AND (C) HOLDERS SHOULD SEEK ADVICE BASED ON THEIR PARTICULAR CIRCUMSTANCES FROM AN INDEPENDENT TAX ADVISER.

* * * * *

The following is a summary of certain material U.S. federal income tax consequences of the acquisition, ownership and disposition of Ordinary Shares by a U.S. Holder (as defined below). This summary deals only with initial purchasers of Ordinary Shares that are U.S. Holders that will hold the Ordinary Shares as capital assets. The discussion does not cover all aspects of U.S. federal income taxation that may be relevant to, or the actual tax effect that any of the matters described herein will have on, the acquisition, ownership or disposition of Ordinary Shares by particular investors, and does not address state, local, foreign or other tax laws. This summary also does not address tax considerations applicable to investors that own (directly, indirectly, or constructively) 10 per cent. or more of the voting stock of the Company, nor does this summary discuss all of the tax considerations that may be relevant to certain types of investors subject to special treatment under the U.S. federal income tax laws (such as financial institutions, insurance companies, investors liable for the alternative minimum tax, individual retirement accounts and other tax-deferred accounts, tax-exempt organisations, dealers in securities or currencies, investors that will hold the Ordinary Shares as part of straddles, hedging transactions or conversion transactions for U.S. federal income tax purposes or investors whose functional currency is not the U.S. dollar).

As used herein, the term "U.S. Holder" means a beneficial owner of Ordinary Shares that is, for U.S. federal income tax purposes, (i) an individual citizen or resident of the United States, (ii) a corporation created or organised under the laws of the United States or any State thereof, (iii) an estate the income of which is subject to U.S. federal income tax without regard to its source, or (iv) a trust if a court within the United States is able to exercise primary supervision over the administration of the trust and one or more U.S. persons have the authority to control all substantial decisions of the trust, or the trust has elected to be treated as a domestic trust for U.S. federal income tax purposes.

The U.S. federal income tax treatment of a partner in a partnership that holds Ordinary Shares will depend on the status of the partner and the activities of the partnership. Prospective purchasers that are partnerships should consult their tax advisers concerning the U.S. federal income tax consequences to their partners of the acquisition, ownership and disposition of Ordinary Shares by the partnership.

The summary assumes that the Company is not a passive foreign investment company (a "PFIC") for U.S. federal income tax purposes, which the Company believes to be the case. The Company's possible status as a PFIC must be determined annually and therefore may be subject to change. If the Company were to be a PFIC in any year, materially adverse consequences could result for U.S. Holders.

The summary is based on the tax laws of the United States, including the Internal Revenue Code of 1986, as amended, its legislative history, existing and proposed regulations thereunder, published rulings and court decisions, as well as on the income tax treaty between the U.S. and Switzerland (the "Treaty"), all as of the date hereof and all subject to change at any time, possibly with retroactive effect.

THE SUMMARY OF U.S. FEDERAL INCOME TAX CONSEQUENCES SET OUT BELOW IS FOR GENERAL INFORMATION ONLY. ALL PROSPECTIVE PURCHASERS SHOULD CONSULT

THEIR TAX ADVISERS AS TO THE PARTICULAR TAX CONSEQUENCES TO THEM OF OWNING THE ORDINARY SHARES, INCLUDING THEIR ELIGIBILITY FOR THE BENEFITS OF THE TREATY, THE APPLICABILITY AND EFFECT OF STATE, LOCAL, FOREIGN AND OTHER TAX LAWS AND POSSIBLE CHANGES IN TAX LAW.

Ordinary Shares

Dividends

General

Distributions paid by the Company out of current or accumulated earnings and profits (as determined for U.S. federal income tax purposes), before reduction for any Swiss Withholding Tax paid by the Company with respect thereto, will generally be taxable to a U.S. Holder as foreign source dividend income, and will not be eligible for the dividends received deduction allowed to corporations. Distributions in excess of current and accumulated earnings and profits will be treated as a non-taxable return of capital to the extent of the U.S. Holder's basis in the Ordinary Shares and thereafter as capital gain. However, the Company does not maintain calculations of its earnings and profits in accordance with U.S. federal income tax accounting principles. U.S. Holders should therefore assume that any distribution by the Company with respect to Ordinary Shares will constitute ordinary dividend income. U.S. Holders should consult their own tax advisers with respect to the appropriate U.S. federal income tax treatment of any distribution received from the Company.

Foreign Currency Dividends

Dividends paid in pounds sterling, euros or Swiss Francs will be included in income in a U.S. dollar amount calculated by reference to the exchange rate in effect on the day the dividends are received by the U.S. Holder, regardless of whether the pounds sterling, euros or Swiss Francs are converted into U.S. dollars at that time. If dividends received in pounds sterling, euros, or Swiss Francs are converted into U.S. dollars at the spot rate on the day they are received, the U.S. Holder generally will not be required to recognise foreign currency gain or loss in respect of the dividend income.

Effect of Swiss Withholding Taxes

As discussed in "Swiss Taxation—Withholding Tax", under current law payments of dividends by the Company out of reserves other than Qualifying Reserves are subject to Swiss Withholding Tax at the then prevailing rate (currently 35 per cent.). The rate of withholding tax applicable to U.S. Holders that are eligible for benefits under the Treaty is reduced to a maximum of 15 per cent. For U.S. federal income tax purposes, U.S. Holders will be treated as having received the amount of Swiss taxes withheld by the Company, and as then having paid over the withheld taxes to the Swiss taxing authorities. As a result of this rule, the amount of dividend income included in gross income for U.S. federal income tax purposes by a U.S. Holder with respect to a payment of dividends will be greater than the amount of cash actually received (or receivable) by the U.S. Holder from the Company with respect to the payment.

A U.S. Holder will generally be entitled, subject to certain limitations, to a credit against its U.S. federal income tax liability, or a deduction in computing its U.S. federal taxable income, for Swiss income taxes withheld by the Company. U.S. Holders that are eligible for benefits under the Treaty will not be entitled to a foreign tax credit for the amount of any Swiss taxes withheld in excess of the 15 per cent. maximum rate, and with respect to which the holder is entitled to obtain a refund from the Swiss taxing authorities.

For purposes of the foreign tax credit limitation, foreign source income is classified in one of two "baskets", and the credit for foreign taxes on income in any basket is limited to U.S. federal income tax allocable to that income. Dividends paid by the Company generally will constitute foreign source income in the "passive income" basket.

U.S. Holders that are accrual basis taxpayers, and who do not otherwise elect, must translate Swiss taxes into U.S. Dollars at a rate equal to the average exchange rate for the taxable year in which the taxes accrue, while all U.S. Holders must translate taxable dividend income into U.S. Dollars at the spot rate on the date received. This difference in exchange rates may reduce the U.S. dollar value of the credits for Swiss taxes relative to the U.S. Holder's U.S. federal income tax liability attributable to a dividend. However, cash basis and electing accrual basis U.S. Holders may translate Swiss taxes into

U.S. Dollars using the exchange rate in effect on the day the taxes were paid. Any such election by an accrual basis U.S. Holder will apply for the taxable year in which it is made and all subsequent taxable years, unless revoked with the consent of the IRS.

Prospective purchasers should consult their tax advisers concerning the foreign tax credit implications of the payment of Swiss taxes.

Sale or other Disposition

Upon a sale or other disposition of Ordinary Shares, a U.S. Holder generally will recognise capital gain or loss for U.S. federal income tax purposes equal to the difference, if any, between the amount realised on the sale or other disposition and the U.S. Holder's adjusted tax basis in the Ordinary Shares. This capital gain or loss will be long-term capital gain or loss if the U.S. Holder's holding period in the Ordinary Shares exceeds one year.

A U.S. Holder's tax basis in an Ordinary Share will generally be its U.S. dollar cost. The U.S. dollar cost of an Ordinary Share purchased with foreign currency will generally be the U.S. dollar value of the purchase price on the date of purchase, or the settlement date for the purchase, in the case of Ordinary Shares traded on an established securities market, within the meaning of the applicable Treasury Regulations, that are purchased by a cash basis U.S. Holder (or an accrual basis U.S. Holder that so elects). Such an election by an accrual basis U.S. Holder must be applied consistently from year to year and cannot be revoked without the consent of the IRS. The amount realised on a sale or other disposition of Ordinary Shares for an amount in foreign currency will be the U.S. dollar value of this amount on the date of sale or disposition. On the settlement date, the U.S. Holder will recognise U.S. source foreign currency gain or loss (taxable as ordinary income or loss) equal to the difference (if any) between the U.S. dollar value of the amount received based on the exchange rates in effect on the date of sale or other disposition and the settlement date. However, in the case of Ordinary Shares traded on an established securities market that are sold by a cash basis U.S. Holder (or an accrual basis U.S. Holder that so elects), the amount realised will be based on the exchange rate in effect on the settlement date for the sale, and no exchange gain or loss will be recognised at that time.

Disposition of Foreign Currency

Foreign currency received on the sale or other disposition of an Ordinary Share will have a tax basis equal to its U.S. dollar value on the settlement date. Foreign currency that is purchased will generally have a tax basis equal to the U.S. dollar value of the foreign currency on the date of purchase. Any gain or loss recognised on a sale or other disposition of a foreign currency (including its use to purchase Ordinary Shares or upon exchange for U.S. dollars) will be U.S. source ordinary income or loss.

Passive Foreign Investment Company Considerations

A foreign corporation will be a PFIC in any taxable year in which, after taking into account the income and assets of the corporation and certain subsidiaries pursuant to applicable "look-through rules," either (i) at least 75 per cent. of its gross income is "passive income" or (ii) at least 50 per cent. of the average value of its assets is attributable to assets which produce passive income or are held for the production of passive income. The Company does not believe that it was a PFIC for its preceding year and does not expect to be or become a PFIC for U.S. federal income tax purposes. Although income from the sales of commodities is generally passive income, a special rule treats active business gains from the sales of commodities as non-passive income provided certain requirements are met. To the extent the Company derives income from the sale of commodities, the Company believes that it currently meets these requirements. The Company's possible status as a PFIC must be determined annually, however, and may be subject to change if the Company fails to qualify under this special rule for any year in which a U.S. Holder holds Ordinary Shares.

If the Company were to be treated as a PFIC, U.S. Holders of Ordinary Shares would be required (i) to pay a materially greater amount of tax on certain distributions and gains on sale and (ii) to pay tax on any gain from the sale of Ordinary Shares at ordinary income (rather than capital gains) rates in addition to paying a materially greater amount of tax on this gain. Prospective purchasers should consult their tax advisers regarding the potential application of the PFIC regime.

Backup Withholding and Information Reporting

Payments of dividends and other proceeds with respect to Ordinary Shares, by a U.S. paying agent or other U.S. intermediary will be reported to the IRS and to the U.S. Holder as may be required under applicable regulations. Backup withholding may apply to these payments if the U.S. Holder fails to provide an accurate taxpayer identification number or certification of exempt status or fails to report all interest and dividends required to be shown on its U.S. federal income tax returns. Certain U.S. Holders are not subject to backup withholding. U.S. Holders should consult their tax advisers as to their qualification for exemption from backup withholding and the procedure for obtaining an exemption.

Reportable Transactions

A U.S. taxpayer that participates in a "reportable transaction" will be required to disclose its participation to the IRS. Under the relevant rules, if the Ordinary Shares are denominated in a foreign currency, a U.S. Holder may be required to treat a foreign currency exchange loss from the Ordinary Shares as a reportable transaction if this loss exceeds the relevant threshold in the regulations (U.S.$50,000 in a single taxable year, if the U.S. Holder is an individual or trust, or higher amounts for other non-individual U.S. Holders), and to disclose its investment by filing Form 8886 with the IRS. A penalty in the amount of U.S.$10,000 in the case of a natural person and U.S.$50,000 in all other cases is generally imposed on any taxpayer that fails to timely file an information return with the IRS with respect to a transaction resulting in a loss that is treated as a reportable transaction. Prospective purchasers are urged to consult their tax advisers regarding the application of these rules.

Foreign Financial Asset Reporting

Recently enacted legislation imposes new reporting requirements on the holding of certain foreign financial assets, including equity of foreign entities, if the aggregate value of all of these assets exceeds $50,000. The Ordinary Shares are expected to constitute foreign financial assets subject to these requirements unless the Ordinary Shares are held in an account at a domestic financial institution. U.S. Holders should consult their tax advisers regarding the application of this legislation.

5 Hong Kong taxation

The summary in the following paragraphs is intended for general information only and therefore does not constitute, in whole or in part, an expression of an opinion. The summary is based solely upon the information, documents, facts and assumptions which are included or referenced in the following paragraphs. Only the following specific Hong Kong tax issues and tax consequences are discussed and no other taxes of any kind are considered. The summary is based on the relevant laws, regulations, and interpretations of Hong Kong (the "authorities") that are in effect as of the date of this Prospectus. The authorities are subject to change, which may be retroactive in their effect. Any changes or developments that may affect the summary or any matters set forth herein and, in particular, any subsequent event after the date of this Prospectus will not be taken into consideration. In addition, the summary is not binding on the tax authorities or the courts and should not be considered as any representation, warranty, or guarantee that the tax authorities or the courts will concur with the summary. Any person who is in any doubt as to his or her tax position should consult his or her tax advisers immediately.

Tax on dividends

If the Company is chargeable to Hong Kong profits tax and a dividend is received from the Company, such dividend is specifically exempted from tax in Hong Kong under Hong Kong tax legislation. In other cases, i.e. where the dividend is received from the Company and the Company is not chargeable to Hong Kong profits tax, the current practice of the Hong Kong Inland Revenue Department is that no tax is charged in Hong Kong on such a dividend.

Tax on gains and profits tax

Chargeability to Hong Kong profits tax on gains from the sale of assets depends on the nature and source of the gains. No tax is imposed in respect of gains arising from the sale of capital assets. Trading gains from the sale of assets by persons carrying on a trade, profession or business in Hong Kong where the gains are derived from or arise in Hong Kong will be subject to Hong Kong profits tax, which is currently imposed at the rate of 16.5 per cent. on corporations and at a maximum rate of 15 per cent. on individuals.

In accordance with the prevailing practice of the Hong Kong Inland Revenue Department, the source of gains from the purchase and sale of listed shares through a stock exchange is ascertained by the location of the stock exchange where the shares in question are traded. In respect of the gains from the sale of Ordinary Shares through the Hong Kong Stock Exchange, the seller will be subject to Hong Kong profits tax if the seller carries on a trade, profession or business in Hong Kong and holds the Ordinary Shares for trading purposes.

Stamp duty

No Hong Kong stamp duty will be payable on the new issue of Ordinary Shares by the Company.

Hong Kong stamp duty will be payable by the purchaser on every purchase and by the seller on every sale of Hong Kong stock. Hong Kong stock is defined as "stock the transfer of which is required to be registered in Hong Kong" and includes Ordinary Shares traded through the Hong Kong Stock Exchange. The duty is charged at the *ad valorem* rate of 0.1 per cent. of the consideration for, or (if greater) the value of, the shares transferred on each of the seller and purchaser. In other words, a total of 0.2 per cent. would currently be payable on a typical sale and purchase transaction with respect to the transfer of the Company's Ordinary Shares through the Hong Kong Stock Exchange. In addition, any instrument of transfer (if required) will be subject to a flat rate of stamp duty of HK$5.00. The agent or, where no agent, the principal effecting the sale or purchase is liable for the payment of the stamp duty.

The purchaser and the seller of Ordinary Shares traded through the Hong Kong Stock Exchange are subject to Hong Kong stamp duty.

SECTION X: ADDITIONAL INFORMATION

1 Responsibility

1.1 The Company and the Directors, whose names and principal functions are set out in Section II: "Directors and Corporate Governance", accept responsibility for the information contained in this Prospectus. To the best of the knowledge of the Company and the Directors (each of whom has taken all reasonable care to ensure that such is the case), the information contained in this Prospectus is in accordance with the facts and does not omit anything likely to affect the import of such information.

1.2 Deloitte LLP accepts responsibility for the purposes of Prospectus Rule 5.5.3R (2)(f) for its reports on the historical financial information and the unaudited pro forma financial information of Glencore set out in Sections VI: "Historical and Financial Information" and VII: "Unaudited Pro Forma Financial Information" of this Prospectus, and has taken all reasonable care to ensure that the information contained in these reports is, to the best of its knowledge, in accordance with the facts and contains no omission likely to affect its import.

1.3 Mr Emerson accepts responsibility for the purposes of Prospectus Rule 5.5.3R (2)(f) for the mineral reserve and resources information in relation to AR Zinc, Los Quenuales and Sinchi Wayra as set out in Section I: "Information on Glencore" and confirms that he has taken all reasonable care to ensure that the relevant information, to the best of his knowledge, is in accordance with the facts and contains no omission likely to affect its import. Mr Emerson has consented to and not withdrawn his consent for inclusion of his name in the Prospectus, in the form and context in which such references appear.

1.4 Mr Simpson and Mr Hosken each accept responsibility for the purposes of Prospectus Rule 5.5.3R (2)(f) for the mineral reserves and resources information in relation to Cobar as set out in Section I: "Information on Glencore" and confirm that they have each taken all reasonable care to ensure that the relevant information, to the best of their knowledge, is in accordance with the facts and contains no omission likely to affect its import. Mr Simpson and Mr Hosken have each consented to and not withdrawn their respective consents for inclusion of their names in the Prospectus, in the form and context in which such references appear.

1.5 Mr Willem Van der Schyff accepts responsibility for the purposes of Prospectus Rule 5.5.3R (2)(f) for the mineral reserves and resources information in relation to Kansuki as set out in Section I: "Information on Glencore" and confirms that he has taken all reasonable care to ensure that the relevant information, to the best of his knowledge, is in accordance with the facts and contains no omission likely to affect its import. Mr Van der Schyff has consented to and not withdrawn his consent for inclusion of his name in the Prospectus, in the form and context in which such references appear.

1.6 Mr Selfe, Mr King, Mr Fowler and Mr O'Callaghan each accept responsibility for the purposes of Prospectus Rule 5.5.3R (2)(f) for the mineral reserves and resources information in relation to Murrin Murrin as set out in Section I: "Information on Glencore" and confirm that they have taken all reasonable care to ensure that the relevant information, to the best of their knowledge, is in accordance with the facts and contains no omission likely to affect its import. Mr Selfe, Mr King, Mr Fowler and Mr O'Callaghan have each consented to and not withdrawn their respective consents for inclusion of their names in the Prospectus, in the form and context in which such references appear.

1.7 Mr Denner and Mr Dippenaar each accept responsibility for the purposes of Prospectus Rule 5.5.3R (2)(f) for the mineral reserves and resources information in relation to Shanduka as set out in Section I: "Information on Glencore" and confirm that they have taken all reasonable care to ensure that the relevant information, to the best of their knowledge, is in accordance with the facts and contains no omission likely to affect its import. Mr Denner and Mr Dippenaar have each consented to and not withdrawn their respective consents for inclusion of their names in the Prospectus, in the form and context in which such references appear.

2 Incorporation and registered office

2.1 The Company was incorporated and registered in Jersey on 14 March 2011 as a public company limited by shares under the Jersey Companies Law with the name Glencore International

Limited and with the registered number 107710. The Company changed its name to Glencore International plc on 12 April 2011 pursuant to a special resolution.

2.2 The Company's registered office is at Queensway House, Hilgrove Street, St Helier, Jersey JE1 1ES (telephone number +44 1534 281800) and its principal place of business is Baarermattstrasse 3, PO Box 777, CH-6341 Switzerland.

2.3 The principal legislation under which the Company operates, and under which the Ordinary Shares were created, is the Jersey Companies Law.

2.4 The principal business of the Company will be to act as the ultimate holding company of the Glencore Group.

2.5 The accounting reference date of the Company is 31 December.

3 The Restructuring

The Restructuring will be implemented prior to UK Admission and will result in the Company becoming the new ultimate parent company of the Glencore Group, and the direct owner of 100 per cent. of the issued share capital of Glencore International at UK Admission. After the Price Determination Date, profit participation certificates issued by Glencore International (further details which are set out in note 14 to Sub-section B of Section VI: "Historical Financial Information") will be exchanged for new shares in Glencore Holding AG, the current parent company of Glencore International. Glencore Holding AG and Glencore L.T.E. AG (which is the other current shareholder of Glencore International) will then simultaneously merge with Glencore International by way of a statutory merger under Swiss law, with Glencore International as the surviving entity. After completion of this merger and before UK Admission, 100 per cent. of the issued shares in Glencore International will be contributed to the Company in consideration of the issue of new shares by the Company. If the Restructuring is not implemented in all material respects as described, the Global Offer will not proceed and Admission will not occur.

4 Subsidiaries

The Company is the ultimate holding company of the Glencore Group. The following table shows details of the Company's significant subsidiaries and undertakings. The issued share capital of each of these companies is fully paid.

Name of Subsidiary	Country of incorporation	Principal Activities	Percentage held by the Company	Publicly traded (✓/✗)
Glencore AG	Switzerland	Operating	100.0	✗
—Allied Alumina Inc. (Sherwin Alumina)	U.S.	Alumina production	100.0	✗
—Columbia Falls	U.S.	Aluminium production	100.0	✗
—Century Aluminum	U.S.	Aluminium production	44.0[1]	✓
—Glencore Funding LLC	U.S.	Finance	100.0	✗
Polymet[2]	Canada	Copper production	9.3	✓
Glencore UK Ltd	UK	Operating	100.0	✗
—Glencore Commodities Ltd	UK	Operating	100.0	✗
—Glencore Energy UK Ltd	UK	Operating	100.0	✗
Glencore Group Funding Limited	UAE	Finance	100.0	✗
—Glencore Finance (Bermuda) Ltd	Bermuda	Finance	100.0	✗
—Los Quenuales	Peru	Zinc/Lead production	97.1	✗
—Glencore Finance (Europe) SA	Luxembourg	Finance	100.0	✗
—Kansuki	DRC	Copper production	37.5	✗
—Mineria Altos de Punitaqui	Chile	Copper production	100.0	✗
—Mopani	Zambia	Copper production	73.1	✗
—Mutanda	DRC	Copper production	40.0	✗
—Prodeco	Colombia	Coal production	100.0	✗
—Recylex	France	Zinc/Lead production	32.2	✓
—Sinchi Wayra	Bolivia	Zinc/Tin production	100.0	✗
—UC Rusal	Jersey	Aluminium production	8.75	✓
Finges Investment B.V.	Netherlands	Finance	100.0	✗
—Biopetrol Industries AG[3]	Switzerland	Biodiesel production	60.3	✓
—Glencore Grain B.V	Netherlands	Operating	100.0	✗
—Nyrstar	Belgium	Zinc production	7.8	✓
—Rio Vermelho	Brazil	Sugar cane/ethanol production	76.0	✗
—Xstrata	UK	Diversified production	34.5	✓

Name of Subsidiary	Country of incorporation	Principal Activities	Percentage held by the Company	Publicly traded (✓/✗)
AR Zinc	Argentina	Zinc/Lead production	100.0	✗
Blackthorn Resources[4]	Australia	Zinc, Copper, Gold, Nickel production	13	✓
Chemoil[5]	Singapore	Oil storage	51.5	✓
Cobar	Australia	Copper production	100.0	✗
Glencore Exploration (EG) Ltd	Bermuda	Oil exploration/development	100.0	✗
Glencore Singapore Pte Ltd	Singapore	Operating	100.0	✗
Kazzinc	Kazakhstan	Zinc/Lead production	50.7[6]	✗
—VasGold	Kazakhstan	Gold production	100.0	✗
Katanga[7]	Bermuda	Copper production	74.4	✓
Murrin Murrin[8]	Australia	Nickel production	40.0	✗
Minara[9]	Australia	Nickel production	70.5	✓
Moreno	Argentina	Edible oils production	100.0	✗
Pacorini Group	Switzerland	Metals warehousing	100.0	✗
Pasar	Philippines	Copper production	78.2	✗
Portovesme S.r.L	Italy	Zinc/Lead production	100.0	✗
OAO RussNeft (various companies)[10]	Russia	Oil production	40.0 – 49.0	✗
Shanduka Coal	South Africa	Coal production	70.0	✗
ST Shipping	Singapore	Operating	100.0	✗
Topley	British Virgin Islands	Ship owner	100.0	✗
Volcan	Peru	Zinc production	5.94	✓

Notes:

(1) Represents Glencore's economic interest in Century, comprising 39.1 per cent. voting interest and 4.9 per cent. non-voting interest.

(2) Publicly traded on the Toronto Stock Exchange under the symbol POM and on the New York Stock Exchange under symbol PLM.

(3) Publicly traded on the Frankfurt Stock Exchange under symbol A0HNQ5. Glencore owns 46,812,601 shares.

(4) Publicly traded on the Australian Stock Exchange under symbol BTR. Subject to final regulatory approvals, Glencore owns 16,032,700 shares.

(5) Publicly traded on the Singapore Exchange under the symbol CHEL.SI. Glencore owns 66,204,594 shares.

(6) Glencore has agreed to acquire additional stakes in Kazzinc thereby increasing its ownership to 93.0 per cent.

(7) Publicly traded on the Toronto Stock Exchange under the symbol KAT.TO. Glencore owns 1,419,031,161 shares.

(8) The balance of the joint venture is held by Minara, giving Glencore an effective interest of 82.4 per cent. in the joint venture.

(9) Publicly traded on the Australian Stock Exchange under the symbol MOR.AX. Glencore owns 824,829,760 shares.

(10) Although Glencore holds more than 20 per cent. of the voting rights, it has limited key management influence and thus does not exercise significant influence.

5 Share capital of the Company

5.1 The Company was incorporated on 14 March 2011 with the name "Glencore International Limited" and a share capital of U.S.$0.02 divided into two Ordinary Shares of U.S.$0.01 each, which were issued on incorporation to each of Computershare Company Secretarial Services (Jersey) Limited and Computershare Nominees (Channel Islands) Limited as nominees for Ivan Glasenberg and Steven Kalmin, respectively. On 20 April 2011, one Subscriber Share was transferred to each of Ivan Glasenberg and Steven Kalmin. The Subscriber Shares will be repurchased by the Company on 23 May 2011 at their nominal value and then cancelled.

5.2 The issued and fully paid share capital of the Company as at 29 April 2011, being the last practicable date prior to publication of this Prospectus, is as follows:

Class of shares	Number	Amount
Ordinary Shares	2	U.S.$0.02

5.3 Pursuant to the Glencore International Purchase Agreement, on the day before the date of UK Admission and in consideration of the transfer of all of the issued share capital of Glencore International to the Company by Revelstoke Limited, the Company will issue 6,000,000,000 Ordinary Shares at the Offer Price, credited as fully paid up, to Revelstoke Limited on behalf of the Existing Shareholders. The Sale Shares will be transferred to the Selling Shareholder pursuant to the arrangements described in paragraph 1 of Section VIII: "Details of the Global Offer". The proposed issued and fully paid share capital of the Company as it is expected to be immediately following the acquisition by the Company of Glencore International becoming effective is as follows:

Class of shares	Number	Amount
Ordinary Shares	6,000,000,000	U.S.$60,000,000

5.4 On 3 May 2011, the Company passed a special resolution to authorise the purchase of the Subscriber Shares. On 3 May 2011, the Company entered into contracts to repurchase the Subscriber Shares at their nominal value on 23 May 2011.

5.5 By various written resolutions passed on 12 April 2011 and 3 May 2011, it was resolved by the holders of the Subscriber Shares that:

(a) the Company change its name from Glencore International Limited to Glencore International plc;

(b) the Company adopt the Articles, conditional on Admission;

(c) the authorised share capital of the Company be increased from U.S.$100 to U.S.$500,000,000 by the creation of an additional 49,999,990,000 Ordinary Shares;

(d) subject to UK Admission having occurred, authority be conferred on the Company's Directors pursuant to article 10.2(a) of the Articles to allot shares or grant rights to subscribe for or to convert any security into shares up to an aggregate nominal amount equal to the Authorised Allotment Amount (as defined in the Articles) for a period commencing on the date of Admission and ending at the conclusion of the Company's annual general meeting in 2012 or on 30 June 2012 (whichever is the earlier), and for the purposes of this resolution, the Authorised Allotment Amount (as defined in the Articles) shall be an amount equal to one-third of the New Issued Share Capital. For the purposes of this paragraph (d) and paragraphs (e), (f) and (g) below, the "New Issued Share Capital" is the nominal amount of the issued share capital of the Company immediately following UK Admission and as increased by any exercise of the Over-Allotment Option and/or the issue of the Kazzinc Consideration Shares;

(e) subject to UK Admission having occurred, authority be conferred on the Company's Directors pursuant to article 10.2(b) of the Articles to allot shares or grant rights to subscribe for or to convert any security into shares up to a further nominal amount equal to the Rights Issue Allotment Amount only in connection with a rights issue (as defined in the Articles) for a period commencing on the date of Admission and ending at the conclusion of the Company's annual general meeting in 2012 or on 30 June 2012 (whichever is the earlier) and, for the purposes of this resolution, the Rights Issue Allotment Amount (as defined in the Articles) shall be an amount equal to a further one-third of the New Issued Share Capital;

(f) subject to UK Admission having occurred, the Directors be empowered pursuant to article 10.3 of the Articles to allot equity securities (as defined in the Articles) wholly for cash:

  (i) pursuant to the authority granted as described in paragraph (d) above in connection with a pre-emptive offer (as defined in the Articles);

  (ii) pursuant to the authority granted as described in paragraph (e) above; and

  (iii) up to an aggregate nominal amount equal to the Non-Pre-Emptive Amount (as defined in the Articles),

  as if article 11 of the Articles (Pre-emption rights) did not apply and for the purposes of this resolution, the Non-Pre-Emptive Amount shall be an amount equal to 5 per cent. of the New Issued Share Capital. This power shall expire at the conclusion of the Company's annual general meeting in 2012 or on 30 June 2012 (whichever is the earlier);

(g) subject to UK Admission having occurred, the Company be generally and unconditionally authorised:

(i) pursuant to Article 57 of the Jersey Companies Law to make market purchases of Ordinary Shares, provided that:

(A) the maximum number of Ordinary Shares authorised to be purchased is the number equal to 10 per cent. of the number of Ordinary Shares comprising the New Issued Share Capital;

(B) the minimum price, exclusive of any expenses, which may be paid for an Ordinary Share is U.S.$0.01;

(C) the maximum price, exclusive of any expenses, which may be paid for an Ordinary Share shall be the higher of:

(I) an amount equal to 5 per cent. above the average of the middle market quotations for Ordinary Shares taken from the London Stock Exchange Daily Official List for the five business days immediately preceding the day on which such shares are contracted to be purchased; and

(II) the higher of the price of the last independent trade and the highest current independent bid on the London Stock Exchange Daily Official List at the time that the purchase is carried out; and

(D) the authority hereby conferred shall expire on the earlier of the conclusion of the Company's annual general meeting in 2012 or on 30 June 2012 (except that the Company may make a contract to purchase Ordinary Shares under this authority before such authority expires, which will or may be executed wholly or partly after the expiry of such authority, and may make purchases of Ordinary Shares in pursuance of any such contract as if such authority had not expired); and

(ii) pursuant to Article 58A of the Jersey Companies Law, to hold, if the Directors so desire, as treasury shares any Ordinary Shares purchased pursuant to the authority conferred by paragraph (i) above;

(h) the Glencore Deferred Bonus Plan, the Glencore Performance Share Plan and the Glencore Employee Share Trust be approved; and

(i) subject to UK Admission having occurred authority be conferred on the Directors to (i) allot (in addition to the authorities set out in paragraphs (d) to (f) above) shares sufficient to satisfy the rights of the investors in the Convertible Bonds to convert their bonds into Ordinary Shares of Glencore; and (ii) take any other action considered necessary or desirable by the Directors or the Company in assuming the obligations of Holdco under the terms and conditions of the Convertible Bonds.

5.6 Save as disclosed in this paragraph 5:

(a) there has been no change in the amount of the issued share or loan capital of the Company within three years of the date of this document; and

(b) no share or loan capital of the Company or any other member of the Glencore Group is under option or is, or will, immediately following UK Admission, be agreed, conditionally or unconditionally, to be put under option.

5.7 Save as disclosed in note 28 of the Historical Financial Information included in Section VI: "Historical Financial Information" of this Prospectus, there has been no change in the amount of the issued share or loan capital of any other member of the Glencore Group (other than intra-group issues by wholly-owned subsidiaries) within three years of the date of this Prospectus which is material in the context of the Glencore Group taken as a whole.

5.8 Save as disclosed in paragraph 18.6 below, the Company has no convertible securities, exchangeable securities or securities with warrants in issue.

6 Summary of the memorandum of association of the Company

Under the Jersey Companies Law, the capacity of a Jersey company is not limited by anything contained in its memorandum or Articles. Accordingly, the memorandum of association of a Jersey company does not contain an objects clause. The Company's memorandum of association is available for inspection at the addresses specified in paragraph 28 below.

7 Summary of the Articles of the Company

The Articles have been adopted conditional upon Admission and include provisions to the following effect:

7.1 **Alteration of share capital**

Subject to the provisions of the Jersey Companies Law, the Company may by special resolution reduce its share capital, share premium account or capital redemption reserve in any way.

7.2 **Share rights**

(a) Without prejudice to any special rights attached to any existing shares or class of shares, any share in the Company may be issued with such preferred, deferred or other special rights or restrictions as the Company may by special resolution determine.

(b) Subject to the provisions of the Jersey Companies Law, the special rights attached to any class of shares may be varied or abrogated either with the written consent of the holders of not less than three-quarters in nominal value of the issued shares of the class or the sanction of a special resolution passed at a separate meeting of the holders of the shares of the class.

7.3 **Allotment of securities and pre-emption rights**

(a) The Company may from time to time pass an ordinary resolution authorising the Directors of the Company to exercise all the powers of the Company to allot shares or grant rights to subscribe for or to convert any security into shares (i) generally up to the nominal amount specified in the resolution as being the Authorised Allotment Amount; and (ii) in connection with a rights issue only, up to a further nominal amount specified in the resolution as being the Rights Issue Allotment Amount. Any authority shall expire on the day specified in the resolution, not being more than five years after the date on which the resolution is passed.

(b) The Articles include pre-emption provisions requiring that equity securities issued for cash by the Company must first be offered to existing shareholders in proportion to their existing holdings of ordinary shares (excluding treasury shares). Exceptions to this rule include the allotment of:

(i) bonus shares;

(ii) equity securities to be paid up (either wholly or partly) otherwise than in cash; and

(iii) equity securities allotted for cash which are to be held under an employee share scheme.

(c) The Company may from time to time pass a special resolution empowering the Directors of the Company to exercise all the powers of the Company to allot equity securities wholly for cash:

(i) in connection with a rights issue;

(ii) in connection with a pre-emptive offer, up to an aggregate nominal amount specified in the resolution as being the Authorised Allotment Amount; and

(iii) otherwise than in connection with a rights issue or a pre-emptive offer, up to an aggregate nominal amount specified in the resolution as being the Non-Pre-Emptive Amount.

(d) Any authority shall expire on the day specified in the resolution, not being more than five years after the date on which the resolution is passed.

7.4 **Purchase of own shares and treasury shares**

Subject to the Jersey Companies Law and the Listing Rules:

(a) the Company may purchase any of its own shares of any class, including any redeemable shares, provided that any such purchase is first approved by special resolution; and

(b) the Company may hold as treasury shares any shares purchased or redeemed by it.

7.5 **Share certificates and uncertificated shares**

(a) Every holder of shares in certificated form whose name is entered on the Company's register of members is entitled, without payment, to a certificate in respect of such shares. In the case of joint holders, delivery of a certificate to one of the joint holders shall be sufficient delivery to all.

(b) Subject to the Jersey Companies Law and the CREST Regulations, the Directors may permit any class of shares to be held in uncertificated form and to be transferred by means of a relevant system and may revoke any such permission.

7.6 **Register of members**

The register of members of the Company must be kept in Jersey although branch registers may be kept in other territories.

7.7 **Calls on shares**

(a) The Directors may, from time to time, make calls upon the members in respect of any moneys unpaid on their shares, subject to the terms of allotment of such shares. Each member shall (subject to being given at least 14 clear days' notice in writing specifying the time or times and place of payment) pay to the Company the specified amount called on his shares.

(b) Unless the Directors decide otherwise, where a call is not paid on a share before or on the due date for payment, the person from whom it is due (and the Directors may also provide that he shall forfeit any dividends due in respect of the share) and shall not be entitled to vote at any meeting or upon a poll, or to exercise any privilege as a member in respect of the share, until he shall have paid all calls for the time being due and payable on the share held by him.

7.8 **Forfeiture and lien**

(a) If a member fails to pay in full any call or instalment of a call on or before the due date for payment, the Directors may, at any time thereafter, serve a notice in writing on him requiring payment of such unpaid amount together with any interest accrued thereon and any expenses incurred by the Company by reason of such non-payment. The notice shall state that, in the event of non-payment in accordance with the notice, the shares on which the call has been made will be liable to be forfeited. If the requirements of such notice are not met within the timeframe stated in that notice, any share in respect of which the notice was given may be forfeited by resolution of the Directors.

(b) The Company shall have a first and paramount lien on every share (not being a fully paid share) for all moneys (whether presently payable or not) called or payable at a fixed time in respect of such share. The Directors may, at any time, either generally or in any particular case, declare any share to be wholly or partly exempt from these provisions. The Company may sell, in such manner as the Directors think fit, any share on which the Company has a lien if any sum in respect of which the lien exists is presently payable and is not paid within 14 clear days of a notice of intention to sell the share in default of payment shall have been given to the holder of the share.

7.9 **Sale of shares of untraced members**

The Company may sell any share of a member who has not claimed dividends during a period of 12 years and who cannot be traced, as set out in the Articles.

7.10 **Transfer of shares**

(a) Any member may transfer all or any of his certificated shares by an instrument of transfer in writing in any usual or common form or in any other form acceptable to the Directors. An instrument of transfer shall be signed by or on behalf of the transferor and, unless the share is fully paid, by or on behalf of the transferee.

(b) All transfers of shares which are in uncertificated form shall, subject to the CREST Regulations, be effected by means of a computer system (as defined in the CREST Regulations).

(c) The Directors may, in their absolute discretion, refuse to register any transfer of an uncertificated share where permitted by the CREST Regulations.

(d) The Directors may, in certain circumstances, refuse to register the transfer of a certificated share, unless the instrument of transfer is:

(i) in respect of one class of share only;

(ii) in favour of not more than four joint transferees;

(iii) left at the registered office of the Company or such other place, as the Directors may decide, for registration; and

(iv) accompanied by the certificate for the shares to be transferred and such other evidence (if any) as the Directors may reasonably require as proof of title.

(e) If the Directors refuse to register a transfer of a share, they shall send the transferee notice of the refusal giving reasons for the refusal as soon as practicable.

(f) No fee shall be charged for the registration of any instrument of transfer or other document relating to or affecting the title to a share.

7.11 **Disclosure of interests in shares**

(a) The Company may give a disclosure notice to any person whom it knows, or has reasonable cause to believe, is either:

(i) interested in the Company's shares; or

(ii) has been so interested at any time during the three years immediately preceding the date on which the disclosure notice is issued.

(b) The disclosure notice may require the person:

(i) to confirm that fact or (as the case may be) to state whether or not it is the case; and

(ii) if he holds, or has during that time held, any such interest, to give such further information as may be required.

(c) The notice may require the person to whom it is addressed, where either:

(i) his interest is a present interest and another interest in the shares subsists; or

(ii) another interest in the shares subsisted during that three-year period at a time when his interest subsisted,

to give, so far as lies within his knowledge, such particulars with respect to that other interest as may be required by the notice, including the identity of persons interested in the shares in question.

(d) The notice may require the person to whom it is addressed, where his interest is a past interest, to give (so far as lies within his knowledge) particulars of the identity of the person who held that interest immediately upon his ceasing to hold it.

(e) Failure to provide the information within the time specified in the notice means that, if the Directors so determine, the holder of the relevant shares shall not be entitled to attend or vote either personally or by proxy at a shareholders' meeting or to exercise any other right confirmed by membership in relation to shareholder meetings for so long as the default continues (and, if those shares represent at least 0.25 per cent. of the issued shares of the class, the holder shall not, if the Directors so direct by notice to such holder, be entitled to receive any payment by way of dividend or to transfer any rights in the shares, provided that, in the case of shares in uncertificated form, the Directors may only exercise their discretion not to register a transfer if permitted to do so by the CREST Regulations).

7.12 **Disclosures pursuant to the Disclosure and Transparency Rules**

(a) The provisions of Chapter 5 of the Disclosure and Transparency Rules ("DTR5") are incorporated by reference into the Articles and the Company is be deemed to be an "issuer" (and not, for the avoidance of doubt, a "non-UK issuer"), as such term is defined in paragraph 5.1.1 of DTR5.

(b) If the Directors determine that a holder of shares has not complied with the provisions of DTR5, with respect to some or all of such shares held by that holder, the Directors shall have the right in the circumstances set out in the Articles to suspend the right of such shareholder to attend or vote in person or by proxy at any meeting of the Company, until said shareholder has cured the non-compliance with the provisions of DTR5; and/or

where the default shares represent 0.25 per cent. or more of the issued shares of the class:

(i) withhold any dividend or other amount payable with respect to such shares, such amount to be payable only after the notice of default ceases to have effect with respect to those shares; and/or

(ii) render ineffective any election to receive shares of the Company instead of cash in respect of any dividend or part thereof; and/or

(iii) prohibit the transfer of any shares in the Company held by the defaulting shareholder except in the circumstances set out in the Articles.

(c) The Company shall put in place policies and procedures under which persons discharging managerial responsibilities (as that term is defined in the Disclosure and Transparency Rules) shall be required to comply with Chapter 3 of the Disclosure and Transparency Rules.

7.13 **General meetings**

(a) The Directors shall convene, and the Company shall hold, annual general meetings, in accordance with the Jersey Companies Law. The Company must hold an annual general meeting within six months of the end of each financial year of the Company and not more than 15 months shall lapse between subsequent annual general meetings.

(b) The Directors may call further general meetings whenever they think fit. On the requisition of members pursuant to the provisions of the Jersey Companies Law or the Articles, the Directors shall also promptly convene a general meeting.

(c) An annual general meeting must be called by at least 21 clear days' notice. Any other general meeting must be called by at least 14 days' clear notice. Subject to the provisions of the Articles, the notice must be sent to all the members, to each of the Directors and to the auditors.

(d) Any procedural resolution put to the vote of the meeting shall be decided on a show of hands, unless (before or on the declaration of such a vote) a poll is demanded by:

(i) the chairman of the meeting;

(ii) at least five members present in person or by proxy and entitled to vote on the resolution;

(iii) a member or members present in person or by proxy and representing not less than one-tenth of the total voting rights of all the members having the right to vote on the resolution; or

(iv) a member or members present in person or by proxy and holding shares in the Company conferring a right to vote at the meeting, being shares on which an aggregate sum has been paid up equal to not less than 10 per cent. of the total sum paid up on all the shares conferring that right.

Any other resolution put to the vote of the meeting shall be decided on a poll.

(e) An ordinary resolution shall be passed by a simple majority of votes in favour and a special resolution shall be passed by a three-quarters majority of votes in favour.

(f) A poll at a general meeting shall be taken in such manner as the chairman of the meeting may decide.

(g) A Director and any proxy shall, notwithstanding that he is not a member, be entitled to attend and speak at any general meeting and at any separate meeting of the holders of any class of shares in the capital of the Company.

(h) The shareholders who generally represent at least 5 per cent. of the total voting rights of all members having a right to vote at a general meeting are permitted to requisition a general meeting and the shareholders who generally represent at least 2.5 per cent. of the total voting rights of all members having a right to vote at an annual general meeting are permitted to require the Company to circulate members' resolutions to be moved at the next annual general meeting and require the Company to circulate statements relating to resolutions to be dealt with at a general meeting.

(i) Shareholders generally representing at least 5 per cent. of the total voting rights or not fewer than 100 members having a right to vote on a matter to which a poll relates may require the Board to obtain an independent report on any poll taken, or to be taken, at a general meeting of the Company.

7.14 **Voting rights**

Subject to the Articles and any special rights or restrictions as to voting attached to any shares, on a show of hands every member (or his proxy) present shall have one vote and on a poll every member (or his proxy) present shall have one vote for every share of which he is the holder. A member may appoint more than one proxy to vote on that member's behalf. A member that is a body corporate may appoint a corporate representative to represent it at a general meeting. Jersey law does not expressly permit the appointment of more than one corporate representative by a member in respect of the same shareholding.

7.15 **Directors**

Appointment of Directors

(a) Unless otherwise determined by ordinary resolution, the number of Directors shall not be subject to any maximum but shall not be less than two. The Directors may be appointed by ordinary resolution or by the Directors. Subject to the provisions on rotation of Directors, any Director appointed by the Board holds office only until the next following annual general meeting and, if not reappointed at such annual general meeting, shall vacate office at its conclusion.

(b) The Directors may appoint any one or more of their body to be executive Directors and confer on them any powers exercisable by them as the Directors think fit.

Chairman of the Board

The Board of the Company may appoint a chairman of the Board.

Age of Directors

No age limit shall apply to Directors of the Company.

Qualification of Directors

A Director shall not be required to hold any shares in the capital of the Company by way of qualification.

Retirement of Directors by rotation

Each Director shall retire at the next annual general meeting if appointed by the Board since the previous annual general meeting. Each Director shall retire at the annual general meeting held in the third calendar year following the annual general meeting at which he was last elected or re-elected. Each such retiring Director of the Company shall be eligible for re-election by shareholders at the annual general meeting at which he has retired unless the Board determines otherwise.

Removal of Directors

The Company may, by ordinary resolution, remove any Director before his period of office has expired. A Director may also be removed from office by the service on him of a notice to that effect signed by or on behalf of all the other Directors.

Remuneration of Directors

(a) The ordinary remuneration of the Directors who do not hold executive office for their services shall be limited to, in aggregate, £3 million per annum, or such higher amount as may be determined by ordinary resolution.

(b) Any Director who holds any executive office with the Company or any subsidiary undertaking of the Company or who performs any special or extra services for, or at the request of, the Company may be paid such extra remuneration as the Board may determine.

(c) In addition to any remuneration to which the Directors are entitled under the Articles, each Director may be paid all reasonable expenses incurred by him in the discharge of his duties, including his expenses of travelling to and from meetings of the Directors or of any committee of the Directors or general meetings of the Company.

(d) The Board may pay, provide or procure the grant of pensions or other retirement or superannuation benefits and death, disability or other benefits, allowances or gratuities for any past or present Director or the relatives or dependants of any such person. For this purpose, the Board may establish and maintain, participate in or contribute to any non-contributory or contributory pension or superannuation fund, scheme or arrangement and pay any insurance premiums.

Payment for loss of office

(a) Except in certain circumstances permitted by the Articles, the Company shall not make a payment for loss of office to a Director of the Company unless the payment has been approved by an ordinary resolution of the Company.

(b) Before such a resolution may be passed, a memorandum setting out particulars of the proposed payment (including its amount) is made available for inspection by shareholders:

    (i) at the registered office of the Company for not less than 15 clear days ending with the date that the proposed resolution is put to the members; and

    (ii) at the meeting at which the proposed resolution is put to the members.

Permitted interests of Directors

(a) Subject to compliance with the Articles and Jersey Companies Law, a Director may hold office, be employed by or be interested in any Glencore company or be party to or be interested in any contract, transaction or arrangement with any Glencore company or in which the Company is otherwise interested.

(b) A Director must have certain interests authorised by the other Directors as if the provisions of section 175 of the UK Companies Act 2006 applied to the Company.

(c) A Director may not vote in respect of authorisation of his interest and will not count towards the quorum of the meeting of Directors at which the interest is considered.

Restrictions on voting

A Director shall not be entitled to vote on any resolution of the Board concerning a matter in which he or any person connected with him is interested, but this prohibition shall not apply to amongst other things:

(a) any transaction or arrangement in which he or any connected person is interested by virtue of an interest in shares, debentures or other securities of the Company or otherwise in or through the Company;

(b) the giving of a guarantee, security or indemnity in respect of money lent or obligations incurred by him or any other person at the request of, or for the benefit of, the Company or any of its subsidiary undertakings;

(c) the giving of a guarantee, security or indemnity in respect of a debt or obligation of the Company or any of its subsidiary undertakings for which the Director has assumed responsibility (in whole or in part and whether alone or jointly with others) under a guarantee or indemnity or by the giving of security;

(d) any issue of shares, debentures or other securities of the Company or any of its subsidiary undertakings for subscription or purchase, in which offer he is or may be entitled to participate as a holder of securities or in the underwriting or sub-underwriting of which he is to participate;

(e) any transaction or arrangement concerning any other company in which he does not hold voting rights representing 1 per cent. or more of any class of the equity share capital of that company;

(f) the adoption, modification or operation of a pension fund, retirement, death or disability benefits scheme or an employee share scheme under which he may benefit and which does not award him any privilege or benefit not generally awarded to the employees or former employees to whom such arrangement relates; or

(g) the purchase or maintenance of insurance for any Director of the Company against any liability.

Board meetings

(a) Directors may convene meetings as they deem fit. The quorum necessary for transactions of the business of a Board meeting is two Directors. The Chairman of the Board meeting has the casting vote.

(b) No fewer than half of the Board meetings in any financial year shall be held in Switzerland.

(c) The Directors may adopt decisions by written resolution and may appoint committees as they deem fit and appropriate.

Borrowing powers

The Board may exercise all the powers of the Company to borrow money and to mortgage or charge its undertaking, property and uncalled capital and to issue debentures and other securities. There is no obligation on the Directors to restrict the borrowings of the Company.

7.16 **Nomination rights**

(a) A member who holds shares on behalf of another person may nominate that person to enjoy information rights.

(b) For these purposes, "information rights" means:

  (i) the right to receive a copy of all communications that the Company sends to its members generally or to any class of its members that includes the person making the nomination;

  (ii) the right to receive one copy of the Company's last annual accounts, the last Directors' remuneration report, the last Directors' report and the auditor's report on those accounts (including the report on the Directors' remuneration report and on the Directors' report);

  (iii) the right to receive one copy of the summary financial statements of the Company; and

  (iv) the right to receive one copy of any document or information, in hard copy form, which has been provided to the members, by the Company, by means of electronic communication.

(c) If the person to be nominated in accordance with paragraph (a) above wishes to receive hard copy communications, he must, prior to the nomination being made, request the person making the nomination to notify the Company of that fact and provide an address to which such copies may be sent. If, having received such a request, the person making the nomination notifies the Company that the nominated person wishes to receive hard copy communications and provides the Company with that address, the right of the nominated person is to receive hard copy communications accordingly.

(d) If the nominated person does not make such a notification or provide an address to the Company for delivery of the information, he is taken to have agreed that documents or information may be sent or supplied to him by the Company by means of a website. Such agreement may be revoked by the nominated person making the notification or sending details of his address to the Company.

(e) The nomination may be terminated at the request of the member or of the nominated person and will cease to have effect in certain circumstances as set out in the Articles.

(f) These rights are in addition to the rights of the member himself.

(g) Any provision of the Jersey Companies Law and any provision of the Articles having effect in relation to communications with members has a corresponding effect (subject to any necessary adaptations) in relation to communications with the nominated person.

7.17 **Electronic communications**

(a) The Company may send or supply a document or information by way of electronic communication to any shareholder who has agreed (generally or specifically) that notices, documents or information can be sent or supplied to them in that form and has not revoked such agreement. The Company may do so by sending or supplying the document or communication to such address as may from time to time be specified for that purpose by the intended recipient or by making it available on a website and notifying the shareholder that it has been made available. A member shall be deemed to have agreed that the Company may send or supply a document or information by means of a website if the conditions set out in the Articles have been satisfied.

(b) A shareholder whose registered address is not within Jersey, the United Kingdom or Hong Kong shall not be entitled to receive any document from the Company in hard copy form unless he gives to the Company a postal address within Jersey, the United Kingdom or Hong Kong at which notices may be given to him.

(c) Where a document or information is sent or supplied by means of a website, it shall be deemed to have been received:

  (i) when the material was first made available on the website; or

  (ii) if later, when the recipient received or was deemed to have received notice of the fact that the material was available on the website.

7.18 **Dividends and other distributions**

(a) Subject to the provisions of the Jersey Companies Law, the Company may, by ordinary resolution, declare dividends but no such dividend shall exceed the amount recommended by the Board.

(b) Subject to the provisions of the Jersey Companies Law, the Board may pay fixed and interim dividends if, and insofar as, in the opinion of the Board, the financial position of the Company justifies such payments. If the Board acts in good faith, the Directors shall not incur any liability to the holders of any shares for any loss they may suffer by the lawful payment, on any other class of shares having non-preferred or deferred rights, of any such fixed or interim dividend.

(c) The Company may, upon the recommendation of the Board, by ordinary resolution, direct payment of a dividend in whole or in part *in specie* and the Board shall give effect to such resolution.

(d) No dividend or other moneys payable in respect of a share shall bear interest against the Company.

(e) The Board may retain any dividend or moneys payable in respect of a share on which the Company has a lien.

(f) Any dividend unclaimed after a period of 12 years from the date on which such dividend was declared or became due for payment shall be forfeited and revert to the Company.

(g) The Board may, if authorised by an ordinary resolution of the Company, offer any holder of shares the right to elect to receive shares by way of scrip dividend instead of cash.

7.19 **Summary financial statements**

The Company may send summary financial statements to shareholders instead of copies of its full accounts and reports, in accordance with the Articles.

7.20 **Indemnity and insurance of Directors and officers**

Subject to the provisions of, and to the extent permitted by, the Jersey Companies Law, the Company shall:

(a) indemnify any Director of the Company (or of a subsidiary undertaking) against any liability;

(b) indemnify a director of a company that is a trustee of an occupational pension scheme for employees (or former employees) of the Company (or of any subsidiary of the Company) against liability incurred in connection with that company's activities as trustee of the scheme;

Subject to the provisions of, and to the extent permitted by Jersey Companies Law, the Company may:

(i) purchase and maintain insurance against any liability for any director referred to in paragraphs (a) or (b) above; and

(ii) provide any director referred to in paragraph (a) or (b) above with funds (whether by loan or otherwise) to meet expenditure incurred or to be incurred by him in defending any criminal, regulatory or civil proceedings or in connection with an application for relief (or to enable any such director to avoid incurring such expenditure).

7.21 **Winding-up**

Subject to any particular rights or limitations for the time being attached to any shares, if the Company is wound up, the assets available for distribution among the members shall be distributed to the members *pro rata* to the number of shares held by each member at the time of the commencement of the winding-up. If any share is not fully paid up, that share shall only carry the right to receive a distribution calculated on the basis of the proportion that the amount paid up on that share bears to the issue price of that share.

If the Company is wound up, the Company may, with the sanction of a special resolution of the Company and any other sanction required by the Jersey Companies Law and the liquidator or, where there is no liquidator, the Directors may, for that purpose, value any assets and determine how the division shall be carried out as between the members or different classes of members and vest the whole or any part of the assets in trustees upon such trusts for the benefit of members as the liquidator or the Directors shall think fit. No shareholder shall be compelled to accept any assets in respect of which there is any liability.

8 Takeover regulation

The City Code will govern takeover offers for the Company and other matters to which the City Code applies. The Jersey Takeover Law provides a statutory framework for the application of the City Code to takeover offers for Jersey incorporated companies and other matters to which the City Code applies, and appoints the Panel on Takeovers and Mergers (the "Panel") as the body to oversee takeover offers for Jersey incorporated companies.

8.1 Mandatory bids

Under the City Code, if an acquisition of Ordinary Shares were to increase the aggregate holding of an acquirer and its concert parties to Ordinary Shares carrying 30 per cent. or more of the voting rights in Glencore, the acquirer and, depending upon the circumstance, its concert parties would be required (except with the consent of the Panel) to make a cash offer for the outstanding Ordinary Shares at a price not less than the highest price paid for the Ordinary Shares by the acquirer or its concert parties during the previous 12 months. A similar obligation to make such a mandatory offer would also arise on the acquisition of Ordinary Shares by a person holding (together with its concert parties) Ordinary Shares carrying between 30 per cent. and 50 per cent. of the voting rights in Glencore, if the effect of such acquisition were to increase that person's percentage of the voting rights.

8.2 Squeeze-out

The Jersey Companies Law provides that, where a person (the "Offeror") makes a takeover offer to acquire all of the shares (or all of the shares in any class) in a Jersey company (other than any shares already held by the Offeror at the date of the offer), if the Offeror has, by virtue of acceptance of the offer, acquired or contracted to acquire not less than 90 per cent. in nominal value of the shares (or class of shares) to which the offer relates, the Offeror may (subject to the requirements of the Jersey Companies Law), by notice to the holders of the shares (or class of shares) to which the offer relates which the Offeror has not already acquired or contracted to acquire, compulsorily acquire those shares. A holder of any shares who receives a notice of compulsory acquisition may (within six weeks from the date on which such notice was given) apply to the Jersey court for an order that the Offeror not be entitled and bound to purchase the holder's shares or that the Offeror purchase the holder's shares on terms different to those of the offer.

8.3 Sell-out

Where, before the end of the period within which the takeover offer can be accepted, the Offeror has by virtue of acceptance of the offer acquired or contracted to acquire not less than 90 per cent. in nominal value of all of the shares (or all of the shares of a particular class) of the Jersey company, the holder of any shares (or class of shares) to which the offer relates who has not accepted the offer may, by written notice to the Offeror, require the Offeror to acquire the holder's shares. The Offeror shall (subject to the requirements of the Jersey Companies Law) be entitled and bound to acquire the holder's shares on the terms of the offer or on such other terms as may be agreed. Where a holder gives the Offeror a notice of compulsory acquisition, each of the Offeror and the holder of the shares is entitled to apply to the Jersey court for an order that the terms on which the Offeror is entitled and bound to acquire the holder's shares shall be such as the court thinks fit.

9 Directors of the Company

9.1 The Directors and their functions within the Company and Glencore and brief biographies are set out in Section II: "Directors and Corporate Governance".

9.2 The companies and partnerships of which the Directors are, or have been, within the past five years, members of the administrative, management or supervisory bodies or partners (excluding the Company and its subsidiaries and also excluding the subsidiaries of the companies listed below) are as follows:

Name	Current directorships/partnerships	Former directorships/partnerships
Independent Chairman		
Simon Murray	Asia Resources Fund Limited ARF Investment Management Limited Beryl Overseas Limited Beyond Asia Holdings Ltd Bright Zone Enterprises Ltd Capital Way Holdings Limited Cheung Kong Holdings Ltd. Compagnie Financière Richemont SA Diamond Creek International Limited Energy Success Investments Limited Essar Energy plc GEMS AAA Limited GEMS Oriental And General Fund II Limited GEMS Oriental And General Fund Limited GEMS III Limited General Enterprise Management Services Limited General Enterprise Management Services (International) Limited Grace Semiconductor Manufacturing Corporation Greenheart Group Limited Guggenheim Investment Advisors (Europe) Limited IRC Limited K.K. Jermyn Capital Million Star Corporation Morningstar Capital & Investment Ltd Onyx Overseas Limited Orient Overseas (International) Ltd. Poly Stone Holdings Limited San Marino Telecom Silver Heritage Limited Simclan Ltd. Simon Film Productions Limited Simon Murray & Associates Limited Simon Murray & Co. (Cayman) Limited Simon Murray & Co. China Fund Limited Simon Murray & Co. (Japan) Limited Simon Murray & Co. Limited Simon Murray & Company (Hong Kong) Limited Simon Murray (San Marino) Holdings Ltd Sino Forest Corporation SMC China Fund SPC SMC (China) Capital Limited SMC RMB General Partner I Limited Tektite Overseas Limited Ultragrand Limited Wing Tai Properties Limited Yarrum Limited	Arnhold Holdings Ltd Bemobile Limited Clariden Limited Compass Technology Holdings Ltd. Hermes International Hutchison Whampoa Ltd. Pacific Century Regional Developments Ltd. Sunday Communications Ltd. Tommy Hilfiger Corporation Usinor SA Vivendi Universal Vodafone Group Plc Yozan Inc.
Executive Directors		
Ivan Glasenberg	Xstrata plc United Company RUSAL Plc	Century Aluminum
Steven Kalmin	None[(1)]	None

Name	Current directorships/partnerships	Former directorships/partnerships
Non-Executive Directors		
Peter Coates	Santos Ltd. Amalgamated Holdings Limited	Cumnock Coal Limited Minara Resources Limited Xstrata Australia Pty Limited Downer EDI Limited
Leonhard Fischer	RHJ International S.A. Kleinwort Benson Group Julius Baer Gruppe AG AXA Konzern AG Arecon AG	3W Power Solutions S.A Winterthur Group Credit Suisse Group
Anthony Hayward	TNK-BP MIT Energy Advisory Board AEA Capital British Olympic Advisory Board	BP plc Corus Group Tata Steel
William Macaulay	BGWM 2 GP, LLC First Reserve Corporation, LLC First Reserve Energy Infrastructure Advisors, LLC First Reserve Energy Infrastructure GP Limited First Reserve International Limited First Reserve XII Advisors, LLC FR Horizon GP Limited FR X Offshore GP Limited FR XI Offshore GP Limited FR XII PBF Holdings LLC FRC Founders Corporation City University of New York Dresser-Rand Group, inc. First Reserve GP X, inc. First Reserve GP XI, inc. First Reserve GP XII Limited First Reserve Management Limited First Reserve Partners Limited FR XII Alternative GP Ltd. Odyssey Investment Partners The Rogosin Institute Weatherford International, Ltd. First Reserve Energy Infrastructure GP Limited	2B2J, L.P. Alpha Natural Resources, inc. AMCI Capital GP Limited AMCI Holdings Australia PTY LTD BGWM L.P. Cairngorm Oil & Gas LLP DEG Acquisitions, LLC Dresser, Ltd. DSS Holdings GP Limited First Reserve GP IX, inc. Foundation Coal Holdings, inc. FR IX Offshore GP Limited FR PRJV GP Limited Narrabri Coal PTY Ltd Petrel Re Holdings Limited Sirocco Holdings Limited Sirocco Reinsurance Limited (Bermuda) Turbo Cayman Limited Whitehaven Coal Mining Limited Dresser, inc.
Li Ning	Henderson Land Development Company Limited Hong Kong (Ferry) Holdings Company Limited	Henderson Investment Limited

Note:

(1) Steven Kalmin will be standing for election to the Century Aluminum board, at the Century Aluminum 2011 annual general meeting expected to be held in June 2011. Century Aluminum has agreed to publicly support and recommend the election of Mr Kalmin at such annual general meeting.

Save as set out above, none of the Directors or the Company Secretary have any business interests, or perform any activities, outside Glencore which are significant with respect to Glencore.

9.3 There are no family relationships between any Directors.

9.4 As at the date of this Prospectus, none of the Directors has, at any time within the last five years:

(a) had any prior convictions in relation to fraudulent offences;

(b) been declared bankrupt or been the subject of any individual voluntary arrangement;

(c) been associated with any bankruptcies, receiverships or liquidations when acting in the capacity of a member of the administrative, management or supervisory body or of a senior manager;

(d) been subject to any official public incrimination and/or sanction by any statutory or regulatory authority (including designated professional bodies);

(e) been disqualified by a court from acting in the management or conduct of the affairs of any issuer;

(f) been disqualified by a court from acting as a member of the administrative, management or supervisory bodies of any issuer;

(g) been a partner or senior manager in a partnership which, while he was a partner or within 12 months of his ceasing to be a partner, was put into compulsory liquidation or administration or which entered into any partnership voluntary arrangement;

(h) owned any assets which have been subject to a receivership or been a partner in a partnership subject to a receivership where he was a partner at a time or within the 12 months preceding such event; or

(i) been an executive director or senior manager of a company which has been placed in receivership, compulsory liquidation, creditors' voluntary liquidation or administration or which entered into any company voluntary arrangement or any composition or arrangement with its creditors generally or any class of creditors, at any time during which he was an executive director or senior management of that company or within 12 months of his ceasing to be an executive director or senior manager.

9.5 The aggregate remuneration paid (including any contingent or deferred compensation) and benefits in kind granted to the Directors by Glencore and its subsidiaries during the financial year ended 31 December 2010 for services in all capacities was U.S.$471.8 million. This sum includes amounts of remuneration allocated to Directors in respect of their profit participation certificates for the financial year ended 31 December 2010. As described in paragraph 3 of Part X: "Additional Information", following completion of the Restructuring, all profit participation certificates will have been exchanged for Ordinary Shares and will not be allocated amounts in respect of profit for financial years commencing on or after 1 January 2011.

9.6 The total amount set aside or accrued by Glencore or its subsidiaries to provide pension, retirement or similar benefits for the Directors of Glencore for the financial year ended 31 December 2010 was U.S.$91,021.

10 Directors' service contracts, terms of appointment and other details

10.1 Each of the Executive Directors has a service contract with Glencore International AG which will be effective from Admission.

10.2 The terms of the Executive Directors' service contracts are summarised below:

Name	Position	Date of contract	Notice period(1)	Salary (£)
Executive Directors(2)(3)				
Ivan Glasenberg	Chief Executive Officer	28 April 2011	12 months	925,000
Steven Kalmin	Chief Financial Officer	28 April 2011	12 months	700,000

Notes:

(1) Other than entitlement to notice, a payment in lieu of notice, Executive Directors will not be entitled to compensation on termination of their contract.

(2) The Executive Directors are entitled to participate in any benefit (including pension) arrangements which Glencore has in place from time to time for categories of employees of which they are members.

(3) The Executive Directors are entitled, at the Company's discretion, to participate in the Company's bonus arrangements from time to time. The current maximum annual bonus opportunity for each of them is 200 per cent. of annual salary mentioned above.

10.3 The Non-Executive Directors do not have service contracts although they have letters of appointment reflecting their responsibilities and commitments. Under the Articles, all Directors must retire by rotation and seek re-election by shareholders every three years, however, it is intended that the Directors shall each retire and submit themselves for re-election by shareholders annually.

10.4 The terms of the Non-Executive Directors' appointment letters are summarised below:

Name	Position	Date of joining the Board	Notice period (months)(1)(2)	Total fees(3) (£)
Non-Executive Directors				
Simon Murray	Non-Executive Chairman	28 April 2011	3	675,000
Peter Coates	Non-Executive Director	14 April 2011	3	128,800
Leonhard Fischer	Non-Executive Director	14 April 2011	3	128,800
Anthony Hayward	Non-Executive Director	14 April 2011	3	158,800
William Macaulay	Non-Executive Director	14 April 2011	3	126,300
Li Ning	Non-Executive Director	14 April 2011	3	90,800

Notes:

(1) Under the Articles, all Directors must retire by rotation and seek re-election by shareholders every three years, however, it is intended that the Directors shall each retire and submit themselves for re-election by shareholders annually.

(2) Other than the entitlement to notice, Non-Executive Directors will not be entitled to compensation on termination of their appointment.

(3) Total fees vary due to different roles and committees the various Non-Executive Directors sit on.

10.5 During the three financial years ended 31 December 2010, no emolument was paid by Glencore to any of the Directors as an inducement to join or upon joining Glencore or as compensation for loss of office. None of the Directors waived any emoluments during the same period.

11 Directors' interests

11.1 The interests in the share capital of the Company of the Directors (all of which, unless otherwise stated, are beneficial or are interests of a person connected with a Director), assuming that the Offer Price is at the mid-point of the Offer Price Range, the Over-Allotment Option is not exercised and that the Kazzinc Consideration Shares have not been issued immediately prior to and following Admission are as follows:

	Immediately prior to Admission		Immediately following Admission	
Name	No. of Ordinary Shares	Percentage of issued share capital	No. of Ordinary Shares	Percentage of issued share capital
Directors				
Ivan Glasenberg	1,086,881,843	18.1	1,086,881,843	15.8
Steven Kalmin	70,676,710	1.2	70,676,710	1.0

11.2 There are no outstanding loans granted by any member of the Glencore Group to any Director, nor has any guarantee been provided by any member of the Glencore Group for their benefit.

11.3 There are:

(a) no potential conflicts of interest between any duties to the Company of the Directors and their private interests and/or other duties; and

(b) no arrangements or understandings with the members, suppliers or others pursuant to which any Director was selected.

11.4 Save as set out in Section VIII: "Details of the Global Offer", there are no restrictions agreed by any Director on the disposal within a certain time of their holdings in the Company's securities.

11.5 No awards have been granted to date to the Directors pursuant to the Glencore employee share plans. See paragraph 14 of this Section X for further details.

12 Interests of significant Shareholders

12.1 Other than the interests of the Directors disclosed in paragraph 11 above and other than any interest that may arise under the Underwriting Agreement (assuming that the Offer Price is at the mid-point of the Offer Price Range, the Over-Allotment Option is not exercised and that the Kazzinc Consideration Shares have not been issued), as far as the Company is aware, the following persons immediately prior to Admission are interested and will following Admission be interested, in three per cent. or more of the Company's issued ordinary share capital:

	Immediately prior to Admission		Immediately following Admission	
Name	**No. of Ordinary Shares**	**Percentage of issued share capital**	**No. of Ordinary Shares**	**Percentage of issued share capital**
Daniel Francisco Maté Badenes	416,354,564	6.9	416,354,564	6.0
Aristotelis Mistakidis	411,766,382	6.9	411,766,382	6.0
Tor Peterson(1)	366,255,354	6.1	366,255,354	5.3
Alex Beard	320,506,122	5.3	320,506,122	4.6
Selling Shareholder	238,782,586	4.0	nil	nil

Note:

(1) Within the meaning of Chapter 5 of the UK Disclosure and Transparency Rules, Tor Peterson is an indirect holder of 105,548,031 Ordinary Shares held by Cititrust (Switzerland) Limited pursuant to a fiduciary arrangement established for his benefit prior to the Restructuring. This indirect holding of Ordinary Shares is included in the above table.

12.2 The Company's significant Shareholders do not have and will not have different voting rights attached to the Ordinary Shares they hold to those held by the other Shareholders.

12.3 The Company is not aware of any person who immediately following Admission, directly or indirectly, jointly or severally, will own or could exercise control over the Company.

13 Pensions

Glencore and certain subsidiaries sponsor various pension schemes in accordance with local regulations and practices and among these schemes are defined contribution plans as well as defined benefit plans. Eligibility for participation in the various plans is based on either completion of a specified period of continuous service or date of hire. The plans provide for certain employee and employer contributions, ranging from five to 16 per cent. of annual salaries, depending on the employee's years of service. However, the majority of employees do not participate in a pension scheme offered by Glencore. Approximately 3 per cent. of Glencore's employees participate in its defined benefit pensions schemes and these are mainly operated in the U.S., the UK and Switzerland, which account for more than 90 per cent. of Glencore's aggregate pension liabilities.

14 Glencore employee share plans

14.1 Overview

Glencore believes that its employee ownership structure has been an important element of its successful growth since its inception, with its consistent profitability, the long-term tenure of its management team and prudent risk management policies having been a direct result of this ownership structure. As explained under "Description of ownership structure" in Section II: "Directors and Corporate Governance", to continue this strong culture of employee ownership within Glencore, the Company has adopted the following employee share plans:

(a) the Glencore Performance Share Plan (the "PSP"); and

(b) the Glencore Deferred Bonus Plan (the "DBP").

No awards have been granted under these plans to date. It is not proposed to make any awards in calendar year 2011 other than awards under the PSP to new hires and any top-up awards to existing employees necessary to reflect their level of seniority and/or performance in line with their peers (where such top-up awards, if any, are not expected to be material). These plans are in addition to the annual short-term bonus arrangements in place for the Glencore employees.

The principal features of the PSP and the DBP are summarised below.

Also summarised below are the principal features of certain long-service and phantom equity awards made to employees of the Group. It is not proposed to grant further awards under either of these arrangements.

The Company has also adopted an employee benefit trust which may be used to provide Ordinary Shares to satisfy awards under the PSP and/or the DBP.

14.2 **Glencore Performance Share Plan**

(a) Summary

Under the PSP, a participant is granted a right (a "PSP Award") to receive free Ordinary Shares after a specified period, subject to continued employment, forfeiture for malus events and, for Executive Directors, satisfaction of the agreed performance condition(s).

PSP Awards will be granted to employees who have demonstrated excellent performance over a sustained period. It is proposed that PSP Awards granted to Executive Directors will vest after three years subject to the satisfaction of the agreed performance condition(s), continued employment and forfeiture for malus events. PSP Awards granted to other employees will vest in annual tranches over five years, subject to continued employment and forfeiture for malus events.

(b) Eligibility to participate

Executive Directors and other employees of the Glencore Group will be eligible to participate in the PSP, subject to selection by the remuneration committee (which for the purposes of this paragraph 14 includes, as appropriate, a sub-committee so formed by the remuneration committee or, by delegation, the Chief Executive Officer).

(c) Grant of PSP Awards

(i) Number of Ordinary Shares: The number of Ordinary Shares comprised in a PSP Award will be determined by the remuneration committee. In respect of an Executive Director, the value of Ordinary Shares comprised in a PSP Award(s) granted in any financial year will not exceed 500 per cent. of salary.

(ii) Structure of PSP Awards: PSP Awards will normally be structured as conditional awards of Ordinary Shares but, at the remuneration committee's discretion, may alternatively be structured as options, forfeitable shares or phantom awards.

(iii) Performance condition: PSP Awards granted to Executive Directors will be subject to an objective performance condition(s) in line with the Company's strategy. The performance condition(s) will be determined by the remuneration committee at grant.

(d) Before vesting

(i) Rights: Participants will not be entitled to vote or receive dividends in respect of PSP Awards which are structured as conditional awards, options or phantom awards. However, the remuneration committee may decide to pay participants a dividend equivalent on vesting.

(ii) Leaving employment: If a participant leaves the Glencore Group before vesting, his PSP Award will lapse unless he is a good leaver. A good leaver reason includes disability, ill-health, redundancy, agreed retirement or sale of his employing company/business or any other reason that the remuneration committee may agree. For good leavers, a PSP Award will generally vest on the normal vesting date(s), subject to any agreed performance condition(s) being met and forfeiture for malus events. The number of Ordinary Shares may be time pro-rated at the remuneration committee's discretion.

(iii) Malus events: In the event that a participant behaves in a way which violates the legitimate interests of the Glencore Group (for example, by breaching confidentiality obligations or otherwise acting in a manner which falls outside the normal course of Glencore's business) and such behaviour results in a material loss or other material detriment to the Glencore Group, the remuneration committee may reduce the PSP Award as it considers appropriate.

(iv) Corporate events before vesting: On a takeover, merger or other corporate reorganisation, participants may be required or permitted to exchange their PSP Awards for equivalent awards over shares in the acquiring company. Alternatively, the remuneration committee may decide that PSP Awards will vest immediately, subject to the satisfaction of any agreed performance condition(s). The number of Ordinary Shares may be time pro-rated at the remuneration committee's discretion.

(v) Rights issues and other variations of share capital: In the event of a rights issue, demerger or other variation in share capital, the number of Ordinary Shares subject to a PSP Award may be adjusted.

(e) Vesting

PSP Awards will vest after the period specified by the remuneration committee. It is currently intended that PSP Awards held by Executive Directors will normally vest on the third anniversary of grant subject to continued employment, satisfaction of any agreed performance condition(s) and forfeiture for malus events. For other participants, it is currently intended that PSP Awards will vest over five years in five equal tranches subject to continued employment and forfeiture for malus events.

14.3 **Glencore Deferred Bonus Plan**

(a) Summary

Under the DBP, all or part of a participant's bonus is deferred as an award of Ordinary Shares (a "Bonus Award") which vests at the end of a specified period subject to continued employment and forfeiture for malus events.

It is intended that the first grant of Bonus Awards under the DBP will be made in 2012 to Executive Directors in respect of bonuses earned in 2011 under Glencore's annual bonus arrangements. These Bonus Awards will vest over three years.

(b) Eligibility to participate

Executive Directors and other employees of the Glencore Group will be eligible to participate in the DBP, subject to selection by the remuneration committee. It is currently intended that Bonus Awards will only be granted to Executive Directors.

(c) Grant of Bonus Awards

(i) Number of Ordinary Shares: The number of Ordinary Shares comprised in a Bonus Award will be determined by reference to the amount of the participant's bonus which is to be deferred and the market value of an Ordinary Share at the time of grant.

(ii) Structure of Bonus Awards: Bonus Awards will normally be structured as conditional awards of Ordinary Shares but, at the remuneration committee's discretion, may alternatively be structured as nil cost options, forfeitable shares or phantom awards.

(d) Before vesting

(i) Rights: Participants will not be entitled to vote or to receive dividends in respect of Bonus Awards which are structured as conditional awards, nil cost options or phantom awards. However, the remuneration committee may decide to pay participants a dividend equivalent on vesting.

(ii) Leaving employment: If a participant leaves the Glencore Group before vesting, his Bonus Award will lapse unless he is a good leaver. A good leaver reason includes disability, ill-health, redundancy, agreed retirement or sale of his employing company/business or any other reason agreed by the remuneration committee. A Bonus Award held by a good leaver will normally vest in full on the normal vesting date, subject to any forfeiture for malus events. The number of Ordinary Shares may be time pro-rated at the remuneration committee's discretion.

(iii) Malus events: If, prior to vesting, a participant behaves in a way which violates the legitimate interests of the Glencore Group (for example, by breaching confidentiality obligations or otherwise acting in a manner which falls outside the normal course of Glencore's business) and such behaviour results in a material loss or other material detriment to the Glencore Group, the remuneration committee may reduce the Bonus Award as it considers appropriate.

(iv) Corporate events before vesting: On a takeover, merger or other corporate reorganisation, participants may be required or permitted to exchange their Bonus Awards for equivalent awards over shares in the acquiring company. Alternatively, the remuneration committee may determine that Bonus Awards will vest immediately and in full.

(v) Rights issues and other variations of share capital: In the event of a rights issue, demerger or other variation in share capital, the number of Ordinary Shares subject to a Bonus Award may be adjusted.

(e) Vesting

Bonus Awards will vest over or at the end of the period specified by the remuneration committee. It is currently intended that vesting will be over three years.

14.4 **Common terms for both the Glencore Performance Share Plan and the Glencore Deferred Bonus Plan**

(a) Authority to operate

The PSP and DBP will be operated by the Company's remuneration committee or, as appropriate, its duly authorised committee or, by delegation, the Chief Executive Officer.

(b) Timing of award

Awards under the PSP and DBP will normally be granted within 42 days of the announcement of results. Subject to dealing restrictions, awards may be granted at other times, for example to a new hire, if there is a change in tax or share plans legislation or in exceptional circumstances, as determined by the remuneration committee. Awards cannot be granted after the tenth anniversary of Admission.

(c) Tax withholding

To the extent any participant is subject to a tax liability which must be withheld by the Company or any other company in the Glencore Group, the Company may make such arrangements as it considers necessary to meet such liability. This may include the sale or reduction in number of any Ordinary Shares subject to an award.

(d) Restrictions

Awards are not transferrable and are not pensionable.

(e) Funding of awards and dilution limits

PSP Awards and Bonus Awards may be satisfied using new issue shares, treasury shares or shares purchased in the market and will be recognized as a non-cash expense under Selling and administrative expenses in the Group's income statement. The number of shares which may be issued, or committed to be issued, in any 10 year period will not exceed (i) 10 per cent. of the Company's issued ordinary share capital, in respect of any employee share plans operated by the Company; and (ii) 5 per cent. of the Company's issued ordinary share capital, in respect of discretionary employee share plans adopted by the Company. As at the date of Admission, the Company will only have discretionary employee share plans in existence. Shares issued, or committed to be issued, before Admission will not be counted for either of these limits.

(f) Amendments

The plans may generally be amended by the remuneration committee. However, shareholder approval is required for amendments to the following provisions which are to the advantage of participants: eligibility, individual and dilution limits, the rights attaching to awards and Ordinary Shares, the adjustment of awards on a variation in share capital and the amendment power. However, shareholder approval is not required to make minor amendments to the rules to facilitate the administration of the relevant plan, which relate to any change in legislation, or which will obtain or maintain favourable tax, exchange control or regulatory treatments for any participating company or any participant.

The remuneration committee may, without obtaining shareholder approval, establish further plans (whether by way of schedules or otherwise) based on the PSP and/or DBP, but modified to take account of local tax, exchange control or securities law in non-UK territories. Any shares issued under such further plans will count towards the limits described in paragraph (e) above.

14.5 **2011 Long-Service Awards**

In April and May 2011, long-service awards were made to certain employees who were employed by the Group for two years or more at the date of grant and who are not Existing Shareholders. The maximum value of a long-service award which may be granted to any individual is U.S.$100,000. The long-service awards will vest on the first anniversary of UK Admission, subject to continued employment of the relevant individual. Long-service awards will vest early on the death of an award holder or on a change of control, subject to the remuneration committee's discretion to roll them over into equivalent awards that may be settled in shares in an acquiring company. Long-service awards may be satisfied in shares by the issue of new Ordinary Shares, by the transfer of Ordinary Shares held in treasury or by the transfer of Ordinary Shares purchased in the market (in each case with a market value equal to the value of the award at vesting calculated by reference to the average price of Ordinary Shares on the five trading days prior to vesting), or in cash. The maximum aggregate value of long-service awards is U.S.$35 million. There is no intention to grant any further long-service awards post-UK Admission.

14.6 **2011 Phantom Equity Awards**

In April and May 2011, phantom equity awards were made to certain employees in lieu of interests in the Group's existing equity ownership schemes. These phantom equity awards will vest on or before 31 December 2013, subject to the continued employment of the award holder. Phantom equity awards will vest early on the death of an award holder or on a change of control, subject to the remuneration committee's discretion to roll them over into equivalent awards that may be settled in shares in an acquiring company. Each award is over a number of notional Ordinary Shares, determined by reference to the Offer Price.

Phantom equity awards may be satisfied in shares by the issue of new Ordinary Shares, by the transfer of Ordinary Shares held in treasury or by the transfer of Ordinary Shares purchased in the market (in each case with a market value equal to the value of the award at vesting, including dividends paid between UK Admission and vesting), or in cash. The aggregate number of notional Ordinary Shares underlying the awards is 23,808,954, assuming that the Offer Price is set at the mid-point of the Offer Price Range.

The aggregate value of the awards at the Offer Price (assuming that the Offer Price is set at the mid-point of the Offer Price Range) is U.S.$210.3 million. If settled in cash, the amount payable under awards on vesting will be referenced to the average price of Ordinary Shares on the five trading days prior to vesting and to the value of dividends paid between UK Admission and vesting. There is no intention to grant any further phantom equity awards under this arrangement post-UK Admission.

15 Working capital

In the opinion of the Company, taking into account the net proceeds of the Global Offer receivable by the Company and Glencore's existing debt facilities, the working capital available to the Company and Glencore is sufficient for the Company and Glencore's present requirements, that is for the next 12 months following the date of this Prospectus.

16 Underwriting Agreement

16.1 Underwriting Agreement

The Company, Glencore International, the Directors, the Selling Shareholder and the Banks have entered into the Underwriting Agreement relating to the Global Offer. Pursuant to the Underwriting Agreement, subject to execution of the Pricing Agreement by 18 May 2011 (or such later time and date as the Company, the Selling Shareholder and the Joint Global Co-ordinators (on behalf of the Banks) may agree being no later than 15 July 2011 and UK Admission becoming effective no later than 8.00 a.m. on 24 May 2011 (or such later time and date as the Company and the Joint Global Co-ordinators (on behalf of the Banks) may agree, being no later than 31 July 2011) and the satisfaction of certain other conditions, including completion of the Restructuring in all material respects:

(a) the Company has agreed to allot and issue, at the Offer Price, the Offer Shares to be issued in connection with the Global Offer;

(b) the Selling Shareholder has agreed to sell, at the Offer Price, the Sale Shares to be sold by it in connection with the Global Offer;

(c) the International Managers have severally agreed to procure subscribers or purchasers, failing which to subscribe or purchase themselves, the International Offer Shares from the Company and the Selling Shareholder at the Offer Price and in such proportions as set out in the Pricing Agreement;

(d) the HK Managers have severally agreed to procure subscribers, failing which to subscribe themselves, for all of the Hong Kong Offer Shares at the Offer Price and in such proportions as set out in the Underwriting Agreement;

(e) in consideration for their services under the Underwriting Agreement, the Company has agreed to pay the Managers a commission of 1.575 per cent. of the product of the Offer Price and the number of New Offer Shares and, if applicable, the Over-Allotment Shares that are allotted pursuant to the Global Offer. In addition the Company has agreed to pay Citi and MSSL a praecipium fee of 0.175 per cent. of the product of the Offer Price and the number of New Offer Shares and, if applicable, the Over-Allotment Shares, if any, allotted pursuant to the Global Offer;

(f) in consideration for their services under the Underwriting Agreement, the Selling Shareholder has agreed to pay the Managers a commission of 1.575 per cent. of the product of the Offer Price and the number of Sale Shares. In addition the Selling Shareholder has agreed to pay Citi and MSSL a praecipium fee of 0.175 per cent. of the product of the Offer Price and the number Sale Shares, allotted pursuant to the Global Offer;

(g) in addition, the Company may, at its sole discretion, pay within 30 days of UK Admission, to any Manager in such proportions as the Company may in its absolute discretion decide a further commission of up to $82.5 million;

(h) the Company has agreed to pay the costs, charges, fees and expenses incurred in connection with the Global Offer, Admission and the arrangements contemplated by the Underwriting Agreement (together with any related value added tax);

(i) the Joint Global Co-ordinators (on behalf of the Banks) have the right to terminate the Underwriting Agreement, exercisable in certain circumstances prior to UK Admission in respect of the Global Offer. These circumstances, which are typical for agreements of this nature, include the occurrence of certain significant changes in the condition (financial or otherwise), business prospects or earnings of the Glencore Group (taken as a whole) and certain changes in financial, political or economic conditions;

(j) in addition to the commissions referred to above, the Company has agreed to pay (together with any VAT payable) the costs, charges, fees and expenses in connection with or incidental to the Global Offer, Admission and the arrangements contemplated by the Underwriting Agreement subject to an agreed cap in respect of the professional fees of the Banks;

(k) each of the Company, Glencore International, the Selling Shareholder and the Directors has given certain representations, warranties and undertakings to the Underwriters. The liabilities of the Company under the Underwriting Agreement are not limited as to time or amount. The liabilities of the Directors and the Selling Shareholder under the Underwriting Agreement are limited as to time and amount;

(l) the Company has given an indemnity to the Banks, in a form that is typical for an agreement of this nature. Glencore International has given an indemnity to the Banks, in a form that is typical for an agreement of this nature, up until UK Admission. Glencore International's obligations under the indemnity will cease upon UK Admission;

(m) the parties to the Underwriting Agreement have given certain covenants to each other regarding compliance with laws and regulations affecting the making of the Global Offer in relevant jurisdictions;

(n) the Company has agreed to certain lock-up arrangements pursuant to the Underwriting Agreement, as more fully described in paragraph 17.1 of Section X: "Additional Information"; and

(o) the Underwriting Agreement also contains the terms of the Over-Allotment Option more fully described in paragraph 2 of Section VIII "Details of the Global Offer".

17 Lock-up arrangements

17.1 Company lock-up

Pursuant to the Underwriting Agreement, the Company has agreed that, subject to the exceptions described in paragraph 17.5 below, during the period commencing on Admission and ending on (and including) the date being the expiry of six months after UK Admission, it will not, without the prior written consent of the Joint Global Co-ordinators (on behalf of the Banks), directly or indirectly, offer, issue, lend, mortgage, charge, pledge, sell or contract to sell, issue options in respect of, or contract to purchase, purchase any option, grant any option, right or warrant to purchase or otherwise dispose of, or announce an offering or issue of, any Ordinary Shares (or any interest therein or in respect thereof) or any other securities exchangeable for or convertible into, or substantially similar to, Ordinary Shares or enter into any transaction with the same economic effect as, or agree to do, any of the foregoing.

17.2 Executive Directors' lock-up

Each of the Executive Directors has executed a Lock-Up Deed, pursuant to which he has agreed that, subject to certain customary exceptions more particularly described in paragraph 17.6 below, during the period from and including Admission to and including the fifth anniversary of Admission, he will not, without the prior written consent of the Company (and, during the first year following Admission, the Joint Global Co-ordinators), Dispose of Ordinary Shares held by him at Admission. The percentage of each Executive Director's Ordinary Shares held at Admission that are subject to restrictions on Disposal decreases each year as set out below.

Period(1)	Year 1	Year 2	Year 3	Year 4	Year 5
Percentage of Executive Director's Ordinary Shares held at Admission that are subject to restrictions on Disposal in that period	100 per cent.	80 per cent.	60 per cent.	40 per cent.	20 per cent.

Note:

(1) Year 1 refers to the period commencing on Admission and ending on (but excluding) the first anniversary of Admission. Year 2 refers to the period commencing on (and including) the first anniversary of Admission and ending on (but excluding) the second anniversary of Admission. Year 3 refers to the period commencing on (and including) the second anniversary of Admission and ending on (but excluding) the third anniversary of Admission. Year 4 refers to the period commencing on (and including) the third anniversary of Admission and ending on (but excluding) the fourth anniversary of Admission. Year 5 refers to the period commencing on (and including) the fourth anniversary of Admission and ending on (but excluding) the fifth anniversary of Admission.

The Ordinary Shares that will be held by the Executive Directors following completion of the Global Offer, and which will be subject to the Lock-Up Deeds as described above, will in aggregate represent 16.8 per cent. of the issued share capital of the Company (assuming that the Offer Price is at the mid-point of the Offer Price Range, the Over-Allotment Option is not exercised and the Kazzinc Consideration Shares have not been issued).

17.3 **Existing Shareholders' lock-up**

Each of the Existing Shareholders (other than the Executive Directors) has also executed a Lock-Up Deed, pursuant to which he/she has agreed that, subject to certain customary exceptions more particularly described in paragraph 17.6 below, during a period of time of between one year, two years or four years from and including Admission as set out below, he/she will not, without the prior written consent of the Company (and, during the first year following Admission, the Joint Global Co-ordinators), Dispose of Ordinary Shares held by him/her at Admission. In the case of lock-up arrangements of two years and four years, the percentage of the Existing Shareholder's Ordinary Shares held at Admission that are subject to restrictions on Disposal decreases each year as set out below.

	Percentage of issued share capital following completion of the Global Offer subject to lock-up arrangement of that period(1)	**Percentage of Existing Shareholder's Ordinary Shares held at Admission that are subject to restrictions on Disposal in each year**(2)			
		Year 1	**Year 2**	**Year 3**	**Year 4**
One year	22.2	100	—	—	—
Two years	12.0	100	50	—	—
Four years	32.6	100	75	50	25

Notes:

(1) Assuming that the Offer Price is at the mid-point of the Offer Price Range, the Over-Allotment Option is not exercised and the Kazzinc Consideration Shares have not been issued.

(2) Year 1 refers to the period commencing on Admission and ending on (but excluding) the first anniversary of Admission. Year 2 refers to the period commencing on (and including) the first anniversary of Admission and ending on (but excluding) the second anniversary of Admission. Year 3 refers to the period commencing on (and including) the second anniversary of Admission and ending on (but excluding) the third anniversary of Admission. Year 4 refers to the period commencing on (and including) the third anniversary of Admission and ending on (but excluding) the fourth anniversary of Admission.

The Ordinary Shares that will be held by Existing Shareholders (other than the Executive Directors) following completion of the Global Offer, and which will be subject to the Lock-Up Deeds as described above, will in aggregate represent 66.8 per cent. of the issued share capital of the Company (assuming that the Offer Price is at the mid-point of the Offer Price Range, no conversion of the Convertible Bonds, the Over-Allotment Option is not exercised and the Kazzinc Consideration Shares have not been issued).

17.4 **Cornerstone Investors' lock-up**

Each of the Cornerstone Investors has agreed that (subject to certain customary exceptions more particularly described in paragraph 17.7 below), without the prior written consent of the Company and the Joint Global Co-ordinators, it will not, at any time during the period ending six months following UK Admission, directly or indirectly, dispose of any Offer Shares subscribed for by it pursuant to the Cornerstone Investment Agreement to which it is party.

In addition, each Cornerstone Investor has acknowledged that it is in the interests of all holders of Ordinary Shares that a disorderly or false market in the Ordinary Shares is not created at the time of the expiry of the six month lock-up period. Consequently, each Cornerstone Investor has agreed that in the event that the Cornerstone Investor intends to dispose of any Ordinary Shares acquired pursuant to the Cornerstone Investment Agreement within one month after the expiry of the lock-up period, it may approach the Joint Global Co-ordinators (on a non-binding basis and subject to applicable laws and regulations) shortly before the expiry of the lock-up with a view to discussing with the Joint Global Co-ordinators the possibility of arranging such disposal together with the holdings of other Cornerstone Investors who may also intend to dispose of any such Ordinary Shares.

The Ordinary Shares that will be held by Cornerstone Investors following completion of the Global Offer, and which will be subject to the lock-up arrangements as described above, will in aggregate represent 5.1 per cent. of the issued share capital of the Company (assuming that the Offer Price is at the mid-point of the Offer Price Range, the Over-Allotment Option is not exercised and the Kazzinc Consideration Shares have not been issued).

17.5 **Exceptions to the Company lock-up**

The restrictions to which the Company is subject pursuant to the Underwriting Agreement as described in paragraph 17.1 of this Section X are subject to the following exceptions:

(a) the issue and offer by the Company of the Offer Shares and the issue of the Kazzinc Consideration Shares;

(b) the issue by the Company of any Ordinary Shares or the grant of any options or awards pursuant to the employee share schemes described in paragraph 14 of this Section X;

(c) the issue by the Company of any Ordinary Shares with an aggregate value of up to U.S.$1 billion to fund a specific acquisition, merger or takeover or as part or full consideration for an acquisition, merger or takeover, provided that the subscriber of such Ordinary Shares agrees to be bound by the lock-up restrictions until the date being the expiry of 6 months after UK Admission; and

(d) the issue by the Company of Ordinary Shares to holders of the Convertible Bonds who exercise their rights to convert their Convertible Bonds into Ordinary Shares after UK Admission (as described in this Prospectus).

17.6 **Exceptions to the Lock-Up Deeds**

The restrictions to which the Existing Shareholders and the Executive Directors are subject pursuant to the Lock-Up Deeds do not apply to any Ordinary Shares issued to them pursuant to the Ordinary Shares awarded, and/or exercise of options granted, after Admission under the Glencore employee share schemes described in paragraph 14 of this Section X, and are subject to the following customary exceptions:

(a) any Disposal notified in writing in advance to the Company (and, in the first year following Admission, the Joint Global Co-ordinators) and to which the Company (and, in the first year following Admission, the Joint Global Co-ordinators) gives its (or their) prior consent in writing;

(b) an acceptance of a general offer for the ordinary share capital of the Company made in accordance with the City Code, or the provision of an irrevocable undertaking to accept such an offer, or a sale of Ordinary Shares to an offeror or potential offeror during an offer period (within the meaning of the City Code);

(c) any Disposal of Ordinary Shares pursuant to a compromise or arrangement by the Company with its members or a statutory merger under Jersey law, in each case providing for the acquisition by any person (or group of persons acting in concert, as such expression is defined in the City Code) of 50 per cent. or more of the ordinary share capital of the Company;

(d) any Disposal of Ordinary Shares pursuant to an arrangement by the Company with its creditors under Jersey law;

(e) any Disposal by way of gift by any individual to a family member, to the trustees of a family trust or to a licensed insurance company to be held under a life insurance policy for the individual or any of his/her family members, or by a trustee to a beneficiary of a trust, or by an insurance company to the original life assured, provided that, prior to the making of any such Disposal, the relevant transferee shall have agreed to be bound by the lock-up restrictions in the same terms as the Existing Shareholder;

(f) any Disposal to personal representatives or persons who take after an individual who dies or is incapacitated;

(g) any Disposal of Ordinary Shares by operation of law or pursuant to an order from a court of competent jurisdiction or as otherwise required pursuant to any applicable laws;

(h) any Disposal of rights to new Ordinary Shares granted, or Ordinary Shares subscribed, in respect of a rights issue or other pre-emptive share offering of the Company;

(i) any Disposal of Ordinary Shares pursuant to any offer by the Company to purchase its own Ordinary Shares which is made on identical terms to all holders of Ordinary Shares in the Company; and

(j) any Disposal of Ordinary Shares to Penwith Limited made on the date of Admission for the purpose of Penwith Limited selling such Ordinary Shares as Selling Shareholder in and for the purpose of the Global Offer pursuant to the Underwriting Agreement or for the purpose of Penwith Limited lending such shares pursuant to any stock lending arrangement.

17.7 **Exceptions to the Cornerstone Investors' lock-up**

The restrictions to which the Cornerstone Investors are subject pursuant to the Cornerstone Investment Agreements as described in paragraph 17.4 of this Section X, are subject to the following exceptions:

(a) an acceptance of a general offer for the ordinary share capital of the Company made in accordance with the City Code or the provision of an irrevocable undertaking to accept such an offer or a sale of Ordinary Shares to an offeror or potential offeror during an offer period (within the meaning of the City Code);

(b) any disposal of Ordinary Shares pursuant to a compromise or arrangement under Article 125 of the Jersey Companies Law or pursuant to a merger under Part 18B of the Jersey Companies Law, in each case providing for the acquisition by any person (or group of persons acting in concert as such expression is defined in the City Code) of 50 per cent. or more of the ordinary share capital of the Company;

(c) any disposal of Ordinary Shares (i) pursuant to an arrangement under Article 167 of the Jersey Companies Law in relation to the Company or (ii) by operation of law or pursuant to an order from a court of competent jurisdiction or as otherwise required pursuant to any applicable laws;

(d) any disposal of rights to new Ordinary Shares granted, or of any Ordinary Shares subscribed, in respect of a rights issue or other pre-emptive share offering of the Company or any disposal of Ordinary Shares pursuant to any offer by the Company to purchase its own Ordinary Shares which is made on identical terms to all holders of Ordinary Shares in the Company;

(e) any pledge, charge, mortgage, lien or other structure for giving credit support to the financial institution (each a "security") granted over or in respect of the Offer Shares subscribed for by the Cornerstone Investor pursuant to its relevant Cornerstone Investment Agreement to a financial institution which is providing financing to the Cornerstone Investor in respect of the Ordinary Shares and the transfer of the relevant Ordinary Shares to such financial institution pursuant to such security or its enforcement and any further pledge, repledge, hypothecation, rehypothecation or lending transaction by such financial institution, provided that in the event that such security is enforced, the relevant financial institution agrees to be bound by the lock-up restrictions contained in the Cornerstone Investment Agreement; and

(f) transfers of all or part of the Offer Shares subscribed for by the Cornerstone Investor pursuant to the relevant Cornerstone Investment Agreement to transferees as permitted in the relevant Cornerstone Investment Agreement and on the basis that the transferee will be subject to the same restrictions on disposal as if it were the transferor by the execution and delivery to the Company and the Joint Global Co-ordinators of a deed of adherence to the relevant Cornerstone Investment Agreement;

18 Material contracts

The following are the only contracts (not being contracts entered into in the ordinary course of business) which have been entered into by the Company and/or members of the Glencore Group within the two years immediately preceding the date of this Prospectus or which are expected to be entered into prior to Admission and which are, or may be, material or which have been entered into at any time by the Company and/or members of the Glencore Group and which contain any provision under which the Company and/or any member of the Glencore Group has any obligation or entitlement which is, or may be, material to the Company and/or the Glencore Group as at the date of this Prospectus:

18.1 **Underwriting Agreement**

Please refer to the description in paragraph 16 above.

18.2 **Cornerstone Investment Agreements**

On 4 May 2011, in connection with the International Offer, the Company, Glencore International, the Joint Global Co-ordinators and the Cornerstone Investors entered into the Cornerstone Investment Agreements.

A brief description of each of the Cornerstone Investors is as set out in paragraph 10.1 of Section VIII: "Details of the Global Offer". Each of the Cornerstone Investment Agreements has been entered into on substantially the same terms. A summary of the material terms of the Cornerstone Investment Agreement is as set out below:

Each Cornerstone Investment Agreement contains, amongst others, the following provisions:

(a) the obligation of the Company to deliver, and the obligation of the Cornerstone Investor to acquire and pay for, the Offer Shares pursuant to the relevant Cornerstone Investment Agreement are subject to certain conditions that are typical for an agreement of this nature. These conditions include:

(i) the Underwriting Agreement not having been terminated on or prior to 24 May 2011 (or such later time and date as the Company and the Joint Global Co-ordinators may agree and notify to the Cornerstone Investor, being no later than 31 July 2011) (the "Closing Date");

(ii) the Pricing Agreement being entered into by the parties thereto by the Closing Date and compliance by the Company and the Selling Shareholder with the terms and conditions set forth therein;

(iii) UK Admission occurring not later than 8.00 a.m. on the Closing Date; and

(iv) the Offer Price being within the price range set out in this Prospectus;

(b) the Company, Glencore International and the Joint Global Co-ordinators have the right to terminate the Cornerstone Investment Agreement in certain circumstances, including the following:

(i) in the event that payment for the relevant Offer Shares by the Cornerstone Investor is not received or settled in accordance with the terms of the relevant Cornerstone Investment Agreement; and

(ii) in the event of a material breach of the terms of the Cornerstone Investment Agreement by the relevant Cornerstone Investor;

(c) the Cornerstone Investor may terminate the Cornerstone Investment Agreement, if there is a material breach by the Company of its obligation to deliver the relevant Offer Shares to the Cornerstone Investor in accordance with the terms of the Cornerstone Investment Agreement;

(d) each of the parties has given certain customary representations and warranties to the other, in particular regarding compliance with laws and regulations affecting the entry into of the Cornerstone Investment Agreement in relevant jurisdictions. The terms of the Cornerstone Investment Agreement do not limit the liability of the parties for breach of contract as to time or amount;

(e) the Company has represented and warranted to each of the Cornerstone Investors that the terms of its Cornerstone Investment Agreement (including any amendment, supplement or side letter) are, in all material respects, the same as the equivalent terms contained in the other Cornerstone Investment Agreements entered into with the other

Cornerstone Investors (including any amendment, supplement or side letter to such agreements), save for any deviations required to reflect the corporate structure of a particular Cornerstone Investor or the manner in which a particular Cornerstone Investor will acquire or hold the Ordinary Shares issued to it pursuant to the terms of the relevant Cornerstone Investment Agreement and the terms on which the Cornerstone Investors which are private banks are engaged by their underlying banking clients;

(f) in addition, the Company has represented and warranted to each of the Cornerstone Investors that no waiver, accommodation or amendment in respect of a Cornerstone Investor's rights and obligations under its relevant Cornerstone Investment Agreement (including any amendment, supplement or side letter to such agreement) shall be extended to any Cornerstone Investor unless such waiver, accommodation or amendment is extended to each other Cornerstone Investor on the same basis contemporaneously therewith; and

(g) each Cornerstone Investor has agreed to certain lock-up arrangements pursuant to the Cornerstone Investment Agreement, as more fully described in paragraph 17.4 above.

The total number of Offer Shares to be acquired by the Cornerstone Investors under the Cornerstone Investment Agreements is set out below:

Name of Cornerstone Investor	Number of Offer Shares subscribed for by the Cornerstone Investor (rounded down to the nearest whole Ordinary Share)(1)	Total amount in U.S.$ committed by the Cornerstone Investor
Aabar	96,226,415	850,000,000
BlackRock	40,754,716	360,000,000(2)
Brookside Capital	25,471,698	225,000,000
Credit Suisse AG(3)	19,811,320	175,000,000
Eton Park Funds	22,641,509	200,000,000
Fidelity	24,339,622	215,000,000
GIC	45,283,018	400,000,000
Och-Ziff	19,811,320	175,000,000
Pictet(3)	11,320,754	100,000,000
UBS AG(3)	11,320,754	100,000,000
York Capital	22,641,509	200,000,000
Zijin	11,320,754	100,000,000
Total	350,943,389	3,100,000,000

Notes:

(1) Assuming that the Offer Price is at the mid-point of the Offer Price Range, the Over-Allotment Option is not exercised and the Kazzinc Consideration Shares have not been issued.

(2) BlackRock Advisors (UK) Limited has agreed to acquire such number of Offer Shares which may be acquired with £95 million, which has been converted into U.S.$158 million based on the pounds sterling/U.S.$ exchange rate of £1.00 = U.S.$1.667 quoted by Bloomberg on 29 April 2011.

(3) As agent on behalf of underlying clients.

18.3 Xstrata Acquisition Agreement and Xstrata Call Option Agreement

Xstrata Acquisition Agreement

Pursuant to the sale and purchase agreement dated 29 January 2009 between Glencore International AG, Xstrata (Schweiz) AG and Xstrata Coal South America Ltd. (the "Xstrata Acquisition Agreement"), Glencore agreed to sell, and Xstrata agreed to buy, all of the shares in each of Chestfield Coal Resources Limited, Tikolan Limited, Simkana Limited, Merani Holding Limited and Wichita Holding Limited (the "Prodeco Target Companies") with effect from 1 January 2009. The Prodeco Target Companies collectively held, directly and indirectly, all of the issued shares of each of C.I. Prodeco S.A., Carbones de La Jagua S.A., Carbones El Tesoro S.A., Carbones de la Loma S.A., and Consorcio Minero Unido S.A. (the "Prodeco Operating Companies"). The Prodeco Operating Companies and Ferrocarriles del Norte de Colombia S.A. carry on the Prodeco coal mining operation and associated infrastructure in

Colombia. Glencore's interests in Prodeco are held through the Prodeco Target Companies (the "Prodeco Business").

The aggregate consideration payable by Xstrata Coal South America Ltd. to Glencore under the Xstrata Acquisition Agreement was U.S.$2 billion (subject to certain adjustments to reflect the fact that the economic effect of the transaction was a sale and purchase of the Prodeco Business as at 1 January 2009). Xstrata Coal South America Ltd. also paid interest to Glencore on the purchase price from 1 January 2009 to completion under the Xstrata Acquisition Agreement, which was on 3 March 2009 (the "Prodeco Closing") at LIBOR plus 1.50 per cent.

As is customary for a transaction of this nature, Glencore agreed in a tax covenant to indemnify Xstrata Coal South America Ltd. in respect of certain taxation liabilities of the Prodeco Target Companies and the Prodeco Operating Companies, which, in each case, are attributable to the period up to 1 January 2009. The time limit for tax claims is two months following the expiry of the statutory limitation period in the relevant jurisdiction. Glencore has no liability for any claim under the tax covenant unless (i) any individual claim exceeds U.S.$0.5 million; (ii) all claims (including claims under the Xstrata Acquisition Agreement), in aggregate, exceed U.S.$5 million; and (iii) the claim relates to a loss suffered as a result of the purchase price on the exercise of the option (see below) being reduced. The maximum liability of Glencore for all claims under the Xstrata Acquisition Agreement and the tax covenant is the purchase price (i.e. U.S.$2 billion) payable pursuant to the Xstrata Acquisition Agreement.

Xstrata Call Option Agreement

Pursuant to the option agreement between Glencore International AG and Xstrata (Schweiz) AG dated 29 January 2009 (the "Xstrata Call Option Agreement"), Xstrata (Schweiz) AG agreed to grant Glencore an option to repurchase the Prodeco Business on any day in the period from Prodeco Closing (being 3 March 2009) to the day immediately following the first anniversary of the date on which Prodeco Closing occurs (and, in each case, the day may not be a Saturday, Sunday or bank or public holiday in England and Wales or in the Swiss Canton of Zug and Zurich).

The option was exercised on 4 March 2010.

The aggregate consideration paid by Glencore under the Xstrata Call Option Agreement upon exercise of the option was an amount equal to the purchase price payable by Xstrata Coal South America Ltd. under the Xstrata Acquisition Agreement, as adjusted in accordance with the terms of that agreement, plus U.S.$250 million, plus all profits of the Prodeco Business accrued and not distributed to Xstrata and any cash paid into the Prodeco Business by Xstrata, less any amounts distributed by the Prodeco Target Companies to Xstrata, in each case in the period from 1 January 2009 to 13 April 2010, being the date on which the sale of the Prodeco Business pursuant to the exercise of the option was completed. Xstrata retained the economic benefit of profits generated by the Prodeco Business in this period.

Xstrata (Schweiz) AG gave limited warranties to Glencore, including as to Xstrata's ownership at the relevant time of the relevant shares in the Prodeco Target Companies and Xstrata (Schweiz) AG's authority to enter into and perform the Xstrata Call Option Agreement. There is no time limit on these warranties.

18.4 **The revolving credit facilities agreement**

On 10 May 2010 (the "Signing Date"), Glencore International (the "Parent"), Glencore Singapore Pte Ltd. ("GSPL") and Glencore AG entered into a U.S.$10.22 billion revolving credit facilities agreement (the "RCF Agreement" and the facilities granted thereby, the "Facilities") with, among others, Banc of America Securities Limited, Banco Santander, S.A., London Branch, Barclays Capital (the investment banking division of Barclays Bank PLC), BNP Paribas, Citigroup Global Markets Limited, Commerzbank Aktiengesellschaft, London Branch, Coöperatieve Centrale Raiffeisen-Boerenleenbank B.A. (trading as Rabobank International), London Branch, Crédit Agricole Corporate and Investment Bank, Credit Suisse AG, DBS Bank Ltd., London Branch, Deutsche Bank Luxembourg S.A., Fortis Bank (Nederland) N.V., HSBC Bank plc, ING Bank N.V., J.P. Morgan plc, Lloyds TSB Bank plc, Morgan Stanley Bank International Limited, Société Générale Corporate & Investment Banking, Standard Chartered Bank, The Royal Bank of Scotland plc and UBS Limited as mandated lead arrangers with Barclays Bank PLC acting as facility agent and swingline agent and various financial institutions as lenders. The Parent and GSPL are borrowers under the RCF Agreement. Glencore AG provides a guarantee for the Parent's borrowing obligations and the Parent provides a guarantee of GSPL's borrowing obligations.

There are three separate Facilities under the RCF Agreement, namely Facility A, Facility B and Facility C. Facility C is further divided into two tranches, namely Facility C1 and Facility C2. Facility B also contains a swingline option. Facility A includes an option whereby the revolving advances may be converted into a term advance (such option being the "Term Out Option" and such advance being the "Term Out Advance"). Facility A also includes an extension option whereby the maturity date of Facility A may be extended by a period of 364 days from its initial maturity date (the "Facility A Extension Option"). Facility B includes two extension options ("Facility B First Extension Option" and "Facility B Second Extension Option") whereby the maturity date of Facility B may, in each case, be extended by a period of 12 months from the then applicable maturity date. The Parent may choose to exercise either of the two extension options under Facility B, or both.

The Facilities are to be used towards working capital or general corporate purposes of Glencore, including, in the case of Facilities A and B, towards refinancing certain of its existing facilities.

The availability of the Facilities is as follows:

(a) Facility A is available until the date falling seven days prior to the Facility A Maturity Date (as defined below);

(b) Facility B is available until the date falling seven days prior to the Facility B Maturity Date (as defined below); and

(c) Facility C is available until the date falling seven days prior to the Facility C Maturity Date (as defined below).

Interest is payable on advances under each of the Facilities at the rate which is the aggregate of:

(a) the margin applicable to the relevant Facility as follows:

    (i) in relation to Facility A advances (other than the Term Out Advance), 1.50 per cent. per annum;

    (ii) in relation to the Term Out Advance, 2 per cent. per annum;

    (iii) in relation to Facility B advances, the margin varies between 1.250 per cent. and 2.125 per cent. per annum, depending on the then current rating assigned by Standard & Poor's and/or Moody's in respect of the Parent's long-term senior unsecured debt; and

    (iv) in relation to Facility C advances, 1.35 per cent. per annum;

(b) LIBOR; and

(c) the mandatory cost (being the regulatory costs of the lenders which are passed on to the borrowers).

The maturity dates of the Facilities are as follows:

(a) Facility A matures on:

    (i) the day falling 364 days after the Signing Date; or

    (ii) if the maturity date of Facility A has been extended under the Facility A Extension Option, the day falling 728 days after the Signing Date,

    such maturity date being the "Facility A Maturity Date";

(b) the Term Out Advance matures 12 months from the Facility A Maturity Date (or any shorter period, as is agreed);

(c) Facility B matures on:

    (i) the day falling 36 months after the Signing Date; or

(ii) if only the Facility B First Extension Option or Facility B Second Extension Option is exercised, the day falling 48 months from the Signing Date; or

(iii) if both the Facility B First Extension Option and the Facility B Second Extension Option are exercised, the day falling 60 months from the Signing Date,

(such maturity date being the "Facility B Maturity Date"); and

(d) Facility C matures on the day falling 364 days after the Signing Date (the "Facility C Maturity Date").

The RCF Agreement includes a mandatory prepayment provision in the event of certain specified change of control events.

The RCF Agreement includes certain financial covenants that require Glencore to maintain certain financial ratios. Pursuant to these covenants, which are calculated in accordance with IFRS, on (i) the last day of each financial year and (ii) 30 June in each year (or such other date as is the end of the first half of each financial year), the consolidated financial condition of the Parent and its subsidiaries, as is evidenced by its latest consolidated financial statements, shall be such that:

(a) net consolidated working capital shall not be less than U.S.$750 million;

(b) the ratio of consolidated current assets to consolidated current liabilities shall not fall below 1.10:1; and

(c) long-term debt shall not be more than 120 per cent. of consolidated tangible net worth.

The RCF Agreement contains representations, warranties and undertakings which are typical for these types of credit arrangements. The RCF Agreement also contains customary events of default upon occurrence of which the lenders may cancel their lending commitments and demand repayment of the advances.

On 3 May 2011 (the "New RCF Signing Date"), the Parent, Glencore AG and GSPL entered into a new U.S.$3,535 million revolving credit facilities agreement (the "New RCF Agreement" and the facilities granted thereby, the "New Facilities") with, among others, substantially the same banks as under the RCF Agreement, as mandated lead arrangers, and Barclays Bank PLC as facility agent. The borrowers and guarantors under the New RCF Agreement are the same as under the RCF Agreement. Facility A, Facility C1 and Facility C2 under the RCF Agreement were refinanced by the New Facilities. There are two separate facilities under the New RCF Agreement, namely a U.S.$2,925 million Facility A1 ("New Facility A1") and a U.S.$610 million Facility A2 ("New Facility A2").

The maturity date of each of the New Facilities is the day falling 364 days after the New RCF Signing Date and both have a one year extension option exercisable at the borrower's discretion. The New Facilities each include an option whereby the revolving advances may be converted into a term advance (each such advance being a "New Facility Term Out Advance").

In addition, the Parent extended the final maturity of U.S.$8,340 million of Facility B for a further year to May 2014. The New Facilities, in aggregate with the amount extended under Facility B represent an increase in committed available liquidity of U.S.$1,645 million.

The representations, warranties, undertakings and events of default contained in the New RCF Agreement are substantially the same as those in the RCF Agreement.

Interest is payable on advances under the New Facilities at the rate which is the aggregate of the applicable margin, LIBOR and the mandatory cost (being the regulatory costs of the lenders which are passed on to the borrowers). The applicable margin for an advance (other than a New Facility Term Out Advance) under each of the New Facilities is 1.10 per cent. per annum. The applicable margin in respect of a New Facility Term Out Advance is 1.60 per cent. per annum.

18.5 Committed secured borrowing base facility agreement

On 10 November 2010 (the "Signing Date"), Glencore International AG (the "Borrower") and Glencore AG (the "Guarantor") entered into a U.S.$1.7 billion committed secured borrowing base facility agreement (the "Base Facility Agreement" and the facility granted under the Base

Facility Agreement, being the "Base Facility") with, among others, BNP Paribas in each of its capacities as bookrunner and global co-ordinator, as agent, as security agent in respect of inventory and cash collateral, and as security agent in respect of receivables, and various financial institutions as lenders. The Guarantor provides a guarantee for the Borrower's obligations under and in connection with the Base Facility Agreement and the other finance documents.

The Base Facility includes an extension option whereby the maturity date may be extended by a period of 364 days from its Initial Maturity Date (as defined below) (the "Base Facility Extension Option").

The Base Facility is to be used towards working capital purposes, being: (i) the financing of the Borrower's physical base metal inventory of aluminium, copper, lead, nickel, zinc and tin; and (ii) the financing of receivables due to the Borrower or the Guarantor by their debtors, arising in the ordinary course of the Borrower's or the Guarantor's business.

The Base Facility is available until the date falling one week prior to the Termination Date (as defined below).

Interest is payable on advances under the Base Facility at the rate which is the aggregate of:

(a) 1.10 per cent. per annum;

(b) LIBOR; and

(c) mandatory cost (being regulatory costs of the lenders which are passed on to the borrowers).

The Base Facility matures on:

(a) the day falling 364 days after the Signing Date (the "Initial Maturity Date"); or

(b) if the Initial Maturity Date has been extended under the Base Facility Extension Option, the day falling 728 days after the Signing Date,

such maturity date being the "Termination Date".

The Base Facility Agreement includes mandatory prepayment provisions in the event of certain specified events (including a change of control event).

The Base Facility Agreement includes certain financial covenants that require Glencore to maintain certain financial ratios. Pursuant to these covenants, which are calculated in accordance with IFRS, on the last day of each financial year and on 30 June in each year, the consolidated financial condition of the Borrower and its subsidiaries, as evidenced by its latest consolidated financial statements, shall be such that:

(a) net consolidated working capital shall not be less than U.S.$750 million;

(b) the ratio of consolidated current assets to consolidated current liabilities shall not fall below 1.10:1; and

(c) long-term debt shall not be more than 120 per cent. of consolidated tangible net worth.

The Base Facility Agreement contains representations, warranties and undertakings, which are typical for these types of credit arrangements. The Base Facility Agreement also contains customary events of default, upon occurrence of which the lenders may cancel their lending commitments and demand repayment of the advances.

18.6 U.S.$2.3 billion 5 per cent. guaranteed convertible bonds due 2014

Glencore Finance (Europe) S.A. (the "Issuer") issued (i) U.S.$2.2 billion 5 per cent. guaranteed convertible bonds due 2014 (the "Original Bonds") constituted by a trust deed dated 23 December 2009 between the Issuer, Glencore International AG, Glencore AG and Citicorp Trustee Company Limited (the "Original Trust Deed") and (ii) a further U.S.$100 million 5 per cent. guaranteed convertible bonds due 2014 (to be consolidated and to form a single series with the Original Bonds) (together with the Original Bonds, the "Bonds"), constituted by the Original Trust Deed as supplemented by a supplemental trust deed dated 10 March 2010 between the Issuer, Glencore International AG, Glencore AG (Glencore

International AG and Glencore AG together, the "Guarantors") and Citicorp Trustee Company Limited (the "Trustee") (together with the Original Trust Deed, the "Trust Deed"). The Bonds constitute direct, general and unconditional obligations of the Issuer.

(a) Guarantee agreement

Pursuant to a guarantee agreement dated 23 December 2009, the Guarantors have unconditionally (subject, in the case of Glencore AG, to applicable Swiss law) and irrevocably guaranteed on a joint and several basis the due and punctual payment of all sums from time to time payable by the Issuer in respect of the Bonds.

(b) Negative pledge

Under the terms of the Bonds, none of the Issuer and the Guarantors will, and the Guarantors will not permit any material subsidiary to, directly or indirectly, create, incur, assume or permit to exist any mortgage, charge, pledge, lien or other security interest, except in certain limited circumstances, on or with respect to any property or assets of such entity or any interest therein or any income or profits therefrom to secure any present or future indebtedness in the form of, or represented or evidenced by, notes, bonds, debentures, debenture stock, loan stock or other securities which are, or are intended to be, with the consent of the person issuing the same, quoted, listed or ordinarily traded on any stock exchange or recognised over-the-counter or other securities market, and any guarantee or indemnity in respect thereof.

(c) Redemption

Unless previously redeemed, converted or purchased and cancelled, the Bonds will mature on 31 December 2014 (the "Maturity Date").

Following a qualifying IPO or a specified merger event, unless previously redeemed, converted or purchased and cancelled, the Issuer will redeem each Bond at its principal amount on the Maturity Date. The Bonds may also be redeemed at the option of the Issuer on the occurrence of certain tax events. Bondholders may require the Issuer to redeem the Bonds in certain limited circumstances, including in the event of a change of control.

If a qualifying IPO or a specified merger has not occurred prior to the Maturity Date, unless previously redeemed, converted or purchased and cancelled, the Issuer will redeem each Bond at 108.10 per cent. of its principal amount on the Maturity Date.

If a qualifying IPO or specified merger event has not occurred by a specified date, bondholders have the right to put their Bonds, if bondholders have requested the Glencore group to carry out a qualifying IPO and certain other conditions have been met, and such request has not been met by a specified date, at a redemption price of between 165.85 per cent. and 209.90 per cent., depending on the relevant redemption date.

(d) Qualifying initial public offering

Under the Bonds, a qualifying IPO shall occur if there is an offering of shares in Holdco by Holdco and/or Existing Shareholders for subscription or sale for cash to retail and/or institutional investors accompanied by the listing and admission to trading of such shares on the London Stock Exchange (premium listing), or other specified stock exchange, and provided that a liquidity condition linked to the amount of free float in respect of the shares is satisfied. If the liquidity condition is not satisfied, bondholders may waive such condition by extraordinary resolution within 120 days following the relevant listing.

(e) Conversion

Following a qualifying IPO or a specified merger event, the Bonds will be convertible into ordinary shares of Holdco at any time up to the 14th day prior to the Maturity Date. The number of shares issued to a bondholder upon conversion shall be equal to the relevant conversion ratio (subject to adjustment in certain circumstances) in effect on the relevant conversion date, as set out in the terms and conditions of the Bonds.

In addition, following a qualifying IPO, the Bonds will be convertible into ordinary shares of Holdco at the option of the Issuer at the conversion ratio in effect on the relevant conversion date, at any time during the period beginning 18 months after the listing and ending on the 14th day prior to the Maturity Date, provided that the share price exceeds 150 per cent. of the conversion ratio for a specified period.

The conversion ratio is subject to adjustment from time to time, for so long as the Bonds remain outstanding, as a result of certain corporate actions taken by the Issuer, the Guarantors and/or Holdco.

Bondholders who exercise conversion rights, other than bondholders who elect to exercise conversion rights and subsequently sell their shares as part of a secondary offering pursuant to the terms and conditions of the Bonds, will not be permitted to sell such shares until the earlier of (i) 90 days from the date of UK Admission; and (ii) the expiry of lock-up arrangements in respect of any Existing Shareholders.

(f) Events of default

An event of default under the Bonds will occur in certain circumstances, including, but not limited to, in respect of a failure to pay principal or interest in respect of the Bonds on the due date for payment thereof and such default continues for a period of 14 days, if the guarantee agreement is not in full force and effect, if any of the Issuer, the Guarantor or any material subsidiary fails to pay when due certain financial indebtedness, or such financial indebtedness becomes due and payable, or where there is a failure to pay when due under any applicable grace period amounts owing under the guarantee, in each case in circumstances where the amount of such financial indebtedness and/or the amount payable under such guarantee individually or in the aggregate exceeds U.S.$50 million (or its equivalent in another currency). If any event of default occurs and is continuing, the Trustee at its discretion may and, if so requested in writing by holders of at least one quarter in principal amount of the outstanding Bonds or if so directed by an extraordinary resolution of the bondholders, shall (subject in certain cases to the Trustee having certified in writing that the happening of such events is in its opinion materially prejudicial to the interests of the bondholders) declare the Bonds due and payable at their principal amount together with accrued interest.

18.7 **U.S.$10 billion EMTN Programme**

Glencore Finance (Europe) S.A. has established a U.S.$10 billion Euro Medium Term Note Programme (the "EMTN Program") under which it may from time to time issue notes (the "EMTN Notes") unconditionally (subject, in the case of Glencore AG, to applicable Swiss law) and irrevocably guaranteed on a joint and several basis by the Guarantors. Deutsche Trustee Company Limited is appointed as trustee (the "Trustee") of the EMTN Notes pursuant to an amended and restated trust deed dated 21 June 2010.

An event of default under the EMTN Notes will occur in certain circumstances, including, but not limited to, in respect of a failure to pay principal or interest in respect of the EMTN Notes on the due date for payment thereof and such default continues for a period of 14 days, if the guarantee agreement is not in full force and effect, if any of the Issuer, the Guarantor or any material subsidiary fails to pay when due certain financial indebtedness, or such financial indebtedness becomes due and payable, or where there is a failure to pay when due under any applicable grace period amounts owing under the guarantee, in each case in circumstances where the amount of such financial indebtedness and/or the amount payable under such guarantee individually or in the aggregate exceeds U.S.$50 million (or its equivalent in another currency).

If any event of default occurs and is continuing, the Trustee at its discretion may and, if so requested in writing by holders of at least one quarter in principal amount of the relevant outstanding EMTN Notes or if so directed by an extraordinary resolution of the noteholders, shall (subject in certain cases to the Trustee having certified in writing that the happening of such events is in its opinion materially prejudicial to the interests of the noteholders) declare the EMTN Notes due and payable at their principal amount together with accrued interest.

As at 29 April 2011, the last practicable date prior to publication of this Prospectus, U.S.$7.9 billion in principal amount of EMTN Notes is outstanding under the EMTN Program.

18.8 **Financing Transaction with Credit Suisse International ("CS") relating to shares in Xstrata (the "CS Financing Transaction") effective as of the first business day after 27 March 2008**

Finges Investment B.V. ("Finges"), a subsidiary of Glencore, entered into the CS Financing Transaction with CS effective as of the first business day after 27 March 2008 in order to obtain financing. The original loan amount under the CS Financing Transaction was U.S.$1.5 billion. Finges "prepaid" U.S.$500 million principal amount of the loan on 14 October 2008, and a further U.S.$250 million principal amount on 29 December 2008, but redrew U.S.$250 million principal amount on 22 April 2009, thereby bringing the principal amount outstanding under the loan to U.S.$1 billion currently. Upon the satisfaction of certain contractual conditions, Finges may increase the amount of financing back up to U.S.$1.5 billion. The loan was structured by way of a prepaid forward sale of a certain number of Xstrata shares by Finges to CS, and a simultaneous equity swap transaction by Finges hedging the exposure of Finges under the prepaid forward sale.

In connection with the CS Financing Transaction, Finges has provided security over a certain number of shares in Xstrata for the benefit of CS in respect of the obligations owed by Finges to CS under the CS Financing Transaction. As at 29 April 2011, the last practicable date before the publication of this Prospectus, the number of Xstrata shares subject to the security arrangement was 70,677,852.

Glencore has guaranteed the payment obligations of Finges under the CS Financing Transaction pursuant to a Swiss law guarantee provided to CS on 11 September 2007, as amended on 27 March 2008.

18.9 **Financing Transaction with the Banks (as defined below) relating to shares in Xstrata (the "Bank Financing Transaction") effective as of the second business day after 25 September 2009**

Finges Investment B.V. ("Finges"), a subsidiary of Glencore, entered into the Bank Financing Transaction with Barclays Bank PLC, Société Générale, The Royal Bank of Scotland plc and Calyon (now known as Crédit Agricole Corporate and Investment Bank following a name change) (together, the "Banks" and each, a "Bank") effective as of the second business day after 25 September 2009 in order to obtain financing. The principal amount outstanding under the loan is currently U.S.$1.3 billion. The loan was structured by way of a prepaid forward sale of a certain number of Xstrata shares by Finges to each of the Banks, and a simultaneous equity swap transaction by Finges hedging the exposure of Finges under the prepaid forward sale.

In connection with the Bank Financing Transaction, Finges has provided security over a certain number of shares in Xstrata for the benefit of each Bank in respect of the obligations owed by Finges to the Banks under the Bank Financing Transaction. As at 29 April 2011, the last practicable date before the publication of this Prospectus, the number of Xstrata shares subject to the security arrangement was 91,881,208.

Glencore has guaranteed the payment obligations of Finges under the Bank Financing Transaction pursuant to a Swiss law guarantee provided to the Banks on 24 September 2009.

18.10 **U.S.$950 million 6 per cent. notes due 2014**

Glencore Funding LLC (the "Issuer") issued (i) U.S.$800 million 6 per cent. notes due 2014 (the "Original Notes") at an issue price of 99.285 per cent. under an indenture dated 5 April 2004 between the Issuer, Glencore International AG, Glencore AG, JPMorgan Chase Bank and BNP Paribas Securities Services, Luxembourg Branch (the "Original Indenture") and (ii) a further U.S.$150 million 6 per cent. notes at an issue price of 96.647 per cent. (fungible, consolidated and to form a single singles with the Original Notes) (together with the Original Notes, the "Notes") issued under the Original Indenture as supplemented by a supplemental indenture dated 21 April 2004 between the Issuer, Glencore International AG, Glencore AG (Glencore International AG and Glencore AG together, the "Guarantors"), JPMorgan Chase Bank (the "Trustee") and BNP Paribas Securities Services, Luxembourg Branch. Interest on the Notes is payable semi-annually in arrears on 15 April and 15 October of each year. The Notes constitute direct, unsecured and unsubordinated obligations of the Issuer.

(a) Guarantee agreement

The Guarantors, jointly and severally, unconditionally (subject, in the case of Glencore AG, to applicable Swiss Law) guarantee the due and punctual payment of the principal and interest on the Notes as they become due and payable (the "Guarantees"). Each Guarantee is a secured obligation of the applicable Guarantor and ranks *pari passu* in right of payment with other unsecured and unsubordinated indebtedness of that Guarantor.

(b) Covenants

Under the Original Indenture, the Issuer and the Guarantors have agreed certain restrictive covenants, including that neither the Issuer nor either of the Guarantors will, and Glencore International AG will not permit any restricted subsidiary to, create, incur or assume any lien on any property or asset of the Issuer, either of the Guarantors or any restricted subsidiary, or any interest therein or any income or profit therefrom, securing any financial indebtedness or interest on any financial indebtedness other than in certain limited circumstances.

The Issuer and each Guarantor, and Glencore International AG on behalf of the restricted subsidiaries, have covenanted with respect to certain limitations for sale and leaseback transactions. The Issuer and each Guarantor have also covenanted with respect to limitations on consolidations, mergers and the conveying, transferring or leasing of their properties and assets.

(c) Redemption

Unless previously redeemed or purchased, the Issuer will redeem each Note on 15 April 2014 (the "Maturity Date"). Notes may also be redeemed at the option of the Issuer or either of the Guarantors in whole or in part at any time for a price equal to the greater of (i) 100 per cent. of the principal amount of the Notes to be redeemed and (ii) the sum of the present values of the applicable remaining scheduled payments discounted to the date of redemption on a semi-annual basis at the U.S. treasury rate plus 35 basis points, together with, in each case, accrued interest on the principal amount of the Notes to be redeemed at the date of redemption. There is no restriction on the ability of the Issuer, the Guarantors or their subsidiaries to purchase or repurchase Notes. Notes are also redeemable at the option of the Issuer or either Guarantor on the occurrence of certain tax events.

(d) Events of default

An event of default under the Notes will occur in certain circumstances, including, but not limited to, a failure to pay any instalment of interest or additional amounts as they become due and payable and continuing for 30 days, non-payment of all or any part of the principal of any of the Notes when due and payable or if there is a failure to perform, or breach of any covenants continuing for 60 days following written notice of such breach. An event of default will also occur if there is a default under any other indebtedness of the Issuer, Guarantors or restricted subsidiary, or such indebtedness is not paid when due within any applicable grace period, or there is a failure by the Issuer, Guarantors or restricted subsidiaries to pay amounts payable under any guarantee or indemnity in respect of borrowed money, in each case provided that the aggregate amount of such financial indebtedness and/or the amount payable under such guarantee or indemnity exceeds U.S.$50 million.

Where an event of default occurs and is continuing, either the Trustee or the holders of not less than 25 per cent. in aggregate principal amount of the Notes then outstanding, by notice in writing to the Issuer and the Guarantors, may declare the entire principal amount of all Notes and interest accrued thereon to be due and payable.

18.11 **Glencore International Purchase Agreement**

Pursuant to the Glencore International Purchase Agreement dated 3 May 2011 between Revelstoke Limited and the Company, Revelstoke Limited has agreed to sell and the Company has agreed to purchase on the day before the date of UK Admission the entire issued ordinary share capital of Glencore International. In consideration of the transfer to it of the entire issued share capital of Glencore International, the Company has agreed to issue to Revelstoke Limited, on behalf of the Existing Shareholders, 6,000,000,000 Ordinary Shares. As a consequence of the Glencore International Purchase Agreement, the Company will become the parent company of the Group on the day before the date of UK Admission.

18.12 **Kazzinc Share Purchase Agreements**

On 13 April 2011, Glencore International entered into two agreements with respect to the 48.73 per cent. interest in Kazzinc currently held indirectly by Verny Investments and Verny Rost:

(a) a share purchase and option agreement between Glencore International, Pasar Holdings Incorporated AG (a wholly owned Group company) ("Pasar Holdings") and Verny Capital, acting in the interests of Verny Investments (the "Verny Investments SPA"); and

(b) a share purchase agreement between Glencore International, Kazastur Zinc AG (a wholly owned Group company) ("Kazastur") and Verny Capital, acting in the interests of Verny Rost (the "Verny Rost SPA" and, together with the Verny Investments SPA, the "Kazzinc SPAs").

Pursuant to the Verny Investments SPA, Pasar Holdings has agreed to purchase a 12.50 per cent. interest in Kazzinc through the acquisition of interests in holding entities from Verny Investments (the "Kazzinc Tranche 1 Acquisition").

The consideration for the Kazzinc Tranche 1 Acquisition shall be satisfied on closing under the Verny Investments SPA by the issue of such number of Ordinary Shares to Verny Investments, at the Offer Price, as is equal to U.S.$1,000,000,000 (the "Kazzinc Consideration Shares"). The Kazzinc Consideration Shares shall, when issued, be subject to a lock-up with a duration of six months from issue.

Pursuant to the Verny Rost SPA, Kazastur has agreed to purchase a 29.82 per cent interest in Kazzinc, through the acquisition of interests in holding entities from Verny Rost (the "Kazzinc Tranche 2 Acquisition").

Closing under the Verny Rost SPA will be staggered such that a 9.94 per cent interest in Kazzinc will be acquired by Kazastur through the acquisition of interests in holding entities from Verny Rost on the first business day of each of October, November and December 2011 (each a "Tranche 2 Closing Date").

The consideration for the Kazzinc Tranche 2 Acquisition shall be satisfied by the payment in cash of U.S.$2,200,000,000, which shall be paid in installments of U.S.$733,333,333.33 on each Tranche 2 Closing Date (the "Tranche 2 Consideration").

Both the Kazzinc Tranche 1 Acquisition and the Kazzinc Tranche 2 Acquisition are subject to certain conditions precedent, including receipt of approvals for the transaction from the Government of Kazakhstan and the occurrence of UK Admission.

The Verny Investments SPA further sets out the agreement between Verny Investments and Pasar Holdings with respect to the terms of a possible acquisition by Pasar Holdings of Verny Investments' remaining 6.41 per cent. interest in Kazzinc (held indirectly) (the "Kazzinc Tranche 3 Acquisition").

Pasar Holdings and Verny Investments have a call option and a put option, respectively, in relation to the Kazzinc Tranche 3 Acquisition. Closing of the call option or put option is conditional upon, amongst other things, (i) completion of the Kazzinc Tranche 1 Acquisition; (ii) receipt of consent and waiver of pre-emption right from the Ministry of Industry and New Technologies of the Republic of Kazakhstan; (iii) subject, in both cases, to Glencore's commercial decisions on the basis of prevailing market conditions the hive-down of all of Kazzinc's gold assets (excluding its non-ferrous business) to a new holding company wholly owned by Kazzinc ("Altyntau") and Pasar Holdings using its reasonable commercial endeavours to ensure Altyntau's listing on the Premium Listing segment of the Official List, subject to eligibility; and (iv) the publication of a pricing statement related to the initial public offering of Altyntau ("Altyntau IPO"). The put or call option may only be exercised after completion of the

Kazzinc Tranche 1 Acquisition and before the earlier of: (i) the date falling two months prior to the proposed intention to float date for Altyntau (or such other date as the parties may agree in writing) and (ii) 31 December 2012; and if the put or call option is not exercised on or before 31 December 2012 then they shall lapse.

The consideration payable by Pasar Holdings following exercise of the put or call option shall be:

(a) a cash amount of U.S$ 192,000,000, plus

(b) a cash amount equal to 6.41 per cent of the issued share capital of Altyntau multiplied by the Altyntau IPO offer price (the "Altyntau Stake Value"), minus

(c) a cash amount equal to 6.41 per cent of the Altyntau Stake Value,

(the "Option Consideration").

The parties to the Verny Investments SPA have further agreed that, following completion of the exercise of the put or call option, Verny Investments shall subscribe for such number of shares in Altyntau as is equal to 6.41 per cent. of Altyntau's issued share capital (the "Kazzinc Subscription Shares") for an amount in cash equal to the Altyntau Stake Value (the "Verny Investments Subscription"). The Kazzinc Subscription Shares shall be issued to Verny Investments prior to admission to trading of the Altyntau shares on completion of the Altyntau IPO.

If UK Admission is not achieved by 30 June 2011, either Pasar Holdings or Verny Investments may terminate the Verny Investments SPA and either Kazastur or Verny Rost may terminate the Verny Rost SPA.

Further, if the Glencore Group, in its sole discretion, decides not to proceed with the Global Offer, and thereby determines that UK Admission is not likely to be achieved by 30 June 2011, Pasar Holdings and Kazastur may terminate the Verny Investments SPA and the Verny Rost SPA, respectively.

Pursuant to the Verny Investments SPA and Verny Rost SPA, Verny Investments and Verny Rost, respectively, have given certain warranties and indemnities to Pasar Holdings and Kazastur respectively, and Pasar Holdings and Kazastur, respectively, have given certain limited warranties to Verny Investments and Verny Rost, respectively.

In the event of any breach of the Verny Investments SPA by Verny Investments, Pasar Holdings shall have the right to reduce the Option Consideration, to the extent unpaid. In the event of any breach of the Verny Rost SPA by Verny Rost, Kazastur shall have the right to reduce the Tranche 2 Consideration, to the extent unpaid.

Glencore International has guaranteed the obligations of Pasar Holdings and Kazastur under the Verny Investments SPA and Verny Rost SPA, respectively.

18.13 **OAO RussNeft Loan Agreement**

On 21 December 2010, OAO RussNeft and Interseal Limited, a member of the Glencore Group ("Interseal"), entered into an amendment and restatement agreement (the "Consolidated Loan Agreement") which amended and consolidated various loans that had been made by Interseal to OAO RussNeft. This amendment was put in place as part of a wider restructuring of OAO RussNeft's indebtedness.

As a result of the amendment and consolidation effected by that agreement, a single loan from Interseal to OAO RussNeft is outstanding in an amount of U.S.$2,080,655,312.12 (the "Outstanding Principal Amount").

The Consolidated Loan Agreement provides that:

(a) interest is payable on the Outstanding Principal Amount at a minimum interest rate of 9 per cent. per annum, 3 per cent of which is payable quarterly in cash, so long as all indebtedness owed by OAO RussNeft to Sberbank of Russia remains outstanding and is current, with the balance of the interest being accrued for future payment. This accrued interest, together with an amount of unpaid interest accrued prior to the execution of the

Consolidated Loan Agreement, is payable by OAO RussNeft to Interseal monthly along with the Outstanding Principal Amount in the circumstances described in (b) below;

(b) the Outstanding Principal Amount, together with accrued and unpaid interest, is only to be repaid following the repayment in full of all indebtedness owed by OAO RussNeft to Sberbank of Russia, and then in minimum monthly instalments of U.S.$96,000,000, commencing in last quarter of 2017;

(c) in addition to the monthly instalments in (b) above, following the repayment in full of the indebtedness owed by OAO RussNeft to Sberbank of Russia, a quarterly cash sweep will also require OAO RussNeft to reduce further the Outstanding Principal Amount by an amount equal to excess cashflow (i.e. the amount by which cashflow exceeds debt service) generated during the relevant quarter; and

(d) in any event, OAO RussNeft is required to repay the Outstanding Principal Amount, together with all accrued and unpaid interest, in full to Interseal on or before 31 December 2020.

The Consolidated Loan Agreement also includes representations, warranties and undertakings from OAO RussNeft which are typical for these types of credit arrangements. The Consolidated Loan Agreement also contains customary events of default upon occurrence of which Interseal may demand repayment of the Outstanding Principal Amount.

The amounts outstanding under the Consolidated Loan Agreement are secured by various pledges of shares of members of the OAO RussNeft group, the enforcement of which is to be agreed with Sberbank of Russia whilst all indebtedness owed to it by OAO RussNeft remains outstanding.

19 Related party transactions

Details of related party transactions entered into by members of the Glencore Group during the period covered by the historical financial information and up to the date of this Prospectus are set out in Notes 14, 26 and 28 to the combined financial information contained in Section VI: "Historical Financial Information".

20 Property, plant and equipment

Glencore's material assets are its mining and exploration claims, permits and licences, the most significant of which are summarised in the MERs included in Section XIV: "Independent Technical Reports".

In addition, Glencore leases or uses under licence properties for its business operations around the world. The Directors of the Company are of the opinion that there are currently no material environmental issues that affect Glencore's utilisation of any property or other tangible fixed assets.

For the three years ended 31 December 2010, and in the context of the Glencore Group taken as a whole, Glencore is of the view that in relation to its controlled industrial assets, there have been no material breaches of any material applicable environmental laws and regulations.

21 Intellectual property rights of Glencore

Glencore owns or uses certain intellectual property rights for its business operations around the world. These key rights are as noted below. However, Glencore does not consider these rights to be material to the business of the Glencore Group, as a whole.

21.1 Trademarks

As at 29 April 2011, the last practicable date prior to publication of the Prospectus, the key trademark in relation to Glencore's business as a whole was the "GLENCORE" logo.

Glencore has approximately 424 trademark applications and registrations relating to the Glencore Group in approximately 117 countries. These trademarks are currently registered, or have been applied for, in the names of companies in the Glencore Group.

21.2 **Domain names**

As at 29 April 2011, the last practicable date prior to publication of the Prospectus, the key domain name registration in relation to Glencore's business as a whole was www.glencore.com.

22 Administrative and judicial proceedings

Neither the Company, nor any member of the Glencore Group is or has in the last 12 months been involved in any governmental, legal or arbitration proceedings which may have, or have had in the recent past, a significant effect on the Company's and/or Glencore's financial position or profitability. So far as the Company is aware, no such proceedings are pending or threatened by or against the Company or any member of Glencore.

23 Other proceedings

In a criminal investigation in Belgium against a public official, the European Commission's Directorate-General for Agriculture ("DG AGRI") and others for violation of professional secrecy, corruption of an international civil servant and criminal conspiracy, Glencore Grain Rotterdam BV, a subsidiary of Glencore, a former employee and one current employee have been charged with having committed corruption in exchange for information covered by professional secrecy in the course of the applications for European export restitutions. Following a complaint by the European Anti-Fraud Office (the "OLAF"), the investigation led by the Brussels Prosecutor's office in co-operation with the European Commission and the French and Dutch police and judicial authorities was initiated in October 2003, covering facts dating from 1999 until 2003. The European Commission became a civil party to this case without quantifying the damage at this stage. The trial is expected to be scheduled in 2011.

24 Significant change

There has been no significant change in the financial or trading position of the Company and/or the Glencore Group since 31 December 2010, the date to which the financial information for the Glencore Group in Section B of Section VI: "Historical Financial Information" was prepared.

25 Consents

25.1 Deloitte LLP (a member of the Institute of Chartered Accountants in England and Wales) has given and has not withdrawn its written consent to the inclusion in this Prospectus of its reports which are set out in Section VI: "Historical Financial Information" and Section VII: "Unaudited Pro Forma Financial Information" and/or references to its name included herein in the form and context in which it appears and has authorised the contents of those parts of this Prospectus which comprise its reports for the purposes of Rule 5.5.3R(2)(f) of the Prospectus Rules. As the Offer Shares have not been and will not be registered under the Securities Act, Deloitte LLP has not filed and will not be required to file a consent under the Securities Act.

25.2 Each of MMC, MBGS, WAI, RPS and Golders has given and has not withdrawn its written consent to the inclusion in this Prospectus of its report which is set out in Section XIV: "Independent Technical Reports" and references to its names included herein in the form and context in which appears and has authorised the contents of those parts of this Prospectus which comprise its respective reports for the purposes of Rule 5.5.3R(2)(f) of the Prospectus Rules.

26 Disclaimers

26.1 Save as otherwise disclosed in this Prospectus, none of the Directors or the experts named in paragraph 25 above has any direct or indirect interest in the promotion of, or in, any assets which have been, within the two years immediately preceding the date of this Prospectus, acquired or disposed of by or leased to any member of the Glencore Group, or are proposed to be acquired or disposed of by or leased to any member of the Glencore Group, and none of the Directors is materially interested in any contract or arrangement subsisting at the date of this Prospectus which is significant in relation to the business of Glencore as a whole.

26.2 Save as otherwise disclosed in this Prospectus, none of the experts named in paragraph 25 above has any shareholding in any member of the Glencore Group or the right (whether legally enforceable or not) to subscribe for or to nominate persons to subscribe for securities in any member of the Glencore Group or is an officer or servant or in employment of an officer or servant of Glencore.

27 Miscellaneous

27.1 There are no arrangements in existence under which future dividends are to be waived or agreed to be waived.

27.2 The information set out in this Prospectus that has been sourced from third parties has been accurately reproduced and, so far as the Company is aware and has been able to ascertain from that published information, no facts have been omitted which would render the reproduced information inaccurate or misleading. Where third party information has been used in this Prospectus, the source of such information has been identified.

27.3 The expenses of, and incidental to, the Global Offer and Admission payable by the Company, including the London Stock Exchange, the FSA and the Hong Kong Stock Exchange fees, professional fees, the costs of preparation, printing and distribution of documents and Swiss federal issuance stamp tax, are estimated to amount to approximately U.S.$434.6 million.

27.4 Save as otherwise disclosed in this Prospectus, as of 29 April 2011, the last practicable date prior to publication of the Prospectus, the Company did not have any outstanding material mortgages, charges, debentures, bank overdrafts or other similar indebtedness, hire purchase commitments, guarantees or other material contingent liabilities.

27.5 The Directors have been advised that no material liability for estate duty is likely to fall on the Company or any of its subsidiaries.

27.6 The Joint Sponsors have made an application on behalf of the Company to the FSA, the London Stock Exchange and the Listing Committee of the Hong Kong Stock Exchange for the listing of and permission to deal in the Ordinary Shares in issue and to be issued as mentioned in this Prospectus, including any Ordinary Shares that may be issued under the Over-Allotment Option. All necessary arrangements have been made to enable the Ordinary Shares to be admitted into CCASS.

27.7 There is no promoter of the Company.

27.8 The business address of each of the Directors is Baarermattstrasse 3, PO Box 777, CH-6341 Baar, Switzerland.

27.9 Penwith Limited, the Selling Shareholder, is selling all of the Sale Shares in the International Offer. The Selling Shareholder's business address is 13/14 Esplanade, St Helier, JE1 1BD Jersey.

28 Documents available for inspection

Copies of the following documents are available for inspection during usual business hours on any weekday (Saturdays, Sundays and public holidays are excepted) for the life of this Prospectus at the London office of Linklaters LLP at One Silk Street, London, EC2Y 8HQ:

(a) the Memorandum and Articles of Association of the Company;

(b) the reports from Deloitte LLP which are set out in Section VI: "Historical Financial Information" and Section VII: "Unaudited Pro Forma Financial Information";

(c) the mineral expert report of RPS Energy Limited which is set out in Sub-section A of Section XIV: "Independent Technical Reports" relating to the West African Oil Assets;

(d) the mineral expert report of Minarco-MineConsult Pty Ltd. and McElroy Bryan Geological Services Pty Ltd. which is set out in Sub-section B of Section XIV: "Independent Technical Reports" relating to Prodeco;

(e) the mineral expert reports of Golder Associates (Pty) Ltd. which are set out in Sub-sections C, D and E of Section XIV: "Independent Technical Reports" relating to Katanga, Mopani and Mutanda, respectively;

(f) the mineral expert report of Wardell Armstrong International Ltd. which is set out in Sub-section F of Section XIV: "Independent Technical Reports" relating to Kazzinc;

(g) the service contracts and letters of appointment referred to in paragraph 10 above;

(h) the material contracts referred to in paragraph 18 above;

(i) the letters of consent referred to in paragraph 25 above; and

(j) this Prospectus.

SECTION XI: U.S. PURCHASER'S LETTER

To: Glencore International plc
Baarermattstrasse 3
P.O. Box 777
CH-6341 Baar
Switzerland
(the "Company")

Citigroup Global Markets Inc.
388 Greenwich Street
New York, NY 10028

Credit Suisse (USA) LLC
11 Madison Avenue
New York, NY 10010

Credit Suisse Securities (Europe) Limited
One Cabot Square
London E14 4QJ

Morgan Stanley & Co. Inc.
1585 Broadway
New York, NY 10036

Morgan Stanley & Co. International plc
25 Cabot Square
London E14 4QA

Morgan Stanley Securities Limited
25 Cabot Square
London
E14 4QA

Exane, Inc.
640 5th Avenue
New York, NY 10019

Merrill Lynch, Pierce, Fenner & Smith Incorporated
One Bryant Park
New York, NY 10036

(collectively the "Banks")

Ladies and Gentlemen:

This letter (a "U.S. Purchaser's Letter") relates either to (a) the issuance of Ordinary Shares (the "Securities") of Glencore (the "Company") acquired in the Global Offer; (b) the acquisition of Securities from the Banks (or their affiliates); or (c) the subsequent transfer of such Securities. In any case, this letter is to be delivered on behalf of the person acquiring beneficial ownership of the Securities by the investor named below or the accounts listed on the attachment hereto (each an "Investor"). Unless otherwise stated, or the content otherwise requires, capitalised terms in this letter shall have the same meaning as is given to them in the prospectus relating to the offering of the Securities described therein published by the Company on 4 May 2011 (the "Prospectus").

The Investor agrees, acknowledges, represents and warrants, on its own behalf or on behalf of each account for which it is acting, that:

1. the Investor has received a copy of the Prospectus and understands and agrees that the Prospectus speaks only as of its date and that the information contained therein may not be correct or complete as of any time subsequent to that date;
2. the Investor is a "Qualified Institutional Buyer" ("Qualified Institutional Buyer") as defined in Rule 144A ("Rule 144A") under the U.S. Securities Act of 1933, as amended (the "U.S. Securities Act") and a "Qualified Purchaser" ("Qualified Purchaser") as defined in section 2(a)(51) and related rules of the U.S. Investment Company Act of 1940, as amended (the "U.S. Investment Company Act");
3. the Investor is not a broker-dealer which owns and invests on a discretionary basis less than U.S.$25 million in securities of unaffiliated issuers;

4. the Investor is not formed for the purpose of investing in the Company;
5. the Investor understands that the Company may receive a list of participants holding positions in its securities from one or more book-entry depositories;
6. the Investor is not subscribing to, or purchasing, the Securities with a view to, or for offer or sale in connection with, any distribution thereof (within the meaning of the U.S. Securities Act) that would be in violation of the securities laws of the United States or any state thereof;
7. the party signing this U.S. Purchaser's Letter is acquiring the Securities for its own account or for the account of one or more Investors (each of which is a Qualified Institutional Buyer and a Qualified Purchaser) on whose behalf the party signing this U.S. Purchaser's Letter is authorised to make the acknowledgments, representations and warranties, and enter into the agreements, contained in this U.S. Purchaser's Letter;
8. the Investor is not a participant-director employee plan, such as a plan described in subsection (a)(1)(i)(D), (E) or (F) of Rule 144A;
9. the Securities are being offered in a transaction not involving any public offering within the United States within the meaning of the U.S. Securities Act and that the Securities have not been and will not be registered under the U.S. Securities Act or with any securities regulatory authority of any state or other jurisdiction of the United States;
10. the Ordinary Shares (whether in physical, certificated form or in uncertificated form held in CREST) are "restricted securities" within the meaning of Rule 144(a)(3) under the U.S. Securities Act, the Ordinary Shares are being offered and sold in a transaction not involving any public offering in the U.S. within the meaning of the U.S. Securities Act and no representation is made as to the availability of the exemption provided by Rule 144 for resales of Ordinary Shares;
11. if in the future the Investor decides to offer, resell, pledge or otherwise transfer any Securities, such Securities will be offered, resold, transferred, assigned, pledged or otherwise disposed of only (i) outside the United States in an offshore transaction complying with the provisions of Regulation S under the U.S. Securities Act ("Regulation S") to a person outside the United States and not known by the transferor to be a U.S. Person, by prearrangement or otherwise and under circumstances which will not require the Company to register under the U.S. Investment Company Act, in each case in accordance with all applicable securities laws, upon surrender of the Securities and delivery to the Company of an Offshore Transaction Letter in the form of Annex I hereto (or in a form otherwise acceptable to the Company); or (ii) to the Company or a subsidiary thereof;
12. notwithstanding anything to the contrary in this letter, the Securities may not be deposited into any unrestricted depositary receipt facility in respect of the Company's securities, established or maintained by a depositary bank;
13. the Investor is knowledgeable, sophisticated and experienced in business and financial matters and it fully understands the limitations on ownership and transfer and the restrictions on sales of such securities;
14. the Investor is able to bear the economic risk of its investment in the Securities and is currently able to afford the complete loss of such investment and the Investor is aware that there are substantial risks incidental to the purchase of the Securities, including those summarised under "Risk Factors" in the Prospectus;
15. the Company has not been and will not be registered as an investment company under the U.S. Investment Company Act and the Company has elected to impose the transfer and selling restrictions with respect to persons in the United States and U.S. Persons described herein as contemplated by Section 3(c)7 of the U.S. Investment Company Act;
16. (i) the Company will not be required to accept for registration of transfer any Securities acquired by the Investor if such transfer is made in violation of the transfer restrictions set out in paragraph 11 above; (ii) the Company may require any U.S. person or any person within the United States who was not a Qualified Purchaser at the time it acquired any Securities or any beneficial interest therein to transfer the Securities or any such beneficial interest immediately in a manner consistent with the restrictions set forth in this U.S. Purchaser's Letter; and (iii) if the obligation to transfer is not met, the Company is irrevocably authorised, without any obligation, to transfer the Securities, as applicable, in a manner consistent with the restrictions set forth in this U.S. Purchaser's Letter and, if such Securities are sold, the Company shall be obliged to distribute the net proceeds to the entitled party;

17. the Investor became aware of the offering of the Securities by the Company and the Securities were offered to the Investor (i) solely by means of the Prospectus, (ii) by direct contact between the Investor and the Company or (iii) by direct contact between the Investor and one or more Banks. The Investor did not become aware of, nor were the Securities offered to the Investor by, any other means, including, in each case, by any form of general solicitation or general advertising, and in making the decision to purchase or subscribe to the Securities, the Investor relied solely on the information set forth in the Prospectus;
18. (i) none of the Banks or their affiliates have made or will make any representation or warranty as to the accuracy or completeness of the information in the Prospectus; (ii) the Investor has not relied and will not rely on any investigation by any Bank, its affiliates or any person acting on its or their behalf with respect to the Company, or the Securities; and (iii) none of the Banks or Glencore makes any representation as to the availability of an exemption from the U.S. Securities Act for the transfer of the Securities;
19. upon a proposed transfer of the Securities, the Investor will notify any purchaser of such Securities or the executing broker, as applicable, of any transfer restrictions that are applicable to the Securities being sold;
20. neither the Investor, nor any of the Investor's affiliates, nor any person acting on the Investor's or their behalf, will make any "directed selling efforts" as defined in Regulation S under the U.S. Securities Act in the United States with respect to the Securities;
21. any Ordinary Shares issued to the Investor in certificated form will bear an appropriate legend setting forth, among other things, the transfer restrictions applicable to the Ordinary Shares and the Investor understands that the legend shall not be removed from the Ordinary Shares, unless the Company agrees, in its sole discretion, to remove the legend;
22. each of the Banks, the Company and their respective affiliates are irrevocably authorised to produce this U.S. Purchaser's Letter or a copy hereof to any interested party in any administrative or legal proceeding or official inquiry with respect to the matters covered hereby; and
23. no agency of the United States or any state thereof has made any finding or determination as to the fairness of the terms of, or any recommendation or endorsement in respect of, the Securities.

The Investor hereby consents to the actions of each of the Banks, and hereby waives any and all claims, actions, liabilities, damages or demands it may have against either Bank in connection with any alleged conflict of interest arising from the engagement of each of the Banks with respect to the sale by the applicable Bank of the Securities to the Investor.

The Investor acknowledges that each of the Banks, the Company and their respective affiliates and others will rely on the acknowledgments, representations and warranties contained in this U.S. Purchaser's Letter as a basis for exemption of the sale of the Securities under the U.S. Securities Act, the U.S. Investment Company Act, under the securities laws of all applicable states and for other purposes. The party signing this U.S. Purchaser's Letter agrees to promptly notify the Company if any of the acknowledgments, representations or warranties set forth herein are no longer accurate.

This U.S. Purchaser's Letter shall be governed by and construed in accordance with the laws of the State of New York.

Where there are joint applicants, each must sign this U.S. Purchaser's Letter. Applications from a corporation must be signed by an authorised officer or be completed otherwise in accordance with such corporation's constitution (evidence of such authority may be required).

Very truly yours,

NAME OF PURCHASER:

By:

Name:

Title:

Address:

Date:

ANNEX I TO SECTION XI: OFFSHORE TRANSACTION LETTER

To: Glencore International plc
Queensway House
Hilgrove Street
St. Helier
Jersey JE1 1ES

Ladies and Gentlemen:

This letter (an "Offshore Transaction Letter") relates to the sale or other transfer by us of Ordinary Shares (the "Securities") of Glencore (the "Company") in an offshore transaction pursuant to Regulation S ("Regulation S") under the U.S. Securities Act of 1933, as amended (the "U.S. Securities Act").

Terms used in this Offshore Transaction Letter are used as defined in Regulation S, except as otherwise stated herein.

The undersigned acknowledges (or if the undersigned is acting for the account of another person, such person has confirmed that it acknowledges) that the Securities have not been and will not be registered under the U.S. Securities Act or with any securities regulatory authority of any state or other jurisdiction of the United States and that the Company has not registered as an investment company under the U.S. Investment Company Act of 1940, as amended (the "U.S. Investment Company Act").

The undersigned hereby certifies that:

1. The offer and sale of the Securities was not and will not be made to a person in the United States or to a person known by us to be a U.S. Person.
2. Either (a) at the time the buy order for the Securities was originated, the buyer was outside the United States or the undersigned and any person acting on the undersigned's behalf reasonably believed that the buyer was outside the United States, or (b) the transaction in the Securities was executed in, on or through the facilities of a designated offshore securities market as defined in Regulation S (including, for the avoidance of doubt, a *bona fide* sale on the London Stock Exchange's main market for listed securities or the Hong Kong Stock Exchange), and neither the undersigned nor any person acting on the undersigned's behalf knows that the transaction was pre-arranged with a buyer in the United States.
3. Neither the undersigned, nor any of the undersigned's affiliates, nor any person acting on the undersigned's or their behalf has made any directed selling efforts in the United States with respect to the Securities.
4. The proposed transfer of the Securities is not part of a plan or scheme to evade the registration requirements of the U.S. Securities Act or the U.S. Investment Company Act.
5. Neither the Company nor any of its agents participated in the sale of the Securities.
6. The undersigned confirms that, prior to the sale of the Securities, the undersigned notified the purchaser of such Securities or the executing broker, as applicable, of any transfer restrictions that are applicable to the Securities being sold.

This letter is governed by and shall be construed in accordance with the laws of the State of New York.

Where there are joint transferors, each must sign this Offshore Transaction Letter. An Offshore Transaction Letter of a corporation must be signed by an authorised officer or be completed otherwise in accordance with such corporation's constitution (evidence of such authority may be required).

The undersigned agrees that the Company and its agents and their respective affiliates may rely upon the truth and accuracy of the foregoing acknowledgments, representations and agreements.

Very truly yours,

NAME OF TRANSFEROR:

By:

Name:

Title:

Address:

Date:

SECTION XII: DEFINITIONS

The definitions set out below apply throughout this Prospectus, unless the context requires otherwise.

"**1C**", "**2C**", "**3C**", "**1P**", "**2P**" and "**3P**"	each has the meaning given to it in Appendix A to the PRMS;
"**Aabar**"	has the meaning given to it in paragraph 10 of Section VIII: "Details of the Global Offer";
"**Adjusted EBIT**"	has the meaning given to it in the section titled "Presentation of Information";
"**Adjusted EBITDA**"	has the meaning given to it in the section titled "Presentation of Information";
"**Adjusted EBIT pre-exceptional items**"	has the meaning given to it in the section titled "Presentation of Information";
"**Adjusted EBITDA pre-exceptional items**"	has the meaning given to it in the section titled "Presentation of Information";
"**ADM**"	means Archer Daniels Midland Company;
"**Admission**"	means UK Admission and HK Admission;
"**API**"	means the American Petroleum Institute;
"**Application Form**"	means the white, yellow and green application form(s), or, where the context so requires, any of them, relating to the Hong Kong Offer;
"**Articles**"	means the articles of association of the Company, which have been adopted conditional upon Admission;
"**AR Zinc**"	means AR Zinc SA, an entity in which Glencore has a 100 per cent. interest;
"**Atlas Petroleum**"	means Atlas Petroleum International Limited, an independent third party;
"**Banks**"	means the Joint Sponsors, the International Managers and the Hong Kong Managers;
"**bbls**"	means barrels;
"**bcf**"	means billion cubic feet;
"**BHP Billiton**"	means BHP Billiton Plc, an independent third party;
"**BlackRock**"	has the meaning given to it in paragraph 10 of Section VIII: "Details of the Global Offer";
"**BlackRock Entities**"	has the meaning given to it in paragraph 10 of Section VIII: "Details of the Global Offer";
"**Blackthorn Resources**"	means Blackthorn Resources Limited, an entity in which Glencore has a 13 per cent. interest;
"**BNP Paribas**"	means BNP Paribas, whose registered office is at 16, boulevard des Italiens, 75009 Paris;
"**Board**"	means the board of Directors of the Company;
"**Bonus Award**"	has the meaning given to it in paragraph 14 of Section X: "Additional Information";
"**BP**"	means BP plc, an independent third party;
"**Brookside Capital**"	has the meaning given to it in paragraph 10 of Section VIII: "Details of the Global Offer";

"**Brookside Fund**"	has the meaning given to it in paragraph 10 of Section VIII: "Details of the Global Offer";
"**bscf**"	means billions of standard cubic feet;
"**Bunge**"	means Bunge Limited, an independent third party;
"**capex**"	means capital expenditure;
"**CBOT**"	means Chicago Board of Trade;
"**CCASS**"	means the Central Clearing and Settlement System established and operated by HKSCC;
"**CCASS Operational Procedures**"	means the document which forms part of the General Rules of CCASS and sets out the operations of CCASS, the services and facilities available thereunder and the procedures to be followed by participants, as amended from time to time;
"**Century Aluminum**"	means Century Aluminum Company, an entity in which Glencore has a 44.0 per cent. interest;
"**Cerrejón**"	means Carbones del Cerrejón Limited;
"**Chemoil**"	means Chemoil Energy Limited, an entity in which Glencore has a 51.5 per cent. interest;
"**CIF**"	means cost, insurance and freight;
"**CIS**"	means the Commonwealth of Independent States, whose participant countries are certain former members of the Union of Soviet Socialist Republics;
"**Citi**"	means Citigroup Global Markets Limited (in its capacity as UK Sponsor) and/or Citigroup Global Markets U.K. Equity Limited (in its capacity as Joint Global Co-ordinator, Joint Bookrunner and International Manager), as the case may be;
"**Citi Asia**"	means Citigroup Global Markets Asia Limited;
"**City Code**"	means the City Code on Takeovers and Mergers;
"**Closing Date**"	has the meaning given to it in paragraph 10 of Section VIII: "Details of the Global Offer";
"**CME**"	means Chicago Mercantile Exchange;
"**Cobar**"	means Cobar Management Pty Ltd., an entity in which Glencore has a 100 per cent. interest;
"**Code**"	means the UK Corporate Governance Code on the Principles of Good Governance and Code of Best Practice published in June 2010 by the Financial Reporting Council in the UK;
"**Colombian Coal Group**"	has the meaning set out in the definition of Prodeco in this Section XII;
"**Columbia Falls**"	means Columbia Falls Aluminum Company LLC, an entity in which Glencore has a 100 per cent. interest;
"**COMEX**" or "**NYMEX**"	means the Commodity Exchange division of the New York Mercantile Exchange;
"**Companies Ordinance**"	means the Companies Ordinance (Chapter 32 of the Laws of Hong Kong), as amended from time to time;
"**Company**"	means Glencore International plc;
"**Consolidated Financial Statements**"	means the consolidated financial statements included in Section VI: "Historical Financial Information";

"**Convertible Bonds**"	means the U.S.$2.3 billion guaranteed convertible bonds due 2014 issued by Glencore Finance (Europe) S.A., one of the financing vehicles in the Glencore Group;
"**Cornerstone Investment Agreements**"	has the meaning given to it in paragraph 10 of Section VIII: "Details of the Global Offer";
"**Cornerstone Investors**"	has the meaning given to it in paragraph 10 of Section VIII: "Details of the Global Offer";
"**Credit Suisse**"	means Credit Suisse Securities (Europe) Limited;
"**Credit Suisse Asia**"	means Credit Suisse (Hong Kong) Limited;
"**CREST**"	means the electronic, paperless transfer and settlement mechanism to facilitate the transfer of shares in uncertificated form operated by CRESTCo;
"**CRESTCo**"	means CRESTCo Limited, the operator (as defined in the Uncertificated Securities Regulations) of CREST;
"**CRU**"	means CRU International Limited;
"**DBP**"	means the Glencore Deferred Bonus Plan details of which are set out in paragraph 14 of Section X: "Additional Information";
"**Directors**"	means the Executive Directors and the Non-Executive Directors;
"**Disclosure and Transparency Rules**"	means the rules relating to the disclosure of information made in accordance with Section 73A(3) of the FSMA;
"**Dispose**" and "**Disposals**" shall be construed accordingly	means, in the context of paragraph 17.6 of Section X: "Additional Information", to directly or indirectly offer, sell, contract to sell, grant or sell options over, purchase any option or contract to sell, transfer, charge, pledge, grant any right or warrant to purchase or otherwise transfer, lend, or dispose of, directly or indirectly, Ordinary Shares or any securities convertible into or exercisable or exchangeable for Ordinary Shares or to enter into any swap or other agreement that transfers, in whole or in part, any of the economic consequences of ownership of Ordinary Shares, whether any such transaction described above is to be settled by delivery of Ordinary Shares or such other securities, in cash or otherwise, or dispose or enter into any other agreement to dispose of Ordinary Shares or announce or otherwise publicise the intention to do any of the foregoing;
"**DMT**"	means dry metric tonnes;
"**DRC**"	means the Democratic Republic of Congo;
"**EEA**"	means the European Economic Area;
"**EHS**"	means environmental, health and safety;
"**Equatorial Guinea**"	means the Republic of Equatorial Guinea;
"**Eton Park**"	has the meaning given to it in paragraph 10 of Section VIII: "Details of the Global Offer";
"**Eton Park Funds**"	has the meaning given to it in paragraph 10 of Section VIII: "Details of the Global Offer";
"**EU**"	means the European Union;
"**Executive Directors**"	means the executive directors of the Company, being Ivan Glasenberg and Steven Kalmin;

"**Existing Shareholders**"	means all holders of Ordinary Shares following completion of the Restructuring and immediately prior to Admission, excluding the Selling Shareholder;
"**Fidelity**"	has the meaning given to it in paragraph 10 of Section VIII: "Details of the Global Offer";
"**Fidelity Entities**"	has the meaning given to it in paragraph 10 of Section VIII: "Details of the Global Offer";
"**FOB**"	means free on board;
"**FSA**"	means the Financial Services Authority;
"**FSMA**"	means the Financial Services and Markets Act 2000;
"**FTSE**"	means FTSE International Limited;
"**FTSE 100**"	means the FTSE 100 index;
"**Gécamines**"	means La Générale des Carrières et des Mines;
"**GIC**"	has the meaning given to it in paragraph 10 of Section VIII: "Details of the Global Offer";
"**Glencore**" or the "**Glencore Group**" or the "**Group**"	means Glencore International AG, and with effect from UK Admission, Glencore International plc and, in each case, their subsidiaries, any subsidiary thereof and "Glencore Group" shall be interpreted accordingly;
"**Glencore Deferred Bonus Plan**"	means the Glencore employee share plan, a description of which is set out in paragraph 14 of Section X: "Additional Information";
"**Glencore International**"	means Glencore International AG, a company incorporated in Switzerland that will become a wholly owned subsidiary of the Company at UK Admission;
"**Glencore International Purchase Agreement**"	means the agreement summarised in paragraph 18 of Section X: "Additional Information";
"**Glencore Performance Share Plan**"	means the Glencore employee share plan, a description of which is set out in paragraph 14 of Section X: "Additional Information";
"**Global Offer**"	means the opportunity to acquire Ordinary Shares being made available to institutional and certain other investors, as set out in Section VIII: "Details of the Global Offer";
"**Golders**"	means Golder Associates South Africa (Pty) Ltd.;
"**g/t**"	means grams per MT;
"**HK Admission**"	means the conditional approval of the Listing Committee of the Hong Kong Stock Exchange for the listing of and dealing in all of the Ordinary Shares on the Main Board of the Hong Kong Stock Exchange;
"**HK Joint Bookrunners**"	means BNP Paribas, Citi Asia, Credit Suisse Asia, Merrill Lynch Asia and Morgan Stanley Asia;
"**HKSCC**"	means the Hong Kong Securities Clearing Company Limited;
"**HK Sponsors**"	means Citi Asia and Morgan Stanley Asia;
"**HMRC**"	means HM Revenue & Customs;
"**Holdco**"	means the Company;
"**Hong Kong**"	means the Hong Kong Special Administrative Region of the PRC;

"**Hong Kong dollar**" or "**HK$**"	means the lawful currency of Hong Kong;
"**Hong Kong Listing Rules**"	means the Rules Governing the Listing of Securities on the Hong Kong Stock Exchange;
"**Hong Kong Managers**"	means ABN AMRO Bank N.V., Banco Santander, S.A., Barclays Capital Asia Limited, BNP Paribas, BOCI Asia Limited, Citi Asia, Commerzbank Aktiengesellschaft, Crédit Agricole CIB Hong Kong Branch, Credit Suisse Asia, DBS Asia Capital Limited, The Hongkong and Shanghai Banking Corporation Limited, Merrill Lynch Asia, Mizuho Securities Asia Limited, Morgan Stanley Asia, The Royal Bank of Scotland N.V., Hong Kong Branch, Société Générale, Standard Chartered Securities (Hong Kong) Limited and UBS AG, Hong Kong Branch;
"**Hong Kong Offer**"	means the opportunity to subscribe for Hong Kong Offer Shares being available to the public and professional investors in Hong Kong (subject to adjustment) subject to and in accordance with the terms and conditions set out in this Prospectus and the Application Forms;
"**Hong Kong Offer Price**"	means the offer price to be paid (denominated in HK$) by Hong Kong retail investors;
"**Hong Kong Offer Shares**"	means the Ordinary Shares initially being made available pursuant to the Hong Kong Offer (subject to adjustment set out in Section VIII: "Details of the Global Offer");
"**Hong Kong Stock Exchange**" or "**HKSE**"	means The Stock Exchange of Hong Kong Limited;
"**IAS**"	means International Accounting Standards;
"**lb**"	means pound-mass;
"**ICE**"	means Intercontinental-Exchange, Inc.;
"**IEA**"	mean International Energy Agency;
"**IFRS**"	means International Financial Reporting Standards issued by the International Accounting Standards Board ("IASB") and adopted for use in the EU;
"**Informa**"	means Informa Plc;
"**International Joint Bookrunners**"	means BNP Paribas, Citi, Credit Suisse, Merrill Lynch and MSSL;
"**International Managers**"	means ABN AMRO Bank N.V., Banco Santander, S.A., Barclays Bank PLC, BNP Paribas, BOCI Asia Limited, Citi, Commerzbank Aktiengesellschaft, Coöperatieve Centrale Raiffeisen-Boerenleenbank B.A., Crédit Agricole Corporate and Investment Bank, Credit Suisse, HSBC Bank plc, ING Bank N.V., Liberum Capital Limited, Merrill Lynch, Mizuho International plc, MSSL, Natixis, The Royal Bank of Scotland N.V. (London Branch), Sberbank of Russia, Société Générale, Standard Chartered Securities (Hong Kong) Limited and UBS Limited;
"**International Offer**"	means the opportunity to acquire International Offer Shares made available to institutional and certain other investors described in Section VIII: "Details of the Global Offer";
"**International Offer Shares**"	means the Ordinary Shares initially being made available pursuant to the International Offer;

"**Investment Company Act**"	means the U.S. Investment Company Act of 1940;
"**IPO**"	means initial public offering;
"**Jersey Companies Law**"	means the Companies (Jersey) Law 1991, as amended;
"**Jersey Takeover Law**"	means the Companies (Takeovers and Mergers Panel) (Jersey) Law 2009 and the Companies (Appointment of Takeovers and Mergers Panel) (Jersey) Order 2009;
"**Joint Bookrunners**"	the International Joint Bookrunners and the HK Joint Bookrunners;
"**Joint Global Co-ordinators**"	means Citi, Credit Suisse and Morgan Stanley;
"**Joint Sponsors**"	the UK Sponsors and the HK Sponsors;
"**JORC Code**"	means the 2004 Report of the Joint Ore Reserves Committee of the Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia;
"**Kansuki**"	means Kansuki Sprl, an entity in which Glencore has an interest;
"**Katanga**"	means Katanga Mining Limited, an entity in which Glencore has a 74.4 per cent. interest;
"**Katanga Report**"	means the technical report dated 4 May 2011 prepared by Golders in relation to the mineral reserves and mineral resources of Katanga set out in Section XIV: "Independent Technical Reports";
"**Kazzinc**"	means Kazzinc LLP, a limited liability partnership organised and incorporated under the laws of Kazakhstan;
"**Kazzinc Consideration Shares**"	has the meaning given to it in paragraph 18.12 of Section X: "Additional Information".
"**Kazzinc Report**"	means the technical report prepared by WAI in relation to the mineral reserves and mineral resources of Kazzinc set out in Section XIV: "Independent Technical Reports";
"**Kazzinc SPAs**"	has the meaning given to it in paragraph 18.12 of Section X: "Additional Information";
"**KT**"	means kilotons;
"**LBMA**"	means London Bullion Market Association;
"**LIBOR**"	means the London Interbank Offering Rate;
"**Listing Rules**"	means the Listing Rules made by the FSA under Part VI of the FSMA;
"**LME**"	means the London Metal Exchange;
"**Lock-Up Deeds**"	means the lock-up deeds entered into by the Existing Shareholders and the Executive Directors in favour of the Joint Global Co-ordinators and the Company in relation to the lock-up arrangements described in paragraph 17 of Section X: "Additional Information";
"**London Stock Exchange**"	means London Stock Exchange plc;
"**Los Quenuales**"	means Empresa Minera Los Quenuales SA, an entity in which Glencore has a 97.1 per cent. interest;
"**MATIF**"	means Marché à Terme International de France;
"**MBGS**"	means McElroy Bryan Geological Services Pty Ltd.;
"**Member State**"	means a member of the EEA;

“**MER**”	means mineral expert’s report;
“**Merlin**”	means Merlin Trade & Consultancy Ltd;
“**Merrill Lynch**”	means Merrill Lynch International;
“**Merrill Lynch Asia**”	means Merrill Lynch Far East Limited;
“**Minara**”	means Minara Resources Ltd., an entity in which Glencore has a 70.6 per cent. interest;
“**MMC**”	means Minarco-MineConsult Pty Ltd.;
“**MMstb**”	means million stock tank barrels;
“**Moody’s**”	means Moody’s Investors Service Limited;
“**Mopani**”	means Mopani Copper Mines plc, an entity in which Glencore has a 73.1 per cent. interest;
“**Mopani Report**”	means the technical report dated 4 May 2011 prepared by Golders in relation to the mineral reserves and mineral resources of Mopani set out in Section XIV: “Independent Technical Reports”;
“**Moreno**”	means Moreno Group, an entity in which Glencore has a 100 per cent. interest;
“**Morgan Stanley**”	means Morgan Stanley & Co. International plc;
“**Morgan Stanley Asia**”	means Morgan Stanley Asia Limited;
“**MSSL**”	means Morgan Stanley Securities Limited;
“**MT**”	means metric tonnes;
“**Murrin Murrin**”	means the joint venture between Minara Resources Ltd. and Glenmurrin Pty Ltd, in which Glencore has an indirect interest;
“**Mutanda**”	means Mutanda Ya Mukonkota Mining Sprl, an entity in which Glencore has a 40 per cent. interest;
“**Mutanda Report**”	means the technical report dated 4 May 2011 prepared by Golders in relation to the mineral reserves and mineral resources of Mutanda set out in Section XIV: “Independent Technical Reports”;
“**NASDAQ**”	means the National Association of Securities Dealers Automated Quotations;
“**New Offer Shares**”	means the Ordinary Shares to be issued by the Company under the Global Offer;
“**Nikanor**”	means the company formerly known as Nikanor PLC;
“**Noble Group**”	means Noble Group Limited, an independent third party;
“**Noble Houston**”	means Noble Energy EG Limited, a subsidiary of Noble Energy, Inc., an independent third party;
“**NOCs**”	means national oil companies;
“**Non-Executive Directors**”	means the non-executive directors of the Company as set out in the table in Section II: “Directors and Corporate Governance”;
“**Nyrstar**”	means Nyrstar NV, an entity in which Glencore has a 7.8 per cent. interest;
“**OAO RussNeft**”	means OAO NK “RussNeft”;
“**Och-Ziff Funds**”	has the meaning given to it in paragraph 10 of Section VIII: “Details of the Global Offer”;

"**Offer Price**"	means the price at which each Ordinary Share is to be issued or sold in the Global Offer, to be determined and as set out in the Pricing Statement;
"**Offer Price Range**"	means 480 pence to 580 pence;
"**Offer Shares**"	means the New Offer Shares and the Sale Shares;
"**Official List**"	means the Official List of the FSA;
"**Ordinary Shares**"	means ordinary shares of U.S.$0.01 each in the share capital of the Company;
"**Over-Allotment Option**"	means the over-allotment option granted by the Company to the Stabilising Manager for up to a maximum of 10 per cent. of the Offer Shares at the Offer Price, exercisable in whole or in part upon notice by the Stabilising Manager at any time on or before the 30th calendar day after the commencement of conditional dealings of the Ordinary Shares on the London Stock Exchange (or, in respect of Hong Kong, before such time in accordance with applicable laws and regulatory requirements);
"**Over-Allotment Shares**"	means the Ordinary Shares that are the subject of the Over-Allotment Option;
"**P10**"	means the value in a probabilistic distribution which corresponds to 10 per cent. cumulative exceedance probability;
"**P50**"	means the value in a probabilistic distribution which corresponds to 50 per cent. cumulative exceedance probability;
"**P90**"	means the value in a probabilistic distribution which corresponds to 90 per cent. cumulative exceedance probability;
"**Pacorini Group**"	means the group of metal warehousing companies acquired by Glencore in the third quarter of 2010, a group of companies in which Glencore has a 100 per cent. interest;
"**Pasar**"	means Philippine Associated Smelting & Refining Corporation, an entity in which Glencore has a 78.2 per cent. interest;
"**Pictet**"	has the meaning given to it in paragraph 10 of Section VIII: "Details of the Global Offer";
"**Polymet**"	means Polymet Mining Corp., an entity in which Glencore has 9.3 per cent. interest;
"**Portovesme**"	means Portovesme srl, an entity in which Glencore has a 100 per cent. interest;
"**PRC**" or "**China**"	means the People's Republic of China but excluding, for the purpose of this document only, Hong Kong, the Macau Special Administrative Region of the PRC and Taiwan;
"**Price Determination Date**"	means the date, expected to be on or around 18 May 2011, on which the Offer Price is fixed for the purposes of the Global Offer;
"**Pricing Agreement**"	means the pricing agreement to be executed by the Underwriters, the Company and the Selling Shareholder immediately prior to the announcement of the Offer Price;
"**Pricing Statement**"	means the statement to be published by the Company detailing the Offer Price and related information;
"**PRMS**"	means the 2007 SPE/WPC/AAPG/SPEE Petroleum Resources Management System;

"**Prodeco**"	means Colombian Coal Group, comprising C.I. Prodeco SA, Consorcio Minero Unido SA, Carbones de la Jagua SA, Carbones El Tesoro SA and Puerto Nuevo SA, a group of companies in which Glencore has an interest;
"**Prodeco Report**"	means the technical report dated 4 May 2011 prepared by MMC and MBGS in relation to the mineral reserves and mineral resources of Prodeco (comprising the Calenturitas mine and the La Jagua complex) set out in Section XIV: "Independent Technical Reports";
"**Prospectus**" or "**Price Range "Prospectus**"	means this document relating to the Company and the Ordinary Shares, prepared by the Company in accordance with the Listing Rules, the Hong Kong Listing Rules, the Companies Ordinance and the Prospectus Rules;
"**Prospectus Directive**"	means Directive 2003/71/EC;
"**Prospectus Rules**"	means the Prospectus Rules published by the FSA under Section 73A of the FSMA;
"**PSP**"	means the Glencore Performance Share Plan details of which are set out in paragraph 14 of Section X: "Additional Information";
"**PSP Award**"	has the meaning given to it in paragraph 14 of Section X: "Additional Information";
"**QIBs**"	means qualified institutional buyers as defined in Rule 144A under the Securities Act;
"**QPs**"	has the meaning as defined in the Investment Company Act;
"**Qualifying Reserves**"	means Capital Contribution Reserves in terms of Swiss tax law and according to the Swiss GAAP financial statements as included in the notes to the annual financial statements. These are reserves from capital contributions made by shareholders to the Company after 31 December 1996, which can be repaid free of Swiss Withholding Tax;
"**Recylex**"	means Recylex SA, an entity in which Glencore has a 32.2 per cent. interest;
"**Regulation S**"	means Regulation S under the Securities Act;
"**Relationship Agreement**"	means the relationship agreement as further described in Section I: "Information on Glencore";
"**Restructuring**"	means the reorganisation of Glencore International's shareholding structure pursuant to which the Company will be inserted as the immediate holding company of Glencore International prior to Admission;
"**Rio Vermelho**"	means Rio Vermelho Acucar e Alcool SA, an entity in which Glencore has a 76 per cent. interest;
"**RPS**"	means RPS Energy Limited;
"**RPS Report**"	means the technical report prepared by RPS Energy Limited in relation to the West African Oil Assets as set out in Section XIV: "Independent Technical Reports";
"**Rule 144A**"	means Rule 144A under the Securities Act;
"**Sale Shares**"	means the Ordinary Shares sold to the Selling Shareholder prior to UK Admission which are being made available for sale by the Selling Shareholder as part of the Global Offer;

"**SAMREC**"	means the 2007 edition of the South African Code for Reporting of Exploration Results, Mineral Resources and Mineral Reserves;
"**SDRT**"	means stamp duty reserve tax;
"**SEC**"	means the U.S. Securities and Exchange Commission;
"**Secondary Listing**"	means the admission of Ordinary Shares to secondary listing and trading on the HKSE pursuant to the Hong Kong Listing Rules;
"**Securities Act**"	means the U.S. Securities Act of 1933, as amended;
"**Selling Shareholder**"	means Penwith Limited, a company incorporated under the Jersey Companies Law for the purpose of aggregating the Sale Shares and selling them in the Global Offer;
"**SFC**"	means the Securities and Futures Commission of Hong Kong;
"**Shanduka Coal**"	means Shanduka Coal (Pty) Limited, an entity in which Glencore has a 70 per cent. interest;
"**Shareholders**"	means holders of Ordinary Shares;
"**Shell**"	means Royal Dutch Shell plc, an independent third party;
"**Sherwin Alumina**"	means Sherwin Alumina Company LLC, an entity in which Glencore has a 100 per cent. interest;
"**SHFE**"	means Shanghai Futures Exchange;
"**SHG**"	means special high grade;
"**Sinchi Wayra**"	means Sinchi Wayra SA, an entity in which Glencore has a 100 per cent. interest;
"**Singapore Stock Exchange**"	means Singapore Exchange Securities Trading Limited;
"**SIX**"	means SIX Swiss Exchange;
"**Stabilising Manager**"	means Morgan Stanley Securities Limited;
"**Standard & Poor's**"	means Standard & Poor's Ratings Services, a division of The McGraw-Hill Companies, Inc.;
"**ST Shipping**"	means ST Shipping & Transport Pte Ltd., an entity in which Glencore has a 100 per cent. interest;
"**Subscriber Shares**"	means the two ordinary shares issued on incorporation of the Company;
"**SXEW**"	means Solvent Extraction Electrowinning;
"**The West African Oil Assets**"	means Block O in Equatorial Guinea held by Glencore Exploration Ltd. and Block I in Equatorial Guinea and five other discoveries in these blocks (Carmen, Diega (A-sand), Diega (B-sand), Felicita and Yolanda) held by Glencore Exploration (EG) Ltd.;
"**Topley**"	means Topley Corporation, an entity in which Glencore has a 100 per cent. interest;
"**toz**"	means troy ounce;
"**UC Rusal**"	means United Company RUSAL Plc, an entity in which Glencore has a 8.75 per cent. interest;
"**UK**" or "**United Kingdom**"	means the United Kingdom of Great Britain and Northern Ireland;

"**UK Admission**"	means admission of the Ordinary Shares to the Official List and to the London Stock Exchange's main market for listed securities;
"**UK Companies Act 2006**"	means the Companies Act 2006 of England and Wales, as amended;
"**UK Sponsors**"	means Citi and Morgan Stanley;
"**Umcebo**"	means Umcebo Mining (Proprietary) Limited, an entity in which Glencore has agreed to acquire a 43.66 per cent. interest;
"**Uncertificated Securities Regulations**" or "**CREST Regulations**"	means the Uncertificated Securities Regulations 2001 (S.I. 2001 No. 3755) or the Companies (Uncertificated Securities) Jersey Order 1999 (as applicable);
"**Underwriters**"	means ABN AMRO Bank N.V., BNP Paribas, Banco Santander, S.A., Barclays Bank PLC, Barclays Capital Asia Limited, BOCI Asia Limited, Citi, Citi Asia, Commerzbank Aktiengesellschaft, Coöperatieve Centrale Raiffeisen-Boerenleenbank B.A., Crédit Agricole Corporate and Investment Bank, Crédit Agricole CIB Hong Kong Branch, Credit Suisse, Credit Suisse Asia, DBS Asia Capital Limited, HSBC Bank plc, The Hongkong and Shanghai Banking Corporation Limited, ING Bank N.V., Liberum Capital Limited, Merrill Lynch, Merrill Lynch Asia, Mizuho International plc, Mizuho Securities Asia Limited, Morgan Stanley Asia, MSSL, Natixis, The Royal Bank of Scotland N.V. (London Branch), The Royal Bank of Scotland N.V., Hong Kong Branch, Société Générale, Standard Chartered Securities (Hong Kong) Limited, UBS Limited and UBS AG, Hong Kong Branch;
"**Underwriting Agreement**"	means the underwriting agreement dated 4 May 2011 relating to the Global Offer entered into by, amongst others, the Underwriters, the Company and the Selling Shareholder as set out in paragraph 16 of Section X: "Additional Information";
"**U.S.**"	means the United States of America;
"**U.S. Persons**"	means U.S. Persons as defined in Regulation S;
"**USDA**"	means the U.S. Department of Agriculture;
"**VaR**"	means value at risk;
"**VasGold**"	means Vasilkovskoje gold mine and concentrator;
"**VAT**"	means value added tax;
"**Verny**"	means Verny Investments together with Verny Rost, each an independent third party (but for its shareholding in Kazzinc);
"**Verny Capital**"	means JSC "Verny Capital" (registered in the Republic of Kazakhstan);
"**Verny Investments**"	means closed unit risk investment fund "Vernye Investitsii" (represented by Verny Capital, acting in the best interest of closed unit risk investment fund "Vernye Investitsii");
"**Verny Rost**"	means closed unit risk investment fund "Verny Rost" (represented by Verny Capital, acting in the best interest of closed unit risk investment fund "Vernye Rost");
"**Volcan**"	means Volcan Compañia Minera S.A.A., an entity in which Glencore has a 4.1 per cent. interest;
"**WAI**"	means Wardell Armstrong International Ltd.;

"**WGC**"	means World Gold Council;
"**White Form eIPO Service**"	means the facility for making an application for Hong Kong Offer Shares to be issued in or transferred into the investor's own name by submitting an application online through the designated website of the White Form eIPO Service Provider (being Computershare Hong Kong Investor Services Limited), www.eipo.com.hk;
"**Xstrata**"	means Xstrata plc and, where the context requires, its subsidiaries, subsidiary undertakings and associated undertakings, an entity in which Glencore has a 34.5 per cent. interest;
"**York Capital Funds**"	has the meaning given to it in paragraph 10 of Section VIII: "Details of the Global Offer"; and
"**Zijin**"	has the meaning given to it in paragraph 10 of Section VIII: "Details of the Global Offer".

SECTION XIII: INFORMATION ON COMMODITIES

The following information relating to the industry overview has been provided for background purposes only. The information is either based on Directors' beliefs or has been extracted from a combination of data sourced from third party industry data providers and data released by public organisations including:

Third party industry data:

CRU International Limited	*Industry data relating to the Metals and Minerals business segment.*
Merlin Trade & Consultancy Ltd.	*Industry data relating to the Energy Products business segment (in particular in relation to coal).*
SSY Consultancy and Research	*Industry data relating to the Energy Products business segment.*
Informa Plc	*Industry data relating to the Agricultural Products business segment.*

Data released by public organisations:

World Gold Council (Metals and Minerals)	*Information was taken from the publicly available "Gold Demand Trends 2010" released 17 February 2011.*
International Energy Association (Energy Products)	*Information was taken from the publicly available "Oil Market Report" released 10 February 2011.*
BP plc (Energy Products)	*Information was taken from the publicly available "Statistical Review of World Energy 2010" released June 2010.*
U.S. Department of Agriculture (Agricultural Products)	*Information was taken from the publicly available "World Agricultural Supply and Demand Estimates" released 12 January 2011.*

The Company confirms that such third party information has been accurately reproduced and, as far as the Company is aware and is able to ascertain from information published by such sources, no facts have been omitted which would render the reproduced information inaccurate or misleading.

Metals and Minerals

Metals are typically classified into base metals (including non-ferrous base metals such as aluminium, copper, lead, nickel and zinc and ferrous base metals such as iron and ferroalloys) and precious metals (including gold, silver, platinum and palladium). Each metal is mined in the form of ore and subsequently processed into finished metal via specialised concentrating, smelting and refining techniques, before being sold to end users in a variety of industrial applications. The mining and processing of metals can take place within a vertically-integrated system or via multiple parties, each undertaking specific production steps. The extent of vertical integration differs between commodities.

Where ore is processed into finished metal by multiple parties, the transfers of intermediate products such as concentrate or blister that occur between parties may be direct or may involve marketers acting as intermediaries. Finished metals may be sold by producers directly to end users or via intermediaries.

Zinc/copper/lead and by-products

Copper

Copper is a base metal with desirable properties of malleability, high thermal and electrical conductivity, resistance to corrosion and strength, which make it attractive for use in electrical wiring and piping.

Copper ore is found in two commercially viable forms: sulphide ore and oxide ore. Sulphide ore is normally mined and processed into copper concentrate and is then smelted and refined into copper cathode (or metal) (99.99 per cent. copper). Oxide ore is mined and converted into copper cathode directly via a process known as Solvent Extraction Electrowinning ("SXEW"). Copper concentrate and copper metal are both traded products.

Copper metal is employed in a variety of end uses, with the construction and electric and electronic components sectors being key. Copper consumption can be divided into three main product groups: copper wire rod comprising wire and cable products, which is the key source of global primary consumption; copper products such as plumbing, pipes, tubes, sheets, strips, rods, bars and sections; and copper alloy products including bronze (copper and tin) and brass (copper and zinc) products.

Copper is found throughout the world and, according to CRU, approximately 28 per cent. of global copper concentrate production in 2010 came from Chile, with China and Peru also being major producers of concentrates. According to CRU, China, Chile and Japan were the largest producers of copper metal globally in 2010. In 2010, according to CRU, global copper concentrate production in terms of contained copper totalled 12.4 million MT, whilst copper metal production totalled 18.7 million MT.

The Directors believe that Chinese consumption continues to be the key driver of copper metal demand, primarily due to industrial production and continued modernisation and investment in infrastructure. According to CRU, in 2010, China was the largest consumer of copper metal globally, accounting for approximately 39 per cent. of total global consumption, whilst the U.S. and Germany were also key consumers.

There are three exchanges where copper metal is traded: the LME, the SHFE and the COMEX/NYMEX. The Directors believe that copper is the second largest traded contract on the LME and prices established on the LME are used for reference globally throughout the industry; however, there are variances in regional supply and demand as well as differences in metal qualities. The exchanges have a network of approved warehouses around the world for use as a last resort, and the stock levels in these warehouses provide an important indicator of market tightness and overall demand. Based on the LME information the Directors believe that at the end of 2010, global closing copper metal stocks on the LME totalled 377k MT, down from 502k MT at the end of 2009.

Copper concentrate is a non-fungible product and cannot be directly traded on an exchange. Pricing of the metal equivalent within the concentrate is made with reference to the quoted exchange price for copper metal.

Zinc

Zinc ore is found in several different forms, although 95 per cent. of global mined zinc production is zinc blende (a zinc sulphide ore). Zinc ore is typically mined and processed into zinc concentrate and is then smelted and refined to produce zinc metal. Metal is produced in various refined product forms dependent upon consumer requirements. High grade metal is 99.95 per cent. zinc and SHG metal is 99.99 per cent. zinc. Zinc concentrate and zinc metal are both traded products.

The construction sector is the main end user of zinc metal, whilst the transport and infrastructure sectors are also significant end users. Zinc's main application is in the manufacture of galvanised steel, where a zinc coating is added to steel to protect against corrosion, increasing the performance and lifespan of steel products. Other applications include brass production (a zinc and copper alloy), die-casting and the manufacture of batteries.

According to CRU, zinc is found throughout the world, with approximately 29 per cent. of global zinc concentrate production coming from China, with Australia and Peru also being the significant contributors to global zinc concentrate production in 2010. According to CRU, China was also the largest producer of zinc metal in 2010, accounting for approximately 41 per cent. of global production. Further, according to CRU, in 2010, global zinc concentrate production in terms of contained zinc totalled 12.4 million MT, whilst zinc metal production totalled 12.7 million MT.

The Directors believe that Chinese demand remains the key driver of zinc metal demand due to the continued growth in the high zinc-consuming construction and transport sectors. For example, according to CRU, in 2010, China was by far the largest consumer of zinc metal globally, accounting for approximately 5 MT, or 42 per cent., of total global consumption, whilst the U.S. and Japan were also key consumers.

There are two exchanges on which zinc metal is traded: the LME and the SHFE. The prices established are used for reference globally throughout the industry; however, there are variances in regional supply and demand as well as differences in metal qualities. The LME has a network of approved warehouses around the world for use as a last resort and the stock levels in these warehouses provide an important indicator of market tightness and overall demand. Based on the LME information, the Directors believe that as at the end of 2010, global closing zinc metal stocks on the LME totalled 701k MT, up from 488k MT as at the end of 2009.

Zinc concentrate is a non-fungible product and cannot be directly traded on an exchange. Pricing of the metal equivalent within the concentrate is made with reference to the quoted LME cash price for zinc metal, with the worldwide standard being 85 per cent., less a treatment charge which is tied to the zinc metal price. A price adjustment is also made for by-product metals contained in the concentrate.

Lead

Lead is amongst the most widely used metals in the world due to its electro-chemical properties, malleability, high density, low melting point, corrosion and weather resistance and ease of recycling.

The primary mined lead ore is galena, which is processed into lead concentrate and subsequently smelted and refined to produce lead metal (99.99 per cent. lead). Primary lead production is currently sourced almost entirely from polymetallic mines as a co-product or by-product. There are currently only two operational mines globally which are primarily lead mines.

In 2010, Glencore estimates that more than half of total global lead metal production was secondary or recycled lead. Glencore expects that secondary lead production as a proportion of total lead production will continue to increase steadily in the medium- to long-term. The supply of secondary lead is dependent upon the availability of feedstock sources, with the major source being scrap lead-acid batteries which have reached the end of their life cycle. According to CRU, recycling lead results in approximately 98 per cent. lead recovery from the scrap.

Metal is produced in various refined product forms, dependent upon consumer requirements. Producers tend also to produce zinc, with the production of the two commodities closely linked because of the fact that they are refined through the same metallurgical process. Lead concentrate and lead metal are both traded products.

The Directors believe that the vast majority of global lead metal consumption in 2010 was in the manufacture of lead-acid batteries. This is divided into Starting-Lighting-Ignition ("SLI") batteries mainly used in the automotive industry and industrial batteries which are sub-divided into stationary batteries (used in back-up power supplies) and traction batteries (used for motive power in certain equipment). Other non-battery uses include chemicals, cable sheathing, alloys and rolled lead sheet.

Lead is found throughout the world and according to CRU approximately 43 per cent. of global lead concentrate production in 2010 was from China, whilst Australia and the U.S. are also key lead mining countries. According to CRU, China was also by far the largest producer of lead metal, accounting for approximately 43 per cent. of global production. Further, according to CRU, in 2010, global lead concentrate production in terms of contained lead totalled 4.1 million MT, whilst lead metal production totalled 9 million MT.

Glencore believes that, Chinese demand, both for SLI and industrial batteries, is the key driver of lead metal consumption levels, and remained resilient even through the global economic downturn of 2008/09. In 2010, according to CRU, China was by far the largest consumer of lead metal globally, accounting for 3.9 million MT, or 43 per cent. of total consumption whilst the U.S. and Germany were also key consumers.

Lead metal is traded on the LME. The prices established are used for reference globally throughout the industry; however, there are variances in regional supply and demand as well as differences in metal qualities. The LME does not distinguish between primary and secondary lead. The LME has a network of approved warehouses around the world for use as a last resort, and the stock levels provide an important indicator of market tightness and overall demand. Based on the LME information, the Directors believe that, at the end of 2010, global closing lead metal stocks on the LME totalled 208k MT, up from 147k MT as at the end of 2009.

Lead concentrate is a non-fungible product and cannot be directly traded on an exchange. Pricing of the metal equivalent within the concentrate is made with reference to the quoted LME cash price for lead metal, with the worldwide standard being 95 per cent., less a treatment charge which is tied to the lead metal price. A price adjustment is also made for by-product metals contained in the concentrate.

Gold

Gold is a precious metal used both as an investment tool by central banks, governments, international financial institutions and retail investors and in jewellery. Gold is also used in fabrication activities, including electronics and dental applications. According to WGC, jewellery is the largest driver of gold demand, representing approximately half of total demand in 2010, of which a significant portion stemmed from India. Mining of gold ore is typically carried out by a small number of large integrated players that are also involved in its refining for industrial purposes.

There are three main sources of supply for gold: mining, recycled scrap and sales of gold held as reserves by central banks, governments and international financial institutions. Hedging by producers, based on their view of the gold price outlook, is also an important driver of the supply and demand balance. According to WGC, mine production accounted for close to two thirds of total supply in 2010 with recycled scrap representing the balance.

Gold is exchange traded and the benchmark price is fixed twice daily by the five fixing members of the LBMA.

Alumina/aluminium

Aluminium is one of the most abundant metallic elements on earth, although it does not exist in nature as a metal. Instead, it is found in the form of bauxite, which can be refined into alumina. Alumina can subsequently be smelted into aluminium. Aluminium is an attractive industrial metal due to its high strength-to-weight ratio, resistance to corrosion, conductivity and recyclability. Bauxite, alumina and aluminium are all traded products.

The key end user markets for aluminium are transportation, construction, and foil stock and packaging. Aluminium consumption can be divided into three main product groups: rolled products such as slabs, plates, sheet and foil; drawn products such as rod, bar, wire and cables; and extruded products.

Mining bauxite is a relatively simple operation and the cost of bauxite forms a small proportion of the total cost of aluminium production. Bauxite is then refined into alumina, an oxide of aluminium, and subsequently alumina is processed into aluminium in an electrolytic smelter. The main costs of smelting aluminium are alumina, power, labour and other raw materials (lime, caustic soda and carbon pitch). The cost of production relative to the cost of freight tends to favour the processing of alumina close to the source of bauxite and the processing of aluminium close to a source of low-cost power. Aluminium is also recycled as a secondary metal from scrap. Typically, four to five MT of bauxite are used to produce two MT of alumina, and two MT of alumina are required to produce one MT of aluminium.

According to CRU, in 2010, global alumina (metallurgical grade) production totalled 81.6 million MT with China, Australia and Brazil being the largest producers. According to CRU, global aluminium production totalled 42 million MT with China, Russia and Canada being the key producers. Further, according to CRU, China produced approximately 36 per cent. of alumina (metallurgical grade) and 40 per cent. of aluminium globally in 2010. China benefits from low capex and short lead times for smelter development, though its aluminium is typically produced at a significantly higher cash cost due to limited access to low cost energy.

The Directors believe that Chinese demand continues to be the key driver of consumption, primarily due to industrial production and continued modernisation and investment in infrastructure. For example, according to CRU, in 2010, China was the largest consumer of aluminium globally, accounting for approximately 41 per cent. of total global consumption.

There are two primary exchanges on which aluminium is traded: the LME and the SHFE. Aluminium that is traded as a commodity generally must meet very specific criteria, principally purity of at least 99.7 per cent. As a result, commoditised aluminium tends to trade at a relatively consistent price between markets. The exchanges have a network of warehouses around the world and the stock levels in these warehouses provide an important indicator of market tightness and overall demand. Based on the LME information, the Directors believe that, at the end of 2010, global closing aluminium metal stocks on the LME totalled 4.3 million MT, down from 4.6 million MT at the end of 2009.

Historically, the price of alumina has been fixed to long-term contracts, which are generally priced by reference to a certain percentage of the LME aluminium price. Since the primary use of alumina is as an input into aluminium production, the two commodities are broadly correlated. In August 2010, Platts launched the first spot-price alumina index with certain major producers beginning to sell some production of alumina on contracts tied to a price index, indicating a movement toward a spot pricing system.

Ferroalloys/nickel/cobalt/iron ore

Nickel

Nickel is a base metal used primarily in the manufacture of stainless steel and other alloys due to its resistance to corrosion, strength and heat resistant properties. Nickel is also used in the production of coinage, batteries, plating, catalysts and fuel cells.

Nickel is found in two commercially viable forms, laterites (oxide ores) and pentlandites (sulphide ores). The Directors believe that, in 2010, approximately half of mined production was from each form. Nickel ore is processed into nickel concentrate, which is then smelted and refined to produce nickel metal containing 99.99 per cent. nickel, once purified through the Mond process[(1)], hydrometallurgical techniques (leaching), electrowinning. Oxide ores can be leached directly, whereas sulphide ores must first be treated with bacteria to make them amenable to leaching. Metal is the form in which nickel is supplied to end user markets and is traded by nickel producing companies. Nickel metal is produced in various refined product forms, dependent upon consumer requirements.

The key end use for primary nickel production is in stainless steel production. There are several grades of stainless steel, each of which has different properties and alloy content. These can be split into two main groups – austenitic (70 to 75 per cent. of total stainless steel production, of which the 300-series contains 8 to 10 per cent. nickel and the 200-series contains 2 to 4 per cent. nickel) and ferretic/martensitic (25-30 per cent. of total stainless steel production containing no nickel).

Nickel is found throughout the world and according to CRU, the largest global producers of finished nickel[(2)] in 2010 were China, Russia and Japan. According to CRU, global finished nickel production in 2010 totalled 1.4 million MT.

The nickel industry is relatively consolidated and as a result the processing of nickel ore from mined ore to nickel metal and the subsequent sale to end users usually takes place within a vertically-integrated system. However, there are still some specialised market participants, undertaking discrete processing steps in the nickel value chain, between which transfers may be direct or may involve an intermediary.

Glencore believes that nickel demand is primarily driven by the expansion of the Chinese and Indian stainless steel industries and re-stocking in industrial sectors. For example, according to CRU, in 2010, China was the largest consumer of finished nickel globally, accounting for approximately 40 per cent. of the total 1.5 million MT consumed globally, whilst Japan and the U.S. were also key consumers.

Nickel metal is traded on the LME. The prices established are used for reference globally throughout the industry; however, there are variances in regional supply and demand as well as differences in metal qualities. LME nickel contracts specify the purity (99.80 per cent. minimum), tonnage and form/shape (full plate cathode, cut cathode, pellets, briquettes), after which a price is determined based on the prevailing demand and LME stock levels. The LME has a network of approved warehouses around the world for use as a last resort and the stock levels provide an important indicator of market tightness and overall demand. Based on the LME information, the Directors believe that, as at the end of 2010, global closing nickel metal stocks on the LME totalled 137k MT, down from 158k MT as at the end of 2009.

Typically, the contracts covering nickel ore supplies are based on a percentage of the LME nickel price, depending on the nickel grade, and quoted on an FOB basis.

Chrome and ferrochrome

Chrome is another key alloying element used in bulk quantities for the production of stainless steel. Chrome's most important property in the context of its industrial application is its ability to form a regenerative oxide film, protecting a metal surface against oxidation, corrosion and wear. Stainless steel contains a minimum of 10.5 per cent. chrome.

Ferrochrome is an alloy of chrome and iron. Global ferrochrome production accounts for the vast majority of chrome ore demand. A significant majority of ferrochrome production is then in turn used in the production of stainless steel and alloy steel. Glencore believes that rapid growth in stainless steel production in China and India in recent years has driven an increase in demand for ferrochrome. According to CRU, in 2010, approximately 9.1 million MT of ferrochrome by gross weight was produced globally.

The ferrochrome market is largely a negotiated market with price and volume agreed on a quarterly basis, typically under long-term contracts of one to five years. In the U.S., prices tend to follow those published in either of the two major industry journals, *Ryan's Notes* and *Metals Week*.

(1) In this process, nickel is reacted with carbon monoxide to form nickel carbonyl, which is then passed at a high temperature into a chamber, causing the nickel carbonyl to decompose and form pure nickel in pellet or powder form.

(2) Finished nickel includes nickel metal and nickel metal substitutes such as ferronickel, nickel pig iron and nickel oxide sinter.

Cobalt

Cobalt is used primarily in superalloys, including in the manufacture of parts for turbines and aero engines, given its temperature stability and its corrosion and wear resistance. Other applications include magnets, diamond tools and catalysts, as well as in a variety of chemical applications.

Cobalt is commonly found as a by-product of nickel and, to a lesser extent, copper, meaning production tends to increase or decrease in line with production of these metals. According to CRU, in 2010, approximately 77k MT of cobalt was produced globally, with the Katanga province in the DRC being the key producer of mined cobalt.

Cobalt has been traded on the LME since February 2010 and is classified as a minor metal.

Iron ore

Iron is the fourth most abundant rock-forming element and composes about 5 per cent. of the Earth's crust. The principal ore minerals of iron are hematite, magnetite, siderite, and goethite. An estimated 98 per cent. of the ore shipped in the world is consumed in the manufacture of iron and steel. The remaining 2 per cent. is used in the manufacture of cement, heavy-medium materials, pigments, ballast, agricultural products or specialty chemicals. As a result, demand for iron ore is tied directly to the production of raw steel and the availability of high-quality ferrous scrap.

Mining iron ore is a high volume, low margin business, as the value of iron is significantly lower than base metals. It is highly capital intensive, requiring significant investment in infrastructure such as rail in order to transport the ore from the mine to a freight ship. For these reasons, iron ore production is concentrated in the hands of a few major players which enjoy significant economies of scale.

The Directors believe that, in 2010, the vast majority of global trade in iron ore was seaborne trade. The two major exporters are Australia and Brazil while the largest importers during 2010 were China followed by Europe and Japan.

Energy Products

Energy products are hydrocarbons sourced from the organic remains of prehistoric organisms or vegetable matter. The main energy products include coal, coke, oil and natural gas.

Coal

Coal is the most widely available and well-distributed fossil fuel in the world. According to Merlin, coal is the second largest primary source of energy after crude oil in consumption terms, and the largest in terms of reserves. Global consumption of coal is forecast to increase significantly between 2010 and 2020.

Coal is mined using two techniques: surface mining which is sometimes referred to as open cast mining, and underground or deep mining. The most appropriate mining technique is largely determined by the geology of the coal deposit. Once raw coal is mined, it is often crushed, sized and washed in processing plants where the product consistency and energy content of the coal is improved. Washing is a process where the denser mineral matter in coal is separated from the main carbon rich component of coal.

Coal is classified into four general categories, or rank: lignite, sub-bituminous, bituminous and anthracite, reflecting the progressive response of the coal to increasing heat and pressure and the time of its formation. Lignite and sub-bituminous coals are commonly referred to as "low-rank" coals, while bituminous and anthracite coals are commonly referred to as "hard" coals. Energy content and sulphur content are among the most important characteristics for coal classification—certainly for steam (or thermal) coal used for energy generation—and help to determine the best use of a particular type of coal, as well as helping determine the price of different qualities of coal. Other important characteristics include moisture, ash and nitrogen content. Bituminous coal represents approximately half of world reserves and can be further classified as either "thermal coal" or "metallurgical coal". Thermal coal, also known as "steam coal" or "energy coal", used in electricity generation and other energy-raising processes, according to Merlin, represented approximately 85 per cent. of the 5.4 billion tonnes of total global coal production in 2010. Metallurgical coal (which refers to all coals used in the steel industry, including "coking coal" used to produce coke and PCI (Pulverised Coal Injection) coals which are injected into the base of a blast furnace to make iron), accounts for most of the balance of production.

Coke is a material derived from the destructive distillation ("coking/carbonisation") of coking coal. Coke's main uses are as a fuel and a reducing agent in smelting iron ore in blast furnaces. This process takes place in coke ovens which are likely to be located close to iron- and steel-making plants rather than geographically proximate to coal mines.

According to Merlin, approximately 90 per cent. of proven global coal reserves are found in just eight countries, including the U.S., Russia, China, Australia and India.

According to Merlin, in 2010, global thermal coal production totalled 4.6 billion tonnes, with China being the largest thermal coal producer globally, accounting for approximately 47 per cent. of global thermal coal production, followed by the U.S. and Australia. The majority of thermal coal produced is consumed in the country of production due to its relatively widespread availability and high transportation costs relative to its energy value and price. In 2010, China was also by far the largest producer of coking coal globally, accounting for approximately 57 per cent. of the 0.8 billion tonnes produced (according to Merlin). In 2010, the total global production of coke was 0.6 billion tonnes (according to Merlin).

Of the limited export volumes, the vast majority is seaborne coal. According to Merlin, the two major seaborne thermal coal markets are the Atlantic region and the Asia-Pacific region. European countries and the U.S. are the key importers of thermal coal in the Atlantic region with the key suppliers being South Africa, Russia and Colombia. In the Asia-Pacific region, the key importers are Japan, South Korea, China and Taiwan and the key exporters are Indonesia and Australia (according to Merlin). For some time Australia has been the largest coal exporter globally along with the U.S., Indonesia, Russia, South Africa and China. However, increasing domestic electricity demand in the latter country has resulted in stronger domestic consumption, with China becoming a net coal importer in 2009 (according to Merlin). India is rapidly becoming an important coal importer receiving coal from both South African and Asia-Pacific suppliers (according to Merlin).

Unit ocean freight costs are a significant component of the price of seaborne export coal and coke. Participants in the coal and coke seaborne export markets either own vessels or lease freight on a "spot charter" or "time charter" basis. According to the shipping brokers Simpson Spence and Young, in 2010, the global seaborne dry bulk trade across all commodities was 3.3 billion tonnes, of which 0.9 billion tonnes was thermal and coking coal; a further 1 billion tonnes was iron ore. The global seaborne dry bulk trade is forecast to increase to 4.5 billion tonnes by 2015 across all commodities (according to Simpson Spence and Young).

Global coal demand is subject to a number of drivers, including primary energy consumption, the decommissioning and construction of new coal-fired power plants, the competitiveness of coal versus alternative energy sources and the regulatory environment, including carbon emission constraints in several countries. Increasing imports into China and India reflect their increasing demand, primarily due to increased electricity and steel production, as well as the higher quality of internationally-traded coals compared to India's and China's own domestic production. According to Merlin, in 2010, China was the largest consumer of thermal coal globally, accounting for almost half of total consumption.

Thermal coal is sold under term contracts or on the spot market. It is priced primarily on calorific value and sulphur content. Seaborne coal prices in each market normally fluctuate with changes in supply and demand, production and transportation costs, availability and prices of substitute fuels, general economic conditions, government regulation and weather. Price settlement between Asian power companies and Australian coal producers have typically acted as benchmarks for pricing in the Asia-Pacific coal market and have been used as a reference point in the Atlantic market.

Price indices are used by market participants to monitor spot prices in various geographic regions. The API#4 index is the benchmark price reference for coal exported out of South Africa's Richards Bay Coal Terminal. In Europe, export market prices are reflected in the API#2 index for coals delivered into the "ARA" (harbours of Amsterdam, Rotterdam and Antwerp) region on a CIF basis. The API#2 index is reflective of prices in the Atlantic market, while API#4 reflects market conditions in both the Atlantic and Asian (mainly Indian) markets. In Australia, the API#6, GlobalCOAL's NEWC contract and the Barlow Jonker Index are indicators of the spot price of thermal coal loaded FOB vessel at the port of Newcastle, Australia.

There are four future exchanges where internationally-traded coal qualities are traded: in Chicago, the CME; in Singapore, SGX and in London, ICE and LCH. However, a majority of coal trading is conducted off-exchange through brokers operating bilateral contracts and through the API swap market, which has trading volumes that exceed the physical underlying market.

Oil

Crude oil is not a homogenous material, but rather is classified by its density (light to heavy) and sulphur content (sweet to sour). Light sweet crude oils are typically more expensive than heavy sour crude oils because they require less treatment to produce refined products.

The process of transforming crude oil into refined products typically involves multiple steps, including distillation, chemical processing and removal of unwanted elements and compounds. Crude oil is processed into a large number of refined oil products including petroleum gases, petrochemicals, gasoline, naphtha, mid-distillates, fuel oil, residual fuels, petroleum coke and niche refined petroleum products.

The extraction of crude oil and its processing into refined oil products can be performed by vertically-integrated companies or by players specialised in each segment of the oil value chain: in the latter scenario, transfers between specialised parties may be direct or may involve an intermediary.

Within the oil value chain, an important role is played by oil freight, which consists of the transportation of crude oil to refineries and refined products to distribution terminals. A key step of this process involves shipping in tankers, the cost of which has an important impact on the price of oil and oil products. Participants in the oil value chain often own tankers and, in addition, there is a market for tanker capacity which is sold on both a "spot charter" and "time charter" basis.

In 2010, global oil demand totalled an average of approximately 87.8 million bbls per day (according to IEA). Glencore believes that oil demand is largely driven by GDP growth. The main uses of oil products are transportation, power generation and heating. Non-OECD countries accounted for approximately half of oil consumption in 2010, and have shown uninterrupted demand growth for several years, even through the global economic downturn of 2008/09 (according to IEA).

World oil supply, which amounted to an average of approximately 87.3 million bbls per day in 2010, can be split into the Organisation of Petroleum Exporting Countries ("OPEC") and Non-OPEC (according to IEA). OPEC nations supplied approximately 40 per cent. of the world's oil supply in 2010 (according to IEA) and controlled approximately three quarters of the world's known reserves at the end of 2010 (according to BP).

The trading of crude oil and oil products consists of direct physical trading and derivatives trading. Participants in the trading of crude oil and refined oil products markets include both physical traders, who handle physical commodity deliveries, and financial traders, who generally settle contracts in cash. Physical traders gain competitive advantages through the optionality offered by trading large physical volumes and the insight into market fundamentals that physical presence provides; financial traders gain competitive advantage through sophisticated research and superior quantitative analytics underpinning complex derivatives structure.

Price of benchmark crude oils such as West Texas Intermediate Crude and Brent Crude is dependent on supply and demand fundamentals; at the end of 2010, closing WTI and Brent spot prices were U.S.$91.38 per bbl and U.S.$94.75 per bbl, respectively. Other crude oils are usually priced at a premium/discount to those benchmarks to reflect differentials in terms of density, sulphur content and location.

Agricultural Products

The agriculture industry includes the farming, processing, movement and storage of crops and products used primarily as food, animal feed or biofuel. The main product groups in which Glencore is active include grains, oilseeds, sugar, cotton and biofuels.

Grains have end uses both in human and livestock consumption and in the production of bioethanol, a substitute for gasoline. Grains for human and livestock consumption are generally milled before reaching end users. Wheat, barley and corn are three of the key grain crops. Oilseeds typically undergo crushing and refining to render them into various types of oils and meals for human consumption and animal feed. Rapeseed, soybean, sunflower and palm are key oilseed crops. Oil contained in these crops is also used to produce biodiesel. Cotton, although primarily used for textile and clothing manufacture, also provides edible oil and seed by-products for livestock feed; about two thirds of the harvested crop is composed of the seed. Sugar-based food crops, such as sugar cane and sugar beet, are used in both the food industry and bioethanol production.

Agricultural production is characterised by a very large number of small players. Even the largest farming players typically only have a fraction of the overall market share in any given country. Agricultural supply primarily evolves as a function of the crop price environment, weather conditions and availability of croppable area. Higher prices serve as an incentive for farmers to increase production levels, as occurred in 2008 and 2009. However, concentration in processing is higher for many crops, with large integrated players enjoying economies of scale. Processing is typically carried out close to the origin.

Production of some crops is concentrated in a limited number of countries, such as the U.S., EU and Canada for wheat and the U.S., Argentina and Brazil for corn, while demand may come from all over the world. This makes trading and logistics an important component of the industry value chain. Freight, logistics and storage services are offered both for raw and processed products. Key components of these services include procurement, ocean freight and distribution.

In crop year 2009/2010, EU-27 countries were the largest producers of both wheat and barley, with 138 million MT and 62 million MT of production, respectively (according to Informa). However, according to USDA, only a small portion of this translated into exports due to the large domestic demand for own production. In the same crop year, the U.S. were the single largest producer and exporter of corn and also led other countries in soybean production and exports followed by Brazil and Argentina (according to Informa). Also in crop year 2009/2010, Brazil was the largest producer and exporter of sugar with 36k MT of production and 24k MT of exports in 2010 (according to USDA). The U.S. is the single largest exporter of cotton, with 12 million 480 lb. bales of exports in crop year 2009/2010, while China is the largest producer and importer owing to its leading position in the textile industry (according to USDA).

According to USDA, income growth and population growth are two primary drivers behind demand for food. Increasing income per capita, especially in emerging countries, typically leads consumers to move away from staple and traditional food towards diets that are richer in protein. The resulting increase in livestock production boosts animal feed demand. Also contributing to the global demand in recent years has been the growing use of crops for biofuel production. A relatively expensive source of energy *per se*, biofuel is subject to government subsidies in most countries and the demand for biofuels grew even throughout the global economic downturn of 2008/09.

According to Informa, certain Middle Eastern and Asian countries were among the largest importers of selected agricultural products in the crop year 2009/2010, mainly due to their fast economic growth and the lack of climatic and agronomic conditions necessary for the production of crops. China was the single largest importer of soybeans, with 51 million MT of imports, while Saudi Arabia was the single largest importer of barley with 7 million MT, due to the high demand for livestock fodder (according to Informa).

In addition to supply/demand dynamics, global agricultural trades are also influenced by a number of exogenous factors such as weather conditions, changing government regulations, foreign exchange rates and other macroeconomic factors such as energy prices.

Wheat, corn, soybean, soyoil, soymeal, barley, rapeseed and sugar are exchange-traded commodities. The main agricultural commodities exchanges include CME (Chicago), NYSE Euronext, Tokyo Grain Exchange ("TGE"), Singapore Mercantile Exchange ("SMX") and the Australian Securities Exchange. Sunflower seed products and biodiesel are not exchange traded. Prices of these commodities are determined by reference to prices of exchange-traded commodities, among other factors.

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4 May 2011

VALUATION OF PETROLEUM ASSETS IN BLOCKS O AND I, OFFSHORE EQUATORIAL GUINEA

In response to Glencore International AG's request of September 2010 and the Letter of Engagement dated 3rd December 2010 with Glencore International AG, RPS Energy Consultants Limited ("RPS") has completed an independent valuation of liquid hydrocarbons in Blocks O and I, offshore Equatorial Guinea (the "Properties") in which Glencore Exploration Limited and Glencore Exploration (EG) Limited respectively (collectively "Glencore") have an interest. The blocks are operated by Noble Energy EG Limited ("Noble", the "Operator").

The information contained in this section is issued by RPS at the request of Glencore International AG as part of the work detailed in the Letter of Engagement made on 3 December 2010 and is subject to the terms and conditions contained therein. This report has been prepared for the specific purpose of inclusion in the prospectus relating to the global offer. This report accords with the requirements set out in the United Kingdom Financial Services Authority's Prospectus Rules and has been prepared having regard to the recommendations for the consistent implementation of the European Commission's Regulation on Prospectuses No. 890/2004 (the European Securities and Markets Authority's ("ESMA") recommendations published by the Committee of European Securities Regulators (now the ESMA) as updated on 23 March 2011 following the publication of a consultation paper in April 2010 in relation to content of prospectuses regarding mineral companies.

The RPS work contained in this section is based on data and information available up to 30th September, 2010. An effective date of December 31st 2010 has been assumed for the valuation.

Both hydrocarbon liquids and gas are present in the discoveries in Blocks O and I and both phases are expected to be present in any future discoveries. The review of in-place hydrocarbon volumes includes both liquids and gas. However, in view of the immaturity of plans to monetise hydrocarbon gas from Equatorial Guinea waters the valuation presented herein was limited to the value of the liquids (both crude oil and condensate).

Where discoveries or prospects straddle the block boundary, RPS has assumed the same equity split as the Operator. These do not represent RPS' opinion on the relative prospects in each block.

The work has been performed by an RPS team of professional petroleum engineers, geoscientists and economists and is based on the Operator's data, supplied through Glencore. All Reserves and Resources definitions and estimates shown in this section are based on the 2007 SPE/AAPG/WPC/SPEE Petroleum Resource Management System ("PRMS").

Our approach has been to review the Operator's technical interpretation of their base case geoscience and engineering data for the field for reasonableness and to review the ranges of uncertainty for each parameter around this base case in order to estimate a range of petroleum initially in place and recoverable. For the prospects, Glencore's technical interpretation of geoscience data was reviewed.

QUALIFICATIONS

RPS is an independent consultancy specialising in petroleum reservoir evaluation and economic analysis. The provision of professional services has been solely on a fee basis. Mr Gordon Taylor, Director, Geoscience for RPS Energy, has supervised the evaluation. Mr Taylor is a Chartered Geologist and Chartered Engineer with over 30 years experience in upstream oil and gas.

Other RPS employees involved in this work hold at least a Masters degree in geology, geophysics, petroleum engineering or a related subject or have at least five years of relevant experience in the practice of geology, geophysics or petroleum engineering.

BASIS OF OPINION

The results presented herein reflects our informed judgement based on accepted standards of professional investigation, but is subject to generally recognised uncertainties associated with the interpretation of geological, geophysical and engineering data. The Work has been conducted within our understanding of petroleum legislation, taxation and other regulations that currently apply to these interests. However, RPS is not in a position to attest to the property title, financial interest relationships or encumbrances related to the properties.

Our estimates of resources and value are based on the data set available to, and provided by Glencore. We have accepted, without independent verification, the accuracy and completeness of these data.

As the offshore fields are yet to be developed and there are no facilities in place on the blocks to date, a site visit was not deemed necessary.

The information in this section represents RPS' best professional judgement and should not be considered a guarantee or prediction of results. It should be understood that any evaluation, particularly one involving exploration and future petroleum developments, may be subject to significant variations over short periods of time as new information becomes available. As agreed in the Letter of Engagement, RPS cannot and does not guarantee the accuracy or correctness of any interpretation made by it. In particular, RPS does not warrant that the work will be any form of guarantee of geological or commercial outcome.

The information in this section relates specifically and solely to the subject assets and is conditional upon various assumptions a summary of which is included herein. Except with permission from RPS, the information in this section may not be reproduced or redistributed, in whole or in part, to any other person than the addressees or published, in whole or in part, for any purpose without the express written consent of RPS. In instances where excerpts only are to be reproduced or published, other than in relation to the circular and prospectus in connection with an initial public offering this cannot be done without the express permission of RPS.

RPS has given and not withdrawn its written consent to the issue of this prospectus, with its name included within it, and to the inclusion of this information and references to the information in this section in the prospectus. For the purposes of Prospectus Rule 5.5.3R(2)(f) RPS accepts responsibility for the information contained in this section set out in this section of the prospectus and those sections of the prospectus which include references to the information in this section and declares that to the best knowledge and belief of RPS, having taken all reasonable care to ensure that such is the case, the information contained herein is in accordance with the facts and does not omit anything likely to affect the import of such information

Yours faithfully,

RPS Energy

Gordon R Taylor, ***CEng, CGeol***
Director, Geoscience

SPE/WPC/AAPG/SPEE RESERVE/RESOURCE DEFINITIONS

The following is extracted from the SPE/WPC/AAPG/SPEE PRMS 2007 using the section numbering and spelling from PRMS.

1.0 Basic Principles and Definitions

The estimation of petroleum resource quantities involves the interpretation of volumes and values that have an inherent degree of uncertainty. These quantities are associated with development projects at various stages of design and implementation. Use of a consistent classification system enhances comparisons between projects, groups of projects, and total company portfolios according to forecast production profiles and recoveries. Such a system must consider both technical and commercial factors that impact the project's economic feasibility, its productive life, and its related cash flows.

1.1 Petroleum Resources Classification Framework

Petroleum is defined as a naturally occurring mixture consisting of hydrocarbons in the gaseous, liquid, or solid phase. Petroleum may also contain non-hydrocarbons, common examples of which are carbon dioxide, nitrogen, hydrogen sulphide and sulphur. In rare cases, non-hydrocarbon content could be greater than 50%.

The term "resources" as used herein is intended to encompass all quantities of petroleum naturally occurring on or within the Earth's crust, discovered and undiscovered (recoverable and unrecoverable), plus those quantities already produced. Further, it includes all types of petroleum whether currently considered "conventional" or "unconventional."

Figure A1-1 is a graphical representation of the SPE/WPC/AAPG/SPEE resources classification system. The system defines the major recoverable resources classes: Production, Reserves, Contingent Resources, and Prospective Resources, as well as Unrecoverable petroleum.

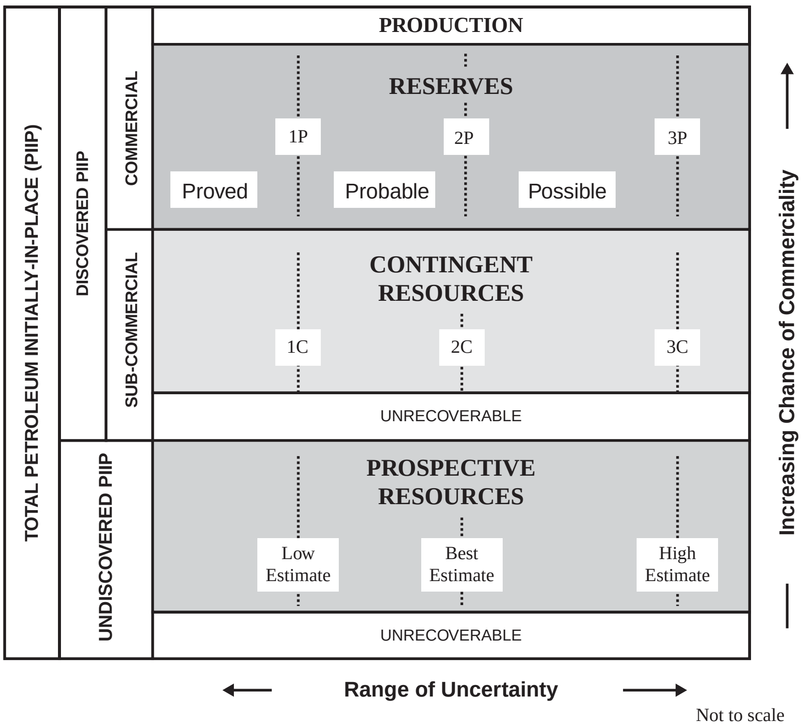

Figure B.1: Resources Classification Framework

The "Range of Uncertainty" reflects a range of estimated quantities potentially recoverable from an accumulation by a project, while the vertical axis represents the "Chance of Commerciality, that is, the chance that the project that will be developed and reach commercial producing status. The following definitions apply to the major subdivisions within the resources classification:

TOTAL PETROLEUM INITIALLY-IN-PLACE is that quantity of petroleum that is estimated to exist originally in naturally occurring accumulations. It includes that quantity of petroleum that is estimated, as of a given date, to be contained in known accumulations prior to production plus those estimated quantities in accumulations yet to be discovered (equivalent to "total resources").

DISCOVERED PETROLEUM INITIALLY-IN-PLACE is that quantity of petroleum that is estimated, as of a given date, to be contained in known accumulations prior to production.

PRODUCTION is the cumulative quantity of petroleum that has been recovered at a given date. While all recoverable resources are estimated and production is measured in terms of the sales product specifications, raw production (sales plus non-sales) quantities are also measured and required to support engineering analyses based on reservoir voidage.

Multiple development projects may be applied to each known accumulation, and each project will recover an estimated portion of the initially-in-place quantities. The projects shall be subdivided into Commercial and Sub-Commercial, with the estimated recoverable quantities being classified as Reserves and Contingent Resources respectively, as defined below.

RESERVES are those quantities of petroleum anticipated to be commercially recoverable by application of development projects to known accumulations from a given date forward under defined conditions. Reserves must further satisfy four criteria: they must be discovered, recoverable, commercial, and remaining (as of the evaluation date) based on the development project(s) applied. Reserves are further categorized in accordance with the level of certainty associated with the estimates and may be sub-classified based on project maturity and/or characterized by development and production status.

CONTINGENT RESOURCES are those quantities of petroleum estimated, as of a given date, to be potentially recoverable from known accumulations, but the applied project(s) are not yet considered mature enough for commercial development due to one or more contingencies. Contingent Resources may include, for example, projects for which there are currently no viable markets, or where commercial recovery is dependent on technology under development, or where evaluation of the accumulation is insufficient to clearly assess commerciality. Contingent Resources are further categorized in accordance with the level of certainty associated with the estimates and may be subclassified based on project maturity and/or characterized by their economic status.

UNDISCOVERED PETROLEUM INITIALLY-IN-PLACE is that quantity of petroleum estimated, as of a given date, to be contained within accumulations yet to be discovered.

PROSPECTIVE RESOURCES are those quantities of petroleum estimated, as of a given date, to be potentially recoverable from undiscovered accumulations by application of future development projects. Prospective Resources have both an associated chance of discovery and a chance of development. Prospective Resources are further subdivided in accordance with the level of certainty associated with recoverable estimates assuming their discovery and development and may be sub-classified based on project maturity.

UNRECOVERABLE is that portion of Discovered or Undiscovered Petroleum Initially-in-Place quantities which is estimated, as of a given date, not to be recoverable by future development projects. A portion of these quantities may become recoverable in the future as commercial circumstances change or technological developments occur; the remaining portion may never be recovered due to physical/chemical constraints represented by subsurface interaction of fluids and reservoir rocks.

Estimated Ultimate Recovery (EUR) is not a resources category, but a term that may be applied to any accumulation or group of accumulations (discovered or undiscovered) to define those quantities of petroleum estimated, as of a given date, to be potentially recoverable under defined technical and commercial conditions plus those quantities already produced (total of recoverable resources).

1.2 Project-Based Resources Evaluations

The resources evaluation process consists of identifying a recovery project, or projects, associated with a petroleum accumulation(s), estimating the quantities of Petroleum Initially-in-Place, estimating that portion of those in-place quantities that can be recovered by each project, and classifying the project(s) based on its maturity status or chance of commerciality.

This concept of a project-based classification system is further clarified by examining the primary data sources contributing to an evaluation of net recoverable resources (see Figure A1-2) that may be described as follows:

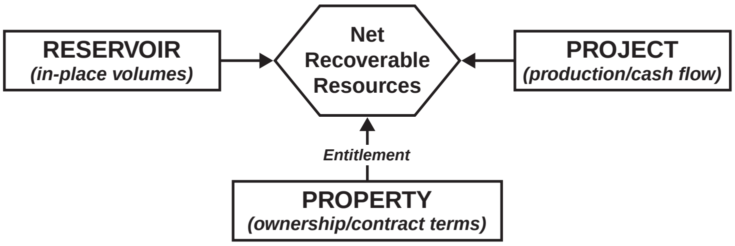

Figure B.2: Resources Evaluation Data Sources

- The Reservoir (accumulation): Key attributes include the types and quantities of Petroleum Initially-in-Place and the fluid and rock properties that affect petroleum recovery.
- The Project: Each project applied to a specific reservoir development generates a unique production and cash flow schedule. The time integration of these schedules taken to the project's technical, economic, or contractual limit defines the estimated recoverable resources and associated future net cash flow projections for each project. The ratio of EUR to Total Initially-in-Place quantities defines the ultimate recovery efficiency for the development project(s). A project may be defined at various levels and stages of maturity; it may include one or many wells and associated production and processing facilities. One project may develop many reservoirs, or many projects may be applied to one reservoir.
- The Property (lease or license area): Each property may have unique associated contractual rights and obligations including the fiscal terms. Such information allows definition of each participant's share of produced quantities (entitlement) and share of investments, expenses, and revenues for each recovery project and the reservoir to which it is applied. One property may encompass many reservoirs, or one reservoir may span several different properties. A property may contain both discovered and undiscovered accumulations.

In context of this data relationship, "project" is the primary element considered in this resources classification, and net recoverable resources are the incremental quantities derived from each project. Project represents the link between the petroleum accumulation and the decision-making process. A project may, for example, constitute the development of a single reservoir or field, or an incremental development for a producing field, or the integrated development of several fields and associated facilities with a common ownership. In general, an individual project will represent the level at which a decision is made whether or not to proceed (i.e., spend more money) and there should be an associated range of estimated recoverable quantities for that project.

An accumulation or potential accumulation of petroleum may be subject to several separate and distinct projects that are at different stages of exploration or development. Thus, an accumulation may have recoverable quantities in several resource classes simultaneously.

In order to assign recoverable resources of any class, a development plan needs to be defined consisting of one or more projects. Even for Prospective Resources, the estimates of recoverable quantities must be stated in terms of the sales products derived from a development program assuming successful discovery and commercial development. Given the major uncertainties involved at this early stage, the development program will not be of the detail expected in later stages of maturity. In most cases, recovery efficiency may be largely based on analogous projects. In-place quantities for which a feasible project cannot be defined using current, or reasonably forecast improvements in, technology are classified as Unrecoverable.

Not all technically feasible development plans will be commercial. The commercial viability of a development project is dependent on a forecast of the conditions that will exist during the time period encompassed by the project's activities. "Conditions" include technological, economic, legal, environmental, social, and governmental factors. While economic factors can be summarized as forecast costs and product prices, the underlying influences include, but are not limited to, market conditions, transportation and processing infrastructure, fiscal terms, and taxes.

The resource quantities being estimated are those volumes producible from a project as measured according to delivery specifications at the point of sale or custody transfer. The cumulative production from the evaluation date forward to cessation of production is the remaining recoverable quantity. The sum of the associated annual net cash flows yields the estimated future net revenue. When the cash flows are discounted according to a defined discount rate and time period, the summation of the discounted cash flows is termed net present value (NPV) of the project.

Licence Overview

The right of Glencore to conduct petroleum operations in Block O is defined in the Production Sharing Contract (the "Block O PSC") between the Republic of Equatorial Guinea and Glencore Exploration Ltd signed on the 13 July 2004.

The right of Glencore to conduct petroleum operations in Block I is defined in the Production Sharing Contract (the "Block I PSC") between the Republic of Equatorial Guinea Glencore Exploration (EG) Ltd signed on the 3 February 2000.

RPS does not opine on Glencore's rights under these PSC's.

Glencore has 23.75 per cent. equity (working interest) as a non-operating participating partner in the Block I PSC and 25 per cent. equity (working interest) as a non-operating participating partner in the Block O PSC. The following table summarises the partners and their respective equity interest in Blocks O and I.GEPetrol holds a 5 per cent. carried interest in Block I. In Block O GEPetrol has a 30 per cent. equity interest of which 10 per cent. is carried.

Glencore's Working Interest in Blocks O & I

Partner	Block I Interest	Block O Interest
	(%)	
Glencore Exploration (EG) Limited	23.75	
Glencore Exploration Limited		25
Noble Energy (Technical Operator)	38	45
Atlas Petroleum International Limited (Administrative Operator)	27.55	
Osborne Resources Limited	5.7	
GEPetrol	5	30

Within the blocks there are two government approved development projects Aseng and Alen; five discoveries, Carmen, Diega A-sand, Diega B-sand, Felicita and Yolanda; and a number of prospects.

Licence Status

The effective dates of the initial exploration licence in Block I was 3rd February 2000 and of Block O was 13th July 2004. The Aseng area of development is currently in an exploitation period (25 years) from the date when the PoD was approved (29 June 2009). Similarly the Alen area of development is in an exploitation period (25 years) from the date when the PoD was approved (11 January 2011).

In Block I, the contractor group has completed all work commitments for the first and second initial exploration sub periods (three years each) and extension periods, as shown in the following table. The second extension period has been extended and will expire on the 3 October 2013. The full activity in Block I to date includes acquisition of 3D seismic over the whole block and drilling of six exploration wells I-1 to I-6.

Block I Work Commitments

Block I PSC	Commitment	
First initial sub-period	Purchase approximately 1,000 km of 2D seismic	Fulfilled
Second initial sub-period	Drill one exploration well to minimum depth of 3,000m kb	Fulfilled
First extension period	Drill one exploration well	Fulfilled
Second extension period	Drill one exploration well	Fulfilled

In Block O, the contractor group has completed all work commitments as shown in the following table. Block O is now held as an appraisal area until 10 May 2013 with no future firm obligations. The full activity in Block O to date includes acquisition of 3D seismic and drilling of five exploration wells O-1 to O-5.

Block O Work Commitments

Block O PSC	Commitment	
First initial sub-period	Acquire 800 km(2) of 3D. Drill one exploration well	Fulfilled
Second initial sub-period	Drill one exploration well	Fulfilled
First extension period	Drill one exploration well	Fulfilled
Second extension period	Drill one exploration well	Fulfilled

Geological Overview

Blocks O and I are located in the Douala Basin which is located offshore Equatorial Guinea to the southeast of the Cameroon Volcanic Line (CVL), a chain of Cenozoic basaltic volcanoes which creates a sea-floor ridge separating the Douala Basin from the prolific Niger Delta Basin to the northwest. Sediment input to the Douala Basin is sourced from the Sanaga River drainage system in Cameroon. The Douala Basin lies on a passive margin which has witnessed little deformation since the Early Cretaceous.

To date hydrocarbon exploration within Blocks O & I has focussed on the Miocene section. Sands of this age were laid down across a slope environment as a repetitive series of isolated, laterally discontinuous channel-fill deposits derived from very low sinuosity turbidites. These sands tend to have high net to gross ratios with very good intergranular porosity and high pore connectivity values.

Oil seeps onshore in Cameroon, plus reservoired oil and gas in Blocks O and I in Equatorial Guinea suggest both Cretaceous and Tertiary petroleum systems are present.

The Alen and Aseng sands are Miocene in age. The Aseng and Alen reservoir sandstones were deposited in a deepwater setting on the continental slope in a relatively confined system which allowed for high net-to-gross sand ratios. Well and seismic data suggest that reservoirs are linear, relatively constant thickness sandstone bodies that appear to have the geometry of a feeder channel, and form a sequence of stacked channel sandstones. Up-dip seal is likely to be produced by a shale infill after the channel was abandoned due to avulsion.

Overview of Discoveries and Prospects

The Aseng discovery is in water depths ranging from 879m to 1,024m and lies wholly within the Block I PSC license area. The reservoir is stratigraphically trapped Miocene channel sands. The wells across the field have intersected gas, oil and water columns providing good control on the depths of the gas-oil (GOC) and oil-water (OWC) contacts. Over 20 well penetrations have been drilled on the Aseng reservoir.

The Alen Field is predominately in Block O although a small portion of the down dip part of the field extends into Block I. Water depths range from 76m to 679 m. Four wells penetrate the stratigraphically trapped Miocene channel sand. It is believed the field is purely a gas condensate field with no oil leg present.

The Felicita discovery is in Block O at a water depth of 63m. One well penetrates the stratigraphically trapped Miocene channel sand reservoir. The discovery contains gas condensate over water.

The Diega (A-Sand) discovery is in Block I at a water depth of 631m. One well penetrates the stratigraphically trapped Miocene channel sand reservoir. The discovery contains gas condensate over water. The Diega (B-Sand) was also penetrated by the same well. The well encountered gas over oil at this level but did not encounter a water contact. The Diega B-Sand accumulation straddles Blocks O and I.

The Carmen is in Block O at a water depth of 50m. One well penetrates the stratigraphically trapped Miocene channel sand reservoir. The well encountered the wet gas over an oil leg.

The Yolanda discovery is in Block I at a water depth of 895m. One well penetrates the stratigraphically trapped Miocene channel sand reservoir. The discovery contains gas. No water contacts were observed.

A large number of prospects have been identified in Blocks O and I in various sands of Early Miocene age.

Resources and reserves

Reserves and Resources Methodology

Reserves and Resources Classification

All reserves and resources definitions and estimates, and also risk factors, shown are based on the 2007 SPE/AAPG/WPC/SPEE Petroleum Resource Management System ("PRMS") and as reported to Glencore by RPS.

In estimating the following reserves and resources RPS have used standard petroleum engineering techniques. These techniques combine geological and production data with detailed information concerning fluid characteristics and reservoir pressure. RPS has estimated the degree of uncertainty inherent in the measurements and interpretation of the data and has calculated a range of recoverable resources. RPS has assumed that the working interest in the assets advised by Glencore is correct and RPS has not investigated nor does it make any warranty as to the Glencore interest in these properties.

Hydrocarbon resource and reserve estimates are expressions of judgement based on knowledge, experience and industry practice and are restricted to the data made available. They are, therefore, imprecise and depend to some extent on interpretations, which may prove to be inaccurate. Estimates that were reasonable when made may change significantly when new information from additional exploration or appraisal activity becomes available.

Risk Assessment

For all prospects and appraisal assets estimates of the commercial chance of success for Contingent Resources, and estimates of geological chance of success for Prospective Resources, have been made. In PRMS the former is called Chance of Development (CoD) and the latter Chance of Discovery (also CoD) in the PRMS system. To avoid confusion with acronyms we have used the term Geological Probability of Success (GPoS) in this document synonymously with Chance of Discovery.

Contingent Resources

The chance of success in this context means the estimated chance, or probability, that the volumes will be commercially extracted. A Contingent Resource includes both proved hydrocarbon accumulations for which there is currently no development plan or sales contract and proved hydrocarbon accumulations that are too small or are in reservoirs that are of insufficient quality to allow commercial development at current prices. As a result the estimation of the chance that the volumes will be commercially extracted may have to address both commercial (i.e. contractual or oil price considerations) and technical (i.e. technology to address low deliverability reservoirs) issues.

Prospective Resources (Exploration Prospects)

Unlike risk assessment for Contingent Resources, when dealing with undrilled prospects there is a more accepted industry approach to risk assessment for Prospective Resources. It is standard practice to assign a Geological Probability of Success (GPoS) which represents the likelihood of source rock, charge, reservoir, trap and seal combining to result in a present-day hydrocarbon accumulation. RPS assesses risk by considering both a play risk and a prospect risk. The chance of success for the play and prospect are multiplied together to give a Geological Probability of Success (GPoS). We consider three factors when assessing play risk: source, reservoir, seal and we consider four factors when assessing prospect risk: trap, seal, reservoir and charge. The result is the chance or probability of discovering hydrocarbon volumes within the range defined (as set out in the paragraph below "Uncertainty Estimation"). It is not an estimation of commercial chance of success.

Uncertainty Estimation

The estimation of expected hydrocarbon volumes is an integral part of the evaluation process. It is normal practice to assign a range to the volume estimates because of the uncertainty over exactly how large the discovery or prospect will be. Estimating the range is normally undertaken in a probabilistic way (i.e. using Monte Carlo simulation), using a range for each input parameter to derive a range for the output volumes. Key contributing factors to the overall uncertainty are data uncertainty, interpretation uncertainty and model uncertainty.

Volumetric input parameters, gross rock volume (GRV), porosity, net-to-gross ratio (N:G), water saturation (S_w), fluid expansion factor (B_o or B_g) and recovery factor, are considered separately. RPS has internal guidelines on the best practice in characterising appropriate input distributions for these parameters.

Systematic bias in volumetric assessment is a well-established phenomenon. There is a tendency to estimate parameters to a greater degree of precision than is warranted(1) and to bias pre-drill estimates to the high side. Rose and Edwards observe the tendency towards assessing volumes in too narrow a range with overly large low-side and mean estimates. RPS uses benchmarked P90/P10 ratios and known field size distributions to check the reasonableness of estimated volumes.

Audit Method

RPS has performed the audit of Reserves and Resources estimates in accordance with generally accepted petroleum engineering evaluation principles as set forth in the Standards Pertaining to the Estimating and Auditing of Oil and Gas Reserves Information promulgated by the Society of Petroleum Engineers ("SPE Audit Standards").

As with any audit RPS reviewed the Operator's interpretation and information and proceeded to perform the tests and procedures deemed necessary to confirm the reasonableness of the Operator's Reserves or Resources estimates. In this case the Operator's work that has been reviewed was confined to the Aseng and Alen fields. The work that RPS audited on the other discoveries in Blocks O and I and the prospect inventory was undertaken by Glencore.

The RPS approach in this instance has been to review the technical interpretation of the geoscience and engineering data for reasonableness. Where necessary RPS has undertaken independent re-interpretation to produce a technically reasonable base case interpretation. RPS then reviewed the Operator's ranges of uncertainty for each parameter around this base case which have been used to estimate a range of petroleum initially in place and recoverable for each field. Production profiles have then been developed for each model. Furthermore, RPS has reviewed the Operator's estimates of operating costs (Opex) and capital expenditure (Capex) for reasonableness.

The following tables show the estimated reserves and resources for Blocks O & I as determined by RPS.

Reserves as of 31 December 2010 (Exclusive of Resources)

	Reserves								
	Gross Field			Glencore Working Interest(2)			Glencore net Entitlement(1)		
	1P	2P	3P	1P	2P	3P	1P	2P	3P
					(MMstb)				
Aseng(3)	97	113	131	23	27	31	27	30	32
Alen(4)	45	82	128	11	20	32	10	17	26

Notes:

(1) Contractor's net entitlement is their share of Cost Oil and Profit Oil calculated using the Production Sharing Contract (PSC) terms. Aseng reserves include carry repayment from Atlas Petroleum

(2) Glencore working interest in Block O is 25 per cent. Glencore working interest in Block I is 23.75 per cent.

(3) Includes oil and condensate

(4) The Operator's assumption that Alen is 95 per cent. in Block O and 5 per cent. in Block I has been used in this valuation. RPS does not opine on this split for equity determination purposes.

(1) Rose, P.R., 1987. Dealing with Risk and Uncertainty in Exploration: How Can We Improve? AAPG Bulletin, 71 (1), pp. 1-16.

Block O and I Contingent Resources as of 31 December 2010 (on-block) (Exclusive of Reserves)

	Contingent Resources								
	Gross Field			Glencore Working Interest[1]			Glencore net Entitlement		
	1C	2C	3C	1C	2C	3C	1C	2C	3C
Liquids (MMstb)[3]									
Yolanda[4]	3.3	5.2	7.5	0.8	1.2	1.8	—[2]	—[2]	—[2]
Felicita[4]	1.8	3.2	5.5	0.4	0.8	1.4	—[2]	—[2]	—[2]
Diega (A-Sand)[4]	3.3	6	10	0.8	1.4	2.4			
Diega (B-Sand)[4][5]	24	52	99	5.7	12	24	4	8	14
Carmen (B-Sand)[4]	5.1	10	20	1.3	2.0	4.9	—[2]	—[2]	—[2]
Gas (Bscf)									
Aseng	419	519	640	100	123	152	—[2]	—[2]	—[2]
Alen	471	850	1,326	118	213	332	—[2]	—[2]	—[2]
Yolanda	393	506	640	93	120	152	—[2]	—[2]	—[2]
Felicita	49	71	104	12	18	26	—[2]	—[2]	—[2]
Diega (A-Sand)	122	176	249	29	42	59	—[2]	—[2]	—[2]
Diega (B-Sand)	46	94	193	11	22	46	—[2]	—[2]	—[2]
Carmen (B-Sand)	24	39	64	6	10	16	—[2]	—[2]	—[2]

Notes:

(1) Glencore working interest in Block O is 25 per cent. and Glencore working interest in Block I is 23.75 per cent.

(2) Valuation of gas and accumulations with minor liquid volumes not undertaken therefore net Entitlement not estimated

(3) Includes oil and condensate

(4) Yolanda & Diega A are 100 per cent. in Block I: Felicita & Carmen 100 per cent. in Block O: Diega B is approximately 90 per cent. in Block I & 10 per cent. in Block O. These approximations have been used in the valuation where appropriate. RPS does not opine on those splits for equity determination purposes.

Block O and I Prospective Resources as of 31 December 2010 (on-block) (Exclusive of Reserves)

	Prospective Resources (Unrisked)									
	In-Place			Recoverable						
	Gross			Gross			Glencore Working Interest(1)			
	P90	P50	P10	P90	P50	P10	P90	P50	P10	GPoS
										(%)
Oil (MMstb)										
Arabella(2)(3)	0	0	0	0	0	0	0	0	0	
Adriana NE(2)	0	0	0	0	0	0	0	0	0	
Sarah A(2)	53	78	111	16	31	56	3.8	7.4	13.3	29
Isidora(2)	33	58	99	10	23	50	2.4	5.5	11.9	33
Regina A(2)	24	49	97	7	20	49	1.7	4.8	11.6	42
Sofia(2)	26	58	126	8	23	63	1.9	5.5	15	47
Carla(2)(3)	210	400	749	63	160	375	15.4	39	91	23
Condensate (MMstb)										
Arabella	13	23	39	3.9	9.2	20	1	2.3	5	44
Adriana NE	5.2	14	36	1.6	5.6	18	0.4	1.4	4.5	47
Sarah A	6.7	10	15	2.0	4.0	7.5	0.5	1.0	1.8	29
Isidora	4.6	8.1	14	1.4	3.2	7.0	0.3	0.8	1.7	33
Regina A	3.3	6.8	14	1.0	2.7	7.0	0.2	0.6	1.7	42
Sofia	3.6	8.2	18	1.1	3.3	9.0	0.3	0.8	2.1	47
Carla	29	56	107	8.7	22	54	2.1	5.4	13.2	23
Gas (Bscf)(4)										
Arabella	189	325	553	142	260	470	35	65	117	44
Adriana NE	76	198	514	57	158	437	14	40	109	47
Sarah A	118	173	245	89	138	208	21	33	49	29
Isidora	58	102	175	44	82	149	10	19	35	33
Regina A	42	86	172	32	69	146	8	16	35	42
Sofia	46	103	224	35	82	190	8	19	45	47
Carla	369	707	1327	277	566	1,128	68	138	275	23

Notes:

(1) Glencore working interest in Block O is 25 per cent. and in Block I is 23.75 per cent.

(2) Sarah A, Isidora, Regina A, Sofia are 100 per cent. in Block I; Adriana NE is 100 per cent. in Block O; Arabella is 90/10 Block O/Block I, and Carla is 50/50 Block O/Block I. These approximations have been used in the valuation where appropriate. RPS does not opine on these splits for equity determination purposes.

(3) Glencore Interest for Arabella and Carla are weighted averages of block working interests.

(4) Gas volumes include inerts.

Alen Development Plan

The Alen development plan is split into two phases. During the first phase, the condensate will be produced with the gas recycled to maintain pressure. Gas will be produced from three wells located updip in the field, condensate will be stripped at the platform and dry gas will be re-injected into the reservoir down dip. It is assumed this phase would last a minimum of three years. The second phase of gas production would commence when the infrastructure for gas sales becomes available and other gas sales commercial arrangements are in place. The produced condensate will be stabilised for export through a subsea pipeline to the Aseng FPSO for storage and sales offload. This will save costs associated with a separate storage and offloading facility for the condensate.

The Operator's concept selection calls for two fixed platforms a well protector platform and a production platform. The production platform will consist of a large jacket and topsides with processing equipment, utilities systems, and quarters. Both fixed platforms will be new build structures. This concept offers an opportunity for Alen Field to become a future gas hub for the area after a staged development of Alen. Alen can be developed first, and then more facilities/satellite platforms can be added as other gas is routed to Alen for processing.

The Alen Field will be produced from surface wells at the fixed platform site with gas re-injected into subsea trees and wellhead systems. The remote subsea wells will be connected to the host fixed platforms with seabed flowlines. Umbilicals will also be provided to support the required control and maintenance functions associated with the subsea systems.

The fixed platforms will incorporate installation and handling aids required for these various lines (pull-in systems, I-tubes, etc.). The fixed platforms will also incorporate the subsea control systems and support utility equipment required to operate the subsea systems (e.g. control stations and panels, hydraulic power units, umbilical termination units, etc.).

First production from Alen is expected from 1 January 2014.

The following table outlines the estimated production profile for the Alen field daily production of condensate and illustrates the expected plateau duration, peak production timings, and anticipated decline and field life.

Average Yearly Production Rate and Cumulative Recovery for Alen

	Low Case (P90)		Base Case (P50)		High Case (P10)	
Year	**Cumulative Production**	**Annualised Daily Production**	**Cumulative Production**	**Annualised Daily Production**	**Cumulative Production**	**Annualised Daily Production**
	(MMstb)	*(stb/d)*	*(MMstb)*	*(stb/d)*	*(MMstb)*	*(stb/d)*
2014	11.9	32,643	12.0	32,832	12.2	33,482
2015	23.8	32,570	24.0	32,832	24.5	33,482
2016	34.1	28,186	36.0	32,878	36.7	33,573
2017	40.3	17,020	47.1	30,359	48.9	33,444
2018	43.4	8,295	56.0	24,313	60.7	32,152
2019	44.7	3,623	63.3	20,109	70.8	27,581
2020	45.3	1,597	69.1	15,796	79.3	23,362
2021	45.6	789	73.3	11,630	87.1	21,335
2022	45.7	459	76.3	8,275	94.2	19,630
2023	45.8	307	78.5	5,771	100.5	17,196
2024	45.9	226	79.9	4,092	105.8	14,435
2025	46.0	178	81.0	2,997	110.0	11,575
2026	46.0	148	81.9	2,293	113.4	9,127
2027	46.1	128	82.5	1,817	116.0	7,304
2028	46.1	114	83.1	1,479	118.2	6,047
2029	46.2	103	83.5	1,216	120.1	5,110
2030	46.2	95	83.9	1,012	121.7	4,384
2031	46.2	88	84.2	848	123.1	3,775
2032	46.3	83	84.5	719	124.3	3,264
2033	46.3	78	84.7	611	125.3	2,816
2034	46.3	74	84.9	526	126.2	2,453
2035	46.3	70	85.1	456	127.0	2,154

Aseng Development Plan

Aseng will be developed by five producers and one water injector that have been drilled and completed subsea from two drill centres. In addition to this, two further water injectors have been drilled and I-1 and I-2 will be completed as gas injectors, I-2 will only be utilised if deemed necessary once production and injection performance has been assessed. These wells will then be tied back to an FPSO, which will be a converted VLCC tanker. Oil export will be by tanker offtake.

The reservoir management plan consists of injecting water (as required) and gas to maintain voidage replacement (and thus maintain reservoir pressure). Later in field life, gas lift can be added (gas lift valves will be included in the initial well completions).

First production from Aseng is expected from 1 January 2012.

The following table outlines the estimated production profile for the Alen field daily production of condensate and illustrates the expected plateau duration, peak production timings, and anticipated decline and field life.

Aseng Field Liquid Production Rate and Cumulative Recovery after 20 Years (Gross, 100 per cent. Basis)

Date	Low Case (P90) Cumulative Production (MMstb)	Low Case (P90) Annualised Daily Production (stb/d)	Base Case (P50) Cumulative Production (MMstb)	Base Case (P50) Annualised Daily Production (stb/d)	High Case (P10) Cumulative Production (MMstb)	High Case (P10) Annualised Daily Production (stb/d)
2012	18	50,000	18	50,000	18	50,000
2013	36	48,821	37	50,000	37	50,000
2014	50	36,952	52	41,920	53	45,934
2015	60	29,628	65	35,093	66	35,667
2016	68	21,748	74	26,673	78	31,000
2017	75	17,560	82	19,858	87	24,470
2018	80	14,100	88	16,726	94	20,291
2019	84	11,005	93	13,985	100	17,379
2020	88	10,397	97	10,830	106	15,373
2021	91	9,567	101	10,362	110	11,488
2022	94	7,160	104	9,792	114	10,838
2023	95	3,215	107	9,156	118	10,367
2024	96	2,641	109	5,255	121	9,847
2025	97	2,828	110	3,019	125	9,167
2026	97	1,381	111	2,647	127	5,849
2027			112	2,756	128	3,260
2028			113	2,400	129	2,685
2029					130	2,666
2030					131	2,923
2031					132	1,685

Note:

Liquid rates oil plus condensate.

Diega B Notional Development Plan

The notional development for Diega B sands has been based on a subsea tie-back to the Aseng FPSO some 20km away. Diega B sand has an excellent reservoir quality, so the initial average 10,000 stb/d per horizontal well from Aseng is maintained for all cases. To minimise the amount of subsea piping, drilling from a subsea template has been assumed. This will necessitate pre-drilling all the producers. Three production wells and one water injector will be required to reach a possible 30,000bopd plateau. The field is timed to come on stream in 2014 when it is thought that sufficient ullage will be available in the Aseng system.

Similar to Aseng a 2-3 years plateau period has been assumed. The forecast is for a 25-year period.

Valuation of reserves

Valuation Assumptions

General

The effective date for the purpose of the valuation is 1 January 2011 and this has been used as the discount date for the valuation. All values are post-tax and have been expressed over a range of discount rates. An annual inflation rate of 2 per cent. has been assumed and is applied to both costs and revenues.

Oil Prices

The valuation has been based on the long term forecast for Brent (long term price of U.S.$83.75/stb in real 2010 dollars) as shown in the following table. A Low Price Case ($65/stb in real 2010 dollars) and High Price Case ($100/stb in real 2010 dollars) are also shown in the Table in Money of the Day (MoD) and have been used for price sensitivity purposes.

Brent Price Forecasts

	Low Price Case	Base Price Case	High Price Case
	(U.S.$/stb, MoD)	*(U.S.$/stb, MoD)*	*(U.S.$/stb, MoD)*
2010	77.84	78.59	79.09
2011	74.00	85.00	95.00
2012	71.50	87.00	102.00
2013	70.00	88.00	106.00
2014	70.36	90.65	108.24
2015	71.77	92.47	110.41
2016	73.20	94.32	112.62
2017	74.66	96.20	114.87
2018	76.16	98.13	117.17
2019	77.68	100.09	119.51
2020	79.23	102.09	121.90
2021 onwards	+2% p.a.	+2% p.a.	+2% p.a.

The RPS Price Forecast comprises of two components: (i) a near term price forecast for 2011-2013 which is based on the RPS near term MoD price forecast (as set out in the table above) and (ii) from 2014 onwards an equivalent long term 2010 real price of U.S.$65/U.S.$83.75/U.S.$100 for low price case/mid price case/ high price case respectively inflated at 2 per cent. p.a. to derive MoD prices. The final low/mid/high price forecasts are a combination of the near and long term price forecasts. They are expressed in the table above and applied in the valuation in MoD terms.

Money of the day prices, sometimes also referred to as nominal or current prices, incorporate the effects of annual inflation and reflect the time value of money. For example, the mid case oil price of U.S.$83.75 in 2010 would be equivalent to U.S.$85.43 one year in the future (2011) assuming that annual inflation was 2%. The figure of U.S.$85.43 would be described as the price in MoD terms. Conversely if the price in one year (2011) was forecast to be U.S.$83.75 in MoD terms this would be equivalent to U.S.$82.11 (i.e. U.S.$83.75/1.02) in (2010). The figure of U.S.$82.11 would be described as the price in real terms. Thus the U.S.$83.75 mid case oil price in 2010 would be equivalent to U.S.$90.65 in 2014 in MoD terms as shown in the table above. The forecast price in every subsequent year after 2014 will increase by 2% over the previous year's forecast price.

The effect of inflation is illustrated below:

	2010	2011	2012	2013	2014	2015
			(U.S.$)			
Price in real terms	83.75	83.75	83.75	83.75	83.75	83.75
Price in MoD terms	83.75	85.43	87.13	88.88	90.65	92.47
Price in real terms	83.75	82.11	80.50	78.92	77.37	75.85
Price in MoD terms	83.75	83.75	83.75	83.75	83.75	83.75

The Aseng crude price is assumed to have a differential to Brent crude prices of −3 per cent., and this assumption has been applied to the Diega discovery. Alen condensate price is assumed at parity with the Brent price.

Gas Prices

The Plans of Development for both Aseng and Alen do not feature gas sales and in view of the immaturity of plans to monetise hydrocarbon gas from Equatorial Guinea waters this valuation does not include possible future gas sales.

Valuation Methodology

Aseng and Alen

The Aseng Field is within the "Block I" PSC area (the PSC for the D15 Block offshore Bioko Island). The Alen Field straddles Blocks O and I PSC contract areas. For valuation purposes RPS has assumed that 95 per cent. of Alen is within Block O and subject to the Block O PSC terms and 5 per cent. of Alen is in Block I and subject to the Block I PSC terms. As a first pass approximation the valuation assumes that the field will be unitised on this basis. RPS is not opining on the unitisation of the field. The relative proportion in each block has been taken from the Alen PoD and is not necessarily the opinion of RPS. The 5 per cent. of Alen assumed to lie within Block I is valued on an incremental basis relative to the Aseng field P50 development case. Spreadsheet based discounted cashflow models were created to honour each of the Block I and O PSC contract terms.

Fiscal Regime and Contract Terms

The PSCs in which Glencore has an interest are typical for Equatorial Guinea. There are royalties payable to the state based on production rates, cost recovery from a percentage of net revenue and contractor profit share based on production. Production bonuses and an abandonment reserve fund also apply. The contractor is subject to Corporation Tax on contractor income. As advised by Glencore, and consistent with both Aseng and Alen PoD submissions, the tax rate on income from Blocks I and O is 25 per cent.

Valuation Summary

Valuation of Aseng

After applying economic limits and deriving entitlement income from Block I PSC, the 1P, 2P and 3P Reserves for the Aseng Field are summarised in the following table.

Aseng Field Reserves Summary (Net Glencore Share)

	Gross Reserves	Net Entitlement Reserves
	(MMstb)	*(MMstb)*
Proved Reserves (1P)	97	27
Proved plus Probable Reserves (2P)	113	30
Proved plus Probable plus Possible Reserves (3P)	131	32

The valuation of the Aseng reserves at the 1P, 2P and 3P levels on a 2011 point forward basis over a range of discount factors is shown in the following table.

Aseng Field Post-Tax Valuation (Net Glencore Share)

	Post-Tax Net Present Value			
Discount Rate	0.0%	5.0%	10.0%	15.0%
		(U.S.$m, MoD)		
Proved Reserves (1P)	1,355	1,133	966	836
Proved plus Probable Reserves (2P)	1,496	1,234	1,041	893
Proved plus Probable plus Possible Reserves (3P)	1,649	1,333	1,108	941

The sensitivity of these values to oil price uncertainty was calculated using the low and high price scenarios described above and is shown below.

Sensitivity of Aseng NPV_{10} to Oil Price (Net Glencore Share)

	Net Present Value$_{10}$ of Future Net Revenue		
Price Case	1P	2P	3P
		(U.S.$m, MoD)	
Low Price ($65)	800	860	912
Base Price ($83.75)	966	1,041	1,108
High Price ($100)	1,117	1,207	1,288

Valuation of Alen

After applying economic limits and deriving entitlement income from Block O and Block I PSCs, the 1P, 2P and 3P Reserves for the Alen Field are summarised in the table below.

Alen Field Reserves Summary

	Gross Reserves	Net Entitlement Reserves
	(MMstb)	(MMstb)
Proved Reserves (1P)	45	10
Proved plus Probable Reserves (2P)	82	17
Proved plus Probable plus Possible Reserves (3P)	128	26

The valuation of the Alen field Reserves at the 1P, 2P and 3P levels on a 2011 point forward basis over a range of discount rates are in the following table.

Alen Field Post-Tax Valuation (Net Glencore Share)

	Post-Tax Net Present Value			
Discount Rate	0.0%	5.0%	10.0%	15.0%
	(U.S.$m, MoD)			
Using RPS Cost Estimates				
Proved Reserves (1P)	259	151	73	17
Proved plus Probable Reserves (2P)	665	419	255	144
Proved plus Probable plus Possible Reserves (3P)	1,148	687	412	240
Using Operator Cost Estimates				
Proved Reserves (1P)	290	182	104	48
Proved plus Probable Reserves (2P)	691	447	284	173
Proved plus Probable plus Possible Reserves (3P)	1,174	715	441	270

The sensitivity of these values to oil price uncertainty was calculated using the Low and High price scenarios described above and is shown below.

Sensitivity of Alen Field NPV_{10} to Oil Price (Net Glencore Share)

	Net Present $Value_{10}$ of Future Net Revenue		
Price Case	1P	2P	3P
	(U.S.$m, MoD)		
Low Price ($65)	(15)	126	233
Base Price ($83.75)	73	255	412
High Price ($100)	167	368	542

After applying economic limits and deriving entitlement income from Block I and Block O PSCs, the 1C, 2C and 3C Contingent Resources for the Diega B Field are summarised in the following table.

Diega B Field Contingent Resources Summary

	Gross Resources	Net Entitlement Resources
	(MMstb)	(MMstb)
1C Resources	23	4
2C Resources	49	8
3C Resources	91	14

Environmental and Facilities

Environmental Permits and Status

A summary of the health and safety review carried out by RPS is given below. The review of both the Alen and Aseng field development projects, based on the interpretation of the data, which was made available to RPS, confirms that both projects are in full compliance with the applicable laws and regulations of Equatorial Guinea and recognised best oilfield practice.

Laws of Equatorial Guinea

The following table provides an overview of Equatorial Guinea's key laws that are of potential relevance to the project.

Law	Description
Law Regulating the Environment in the Republic of Equatorial Guinea: Ministry of Fishing and Environment (Issued January 2004)	Provides the legal and philosophic basis concerning the basic norms of conservation, protection and recovery of the environment, promoting the sustainable use of natural resources, while achieving sustainable human development in the Republic of Equatorial Guinea.
Hydrocarbon Law. Ministry of Mines, Industry and Energy. 8/2006 (November 2006, "The Hydrocarbon Law")	Provides the framework for the licensing and awarding of exploration and production rights and authorizes the MMIE to enter into contracts with oil companies. The legal framework of the Hydrocarbon Law was updated to provide the necessary coverage for elements within the hydrocarbon sector that were previously nonexistent or did not adequately meet the needs of the Government.
Law of Territorial Seas and Exclusive Economic Zone (November 1984)	Defines the sovereignty of EG over its territorial sea and defines its rights over the marine resources therein. This sovereignty is exercised, in accordance with international law, over the water column, seabed, subsoil, and resources of the sea, and the superjacent airspace.

Social and Environmental Impact Assessment

Both projects are subject to environmental regulations under the legal framework of the environmental management of Equatorial Guinea and as such, the Operator provided the Equatorial Guinea regulatory authorities with a Social and Environmental Impact Assessment ("SEIA") pursuant to which relevant environmental protection, management standards and procedures which will be continually enforced during the project.

The SEIA sufficiently assesses the potential impact that the proposed project could have on the environment and social community. The SEIA also offers proposed mitigation measures to lower the risk / impact to as reasonably possible. The SEIA exceeds the requirements for an environmental impact study.

In summary, the SEIA for each project demonstrates that operations are in full compliance with the applicable laws and regulations of Equatorial Guinea and also sufficiently assesses / mitigates any potential impacts that could be caused by the project.

Oil Spill Contingency Plan

Both fields have been included on one approved Oil Spill Contingency Plan ("OSCP"), which covers operations and responsibility in the event of an oil spill.

The Operator OSCP gives clear directions and identifies responsibility in the event of a spill. It also provides project specific modelling data, which estimates the position of the oil spilt and also gives an estimated beaching location.

SECTION XIV: INDEPENDENT TECHNICAL REPORTS

SUB-SECTION B: PRODECO REPORT

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minarco mineconsult

McElroy Bryan Geological Services MBGS Consulting Geologists Since 1970

Ref: ADV-SY-03728

4th May 2011

The Directors
Glencore International plc (the "Company")
Queensway House, Hilgrove Street
St Helier Jersey JE1 1ES

Dear Sirs,

COMPETENT PERSON'S REPORT – GLENCORE COLOMBIAN COAL ASSETS

This Competent Person's Report ("*CPR*") has been prepared jointly by Minarco-MineConsult ("*MMC*") and McElroy Bryan Geological Services ("*MBGS*") at the request of Glencore International AG ("*Glencore*"). The scope is to undertake an independent technical review and valuation of the relevant geological, mining and infrastructure assets of Glencore in Colombia; including specifically CI Prodeco SA ("*Prodeco*"), the Calenturitas Coal Mine ("*Calenturitas*") and the La Jagua Coal Mine ("*La Jagua*"). The combined MMC and MBGS technical review team is referred to in this report as "*MMC/MBGS*". It is understood that Glencore will include this report in a prospectus to be published in connection with the Initial Public Offering ("*IPO*") of Glencore International plc on the London Stock Exchange and the Hong Kong Stock Exchange. Glencore International plc is expected to be the parent company of the group.

The purpose of the report is to provide a technical opinion as to the accuracy and reasonableness of the information supporting the assets. The focus of the review is on the technical aspects of the assets; including geology, Resources and Reserve Statements, mine plans, production rates, infrastructure, environment and capital and operating costs estimates.

This report, which summarises the findings of our review, has been prepared in order to satisfy the requirements of the "Prospectus Rules" published by the UK Financial Services Authority from time to time and governed by the UK Listing Authority, the "Prospectus Directive" (2003/71/EC) and the Prospectus Regulations (809/2004), "CESR's (now the European Securities and Markets Authority) recommendations for the consistent implementation of the European Commissions Regulation on Prospectuses No. 809/2004" (as updated by the European Securities and Market Authority on 23 March 2011 following the publication of a consultation paper in April 2010 in relation to the content of prospectuses regarding mineral companies) and Chapter 18 of the Hong Kong Listing Rules. The CPR has been conducted in recognition of the requirements of the "Australian Code for Reporting of exploration Results, Mineral Resources and Ore Reserves" (December 2004) published by the Joint Ore Reserves Committee ("JORC") of the Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and the Minerals Council of Australia (the "JORC Code"). The JORC Code establishes the nature of evidence required to ensure compliance with the JORC Code. The review was conducted with regard to the JORC Code because it is internationally recognised. In this report, all resource and reserve estimates are reported in accordance with the JORC Code and have been substantiated by evidence obtained from our site visits and observation and are supported by details of drilling results, analyses and other evidence and takes account of all relevant information supplied to us by company management and the directors of Glencore.

MMC/MBGS has made no independent review to determine whether Glencore holds any other key Colombian assets. Other global assets of Glencore have not been valued as part of this report.

Glencore, through its wholly owned subsidiary Prodeco, owns and operates two open cut coal mines in Colombia; the Calenturitas and the La Jagua coal mines. The mines are located in an active mining region of the Department of Cesar, Colombia, approximately 100 km south of the city of Valledupar. The Puerto Prodeco is located some 220 km to the north of the project site on Colombia's Caribbean coast near the city of Santa Marta, as shown in **Figure 1**. The two mines are separated by approximately 20 km. Prodeco holds exploration and mining title over both coal deposits.

The Calenturitas mine has **400 Mt** of Resources, **209** Mt of Reserves and for 2011 is budgeted to produce 8.5 Mtpa with plans to expand to approximately 14 Mtpa by 2015 with a life of mine to 2029.

The La Jagua mine has **140 Mt** of Resources, **128 Mt** of Reserves and for 2011 is budgeted to produce 7.1 Mtpa with a life of mine to 2029.

MMC/MBGS has reviewed each of the Prodeco assets and has undertaken a valuation of the operating assets included in Prodeco's cash flow forecasts. MMC/MBGS concludes from this review:

- no material flaws, errors or omissions on the technical aspects of the Project were discovered during the review;
- the technical information reviewed is considered reasonable and has been prepared by professionals using appropriate software and industry standards;
- the geological and geotechnical understanding is of a sufficient level to support short, medium and long-term planning as appropriate;

- the mine plans appropriately reflect known geological and geotechnical understanding and account for predicted mining hazards;
- Prodeco's mining equipment (either in place or planned in the capital forecasts) is suited to its mine plans and supports the production levels forecast;
- the assumptions used in estimating coal and waste production volumes, working room, mining losses and dilutions are appropriate and reasonable;
- coal handling and other infrastructure including rail and port are capable of producing and supplying appropriate coal quality products to satisfy the export markets at the forecast volumes;
- identified environmental issues are being well managed and there are no apparent issues that could impede production nor are any prosecutions pending;
- the assumptions used in estimating operating costs are appropriate and reasonable, covering the spectrum of mining, processing, coal transport, and site administration associated in getting the coal to the point of sale;
- capital costs used in the financial models reflect the mine plans, development and construction schedules and the forecast production levels;
- key risks identified by MMC/MBGS are understood by management and appropriate action to mitigate these risks has been taken. Further, the mine plans and cost forecasts appropriately account for these risks; and
- the drivers of the production and cost forecasts are understood by management and are receiving the management focus required.

MMC/MBGS is of the opinion that the Colombian coal assets of Prodeco:

- represent a significant component of the Colombian coal industry;
- have mine plans over areas of Measured and Indicated Resources which generate forward schedules for more than 19 years;
- have a total value (at 10% discount factor) of Proved and Probable Reserves of approximately USD 4,885 million with 75% of this value associated with Proved Reserves (based on a valuation date 01/01/2011); and
- have value that is most sensitive to changes in coal price with a 15% reduction in coal price decreasing reserve value by over 32 % to USD 3,298 million.

MMC and MBGS have both been commissioned to jointly prepare this CPR and this CPR was undertaken on behalf of MMC and MBGS by the signatories of this report.

The first signatory to this CPR, Mr. Grant Walker, BE (Mining) MAusIMM, is a member of the Australasian Institute of Mining and Metallurgy, and is an employee of MMC. He has over 15 years experience in the mining industry with significant experience in technical reviews, audits, due diligence assessments and valuation of mining assets. He has sufficient experience which is relevant to the style of mineralisation and types of coal deposits under consideration, and to the activity he is undertaking outcome of this CPR, to qualify him as a Competent Person (as defined in the 2004 Edition of the JORC Code).

The second signatory to this letter, Mr. Kerry Whitby, FAusIMM, is a Fellow of the Australasian Institute of Mining and Metallurgy, and is the Managing Director of McElroy Bryan Geological Services. He has 39 years experience in the mining industry and has sufficient experience which is relevant to the style of mineralisation and types of coal deposits under consideration, and to the activity he is undertaking in relation to this CPR, to qualify him as a Competent Person (as defined in the 2004 Edition of the JORC Code).

Yours sincerely,

Grant Walker	Kerry Whitby
Consulting Mining Engineer	**Managing Director**
Minarco-MineConsult	**McElroy Bryan Geological Services**

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1. INTRODUCTION

1.1 Purpose of Report

This Competent Person's Report ("*CPR*") has been prepared jointly by Minarco-MineConsult ("*MMC*") and McElroy Bryan Geological Services ("*MBGS*") at the request of Glencore International AG ("*Glencore*"). The scope was to undertake an independent technical review and valuation of the relevant geological, mining and infrastructure assets of Glencore in Colombia; including specifically CI Prodeco SA ("*Prodeco*"), the Calenturitas Coal Mine ("*Calenturitas*") and the La Jagua Coal Mine ("*La Jagua*") (together the "Assets"). The combined MMC and MBGS technical review team is referred to in this report as "*MMC/MBGS*". It is understood that Glencore will include this report in a prospectus to be published in connection with the Initial Public Offering ("*IPO*") of Glencore International plc on the London Stock Exchange and Hong Kong Stock Exchange. Glencore International plc is expected to be the ultimate parent company of the group.

The purpose of the report is to provide a technical opinion as to the accuracy and reasonableness of the information supporting the assets. The focus of the review is on the technical aspects of the assets; including geology, resources and reserve estimates, mine plans, production rates, infrastructure, environment and capital and operating costs estimates.

This report, which summarises the findings of our review, has been prepared in order to satisfy the requirements of the "Prospectus Rules" published by the UK Financial Services Authority from time to time and governed by the UK Listing Authority, the "Prospectus Directive" (2003/71/EC) and the Prospectus Regulations (809/2004), "CESR's (now the European Securities and Markets Authority "ESMA") recommendations for the consistent implementation of the European Commissions Regulation on Prospectuses No. 809/2004" (as updated by the European Securities and Market Authority on 23 March 2011 following the publication of a consultation paper in April 2010 in relation to the content of prospectuses regarding mineral companies) and Chapter 18 of the Hong Kong Listing Rules. With respect to resources and reserves the CPR has been conducted in recoginition of the "Australian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves" (December 2004) published by the Joint Ore Reserves Committee ("JORC") of the Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and the Minerals Council of Australia (the "JORC Code"). The JORC Code establishes the nature of evidence required to ensure compliance with the JORC Code. The review was conducted with regard to the JORC Code because it is internationally recognised. In this report, all resource and reserve estimates are reported in accordance with the JORC Code and have been substantiated by evidence obtained from our site visits and observation and are supported by details of drilling results, analyses and other evidence and takes account of all relevant information supplied to us by company management and the directors of Glencore.

Also, the CPR recognises the *Code for The Technical Assessment and Valuation of Mineral and Petroleum Assets and Securities for Independent Expert Report, The VALMIN Code, 2005 Edition*, prepared by the VALMIN Committee, a joint committee of the Australasian Institute of Mining and Metallurgy.

MMC has made no independent review to determine whether Glencore holds any other key Colombian assets and other global assets of Glencore have not been valued as part of this report.

1.2 Scope of Work

MMC/MBGS carried out the following scope of work:

- Introductory meetings with Glencore's management and consultants to fully understand the business plan.
- Site visits and collection of data.
- Review and assessment of technical aspects of the Assets. The key elements of review included:
    - suitability of existing information supporting the Life of Mine and Business Plans;
    - geology reports and models;
    - resource and reserve estimates;
    - mining operations and proposed expansions;
    - coal preparation and handling;
    - coal transportation;
    - port operations;
    - environmental approvals and matters;
    - estimated capital and operating costs
    - identification of key project drivers and issues; and
    - valuation of Reserves.

- Preparation of this CPR in a format commensurate with the recommendations and guidelines of the UKLA, European Securities and Market Authority and the listing rules.

In accordance with ESMA Recommendations and the Prospectus Rules, only Proved and Probable Reserves have been valued.

1.3 Capability and Independence

This CPR was undertaken on behalf of MMC and MBGS by the signatories to this report, details of whose qualifications and experience are set out in **Annex A**. MMC and MBGS both operate as independent technical consultants providing resource evaluation, mining engineering and mine valuation services to the resources and financial services industry.

MMC and MBGS have both been commissioned as technical consultants to Prodeco for Calenturitas and La Jagua for a number of years and previously have produced JORC Code compliant Resources and Reserves Statements as well as Life of Mine ("*LOM*") plans for Prodeco. MMC/MBGS has also carried out assignments for potential investors for other nearby coal projects in the last three years. MMC/MBGS has considered the matter of potential conflict of interest concerning former work and former reviews and have concluded that they would not be conflicted in preparing this CPR, on the basis that it is being prepared as an independent report and their fees are not dependent on the outcome of the report.

None of MMC/MBGS or MMC/MBGS's staff or specialists who contributed to this report has any interest or entitlement, direct or indirect, in Glencore, Glencore International plc, Calenturitas, La Jagua or the outcome of this technical review in the contents of this CPR.

For the purposes of Prospectus Rule 5.5.3R(2) MMC and MBGS are responsible for this report as part of the Prospectus and declare that they have each taken all reasonable care to ensure that the information contained in this report is, to the best of their knowledge, in accordance with the facts and contains no omission likely to affect its import. This declaration is included in the Prospectus in compliance with item 1.2 of Annex I and item 1.2 of Annex III of the Prospectus Directive Regulation.

Drafts of this CPR report were provided to Prodeco and Glencore for review as to any material errors of fact, omissions or incorrect or unreasonable assumptions.

All opinions, findings and conclusions expressed in this CPR are those of MMC/MBGS (as relevant) except to the extent that such opinions, findings or conclusions are based upon, either in whole or in part, on information provided by Prodeco, Glencore or any 3rd parties.

1.4 Methodology

The reasonableness of the geological data and the technical assumptions used in Glencore's mine plans and financial models were the prime focus of this review.

The following points cover the main areas that the review focussed on and a brief description of the methodology used:

- Resources and Reserves: The JORC Code reports were reviewed for compliance and then the JORC Code totals were cross referenced to the sales tonnes in the business model;
- Mine Plans: Production assumptions, mining rate and production schedules were reviewed and matched against the Mine Plan model inputs;
- Capital and Operating Costs: The key inputs were cross referenced to an in-house MMC cost database for reasonableness; and
- Key Project Issues: Important issues which may have a material impact on the outcomes presented in the Mine Plan were identified during the review.

1.5 Technical Review Team

MMC and MBGS were joint project managers for this Independent Technical Review. A Technical Review Team (the "Team") was assembled including:

- Minarco-MineConsult ("MMC") – Joint project management, review of mining and coal reserves, and valuation of assets;
- McElroy Bryan Geology Services ("MBGS") – Joint project management, review of geology and coal resources, and coal quality;
- Bob Leach Pty Ltd ("B Leach") - Review of coal quality;
- Hansen Bailey Pty Ltd ("Hansen Bailey") – Review of environmental approvals and matters; and
- Inteplan Pty Limited – Review of infrastructure, including coal transport and Port.

We understand from discussions with Glencore that in parallel to these technical reviews, Glencore has commissioned reviews of the corporate, legal and marketing aspects of Prodeco. These reviews and their subject matter are not included in this CPR.

Qualifications of the team are listed in Annex A.

1.6 Site Inspection

In general, as part of ongoing technical consultants work for Prodeco, MMC, MBGS, B Leach and Inteplan have all visited the sites on numerous occasions and both signatories to this CPR have visited the mines on many occassions. More recently, for the specific purpose of this CPR, Inteplan and Hansen Bailey visited the sites in November 2010. MMC/MBGS believes the Technical Review Team is suitably familiar with the sites to act as Competent Persons.

1.7 Limitations and Exclusions

This CPR specifically excludes all aspects of legal issues, land titles and agreements, except such aspects as may directly influence technical, operational or cost issues. MMC/MBGS has not undertaken an evaluation of marketing or coal pricing forecasts. This CPR does not consider financial or commercial matters, including without limitation loan funding aspects, profit and loss, balance sheet, non-cash items, commodity prices, or exchange rates. MMC/MBGS reserves the right to change its view of any of the conclusions set out in this CPR should any of the fundamental information provided to MMC/MBGS materially change.

1.8 Materiality

MMC has adopted the Australian Accounting Standards Board AASB 1031 which proposes that the materiality of information or data can be assessed in terms of the extent to which its omission or inclusion could lead to changes in total value:

- equal to or less than five percent – immaterial;
- between five and ten percent – discretionary; and
- equal to or greater than ten percent – material.

These guidelines were used as a general guide. MMC/MBGS has not in all cases been able to determine the value impact of an issue when determining the materiality of an item.

1.9 Information Sources

The contents of this CPR have been created using data and information provided by or on behalf of Glencore. In MMC/MBGS's opinion, the information provided was reasonable and nothing discovered during the review suggested that there was any material error or misrepresentation in respect of that information. Information generated by third parties, consultants or contractors to Glencore has not been independently validated by MMC through the generation of new work or new data.

MMC accepts no liability for the accuracy or completeness of data and information provided to it by, or obtained by it from Glencore or any third parties, even if that data and information has been incorporated into or relied upon in creating this report. The report has been produced by MMC using information that has been provided to MMC as at the date stated on the cover page. MMC is under no obligation to update the information contained in the report at any time after the date shown on the cover page, though MMC reserves the right to change its view of any of the conclusions set out in this CPR should any of the fundamental information provided to MMC materially change.

1.10 Information About This Document

This CPR must be read in its entirety and must be read in light of the following.

- Its reliance upon information provided to MMC/MBGS by Prodeco, Glencore and others;
- The methodology and limitations and assumptions referred to throughout the report;
- The limited scope of the report; and
- Other relevant issues not within the scope of the report.

Save as provided under PR5.5.3(2) and to the fullest extent permitted under law, use of or reliance on this report by any third parties is at their sole risk and MMC/MBGS will not be liable for any liability, loss or damage suffered by a third party relying on this report regardless of the cause of action, whether breach of contract, tort (including negligence) or otherwise.

MMC/MBGS makes no warranty, express or implied in respect of this CPR, particularly with regard to any commercial investment decision made on the basis of this CPR. This CPR has been prepared without taking into account the objectives, financial situation or needs of any individual, entity or organization.

This document speaks only as of the date of the report and MMC/MBGS has no duty to update it.

1.11 Glossary of Terms

A glossary of terms is listed in Annex B.

1.12 Currency

All currency is United States dollars unless otherwise indicated.

1.13 Inherent Mining Risks

Coal mining is carried out in an environment where not all events are predictable.

Whilst an effective management team can identify the known risks and take measures to manage and mitigate those risks, there is still the possibility for unexpected and unpredictable events to occur. It is not possible therefore to totally remove all risks or state with certainty that an event that may have a material impact on the operation of a coal mine, will not occur.

It is therefore not possible to state with certainty, forward looking production and economic targets, as they are dependent on numerous factors that are beyond the control of MMC/MBCS and cannot be fully anticipated by MMC/MBGS. These factors include but are not limited to, site specific mining and geological conditions, the capabilities of management and employees, availability of funding to properly operate and capitalise the operation, variations in cost elements and market conditions, developing and operating the mine in an efficient manner. Unforeseen changes in legislation and new industry developments could also substantially alter the performance of any mining operation.

2. PRODECO OVERVIEW

MMC/MBGS is satisfied that Glencore management has established a capable management team at each operating asset. MMC/MBGS found that management understands the key drivers and risks at each of the coal mines and has developed credible mine operation plans that address these drivers and risks. Although projected results are subject to variances in accuracy and to risks typically associated with mining, the life of mine plans are based on sound resources, sound technology, supportable production levels, and adequate infrastructure. MMC/MBGS found nothing during the preparation of this CPR which would have a material impact (as defined in Section 1.8) upon the LOM forecast production or capital or operating costs of the assets.

2.1 Description of Assets

Glencore, through its wholly owned subsidiary Prodeco, owns and operates two open cut coal mines in Colombia; the Calenturitas and the La Jagua coal mines. The mines are located in an active mining region of the Department of Cesar, Colombia, approximately 100 km south of the city of Valledupar. The Puerto Prodeco is located some 220 km to the northwest of the project site on Colombia's Caribbean coast as shown in **Figure 1**. The two mines are separated by approximately 20 km. Prodeco holds exploration and mining title over both coal deposits.

The Calenturitas mine is currently producing at approximately 8.5 Mtpa with plans to expand to approximately 14 Mtpa by 2015 with a life of mine to 2031. The La Jagua mine is currently producing at approximately 7 Mtpa with a life of mine to 2029.

The mining method is open cut mining. This is based on multi-seam, steep dip, truck and shovel open cut coal mining initially in strips to ex-pit dumps with a progression over time to haulback waste dumping in-pit. Small scale underground mining was undertaken at La Jagua but is no longer operating. Trials of highwall entry methods, such as auger mining, have been conducted at Calenturitas. The auger mining trial has been successfully completed and approximately 200kt of coal has been produced. This exercise has shown good roof stability in the auger holes, confirmed seam consistency and manageable methane gas levels were encountered giving early confidence for future plans to extract additional coal not included in this valuation.

Infrastructure exists at each deposit and consists of a mine camp and facilities, workshops, offices and coal handling facilities. A rail spur was completed in 2008 to replace the previous system of hauling the coal to the coast at Santa Marta by road trucks. Coal from the nearby La Jagua mine is hauled by road trucks to Calenturitas where it is blended and train loaded out to Puerto Prodeco. The mined coal is crushed and shipped to market without any additional washing/processing.

Prodeco owns and operates its own rail haulage and port facilities. The rail line concession is held by Fenoco in which Prodeco holds a 39.76% share.

Most coal is currently sold to the international market as a thermal coal with approximately 0.5 Mt to 1.5 Mt of La Jagua coal sold as high volatile Pulverized Coal Injection ("PCI"). The coal has a track record with recognition in the market and its energy and relatively low sulphur content makes it attractive in the market place. Some of the quality characteristics of the La Jagua coal have allowed sales into the high volatile PCI metallurgical coal markets. The coal is marketed by Glencore, the owner of Prodeco.

The general locations of Prodeco's assets are shown in **Figure 1** and the more specific locations within the relevant coalfields for the various assets are shown in **Figure 2**

A more detailed description of the assets is provided in **Section 3** and **4.**

2.2 Summary of Geology

The coal deposits are part of Tertiary coal bearing sediments preserved in the Cesar-Rancheria basin. The basin is limited tectonically by the Oca Fault in the north and the Bucaramanga-Santa Marta Fault in the south and west. Two other structural features control the basin limits, an igneous and metamorphic complex to the northwest (Sierra Nevada de Santamarta) and the Perija Hills to the east which comprises Jurassic and Cretaceous sediments. These hills are an extension of the eastern Andean Mountains of Colombia (Cordillera Oriental).

The basin is subdivided into the Rancheria Basin in the north where the Cerrejon Mine is located and the Cesar Basin in the south with the Calenturitas and La Jagua deposits. Continuity of the coal measures between the two sub-basins has not been demonstrated.

The Calenturitas deposit is part of a regional synclinal structure (La Loma Syncline) and subsequent NE trending thrust faulting has resulted in the current distribution of numerous coal deposits in that area. Those deposits are now the focus of a number of open cut operations such as Pribbenow and El Descanso (Drummond), La Francia (Goldman Sachs) and El Hatillo (Vale). The tectonic setting is predominantly compressive with NE-trending thrust faults the main structural features. Extensive 2D seismic surveys in the Cesar Basin over the last 30 years have clearly indicated the structural control governing the distribution of the coal measure strata.

The La Jagua coal deposit is a synclinal basin formation approximately 5 km long and 2 km wide. The deposit is multi seamed and steeply dipping on both the north-west and south-east flanks. The centre of the deposit is much flatter with dips up to 5°. On the basis of borehole and mining records to date, faulting is not common and no major structures have been identified.

Both deposits are characterised with multiple dipping seams of variable thickness and quality. **Figure 4** and **Figure 9** show cross sections of the coal deposits.

2.3 Summary of Resources and Reserves

MMC/MBGS is of the opinion that Glencore understands the geology of the coal resource of each asset. This has enabled technical, operational and marketing personnel to identify opportunities particular to each asset and to implement strategies that maximise resource development within the framework of the total business.

Glencore has standardised the collection and treatment of geological, geotechnical and coal quality data for each asset. Each coal mine has a comprehensive geological and resource assessment team and computerised database and geological model accessible to technical staff.

Glencore's focus on understanding the geology of each asset is evident in the relatively high proportion (87%) of the total coal resources which are classified as Measured and Indicated Resources. Consequently, Glencore can exploit a large Coal Reserve base and integrate long term planning options between the various assets with a reasonable level of confidence.

Coal resources for each mine area were estimated after assessment of the quality, quantity and distribution of geoscientific points of observations and knowledge available for that site. The exploration data was in all cases collected from a variety of sources over the life of each project. Points of observation such as cored and non-cored drill holes, outcrops, geological mapping of open cut pits and previous underground mine workings and geophysical data provided a level of confidence of seam continuity throughout each resource block.

Additional information such as lithological and geotechnical logging of core samples, coal quality analyses from core samples and mine strip samples, downhole geophysical logging and sonic acoustic scanners were used to establish evidence of coal quality continuity and structural disturbance of the coal-bearing strata. Detailed validation of data stored in geological databases was carried out and checked for integrity against raw data, especially in relation to seam thickness and relative density. The process used to create geological computer models was critically reviewed and validated.

Resources were classified as Measured, Indicated and Inferred according to the level of confidence in the geological interpretation and were estimated within discrete resource blocks, on the basis of resource classification, geological and surficial limits. In general, Measured Resources were supported by data points of observation close enough (generally less than 500 m apart) to support a high level of confidence in the geological and/or grade continuity. Indicated Resources were supported by points of observation generally less than 1 kilometre apart and Inferred Resources, characterised by a lower level of confidence in seam continuity and quality, were typically supported by data points more than 1 kilometre apart.

JORC Code compliant Resources Statements were prepared for the assets as of 31st December 2010. The Reserves estimates for both assets were updated to the same date.

Proved and Probable Reserves are based on Measured and Indicated Resources and were estimated for each coal mine for which the appropriate level of planning has been carried out. Coal from each mine is not washed and hence no metallurgical factors were applied.

MMC/MBGS found that Glencore has developed mine layouts over areas of Measured and Indicated Resources, which generate forward schedules in the range of +20 years. This has been achieved by completing mining options studies and economic sensitivity analysis which optimise value whilst minimising mining risks.

The current Resources and Reserves estimates are summarised in **Table 2.1** following.

Table 2.1 – Summary of Resources and Reserves (as of 31st December 2010)

Mine Project	Measured Resources (Mt)	Indicated Resources (Mt)	Inferred Resources (Mt)	Total Resources (Mt)	Proved Reserves (Mt)	Probable Reserves (Mt)	Total Opencut Coal Reserves (Mt)
Calenturitas	170	160	70	400	113	96	209
La Jagua	117	23	-	140	106	22	128
Total	**287**	**183**	**70**	**540**	**219**	**118**	**337**

Note: Reserves are a subset of Resources and are included in the Resources estimate.

2.4 Mines and Projects

2.4.1 Mining Methods and Equipment

MMC/MBGS inspected operations at each coal mine. MMC/MBGS observed that each coal mine operator uses well maintained, modern mining equipment and technology and mining methods typical for the international coal industry and suited to the targeted resources. The open cut mining equipment comprises hydraulic excavators loading off highway rear dump trucks. Support equipment includes bulldozers, drills, water trucks and graders.

MMC/MBGS is satisfied that:

- the major plant items are suited to their intended application at each coal mine;
- plant is well maintained; and
- historical costs and projected costs for repair and maintenance of plant are reasonable.

Glencore forecast capital expenditure for major plant replacement is consistent with the age/condition of equipment and industry practice.

2.4.2 Production Levels

MMC/MBGS reviewed Glencore production forecasts for each coal mine. These forecasts are based on historical performance with increased production included only where clearly defined and realistic operating improvements or expansions have been identified and implemented. MMC/MBGS's review indicates that the overall production under Prodeco management will steadily increase in the period to 2016. This increase will be achieved through operating improvements plus additional output from the development of new mining areas and additional mining equipment. A summary of historical and planned production for the 5 year period from 2009 to 2014 is shown in **Table 2.2.**

Table 2.2 – Saleable Coal Production

Mine Project	2008 (Actual) Mt	2009 (Actual) Mt	2010 (Actual) Mt	2011 (Plan) Mt	2012 (Plan) Mt	2013 (Plan) Mt	2014 (Plan) Mt
Calenturitas	4.7	5.7	5.2	8.5	10.5	12.8	13.3
La Jagua	4.4	4.8	4.8	7.1	7.1	7.1	7.0
Total	**9.1**	**10.5**	**10.0**	**15.6**	**17.6**	**19.9**	**20.3**

MMC/MBGS is satisfied that Glencore production forecasts are realistic and achievable.

For the 2010 production year Prodeco are below budget forecasts. Actual production for 2010 at Calenturitas was 5.2Mt against a budget target of 7.2 Mt. Actual production for 2010 at La Jagua was 4.8 Mt against a budget target of 7.3 Mt.

The following points contributed to the 2010 production statistics:

- Higher than expected groundwater inflows from near surface alluvial aquifers in Sector A at Calenturitas impacted on operations. This issue is now better understood by management and appropriate action to mitigate the risks has been taken. Further, the mine plans and cost forecasts appropriately account for this risk.
- There was a 100% increase in mine operating hours lost to wet weather compared to what was budgeted. This was due to record high rainfall, particularly during the second half of the year. Although a risk exists of a repeat of the higher than average rainfall occurring MMC/MBGS do not believe this would be an annual occurence which would impact on long term forecasts.
- The collective bargaining process in Colombia involves direct negotiations between the parties that can last for up to 40 calendar days. If no agreement is reached during this period, the union may opt to call a strike or to go to arbitration. In 2010 the collective bargaining negotiation with the CDJ union at La Jagua did not result in an agreement after the 40 day period and subsequently the union called a strike which lasted for an additional 38 days. At the end of the strike period an agreement was reached and a new collective bargaining agreement was reached which is effective until 2012.
- Due to high coal inventories in early 2010, Prodeco delayed the purchase of additional waste production fleet. Inventories were depleted when the high rainfall occurredhowever the additional fleet was not available to catch up production.

2.4.3 Management

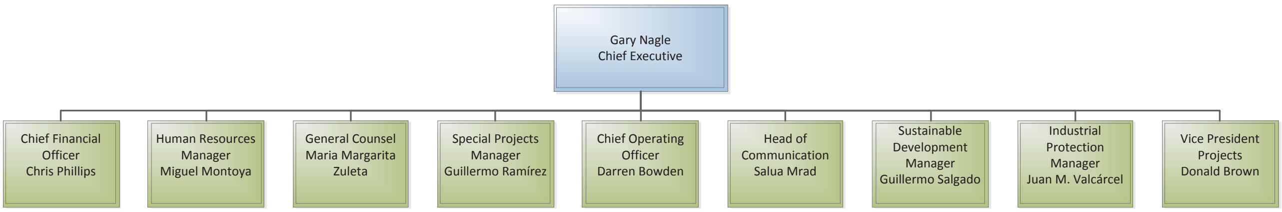
During the conduct of this review, MMC/MBGS project team members were in regular contact and have held numerous discussions with all levels of Prodeco management. Based on this contact, MMC/MBGS is satisfied that:

- Prodeco has established a capable management team at each of its coal mines; and

- coal mine management understands the key drivers and risks at each coal mine and have developed credible mine operation plans that address these issues.

A technical services group within Prodeco coordinates mine planning. This group comprises business development, geological, mining engineering and environmental management. Geological and mine planning functions are maintained at each coal mine and supplemented by outside consultants as required. Each coal mine maintains modern computer-based software for mine planning.

The reported organisation structure of Prodeco is shown below.



2.4.4 Manning Numbers

Table 2.3 summaries the number of employees and contractors at each of the key project locations.

Table 2.3 – Current Manning Numbers

	La Jagua	Calenturiatas	Port	Rail	Admin	Total
Employees	866	808	389	145	206	**2,414**
Contractors	1,222	1,143	505	42	30	**2,942**
Total	**2,088**	**1,951**	**894**	**187**	**236**	**5,356**

2.4.5 Health and Safety

MMC/MBGS reviewed health and safety management systems and their implementation. MMC/MBGS found that an executive safety committee sets health and safety management policy within Prodeco. Prodeco has appointed a Prodeco group safety manager responsible for implementing overall safety strategy and safety management systems.

Direct health and safety responsibility rests with line management and, as is essential in the effectiveness of any system, relies on workforce involvement.

Prodeco undertakes regular audits, both internal and external, at each coal mine. These audits monitor and identify any improvement needs within the safety management systems.

As noted above, Prodeco requires independent operational and safety audits at each coal mine. Wherever these audits identify shortcomings, there is an auditable process in place for rectification and ongoing improvement in the standard of coal mine operations and safety. This process of ongoing audit and improvement is fundamental to a robust, effective and continuously maintained health and safety management system.

Safety performance in 2010 for Prodeco coal mines, expressed as lost time injury frequency rate, is below the average for the national coal industry.

2.4.6 Coal Processing

MMC/MBGS observed that all ROM coal is crushed at each mine and is the loaded into trucks or trains without further processing. Coal is sold "unwashed", meaning there is no metallurgical treatment required to achieve a saleable product. The yield is therefore 100%.

2.4.7 Transport and Port

Coal from the operating mines of Calenturitas and La Jagua is exported primarily through the port of Puerto Prodeco with some shipments through the Carbosan Port at Santa Marta. The coal is railed approximately 220 km to Puerto Prodeco in train sets owned and operated by Prodeco. The rail line is operated and maintained by Fenoco which has been granted the concession from Chiriguana to Santa Marta. Fenoco is owned by the producing coal companies in the Cesar region with Prodeco holding a 39.76% share. Drummond Coal owns 40.96% of Fenoco with the remainder held by Vale, Carboandes and Carbones del Cesar.

Puerto Prodeco is owned and operated by Prodeco and has the capacity to handle up to 17 Mtpa. The coal loading in this area of Colombia is currently undertaken by barge loading and crane transfer to ships. The Colombian Government has decreed that all coal ports are to implement direct ship loading techniques. The government has granted Prodeco a concession in Cienaga and Prodeco are undertaking a project to develop a new coal loading terminal, Puerto Nuevo, scheduled to commence operations in 2013. At that time the existing Puerto Prodeco will be closed down.

The rail and port operations of Prodeco have been planned to match the forecast throughput and Prodeco has exercised control of its future by:

- investing in Fenoco;
- developing facilities at La Jagua and Calenturitas to ensure the trains can be loaded as required;
- establishing its own rail operation;
- expanding the existing port to cope with the growth; and
- constructing a new port to meet forecast throughput and government requirements.

The assets are in generally good condition, and appear to be well maintained and operated.

2.5 Environmental Issues and Management

Hansen Bailey has carried out an environmental review of Glencore's Colombian coal assets including key environmental approval documentation pertaining to its mining operations and port facilities. They have determined environmental management at Prodeco is undertaken generally in accordance with its Environmental Policy. The Environmental Policy forms the foundation of its Environmental Management System (EMS) and describes its vision of environmental management for the mining operations.

The EMS's developed for the Prodeco operations are based on the principles of the ISO14001 international environmental standard. It should be noted that the port facility (Puerto Prodeco) is certified to ISO14001.

Prodeco has undertaken an environmental risk assessment to identify the potential high risk aspects and impacts associated with its activities. Relevant Environmental Management Plans ("EMPs") have been developed to mitigate potential adverse impacts as described in its EMP document. There was evidence of environmental training and general awareness of environmental issues amongst employees.

Environmental monitoring is undertaken in accordance with the relevant EMP which is approved by the Ministry of Environment, Housing and Land Development ("MAVDT"). MAVDT undertakes several site visits per year and reviews the environmental performance of the site against relevant criteria. Prodeco has established environmental monitoring systems to measure its performance and receives regular monthly reports on environmental aspects including surface water, groundwater and ecology. Air quality monitoring is managed by the Regional Environmental Authority ("REA").

There are currently five operating coal mines in the area surrounding Calenturitas, including El Hatillo, Pribbenow, El Descanso, La Francia and Calenturitas. REA commissioned a cumulative air quality impact assessment in 2009 to investigate the potential impacts on local residents and communities located in the area. Results from the assessment indicated that cumulative impacts from the five existing operating mines would adversely impact three local communities (Boqueron, Plan Bonito and El Hatillo). The REA has recommended that the identified communities to be impacted by mining be relocated. Discussions regarding the relocation strategy and responsibility are ongoing and these had not been finalised at the time of this review. A preliminary proposal outlining the shared responsibility between the five mining operations in the area has been put forward by REA. The preliminary proposal includes a methodology to determine the level of contribution of each mining operation. Calenturitas will be required to contribute to the relocation of these communities. The cost of the relocation has been included in the valuation of Calenturitas.

A Biodiversity Offset Management Plan has been developed and will be implemented over the life of the mining projects. It is anticipated that Calenturitas will be required to contribute up to USD 21 Million and La Jagua up to USD 15 Million towards the implementation of the Biodiversity Offset Strategy.

Prodeco has developed Mine Closure Plans for the operations which have been approved by MAVDT. The Mine Closure Plan is reviewed every five years in accordance with MAVDT. There is no rehabilitation security bond required for either La Jagua or Calenturitas.

MMC/MBGS found that Prodeco has developed environmental management systems generally based on international standards. The mines were inspected as part of this review. These inspections found:

- a high level of environmental awareness among senior Prodeco and coal mine staff;
- clear identification of most environmental issues;
- board-level reporting;
- active resolution of identified issues which could have material implications for mining; and
- a high standard of housekeeping.

2.6 Statutory Authorisations

Hansen Bailey reviewed the status of the statutory authorisations for the port facilities and mining operations. Prodeco currently holds all necessary leases and licences to cover exploration and mining activities. A summary of the status of the mining leases and authorisations is set out in the following **Table 2.4**.

Table 2.4 – Prodeco Operations Approvals and Status

Doc.	Detail	Granted	Auth.	Comment	Expiry
CALENTURITAS					
1.	Mining Lease (ML) 044/89	03/07/2005	Ministry of Mining and Energy (MME)	Mining Authority over 6,677 ha	03/07/2035
2.	Works Program (PTI)	2005	MME	Approval to extract up to 7 Million tonnes per annum (Mtpa) ROM Coal	Expires with ML
3.	PTI - Modification	Dec 2010	MME	Proposal to extract up to 14.2 Mtpa ROM coal by 2019, submitted in June 2010, additional information provided in October 2010	Will expire with ML 044/89
4.	Environmental Management Plan	2009	MAVDT	Includes Environmental Management Plans for each aspect of the mining operation	Expires with ML
5.	Environmental Pollution Licence	6/03/2009	MAVDT	The Environmental Pollution Licence is consistent with the EMP's approval No. 0464	Expires with ML
LA JAGUA					
6.	ML - CDJ 285-95	24/04/1997	MME	Mining Authority over area identified as CDJ	23/04/2027
7.	ML - DKP 141	17/12/2004	MME	Mining Authority over area identified as DKP	17/12/2034
8.	ML - HKT 08031	11/11/2008	MME	Mining Authority over area identified as HKT	10/11/2038
9.	ML - CMU 109-90	25/09/1991	MME	Mining Authority over area identified as CMU	24/09/2014
10.	ML - CET 132-92	23/09/1998	MME	Mining Authority over area identified as CET	23/10/2028
11.	PTI	12/04/2010	MME	PTI approved in letter from MME reference 006954 for up to 7 Mtpa ROM coal from 2010 to 2027	Expires with relevant ML
12.	Environmental Management Plan	09/2008	MAVDT	Includes 18 Environmental Management Plans for each aspect of the mining operation	Expires with relevant ML
13.	Environmental Pollution Licence	18/12/2008	MAVDT	The Environmental Pollution Licence is consistent with the EMP's approval No. 2375	Expires with relevant ML
PORT PRODECO					
14.	Environmental Pollution Licence	28/05/2009	MAVDT	License Number 983	Expires with the Port Concession
15.	Port Concession Resolution 097	1/03/2010	MME	Provides for the ongoing use of the Port Facility, MME audit every 6 months to assess progress of New Port	1/03/2011
NEW PORT					
16.	Environmental Pollution Licence 0447	5/03/2010	MAVDT	Provides approval of phase 1 up to a capacity of 35 Mtpa product coal, original Environmental Pollution Licence 0435 dated 02/03/09 modified	Expires with the Port Concession
17.	Port Concession, Resolution 333	4/08/2010	MME	Approval for terrestrial and marine based activities	n/a

Table 2.5 summarises the terminology used in Colombia and for this review.

Table 2.5 – Colombian Terminology

Item	Colombian (Spanish)	Abbreviation
Mining Lease	Titulo Minero	ML
Environmental Management Plan	Plan de Manejo Ambiental	EMP
Environmental Pollution Licence	Licencia Ambiental	EPL
Ministry of Mining and Energy	Ministerio de Minas y Energía	MME
Ministry of Environment, Housing and Land Development	Ministerio de Ambiente, Vivienda Y Desarrollo Territorial	MAVDT
Works Program	Programa de Trabajos e Inversiones	PTI
Regional Environmental Authority	Corpocesar an Corpamag	REA

In MMC/MBGS's opinion:

- appropriate statutory authorisations are in place for each coal mine and relevant project;
- management is taking appropriate steps to maintain statutory authorisations for its coal mines and to obtain, where needed, new statutory authorisations for assets;
- the coal mines are generally operated in accordance with statutory authorisations and are not in material breach of those statutory authorisations. However, there was evidence that issues raised and recommendations made in previous government audits had not been fully implemented at Calenturitas. Prodeco are currently working through the outstanding recommendations. These outstanding items are minor and are not considered material; and
- nothing found during the preparation of the CPR indicated that statutory authorisations will not be renewed as they fall due.

2.7 Costs

2.7.1 Operating Costs

A summary of historical cash cost for each of the operations from 2008 to 2010 are shown in **Table 2.6** and **Table 2.7.**

Table 2.6 – Calenturitas Historic Operating Cash Costs

Activity	2008	2009	2010
Waste Mined (kbcm)	38,334	54,434	42,491 (1)
Coal Mined (kt)	4,698	5,700	5,234
Strip Ratio	8.2	9.6	8.1
Waste removal ($/t)	17.61	19.88	19.52
Coal mining ($/t)	1.44	1.36	1.66
Mining support ($/t)	4.51	5.24	7.87
Coal handling ($/t)	0.81	0.41	0.49
Admin & Infrastructure ($/t)	1.39	1.63	2.19
Contractor ($/t)	0.04	0.00	0.00
Rail & transport ($/t)	9.38	6.18	6.08
Port ($/t)	5.29	5.47	4.81
Royalty ($/t)	11.35	11.72	6.53
HO & Marketing ($/t)	1.66	1.51	2.24
Total Operating Cost	**53.48**	**53.40**	**51.39**

Note (1): Excludes Boxcut of 8,474 kbcm

Table 2.7 – La Jagua Historic Operating Costs

Activity	2008	2009	2010
Waste Mined (kbcm)	23,616	36,990	30,829
Coal Mined (kt)	4,366	4,787	4,808
Strip Ratio	5.4	7.7	6.4
Waste removal ($/t)	12.76	17.40	21.76
Coal mining ($/t)	1.73	0.95	2.03
Mining support ($/t)	4.96	6.56	7.37
Coal handling ($/t)	1.16	1.34	1.48
Admin & Infrastructure ($/t)	2.06	2.54	3.02
Rail & transport ($/t)	16.71	10.39	9.74
Port ($/t)	5.23	5.37	4.78
Royalty ($/t)	6.26	6.24	4.33
HO & Marketing ($/t)	1.36	1.29	1.52
Total Operating Cost	**52.23**	**52.08**	**56.03**

Prodeco gave MMC/MBGS their current Business Financial Model for review and for use in generating valuations for Calenturitas and La Jagua. The Model is set up to value Calenturitas and La Jagua separately, or both Calenturitas and La Jagua as combined joint operations.

The Business Model is a time based spreadsheet model, allowing for operations from 2011 to 2030 inclusive with yearly time increments. In summary, the Business Model allows for:

- production schedules (mined, railed, shipped);
- mine equipment fleets, operating hours and productivities;
- labour requirements and hours;
- build up of all mine operating costs;
- coal rail, transport and port operating costs;
- equipment capital costs; both initial and replacements;
- non-mining capital costs (infrastructure, coal handling, administration, contractor mobilization);
- coal stocks and working capital calculations;
- depreciation and tax calculations;
- coal pricing and revenues;
- royalty;
- cash flows; and
- discounted cash flow ("*DCF*") and net present value ("*NPV*") analysis.

A summary of life-of-mine (LOM) average operating costs is given in **Table 2.8**.

Table 2.8 – Average LOM Operating Cost

Activity	Calenturitas (US$/t)	La Jagua (US$/t)	Combined (US$/t)
Waste removal	$28.50	$20.22	$25.30
Coal mining	$3.08	$2.66	$2.91
Mining support	$3.15	$3.73	$3.38
Coal handling	$1.04	$0.75	$1.02
Admin & Infrastructure	$1.32	$2.98	$1.96
Rail & transport	$3.35	$5.78	$4.09
Port	$1.61	$1.90	$1.79
Royalty	$10.97	$11.03	$11.01
HO & Marketing	$0.96	$1.40	$1.14
Total Operating Cost	**$53.99**	**$50.46**	**$52.60**

In MMC/MBGS's opinion:

- the assumptions used in developing Prodeco's financial forecasts are reasonable; and
- the operating cost forecasts are realistic and achievable.

2.7.2 Capital Expenditure

Capital costs for each of Calenturitas and La Jagua were reviewed. The term "Initial Capital" refers to the investment required to bring the operations to their full forecast production level. This is spread over several years to match the build up and construction period. Replacement capital allows for the fact that the equipment life is shorter than the mine life and therefore when it is worn out allowance has been made in the model to purchase new equipment. Sustaining capital is a more general allowance for smaller capital items of lower cost (for example computers) that is required on an ongoing basis. A summary of all capital costs is given in **Table 2.9**.

Table 2.9 – Capital Cost Estimates (US$k)

Item	Calenturitas (kUS$)	La Jagua (kUS$)	Combined (kUS$)
Intial Capital			
Waste Removal	$267,443	$50,584	$318,028
Coal Mining	$26,454	$4,620	$31,074
Mining Support	$10,675	$7,347	$18,022
Coal Handling	$23,933	$21,637	$45,570
Admin & Infrastructure	$24,735	$24,567	$49,302
Rail & Transport	$9,061	$4,539	$13,600
Port	$335,233	$167,904	$503,137
HO & Admin Support	$4,331	$2,169	$6,500
Total Initial Capital	$701,866	$283,367	$985,233
Replacement Capital			
Waste Removal	$622,488	$197,077	$819,565
Coal Mining	$87,183	$28,419	$115,602
Mining Support	$54,613	$24,514	$79,127
Total Replacements	$764,284	$250,010	$1,014,295
Sustaining Capital			
Mining Support	$72,000	$71,250	$143,250
Coal Handling	$18,000	$18,000	$36,000
Admin & Infrastructure	$17,600	$26,500	$44,100
Rail & Transport	$3,798	$1,902	$5,700
Port	$3,398	$1,702	$5,100
HO & Admin Support	$12,659	$6,341	$19,000
Total Sustaining	$127,455	$125,695	$253,150
Total Capital	$1,593,605	$659,072	$2,252,677

These expenditure estimates are planned to support each coal mine and to fund the development of projects and expansions.

MMC/MBGS found that capital expenditure for approved projects and coal mine expansions is supported by the appropriate level of feasibility study and engineering design.

The capital allowances made by Prodeco in the forecasts are appropriate and are in line with industry norms.

In MMC/MBGS's opinion, Prodeco's capital expenditure forecasts:

- reflect the current condition of equipment and infrastructure;
- allow for replacement of equipment and facilities as required;
- allow for the development of projects and upgrade of operations to bring new production online; and
- are reasonable and comparable with other coal mines in Colombia.

2.8 Issues and Risks

Coal mining has inherent risk, which is a function of the geological setting and mining methods. These inherent risks can be mitigated by sound management, however they cannot be totally removed. Prodeco has minimised the potential impact of these inherent risks to their overall business by building two mines with multiple pits and also by controlling the transport chain and over time improving this so it is more efficient and less prone to disruption.

MMC note the following potential issues:

- The depth of the Calenturitas pit (> 300 m) increases the risk of potential geotechnical issues in highwall and lowwall stability;
- Due to the proximity of the mines to several rivers the potential effects of flooding causing ingress of water are increased. Prodeco have reduced the risk through the construction of bunds around the mining areas;
- Failure to meet planned production levels caused by events such as higher than average rainfall or strikes will impact on cash flows;

- Geological risk is always present however with progressive exploration drilling and increasing in-pit exposures this risk is constantly being reduced;
- Political activity and government policies;
- Risk in the production build up period. Some items that may impact on the rate of production build up include construction of the new port facility, delivery of new mining equipment or staffing shortages; and
- Prodeco do not currently have approvals in place to implement the final stage of the river diversion at Calenturitas. Failure to gain approvals will impact on mining in Pit B.

MMC/MBGS is satisfied that none of these risks presents any significant threat to the assets of Prodeco because Prodeco:

- is aware of them;
- has addressed and is continuing to address them through prudent and diligent management; and/or
- has made appropriate allowance in its cash flow forecasts.

2.9 Synergies

There are significant synergy opportunities available within the Prodeco operations. In a general sense, these include economies of scale, sharing of expertise and blending synergies, all of which have been discussed elsewhere. Prodeco has realised these opportunities through:

- a flat management structure with low head office overheads. MMC/MBGS observed that the executive management team was aware of issues across the business and spent a significant portion of their available time with site management; and
- integrated production and marketing allowing key productivity drivers at each coal mine to be optimised with a focus on Prodeco's markets.

2.10 Sales and Marketing

MMC/MBGS reviewed exploration data, coal quality analysis, and mining practices and concluded that forecast product quality can be achieved.

The quality of the coal produced by Prodeco is typical for the relevant coal field. The rank of the coal is medium to high volatile bituminous. The coal mines have flexibility to produce to a broad range of specifications by controlling the seam mined, the mining horizon and coal blending. The transport process allows Prodeco to buy in coal and blend products to meet customer specification.

All coal from Calenturitas and La Jagua is sold raw into the export market with a major portion sold blended from both mines to meet a general energy target ranging from 11,100 Btu/lb to 11,500 Btu/lb on a gross, as received (gar) basis. Most coal from La Jagua however, is sold into higher energy markets above 12,000 Btu/lb gar.

Both coal sources have relatively similar thermal properties:

- Total sulphur typically 0.5% to 0.7% gar though both mines have some coal with sulphur in excess of 1% which is blended down to meet specifications. In addition to the high sulphur seams there are also coals with sulphur 0.4% or below;
- Chlorine 0.02% to 0.04% is low to moderate;
- HGI 44 – 48 indicates the coal is moderately hard but this does not impact adversely on grindability when combusted;
- Nitrogen 1.5% to 1.7% is moderate and acceptable in most export markets;
- Ash fusion (reducing condition) Initial Deformation Temperature (IDT) 1250ºC to 1,450 ºC and Flow Temperature 1,450ºC to 1,550ºC. La Jagua has slightly superior ash fusion characteristics likely due to lower calcium and sodium oxides in ash (1% to 2.5%) and (0.5% to 0.8%) respectively compared to Calenturitas (2% to 4%) and (0.8% to 1.5%) respectively though both scenarios are acceptable; and
- Silicon, aluminium and iron oxides in ash are respectively 50% - 57%, 18% - 23%, 9% - 12% for both mines.

2.11 Valuation of Reserves

2.11.1 Methodology and Assumptions

Each of the coal mines that contributes to Prodeco's cash flow forecasts have been valued separately and have been valued using discounted cash flow methods. The cash flows used are those provided by Prodeco in their LOM schedules as modified by MMC/MBGS to allow for CPR specific requirements such as valuing only reserves and valuing Proved and Probable Reserves separately.

The key valuation assumptions are as follows:

- cash flows are ungeared and unescalated and are real values;
- cash flows have been discounted mid year;
- the valuation is carried out on real post-tax cash flows;
- cash flows have been allocated to Proved and Probable Reserves and valued separately;
- post tax real discount rates for a range of discount rates of 8% to 12% have been applied;
- long term coal prices were provided by Glencore and checked for reasonableness;
- it is assumed that all coal mined is processed and sold in the same year;
- rehabilitation is concurrent with mining and has been allowed for in the operating cost estimates;
- valuation is in USD; and
- plant has not been valued separately. As the plant and equipment is an integral component in the generation of the cash flows used to estimate the value of the Reserves, and the coal mines and projects have in general long lives, the value of the plant and equipment is therefore included in the Reserves value. Any residual value is not considered to be material.

In the Prodeco Business Model coal revenues are estimated by applying assumed future benchmark coal prices to the annual coal quantities given in the production schedules and adjusting for the annual specific energy of the mined coals. MMC/MBGS is not aware of any independent coal pricing and/or marketing studies being commissioned by Prodeco.

Based on specific energy and freight advantages coal sold from La Jagua generally experiences approximately a $6 premium above the bench mark price when sold into the thermal coal market. The premium is usually higher when the La Jagua coal is sold into the metallurgical market.

The benchmark prices and the adjusted prices for each deposit are given in **Table 2.10**.

Table 2.10 – Coal Pricing

Sector	2011	2012	2013	2014	2015	LT
Bench Mark Price						
La Jagua (@12,400BTU)	101.54	115.83	115.09	123.76	124.00	102.00
Calenturitas (@11,300 BTU)	82.35	95.57	95.67	105.99	106.00	85.75
Average Coal Price						
La Jagua	98.68	114.32	112.28	121.74	121.28	96.32
Calenturitas	80.36	93.09	94.00	103.99	104.48	81.59
Average Coal Price	**88.70**	**101.64**	**100.54**	**110.12**	**110.23**	88.38

Supplied by Glencore

2.11.2 Valuations

Based on the methodology and assumptions set out in **Section 2.11.1**, a summary of the NPV valuation carried out by MMC/MBGS for a range of discount rates is included in **Table 2.11.**

A summary of financial analysis for both projects separately and for the combined projects is given in **Table 2.11**.

Table 2.11 – Summary of Financial Analysis

Sector	Units	Calenturitas	La Jagua	Combined
Production				
Peak Coal	Mtpa	~14	~ 7.0	~ 21
JORC Reserve	Mt	209	128	337
Strip Ratio	bcm/t	10.0:1	6.5:1	8.7:1
Operating Costs				
Average	US$/t	$53.99	$50.46	$52.60
Capital Costs				
Life of Mine	US$ M	$1,594	$659	$2,253
Net Present Value				
@ 8% DR	US$ M	$2,786	$2,780	$5,566
@ 10% DR	US$ M	$2,439	$2,446	$4,885
@ 12% DR	US$ M	$2,148	$2,172	$4,320

Table 2.12 shows the attributable value estimated for both Proved and Probable Reserves for each coal mine and project.

Table 2.12 – Valuation of Attributable Reserves @ 10% DR

	Proved Reserve (US$M)	Probable Reserve (US$M)	Total Open Cut Coal Reserve (US$M)
La Jagua	$2,089	$357	$2,446
Calenturitas	$1,775	$664	$2,439
Valuation	**$3,864**	**$1,021**	**$4,885**

2.11.3 Sensitivity Analysis

The values of the coal mines have been tested seperately for sensitivity to movements in the key parameters of operating cost, production, capital cost and coal price.

- Operating Costs - Forecast operating costs are supported by operating history but the mine is expanding and a new port is yet to be built and therefore a 10% sensitivity test is considered appropriate;
- Production - Coal mines can be subject to relatively large short term production variations from plan. However, the likelihood of long term variation is largely mitigated by Prodeco's portfolio of assets, which reduces the impact of poor performance from any one asset and also allows production to be made up from other assets. A sensitivity of 10% is considered appropriate;
- Capital Cost - Prodeco have completed detailed capital cost forecasts. These forecasts, whilst appropriate and not likely to vary much in the short term, may be subject to variation in the medium to long term. Therefore a 25% sensitivity is considered appropriate; and
- Coal Price - Historically export coal prices have been highly variable with the variability largely driven by high barriers to industry entry and exit and a relatively inelastic demand. A 15% sensitivity is considered appropriate for export prices.

A summary of the effect of sensitivity of the valuation of reserves to these variables is included in **Table 2.13.**

Table 2.13 – Sensitivity of Attributable Reserves Valuation

	Base Case Total Value US$M	Operating Cost (+10%) US$M	Production (-10%) US$M	Capital Cost (+25%) US$M	Coal Price (-15%) US$M
Valuation	$4,885	$4,187	$4,052	$4,641	$3,298

2.12 Summary of Conclusions

Table 2.14 – Summary Table – Group Level

	2008A	2009A	2010A	2011E	2012E	2013E	2014E	2015E
Capacity (Mt)	10.1	12.1	14.5	15.6	17.6	19.9	20.3	20.7
Production (Mt)								
Own Mine	9.1	10.5	10.0	15.6	17.6	19.9	20.3	20.7
Third party	1.4	1.0	0.2	-	-	-	-	-
Saleable (Mt)	10.6	10.4	11.7	15.6	17.6	19.9	20.3	20.7
Cash Costs excl. Royalty (US$m)	398.6	450.0	501.0	807.7	826.3	810.6	849.7	854.8
Royalty (US$m)	80.7	96.7	55.0	142.6	194.8	225.4	280.2	276.8
Depreciation & amortisation (US$m)**	77.1	99.5	104.5	125.0	132.7	140.5	153.4	158.7
Tax Rate (%)	12.04***	-9.81***	17.51***	33.0	33.0	33.0	33.0	33.0
Capex (US$m)								
Sustaining	11.7	4.7	7.4	14.4	1.5	1.0	15.0	15.0
Expansionary	296.7	237.0	269.3	564.4	256.3	80.6	102.6	100.4

*** IFRS accounting (not tax)*

*** *Effective rate*

Table 2.15 – Summary Table – Calenturitas

	2008A	2009A	2010A	2011E	2012E	2013E	2014E	2015E
Capacity (t)	5.5	7.1	7.2	8.5	10.5	12.8	13.3	13.6
Production (t)								
Own Mine	4.7	5.7	5.2	8.5	10.5	12.8	13.3	13.6
Saleable (t)	4.7	4.7	6.3	8.5	10.5	12.8	13.3	13.6
Cash Costs excl. Royalty (US$m)	197.9	237.6	233.7	481.1	500.9	506.1	552.9	573.6
Royalty (US$m)	53.3	66.8	34.2	76.2	117.7	150.8	182.4	191.8

Table 2.16 – Summary Table – La Jagua

	2008A	2009A	2010A	2011E	2012E	2013E	2014E	2015E
Capacity (t)	4.6	5.0	7.3	7.1	7.1	7.1	7.0	7.1
Production (t)								
Own Mine	4.4	4.8	4.8	7.1	7.1	7.1	7.0	7.1
Saleable (t)	4.5	4.7	5.0	7.1	7.1	7.1	7.0	7.1
Cash Costs excl. Royalty (US$m)	200.7	219.4	246.2	326.6	325.4	304.5	296.8	281.2
Royalty (US$m)	27.3	29.9	20.8	66.4	77.1	74.6	97.8	85.0

MMC/MBGS has reviewed each of the Prodeco assets and has undertaken a valuation of the operating assets included in Prodeco's cash flow forecasts. MMC/MBGS concludes from this review:

- no material flaws, errors or omissions on the technical aspects of the Project were discovered during the review;
- the technical information reviewed is considered reasonable and has been prepared by professionals using appropriate software and industry standards;
- the geological and geotechnical understanding is of a sufficient level to support short, medium and long-term planning as appropriate;
- relevant miing authorities and environmental approvals are in place and new approvals are sufficiently advanced to achieve the proposed future production targets;
- the mine plans appropriately reflect geological and geotechnical understanding and account for predicted mining hazards;
- Prodeco's mining equipment (either in place or planned in the capital forecasts) is suited to its mine plans and supports the production levels forecast;
- the assumptions used in estimating coal and waste production volumes, working room, mining losses and dilutions are appropriate and reasonable;
- coal handling and other infrastructure including rail and port are capable of supplying appropriate quality products to satisfy the export markets at the forecast volumes;
- environmental issues are generally well managed and there are no issues that could significantly impede production nor are any prosecutions pending;
- the assumptions used in estimating operating costs are appropriate and reasonable, covering the spectrum of mining, processing, coal transport, and site administration associated in getting the coal to the point of sale;
- capital costs used in the financial models reflect the mine plans, development and construction schedules and the forecast production levels;
- key risks identified by MMC/MBGS are understood by management and appropriate action to mitigate these risks has been taken. Further, the mine plans and cost forecasts appropriately account for these risks; and
- the drivers of the production and cost forecasts are understood by management and are receiving the management focus required.

MMC/MBGS is of the opinion that the Colombian coal assets of Prodeco:

- represent a significant component of the Colombian coal industry;

- have mine plans over areas of Measured and Indicated Resources which generate forward schedules for more than 19 years;
- have a total value of Proved and Probable Reserves of approximately USD 4,885 million with 75% of this value associated with Proved Reserves; and
- have value that is most sensitive to changes in coal price with a 15% reduction in coal price decreasing reserve value by over 32 % to USD 3,298 million.

3. CALENTURITAS COAL MINE

3.1 Description

Calenturitas commenced operation over 10 years ago but only established a box cut with the mine remaining on a "care and maintenance" basis for a number of years. Full scale production re-commenced in early 2004 with the establishment of a strip mine on the eastern subcrop of the coal deposit.

The mining rate in 2011 is planned for 8.5 Mtpa increasing to approximately 14 Mtpa by 2015. This involves opening up and developing three active pits (called Sectors A, B and C) to provide the working area required to support this mining rate. This development strategy also ameliorates many of the possible mining risks such as flooding, short term geological issues and geotechnical instability. It also allows for blending of the different seams to provide uniform quality.

The Calenturitas River meandered across the northern part of the deposit from northeast to southwest and has been diverted in order to extract the coal. Infrastructure including workshops, offices and coal handling facilities is located in the central part of the deposit above the deeper coal.

The Calenturitas site visit confirmed the following:

- the equipment is owned and managed by Prodeco;
- some contractors are used for maintenance (such as Chaneme and Gecolsa which is known as a "MARC" or maintenance and repair contract);
- stage 1 of the river diversion, which covers the current mining limits of Sector A is in place. A second diversion is required for the mining of the southern portion of Sector B. Approvals for the second diversion have not been granted;
- sufficient land has now been purchased for the operational requirements;
- the railway loading facility is installed and working;
- Sector C is fully developed with haulback in to in-pit dumps;
- Sector A is being opened up;
- Sector B has yet to commence;
- additional equipment is required for the mine expansion; and
- new offices and workshops have just been completed.

3.2 Maps and Plans

The regional location of the mine is shown on **Figure 1**. Typical stratigraphy and a cross section showing the geological structure is shown on **Figures 3** to **Figure 4**.

3.3 Geology

3.3.1 Regional Geology

The Calenturitas coal deposit is part of Tertiary coal-bearing sediments preserved in the Cesar-Rancheria Basin. This basin is limited tectonically by the Oca Fault in the north and the Bucaramanga-Santa Marta Fault in the south and west. Two other structural settings control the basin limits, the igneous and metamorphic complex of Sierra Nevada de Santa Marta to the north and the Serrania de Perija to the southeast. These mountain ranges are an extension of Colombia's Eastern Cordillera.

The basin is subdivided into the Rancheria Basin in the north where Cerrejon Mine is located and Cesar Basin in the south which contains La Jagua and Calenturitas mines. Continuity of coal measures between the two sub-basins has not been demonstrated.

Outcrop in the Cesar-Rancheria Basin ranges from Jurassic to Quaternary in age. The unit containing the main coal seams is the Los Cuervos Formation of Palaeocene to early Eocene age. Los Cuervos Formation conformably overlies the Barco Formation which consists of massive sandstone units and the coal-bearing Los Cuervos Formation is unconformably overlain in some areas by coarse-grained sediments of the Cuesta Formation. This unconformable surface does not erode coal measures in the Calenturitas lease area, however in some areas to the west and southwest of Calenturitas, erosion of coal measure strata is apparent on the basis of seismic and borehole information. Alluvial sediments overly the coal-bearing strata at Calenturitas and these sediments are predominantly fine to coarse grained sand ranging from 5 m to 40 m thick. The Los Cuervos Formation is between 250 m and 1,600 m thick.

The tectonic setting is predominantly compressive with northeast trending thrust faults that divide the basin into a number of northeast-oriented elongate blocks within which the strata have been folded with the Los Cuervos coal seams brought up to the surface by the thrust faults. (see **Figure 2**). Most of these blocks are the focus of a number of open cut operations such as Pribbenow, El Descanso, La Francia, El Hatillo, Calenturitas and La Jagua.

Extensive 2D seismic surveys have identified three main thrust structures that govern the distribution of coal measure strata into structural blocks – El Hatillo Fault; La Loma Fault; El Tigre Fault. Within each structural block, the disposition of the coal seams is controlled by the main fold structures – El Boqueron Syncline; La Loma Syncline (Calenturitas Mine); El Descanso Syncline; La Jagua Syncline.

3.3.2 Site Geology

The Calenturitas coal deposit occurs within a northeast-trending asymmetrical syncline, the axis of which plunges at less than 10º towards the southwest (see **Figure 2**). Seams dip at 5º to 10º on the northeastern nose of the syncline (Sector A). Seam dips increase along the limbs of the syncline to 18º along the eastern limb (Sectors C and D) and up to 55º on the western limb (Sector B). Coal seams are relatively flat-lying in the vicinity of the synclinal axis with dips less than 10º observed on seismic lines crossing the area.

The Calenturitas deposit is divided into sectors A to D based on geological/geographical and mining characteristics. The majority of exploration drilling has focussed on the northern and eastern margins (Sectors A, C and D) of the deposit and as a result, the seams in those areas are mostly classified as Measured Resources. Coal resources in the western area (Sector B) tend to be classified as Indicated or Inferred because of the effect of steeply dipping strata and further drilling is required in that area to elevate resource to Measured status. Resources within the deeper area of the syncline (close to the axis) have not been classified due to the lack of drill hole information in this area and these resources are not included in the current Calenturitas life of mine plan. These resources will be the subject of studies related to the potential for future underground mining.

Figure 4 shows typical cross-sections through the deposit

3.3.3 Stratigraphy

The Los Cuervos Formation comprises three stratigraphic units; a lower unit containing interbedded claystone, siltstone and thin coal bands; a middle unit that contains the economic coal seams; an upper unit of primarily fine to medium grained sandstone interbedded with siltstones. A typical stratigraphic column for the Cesar Basin and geology of Calenturitas is presented in **Figure 3** shows how the coal seams at Calenturitas are correlated with those of the La Jagua deposit.

At Calenturitas, a total of 47 seams sub-crop along the western and eastern limbs of the syncline (C420 to C100). Seam C420 is the uppermost coal seam and Seam C199 is at the base of the main economic sequence, a stratigraphic interval approximately 245 m thick with 30 m of cumulative coal thickness. Seams C200 and C270 Upper and Lower are the thickest coal seams (average 4 m) and Seams C330, C310, C270, C260, C250, C210 and C200 contain an intra-seam stone parting greater than 0.10 m thick (see **Figure 5**). Some of the seams below Seam C199 (down to Seam C130) are considered to be economically mineable in parts of the deposit thickness. There are a number of thin seams below C130 however they tend to be quite thin (<0.5 m) and as they appear to have no economic significance, they have not been included in the Resource estimate.

3.3.4 Structure

The Calenturitas coal deposit is in an asymmetrical syncline aligned northeast to southwest and plunging at a shallow (<10°) angle towards the southwest. The seams dip at 5° to 10° on the northeastern nose of the syncline ("*Sector A*"). Seam dips increase along the limbs of the syncline to 14° and 18° along the eastern limb ("*Sector C*") and up to 50° on the western limb ("*Sector B*") and in the eastern limbs of Sector A. Coal seams are flat lying in the vicinity of the synclinal axis with dips less than 10° observed along seismic lines crossing the area. On the basis of seismic data at least five thrust faults (Maracas, Calenturitas, La Loma, La Francia and El Tigre) oriented NE-SW have been interpreted affecting the deposit. The Calenturitas Fault and The El Tigre Fault have the greatest impact on dip angles in the eastern flank of the syncline with fault throws greater than 50 m.

3.3.5 Resources

The JORC Code identifies three levels of confidence in the reporting of Resources categories as follows:

- Measured: that part of Coal Resources for which tonnage, densities, shape, physical characteristics, and coal quality can be estimated with a high level of confidence;

- Indicated: can be estimated with a reasonable level of confidence; and

- Inferred: can be estimated with a low level of confidence.

Coal Resources within the Calenturitas coal tenements total **400** million tonnes (Mt) to a depth in excess of 400 m, comprising:

- **170 Mt** of Measured Resources;

- **160 Mt** of Indicated Resources; and
- **70 Mt** of Inferred Resources.

Table 3.1 – Calenturitas Gross and Net Attributable Resources (as of 31st December 2010)

Sector	Measured (Mt)	Indicated (Mt)	Inferred (Mt)	TOTAL (Mt)
A	103.9	57.7	50	211.6
B	0.0	98.0	12	110.0
C/D	69.0	5.4	8	82.4
Totals	**172.9**	**161.1**	**70**	**404**
Rounded	**170**	**160**	**70**	**400**

Because of the shallow southwesterly plunge of the Calenturitas Syncline, the coal seams intersected in drill holes in Sector C and Sector B on the eastern and western limbs of the syncline respectively, may occur in the core of the syncline in the south of Calenturitas, but at considerable depth. This deep coal is considered to be an exploration target in the order of 300M-400M tonnes, provided the coal seams in Sectors B and C maintain their thickness at depth. This tonnage range was estimated on the basis of including all seams down dip of Sectors B and C where the dip of the seams is more than 10 degrees (to an approximate depth of 600m). Below that depth, within a zone proximal to the synclinal axis, where the strata dip is likely to be less than 10 degrees, Resource tonnages for the thicker seams only (seams C400 – 1.9m, C330 – 2m, C270 – 3m, C200/199 – 5m) were estimated. The potential tonnage is conceptual only as there is no drill data that confirms the thickness or even the presence of coal in the deeper part of the syncline, although historical seismic surveys, conducted by Ecopetrol and some private hydrocarbon exploration companies, have clearly delineated the shape of the synclinal fold at depth. There has been insufficient exploration, however, to define a Coal Resource and it is uncertain if further exploration will result in the determination of a Coal Resource.

3.3.6 Resource Coal Quality

The geological model has utilised all the coal quality data obtained in previous exploration programs since the early 1990's. Average estimated in situ moisture was determined from total moisture analysis of core samples which had been sampled and placed in cold storage immediately after the sample was retrieved on the surface. A sub-sample of the crushed coal was analysed for relative density together with air dried moisture and ash from proximate analyses. Using the Preston-Sanders equation, the RD was converted to the average in situ moisture basis. Ash was also converted to in situ moisture basis.

The average coal qualities for each seam are presented in **Table 3.2**.

Table 3.2 – Calenturitas Resource Coal Qualities by Seam (@moisture Insitu)

Seam	Density (t/cu.m)	Ash (%) is	Energy (BTU/lb) is	Total Sulphur (%) is	Volatile Matter (%)is	Total Moisture (%) is
C420	1.32	6.0	10,860	1.43	36.2	14.7
C410	1.35	9.6	10,329	3.44	35.6	14.9
C400	1.30	3.9	11,142	0.55	35.6	14.7
C390	1.31	4.8	11,067	1.36	37.1	14.5
C380	1.32	5.7	10,915	0.74	35.3	14.7
C375	1.35	10.0	10,000	0.90	35.0	12.0
C370	1.33	7.0	10,739	1.12	35.7	14.7
C360	1.32	6.4	10,843	0.83	35.2	14.5
C359	1.31	5.2	11,056	1.24	36.0	14.3
C350	1.35	10.0	10,000	0.90	35.0	12.0
C345	1.31	4.9	11,303	0.68	36.6	13.3
C340	1.30	3.8	11,454	0.65	36.6	13.3
C335	1.34	8.3	10,795	0.64	35.5	13.5
C330	1.29	3.0	11,549	1.14	36.7	13.4
C329	1.32	6.8	11,097	1.98	36.8	13.0
C325	1.36	10.4	10,532	3.68	36.9	13.4
C320	1.31	5.6	11,109	0.84	35.0	13.7
C310	1.30	3.5	11,497	0.64	36.4	13.3
C300	1.31	4.8	11,310	0.81	35.8	13.3
C290	1.42	17.7	9,543	2.11	32.5	13.3
C285	1.33	7.6	10,949	0.79	36.1	13.1
C280	1.30	4.4	11,342	0.71	35.9	13.4
C270U	1.30	3.6	11,483	0.37	35.3	13.3
C270L	1.31	4.6	11,351	0.47	34.8	13.3
C260U	1.35	9.9	10,615	0.40	32.3	13.3
C260L	1.35	9.7	10,645	0.45	33.2	13.3
C250U	1.32	5.9	11,425	0.46	36.4	12.3
C250L	1.33	6.9	11,287	0.47	36.4	12.3
C240	1.30	4.3	11,647	0.46	36.9	12.3
C230	1.38	13.3	10,420	1.61	34.1	12.2
C220	1.32	6.4	11,350	0.69	35.9	12.3

C210U	1.32	6.6	11,325	0.44	34.2	12.3
C210L	1.32	6.3	11,370	0.44	34.6	12.3
C200U	1.29	2.1	11,945	0.41	36.4	12.3
C200L	1.29	2.5	11,895	0.41	36.2	12.3
C199	1.29	3.1	11,819	0.45	36.9	12.3
C195	1.35	10.0	10,000	0.90	35.0	12.0
C190U	1.35	10.3	10,783	1.11	35.7	12.4
C190L	1.33	7.9	11,116	1.08	36.5	12.4
C185	1.35	10.0	10,000	0.90	35.0	12.0
C180	1.30	4.0	11,696	0.61	34.7	12.3
C175	1.38	13.3	10,474	1.62	33.1	12.0
C170	1.31	5.6	11,489	1.08	35.9	12.1
C169	1.32	6.8	11,134	0.63	36.9	13.0
C165	1.34	8.2	11,101	2.73	35.3	12.3
C160	1.30	4.3	11,651	1.21	35.3	12.2
C155	1.33	6.9	11,253	2.49	35.8	12.4
C140U	1.32	5.7	11,628	0.86	36.7	11.4
C140L	1.31	4.6	11,818	1.21	36.4	11.3
C130U	1.32	6.2	11,617	0.68	35.9	11.1
C130L	1.32	6.5	11,571	0.68	35.9	11.2
TOTAL	**1.3**	**4.9**	**11,425**	**0.7**	**35.8**	**12.9**

3.4 Mining

3.4.1 Reserves

The process used in converting the Coal Resources into Coal Reserves included the following:

- The latest (October 2010) geological model was used to update the Life of Mine Plan;
- Pit limits incorporate physical boundaries such as river diversions (now completed), lease boundaries, sub crops of the coal seams and economic limits (determined as the coal seams get deeper);
- Appropriate and reasonable allowances were made for mining recovery; losses and dilution for the proposed equipment and past experience;
- Coal is not washed and hence no metallurgical factors were applied; and
- Based on the level of confidence in the mine planning, all of the Indicated Resources within the practical pit shell are classified as "Probable Reserves" and the Measured Resources within the practical pit shell are classified as "Proved Reserves". Inferred Resources were not included in the Reserves.

The difference between the Measured and Indicated Coal Resources (330 Mt) and the Coal Reserves (209 Mt) is explained by the following:

- there are geological and mining losses and dilution gains in the Reserves estimation;
- minimum coal seam thickness rules have been applied in estimating Reserves; and
- the Measured and Indicated Resource polygons extend beyond the practical pit shell in some instances.

The review and cross reference against the JORC Code check list showed no material omissions and confirmed that the reserve estimating process is in compliance with JORC guidelines.

Total Coal Reserves are **209 Mt** including 113 Mt of Proved Coal Reserves and 96 Mt of Probable Coal Reserves. The average coal quality is 11,112 BTU/lb (ar), ash 7.2% (ar) and sulphur 0.6% (ar). As received moisture is 12%. Coal Reserves are classified based on the level of detail completed in the mine planning and also the level of confidence in the Resources. Coal Resources are reported inclusive of Coal Reserves (that is, Coal Reserves are not additional to Coal Resources).

Table 3.3 – Calenturitas Gross & Attributable Coal Reserves (as of 31st December 2010)

Date	Proved (Mt)	Probable (Mt)	Totals (Mt)
Reserves 31st Dec 2010	**113**	**96**	**209**

3.4.2 Mining Operations

The Calenturitas coal deposit can be characterised as a deep, multiple seam, sub-cropping and steep to moderately dipping synclinal basin. The dipping nature of the coal structure makes it suitable for excavation using conventional open cut mining methods that initially excavate low strip ratio sub-cropping coal followed by deeper coal mining that progresses from one end of the deposit to the other.

A combinatation of small and large hydraulic excavators (100 t - 550 t) are used to load overburden into off highway rear dump trucks which haul the material to a combination of inpit and expit dumps.

Coal mining is by a combination of hydraulic excavators working in tandem with dozers. Medium sized backhoes excavate the overburden and interburden to near the contacts between waste and coal. Smaller dozers or flat bladed small hydraulic excavators clean the waste materials from the coal roof contact. The care taken in this method determines the amount of both loss and dilution. Finally, excavators dig the waste material which has been heaped by the dozers.

In determining the pit layout Prodeco has made considerations for working room, slope angles, safety considerations, haul road designs, production requirements and materials balance. All pits have been designed to operate with ramp access developed in the advancing faces, these ramps will carry all coal haul trucks to the surface and waste trucks either to the surface or to benches with direct access to the horizontal haul back roads to the in-pit waste dumps.

Coal is hauled to the ROM pad located at the current coal handling facility.

3.4.3 Production Schedules

Key production scheduling criteria included:

- mining from the three pits at the same time;
- nominal 3 months in-pit coal inventory; and
- maximum coal production of 14.3 Mtpa (9.5 Mtpa from Sector A, 2.0 Mtpa from Sector B and 2.8 Mtpa from Sector C).

The mine scheduling blocks have been sequenced into a logical mining progression. All pits have been sequenced with a layback angle of 11°-15° on the advancing face. The resulting waste and coal production schedule is given in summary in **Table 3.4**.

Table 3.4 – Calenturitas Waste and Coal Production

Seam	Waste (Mbcm)	ROM Coal (Mt)	Strip Ratio (bcm/t ROM)	ROM Energy @12.5% moist. (BTU/lb)
2011	90.7	8.5	10.7	11,027
2012	102.8	10.5	9.8	11,006
2013	109.7	12.8	8.6	11,102
2014	127.7	13.3	9.6	11,086
2015	133.4	13.6	9.8	11,138
2016	133.6	14.0	9.6	11,132
2017	134.2	14.2	9.5	11,114
2018	134.8	14.1	9.6	11,150
2019	133.2	14.3	9.3	11,158
2020	135.2	14.1	9.6	11,131
2021	133.0	14.0	9.5	11,137
2022	127.3	12.1	10.5	11,149
2023	118.7	11.4	10.4	11,107
2024	116.2	10.9	10.7	11,082
2025	105.6	8.6	12.3	11,125
2026	105.7	8.5	12.4	11,053
2027	88.8	8.7	10.3	11,040
2028	62.7	5.3	11.4	11,097
Total	**2,093.3**	**208.8**	**10.0**	**11,112**

Note: Additional non JORC Reserve in the LOM Pit shell could potentially extend mine life by approximately 3 years

3.4.4 Mining Equipment

Large production equipment currently operates on a 7-day, 2 x 12-hour roster with 3 panels. Although equipment is scheduled to work 7 days at 24 hours per day, there are many factors that reduce the actual operating time.

Table 3.5 shows the typical main equipment types and numbers operating at Calenturitas.

Table 3.5 – Calenturitas Fleet Numbers

Category		Size	2010
Budget Coal		Mt	7.2
Budget Waste		Mbcm	67.0
Waste Equipment	**Specification**		
Excavators	O&K RH340	34 cu.m	1
	EX 3600	23.5 cu.m	5
	O&K RH120-E	17 cu.m	4
	O&K RH40-E	6 cu.m	5
Haul Trucks	Caterpillar 793C	220 t	7
	Caterpillar 789C	180 t	28
	Caterpillar 777F	91 t	42
Drills	Drill	55,000 lb	8
	Drill	40,000 lb	3
Dozers	Caterpillar D10T	433 kW	5
	Caterpillar D9R	302 kW	8
	Caterpillar 834G	358 kW	4
Coal Equipment			
Excavator	O&K RH 40-E	8 cu.m	3
	Cat 330	2 cu.m	5
Haul Truck	Caterpillar 777F	91 t	9
Dozers	Caterpillar D10T	433 kW	3
	Caterpillar D7R	171 kW	5
	Caterpillar 834G	358 kW	2
Support Equipment			
Excavators/FEL	Caterpillar 988G	6.4 cu.m	4
Haul Truck	Caterpillar 763F	91 t	5
Grader	Caterpillar 16H	205 kW	11
Water Truck	Caterpillar 777	100 t	5

3.4.5 ROM Coal Quality

Average ROM coal qualities for each seam are presented in **Table 3.6**.

Table 3.6 – Calenturitas Average ROM Coal Qualities by Seam (@12.5% moisture)

Seam	Density (t/cu.m)	Ash (%) is	Energy (BTU/lb) is	Total Sulphur (%) is	Volatile Matter (%)is
C420	1.4	10.9	10,219	1.3	34.4
C410	1.4	16.5	9,417	3.4	33.0
C400	1.3	5.2	10,973	0.6	35.2
C390	1.3	8.4	10,606	1.4	35.9
C380	1.3	7.9	10,627	0.8	34.5
C375	1.4	17.1	9,093	0.9	32.5
C370	1.4	11.0	10,210	1.1	34.2
C360	1.4	9.3	10,465	0.8	34.2
C359	1.4	9.5	10,499	1.0	34.5
C350	1.5	27.1	7,872	0.8	28.7
C345	1.4	9.8	10,656	0.7	34.8
C340	1.3	6.9	11,039	0.6	35.5
C335	1.4	16.1	9,716	0.7	32.6
C330	1.3	4.1	11,400	1.1	36.3
C329	1.4	12.5	10,320	1.9	34.9
C325	1.4	17.4	9,591	3.5	34.1
C320	1.4	13.0	10,092	0.9	32.4
C310	1.3	6.0	11,165	0.6	35.5
C300	1.3	7.5	10,952	0.8	34.8
C290	1.5	23.6	8,737	2.0	30.3
C285	1.4	12.4	10,322	0.7	34.4
C280	1.3	8.5	10,777	0.7	34.5
C270U	1.3	4.2	11,399	0.4	35.1
C270L	1.4	10.0	10,624	0.5	33.1
C260U	1.4	12.8	10,213	0.5	31.5
C260L	1.4	16.9	9,666	0.5	30.9
C250U	1.3	6.8	11,289	0.5	36.1
C250L	1.4	17.1	9,909	0.5	32.8
C240	1.3	5.8	11,439	0.5	36.3
C230	1.4	19.4	9,613	1.3	31.8
C220	1.4	12.1	10,579	0.7	33.8
C210U	1.3	8.1	11,107	0.5	33.8
C210L	1.4	13.3	10,383	0.5	32.2
C200U	1.3	2.4	11,914	0.4	36.3

C200L	1.3	4.8	11,589	0.4	35.5
C199	1.3	5.6	11,482	0.5	36.0
C195	1.5	21.8	8,543	1.0	31.1
C190U	1.4	14.7	10,200	1.1	34.1
C190L	1.4	17.4	9,834	1.0	32.9
C185	1.4	15.8	9,318	0.9	32.9
C180	1.3	6.8	11,302	0.6	33.9
C175	1.4	18.7	9,720	1.5	31.2
C170	1.3	7.6	11,218	1.1	35.1
C169	1.4	13.7	10,174	0.6	34.7
C165	1.4	11.1	10,721	2.7	34.4
C160	1.3	6.6	11,343	1.2	34.5
C155	1.3	9.0	10,980	2.5	35.2
C150	1.4	11.4	10,877	1.7	34.1
C140U	1.4	11.8	10,724	0.9	35.0
C140L	1.3	7.6	11,398	1.2	35.4
C130U	1.3	8.6	11,294	0.7	35.1
C130L	1.4	13.9	10,541	0.6	33.4
TOTAL	**1.3**	**7.2**	**11,112**	**0.7**	**34.9**

3.5 Coal Handling & Processing

Calenturitas coal is not washed; there is no wash plant for either Calenturitas or La Jagua coal. ROM coal is sized and sold as product coal.

ROM coal from the Calenturitas mine is truck dumped into a 320 t hopper and fed through both primary and secondary sizing, weighed, sampled and stacked via a linear stacker onto the product stockpile at a rate of up to 3,000 tph. The stockpile is designed to hold 80,000 t of live coal in two grades. Dozer pushout of the pile will enable up to 400,000 t of product coal to be stockpiled.

A new truck dump area will be operational in 2011 with a 60 t hopper feeding to one of two radial stackers onto the product stockpile. Two grades of coal with 30,000 t live capacity for each grade (60,000 t total) can be stockpiled. Dozer pushout can increase the stockpile to 350,000 t.

Beneath the stockyard is a 4,000 tph reclaim conveyor fed by eight valves which can be controlled to blend the coal being loaded into the trains. Coal is weighed and sampled before entering a 360 t surge bin above the rail loadout. A Coalscan device is fitted to the base of the inclined belt and provides instantaneous quality control.

A 65 t batch weigh bin prepares the coal for the final loading into the rail wagons.

There are stockpiles at the mine to facilitate blending and to smooth fluctuations in coal supply due to weather and interruptions to the continuity of coal supply due to equipment maintenance and other interruptions.

There are variations in coal quality between each seam and between each pit. Blending is achieved by:

- mining from different pits during the one shift;
- mining from different seams;
- blending at the crusher;
- blending on the stockpile before the train is loaded; and
- further blending at the port(s).

3.6 Long Term Prospects

The Calenturitas deposit has to a large extent been optimised with limited upside in extending the economic pit limits or the annual mining rate. There are opportunities to mine from the high wall with underground techniques such as highwall miners, augers and traditional underground mining. These methods have not been examined in the current mine plan.

4. LA JAGUA COAL MINE

4.1 Overview

The La Jagua coal deposit is contained within an isolated, elongated basinal structure (La Jagua Syncline) and is typified by the presence of a prominent hill (Cerro de Piedra) overlying the coal reserves in the southern part of the deposit.

La Jagua had many local producers operating in the deposit during the 1990's. Five years ago there were three companies producing coal out of the La Jagua deposit; Carbones del Caribe ("*CD*"), Concorcio Minero Unido ("*CMU*") and Carboandes ("*CA*"). Prodeco purchased these leases and consolidated what were three different mine plans into a single operation which provided the opportunity to develop a mine plan that delivered the maximum recovery of coal otherwise lost in the boundary between each lease.

Prodeco bought the main lease of the deposit and established the company Carbones de La Jagua ("*CDJ*") in 2005. In 2006, Prodeco purchased CMU and in 2007 the CA Lease was acquired and the new company Carbones El Tesoro ("*CET*") was formed. Each company previously developed separate areas of the deposit which created the South Pit , North Pit, El Tesoro Pit and the CMU Pit. CDJ/CMU/CET now operates all three areas as one operation.

Prodeco mines La Jagua in combination with the other Prodeco coal deposit, Calenturitas, located 20 km west of La Jagua. By operating both deposits under similar management and pooling resources, costs can be reduced and revenue can be optimised by blending coal.

The target production from the La Jagua deposit is 7 Mtpa. The mine is being developed from the north to south using Caterpillar haul trucks loaded by O&K excavators. The entire deposit (except for a small wedge in the north) will be mined with underburden on the western side due to geotechnical constraints. Mining under the Tucuy River will commence in 2014. New offices and workshop facilities are currently being built and will be completed early 2011.

The mining sequence is based on haulback mining progressing south along the length of the deposit. This allows in-pit dumping, thereby minimizing ex-pit dump size. This also results in a better final landform because more material is backfilled into the mined out areas.

Coal is hauled from the pit to the ROM stockpile were it is stockpiled according to coal quality. Coal is crushed to size and loaded to road trucks where it is hauled to Calenturitas for blending and train load out for transport to the port. The coal is not washed.

Most of the product coal is primarily sold on the international market as a thermal coal with approximately 0.5 Mt to 1.5 Mt of La Jagua coal sold as high volatile PCI. The coal has a track record with recognition in the market and its energy and relatively low sulphur content makes it attractive in the market place. Some of the quality characteristics of the La Jagua coal would lend it to potential sales into the high volatile PCI markets. The coal is marketed by Glencore, the owner of Prodeco.

4.2 Maps and Plans

The regional location of the mine is shown on **Figure 1**. Typical stratigraphy and a cross section showing the geological structure is shown on **Figures 9** and **Figure 10**.

4.3 Geology

4.3.1 Site Geology

La Jagua is a multi-seam coal deposit in a northeast-oriented synclinal basin structure, approximately 5km long and 2km wide. The deposit dips steeply on the northwest and southeast flanks. The centre of the deposit is flatter with dips up to 5 degrees. On the basis of borehole and mining records to date, two faults have been identified within the deposit, La Victoria and La Nueva faults. La Victoria is a southwest-trending normal fault with a throw up to 20 m parallel to and close to the syncline axis. La Nueva Fault has been interpreted from drill hole data and occurs to the west of La Victoria Fault and has a throw up to 10 m. A series of geological cross sections, illustrating the synclinal shape and distribution of coal seams are presented in **Figure 9**. A significant topographic feature which impacts on the open cut strip ratio is the hill in the southern half of the deposit (Cerro de Piedra).

4.3.2 Stratigraphy

A typical stratigraphic column for Cesar basin and geology of La Jagua is illustrated in **Figure 2** and a coal seam correlation with Calenturitas is shown on **Figure 3**.

A total of 23 seams with a cumulative thickness of approximately 35 m occur within the La Jagua deposit sub cropping along the western and eastern limbs of the syncline. Seam M0 is the uppermost coal seam and Seam M45 is at the base of the main economic sequence – a stratigraphic interval approximately 200 m thick. Seam M15 is the thickest coal seam (average 5m) and seams M2 and M3 contain a thin intra-seam stone band.

4.3.3 Resources

Coal Resources within the La Jagua area total **140** million tonnes (Mt) comprising:

- **117 Mt** of Measured Resources;
- **23 Mt** of Indicated Resources; and
- **There are no Inferred** Resources.

Table 4.1 – La Jagua Gross and Net Attributable Resources (as of 31st December 2010)

Sector	Measured (Mt)	Indicated (Mt)	Inferred (Mt)	TOTAL (Mt)
Totals	117.2	23.1	0.0	140.3
Rounded	**117**	**23**	**0**	**140**

4.3.4 Resource Coal Quality

The average estimated in situ moisture was determined from total moisture analysis of core samples which had been sampled and placed in cold storage immediately after the core reached the surface. A sub-sample of the crushed coal was analysed for relative density together with an air dried moisture and ash from proximates. Using the Preston Sanders equation, the RD was converted to the average in situ moisture basis at 7.5%. Ash was also converted to 7.5% moisture basis.

Average coal qualities for each seam are presented in **Table 4.2**.

Table 4.2 – La Jagua Resource Coal Qualities by Seam (@ 7.5% moisture ar)

Seam	Density (t/cu.m)	Ash (%)	Energy (BTU/lb)	Total Sulphur (%)	Volatile Matter (%)
M00	1.32	4.2	12,460	1.3	38.8
M01	1.36	8.6	11,750	1.1	38.0
M02U	1.32	2.5	12,673	0.6	38.3
M02L	1.34	7.6	12,039	3.8	38.5
M03U	1.31	2.8	12,795	0.5	38.8
M03A	1.35	5.8	11,927	0.8	37.5
M03B	1.35	7.6	12,072	0.9	36.7
M04	1.33	5.0	12,439	2.4	39.7
M05	1.30	2.8	12,798	0.8	38.6
M08	1.33	4.6	12,235	0.9	37.4
M09	1.34	7.5	12,033	0.8	35.8
M10	1.30	2.6	12,777	0.9	37.7
M11	1.33	6.0	12,265	2.3	39.1
M15	1.30	2.4	13,068	0.4	37.4
M17	1.34	6.6	12,126	0.6	36.4
M20	1.32	4.0	12,764	0.4	36.9
M25	1.32	4.2	12,717	1.0	36.8
M27	1.48	23.1	9,795	0.5	27.5
M28	1.37	9.1	11,596	0.8	37.4
M30	1.33	5.7	12,407	0.5	36.1
M35	1.30	3.0	12,988	0.7	36.7
M40	1.32	4.7	12,718	1.1	38.3
M45	1.30	2.2	13,071	0.6	37.3
Average	**1.31**	**3.8**	**12,741**	**0.8**	**37.4**

4.4 Mining

4.4.1 Reserves

The process used in converting the Coal Resources into Coal Reserves included the following:

- The latest (October 2010) geological model has been used to update the Life of Mine Plan;
- The mine design includes all coal in the basin;
- The side slopes have been flattened to allow for stability. This means some waste material below the lowest coal seam has to be mined;
- Pit limits incorporate physical boundaries such as river diversions, lease boundaries, sub crops of the coal seams and economic limits (determined as the coal structure gets deeper);
- Appropriate and reasonable allowances have been made for mining recovery; losses and dilution considering the proposed equipment and past experience;

- Coal is not washed and hence no metallurgical factors have been applied; and
- All of the Indicated Resources within the practical pit shell are classified as "Probable Reserves" and the Measured Resources within the practical pit shell are classified as "Proved Reserves". There are no Inferred Resources.

The difference between the Measured and Indicated Coal Resources (140 Mt) and the Coal Reserves (128 Mt) is explained by the following:

- geological and mining losses and dilution gains in the Reserves estimation;
- a small portion of Resource coal falling outside the practical pit shell; and
- minimum thickness rules being applied in estimating Reserves.

Coal Reserves total **128 Mt** comprising 106 Mt of Proved and 22 Mt of Probable Coal Reserves as shown in **Table 4.3.**

The average strip ratio over the mine life is 6.6 bcm/ tonne. The average coal quality is 12,154 BTU/lb (ar), ash 8.4% (ar) and sulphur 0.78% (ar). As received moisture is estimated at 8.0%. Coal Reserves are classified based on the level of detail completed in the mine planning and also the level of confidence in the resources. Coal Resources are reported inclusive of Coal Reserves.

Table 4.3 – La Jagua Gross & Attributable Coal Reserves (as of 31st December 2010)

Date	Proved (Mt)	Probable (Mt)	Totals (Mt)
Coal Reserves 31st December 2010	**106**	**22**	**128**

4.4.2 Mining Operations

The La Jagua coal deposit consists of 23 seams and can be characterised as a deep, multiple seam, sub-cropping and steep to moderately dipping synclinal basin. The dipping nature of the coal structure makes it suitable for excavation using conventional open cut mining methods that initially excavate low strip ratio sub-cropping coal followed by deeper coal mining that progresses from one end of the deposit to the other.

A combinatation of small and large hydraulic excavators (100 t - 550 t) are used to load overburden into off highway rear dump trucks which haul the material to a combination of in-pit and ex-pit dumps.

Coal mining is by a combination of hydraulic excavators working in tandem with dozers. Medium sized backhoes excavate the overburden and interburden to near the contacts between waste and coal. Smaller dozers or flat bladed small hydraulic excavators will clean the waste materials from the coal contact. The care taken in this method determines the amount of both loss and dilution. Finally, excavators dig the waste material which has been heaped by the dozers.

In determining the pit layout Prodeco have made considerations for working room, slope angles, safety considerations, haul road designs, production requirements and materials balance. All pits have been designed to operate with ramp access developed in the advancing faces, these ramps will carry all coal haul trucks to the surface and waste trucks either to the surface or to benches with direct access to the horizontal haul back roads to the in-pit waste dumps.

4.4.3 Production Schedules

All pits have been sequenced with a layback angle of 11°-15° on the advancing face. The resulting waste and coal production schedule is given in summary in **Table 4.4**.

Table 4.4 – La Jagua Waste and Coal Production

Seam	Waste (Mbcm)	ROM Coal (Mt)	Strip Ratio (bcm/t ROM)
2011	47.1	7.1	6.6
2012	49.7	7.1	7.0
2013	49.6	7.1	7.0
2014	53.9	7.0	7.7
2015	54.5	7.1	7.7
2016	54.5	7.2	7.6
2017	54.4	7.0	7.8
2018	54.7	7.1	7.7
2019	54.6	7.1	7.7
2020	54.5	7.0	7.8
2021	52.1	7.0	7.4
2022	52.0	7.0	7.4
2023	45.0	7.0	6.4
2024	40.9	7.1	5.8
2025	35.0	7.1	4.9
2026	30.0	7.1	4.2
2027	25.0	6.0	4.2
2028	24.0	6.0	4.0
2029	7.5	2.9	2.6
Totals	**839.9**	**128.2**	**6.5**

4.4.4 Mining Equipment

Large production equipment currently operates on a 7-day, 2 x 12-hour roster with 3 panels.

Table 4.5 shows the typical main equipment type and number operating at La Jagua.

Table 4.5 – La Jagua Fleet Numbers

Category		Size	2010
Budget Coal		Mt	7.3
Budget Waste		Mbcm	49.5
Waste Equipment	**Specification**		
Excavators	PC 5500	34 cu.m	1
	O&K RH170	22 cu.m	4
	O&K RH120-E	17 cu.m	3
	O&K RH40-E	6 cu.m	4
Haul Trucks	Caterpillar 789C	180 t	24
	Caterpillar 777F	91 t	44
Drills	Drill	55,000 lb	3
	Drill	40,000 lb	2
Dozers	CaterpillarD10R	425 kW	3
	CaterpillarD9R	302 kW	7
	Caterpillar834G	358 kW	3
Coal Equipment			
Excavator	O&K RH 40-E	8 cu.m	3
	Catepillar 330DL	2.5 cu.m	6
Haul Truck	Caterpillar 777F	91 t	6
Drills	Drill	40,000 lb	1
Dozers	Caterpillar D9R	302 kW	3
	Caterpillar 834G	358 kW	3
	Caterpillar D7R	171 kW	3
Support Equipment			
Excavators	Caterpillar 988G	6.4 cu.m	3
	Caterpillar 330DL	2.5 cu.m	2
Haul Truck	Caterpillar 777F	91 t	5
Grader	Caterpillar 16H	205 kW	6
Water Truck	Caterpillar 777	100 t	4

4.4.5 ROM Coal Quality

Average ROM coal qualities for each seam are presented in **Table 4.6**.

Table 4.6 – La Jagua ROM Coal Qualities by Seam (@ 8.0% moisture ar)

Seam	Ash (%)	Energy (BTU/lb)	Total Sulphur (%)	Volatile Matter (%)
M00	12.9	11,360	1.35	35.9
M01	19.7	10,383	1.02	34.2
M02U	6.1	12,355	0.61	37.5
M02L	19.5	10,347	3.30	33.9
M03U	6.9	12,244	0.50	37.4
M03A	23.2	9,846	0.70	32.2
M03B	17.1	10,767	1.08	33.5
M04	12.7	11,399	2.51	37.0
M05	5.4	12,459	0.84	37.8
M08	14.4	11,142	0.89	34.6
M09	22.7	9,964	1.15	30.9
M10	10.1	11,790	0.83	35.3
M11	22.5	9,904	2.90	32.8
M15	4.1	12,847	0.35	36.9
M17	19.1	10,602	0.54	32.6
M20	9.0	12,115	0.38	35.3
M25	8.2	12,223	0.99	35.6
M27	33.5	8,499	0.48	24.4
M28	26.7	9,427	0.71	31.8
M30	11.5	11,734	0.47	34.5
M35	5.7	12,602	0.71	35.9
M40	7.5	12,316	1.11	37.5
M45	4.8	12,751	0.60	36.5
Average	**8.3**	**12,163**	**0.77**	**35.9**

4.5 Coal Handling & Processing

La Jagua coal is not washed; there is no wash plant for either La Jagua or Calenturitas coal. ROM coal is sized and sold as product coal. There is no rail connection between La Jagua and Calenturitas. The coal from La Jagua is generally trucked 20 km to Calenturitas.

Prodeco is currently relocating and upgrading the La Jagua ROM stockpiles at Las Flores with new primary and secondary sizing and an overhead bin for truck loading scheduled to be operational in early 2011. The bin has been designed to batch weigh the coal and load 35 t, 50 t and 70 t trucks. Additionally, the National Highway between La Jagua and Calenturitas is to be fully sealed by July 2011 to improve the truck cycle time. A new contract for the coal haulage is being negotiated and will include the required truck fleet to support the proposed throughput.

The product stockpiles at Calenturitas facilitate blending and smoothe fluctuations in coal supply due to weather and interruptions to the continuity of coal supply. There are variations in coal quality between each seam and between each pit and blending is achieved in a similar fashion as described for Calenturitas in **Section 3.5**.

4.6 Long Term Prospects

The La Jagua deposit has to a large extent been optimised with limited upside in extending the economic pit limits or the annual mining rate.

5. PORT AND RAIL

5.1 Overview

Coal from the operating mines of Calenturitas and La Jagua is exported primarily through the port of Puerto Prodeco with some shipments through the Cabosan Port at Santa Marta port. The coal is railed approximately 220 km to Puerto Prodeco in train sets owned and operated by Prodeco. The rail line is operated and maintained by Fenoco which has been granted the concession from Chiriguana to Santa Marta. Fenoco is owned by the producing coal companies in the Cesar region with Prodeco holding a 39.76% share. Drummond Coal owns 40.96% of Fenoco with the remainder held by Vale, Carboandes and Carbones del Cesar.

Puerto Prodeco is owned and operated by Prodeco and has the capacity to handle up to 17 Mtpa. The coal loading in this area of Colombia is currently undertaken by barge loading and crane transfer to ships. The Colombian Government has decreed that all coal ports are to implement direct ship loading techniques. The government has granted Prodeco a concession in Cienaga and Prodeco are undertaking a project to develop a new coal loading terminal, Puerto Nuevo, scheduled to commence operations in 2013. At that time the existing Puerto Prodeco will be closed down.

5.2 Rail

5.2.1 Fenoco Track

Fenoco is a company incorporated to hold the rail concession from Chiriguana to Santa Marta. Currently, the only traffic on the rail line is coal transported from the Cesar region to the ports of Rio Cordoba, Drummond and Puerto Prodeco for various coal companies which are also shareholders of Fenoco.

The Fenoco main line is a narrow gauge line (914 mm) covering a distance of approximately 200 kms (excluding Calenturitas spur). The various mines and ports are connected to the main line at various points. The actual main line has been and is continuing to be upgraded; initially through the construction of sidings to increase its capacity and ultimately through the construction of a parallel railroad. The construction phases are being carried out by Fenoco. The original timetable for construction of the parallel line has been delayed for a number of reasons including approval processes. **Figure 12** shows the expected track configuration in 2011 when existing duplications are connected.

An area known as Sector 2 from km 865 to km 922 (57 km) does not have an environmental licence for construction due to encroachment by local communities. A number of alternative rail operation scenarios are being considered and negotiated with the government to ensure that adequate capacity is available when required through an alternative alignment for the second line through Sector 2 or through placement of additional passing loops.

In the sector from Puerto Drummond to Puerto Prodeco a curfew restriction was imposed on the operation and trains are not allowed to use that section between 2300 hr and 0500 hr, which limits the operations of Prodeco into their port. This will be immaterial in 2013 when the new port becomes operational as it branches off the main line before the Drummond port. In the last two quarters of 2012 the night time restrictions will be an issue for Prodeco. Management have developed appropriate procedures to implement as required including partial easing of the restrictions and/or additional rolling stock.

5.2.2 Prodeco Rail Operation

Prodeco has developed its own above rail operations with a fleet of 18 x GE C21 locomotives and 700 x FreightCar America coal wagons with nominal 60 t load and bottom dump doors. Operations commenced in 2008 and have been steadily increasing throughput, delivering 10.8 Mt in the 2010 calendar year.

Current operations use trains made up of two locomotives and 97 wagons carrying 5,820 t. The average theoretical cycle time is approximately 19.5 hours although non-operational delays such as the night restrictions into the port and passing loop delays increase the current cycle time to an average 24.5 hours. The capacity of the existing rail fleet under current conditions is 14.5 Mtpa. It is expected that the cycle time can be reduced with the completion of Fenoco track duplications which will enable faster running times, improved unloading rates at the port with the recent port expansion and the use of an additional standby siding at the port which reduces the impact of the night restrictions. The anticipated rail fleet capacity in 2011, considering the night restrictions, is 15.9 Mtpa.

To cope with future forecasts a number of alternatives are being considered including:

- some direct trucking of coal to Carbosan port rather than transporting by rail to Puerto Prodeco and loading trucks at the port to transport on to Carbosan port;
- negotiating some easing of the night time restrictions for a limited period of time; and
- adding an additional train consist which will increase the capacity to 16.7 Mtpa.

When Puerto Nuevo becomes operational, the train sizes will increase to 3 locomotives and 133 wagons hauling 7,980 t. With 5 train sets and the reduced cycle times the capacity will increase to approximately 21.9 Mtpa. The loading capacity at Calenturitas and the unloading capacities at Puerto Prodeco and Puerto Nuevo will always be higher than the rolling stock capacity.

5.3 Port

5.3.1 Puerto Prodeco

Puerto Prodeco is located 15 km south of Santa Marta. The operation has been continuously expanded over the last few years and the latest expansion to 17 Mtpa was completed in May 2010. The port is a barge loading facility and was started after a port concession was granted in 1979. Until 2008, coal was transported to the port by road trucks travelling 227 km from the mines.

Rail operations commenced with trains dumping through one 3,000 tph unloading pit and the coal being sent either to 2,500 tph stacking conveyors or directly to the barge loading conveyor with 2,500 tph capacity. In 2009 a port upgrade was commenced to increase the port capacity from 11 Mtpa to 17 Mtpa. The upgrade involved a second rail unloading pit, a second radial stacker, a second surge bin, and a barge loading system with 3,000 tph capacity. Additionally, a system for reloading trucks for transport to Carbosan port was installed.

The terminal operates with small stockpiles; maximum 300,000 t with up to 60% of coal being directly loaded into barges from the trains. Seven barges (5 x 2,800 t and 2 x 3,000 t) have been operating in 2010. Two more barges have been purchased and will be operational from January 2011.

Ocean going ships are moored at one of 3 mooring points located 2.75 km offshore. The mooring points are capable of accommodating large Capesize vessels up to 180,000 dwt. The October 2010 year-to-date shipping mix is 20% Handy, 35% Capes and 45% Panamax. Coal is transferred from the barges to the ships by cranes. The crane operation is contracted to Louis Dreyfus Armateurs and as at 1 January 2011 there will be four cranes in operation; 1 x 35 t, 2 x 25 t and 1 x 17 t with a backup 15 t crane held in reserve.

The Puerto Prodeco operation will be closed down in 2013 when Puerto Nuevo becomes operational.

5.3.2 Puerto Nuevo

In 2007 the Colombian government decreed that coal loading ports should be direct loading and the practice of indirect loading via barges should be eliminated. Prodeco, after committing to the new port construction in Cienaga, were granted an extension of the operational concession Puerto Prodeco until the new port is operational.

The land based environmental impact statement (EIS) has been completed and an Environmental License issued. The marine concession has been granted and the marine EIS completed with an environmental license granted. The marine areas are under appeal by Drummond; but are expected to be resolved by early 2011.

The port is designed for a capacity of 27 Mtpa and will include:

- a rail loop enabling one train (3 Locomotives and 133 wagons) before and one train after the dump station;
- an inbound storage track parallel to the loop track to allow queuing of one additional train;
- an outbound storage track parallel to the loop track to allow the unloading of two consecutive trains;
- an 8,000 tph dump station;
- 2 x 8,000 tph stacker reclaimers servicing a central 1 Mt stockyard;
- a 1.7 km long conveyor trestle;
- a 350 m long loading pier, 21 m wide;
- 1 x 8,000 tph ship loader capable of slewing to load on either berth; and
- a 8.5 km navigation channel, 20.3 m deep and a ship turning basin.

The design is consistent with recent developments and current design proposals elsewhere in the world; particularly in Australia where NCIG in Newcastle commissioned its 30 Mtpa first stage in 2010. Similar 30 Mtpa designs are proposed for Wiggins Island in Gladstone, Australia and for Abbot Point near Bowen in Australia.

Modeling of the new terminal has been undertaken by Sandwell, demonstrating that under the proposed operating conditions the port terminal is capable of handling 27 Mtpa. The assumptions used in the modeling appear appropriate and the results are consistent with modeling and performance evaluation of similar direct loading terminals around the world.

The modeling assumed that the Fenoco main line could operate with 20 minute headways and that duplication of the main line will be complete. This implies that a cycle time of approximately 12 hours will be required. Since there is some risk that the duplication will not be completed we have reviewed this aspect. Prodeco has modeled the 22 Mtpa operation and has used a cycle time of 15 hours which is consistent with dynamic simulation results from the Inteplan model of the system when Sector 2 is not duplicated. An additional passing loop at Nuevo Sevilla is included. The potential throughput of Drummond and the other rail users is important in determining the timing of additional rail infrastructure. We believe that the 22 Mtpa throughput will be achievable and that there is scope for additional throughput with the implementation of efficiencies such as reduced maintenance possessions and additional passing loops on the Fenoco track infrastructure.

5.4 Cost Estimates

Cost estimates have been provided by Prodeco, and have been analysed and reviewed.

5.4.1 Operating Costs

Rail costs have been budgeted based on historical performance and use forecast throughputs to calculate forward costs.

Table 5.1 – Rail Costs

Year	Below Rail		Above Rail		Total Rail	
	US$/t	US¢/ntk	US$/t	US¢/ntk	US$/t	US¢/ntk
2010 (9 mths)	2.45	1.2	2.71	1.4	5.16	2.6
2011	2.56	1.3	2.28	1.1	4.83	2.4
2012	2.66	1.3	2.39	1.2	5.05	2.5

Above Rail costs include o'heads, amortization and depreciation

Benchmark figures in Australian coal regions would be in the range of 0.6US¢/ntk – 1.7US¢/ntk below rail and 2.5US¢/ntk above rail. The below rail cost is at the upper end of general benchmark ranges and is associated with the significant capital investment undertaken by Fenoco recently and ongoing and the current exclusive use of the rail line by coal exporters. The above rail cost, operated by Prodeco, is particularly competitive.

Prodeco holds a concession with the Colombian government to operate a Port on the coast just south of the city of Santa Marta. After coal is unloaded from the trains it is stockpiled or else loaded directly via conveyor onto barges. Tugboats tow the barges to floating cranes offshore which then transfer the coal from the barges to the ship.

This facility has limited capacity in its current form and the government policy is to build a new "direct loading port" further south. This will allow for expansion as well as reducing operating costs by 66% as the tugboats, barges and floating crane will not be required.

Table 5.2 shows port operating costs at Puerto Prodeco:

Table 5.2 – Port Costs

Year	Operating US$/t	Overheads US$/t	Totals US$/t
2010 (9 mos)	$4.24	$0.97	$5.21
2011	$3.99	$1.16	$5.16
2012	$3.78	$1.08	$4.86

Overheads include amortization and depreciation

The barge loading port is scheduled to be closed down in 2013 when Puerto Nuevo commences operations.

Operating costs for the new direct loading port have been estimated by Sandwell for an annual throughput of 23 Mtpa as US$1.20/t. The savings compared to the existing port arise from reduced manning levels (260 compared to 400), higher handling rates, higher throughput and removal of costs associated with barges and cranes. Depreciation is assumed to be approximately US$1.60/t giving a total estimated operating cost for Puerto Nuevo of US$2.80/t. Benchmark rates in Australia for new and existing expanded terminals are in the order of US$4/t - US$6/t although the new proposed terminal in Gladstone has been reported as US$9/t. The rate for the existing port is similar but the new port will be considerably cheaper due to the lower labour rates and lower capital cost.

5.4.2 Capital Costs

There appear to be no major capital expenses scheduled in 2011 for the rail operation other than completion of rail connections and crossings on the mine spur line, maintenance equipment and fire suppression installation in locomotives. Total capital required for rail in 2011 is approximately US$6 million.

The existing port requires capital in 2011 of US$3.6 million for dry-docking of barges, US$1.2 million for tugboat dry-docking and US$1.4 million for D10 equipment. Other capital items include berths for the additional cranes, warehouse equipment, barge mooring and utility vehicles. Total capital required for theexisting port in 2011 is approximately US$7 million.

The major forecast capital expenditure is for the new port at Puerto Nuevo is US$528 million. The capital cost estimate for development of Puerto Nuevo is given in **Table 5.3**. At the end of 2010 approximately US$56 of this budget estimate has been spent.

Table 5.3 – Puerto Nuevo Capital Costs (US$ millions)

Item	Capital Cost (US$ mill)
Trestle/Pier	$111.1
Dredging	$33.1
Coal Handling	$138.8
Infrastructure	$76.5
Other Direct Costs	$33.4
Total Direct Costs	**$392.9**
Indirect Costs – Owner	$42.6
Land	$20.1
Financing – Taxes	$40.3
Total Indirect Costs	**$103.0**
Contingency	$32.1
Total with Contingency	**$528.0**

For the scope of work proposed this is less than might be anticipated when comparing against similar developments elsewhere in the world and is also lower than the Sandwell estimate of US$844 million. Installed capacity in Australia is often quoted as US$30 – US$50 per Mt of throughput whereas Puerto Nuevo is proposed at US$20/Mt of annual throughput. Prodeco has undertaken significant negotiation with prospective contractors both on cost and scope and the lower estimate is based on the results of these negotiations.

Sandvik has been awarded the Coal Handling contract and the Onshore Civil, Marine Civil and Dredging contracts should be awarded by December 2010. Phase 1 of the onshore civil works is almost complete with major earthmoving to form the rail loop, stockyard, screening bunds and drainage channels.

5.5 Summary

The rail and port operations of Prodeco have been planned to match the forecast throughput and Prodeco has exercised control of its future by:

- investing in Fenoco;
- developing facilities at La Jagua and Calenturitas to ensure the trains can be loaded as required;
- establishing its own rail operation;
- expanding the existing port to cope with the growth; and
- constructing a new port to meet forecast throughput and government requirements.

The assets are in generally good condition, and appear to be well maintained and operated.

Annex A – Qualifications and Experience

Grant Walker – Consulting Mining Engineer at Minarco-MineConsult - Bachelor of Engineering - Graduate Diploma in Applied Finance - Member of Australasian Institute of Mining and Metallurgy

Grant has over 15 years experience as a mining engineer, initially with operational experience at a number of coalmines in Australia and Indonesia, and later as a consultant. He has extensive experience of reserve calculation, mine design, feasibility studies and bankable documents and has developed and continues to operate a coal supply cost model for the Australian coal industry.

Grant has worked on numerous mine valuations, technical audits, operational assessments and coal supply studies within Australia, Colombia and other overseas countries and has carried out numerous due diligence exercises for financiers and investors.

Grant is a Competent Person as described by the JORC Code.

Kerry Whitby - Managing Director of McElroy Bryan Geological Services Pty Ltd - Bachelor of Science - Fellow of Australasian Institute of Mining and Metallurgy - Member Australian Institute of Geoscientists - Member Geological Society of Australia

Kerry Whitby is the Managing Director of McElroy Bryan Geological Services Pty Ltd, a consulting company based in Sydney, Australia that focuses on providing technical support and advice to the international coal exploration and mining industry. Kerry has been employed by the company since 1971. In that time he has been responsible for designing, implementing and managing coal exploration programmes in all major coal basins within Australia as well as a variety of coal deposits in South America, Africa and Asia. Over the last 15 years, Kerry has been involved in the preparation of geological appraisals, resource estimates and technical opinions related to project valuations on behalf of numerous companies in a variety of locations including Australia, U.K, U.S.A, Canada, Colombia, Mozambique, South Africa, Botswana, Mongolia, China, Indonesia, Sarawak, Myanmar and Bangladesh. Kerry is a Competent Person as described by the JORC Code and a Qualified Person in relation to NI 43-101.

Bob Leach

Bob Leach is a self employed coal quality consultant with a B Sc in Chemistry and M Sc in Primary Metallurgy. His current work committment involves diligence exercises conducted on behalf of several major companies focusing their attentions in the coal and related industries, peer review of project work and management of several coal quality and coal preparation projects located within Australia and internationally. He has worked on over 50 coal quality and coal preparation projects in the past ten years, within Australia and overseas. These projects have targeted either or both, thermal and coking coal products. Some current and recent projects are:

- Hinton Project, Canada for Coalspur Coal Ltd,
- Baruun Naran, Mongolia, for QGX Ltd,
- Donkin project Nova Scotia Canada, for Xstrata,
- Wandoan, Australia, for Xstrata,
- Calenturitas and La Jagua, Colombia, for Prodeco (Glencore).

Ben Eastwood - Senior Environmental Scientist at Hansen Bailey – Bachelor of Natural Resource Management (2nd class Hons)

Ben Eastwood is a senior environmental scientist with over seven years experience in both coal mine site environmental management and in the gaining of mine planning approvals. Ben has recently project coordinated mining authorities applications for the West Muswellbrook Project and has just completed an Environmental Assessment for the Continuation of Boggabri Coal Mine in the Gunnedah Coal Basin of NSW.

Ben has also conducted numerous due diligence audits for large scale coal mining and exploration projects throughout Australia. Ben has lived and worked in South America for six years and has a good understanding and appreciation of the people and culture. Ben is fluent in South American Spanish.

Ian Travis - Managing Director at Inteplan Pty Limited – Bachelor of Engineering (Hons) – MIEAust, CPEng, FCIT, MAICD

Ian was responsible for planning the expansion of the Port Waratah Coal Services Carrington Terminal during the 1980s and gained considerable experience in the management/planning of coal stockpiling systems. In 1989 Ian became Chief Executive of a joint venture company developed to promote major infrastructure projects, and held senior management positions with rail rolling stock manufacturers.

In 1991 Ian founded Inteplan Pty Limited, a consultancy service providing assistance to numerous logistics based industries with the main focus being Coal Export Supply Chain development; intermodal infrastructure capacity/development; rail industry business development; and freight contract development. Clients have included most major coal producers, port operators and banks. Significant work has been undertaken to provide expert advice on coal system capacities including for the development of Newcastle Coal Infrastructure Group and for coal export systems in Colombia, Russia and New Zealand.

Annex B – Glossary of Terms

acid mine drainage	Acidic run-off water from mine waste dumps and mill tailings ponds containing sulphide minerals. Also refers to ground water pumped to surface from mines. Such drainage often requires treatment to buffer acidity.
adb	Air dried basis, defining the moisture basis for coal quantity and quality parameters
adit	A horizontal or nearly horizontal entrance/access to an underground mine from the surface.
ar	As received basis, defining the moisture basis for coal quantity and quality parameters
alluvial	Relatively recent deposits of generally poorly consolidated sedimentary material laid down in river beds, flood plains and lakes.
ANFO	Acronym for Ammonium Nitrate and Fuel Oil, a mixture used as a blasting agent in many mines.
angle of repose	The maximum angle from horizontal at which a given material will rest on a given surface without sliding or rolling.
anthracite	Coal of the highest rank with a carbon content above 92%. This type of coal has a semi-metallic lustre
anticline	A line or axis to which strata rise from both directions in an arch shape.
aquifer	A water-bearing bed of permeable rock.
Ash	The inorganic residue remaining after a pulverised sample of coal is incinerated under standard laboratory conditions
attributable production	That part of the mine or operation production in which Glencore has an economic interest. It therefore excludes production attributable to the interests of any other partners
attributable reserves	That part of the reserves from a mine or project in which Glencore has an economic interest. It therefore excludes reserves attributable to the interests of any other partners.
attributable resources	That part of the resources from a mine or project in which Glencore has an economic interest. It therefore excludes reserves attributable to the interests of any other partners.
attributable sales	That part of the sales from a mine or project in which Glencore has an economic interest. It therefore excludes reserves attributable to the interests of any other partners.
A$	Australian dollars
bank cubic metre	The volume in cubic metres of an excavation measured in place before being disturbed
basalt	Fine grained igneous rock from an extrusive lava flow
basement	The older rock mass which underlies an ore body or a sedimentary basin. Often refers to rocks of Precambrian age which may be covered by younger rocks.
beneficiation	Treatment of mined coal by either drying, flotation, or gravity to improve the quality of the product material.
bord and pillar	A mining method for underground mines in which supporting pillars are formed as the development proceeds, and which may or may not be subsequently mined

calorific value	The heat of combustion of a unit quantity of coal; expressed in either British thermal units per pound (Btu/lb), kilocalories per kilogram (kcal/kg) or megajoules per kilogram (MJ/kg). The gross calorific value includes all heat of vapourisation of water. Net calorific value assumes that all water is in the vapour phase. See "*specific energy*".
Carboniferous	The period from about 345 to 280 million years ago. It is part of the Paleozoic era
Chapter 19	Chapter 19 of the London Stock Exchange Listing Rules
CHPP	Coal Handling and Preparation Plant
coal, bituminous	A rank of black coal
coal, coking	Coal which is suitable for marketing and use as metallurgical coal, which is generally used in the steel making process
coal, high vol PCI	Coal which is suitable for direct injection into blast furnaces in a pulverized state and which has a high level of volatile matter
coal measures	A sequence of strata deposited within the same geological period that contains coal seams
coal, metallurgical	A broader term for describing coal which comprises both coking coals and PCI coals, both of which are used in the steel making process
coal, semi-soft	Coal which is not sutiable as a hard coking coal but is suitable as a component in coke oven blends
coal, thermal	Coal which is combusted to provide heat for steam generation and subsequent power generation, or burned for heat generation only
comminution	The physical breaking of the rock and coal into smaller sizes
Competent Person	A professionally qualified specialist defined in Chapter19.
conglomerate	A coarse grained sedimentary rock comprising large fragments set in a fine grained matrix of sand and cementing material
CPR	Competent Person's Report
CSN	Crucible Swell Number; a measure of the swelling properties of coal when heated; one of the most common tests to determine coal suitability for coking
dilution	The contamination of ore with barren or low grade rock during the mining process; effectively lowering the grade of the mined ore.
dyke	Igneous material cutting across the strata usually in a vertical or near vertical plane
fault	A fracture in the earth one side of which is displaced with respect to the other in any direction
fluvial	Pertaining to rivers. River environment for deposition of material
FOB	Free on board; commonly used to describe quantities or costs to deliver coal loaded onto a coal carrying ship
FOR	Free on rail; commonly used to describe quantities or costs to deliver coal loaded onto rail cars.

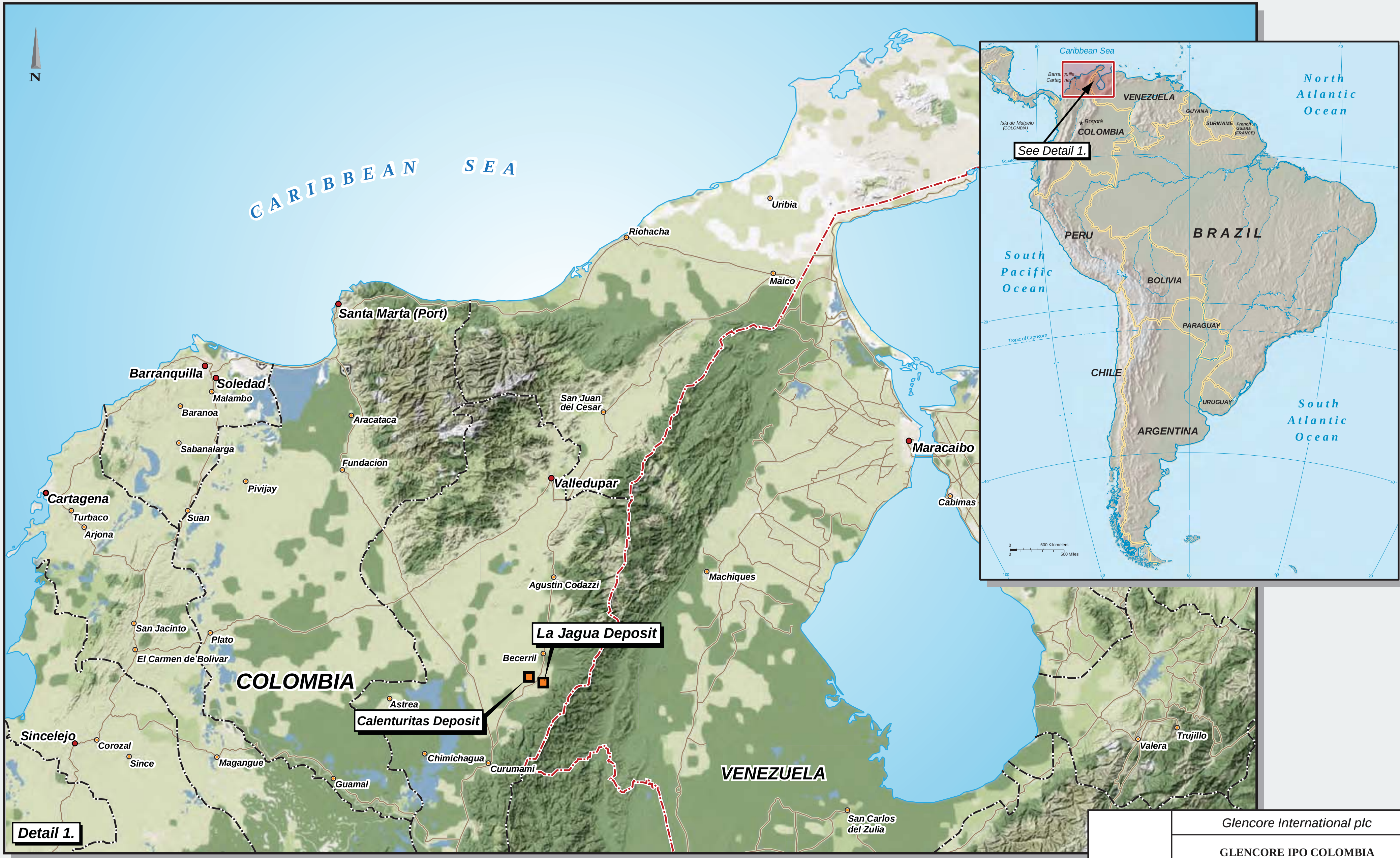
fold	Deformation of the strata due to tectonic forces
froth flotation	A coal cleaning process applied for the beneficiation of fine particles typically 0.5 millimetres in diameter. Hydrophobic coal particles attach themselves to air bubbles in a water medium and rise to the surface to form a froth
gar	Gross as received basis
geotechnical	The engineering properties of rocks
Glencore	Glencore International AG
graben	The lowering of strata between two fault planes forming a block of overburden rock interrupting the continuity of the coal seam
grade	The quality of an ore, alloy or metal; often expressed as a percentage contained within an ore, but sometimes a combination of numerous properties
greenfields	A location where no previous mining activity has taken place
Hansen Bailey	Hansen Bailey Environmental Consultants
Igneous	Material that has originated from a molten state
In situ	Material in the ground in its natural state; not mined, not processed
Inteplan	Inteplan Pty Limited, coal logistics consultants
interburden	Rock material separating coal seams
ITR	Independent technical review
joint	Natural fractures in rock generally vertical
JORC Code	*"Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves, The JORC Code, 2004 Edition"*; prepared by The Joint Ore Reserves Committee of The Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia (JORC)
km	Kilometre
LD core	Large diameter exploration boreholes from which samples of the strata are retrieved. The diameter of the core is generally 100 mm or more.
lithological	Description of the features of sedimentary rocks such as colour, grain size and composition
lithology	General description relating to the physical composition of rock forming materials
LOM	Life of mine
loose cubic metre	The volume in cubic metres of excavated materials after being disturbed; normally applied to materials in stockpiles, in haulage trucks and on converyors

losses, geological	Ore lost due to unpredictable geology
losses, mining	Ore lost due to inefficiency in mining operations
m	Metre
magnetic survey	A geophysical technique that measures the earth's magnetic field and its changes
MBGS	McElroy Bryan Geology Services, geology consultants
mm	Millimetres
MMC	Minarco-MineConsult, a subsidiary of Runge Limited, mining consultants
moisture, air dried	Moisture in the analysis sample (as determined) or the residual moisture in equilibrium with the prevailing laboratory conditions
moisture, as received	Moisture determined on the as-received coal.
moisture, bed	In situ moisture; natural moisture content of the coal in the seam, that exists as an integral part of the coal seam in its natural state.
moisture, equilibrium	Moisture in a coal sample after attaining equilibrium at a temperature of 30 °C and a humidity of 97 % (by mass fraction).
moisture, free	Moisture that is lost by the coal in the course of attaining approximate equilibrium with the atmosphere to which it is exposed.
moisture, inherent	Moisture that exists as part of the coal seam in its natural state. In the case of most coals, the inherent moisture may be equated to the bed moisture and to the total moisture. In South Africa however, the term inherent moisture generally refers to the moisture in the analysis sample or the residual moisture.
moisture, in situ	Bed moisture; natural moisture content of the coal in situ in the seam, that exists as an integral part of the coal seam in its natural state.
moisture, residual	Moisture content that remains in the coal after it has been air-dried at room temperature and that can be removed by heating at 105 °C.
moisture, surface	The difference between total moisture and residual moisture.
Mbcm	million bank cubic metres
Mbcmpa	million bank cubic metres per year
Mt	million metric tonnes
Mtpa	million metric tonnes per year
MUS$	million US dollars
MW	mega (million) watts
Mylec	AB Mylec, coal quality/processing consultants

outcrop	An exposure of strata projecting through the overlying cover of detritus and soil
overburden	Strata that lies above the coal seam
paleo	Ancient reference to past geological times
paleozoic	An era of geological time from about 570 to 225 million years ago
PCI	Pulverized Coal Injection
Permian	The period from 280 to 225 million years ago. It is sometimes considered part of the Carboniferous period. It is part of the Paleozoic era
ply	A layer of a coal seam of distinguishing properties formed from different plant and sediment material deposited separately
£	British pounds
Project	A coal deposit which is in the pre-operating phase of planning and/or development and may be brought into operation subject to feasibility and approvals processes
Quaternary	The period following the Tertiary extending to the present
reject	The material extracted from the ROM coal feed during cleaning
relative density (RD)	
Reserves, Probable	As per Chapter19, "*..those measured and/or indicated mineral resources which are not yet "proved" but of which detailed technical and economic studies have demonstrated that extraction can be justified at the time of the determination and under specific economic conditions;*"
Reserves, Proved	As per Chapter19, "*..those measured mineral resources of which detailed technical and economic studies have demonstrated that extraction can be justified at the time of the determination, and under specified economic conditions,*"
Resources, Indicated	As per Chapter19, "*..that portion of a mineral resource for which quantity and quality can only be estimated with a lower degree of certainty than for a measured mineral resource because the sites used for inspection, sampling and measurement are too widely or inappropriately spaced to enable the material or its continuity to be defined, or its grade throughout to be established.*"
Resources, Inferred	A third classification of Mineral Resources with lower confidence than both Measured Resources and Indicated Resources which is defined in many international mineral estimating codes; including both the JORC (Australian) and the SAMREC (South African) codes. Note that Inferred Resources are not mentioned in Chapter19.
Resources, Measured	As per Chapter19, "*..that portion of a mineral resource for which tonnage or volume can be calculated from outcrops, pits, trenches, drill-holes or mine workings, supported where appropriate by other exploration techniques. The sites for inspection, sampling and measurement must be so spaced that the geological character, size, shape, quality and mineral content will be established with a high degree of certainty;*"
Resources, Mineral	As per Chapter19, "*..include metallic and non-metallic ores, mineral concentrates, industrial minerals, construction aggregates, mineral oils, natural gases, hydrocarbons and solid fuels including coal;*"
ROM	Run-of-mine, which defines a state of material which has been mined but not yet processed

sandstone	A sedimentary rock comprising sand set in a matrix of silt or clay united by a cementing material. Contains 85%-90% quartz
seam	A stratum of coal
shaft	A vertical or inclined excavation, commonly from the surface, of limited size, and normally used for mining, drainage, ventilation, people access, and delivery of mined materials to the surface
specific energy	The heat of combustion of a unit quantity of coal; expressed in either British thermal units per pound (Btu/lb), kilocalories per kilogram (kcal/kg) or megajoules per kilogram (MJ/kg). See "*calorific value*".
strip ratio	The ratio (bcm/t) of volume of waste mined (in bcm) to weight of coal mined (in t) in an open cut mining operation
sub-basin	A regional low area within a wider basin structure
subcrop	A mineral occurrence, including coal seams and plies, which comes near the surface but is covered by a thin layer of non-mineral overburden
syncline	A line or axis towards which strata dip or slope down from both directions
t	metric tonnes
tailings	The waste material remaining from finely ground ore from which the valuable minerals have been extracted
t/bcm, t/cm	Metric tonnes per bcm, or per cm, usually a measure of density
TC	Total carbon
tectonic	Relates to the movement and structural features of the earth's crust
Tertiary	The period between about 65 million and 2 million years ago
TM	Total moisture
tpa	metric tonnes per year
tph	metric tonnes per hour
Triassic	The period from 225 to 190 million years ago. It is part of the Mesozoic era
TS	Total sulphur
tuff	A general term for consolidated material ejected from a volcanic vent
US$	United States dollars
wash plant	A process plant designed to size and clean ores to produce beneficiated ore with higher grade and/or predetermined sizes
waste	Rock that is not part of the coal seam

VALMIN Code	"*Code for the Technical Assessment and Valuation of Mineral and Petroleum Assets and Securities for Independent Expert Reports, The VALMIN Code, 2005 Edition*", prepared by the VALMIN Committee, a joint committee of The Australasian Institute of Mining and Metallurgy, the Australian Institute of Geoscientists and the Mineral Industry Consultants Association with the participation of the Australian Securities and Investment Commission, the Australian Stock Exchange Limited, the Minerals Council of Australia, the Petroleum Exploration Society of Australia, the Securities Association of Australia and representatives from the Australian finance sector.



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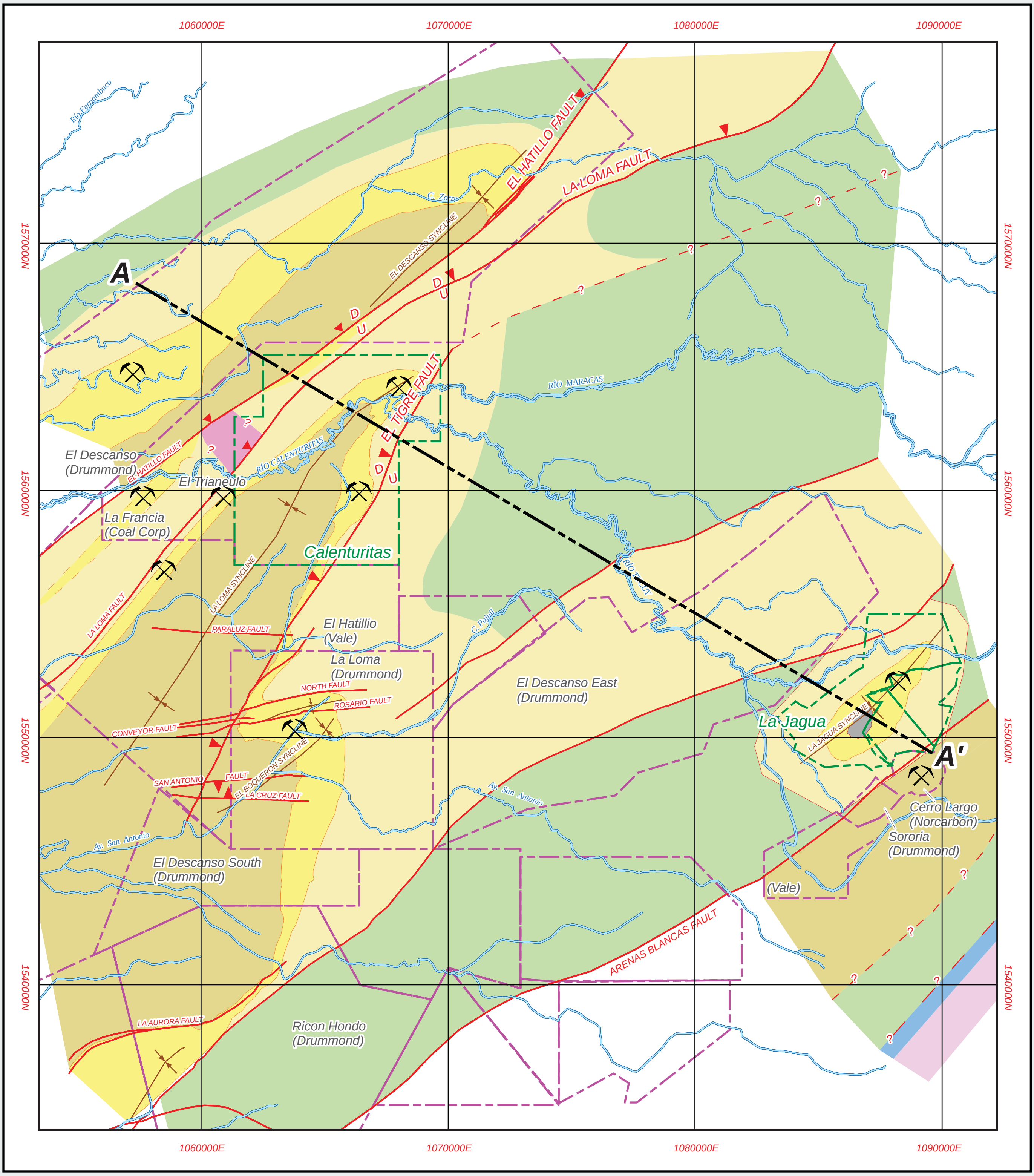
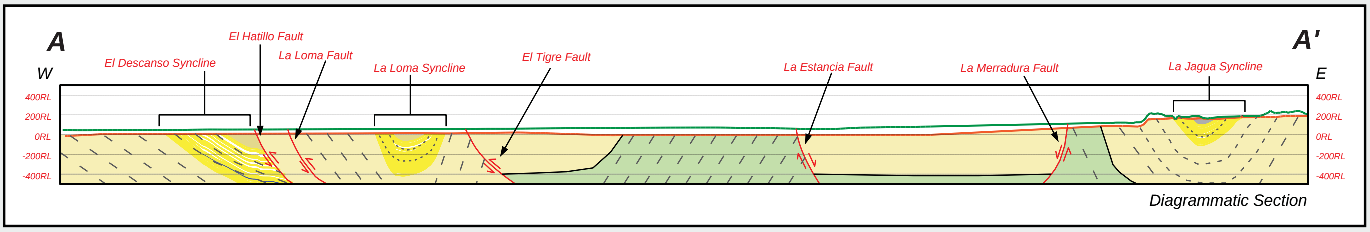
GENERAL LOCATION PLAN

Date: May 2011 | Job No: ADV-SY-03728 | Figure: 1





LEGEND

Fault	Prodeco Leases		Colluvium
Syncline	Other Leases		Cuesta Formation
Anticline	Rivers	Los Cuervos Fm	Upper member
Subcrop	Current operations		Middle member Coal bearing unit
			Lower member
		Barco Fm	
			Cretaceous undifferentiated
			Jurassic
			Paleozoic

0 2.5 5 10
kilometres

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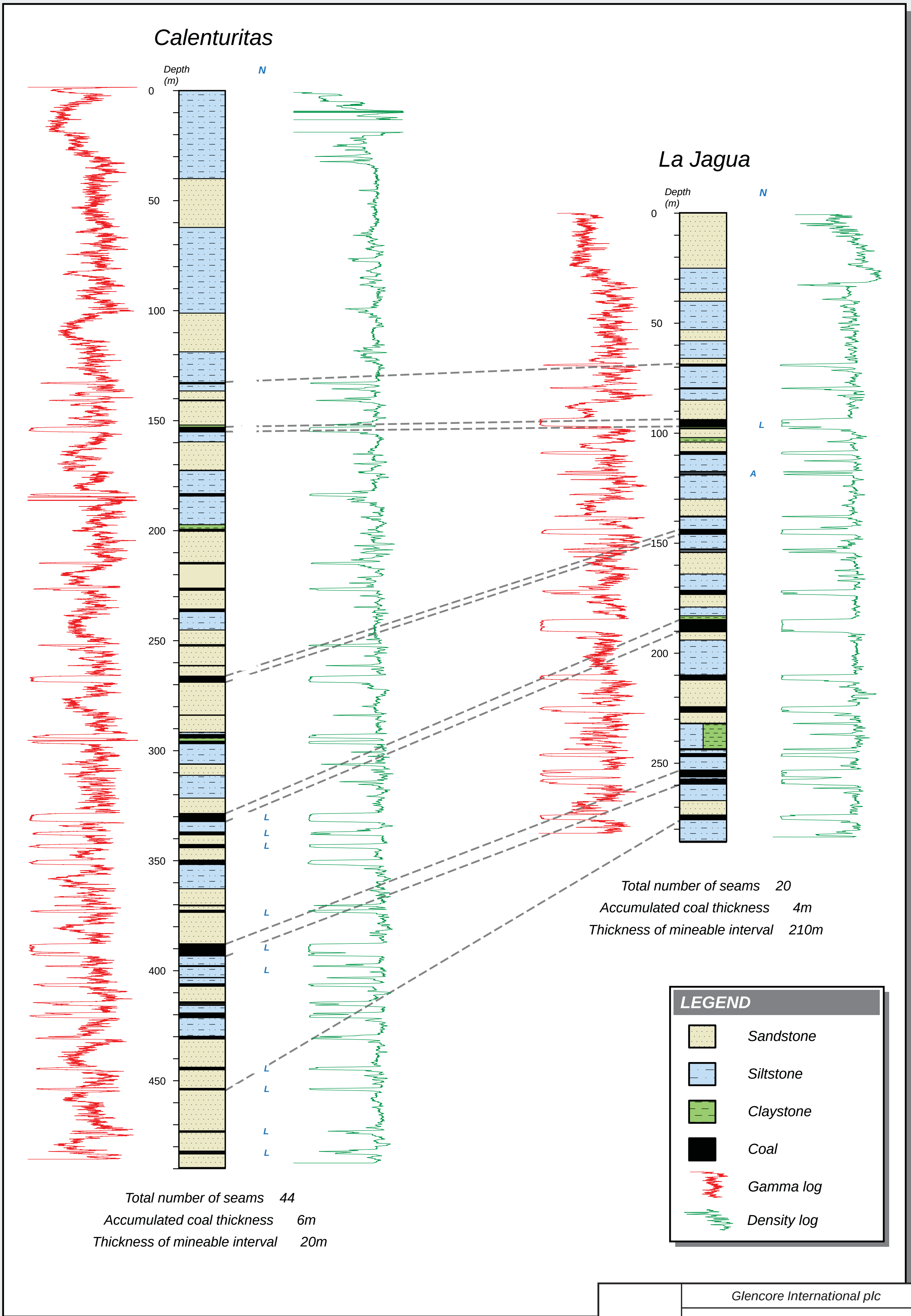
SOLID GEOLOGY - CESAR BASIN

Date: May 2011	Job No: ADV-SY-03728	Figure: 2



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S RA IGRAP IC SEC IONS AND COAL SEAM CORRELA ION

Date: May 2011	Job No: ADV-SY-03728	Figure: 3

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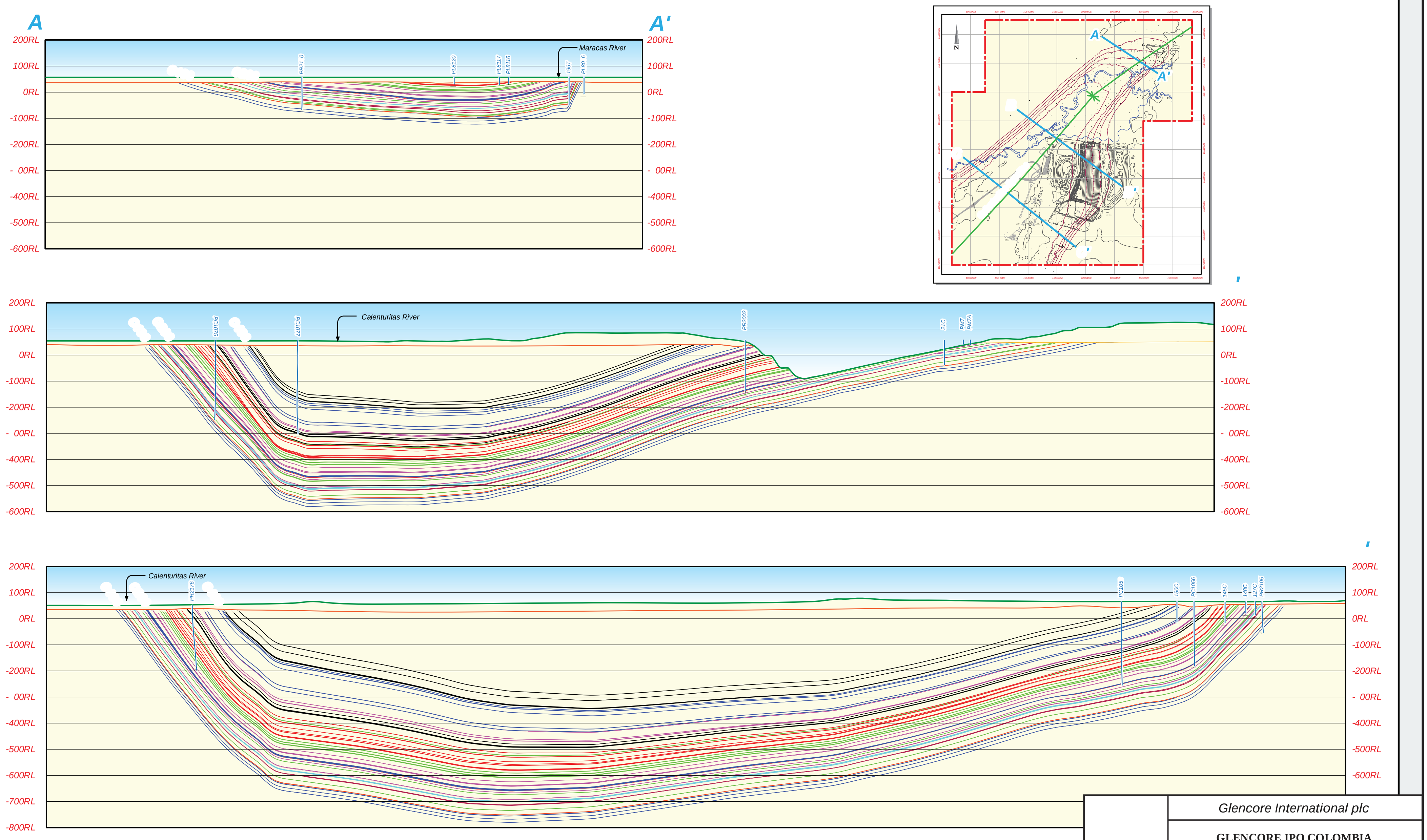

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CALEN RI AS GEOLOGICAL SEC IONS

Date: May 2011 | Job No: ADV-SY-03728 | Figure:

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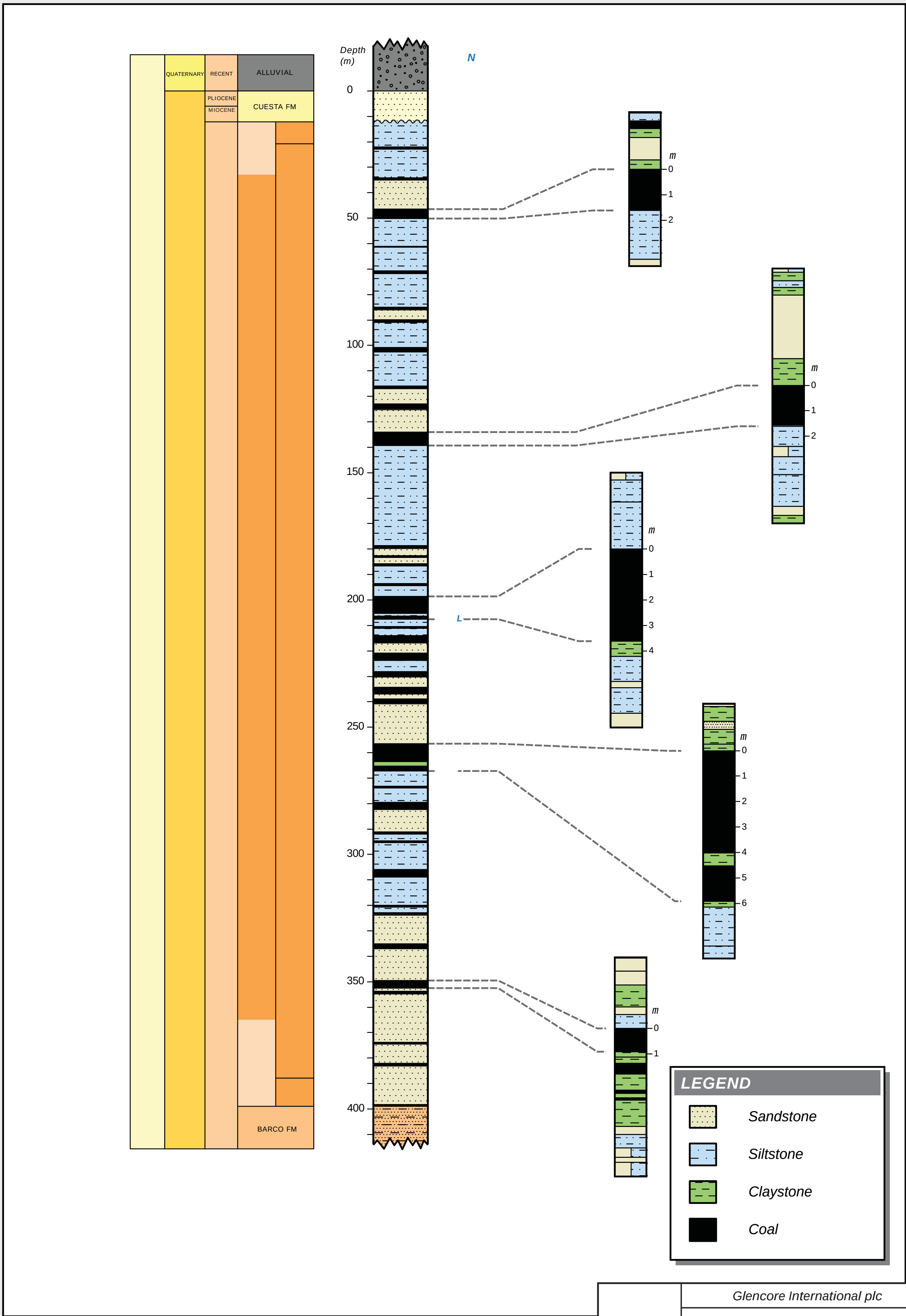

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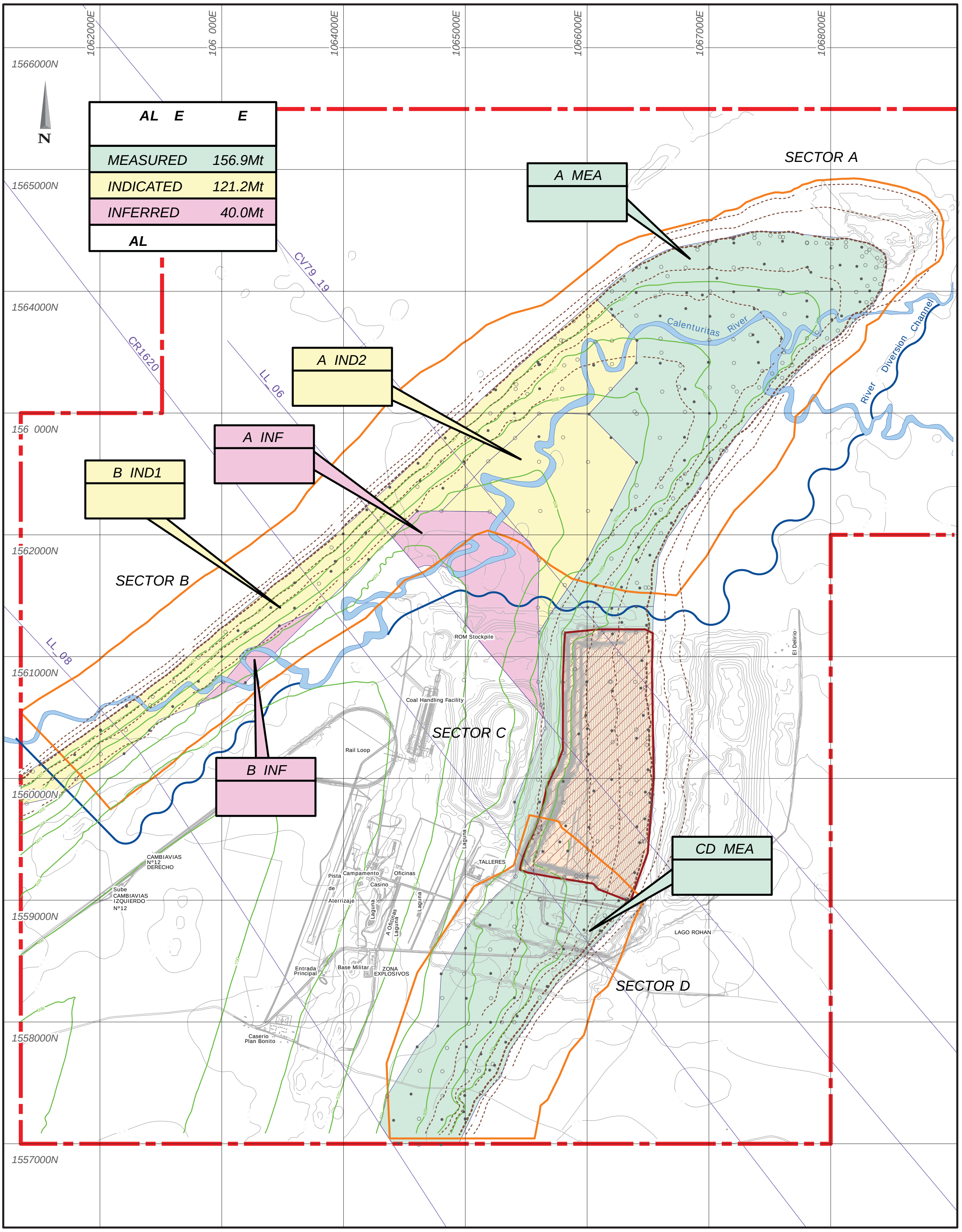
GLENCORE IPO COLOMBIA

CALEN RI AS DIAGRAMMA IC
S RA IGRAP IC SEC IONS

Date: May 2011 | Job No: ADV-SY-03728 | Figure:

minarco mineconsult

McElroy Bryan Geological Services



LEGEND

Core hole	LOM Pit Shell
Non core hole	Seismic line
Seam subcrop	River
Depth of cover to C1 0	River diversion
Mined Area	

Measured
Indicated
Inferred

0 1 2km

kilometres

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CALEN RI AS COAL RESO RCE AREAS
C O C SEAMS

Date: May 2011	Job No: ADV-SY-03728	Figure:

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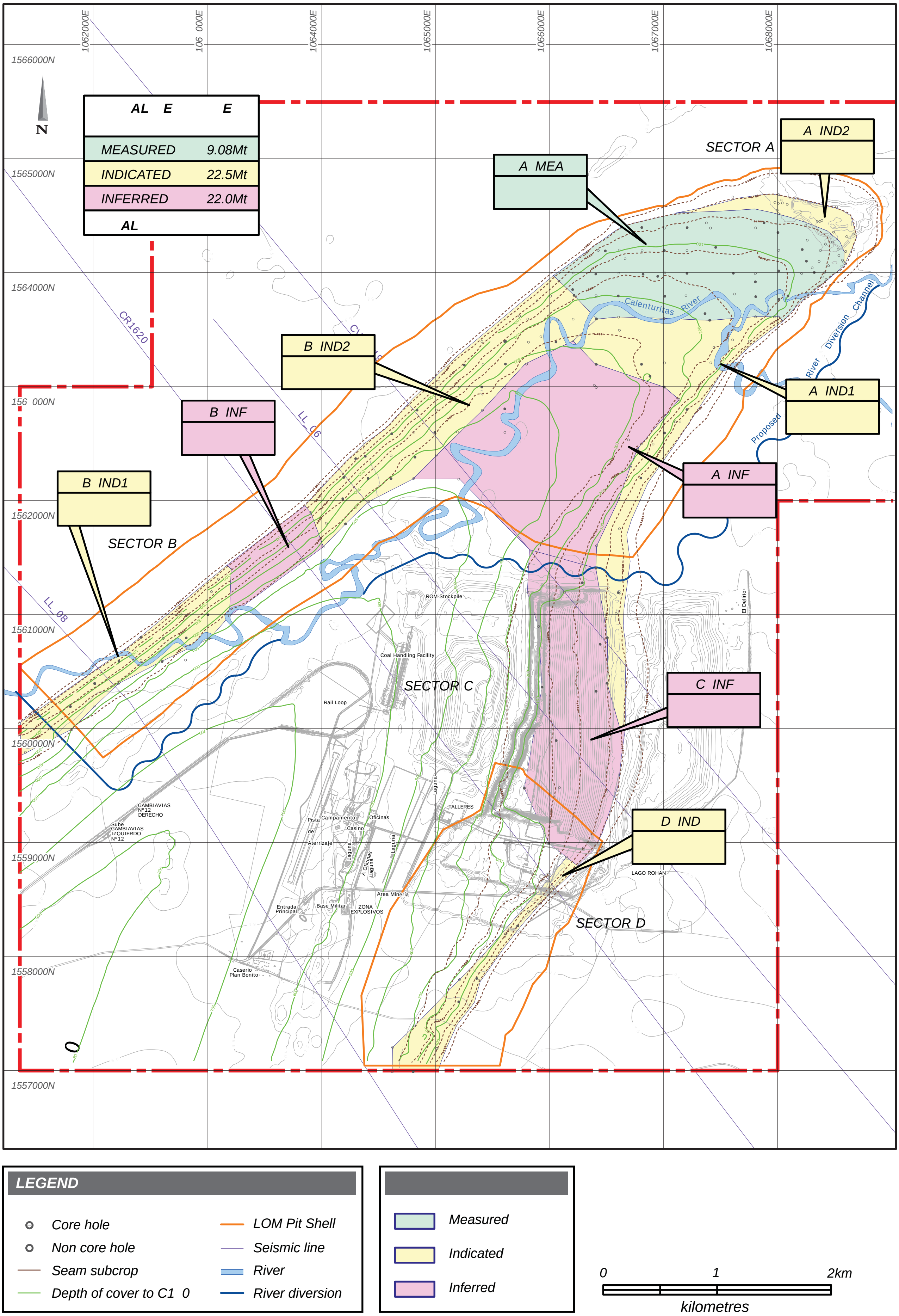

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CALEN RI AS COAL RESO RCE AREAS
C O C SEAMS

Date: May 2011	Job No: ADV-SY-03728	Figure: 7

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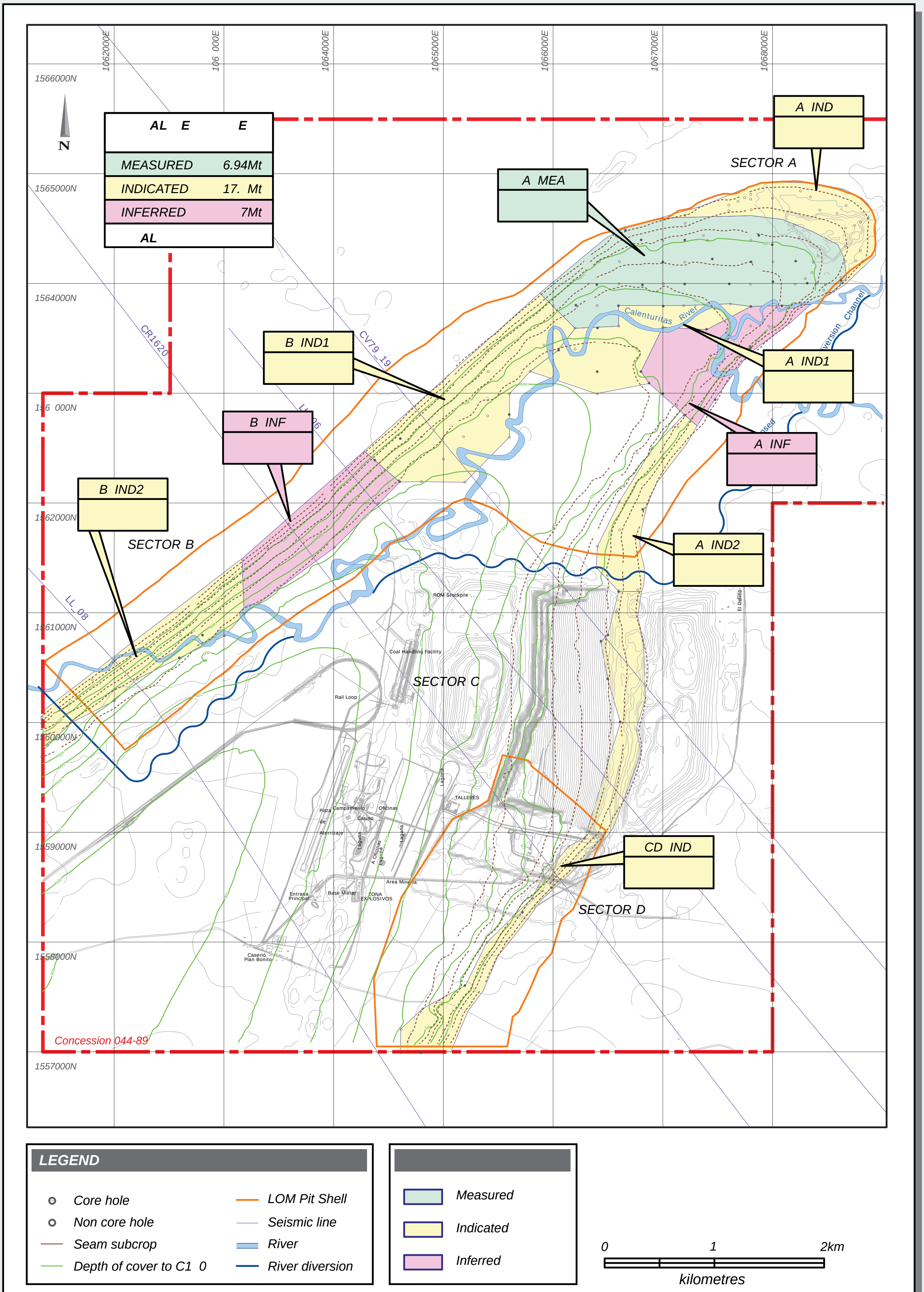

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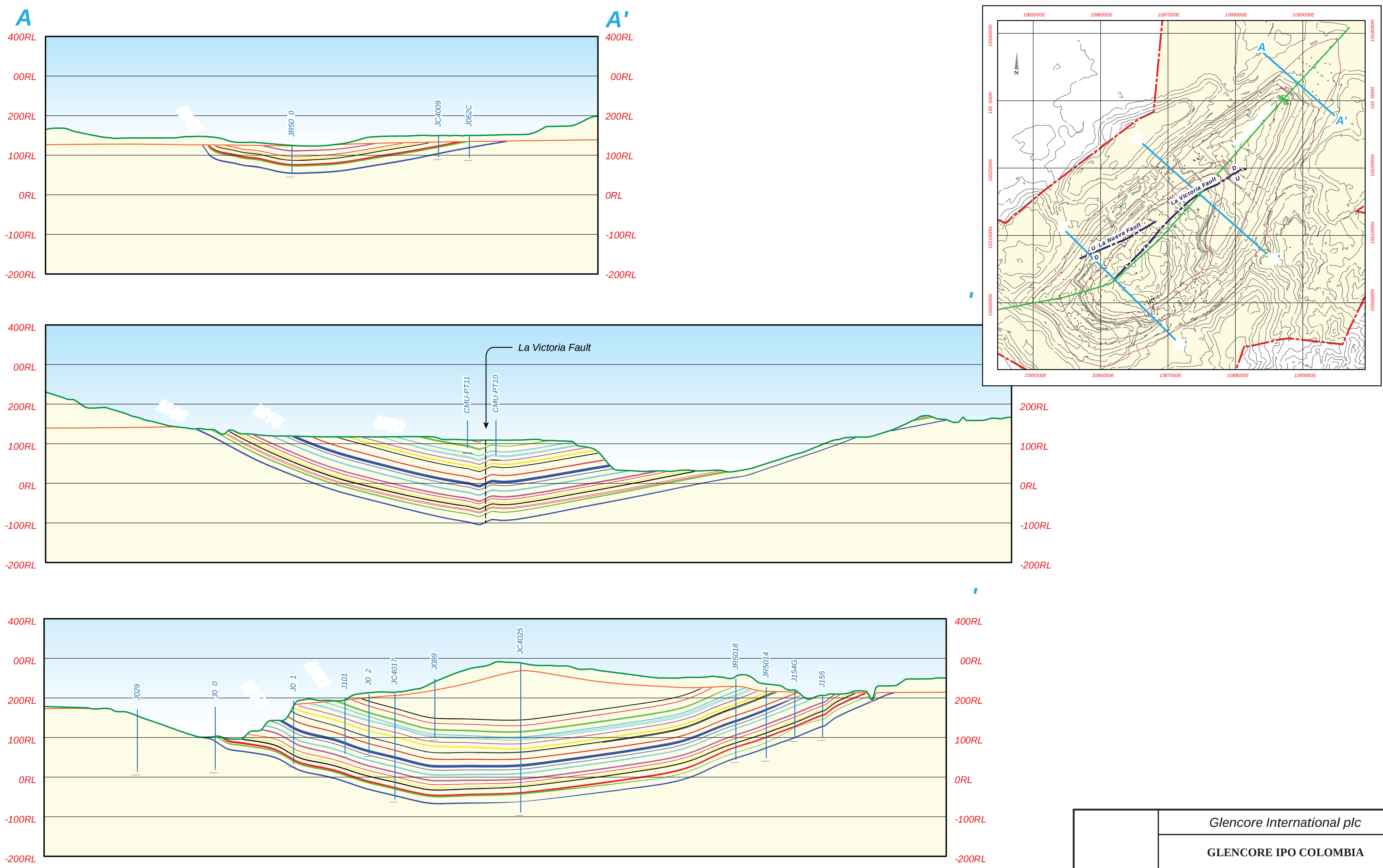
CALEN RI AS COAL RESO RCE AREAS
C O C SEAMS

Date: May 2011 | Job No: ADV-SY-03728 | Figure: 8



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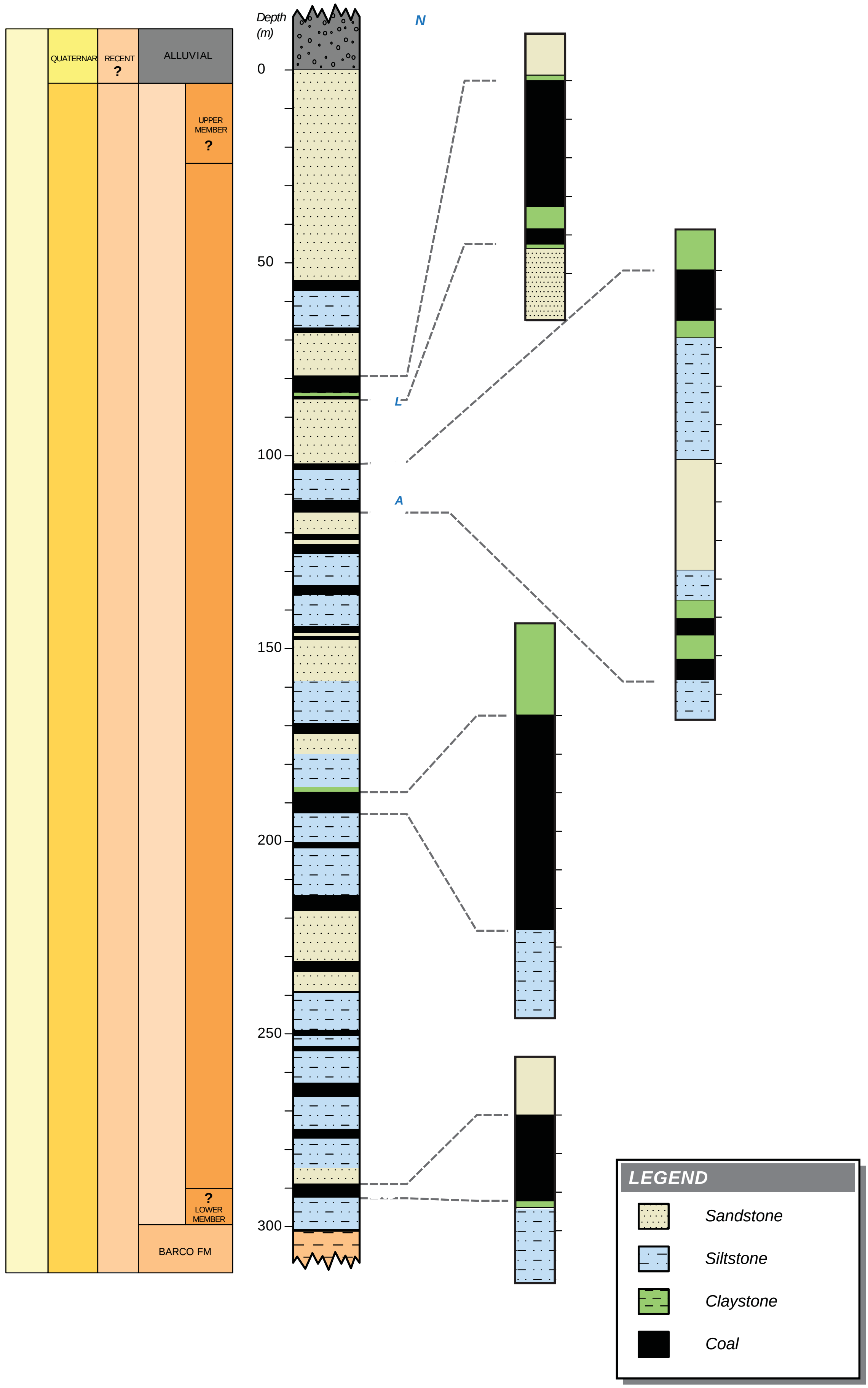
GLENCORE IPO COLOMBIA	
LA AG A GEOLOGICAL SEC IONS	
Date: May 2011	Job No: ADV-SY-03728	Figure:



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LA AG A DIAGRAMMA IC
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Date: May 2011	Job No: ADV-SY-03728	Figure:10

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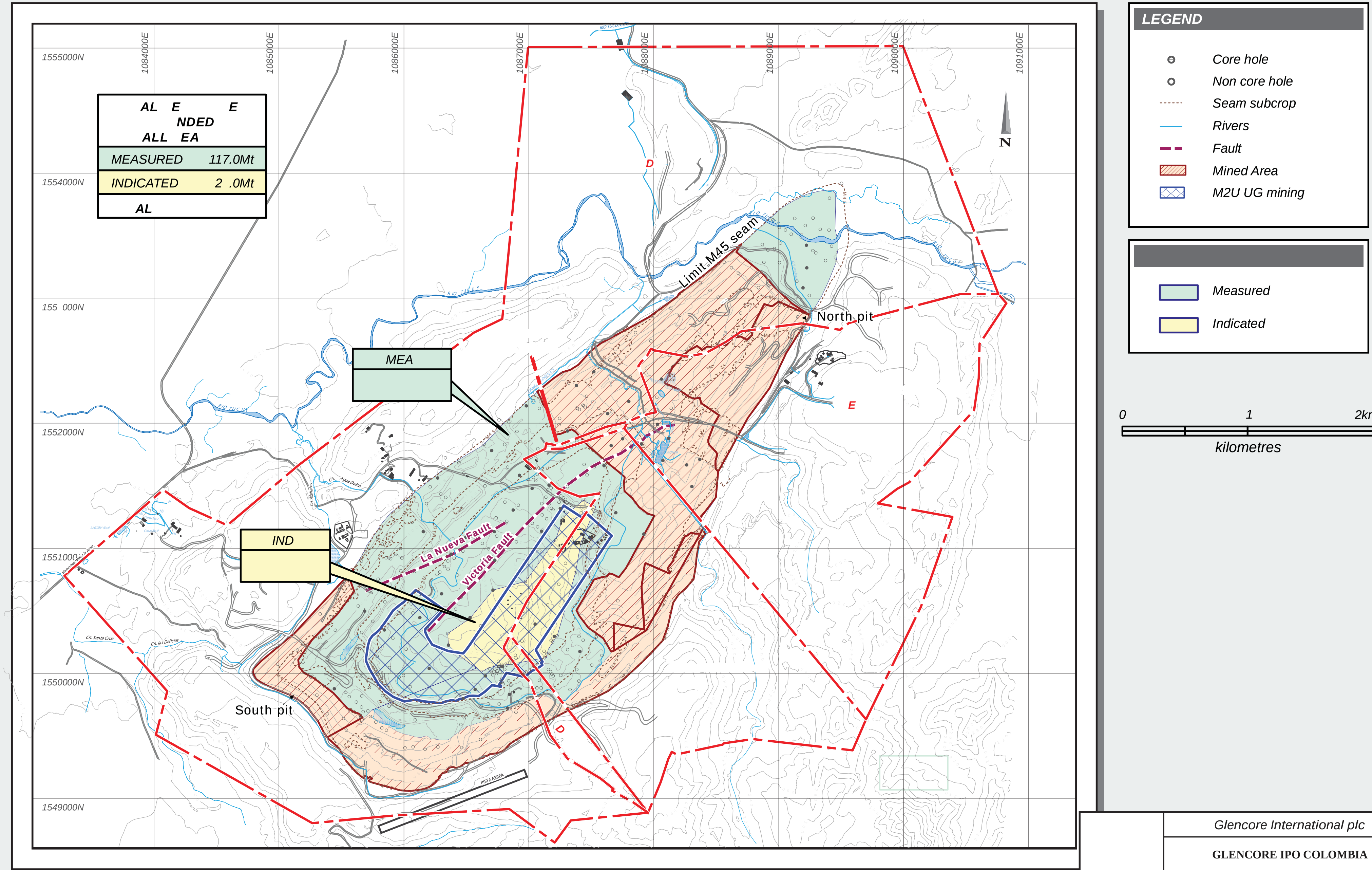

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LA AG A COAL RESO RCE AREAS

Date: May 2011 | Job No: ADV-SY-03728 | Figure: 11

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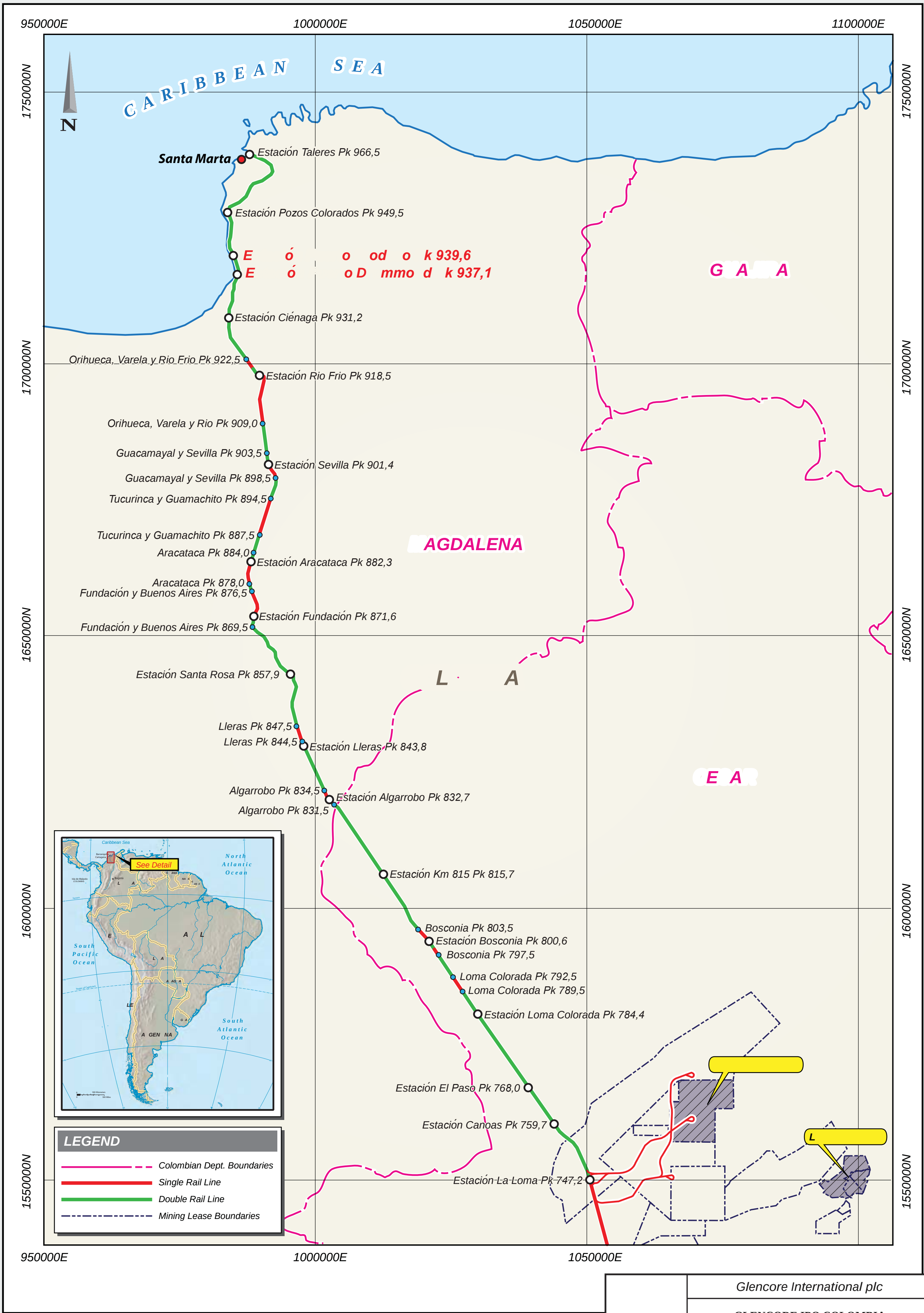

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kilometres

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COAL RANSPOR RAIL LINE

Date: May 2011 | Job No: ADV-SY-03728 | Figure: 12

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SECTION XIV: INDEPENDENT TECHNICAL REPORTS

SUB-SECTION C: KATANGA REPORT

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04 May 2011

GLENCORE INTERNATIONAL PLC

Mineral Expert's Report: Kamoto Copper Company (KCC)

Submitted to:

3

341

Contributing Authors	Company Name	Qualification

REPORT

Report Number. 12 1 101 2

Distribution:

1

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A world of capabilities delivered locally

Golder Associates

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04 2011 12 1 00

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CC:

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MINERAL EXPERT'S REPORT: KATANGA MINING LIMITED

PURPOSE OF REPORT

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0 2004

23 2011 2010
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2004

200
43 101
43 101

CAPABILITY AND INDEPENDENCE

50

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1 2 1 2

METHODOLOGY

- 2010
-
-
-

1 2011

DECLARATIONS

GLOSSARY OF TERMS

QUALIFICATIONS OF CONSULTANTS

1

Name	Company	Qualification
		40

Name	Company	Qualification
		25 00
		20
		12 20030022 0123

Name	Company	Qualification
		30

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1.0 EXECUTIVE SUMMARY

1.1 Introduction

2010

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1 200

2010

2004

2005

- 2010

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1 2011

1.2 Ownership

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1.3 History

200
5 5

200
0

200
11 200
200
200 100

200

200 200
25
200
2 2010

- 525 13 4 5 11 02
1
1
525 4 5
2 200
5 21 200 2 200

- 044 11 01
52
52
2 200
5 22 200 2 200

-
41
1

41

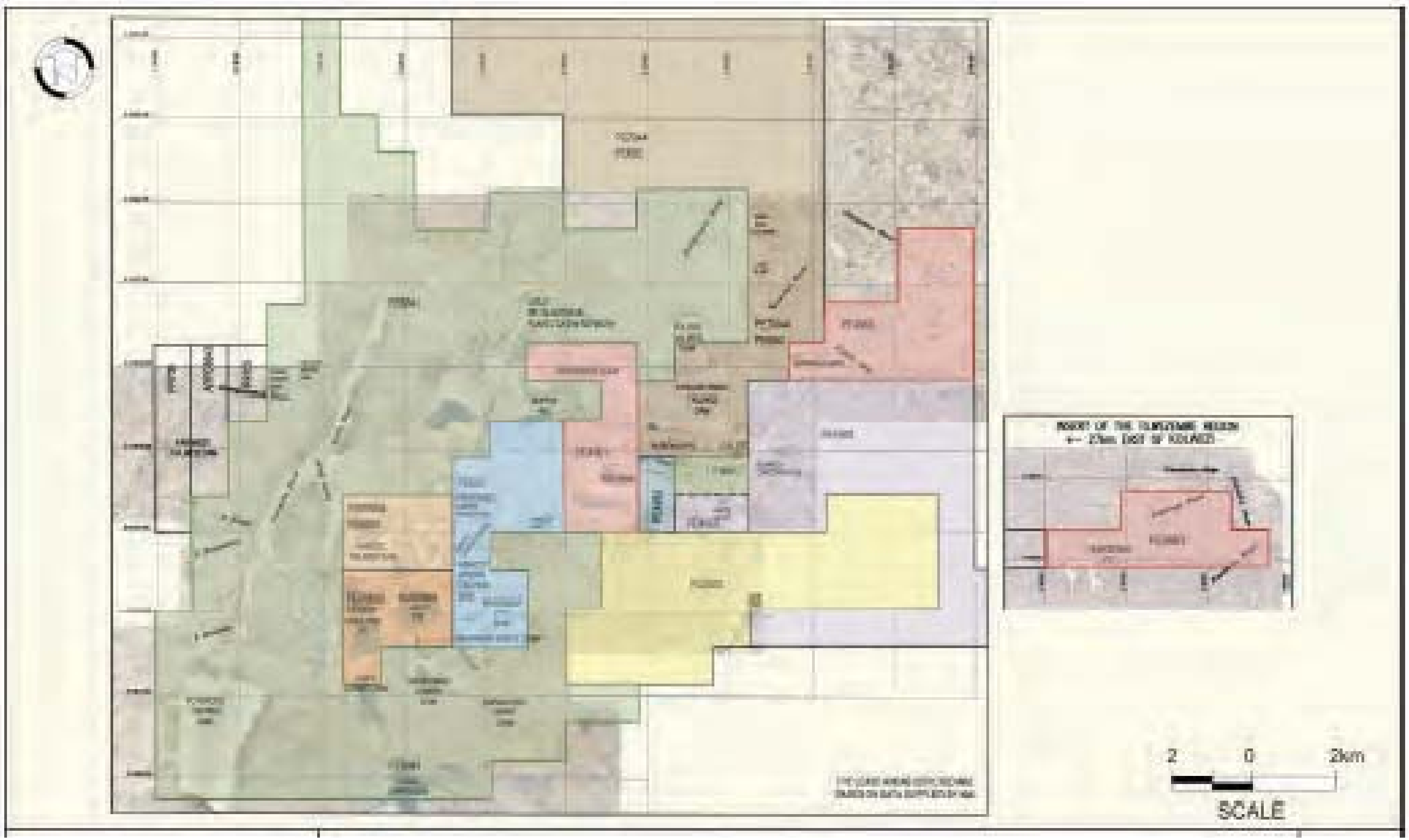
3
00 000
22

1 200 000
22

1.4 Legal Tenure

15

Property	Exploitation Permit Number	Rights Granted	Location	Held By	Area of Title	Valid Until
	525		10 43 25 24		13 11 04 2	03 04 2024
1	11 02				2 1 2	03 04 2024
	11 01				1 0 4 2	0 05 2022
	4 1		10 42 25 25		10 4 2	03 04 2024
	4 3		10 4 25 42		4 2	03 04 2024
	4 0		10 40 25 2		13 11 04 2	03 04 2024


2
0
2km
SCALE

Status of Material Assets

Property	Holder	Type	Status	Licence		Comments
				Expiry Date	Area	
				3 2024	11 04 2	2013
1				3 2024	1 2	
				3 2024	4 2	
				3 2024	4 2	200
				3 2024	11 04 2	
				2022	0 4 2	

Property	Holder	Status

Replacement Reserves

3 2 1 5 205 2

1 2015

1

1 2015 2 5 000 000
1 2015

1 2015 12

300
12

1.5 Resources Model

Geology

0
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300

Mineralisation

100

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Mineral Resources

31 2010
31 2010

KCC: Consolidated Mineral Resources as at 31 December 2010

Classification	Project Area	Mt	%TCu	%TCo
		30	4 54	0 54
		30	4 54	0 54
		35	4	0
		5 0	1 0	0 3
	1	5	2 5	0
		123	5 3	0 4
		4 1	1 1	0
		5	1	0
		25	3 5	0 45
		4	4 2	0 5
		5 0	1 0	0 3
	1	5	2 5	0
		123	5 3	0 4
		4 1	1 1	0
		5	1	0
		2 4	4 02	0 4
		10	5 11	0 5
		5 3	0	0 1
	1	15 3	1 1	0 1
		1 2	3 5	0 32
		4 0	2 00	0
		13	1 5	0 0
		1 0 2	2 32	0 32

1
2004

2

3

1.6 Reserve Estimate

2010

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2 2
4
4 13 0 50

3 3

201
1
13
20 5 2 4 4

1
2012 1 5
2011 2012 2
2012

4 14 3 2
2030
55 4

12 2
2 0
5 3 0

2030 1
3 4 2

KCC: Consolidated Mineral Reserves as at 31 December 2010

Proved			Probable			Total		
000			000			000		
14 5	3 4	0 51	2 450	4 33	0 4	03	4 20	0 4

1.7 Plant and Equipment

4

Kamoto Concentrator

1 2 1 1 2
1 2 1 1 1 2

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Luilu Refinery

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0
1 0 1 5

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2004

1 200
2 200 200
3

3 150
3 2011

150
2010
2 0 310

2 0
310 000
310

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2013
250 2014
2014 310 2015

1.8 Closure

111 200

1.9 Environmental, Health and Safety

2010

Results of the Audit: Permits

- 525 4 0 4 1 4 3 11 01 11 02 4 00 2002 11 2002
- 2010 2011 03 2003 2003

200 2010

Results of the Audit: Environmental Impacts

-
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2011

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500
2010
2011

2012

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2004

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Results of the Audit: Community Relations

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2010

10 2011

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■ 200 200 1 25
2 0

- 2010
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-
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1.10 Economic Evaluation

Revenue, capital and operating cost estimates

3 4 310
25

Capital Expenditure for KCC

USD million	2011	2012	2013	2014	2015	2016 - 2035	LOM Total
	320	353	3 0	132	120	1 352	2 4

Valuation

10 1 2011
00

1.11 Katanga MER Extraction Table

31

5 5

		2008	2009	2010	2011	2012	2013	2014	2015
Finished metal production capacity	**Units**								
		40 00	0 000	130 000	150 000	150 000	200 000	250 000	310 000
		2 050	3 240	5 500	000	000	000	000	000
							22 000	22 000	22 000
Finished metal actual / forecast production									
		22 122	41 4	52 1	110 414	150 000	1 4 54	24	30 1 4
		4	2 534	3 43	5 01	5	0	000	000
							2 21	5 4	
			1 3	054	21 1				
		1							
Cash cost (excl. royalties, realisation charges, before by-product revenues)		2	2	2 1	3	4 3	4 5	52	3
By-products revenues		1 4		155	343	251	2 4	451	3 1
Royalties (as a % of net revenue)		4 50	4 50	4 50	4 50	4 50	4 50	4 50	4 50
Depreciation & amortisation		3 4	2	200	310	3 1	323	214	1
Statutory Tax rate		30 00	30 00	30 00	30 00	30 00	30 00	30 00	30 00
Capex									
		11	1	5	0			5	3
		31	100	1 5	2 0	2	2 5	3	3

Production Numbers - Mining

		2008	2009	2010	2011	2012	2013	2014	2015
KTO									
		551 333	1 0 4 0	1 30 35	1 30 520	1 0 20	1 22 24	1 4 355	2 25 11
		3 3	3 5	3 2	3 0	3	3 4	3	3
		0 43	0 4	0 5	0 4	0 5	0 5	0 5	0 5
KOV									
				22 324	1 51 34	2 3 4 53	3 33 3	5 1 4	1 4
				4 43	4 1	5 02	5 11	4 21	3 1
				0 30	0 3	0 3	0 35	0 22	0 15
T-17									
		4 543	1	1 44 42	1 100 000	3 0 000			
		1 2	1 30	2 55	2 5	2 3			
		0	0 5	0 5	0 4	0 44			
Tilwezembe									
		0 2							
		1 3							
		1 1							
Mashamba East									
									4 510
									4 14
									0 10

Production Numbers - KTC

		2008	2009	2010	2011	2012	2013	2014	2015
Sulphide circuit									
		40 000	1 0 000	2 520 000	2 520 000	2 520 000	2 520 000	2 520 000	2 520 000
		5 2 33	1 0 02	1 324 2	1 30 520	1 0 20	1 22 24	1 4 355	2 25 11
		3 0	3 0	3 3	3 0	3	3 4	3	3
		0 40	0 4	0 54	0 4	0 5	0 5	0 5	0 5
		4 0	2 4	113	113 122	134 1 5	145	145 2	1 0 3 3
		40 0	40 0	3 5	40 00	42 00	42 00	42 00	42 00
		4 40	5 00	5	3 0	4 0	4 0	4 0	4 0
Oxide and Mixed Circuit									
		40 000	1 440 000	3 000 000	5 1 0 000	5 1 0 000	5 1 0 000	0 000	0 000
1		43 54	5 31	1 23 354	2 1 5 0 0	2 3			
		2 0	2 34	2 45	1	2 30			
		0 0	0	0 5	0 0	0 0			
				3 4 455	1 5 1 34	2 3 4 53	3 33 3	5 1 4	1 4
				4 43	4 1	5 02	5 11	4 21	3 1
				0 30	0 3	0 3	0 35	0 22	0 15
									4 510
									4 14
									0 10
		43 54	5 31	1 00 0	3 5 40	3 1 2 142	3 33 3	5 1 4	1 1 15
		2 2	2 34	2	3 1	4 32	5 11	4 21	3
		0 4	0	0 3	0 5	0 4	0 35	0 22	0 14
		55 323	4 5	1 3	44 5	42 5 4	34 3 4	452 004	1
		1	1 5	1 20	22 50	24 00	24 00	24 00	24 00
		3 30	3	2 3	2 40	1 0	1 0	1 0	0 0
						3 1	154 5 0	1 3 12	1 0 31
						42 00	42 00	42 00	42 00
						2 30	2 10	1 0	1 10

Production Numbers – Kolwezi Concentrator ("KZC") (No longer an asset of KCC - returned to Gecamines)

		2008	2009	2010	2011	2012	2013	2014	2015
Capacity	**Unit**								
		555 53							
		1 4							
		0 3							
		3 5 3							
		12 31							
		4							

Number of employees (As of 31 December 2010)	
	31
	1 335
	431
	3
	153
Total KCC Employees	**3 147**
	2 354
	5
Total Contractors	**3 313**
	22
Total Personnel	**6 488**

Table of Contents

TABLES

FIGURES

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2.0 INTRODUCTION

2.1 Project Description and Location

2.1.1 Project Description

200

1

15 235

2.1.2 Location

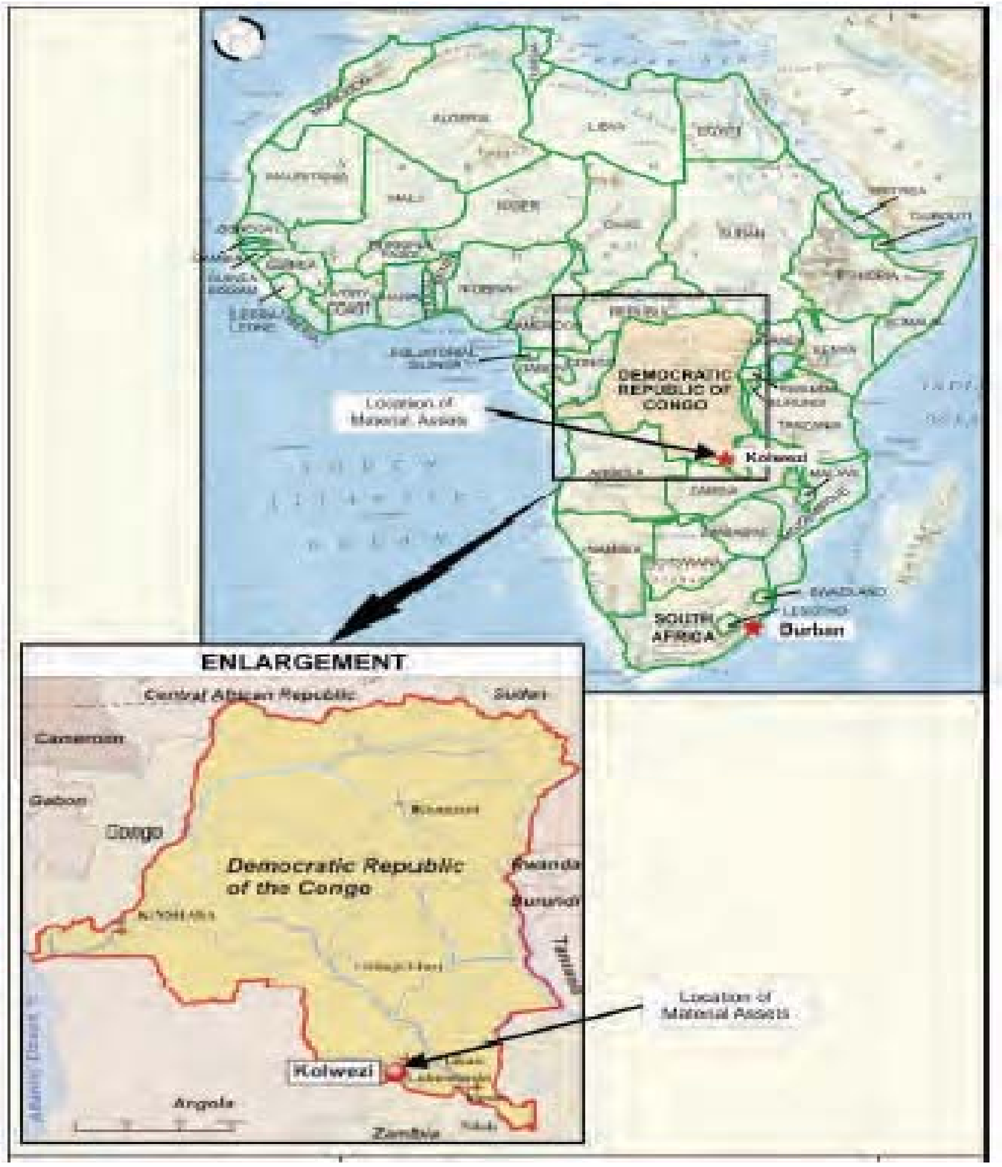

Figure 1 Geographic Location Map of the Material Assets

2.2 Ownership

5

2.2.1 History

200
5 5

200
0

200
11 200
200
200 100

200

200 200
25
200

2 2010

- 525 13 4 5 11 02
1
1
525 4 5
2 200
5 21 200 2 200
- 044 11 01
52
52
2 200
5 22 200 2 200
-

41
1

41

3
00 000
22

1 200 000
22

2.2.2 Legal Tenure

Table 1: KCC Permits

Property	Exploitation Permit Number	Rights Granted	Location	Held By	Area of Title	Valid Until
	525		10 43 25 24		13 11 04 2	03 04 2024
1	11 02				2 1 2	03 04 2024
	11 01				1 0 4 2	0 05 2022
	4 1		10 42 25 25		10 4 2	03 04 2024
	4 3		10 4 25 42		4 2	03 04 2024
	4 0		10 40 25 2		13 11 04 2	03 04 2024

15

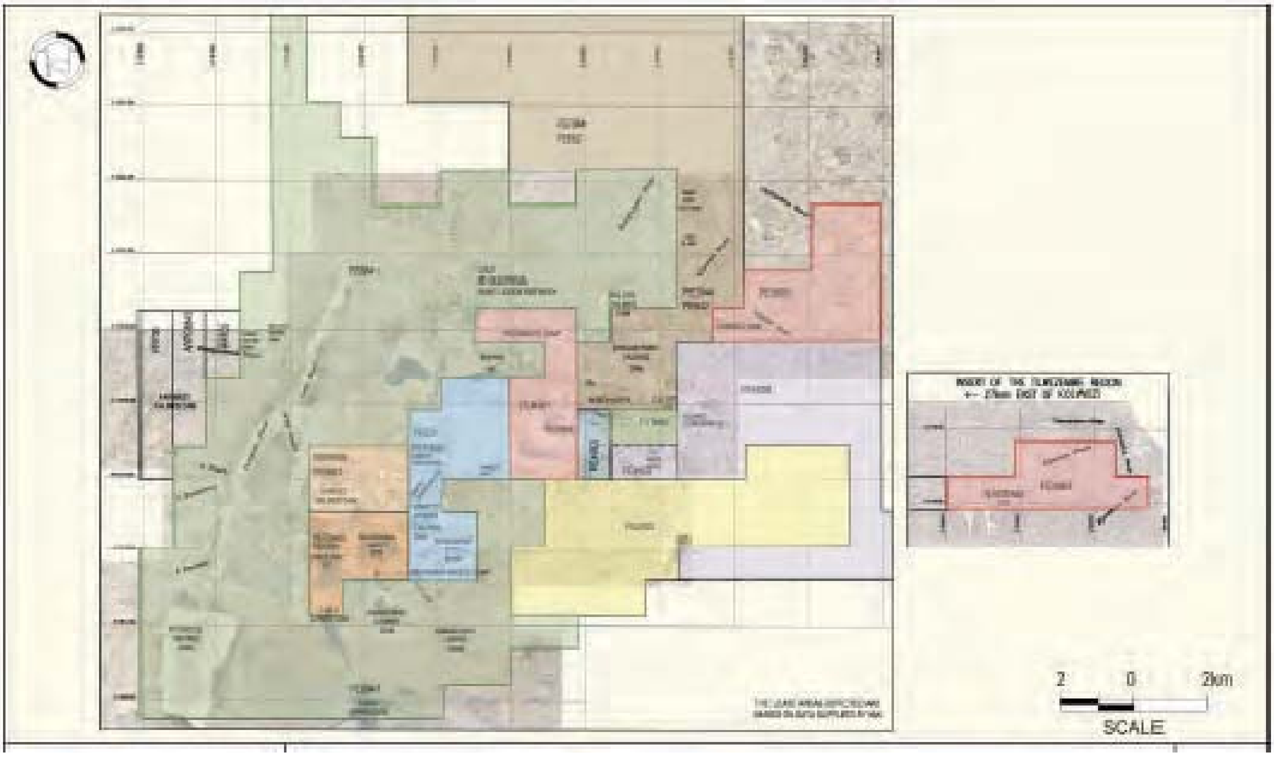

Figure 2 Concession Boundries

2.2.3 Status of Material Assets

Table 2: Mining Assets

Property	Holder	Type	Status	Licence		Comments
				Expiry Date	Area	
				3 2024	11 04 ^{2}	2014
1				3 2024	1 ^{2}	
				3 2024	4 ^{2}	
				3 2024	4 ^{2}	200
				3 2024	11 04 ^{2}	
				2022	0 4 ^{2}	

Table 3: Mineral Processing Assets

Property	Holder	Status

2.2.4 Replacement Reserves

3 2 1 5 205 2

1 2015

1

1 2015 2 5 000 000
1 2015

1 2015 12

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3.0 DESCRIPTION OF RESOURCES

3.1 Geological setting

3.1.1 General Geology

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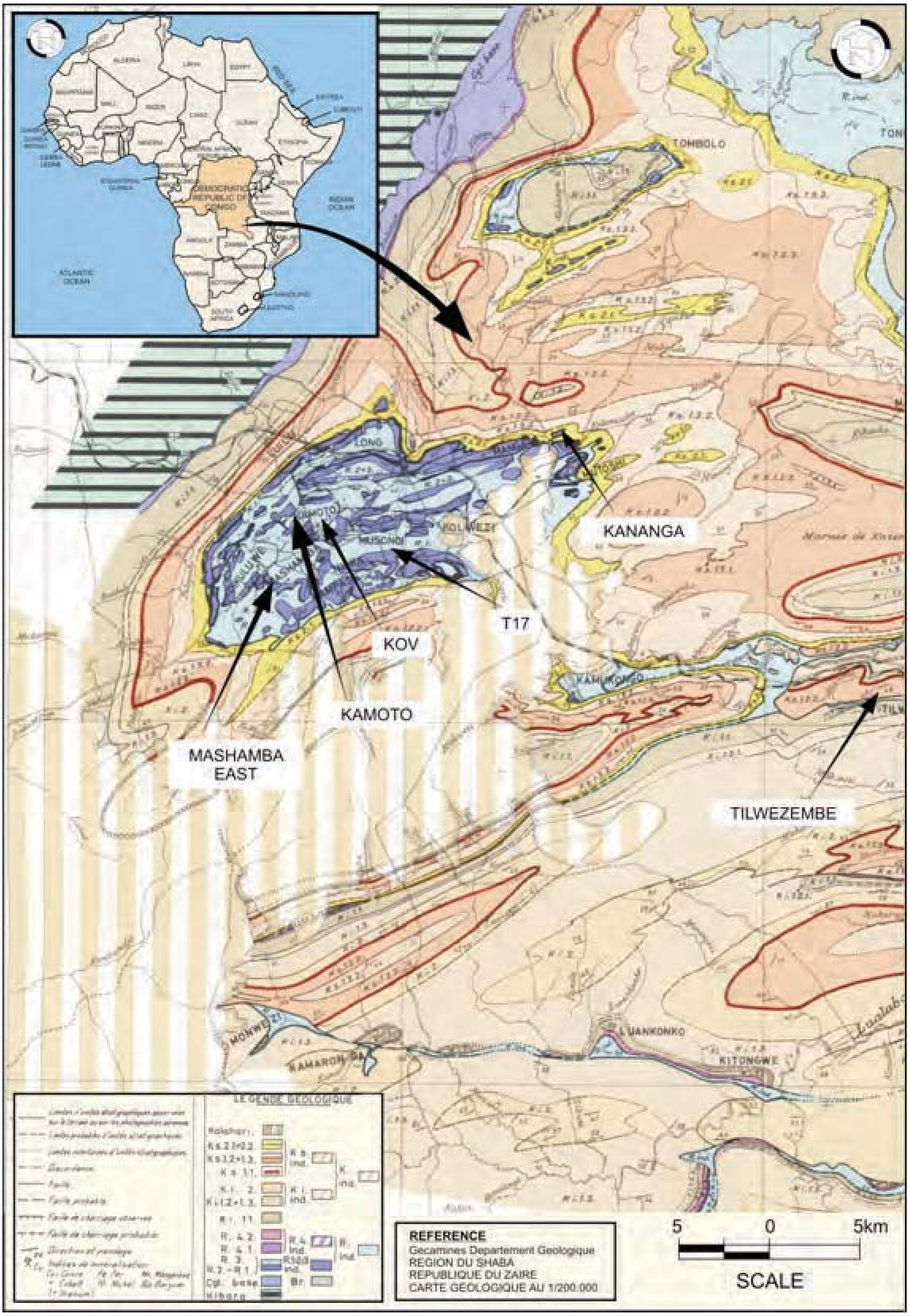

Figure   Regional Geology

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1 4

Table 4: General Stratigraphy of the Katangan System

KATANGA SYSTEM						STRATIGRAPHY	
System	Series	Formation	Local Name			Description	Thickness (m)
	UPPER KUNDELUNGU					Sediments	30-50
	LOWER KUNDELUNGU					Sediments, sandstones and shales	200-500
KATANGA	ROAN	R4-1 AND 2	MWASHYA			Shales, siltstone, sandstone to dolomites	50-100
		R3-2	DIPETA			Shales and sandy schists	1000
		R3-1	RGS			Roches Greseuse Superieur	100-200
		R2-3	CMN			Calcaire a Minerais Noirs	130
		R2-2	SDS			Schistes Dolomitic Superieur	50-80
		R2-1	SDB	LOB	COMBINED OREBODY	Schistes Dolomitic Superieur	10-15
			RSC	LOB		Schistes De Base	12-25
			RSF	LOB		Roches Silicieuses Cellulaire	5
			D STRAT			Roches Silicieuses Feuilletees	3
			RAT Grises			Dolomie Stratifiee, argilitic dolomite	2-5
			RAT 2			Roches Argilleuses Talceuse	190
		R1	RAT 1			Roches Argilleuses Talceuse	40
			POUDINGUE			Unknown formation, transgression conglomerate	?

2 3 4

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  2 1
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3.1.2 Local Geology and Geological Models

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45 5
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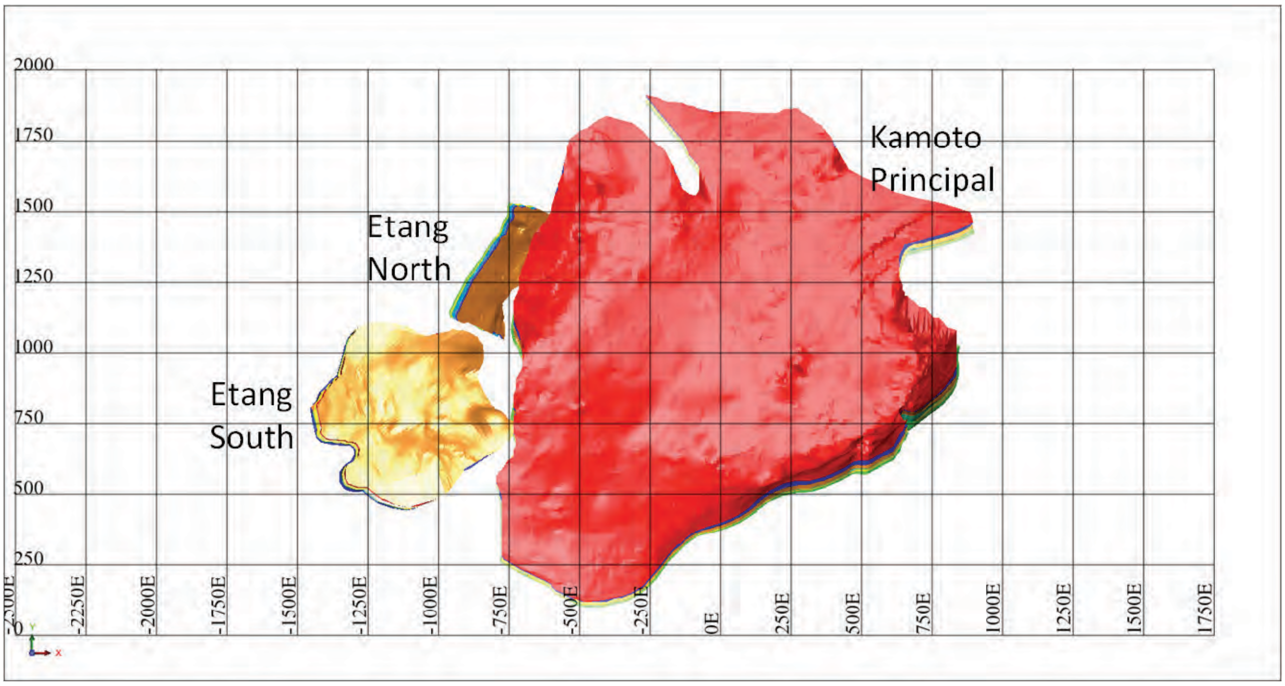

Figure 4 Plan view of TO Mine Resource Model

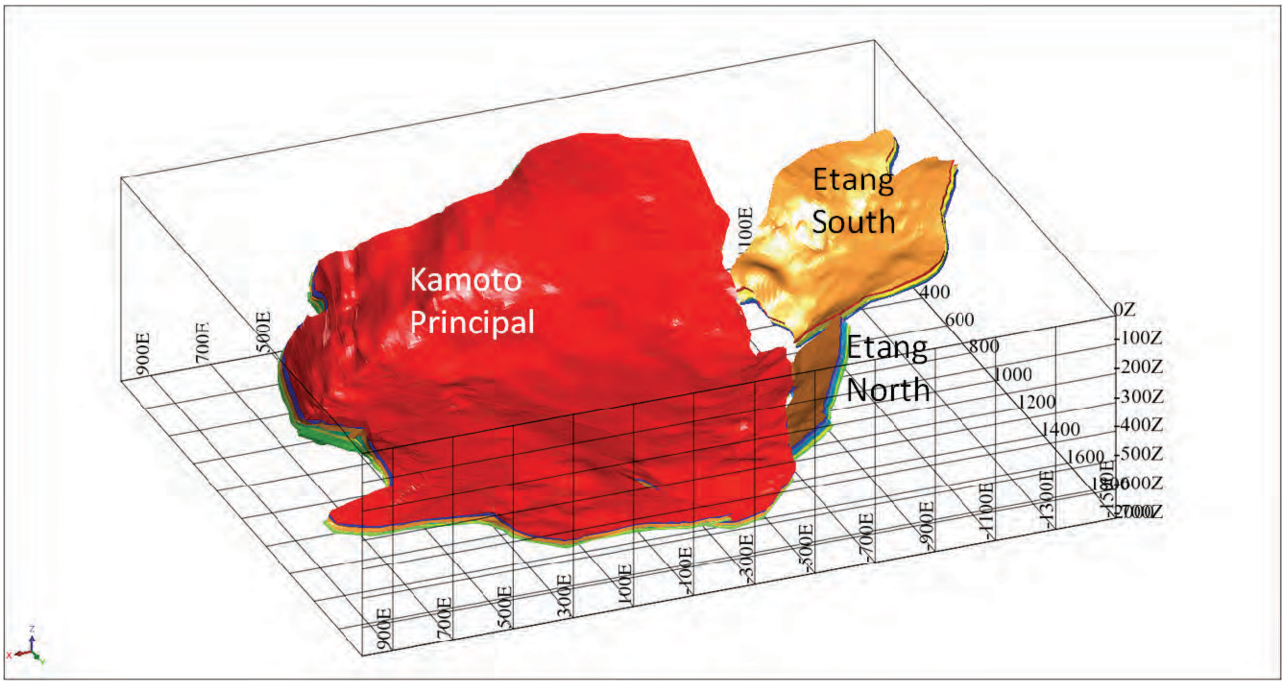

Figure 5 Obli ue view of TO Mine with Resource Model

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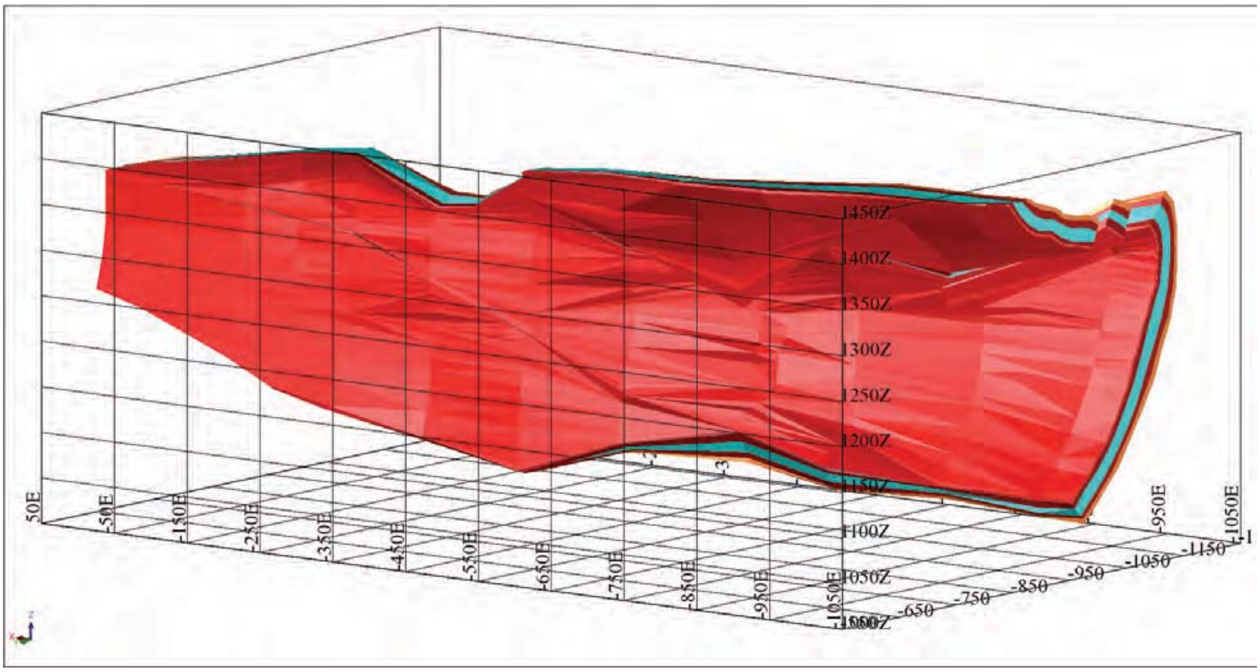

Figure 6 Obli ue view of T17 Open Pit Resource Model

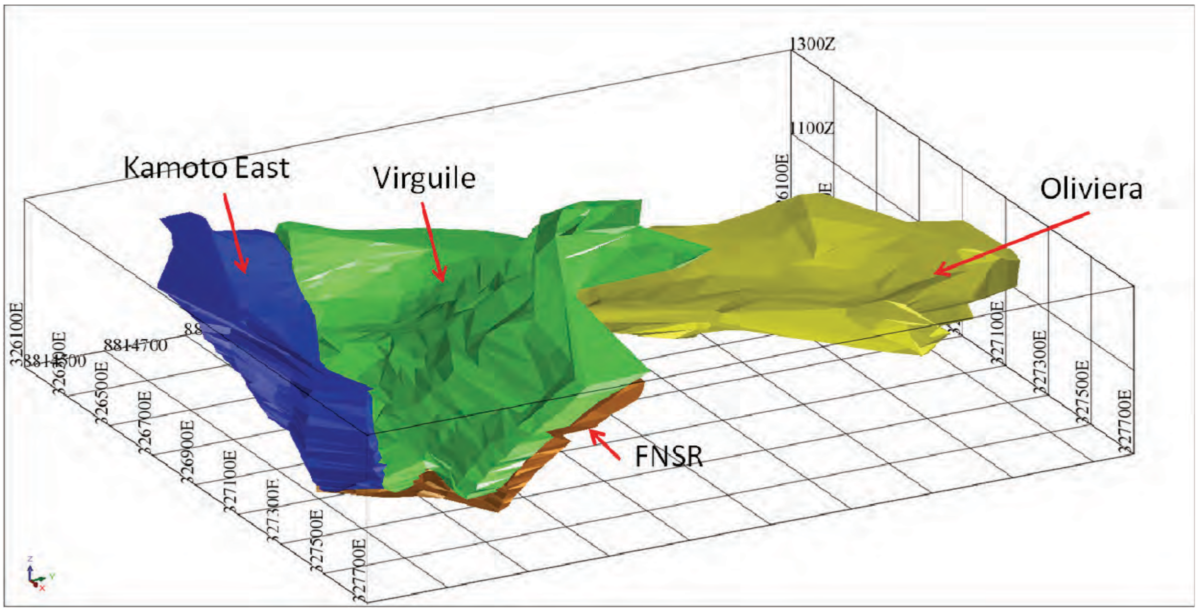

Figure 7 Obli ue view of OV Open Pit Resource Model

E

1 5 1
4 0 35 1

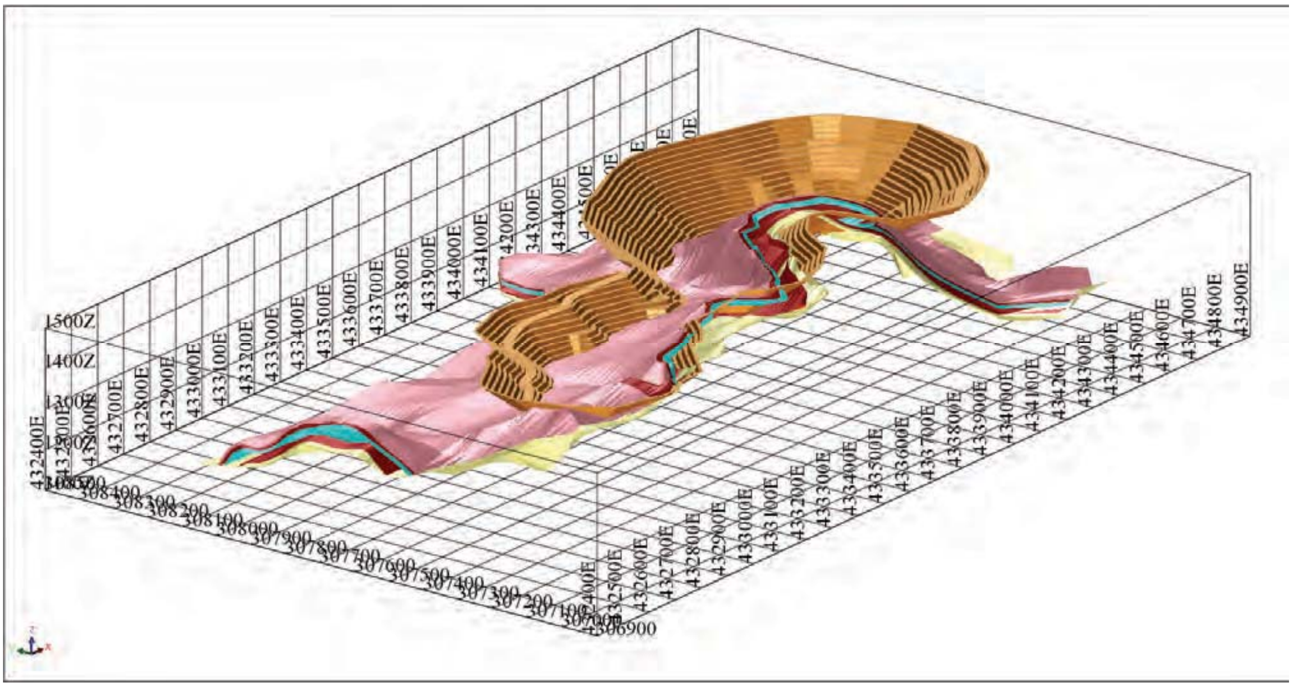

Figure 8 Obli ue view of Mashamba East Resource Model and Planned Pit Layout

10 20

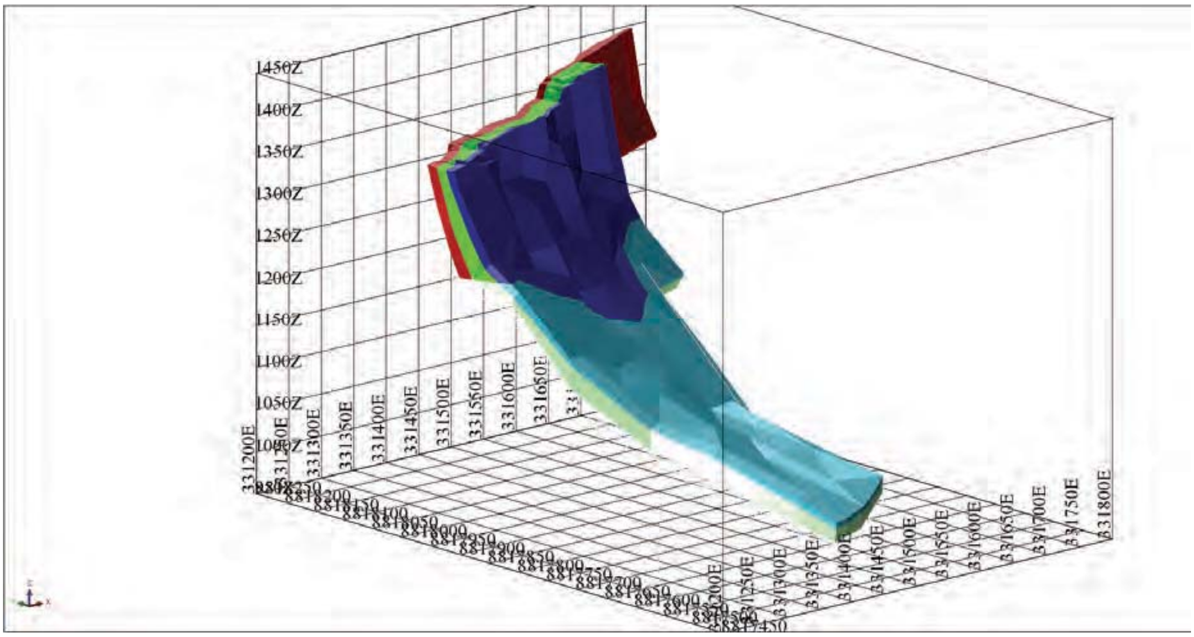

Figure 9 Obli ue view of the ananga Resource Model

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45

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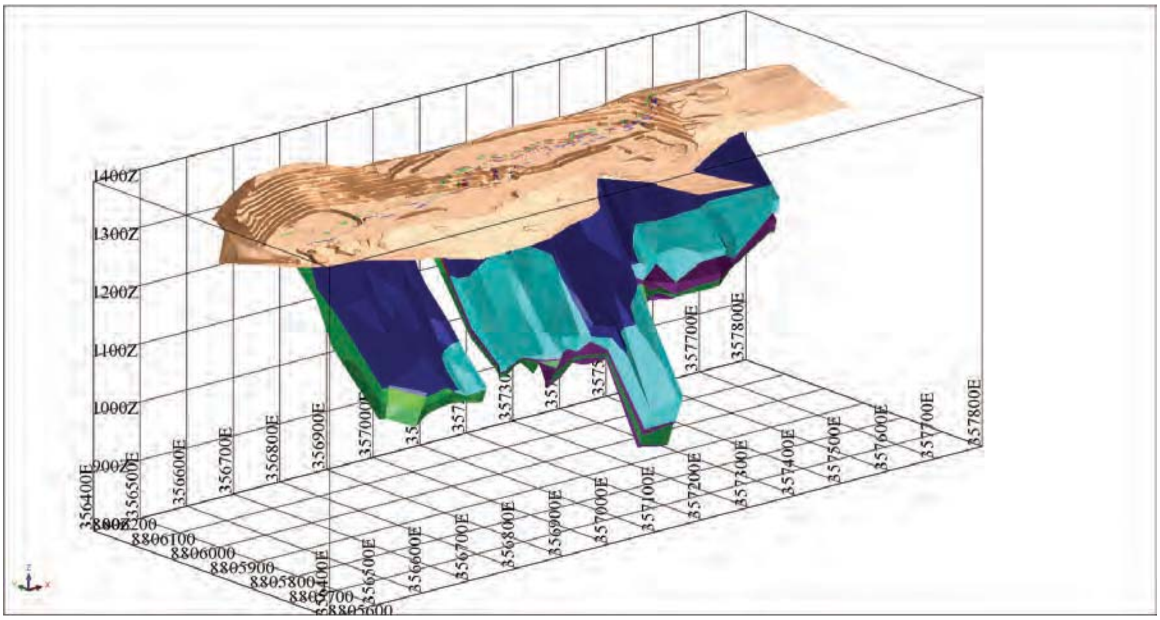

Figure 10 Obli ue view of Tilwezembe Pit with Resource Model and Pit Layout

3.1.3 Deposit types

3.1.4 Mineralisation

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3.2 Mineral Resource Estimation Methodology

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3.2.1 Exploration and Data

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KTO Mine

3 1 52 1 1
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1 2 2002 400

10 10 200 2010

200

T17 Open Pit

1 3 2
1 3 1 54 011 1 1
100 100 50 50

20 200 2010
4 2
1 0

2

10
1
5

Table 5: Summary of 2010 drill data for T-17

	Hole_id	Depth	OBS	RSC	OBI	%Cu	%Co
1	1 001	113 4	34 53 5	1 10	53 5 1 0	3 25	0 31
	1 002	13	45 0	110 2 12 55	0 110 2	3 1	0 11
	1 003	4	1 1 32	1 3 3	32 0 1 3	2 0	0 25
	1 004		1 2 14 3	5 1 4	14 3 5 1	2 2	0 5
	1 005	11	34 3 50	50 11		3 0	0 31
	1 00	200	4 10	1 2 1 4	10 1 2	3	0 3
	1 00	125 3					
	1 00			44 4 5	12 44	2 43	0 4
	1 00	5	3 32	32 1 2	1 2 5	2 55	0 2
	1 010	151	23 1 3 1	3 1 5	5 3 5	3 2	0 54

KOV Open Pit

1 40

1 0

1 0 100

100

214 100

100 5 33 1

2010 10 34 1

200 5

Table 6: Summary of 2010 drill data for Kamoto East

	Hole_id	Depth	OBS	RSC	OBI	%Cu	%Co
	0 01	31	20 4 225 0	225 243 0	243 24	4 4	0 32
	0 02	250 5					
	0 03	31 1	221 23	23 252	252 2 3 1	1	0 31
	0 04	325	21 13 23 4	23 4 252	252 2 4 14	4 22	0 22
	0 1	430	353 42 1			2 2	1
	0 1	442	3 4 2 422	422 440 25	440 25 441	5 23	0
	0 1	500	413 455	455 4 2 5	4 2 5 4 1	3	0 1
	0 20	241					
	0 21	402 3					
	0 22	231	3 41 4	41 4 431		4 42	0 32
		34 1 4				4 4	0 3

11 1 5 1 2

Table 7: Summary of 2010 drill data for Virgule

	Hole_id	Depth	OBS	RSC	OBI	%Cu	%Co
	0 05	140	2 101 2	101 2 11 5	11 5 135 1	5 1	0 22
	0 0	312					
	0 0	5					
	0 0	100 5			55 1 2 4	1 45	0 0
	0 0				0 1 4	3 55	0 0
	0 10	0			55 2 1	3 1	0 23
	0 11	122 5		2 4 101	101 11	3 42	0 34
	0 12	1 0 5	10 5 125	125 144	144 15	5	0 14
	0 14	0 2	34 40 1	40 1 5	5 4	2 2	0 0
	0 15	100 5		4 4	5 100 2	5	0 12
	0 1	30	2 3 3 24 4	24 4 2 4	2 4 2 1	3 3	0 4
		15 5				3 2	0 1 1

Mashamba East Open Pit

100 100
122
20 4 4 1 1

Kananga Mine

52

Tilwezembe Open Pit

25 100 50
15

A

Historical Sampling

1 100

42
42 2 3
42

-
-
-
-
- 30

Current Sampling

■

■

D

Table 8: Historical Core Recoveries per Area

Area	Average Core Recovery (%)
	5
1	3
	42
	1
	0

1
1 2
1

■

■

A

Historical Sample Preparation and Analyses

50

0 5
2 5

Recent Sample Preparation and Analyses

■

■

■ 250

■ 5

5

Current Sample Preparation and Analyses

20 5
250 50µ

3.2.2 Data Verification

3

A *A*

A

5

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3.2.3 Exploratory Data Analysis

11

Table 9: Statistical Analysis of Kamoto Principal

Lithology	Variable	No Samples	Minimum	Maximum	Mean	Std. dev
	%TCu	42	0 11	5	4 0	1 4
		404	0 14	22	4	1
		241	0 1	2 4	5	3
		1 5	0 24	1 3	5	3 53
1		32	0 4	22 4	5	2 1
	%TCo	3 3	0 01	24	0 3	0 44
		3	0 01	3 15	0 3	0 2
		224	0 03	5	0 51	0
		15	0 01	4 3	0 3	0 5
1		30	0 01	4	0 3	0 51

Table 10: Statistical Analysis of Etang South

Lithology	Variable	No Samples	Minimum	Maximum	Mean	Std. dev
			0 3	2	2	1 33
		103	0 2	1 1	3 44	1 44
		50	0 1	12 05	2	2 35
		3	0 25	12	2 4	1
1		155	0 15	13 2	5 2	2
		1	0 0	1 1	0 5	1 4
		104	0 1	2 55	0	0 42
		4	0 22	5 4	1 22	1 0
		40	0 1	2	0	0 1
1		154	0 0	3	1 04	0 4

Table 11: Statistical Analysis of Etang North

Lithology	Variable	No Samples	Minimum	Maximum	Mean	Std. dev
		2	0 5	3 3	2 03	0
		23	0 5	5 15	3 02	1 15
	%TCu	1	0	12	3 5	2
			0	3	3 54	2 54
1		45	0 22	0	3 3	1 4
		23	0 12	0 4	0 42	0 1
		1	0 0	0	0 42	0 2
	%TCo	12	0 31	2 32	1 14	0 5
			0 5	2 52	1 24	0 5
1		31	0 32	2 3	0 2	0 54

2 5

12

Table 12: Statistical Analysis of T17 Open Pit

Lithology	Variable	No. Samples	Minimum	Maximum	Mean	Std. dev	CoV
		3	0 10	15	**4.18**	3 3	0 0
		202	0 10	15	**5.14**	4 04	0
		202	0 00	1 20	**1.65**	2 4	1 2
		135	0 15	10 2	**2.94**	2 4	0 4
		101	0 2	5	**3.93**	2 0	0
		3	0 00	40	**0.51**	0	1 3
		202	0 00	40	**0.78**	1 0	1 3
		202	0 00	4 0	**0.44**	0 1	1 4
		135	0 0	0	**0.99**	1 1	1 20
		101	0 0	4 0	**0.39**	0 4	1 24

2 5

13

1

Table 13: Statistical Analysis of KOV Open Pit; Virgule

Lithology	Variable	No Samples	Minimum	Maximum	Mean	Std dev
			0 10	12 00	3 54	3 10
		112	0 00	3 2	0 4	0
		2	0 02	12 2	5	3 0
		3 1	0 00	11 50	0 4	0 4
		3 4	0 0	23 14	4 3	3 4
		5	0 00	5 00	0 21	0 40
		1 1	0 14	12 00	20	3 03
		244	0 00	2 25	0 1	0 32
		103	0 50	12 00	43	2 41
		12	0 00	1 52	0 22	0 31
		4	0 0	14 35	3	3 42
		103	0 00	0	0 0	0 1

Table 14: Statistical Analysis of KOV Open Pit; Oliviera

Lithology	Variable	No Samples	Minimum	Maximum	Mean	Std dev
		2	0 15		2 05	1
		0	0 00	2 25	0 41	0 42
		250	0 10	13	5 5	2 4
		23	0 00	3	0 3	0 0
		2	0 10	1 5	4 2	3 1
		512	0 00	4 5	0 2	0 55
		120	0 40	14	5 40	3 1
		111	0 00	2 0	0 3	0 4
		3	0 1	12 00	4 2	2 31
		1	0 00	1 1	0 32	0 33
		43	0 0	1 41	4 0	2
		0	0 00	1 24	0 23	0 33

Table 15: Statistical Analysis of KOV Open Pit; FNSR

Lithology	Variable	No Samples	Minimum	Maximum	Mean	Std dev
			0 53	12 00	5 24	3 41
		11	0 00	2 5	0	0
		1	1 11	12 00	3	3 1
			0 00	15	0 42	0
			0 15	12 00	5 2	4 2
		110	0 00	1	0 1	0 2
		25	1	12 4	5	2 40
		25	0 02	0 4	0 1	0 13
			4 30		1	1 4
			0 00	0 1	0 04	0 05
		2	4 0	02	04	1
		2	0 02	0 0	0 04	0 02

Table 16: Statistical Analysis of KOV Open Pit; Kamoto East

Lithology	Variable	No Samples	Minimum	Maximum	Mean	Std dev
		2	0 1	13 22	1	3 31
		43	0 00	4	0 1	0
		133	0 0	14 3	32	3 34
		1 3	0 00	4 3	0 41	0 5
		20	0 11	1 0	4 20	3 2
		2	0 00	2 52	0 22	0 2
			0 21	10 4	5 0	3 11
			0 00	1 50	0 2	0 30
		43	0 21	11 55	5 53	2
		0	0 00	1 40	0 21	0 2
		15	3 02	02	3	1 1
		25	0 00	0	0 13	0 1

E

2 5

1

Table 17: Statistical Analysis of Mashamba East Open Pit

Lithology	Geozone	Variable	No Samples	Minimum	Maximum	Mean	Std. dev	CV
			125	0 01	10 0	0 4	1 40	2 4
			125	0 01	0 44	0 0	0 11	1 20
				0 01	12 00	0 0	1	2 53
				0 01	1 0	0 14	0 23	1 5
			23	0 01	1 2	1 1	2 4	2 0
			23	0 01	4 14	0 3	0 1	1
			4	0 01	15	1 2	2 51	1 3
			4	0 01	2 3	0 33	0 4	1 42
			24	0 01	12 00	0 0	2 00	3 34
			24	0 00	2 01	0 0	0 23	3 24
			112	0 01	12 00	0	2 0	2
			112	0 01	0	0 04	0 0	2 31
			440	0 01	12 00	2 2	2 5	1 25
			440	0 00	2 0	0 3	0 54	1 4
			11	0 01	11 3	3 3	2	0
			11	0 00	1 2	0 14	0 22	1 5

1 25 25 1

Table 18: Statistical Analysis of Kananga Mine

Domain	Variable	No Samples	Minimum	Maximum	Mean	CV
		250	0 0	10 05	1 13	1 1
		52	0 02	0 4	0 1	0
		2	0 03	2	1 3	0
		122	0 01	1	1 3	0
		2	0 02	1	0 2	0
		234	0 13	5	2 1	0
		250	0 02	05	0 5	1 2
		52	0 01	0 2	0 12	0
		2	0 01	2	1 2	1 1
		122	0 01	1 1	0 15	1 2
		2	0 01	0 3	0 0	1
		234	0 01	2	0 22	1
		250	0 0	4 51	0 4	1 2
		52	0 02	2 3	0 2	0
		2	0 02	3 3	0	0
		122	0 01	4	0 4	1 1
		2	0 0	2 03	0 53	0

Domain	Variable	No Samples	Minimum	Maximum	Mean	CV
		234	0 02	3 4	1 05	0

1 25 25 1

Table 19: Statistical Analysis of Tilwezembe Open Pit

Domain	Variable	Samples	Minimum	Maximum	Mean	CV
		1054	0 01	2 5	1 2	1 1
		4 5	0 1	1 4	3	0
		4	0 05	4 2	0 5	1 05
		511	0 03	3	1 1	2 42
		33	0 02	21 3	3 2	0
		40	0 01	2	0 53	1 2
		1054	0 01	14 12	0 1	1 5
		4 5	0 05	14 2	3 1	0
		4	0 01	4	0 44	1 1
		511	0 01		0 24	2
		33	0 01	3 52	0 33	1 1
		40	0 01	1 0	0 13	1 21
		1054	0 01	11 15	0 5	1 4
		4 5	0 01	13 4	0	1 5
		4	0 01	3 1	0 2	1 02
		511	0 01	4	0 3	1 52
		33	0 03	4	1 1	1 01
		40	0 02	4	0 34	1 15

3.2.4 Variography Analysis

20

2

Table 20: KTO Mine: Omni-directional Variography Parameters

Lithology	DSTRAT		RSF		RSC		SDB		BOMZ	
Variable										
C0 Nugget Variance	0 01	0	0 031	0 003	0 043	0 004	0 124	0 005	0 042	0 021
C1 Variance	1 2	0 0	1	0 12	2 2	0 11	3 2	0 1	1 3	0 1
Range 1 XDirection		11	3 2	3 05	3	52		10	3	5 5
Range 1 YDirection		11	3 2	3 05	3	52		23	3	1 0
Range 1 ZDirection	5 4	4	3 2	5		2		4		11
C2 Variance	1 3	0 03	2 2	0 12	5 0	0 11	5 31	0 2	1 3	
Range 2 XDirection	30	14 5	30 1	1 4 05	52 1	0 5	4 3	31	2 2 1	
Range 2 YDirection	30	14 5	30 1	1 4 05	52 1	0 5	4 3	324 2	2 2 1	
Range 2 ZDirection	24 1	1 2	5	15 3	2 4	2	3	11 3	20 3	
C3 Variance	1 44		1 2				2 43			
Range 3 X Direction	324		2 1				1 2			
Range 3 YDirection	324		2 1				1 2			
Range 3 ZDirection	24 1		20 3				2 4			

Table 21: T17 Open Pit: Omni-directional Variography Parameters

Zone	Variable	C0 Nugget Variance	C1 Variance	Range	C2 Variance	Range2
DSTRAT		0 5135	1 5	232		
		0 035 5	0 044 1	3 2		
RSF		1 5	2 35	12 01	3 421	5 5 5
		0 0 55	0 14 4	321		
RSC		0 1042	1	1 33		
		0 00	0 24 5	1 0 3		
SDB		0 3 1	0 2 1	25 5		
		0 01 2	0 0553	1 4 02		
BOMZ		1 4	3 25	2 3 4		
		0 030	0 021 2	2 3 32		

Table 22: KOV Open Pit: Omni-directional Variography Parameters for Virgule

Lithology	Variable	C0 Nugget Variance	C1 Variance	Range
		1 5	3 3	30 3
		0 03	0 0	204 1
		4	3	3 0 12
		0 05	0 13	204 0
		5	3 44	20
		0 0	0 0	2
		2 44	0	245
		0 00	0 01	21 35
		3 0	2 51	243
		0 01	0 01	31 03

Table 23: KOV Open Pit: Omni-directional Variography Parameters for Oliviera

Lithology	Variable	C0 Nugget Variance	C1 Variance	Range
			2	2 22
		0 04	0 0	2 4 5
		3 15	1 1	303 40
		0 01	0 03	1 2 5
		3 1	1 5	2 1
		0 03	0 01	221 5
		1 01	2 0	2 5 0
		0 00	0 02	1
		0 2	1 12	350 2
		0 02	0 0	253 1

Table 24: Mashamba East Open Pit: Omni-directional Variography Parameters

Lithology	Variable	C0 Nugget Variance	C1 Variance	Range
		1 43	1 425	15
RSF		0 0415	0 0 53	332 5
		1 00	0 15	210
RSC		0 0 3	0 03 45	25 14
		1 235	1 5 4	21
SDB		0 050 3	0 1141	2 1 4
		0 1 0	2 31	353
BOMZ		0 021 3	0 0312	4 4

Table 25: Tilwezembe Open Pit: Variogram Parameters for Manganiferous Dolomites

Variable (%)	C0 Nugget Variance	Structure 1				Structure 2				Direction (Major, Semi-major, Minor)
		C1 Variance	Range Dir 1 (m)	Range Dir 2 (m)	Range Dir 3 (m)	C2 Variance	Range Dir 1 (m)	Range Dir 2 (m)	Range Dir 3 (m)	
	0 05	0 52	40	20		0 43	1 0	0	14	0 1 0 40
	0 04	0 5	40	15	12	0 3	130	0	12	0 1 0 40
	0 05	0 3	30	10		0 32	1 0	0	12	0 1 0 40

Table 26: Tilwezembe Open Pit: Variogram Parameters for Breccia

Variable (%)	C0 Nugget Variance	Structure 1				Structure 2				Direction (Major, Semi-major, Minor)
		C1 Variance	Range Dir 1 (m)	Range Dir 2 (m)	Range Dir 3 (m)	C2 Variance	Range Dir 1 (m)	Range Dir 2 (m)	Range Dir 3 (m)	
	0 12	0 13	20	0	10	0 5	1 0	0	10	0 1 0 0
	0 11	0 22	40	10	3	0 1	40	100	12	0 1 0 0
	0 22	0 4	30	50		0 3	1 0	50		0 1 0 0

Table 27: Tilwezembe Open Pit: Variogram Parameters for Tillites and Argillites

Variable (%)	C0 Nugget Variance	Structure 1				Structure 2				Direction Major, Semi-major, Minor)
		C1 Variance	Range Dir 1 (m)	Range Dir 2 (m)	Range Dir 3 (m)	C2 Variance	Range Dir 1 (m)	Range Dir 2 (m)	Range Dir 3 (m)	
	0 15	0 4	110	0	15	0 44	125	110	15	0 1 0 45
	0 0	0 1	1 0	50	2	0 3	1 0	50	20	0 1 0 45
	0 12	0 53	35	0	12	0 3	1 0	0	12	0 1 0 45

Table 28: Kananga Mine: Variogram Parameters for Upper Orebody

Variable (%)	C0 Nugget Variance	Structure 1				Structure 2				Direction (Major, Semi-major, Minor)
		C1 Variance	Range Dir 1 (m)	Range Dir 2 (m)	Range Dir 3 (m)	C2 Variance	Range Dir 1 (m)	Range Dir 2 (m)	Range Dir 3 (m)	
	0 1	0 2	0	0	11	0 3	300	0	11	5 155 40
	0 0	0 1	50	20		0 33	300	0		55 145 35
	0 23	0 2	0	10		0 4	1 0	140		55 145 35

Table 29: Kananga Mine: Variogram Parameters for Internal/Middle Zone

Variable (%)	C0 Nugget Variance	Structure 1				Structure 2				Direction (Major, Semi-major, Minor)
		C1 Variance	Range Dir 1 (m)	Range Dir 2 (m)	Range Dir 3 (m)	C2 Variance	Range Dir 1 (m)	Range Dir 2 (m)	Range Dir 3 (m)	
	0 12	0 41	50	20	10	0 4	4 0	230	25	5 155 40
	0 02	0 4	0	50	11	0 51	340	2 0	2	55 145 35
	0 05	0 53	50	130	13	0 41	3 0	130	13	55 145 35

3.2.5 Estimation Parameters

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D *A* *D*

15

15

Table 30: GCM criteria for assigning density values

Definition and Criterion	Density, t/m^3
Siliceous= (%TCu/%CaO) >=15	
1 2	2 0
2 0 0 5	2 2
1 2 1	2 2
2 0 0 5	2 4
Dolomitic = (%TCu/%CaO) <15	
1 2	2 4
2 0 0 5	2 4
2 0 0 5 0 5	2 4
2 0 0 5 0 5	2

2 0 3

2 4 3

200

KTO Mine

Table 31: KTO Mine: Density Determinations on Various Lithologies

Stratigraphic Unit	Number of samples	Minimum t/m³	Maximum t/m³	Average t/m³	Stratigraphic Unit
1		2	2 0	2 0	1
		2 4	2 2	2	
		2 51	2	2	
		2 5	3 03	2 1	
	5	2	3 02	2 1	
	3	2 4	2	2 0	
	3	2 3	2 5	2	

2 ^{3}

T17 Open Pit

1

Table 32: T17 Open Pit: Density Determinations on Various Lithologies

Stratigraphic Unit	Number of samples	Minimum t/m³	Maximum t/m³	Average t/m³
		2 10	2	2 3
	1	2 0	2 0	2 0
		2 10	2	2 3
	5	2 21	2 3	2 34
		2 0	2 51	2 32
	5	1	2 40	2 13

1305

2 4

1 2 4

1 2 2 3
2 4 3

KOV Open Pit

2 2 3

Mashamba East Open Pit

Table 33: Mashamba East Open Pit: Density Determinations on Various Lithologies

Stratigraphic Unit	Number of samples	Minimum t/m^3	Maximum t/m^3	Average t/m^3
	1	2 34	2	2 52
	10	2 40	2 1	2 51
	5	2 2	2 50	2 3

2 2 3 2 4 3

Kananga Mine

Table 34: Kananga Mine: Density Determinations on Various Lithologies

Domain	Declustered mean
	1
	1
	2
	2 1
	2
	2 1

Tilwezembe Open Pit

100 200

5
25 25 1

Table 35: Tilwezembe Open Pit: Density Determinations on Various Lithologies

Domain	Bottom Cut	Top Cut	Percentage cut	Declustered mean (before cut)	Declustered mean (after cuts)
	1 1	3	5	2 04	1
		2	4	1	1 1
		3	5	2 0	1
		2	3	2 2	2 2
	1 5	2	3	2 23	2 24
	1	2 5	3	2 1	2 1

Summary

Table 36: Kananga Mine: Density Determinations on Various Lithologies

Project Area	Mineralized Zone	Density, t/m³
T17 Open Pit		2 2
		2 4
Tilwezembe Open Pit		1
		1 1
		1
		2 2
		2 24
		2 1
KTO Mine		2
Kananga Mine		1
		1
		2
		2 1
		2 0
		2 1
KOV Open Pit		2 2
Mashamba East Open Pit		2 2
		2 4

3.2.6 Mineral Resource Classification

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The classification of the resources is considered to be conservative

200

3.2.7 Mineral Resource Statement

3 31
2010 31 2010

Table 37: KCC: Consolidated Mineral Resources as at 31 December 2010

Classification	Project Area	Mt	%TCu	%TCo
		30	4 54	0 54
		30	4 54	0 54
		35	4	0
		5 0	1 0	0 3
	1	5	2 5	0
		123	5 3	0 4
		4 1	1 1	0
		5	1	0
		25	3 5	0 45
		4	4 2	0 5
		5 0	1 0	0 3
	1	5	2 5	0
		123	5 3	0 4
		4 1	1 1	0
		5	1	0
		2 4	4 02	0 4
		10	5 11	0 5
		5 3	0	0 1
	1	15 3	1 1	0 1
		1 2	3 5	0 32
		4 0	2 00	0
		13	1 5	0 0
		1 0 2	2 32	0 32

1
2004

4

5

4.0 DESCRIPTION OF RESERVES

4.1 Overview of Mining Operations

2010

1

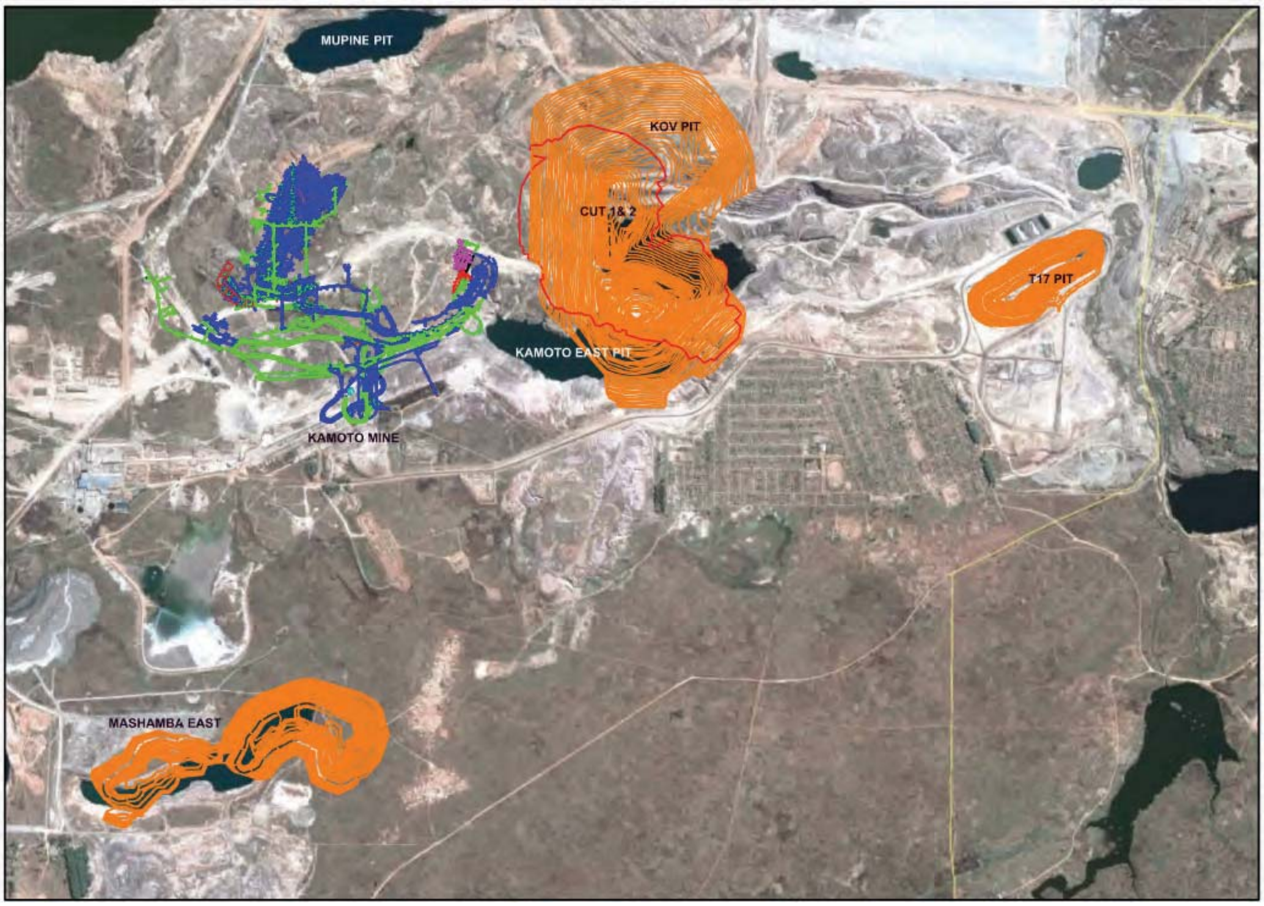

Figure 11 Relative Location of CC Mining Assets

1

0 5 200 1 1
3 200 1 3 3 2010
2 2 4

200
3
3 5

4 13

0 50

10

201

1

30

20 5 4 4 2 4
202

3 0

201
201

1 13
2 1 1
1 1 2 0 30

1 4

1
231

2015 201
1

1

1
2012 2 0 2 53
2010 0 30
10 5
1 4 2011 2012
2 2012

0 4 21
2010 1 2 3 4
1 0
5 4 1 3 1
2030
55 4

12
2 1
5
0 3

5 3 0

10

310 000 4
202 50

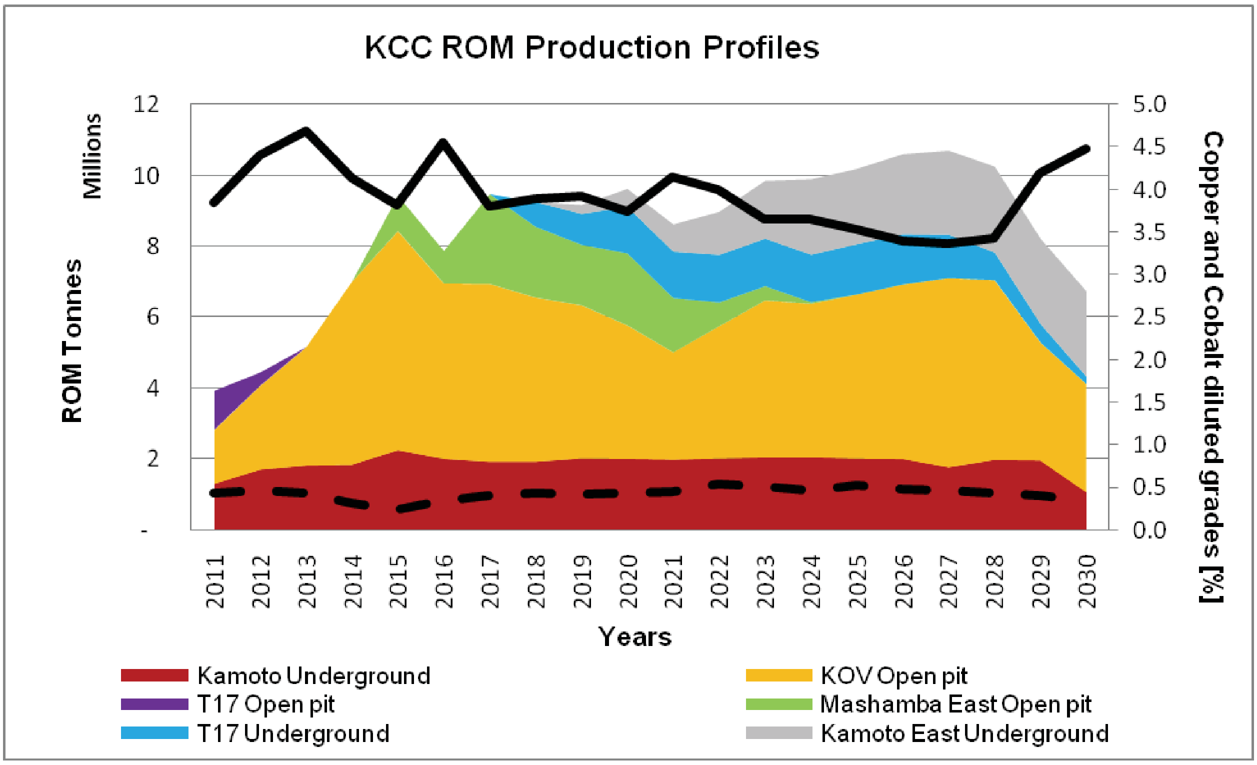

Figure 12 CC ROM Production Profile

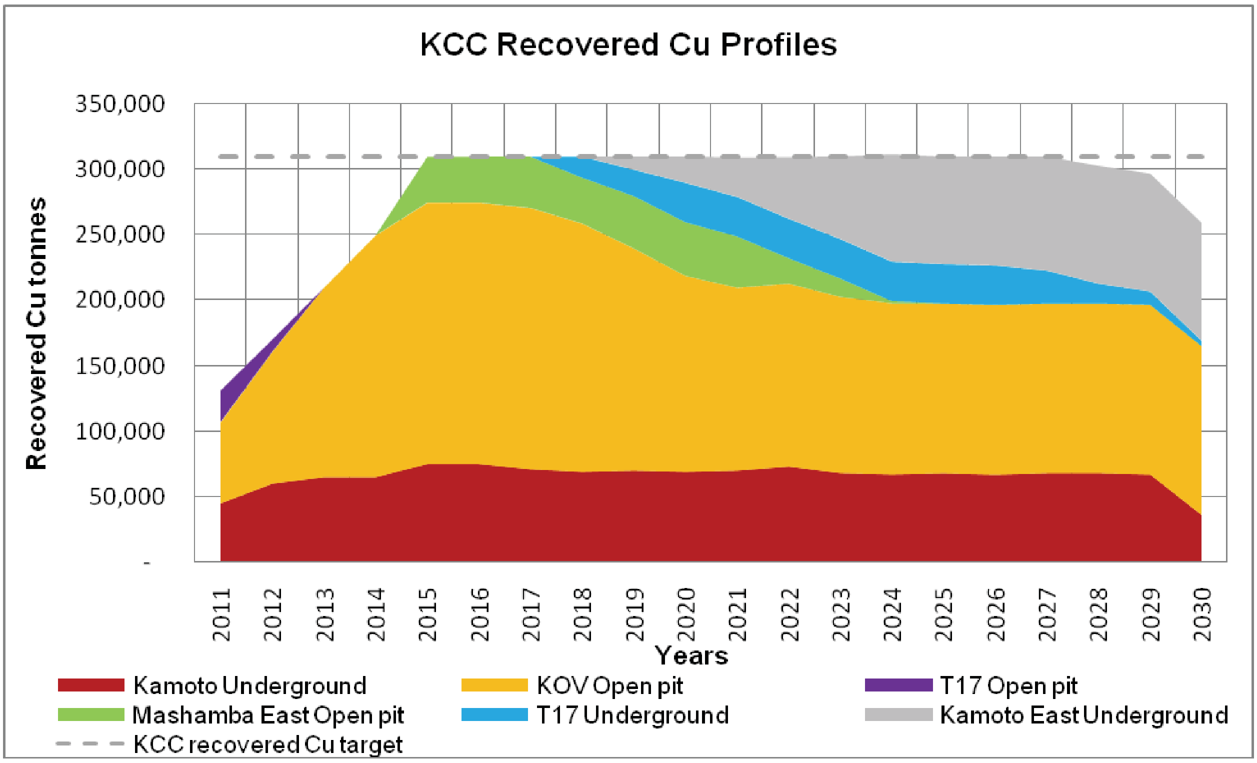

Figure 1 CC Recovered Copper Production Profile

4 2 14

Table 38: Mineral Reserve Estimate

Mining operation	Proved			Probable			Total		
	Tonne (*000)	% TCu	% TCo	Tonne (*000)	% TCu	% TCo	Tonne (*000)	% TCu	% TCo
KTO	14 5	3 4	0 51	1 400	3 0	0 53	33	3 0	0 52
T-17 Open Pit				1 4 0	2 1	0 4	1 4 0	2 1	0 4
Mashamba East Open Pit				5 14	3 00	0 3	5 14	3 00	0 3
KOV Open Pit				55	4 3	0 45	55	4 3	0 45
Total	**14 589**	**3.47**	**0.51**	**82 450**	**4.33**	**0.46**	**97 039**	**4.20**	**0.47**

31 200

4.2 Underground Mining Operations and Projects

200 200
200
200

4.2.1 KTO Mine

14

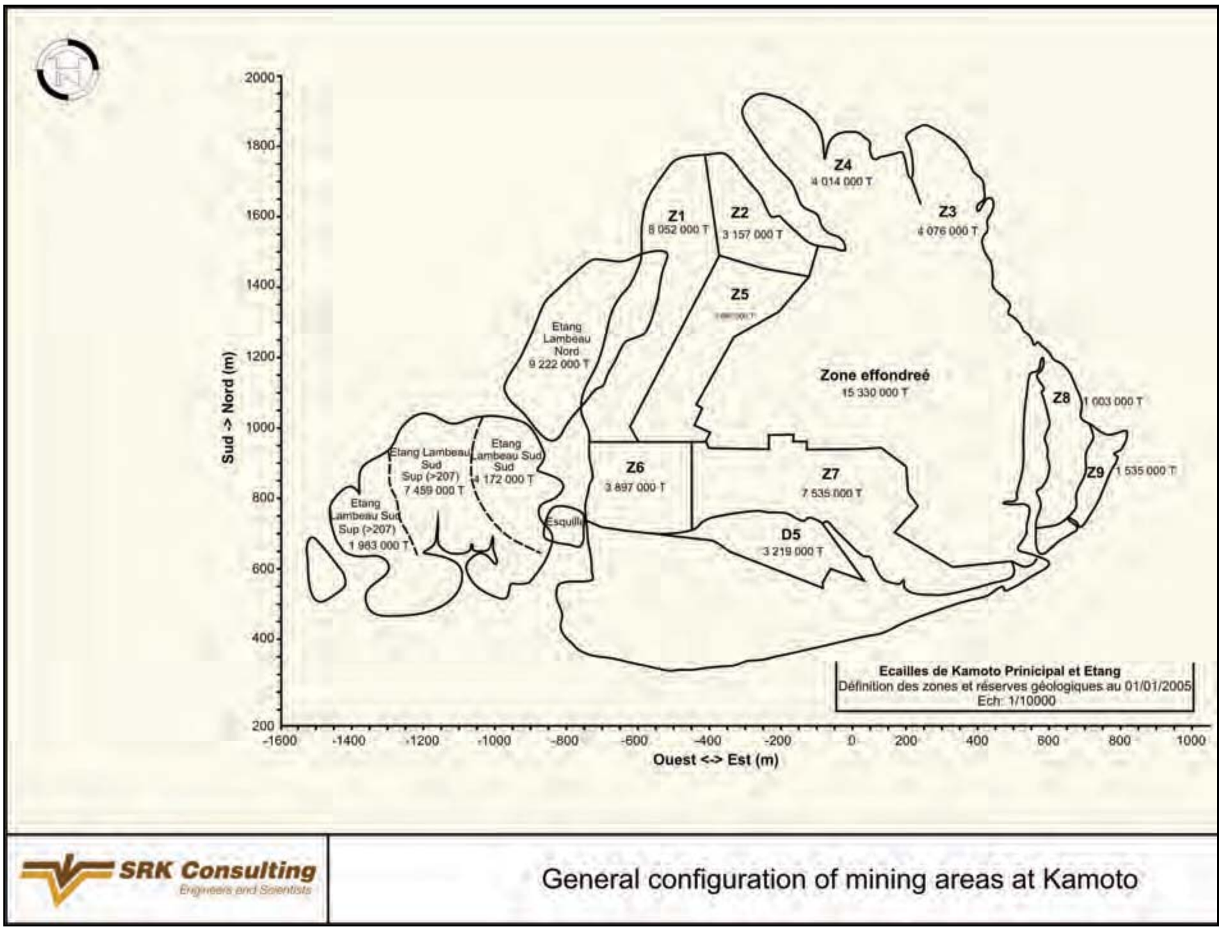

Figure 14 General Configuration of Mining Areas at TO

200

Table 39: Summary of Proposed Mining Methods

Zone	Geometry	SRK 2008 Feasibility Study
Z1 Bottom and Top OBS and OBI		
Z2 OBS and OBI		
Z3 & Z4 OBS		
Z3 & Z4 OBI		
Z5 OBS		
Z5 OBI		
Z6 OBI		
Z7 OBI		
Z8 OBS		
Z8 OBI		
Z9 OBS		
Z9 OBI		
Etang OBS & OBI		
Etang North OBS & OBI		
Etang Middle & Bottom OBS & OBI		

D *A*

- 3 4
- 0 12 13 55
  5 45
-
-
- 1
  5 15
-
-

A

- 5 25 1 5
- 12 5 112 5 5
- 12 5 15

A

15

12 55
5

■

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■

■

■ 1

■

■

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■

1 0

Table 40: Life of Mine Backfill Requirement

ZONE	% backfill	Backfill factor	Backfill solids (kt)
Z1 Btm OBI & OBS CAF	0	0	1 1
Z1 Top OBI & OBS CAF	0	0	1 35
Z2 CAF	0	0	1 022
Z3&4 OBS RAP	0	0 5	4
Z3&4 OBI LHRS	0	0	1 1
Z5 OBS RAP	0	0 5	201
Z5 OBI RAP	0	0 5	0
Z6 OBI CAF	0	0	53
Z7 SLC	0	0	0
Z8 OBI RAP	0	0 5	1 5
Z8 OBS RAP	0	0 5	11
Z9 OBS SLC	0	0	0
Z9 OBI SLC	0	0	0
ETANG CAF	0	0	3
			2 4

Table 41: KTO LOM Production Schedule

KTO	Unit	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Ore		1 30	1 0	1 23	1 4	2 25	2 011	1 2	1 30	2 02	2 015
Cu grade		3 0	3	3 4	3	3	4 12	4 0	3 5	3 2	3
Co grade		0 4	0 5	0 5	0 5	0 5	0 5	0 5	0 5	0 54	0 52
Waste Dev.		5	5 5	4	3	3	3 2	3 2	3 0	3 0	2
Cu content		50		2	2	3	3				
Co content			10	11	11	13	11	11	11	11	11

KTO	Unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
Ore		1 0	2 022	2 050	2 05	2 021	2 00	1 5	1 3	1	1 0	**37 795**
Cu grade		3	3	3	3 1	3 1	3	4 1	3 0	3	3 2	**3.85**
Co grade		0 51	0 55	0 5	0 55	0 2	0 53	0 4	0 4	0 50	0 4	**0.54**
Waste Dev.		2	2	2	2 4	2 3	2 2	2 2	2 0	1 5	0	**61**
Cu content			1	5	4	5	4	4	5	4	40	**1 454**
Co content		10	11	12	11	13	11			10	5	**206**

2 0
20
3 3 5

4.2.2 T-17 Underground Mine

1 1 300
130 1

200

1

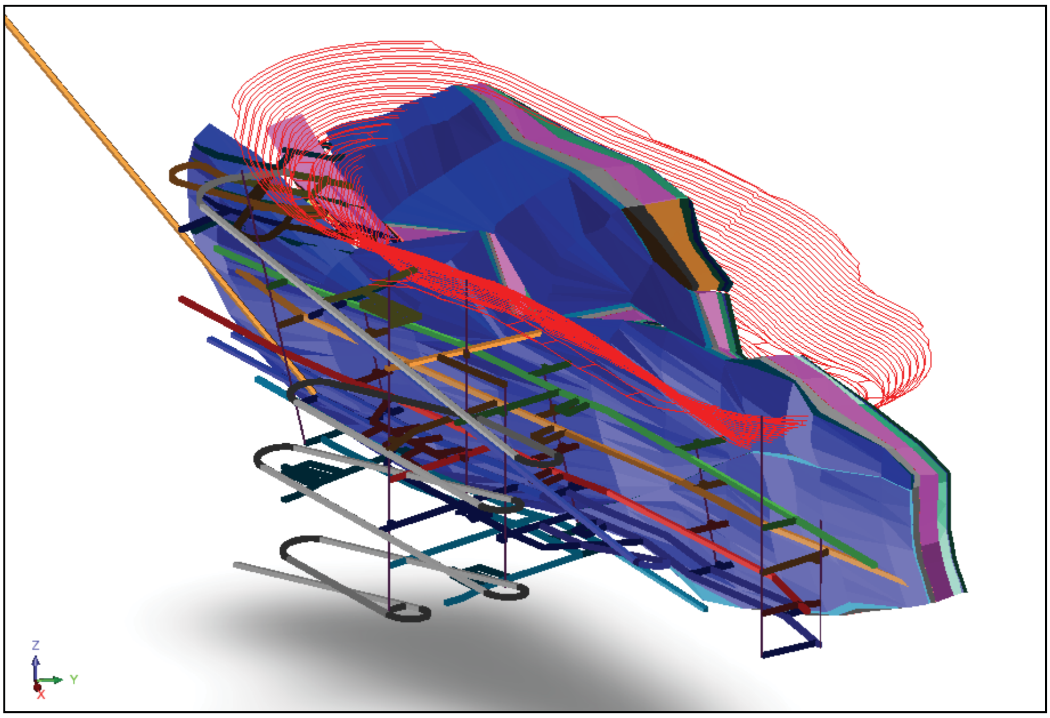

Figure 15 Conceptual Design of T-17 Underground

1

Table 42: T-17 Underground LOM Production Schedule

T-17 Underground	Unit	2015	2016	2017	2018	2019	2020	2021	2022	2023
Ore						2	1 30	1 30	1 33	1 33
Ore Dev.					1 3	1	2 4	2 4	2 5	2 5
Waste Dev.		1 0	2 0	2 5	2 5	2 5	2 5	2 5	2 0	1 5
Cu grade					2	2	2	2	2 4	2 4
Co grade					0 53	0 53	0 53	0 53	0 2	0 2
Cu content					1	24	35	35	35	35
Co content					4	5				

T-17 Underground	Unit	2024	2025	2026	2027	2028	2029	2030	Total
Ore		1 33	1 412	1 412	1 220	4	51	20	**13 734**
Ore Dev.		2 5	2	2	2 3	1 4	1 0	0 4	**25.5**
Waste Dev.		1 0	1 0	1 0	0 5	0 5	0 5	0 3	**23.8**
Cu grade		2 4	2 5	2 5	2 41	2 2	2 2	2 2	**2.57**
Co grade		0 2	0 5	0 5	0	1 03	1 03	1 03	**0.69**
Cu content		35	35	35	2	1	12	5	**353**
Co content			11	11	11		5	2	**94**

2

1

4.2.3 Kamoto East Underground Mine (“KTE”)

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4 44 20 5 201 2030

2 4 202 2030

Table 43: KTE LOM Production Schedule

KTE	Unit	2016	2017	2018	2019	2020	2021	2022	2023
Ore					25	515	2	1 21	1 3
Ore Dev.					0	1 5	2 3	2	3
Waste Dev.		0	3 0	4 0	4 5	4 5	4 5	5 0	5 0
Cu grade					4 5	4 5	4 5	4 54	4 53
Co grade					0 2	0 2	0 2	0 25	0 24
Cu content					12	24	35	55	4
Co content					1	1	2	3	4

KTE	Unit	2024	2025	2026	2027	2028	2029	2030	Total
Ore		2 130	2 130	2 2 0	2 3	2 42	2 40	2 40	**20 528**
Ore Dev.		4	4	4 2	4 4	3	3	1 4	**38**
Waste Dev.		4 0	3 0	2	1 5	1 0	0 5	0 2	**44**
Cu grade		4 53	4 53	4 32	4 32	4 3	4 40	4 40	**4.44**
Co grade		0 24	0 24	0 24	0 24	0 23	0 21	0 24	**0.24**
Cu content					102	10	10	10	**912**
Co content		5	5	5			5		**49**

4 4

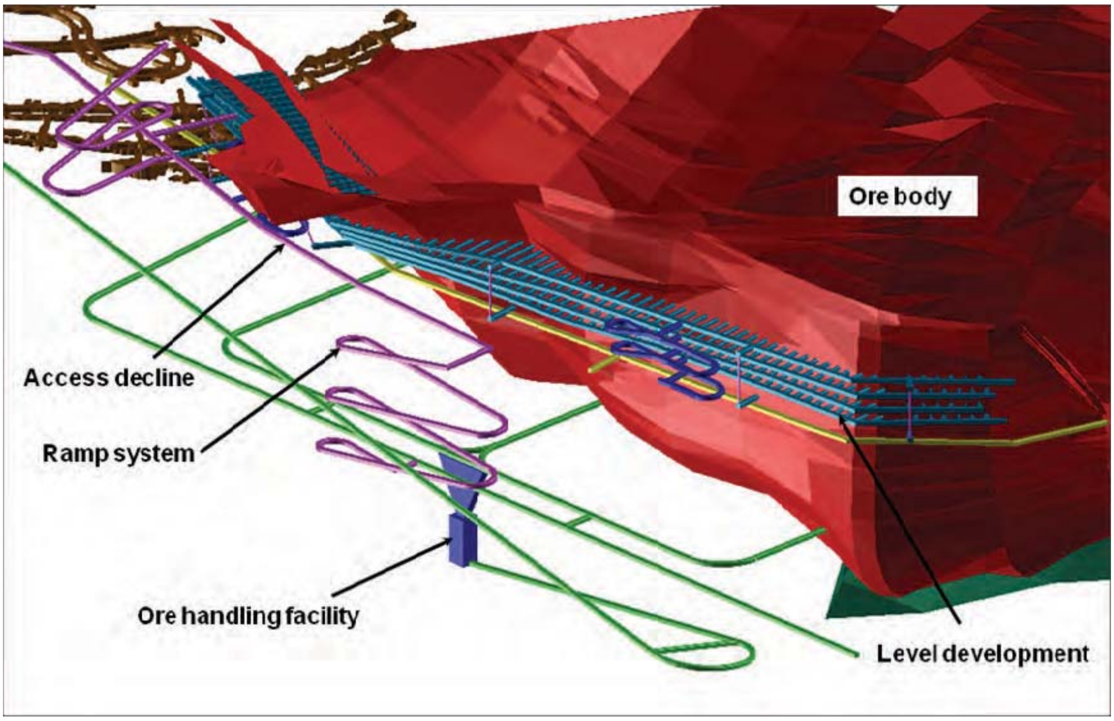

Figure 16 TE Conceptual Development Layout

4.2.4 Underground Mining Mineral Reserve Estimate

200

200 200 2010

Table 44: Underground Mining Mineral Reserve Estimate as at 31 December 2010

Mining operation	Proved			Probable		
	Tonnes (*000)	% T Cu	% T Co	Tonnes (*000)	% T Cu	% T Co
	14 5	3 4	0 51	1 400	3 0	0 53

4.3 Surface Mining Operations and Projects

4.3.1 LOM Planning Process

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Table 45: Selected SMU Dimensions per Open Pit

Mining Operation	Unit	SMU
1		5 5 5
		10 10 5
		10 10 5

Dilution

100

Mining loss

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D

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5 10

T-17 Open Pit

1

2012 2 0 2 53

2010 0 10

30 1 5

2011 2012 2

1

5 5

1 5 5 5

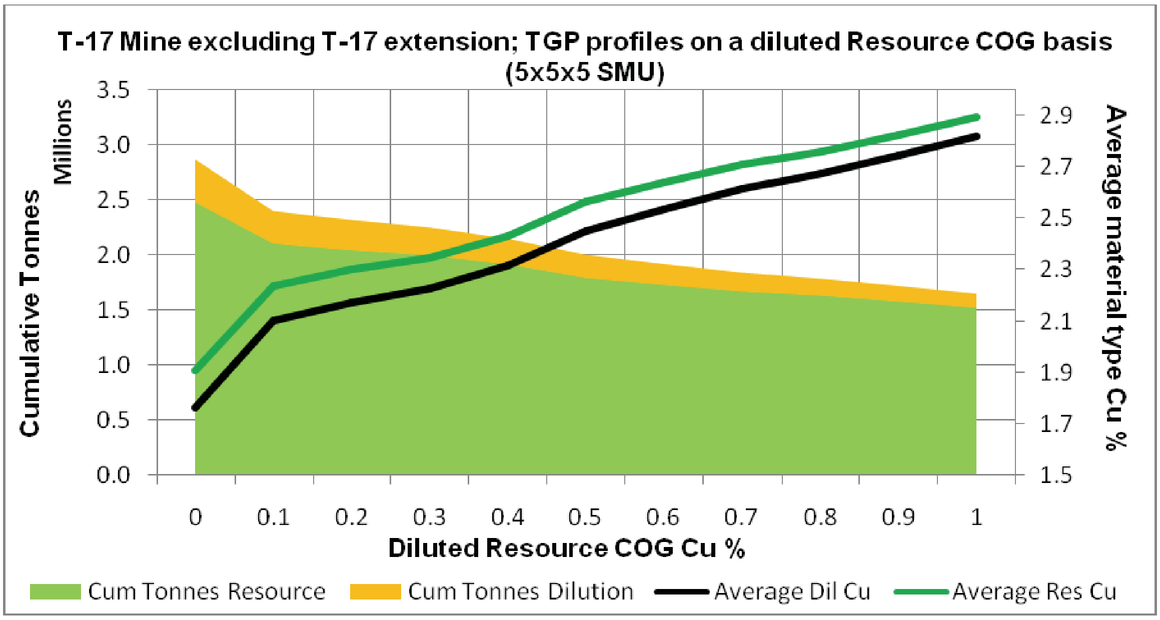

Figure 17 T-17 Open Pit Diluted Resource Tonnage and Grade Profile

0 30

10

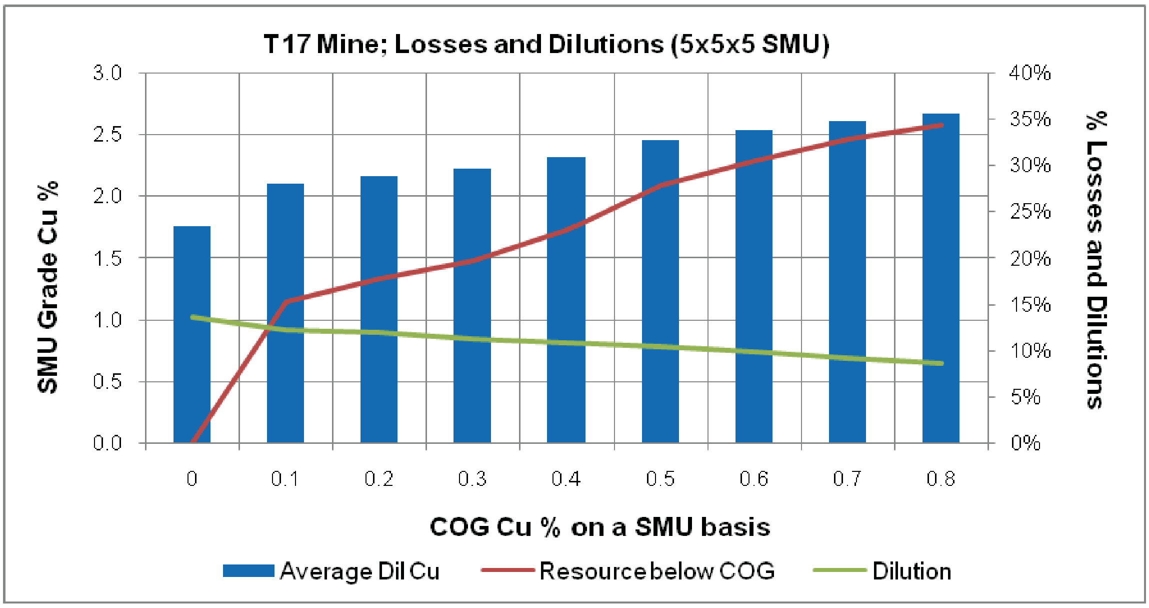

Figure 18 T-17 Open Pit In-pit Losses and Dilutions

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D

1

10 5

Figure 19 T-17 Open Pit

130 1 300

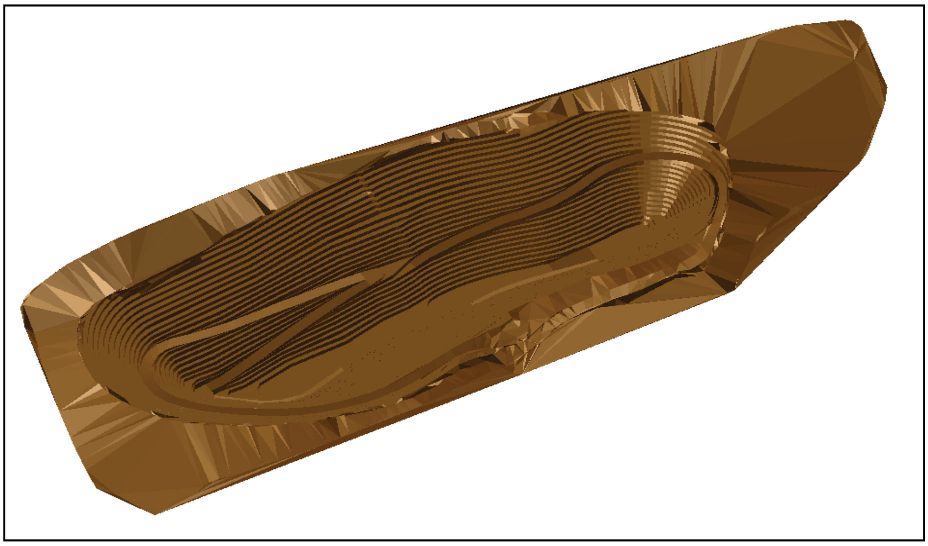

Figure 20 T-17 Open Pit Final Design

Table 46: T-17 Open Pit Design Criteria

Pit Design Criteria	Unit	T-17 Open Pit
		5 0
		4 3
		0
		1 0
		5 0 1 12

Table 47: Ore and Waste Contained in the T-17 Open Pit

Parameter	Unit	T-17 Open Pit
		1 4 4
		2 555
		4 025
		1
		0

1 1 1 2011
2012

Table 48: T-17 Open Pit LOM Production Profile (excl. East Extension)

Year	Unit	2011	2012	Total
Ore		1 100	3 0	**1 470**
Waste		2 2 1	2 5	**2 555**
Cu grade		2 5	2 3	**2.66**
Co grade		0 4	0 44	**0.45**
Cu content		2	11	**39**
Co content		5	1	**6**

1

KOV Open Pit

0 4 21
2010 1 0
4 14 3 2
2030

1 5

10 10 5

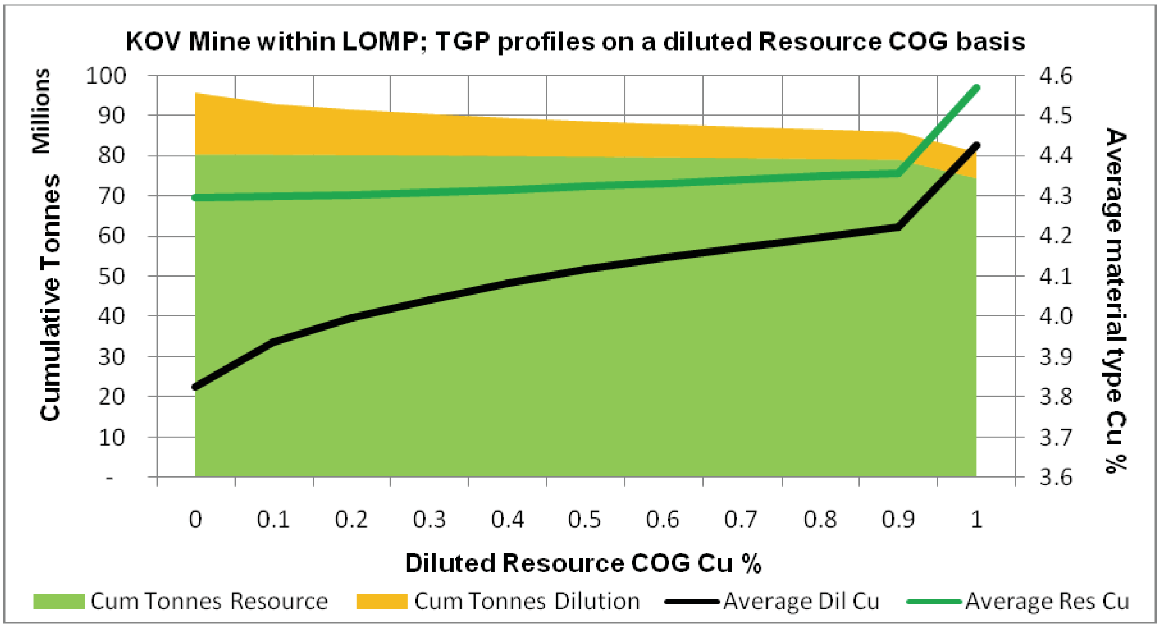

Figure 21 OV Open Pit Diluted Resource Tonnage and Grade Profile

0

1

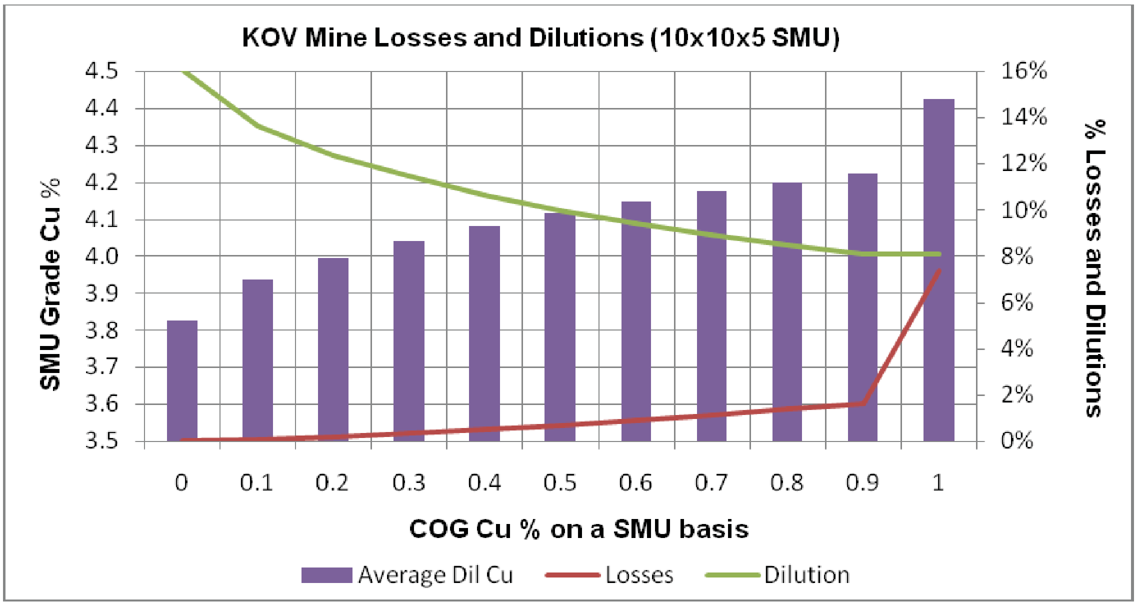

Figure 22 OV Open Pit In-Pit Losses and Dilutions

D

Figure 2 OV Open Pit

1 2 2020
3 4

1 2

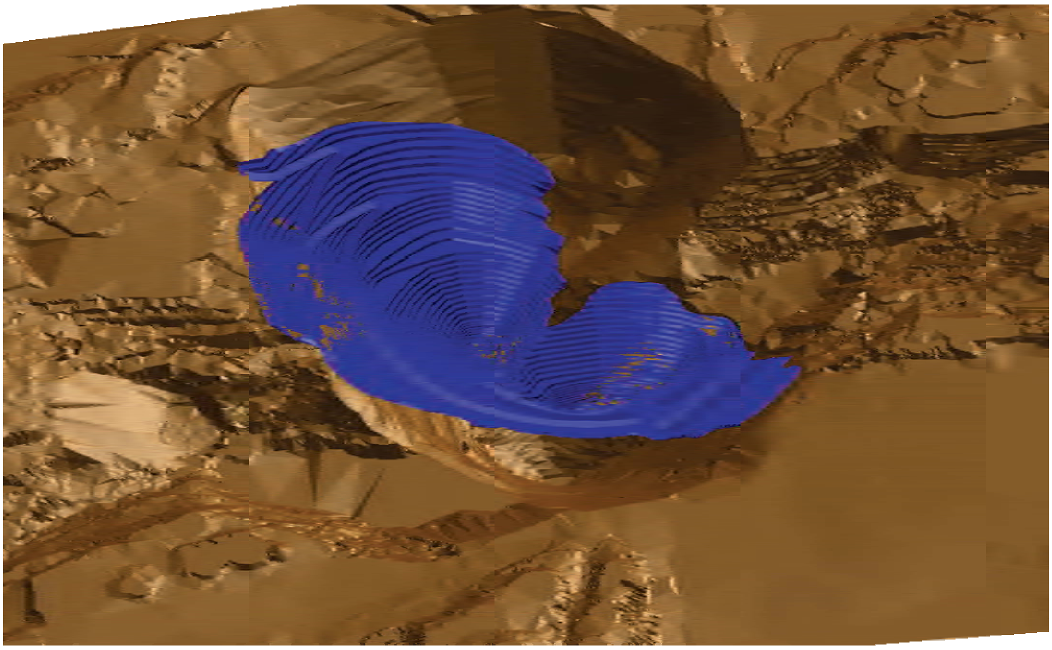

Figure 24 OV Open Pit Design (Cut 1 and Cut 2)

Table 49: KOV Open Pit Design Criteria

Pit Design Criteria	Unit	KOV Open Pit
335		10 0
335		5 0
10		13 5
5		4 0
10		5 0
5		0
		35 0
		5 1 10

Table 50: Ore and Waste Contained in KOV Open Pit

Parameter	Unit	KOV Open Pit
		3 114
		4 3 350
		54 4 4
		5
		0

1
310 000

Table 51: KOV Open Pit LOM Production Profile

KOV Open Pit	Unit	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Ore		1 51	2 3 5	3 33	5 1 5	1	4 4	5 020	4 33	4 322	3 4
Waste		22 4 3	42 35	41 3	3 35	34 3 2	3 052	3 0	30 3	2 1	31 23
Cu grade		4 1	5 02	5 11	4 21	3 1	4	4	4 2	4 3	4
Co grade		0 3	0 3	0 35	0 22	0 15	0 30	0 40	0 34	0 3	0 45
Cu content		3	11	1 1	21	235	235	235	224	200	1
Co content				12	11		15	20	1	1	1

KOV Open Pit	Unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	Total
Ore		3 031	3 3	4 433	4 334	4 33	4 2	5 33	5 0 3	3 335	3 0 2	**83 151**
Waste		31	31 2 4	25 5	1 221	5 0 0	2 20	1 3	2	4 2	50	**461 813**
Cu grade		5 43	4 41	3 5	3 5	3 30	3 10	2	3 01	4 5	4	**4.14**
Co grade		0 45	0 3	0 5	0 50	0 5	0 51	0 4	0 43	0 3	0 32	**0.40**
Cu content		1 5	1 5	15	154	153	153	153	153	153	152	**3 445**
Co content		14	24	25	22	2	25	24	22	12	10	**333**

Mashamba East Open Pit

201
12 2 2 5

0 3

1 5

10 10 5

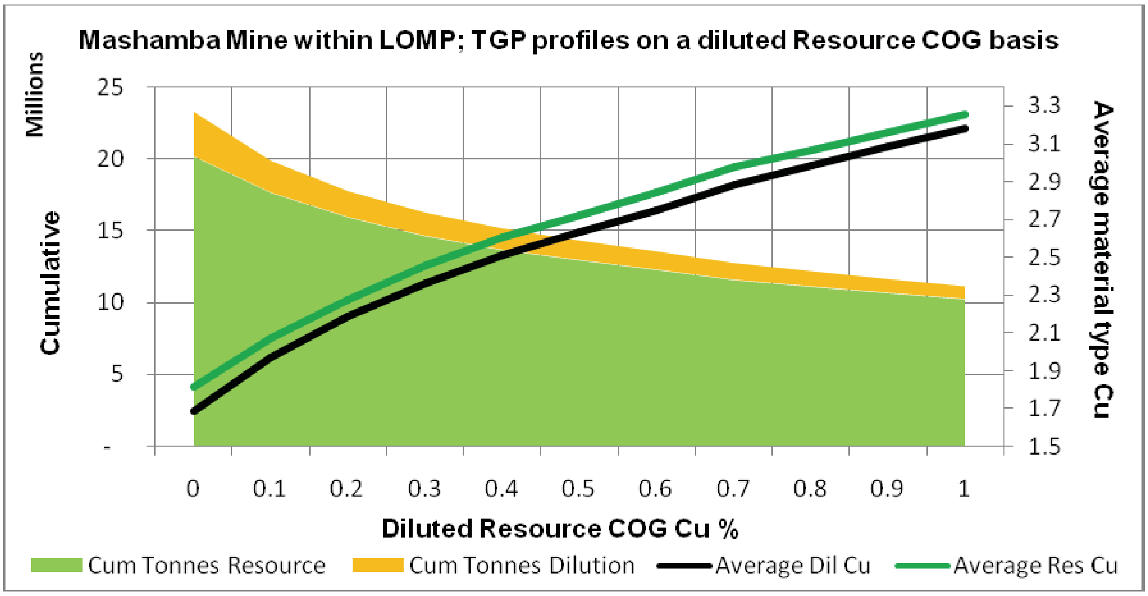

Figure 25 Mashamba East Open Pit Diluted Resource Tonnage and Grade Profile

0

3

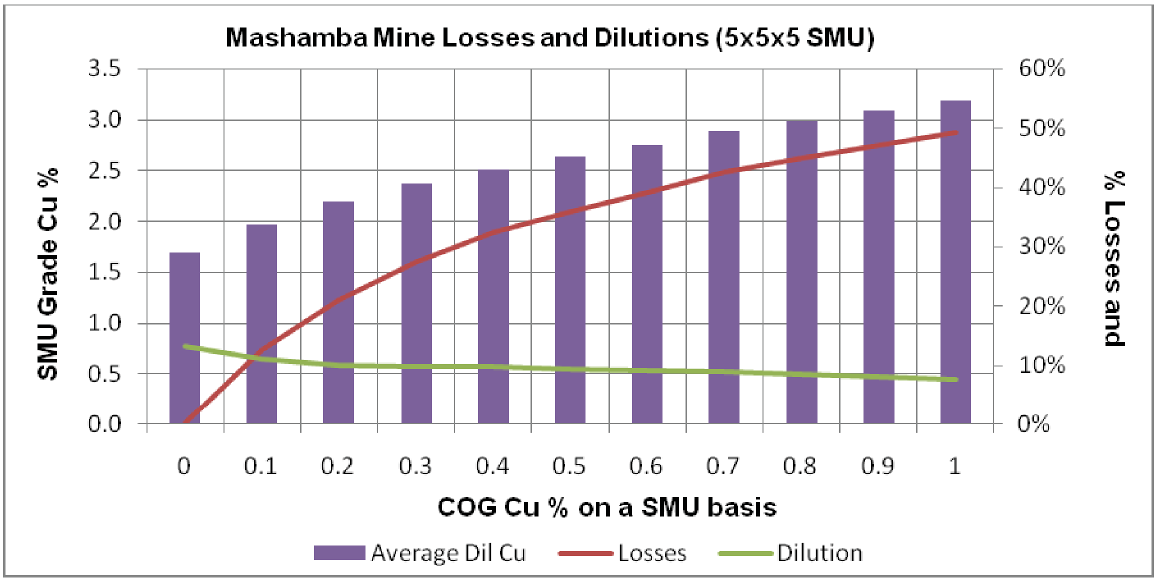

Figure 26 Mashamba East Open Pit In-Pit Losses and Dilutions

D

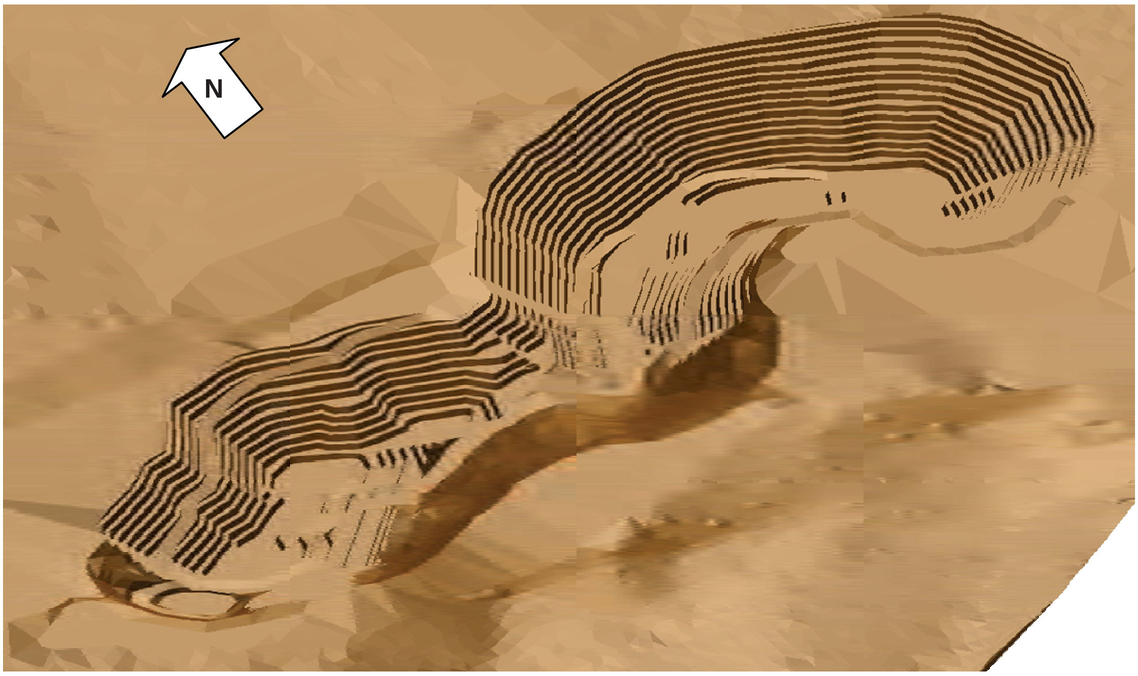

Figure 27 Mashamba East Open Pit Design

Table 52: Mashamba East Open Pit Design Criteria

Pit Design Criteria	Unit	Mashamba East
		10 0
		0
		5 0
		25 0
		5 2 1 11

Table 53: Ore and Waste Contained in Mashamba East Open Pit

Parameter	Unit	Mashamba East Open Pit
		12
		3
		102 1 5
		0
		0

2 5

Table 54: Mashamba East Open Pit LOM Production Profile

Mashamba East Open Pit	Unit	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Ore						5	1	2 524	1 1	1 04	2 02
Waste						14 005	14 0 4	12 4	13 00	13 2	12 3
Cu grade						4 14	4 50	1 2	2 0	2	2 3
Co grade						0 10	0 1	0 2	0 4	0 43	0 30

Mashamba East Open Pit	Unit	2021	2022	2023	2024	Total
Ore		1 52	0	402	42	**12 797**
Waste		4 4 2	4 0	144	11	**89 378**
Cu grade		3 02	3 42	4 10	4 2	**2.75**
Co grade		0 41	0 3	0 3	0 2	**0.34**

Reserve Statement

31 2010

Table 55: Surface Mining Mineral Reserve Estimate as at 31 December 2010

Surface Mining Operation	Proved			Probable		
	Tonnes (*000)	% T Cu	% T Co	Tonnes (*000)	% T Cu	% T Co
T-17 Open Pit				1 4 0	2 1	0 4
Mashamba East Open Pit				5 14	3 00	0 3
KOV Open Pit				55	4 3	0 45
Total				**63 050**	**4.52**	**0.44**

31 200 0 4

4.4 Mining Risks

KTO Mine

T-17 Underground and KTE Mine

1

Surface Operations

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- 400
50

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- 4 2 2030

150 1
2013

- 0

5.0 PLANT AND EQUIPMENT

5.1 General Process Commentary

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1 3 0
35

10 0

5.2 Processing Facilities

5.2.1 Kamoto Concentrator

1 2 1 1 2
1 2 1 1 1 2

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5.2.2 Luilu Refinery

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2004

1 200
2 200 200
3

3 150

150
2010
2 0 310

2 0
310 000

5.3 The Kamoto Concentrator

2

5.3.1 Ore Reception and Crushing

1

5.3.2 Milling

1 3
3 500
400 2
150 32 350
0 5 5

400
2
150 0 5

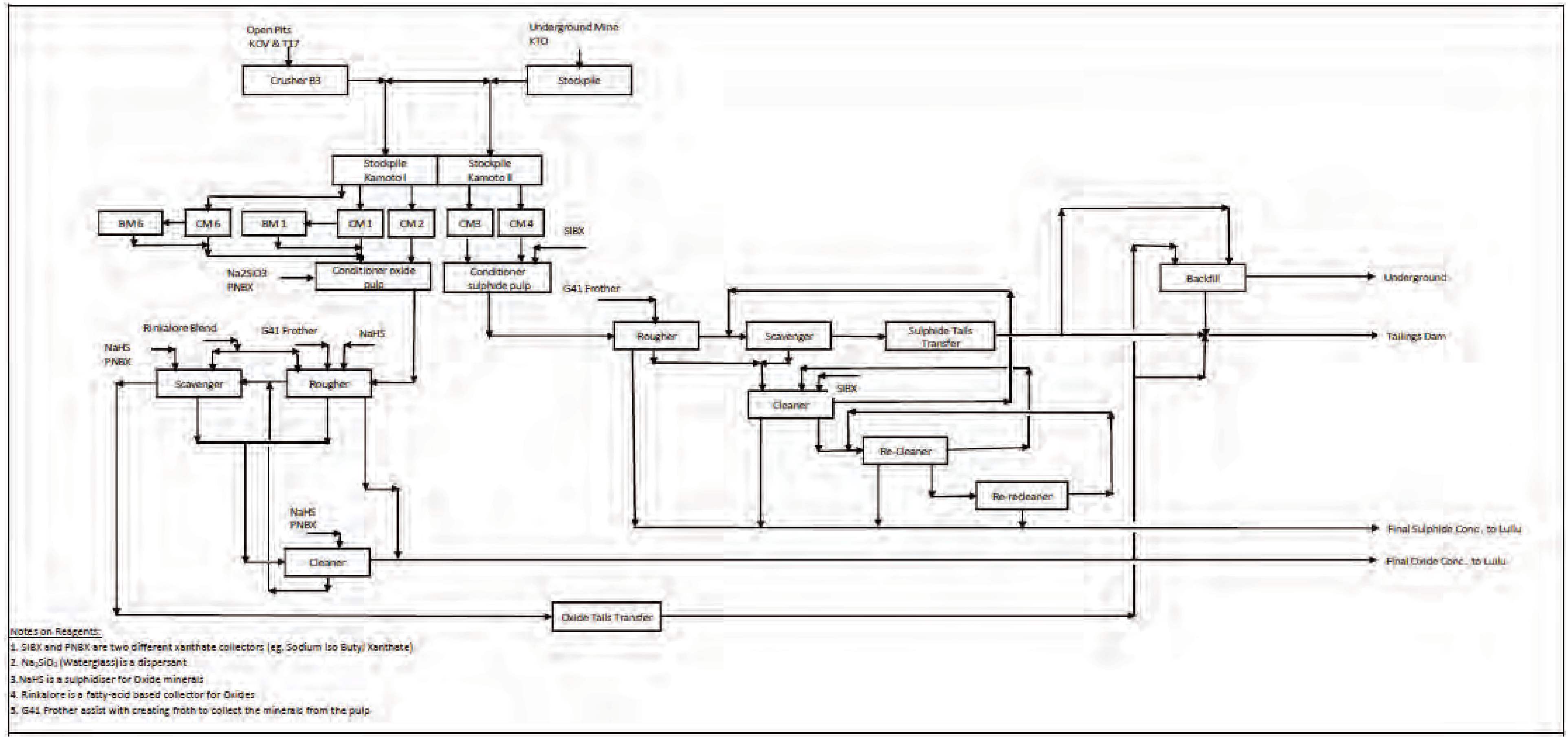

Figure 28 TC Concentrator Block Flow Diagram (Present Arrangement)

Figure 29   2 DIMA Mills

5.3.3 Flotation

2   3

41

41

Figure 0 Flotation Cells

5.3.4 KTC Project Development

3
2011 230

2 0

2 0 310

2

3

10 22

5.4 Luilu Refinery

31

5.4.1 Concentrate Reception

3

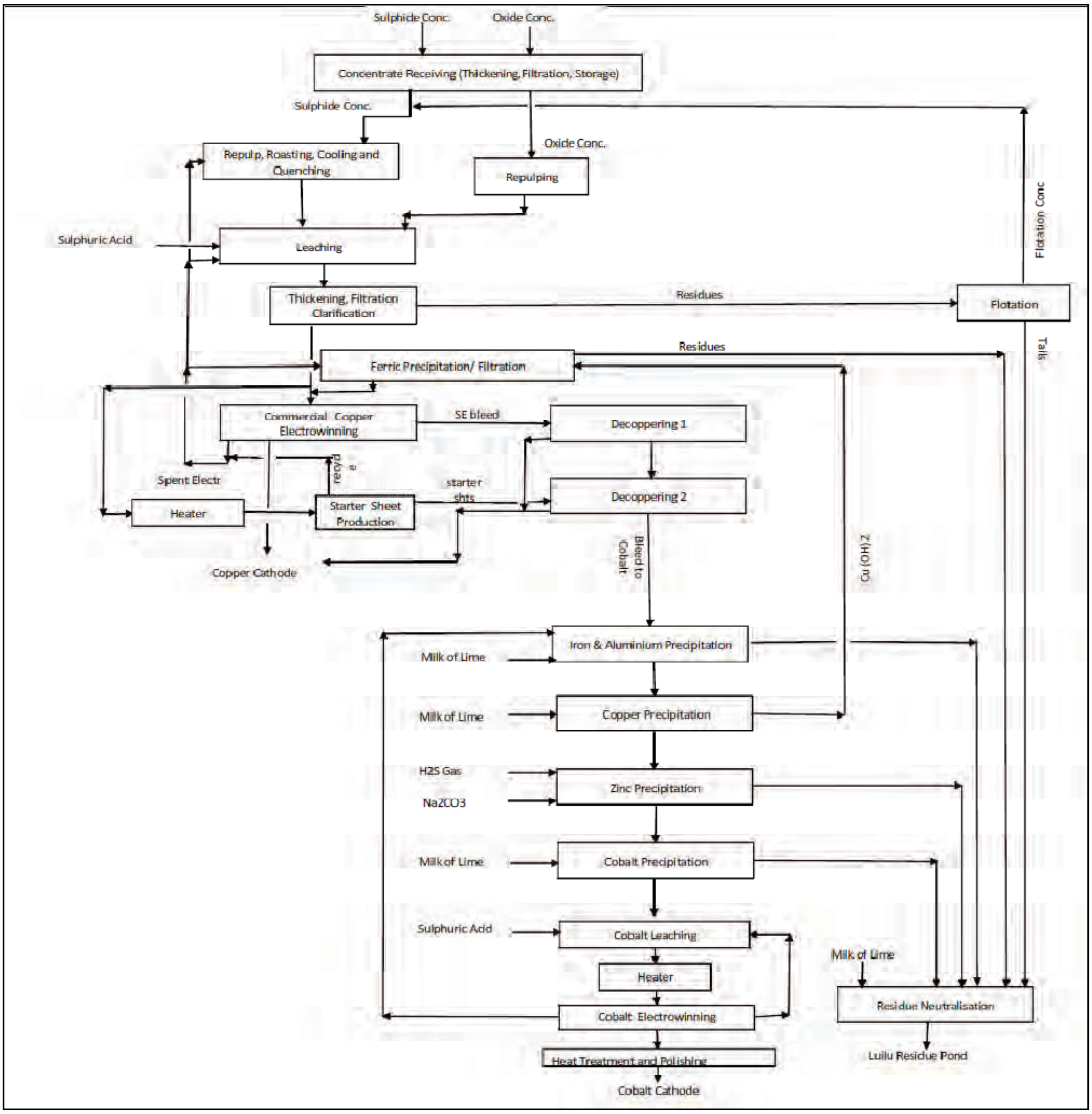

Figure 1 Luilu Refinery Block Flow Diagram (Present Arrangement)

5.4.2 Copper Production

450

150 50

300

Figure 2 Sulphide Roaster at Luilu

5.4.3 Leach Circuits

2 2 5

Figure   Finished Copper Product

5.4.4 Cobalt Circuit

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Figure 4 Finished Cobalt Product

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5.5 Risks

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6.0 TAILINGS AND WASTE

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1 1 3 3

350

2010 2 2
0 000

Figure 5 Layout of the amoto Interim Tailings dam

Figure 6 Western Flank of the ITD Starter Wall (looking south)

Figure 7 Spigot System Deposition on the eastern flank of the dam

6.1 Desktop Review of Available Environmental Reports

- 3 02 1
  200 200
- 41052 1 2010 2010

- 2010
  2010
- 4111 1
  2010 2010

6.2 Assessment of Compliance with Statutory Requirements

4

525 4

6.3 Review of Rehabilitation Provisions and Liabilities

2010

7.0 CLOSURE

7.1 Approach and Limitations to Closure Cost Review

7.1.1 Approach

7.1.2 Limitations

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  <u>indicative only</u>

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7.2 Available Information

-
  2010 4111 1
- 4 3
  200

  2010
-
-
-
  2024 10
-
  2004
-

7.3 Battery Limits

7.3.1 Available information

- 2323
- 51
- 3 4
- 5 4
- 25
- 50
- 1 35
- 4

2004

7.3.2 Additions by GAA

-
-
-
-

3
525 4 1 2
11 02 1

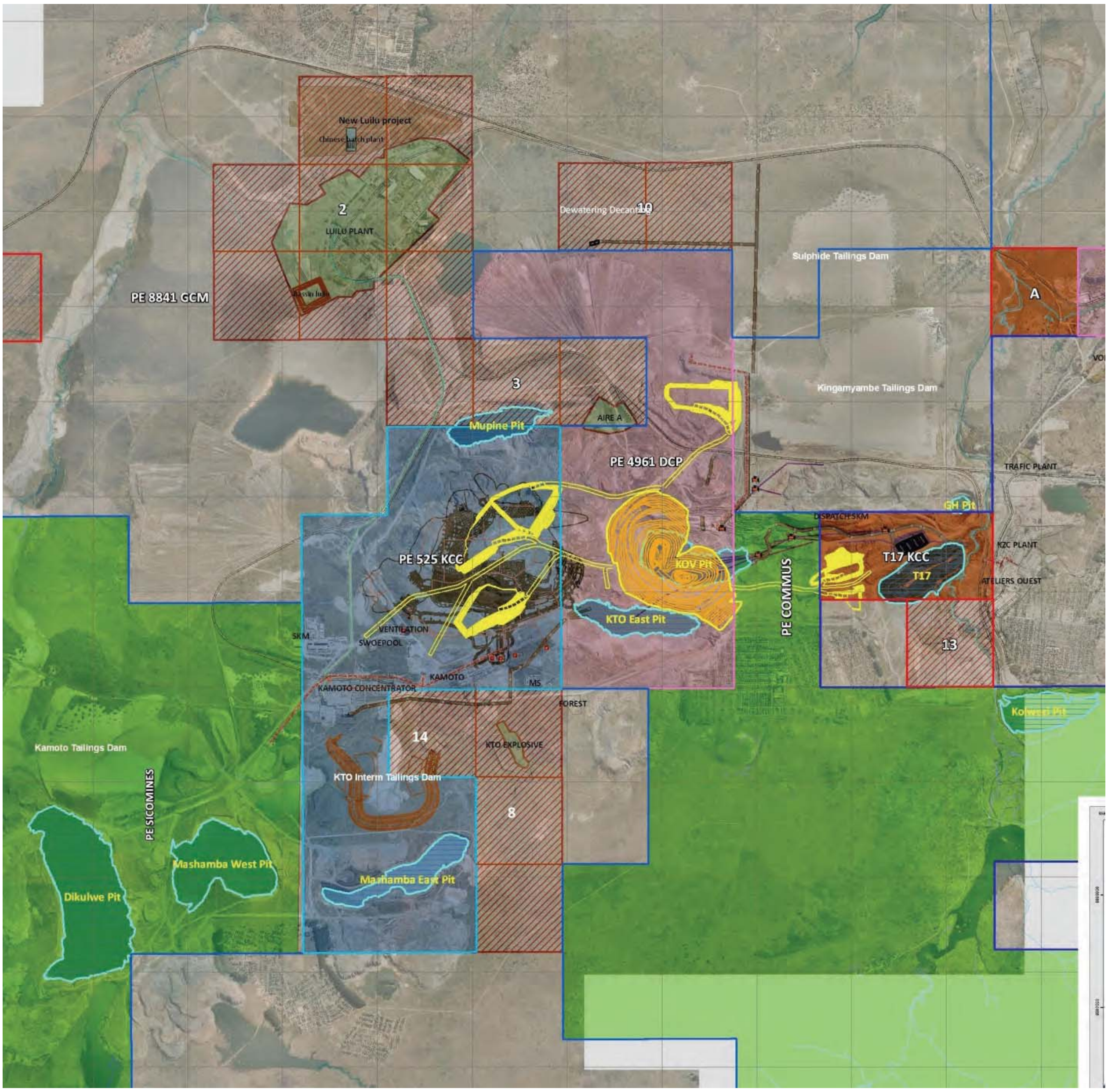

Figure 8 Map of infrastructure on perimeters of the convention JVACR - CC

7.4 Assumptions and Qualifications

7.4.1 General

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- **gross**
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7.4.2 Site specific

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7.4.3 Additional allowances

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7.5 Closure Cost Comparison

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Table 56: Overall cost comparison

Aspect	SRK 2008	GAA 2010
1	14 4 0 00	3 4 0 50
2	3 5 43 00	04 45 05
3	0	45 1 054 10
4	0	
Subtotal 1	**$98 424 196.00**	4 100 5 5
5. Post closure aspects	2 14 00	1 5 0 00
Subtotal 2	**$2,714,787.00**	1 5 0 00
		15 05 0 2 5
Subtotal 3	**$0**	15 05 0 2 5
GRAND TOTAL	**$101,890,223.00**	**$110,914,631.23**

Table 57: Detailed comparison of closure measures and related costs

Category with sub-categories	Evaluation
7.6 Infrastructural areas	
■ ■ ■ ■ ■ ■ ■	■ ■ ■ ■ ■
7.7 Mining areas	
■ ■ ■ ■ ■ ■	■ 1 3 5 43 00 ■ 3 20 ■

Category with sub-categories	Evaluation
■	00 ■ ■ ■ ■ ■

7.8 General surface reclamation

■ ■	■ ■ 500 ■

Category with sub-categories	Evaluation
7.9 Water management	
■ ■	■ ■
Cost comparison based on the rate per hectare:	
7.10 Post closure aspects	
■ ■ ■ ■ ■	■ ■ 5 20 0 ■
7.11 Additional allowances	
■ ■	10

7.12 Matters Requiring Further Attention

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7.13 Conclusion

111 200

8.0 ENVIRONMENTAL, HEALTH AND SAFETY

8.1 Terms of Reference

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8.2 The KCC Concession Area

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8.3 Information Sources Reviewed

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■ 2010

■ 2010

8.3.1 Site documentation

- 200 200
- 2010 2010

200 2010

- 200 2010
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  - 200 2010
  - 2 2010 24 2010
  - 14 20 2010 1 2010
  - 1 2 2010 1 2010
- 2010
- 200

8.3.2 Interviews with site personnel

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8.3.3 Site areas visited

2010

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8.4 Limitations of the Audit

8.5 Results of the Audit

8.5.1 Authorisations

4 00 2002 11 2002

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03 2003 2003

2010

2011

8.5.2 Compliance against Equatorial Principles

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2010

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Table 58: Synopsis of key environmental and social findings of the Metago (2009) due diligence report.

Equator Principle	Requirement	Compliance Rating	Reasons for Compliance / Non Compliance
1			■
2			■ 2010 ■ 4 ■
3	1		■ ■ ■ ■ ■ 2011

	2		■
	2		■
	2		■ ■ ■ 2010
	2		■ ■
	2		■ ■ ■

	3		■ ■ ■ ■ ■ ■
	4		■ 4

	4		■ 4
	5		■
	5		■
			■
			■
			■
4			■ 2011
5			■
			■
			■

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			■

Note IFC refers to the International Finance Corporation. PS refers to Performance Standard

8.6 Key environmental risks relating to KCC operations

8.6.1 Impact of TSF and plant effluent discharges on river systems

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2011

■

500
2010
2011
2012

■

8.6.2 Impact of KOV Open Pit dewatering on Musonoi and Luilu River quality

2010 5 000 000 [3]

100

2010

1 200 3 2 500 3 4 000 3

8.6.3 Impact of dust fallout on communities

2010 10
500 µ 3

1200 2400 2
2400 2

3 200 200 2010
2010 2010
2010

2010

200 2010
500
1 40

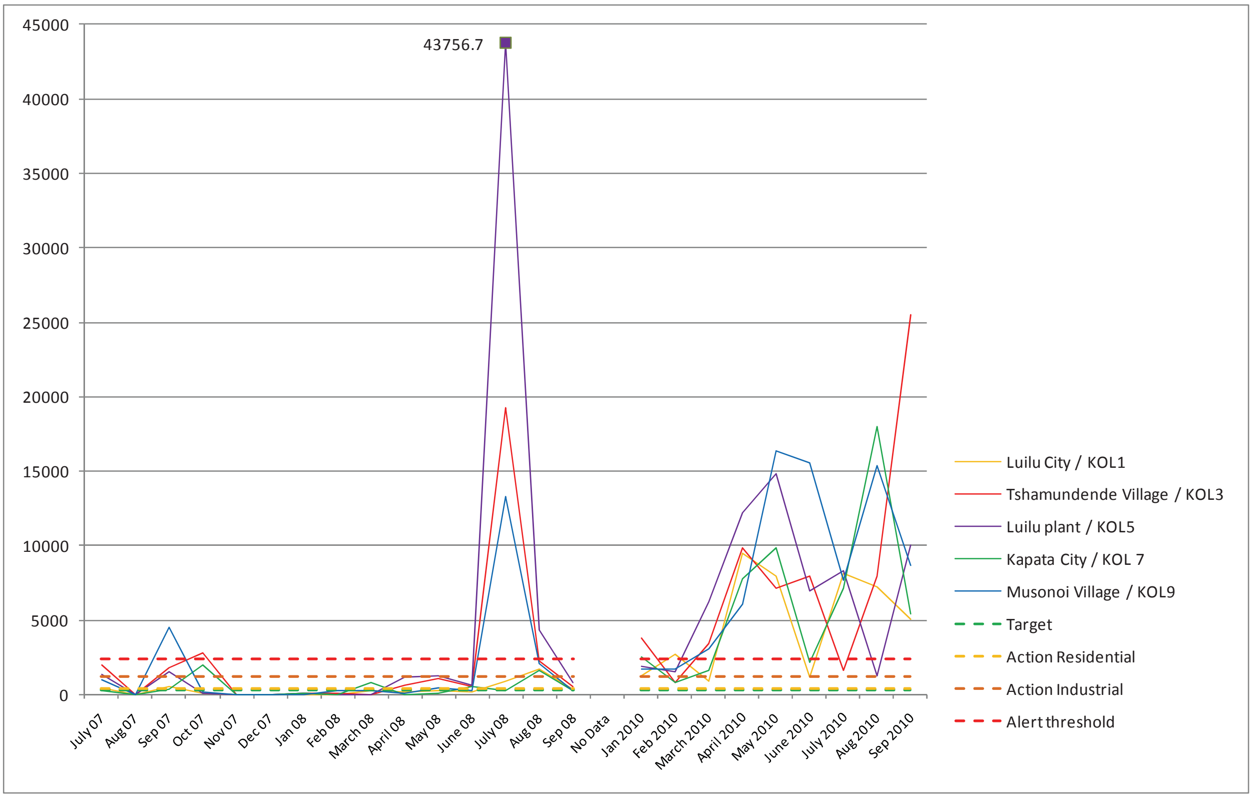

Figure 9 Dust fallout (mg m2 day) at various monitoring locations within the CC comple

Figure 40 Musonoi village photographed from T17 waste rock dump

8.6.4 Impact of blasting and vibration on communities

1

2010

- 0 5
- 5 0
- 15 5
- 150
- 00

5

2010

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8.6.5 Radioactivity impacts

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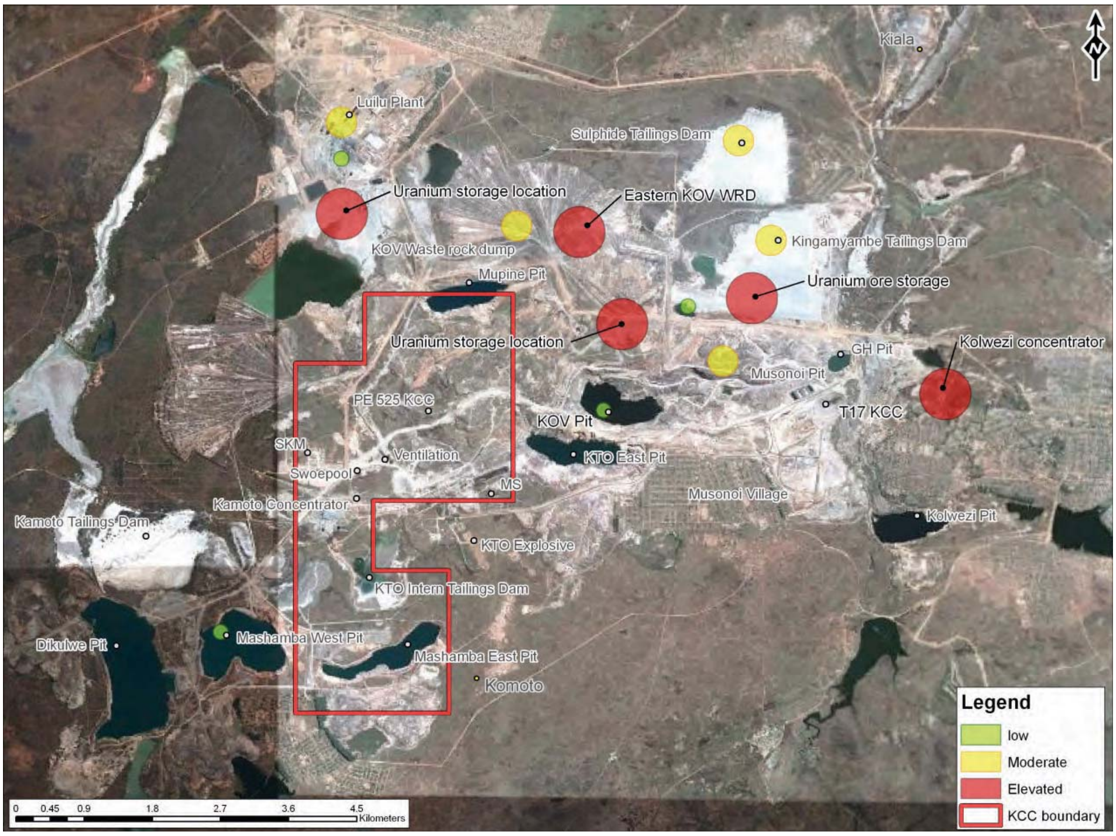

Figure 41 Relative levels of radioactivity in the CC Concession and surrounds

1

8.6.6 Rehabilitation of waste rock dumps

200

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8.6.7 Disposal of hazardous and non-hazardous wastes

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2011

8.6.8 Historical soil pollution sites

8.6.9 Risk of acid rock drainage with future mining of sulphide ores

8.7 Key Social Aspects and Risks Relating to KCC Operations

2010

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- **Social Assessment (Equator Principle 2):** 2011
- **Social / Environmental permits (Equator Principle 2):** .
- **Corporate Social Responsibility (Equator Principles 3 & 4):**

1

2010

10 2011

- **Incidents (Equator Principle 3 - IFC PS 4 Community Health, Safety and Security).** 200 2010
- **Resettlement (Equator Principle 3, IFC PS 5):**
- **Community Grievances (Equator Principle 6):** 2010 1
- **):**
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8.8 Summary of Key Audit Findings

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8.9 References

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2 2010
4111 1 2010

3 2010
20 2010

4 200 200 200

5 2010 200 2010

2010
200 2010
2010
2010
200
3 2 1 200

3 10 1 24 2010 2 2010
11 0 10 1 2010 14 20 2010
13 1 10 1 2010 1 2
2010

9.0 MARKET

9.1 Copper

15 200 5 4 35
0 3 0 3 1
200 1 4 2
1 2 1 2010
2011 1 1 5 2011

Table 59: Global refined copper market balance (Source: USGS)

Thousand metric tonnes	2006	2007	2008	2009	*2010 Jan-Sept*	2010 forecast	2011 forecast
Global Mine Production	14 991	15 474	15 528	15 754	*11 853*	16 235	17 076
Primary Refined Production	14 678	15 191	15 399	15 466	*11 729*		
Secondary Refined Production	2 613	2 743	2 823	2 911	*2 513*		
Total World Refined Production	17 291	17 934	18 222	18 377	*14 242*	19 278	20 498
Consumption	17 058	18 239	18 056	18 198	*14 678*	18 882	19 729
LME Copper Price (USD/t avg)	6 727	7 126	6 952	5 164	*7 175*	7 543	

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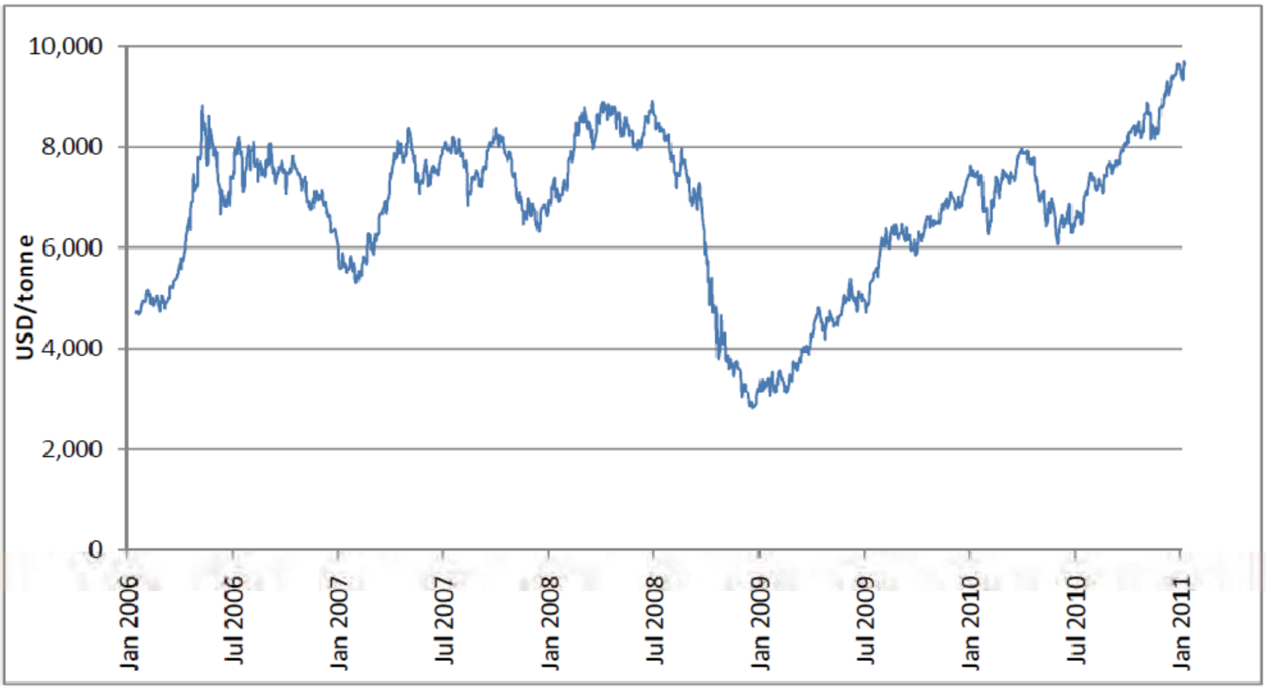

Figure 42 The London Metal E change copper price from January 2006 to date (Source LME)

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Table 60: Copper price forecast

Copper price (USD/tonne)	2011	2012	2013	2014	2015	2016	2017	2018	2019	Long Term
Nominal	00	300	000	00	200	00	500	100	00	1
Real	00	20	22	34	0	240	5	3	03	000
US CPI	1 0	1 0	1 0	1 0	1 0	1 5	1 5	1 5	1 5	

9.2 Cobalt

2 000 200

25 000 40

200 10 200 5 00
0 54 1

2 500 2011 2010

Table 61: Global refined cobalt market balance

Metric tonnes	2004	2005	2006	2007	2008	2009
	0 300	200	00	2 00	5 00	2 000
	4 500	54 100	53 00	53 300	5 00	
	51 400	54 5	54 5	5 250	0 54	5 000
(USD/t avg)	22	14 5	15 35	2 31	3 1	15

Source Cobalt News (Oct 2005 Jan 2011) Published by the Cobalt Development Institute

4 3 200
5 11 200
2010 1 55
1 4 15 4

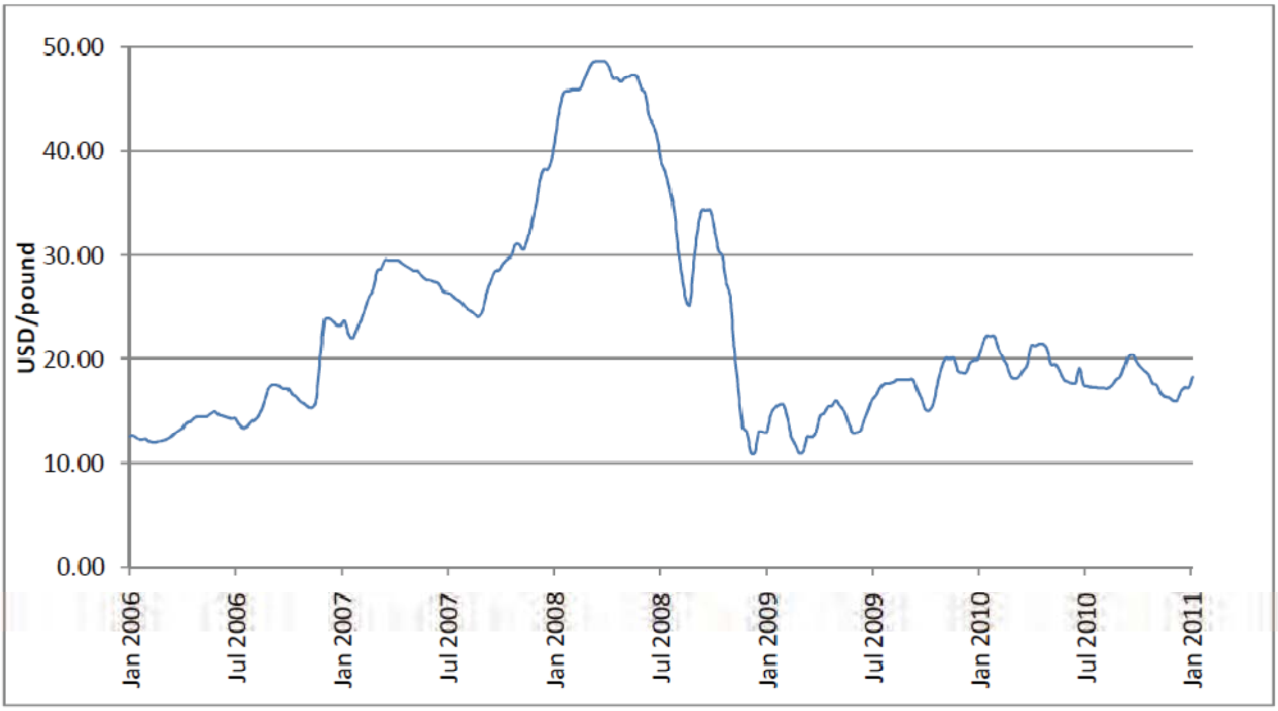

Figure 4 The cobalt price from January 2006 to date (Source Inet Bridge)

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2011 1 24 13 00 201

Table 62: Cobalt price forecast

Cobalt price (USD/pound)	2011	2012	2013	2014	2015	2016	2017	2018	2019	Long Term
Nominal	1 24	1	1 00	15 00	15 00	15 00	13 00	13 00	13 00	13 00
Real	1 24	1 2	15	14 5	14 41	13 2	11	11 1	11 54	11 00
US CPI	1 0	1 0	1 0	1 0	1 0	1 5	1 5	1 5	1 5	

10.0 TECHNICAL AND ECONOMIC ASSUMPTIONS

10.1 Revenue assumptions

100

10.2 Capital Cost Estimate

3

- **KTO Mine:**
- **KOV Open Pit:**
- **Kamoto East Underground Mine:**
- **T-17 Underground Mine:**
- **Mashamba East Mine:**
- **Processing plant:**
  5 0
- **Effluent Ponds and Tailings:**
  0
- **Power:**
  12 2
- **Environmental and Social:**
- **General:**

Table 63: Capital Expenditure

USD million	2011	2012	2013	2014	2015	2016 - 2035	Total
Mining							
	30	30	30	23	11	1 0	**219.2**
	2 0	0 0	0 0	0 0	0 0	0 0	**-28.0**
	13 5	5 0	5 0	20	1	0 0	**61.0**
	0 0	0	12 4	21 5	31 2		**81.8**
	0 0	0 0	0 0	0 0	0 0	343	**343.8**
1	0 0	0 0	0 0	0 0	4	220	**227.2**
Mining subtotal	**16.4**	**43.9**	**48.2**	**66.1**	**66.1**	**664.3**	**905.0**
Processing							
3	103 0	0 0	0 0	0 0	0 0	0 0	**103.0**
4	10 4	204	224	0 0	0 0	0 0	**537.2**
Processing subtotal	**210.4**	**204.9**	**224.9**	**0.0**	**0.0**	**0.0**	**640.2**
Other Cost Centres							
	5 1	15 1	15 1	15 0	12	113 5	**176.4**
	10 0	10 0	10 0	10 0	10 0	14 5	**197.5**
	50 0	53 2	4	1 4	4	5 1	**231.7**
	2 5	2 4	25 0	25 0	25 0	3	**498.6**
Other subtotal	**93.6**	**104.6**	**97.7**	**66.4**	**54.1**	**687.8**	**1 104.2**
Total capital expenditure	**320.4**	**353.4**	**370.8**	**132.5**	**120.2**	**1 352.0**	**2 649.4**

10.3 Operating Cost Estimate

- **Open Pit and Underground Mining:**
  - **KTO Mine:**
    2 4
  - **KOV Open Pit:**
    23 2 2
  - **T-17 Open Pit:**
    0 2 0
  - **Kamoto East Underground Mine:**
    2 50
  - **T-17 Underground Mine:**
    2 4

- **Mashamba East Open Pit:**
  2 30

- **Kamoto Concentrator:**
  13 1 1
  11 5

- **Luilu Refinery:** 0 1 0 11

- **General and Administration:**

- **Freight, Insurance and Sales:**

4

Table 64: Major Operational Expenditure

USD million	2011	2012	2013	2014	2015	2016 - 2035
Operating Costs						
	13 3	20	203 4	202 1	24 4	3 213 2
	10	142 4	120 5	2 3	10 3	1
	5 3	53 5	55 4		100	1 53
4	0 0	0 0	2	11 0	113 4	1 20
	0	0	0	1 2	1	24
Total Operating Costs	**308.3**	**406.4**	**409.8**	**459.3**	**571.7**	**8 689.3**
General and Administrative Costs	**81.5**	**78.5**	**76.9**	**71.4**	**66.8**	**1 348.8**

10.4 Taxation, Royalties and Other Business Parameters

5

Table 65: Royalty, tax and import duty assumptions

Description	Application	Rate
		2 0
		2 5
		30
1		0
2 10		12 1
		3 5

0
5 5
201

11.0 ECONOMIC ANALYSIS

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25

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11.1 Valuation Methodology

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11.2 Valuation Assumptions

- 1 2011
- 10
- 4 0 5 0
- 0
- 10 2
- 10 3
- 10 4
- 5

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11.3 The Valuation of KML's Interest in KCC

KATANGA MER EXTRACTION TABLE

31

5 5

		2008	2009	2010	2011	2012	2013	2014	2015
Finished metal production capacity	**Units**								
		40 00	0 000	130 000	150 000	150 000	200 000	250 000	310 000
		2 050	3 240	5 500	000	000	000	000	000
							22 000	22 000	22 000
Finished metal actual / forecast production									
		22 122	41 4	52 1	110 414	150 000	1 4 54	24	30 1 4
		4	2 534	3 43	5 01	5	0	000	000
							2 21	5 4	
			1 3	054	21 1				
		1							
Cash cost (excl. royalties, realisation charges, before by-product revenues)		2	2	2 1	3	4 3	4 5	52	3
By-products revenues		1 4		155	343	251	2 4	451	3 1
Royalties (as a % of net revenue)		4 50	4 50	4 50	4 50	4 50	4 50	4 50	4 50
Depreciation & amortisation		3 4	2	200	310	3 1	323	214	1
Statutory Tax rate		30 00	30 00	30 00	30 00	30 00	30 00	30 00	30 00
Capex									
		11	1	5	0			5	3
		31	100	1 5	2 0	2	2 5	3	3

Production Numbers - Mining

		2008	2009	2010	2011	2012	2013	2014	2015
KTO									
		551 333	1 0 4 0	1 30 35	1 30 520	1 0 20	1 22 24	1 4 355	2 25 11
		3 3	3 5	3 2	3 0	3	3 4	3	3
		0 43	0 4	0 5	0 4	0 5	0 5	0 5	0 5
KOV									
				22 324	1 51 34	2 3 4 53	3 33 3	5 1 4	1 4
				4 43	4 1	5 02	5 11	4 21	3 1
				0 30	0 3	0 3	0 35	0 22	0 15
T-17									
		4 543	1	1 44 42	1 100 000	3 0 000			
		1 2	1 30	2 55	2 5	2 3			
		0	0 5	0 5	0 4	0 44			
Tilwezembe									
		0 2							
		1 3							
		1 1							
Mashamba East									
									4 510
									4 14
									0 10

Production Numbers - KTC

		2008	2009	2010	2011	2012	2013	2014	2015
Sulphide circuit									
		40 000	1 0 000	2 520 000	2 520 000	2 520 000	2 520 000	2 520 000	2 520 000
		5 2 33	1 0 02	1 324 2	1 30 520	1 0 20	1 22 24	1 4 355	2 25 11
		3 0	3 0	3 3	3 0	3	3 4	3	3
		0 40	0 4	0 54	0 4	0 5	0 5	0 5	0 5
		4 0	2 4	113	113 122	134 1 5	145	145 2	1 0 3 3
		40 0	40 0	3 5	40 00	42 00	42 00	42 00	42 00
		4 40	5 00	5	3 0	4 0	4 0	4 0	4 0
Oxide and Mixed Circuit									
		40 000	1 440 000	3 000 000	5 1 0 000	5 1 0 000	5 1 0 000	0 000	0 000
1		43 54	5 31	1 23 354	2 1 5 0 0	2 3			
		2 0	2 34	2 45	1	2 30			
		0 0	0	0 5	0 0	0 0			
				3 4 455	1 5 1 34	2 3 4 53	3 33 3	5 1 4	1 4
				4 43	4 1	5 02	5 11	4 21	3 1
				0 30	0 3	0 3	0 35	0 22	0 15
									4 510
									4 14
									0 10
		43 54	5 31	1 00 0	3 5 40	3 1 2 142	3 33 3	5 1 4	1 1 15
		2 2	2 34	2	3 1	4 32	5 11	4 21	3
		0 4	0	0 3	0 5	0 4	0 35	0 22	0 14
		55 323	4 5	1 3	44 5	42 5 4	34 3 4	452 004	1
		1	1 5	1 20	22 50	24 00	24 00	24 00	24 00
		3 30	3	2 3	2 40	1 0	1 0	1 0	0 0
						3 1	154 5 0	1 3 12	1 0 31
						42 00	42 00	42 00	42 00
						2 30	2 10	1 0	1 10

Production Numbers – Kolwezi Concentrator (“KZC”) (No longer an asset of KCC - returned to Gecamines)

		2008	2009	2010	2011	2012	2013	2014	2015
Capacity	Unit								
		555 53							
		1 4							
		0 3							
		3 5 3							
		12 31							
		4							

Table 66: Project cash flows over the LOM

Cash Flow Analysis	Unit	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Revenue	**MUSD**	**1,365**	**1,583**	**1,795**	**2,497**	**2,789**	**2,637**	**2,609**	**2,455**	**2,324**	**2,320**	**2,318**
		151	123	145	20	243	24	2 3	2 1	25	2 2	2 2
		55		4	103	3		10		3	3	3
Net Revenue	**MUSD**	**1,160**	**1,394**	**1,575**	**2,185**	**2,464**	**2,313**	**2,240**	**2,095**	**1,973**	**1,966**	**1,964**
		3	4 3	4 5	52	3	0	4	51	5		
		4	1	1	1	1	1	2	2	2	1	1
		24	2	4	10	3	15	3	10			
Total Expenses	**MUSD**	**(411)**	**(528)**	**(586)**	**(536)**	**(690)**	**(608)**	**(652)**	**(642)**	**(650)**	**(704)**	**(669)**
		1	2	2	2 4	53	544	452	414	35	330	335
		320	353	3 1	133	120		105	11		110	103
		11	21	15	4	1	15	2 0	23	21	205	20
Net Free Cash	**MUSD**	**416**	**490**	**601**	**1,159**	**910**	**915**	**771**	**683**	**649**	**617**	**647**
Cash Flow Analysis	Unit	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Revenue	**MUSD**	**2,354**	**2,362**	**2,369**	**2,363**	**2,332**	**2,273**	**2,258**	**2,167**	**1,843**	**–**	**–**
		2	2	2	2	2 4	25	255	243	204		
		4	4	5	4	3	1	0		4		
Net Revenue	**MUSD**	**1,993**	**2,000**	**2,007**	**2,002**	**1,975**	**1,925**	**1,913**	**1,837**	**1,565**	**–**	**–**
		02	34	24	03		0	0	5	4 0		
		2	1	1	2	1	1	2	1	1	5	5
			1	4	4	3		0	35	24	1 2	
Total Expenses	**MUSD**	**(711)**	**(736)**	**(722)**	**(701)**	**(697)**	**(673)**	**(672)**	**(543)**	**(457)**	**135**	**(56)**
		35	355	34	3 2	3	354	342	34	35	2 3	
		103	4				5	3		5		
		20	204	211	213	20	20	202	21	1	2	
Net Free Cash	**MUSD**	**618**	**611**	**641**	**650**	**622**	**616**	**615**	**652**	**517**	**(200)**	**(56)**

4 0

00 0

4 44 14

Table 67: Sensitivity of NPV to discount rate and changes in metal prices

NPV (USD million)		*Change in metal prices*				
		-20%	**-10%**	**0%**	**10%**	**20%**
Discount Rate	0	4 5 2	5 1	0	35	
	10 0	4 012	5 00	00	4	5
	12 0	3 54	4 431	5 315	142	44
	14 0	3 1 2	3 54	4 44	5 4 1	1 3

Table 68: Sensitivity of NPV to discount rate and changes in operating costs

NPV (USD million)		*Change in operating costs*				
		-20%	**-10%**	**0%**	**10%**	**20%**
Discount Rate	0	513	155	0	511	210
	10 0	525	2 5	00	5 04	5 442
	12 0	5	5 541	5 315	5 04	4 1
	14 0	5 14	4 45	4 44	4 505	4 2

Table 69: Sensitivity of NPV to discount rate and changes in capital expenditure

NPV (USD million)		*Change in capital e penditure*				
		-20%	**-10%**	**0%**	**10%**	**20%**
Discount Rate	0			0	52	41
	10 0	12	10	00	5 0	5 05
	12 0	5 42	5 40	5 315	5 220	5 124
	14 0	4 54	4 33	4 44	4 54	4 5 4

44

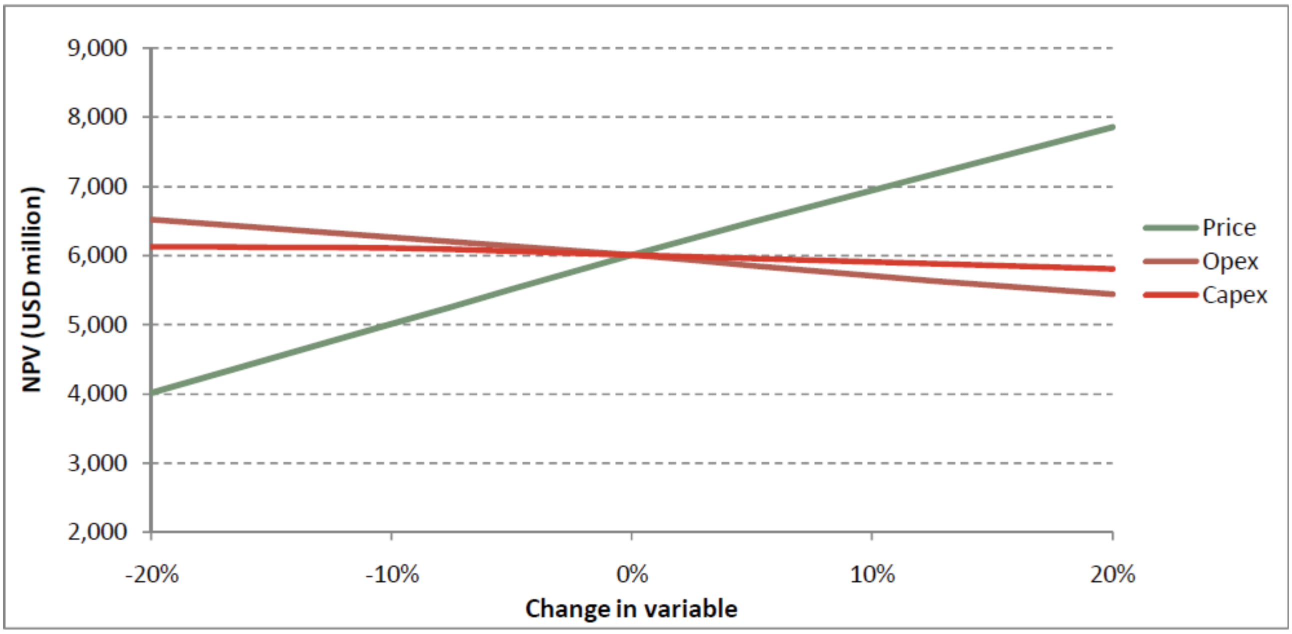

Figure 44 The sensitivity of Base Case NPV to changes in metal price ope and cape

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12.0 RISK ANALYSIS

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12.1 Mining risks

- 2010

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150 1 2013

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12.2 Processing risks

Unavailability and Quality of Key Reagents for Metallurgical Processing:

Power Availability and Supply Fluctuations:

230 250

1 0 2011

450 2015

12.3 Capital risks

Escalation of Costs:

12.4 Operating risks

Poor Condition of Railway Line:

-
-
-
-

Availability of Rolling Stock:

Underdeveloped in-country institutional infrastructure and capacity:

Senior Management and Technical Expertise:

Artisanal Miners:

12.5 Sovereign risk

12.6 Economic and Market risk

Commodity prices:

Operating costs:

Currency risk:

12.7 Environmental and Social risks

2010

KOV mine dewatering:

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Dust fallout on communities:

Acid rock drainage:

Non-compliance with the DRC Mining Code:

200

2011

Legacy environmental issues:

04 2004 **are not regarded as risks**

GOLDER ASSOCIATES AFRICA (PTY) LTD.

2002 00 104 0

12 1 4 12 1 101 2 2 04 2011

APPENDIX A

Abbreviations and Glossary of Terms

LIST OF ABBREVIATIONS

Abbreviations

3	
	2004

1	
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Units

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Chemical Elements

2 4	
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2	
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5 4	
2	
2 2 5	

GLOSSARY OF TECHNICAL TERMS AND DEFINITIONS

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2010	31 2010
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	2 5 10 5 0 10
	2 1 2 1
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At Golder Associates we strive to be the most respected global group of companies specialising in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organisational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.

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Golder Associates

SECTION XIV: INDEPENDENT TECHNICAL REPORTS

SUB-SECTION D: MOPANI REPORT

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04 May 2011

GLENCORE INTERNATIONAL PLC

Mopani Copper Mines Plc

Submitted to:

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341

Contributing Authors	Company Name	Qualification

Report Number. 12 1 101 1

Distribution:

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1
1

REPORT

A world of capabilities delivered locally

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Golder Associates

04 2011 12 1 00

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MINERAL EXPERT'S REPORT: MOPANI COPPER MINES Plc

PURPOSE OF REPORT

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23 2011 2010
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2004

CAPABILITY AND INDEPENDENCE

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METHODOLOGY

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DECLARATIONS

GLOSSARY OF TERMS

QUALIFICATIONS OF CONSULTANTS

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Name	Company	Qualification
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Name	Company	Qualification
		25 00
		20
		12 20030022

Name	Company	Qualification
		0123
		30

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Golder Associates: Operations in Africa, Asia, Australasia, Europe, North America and South America

Reg. No. 2002/007104/07 Directors: FR Sutherland, AM van Niekerk, SAP Brown, L Greyling

1.0 EXECUTIVE SUMMARY

1.1 Introduction

2010

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Property Description and Location

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TUNISIA
MOROCCO
WESTERN SAHARA
ALGERIA
LIBYA
EGYPT
MAURITANIA
MALI
NIGER
CHAD
SUDAN
SENEGAL
BURKINA FASO
GUINEA
NIGERIA
SOMALIA
SIERRA LEONE
COTE D'IVOIRE
GHANA
CENTRAL AFRICAN REPUBLIC
ETHIOPIA
CAMEROON
LIBERIA
UGANDA
KENYA
GABON
CONGO
DEMOCRATIC REPUBLIC OF CONGO
TANZANIA
ANGOLA
MOZAMBIQUE
ZAMBIA
ZIMBABWE
NAMIBIA
BOTSWANA
MADAGASCAR
SOUTH AFRICA
Zambia
International Boundary
Road
Minor Road
River
National Capital
City or Town
100 200 KM
100 200 Miles
© 2007 Geology.com
Lake Tanganyika
Sumbawanga
Lake Rukwa
TANZANIA
Kasanga
Chunya
Pweto
Kamina
DEMOCRATIC REPUBLIC OF THE CONGO
Mbala
Mbeya
Lake Mweru
Mporokoso
Tukuyu
Nchelenge
Chitipa
Kasama
Lake Bangweulu
Chinsali
Kolwezi
Likasi
Mansa
Rumphi
Luapula
Chambeshi
Nkhata Bay
Lake Malawi
Mwinilunga
Kipushi
Lubumbashi
Mpika
ANGOLA
Solwezi
Lundazi
Chingola
Mufulira
Kitwe
Ndola
Nkhotakota
Luanshya
MALAWI
Zambezi
Kabompo
Kapiri Mposhi
Mchinji
Salima
Lilongwe
ZAMBIA
Kafue
Kabwe
Dedza
Nyimba
Ncheu
Mumbwa
Mongu
Lusaka
MOZAMBIQUE
Zumbo
Zomba
Mazabuka
Zambezi
Lago de Cahora Bassa
Blantyre
Senanga
Monze
Tete
Kariba
Choma
Kalomo
Mhangura
Lake Kariba
Bindura
Nsanje
Chinhoyi
Kazungula
Livingstone
Harare
Mutarara
NAMIBIA
Chegutu
Hwange
ZIMBABWE
Marondera
Inhaminga
BOTSWANA

1.2 Ownership

3 1

1 10 0

1.3 History

1 31 1 33

50

2000

Products

1.4 Legal Tenure

Name	License Number	Issue Date	Expiry Date	Status
	25	31 2000	31 2025	
	0 3	31 2000	31 2025	

1.5 Resource Model

Geology

00

45

Mineralisation

0 40

10

Mineral Resources and Ore Reserves

1 2011
21 2 02 0 23 0 11

Mopani Mineral Resources as at 31st December 2010

	Nkana				Mufulira				Total			
	145	2 00	0 10	0 25	2 2	2 1		0 2	1 3	2 01	0 10	0 25
	34 5	1 0	0 14	0 0		2 2		0 31	44 3	1 3	0 14	0 11
	1 0 3	1	0 11	0 21	3 1	2 30		0 2	21 2	2 02	0 11	0 23
	35 4	1 5	0 14	0 0	3	2 2		0 11	3 0	2 12	0 14	0 0

1

2

3

1.6 Reserves Estimate

Nkana

1 31

3 4 1 4 0 12

2011

40 000 120 000

40 000

220 000 2011

2010

1

10

54

5 5 20

0 100

2 200 1 5

1 3

10 1 2035

2012 5 1

201 202 1 2 2014

2

3 0 13 10 1

1 3 0 12

1

	Proved Reserve				Probable Reserve			
Ore type	Mt	% TCu	% ASCu	% TCo	Mt	% TCu	% ASCu	% TCo
Oxide ore	1	4 02	2	0 14	0	2 4	2 10	0 10
Sulphide ore	2 3	1 4		0 10	15	1 0		0 23

Mufulira

1 1

2 2

-
-
-

4 2

1

3 2 4
1 30

1 200 2 0
2 12 3
2022
1 0 2015 2022

10 2 1 0

Proved Reserve			Probable Reserve		
Mt	% TCu	% ASCu	Mt	% TCu	% ASCu
1	2 51	0	2 5	2	

1.7 Plant and Equipment

12 000

30

41 350

3

2 5
4

1.8 Closure

Closure Assessment	Assessed Closure Cost
	24 5
	2 05
Total Mopani	51

51

1.9 Environmental Review

Nkana

Key Results of the Audit

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- [1]
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2011

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  - 2015

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Mufulira

Key Results of the Audit

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1.10 Economic Evaluation

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Revenue, Capital and Operating Cost Estimates

Special Projects:

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Capital Expenditure for Mopani

USD Million	2010 Actual	2011	2012	2013	2014	2015	2016 - 2035	Total (2011 – 2035)
	12	1 2	1 0	151 1	15 2	4	33 3	1 4

1.11 Valuation

10 1 2011 3 1
1 22

1.12 Mopani MER Extraction Table

Group level	2008A[2]	2009A	2010A	2011E	2012E	2013E	2014E	2015E
Finished metal production capacity (tonnes) - actual / forecast								
	2 5 000	2 5 000	300 000	300 000	300 000	300 000	300 000	300 000
	2 00	2 00	2 00	2 00	2 00	2 00	2 00	2 00
Finished metal production (tonnes) - actual / forecast								
	110 2 1	31	4 43	110 30	103 504	100 530	10 515	103 11
	1 45	1 2 1		1 331	1 303	1 21	1 215	1 32
	52	2 105	41	23 4	3	35	3	3
	0	0	303	5	5	5	5	5
	4 205	4 24	5 05	101 5 1	151	133 5	11 4	130 1
	0	0	0	0	0	0	0	0
Operating Cost[3]	**652,090**	**434,281**	**513,581**	**546,899**	**477,008**	**477,821**	**476,254**	**469,001**
By-products revenues (US$m)	**64,555**	**60,417**	**60,802**	**77,811**	**91,907**	**119,097**	**105,669**	**143,472**
Royalties (as a % market price)								
	3	3	3	3	3	3	3	3
	3	3	3	3	3	3	3	3
Depreciation & amortisation (US$m)	**110,769**	**139,437**	**150,050**	**107,916**	**110,934**	**107,480**	**93,359**	**86,395**
Statutory Tax rate %	**30%**	**30%**	**30%**	**30%**	**30%**	**30%**	**30%**	**30%**
Capex (US$m)								
	5	33 042	1 032	002	5 321	5 21	3 215	51 21
	1 2	24 512	3 5 2	501	102 2	1 51	120 013	23 35
TOTAL CAPEX	**136,945**	**57,554**	**129,604**	**182,503**	**178,048**	**151,069**	**157,228**	**74,577**

2

3

1.13 Mopani Headcount

December 2010 Mopani Headcount	
	3 4 5
	4
	2 22
	32
	420
Total	**7,522**
	4
Grand total	**8,010**

413

Table of Contents

TABLES

FIGURES

2.0 INTRODUCTION

2010

3 1

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10

3.0 DESCRIPTION OF RESOURCES

3.1 General Geology

3.1.1 Nkana Operation

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3.1.2 Mufulira Operation

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5 5

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0 40

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2

3.2 Local Geology

3.2.1 Nkana Operation

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1550 3 00 30
13 0 13 0 45
1300 0
5
5 0 2330 5000

20 45
350

250

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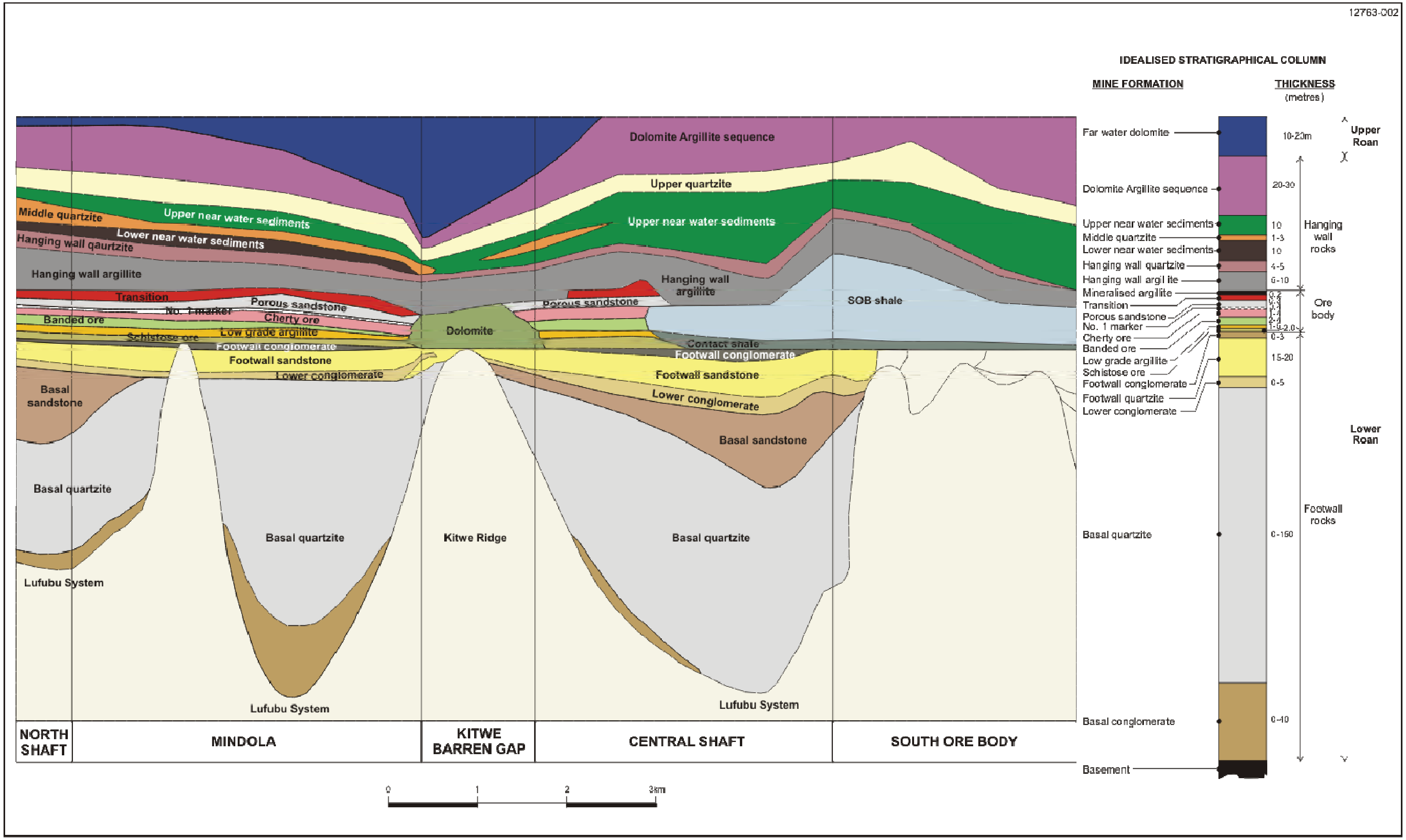

Figure 1 A generalised stratigraphic column for Nkana Mine

3.2.2 Mufulira Operation

5 5 2

10

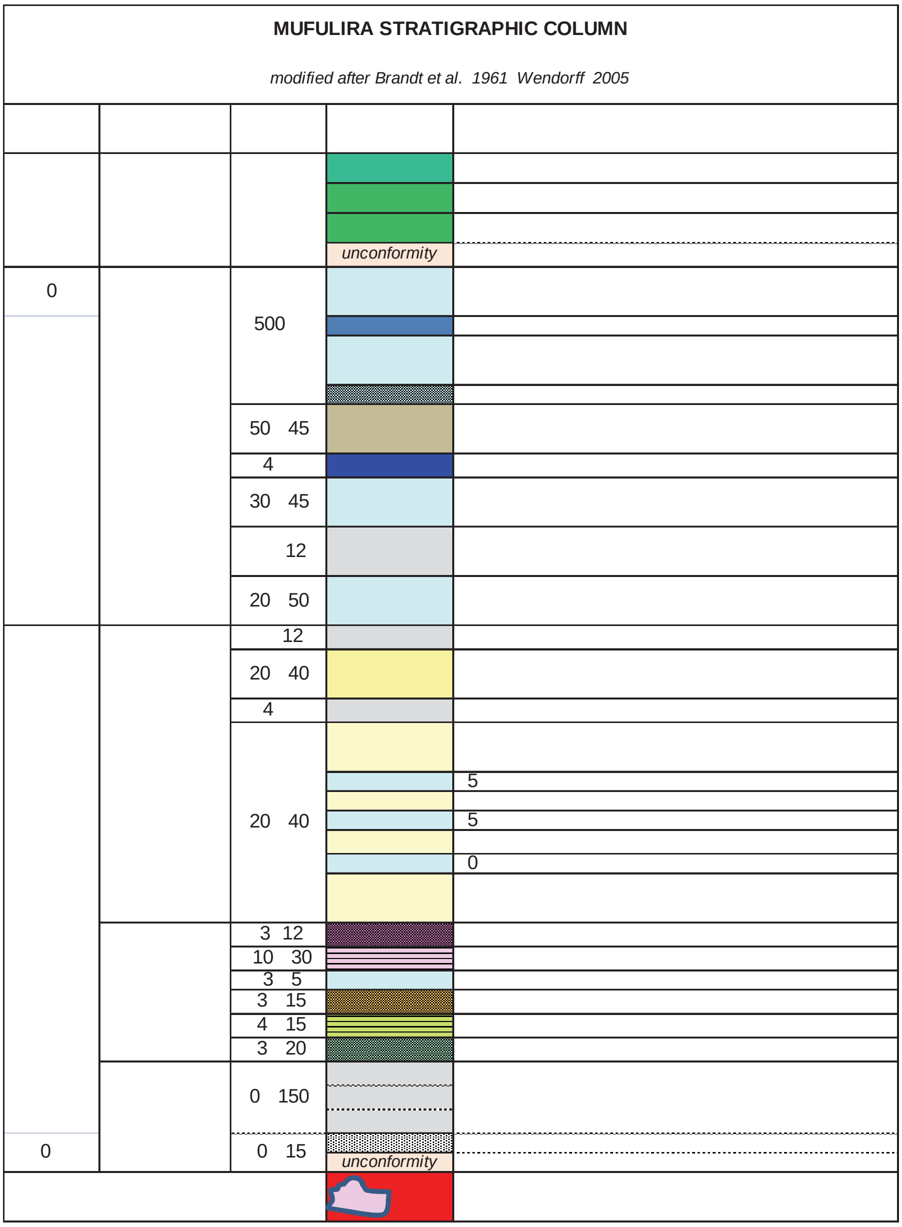

Figure 2 Mufulira Stratigraphic column

3.3 Mineral Resource Estimation Methodology

3.3.1 Exploration and Data

N

■ 120 300 0

■ 0
5

■ 30

200
200 500
0 5

100

2 5 3

Table 1: Summary of data provided in Collar Tables for Nkana

Database	Number Hole ID's	Boreholes	Chips
	1 31	1 00	30
	1	3	235
	2 005	1 0 1	44
	2	2	
	2	2	
	51	51	
	113	113	
	40	2	11
	155		5
		2	4
Total	**4,862**	**3,301**	**1,561**

0 5 1 0

1 5
2

0 10
1 5

0 4 1 0

15 100 200
2

20 30 100

250 0

2

10
0 1

10

1 200

3.4 Quality Assurance and Quality Control

001 200 2013

0141

3.4.1 Nkana

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4 5
4 4 5

2

Table 2: Statistics for the Standards used at Mopani Mine

Division	Standard	%TCu				%TCo			
		Min	Max	Ave	1 std dev	Min	Max	Ave	1 std dev
	1	1 03	1 11	1 0	0 020	0 04	0 055	0 052	0 002
	2	2 04	2 04	2 11	0 03	0 0 4	0 0 0	0 0	0 002
	51	2 0	2 4	2 2	0 200	0 13	0 1	0 15	0 020
	52	1 4	2 04	1 4	0 200	0 0	0 10	0 0	0 020
	53	1 5	2 05	1 5	0 200	0 0	0 12	0 10	0 020
	54	1 50	1 0	1 0	0 200	0 0	0 10	0 0	0 020

2

2

3.4.2 Mufulira

13

34 1 5
14 0

42 200
0 1 3

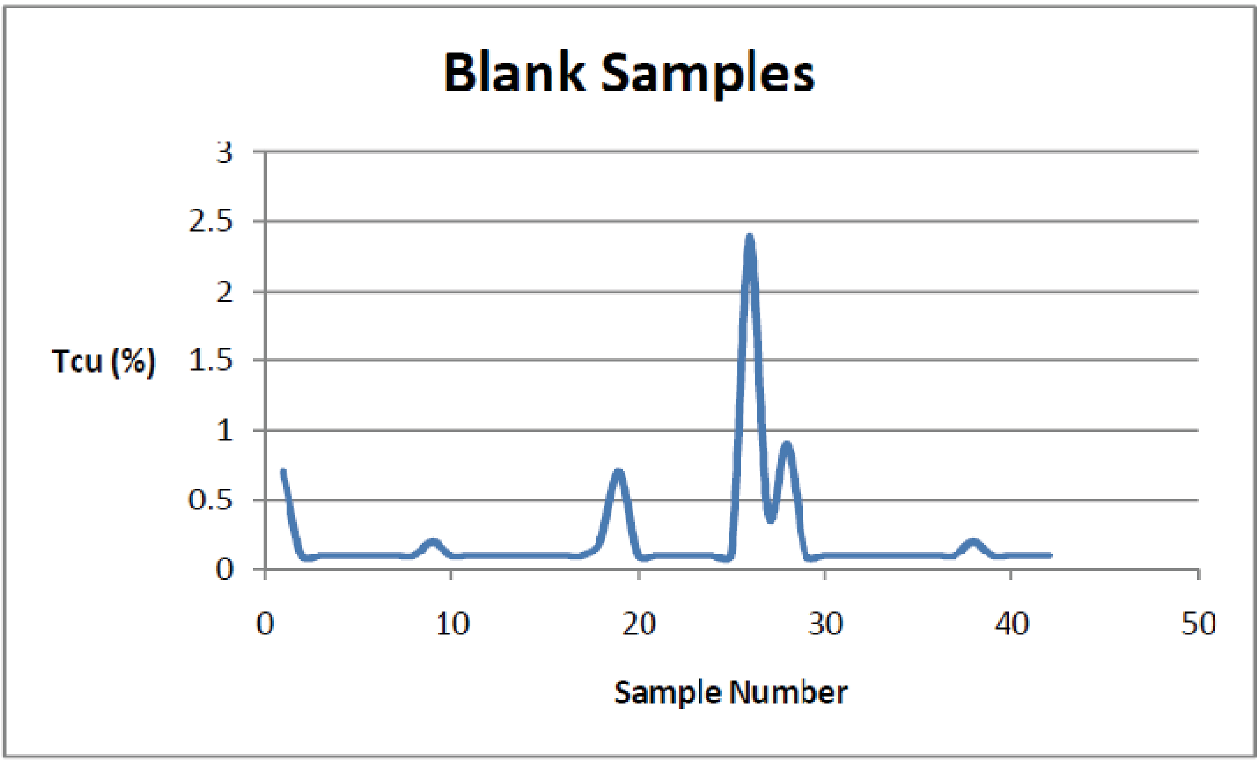

Figure Results from the Blank Samples

3.5 Geological Modelling

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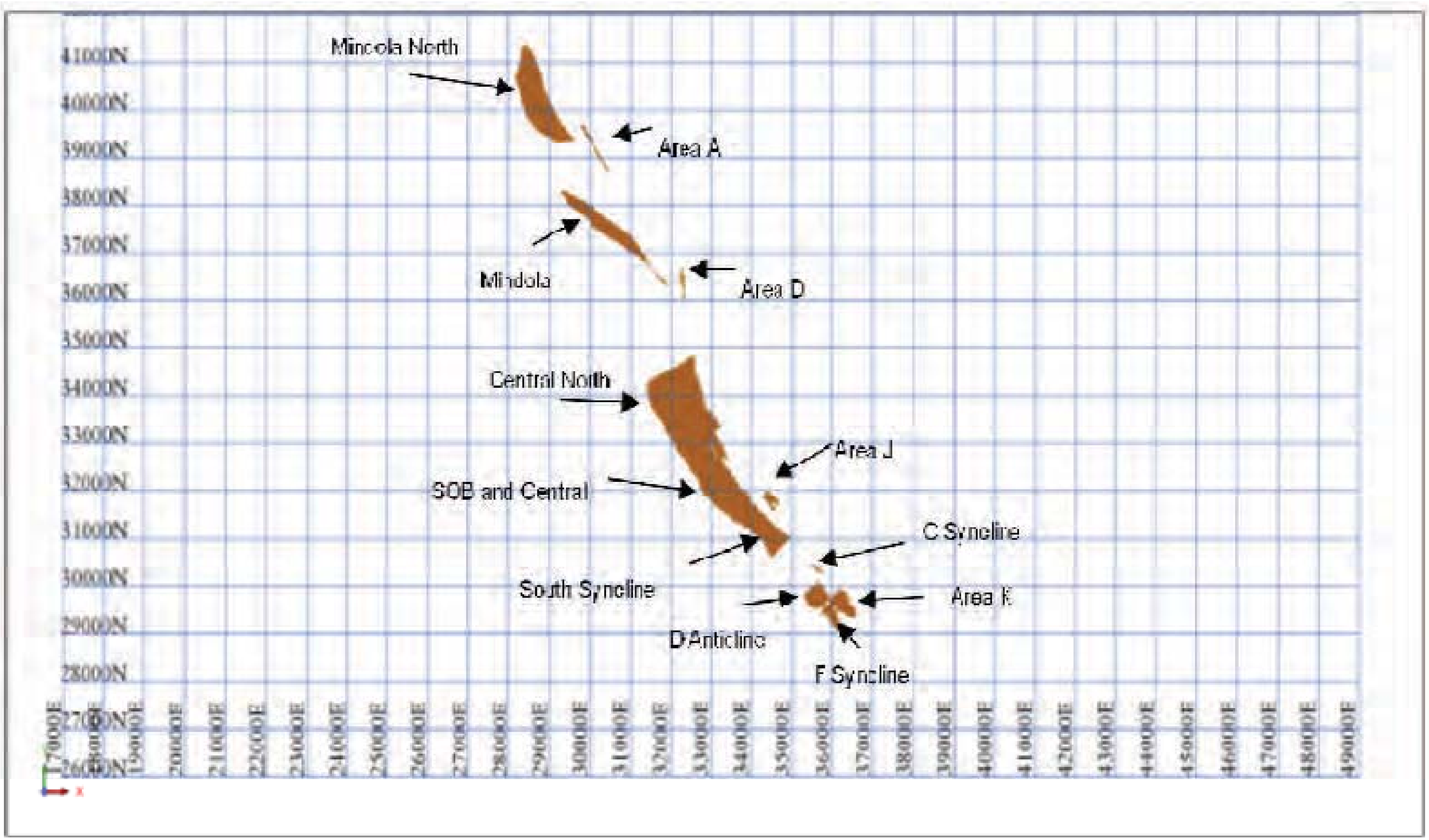

Figure 4 Wireframes of the mineralized areas - Nkana

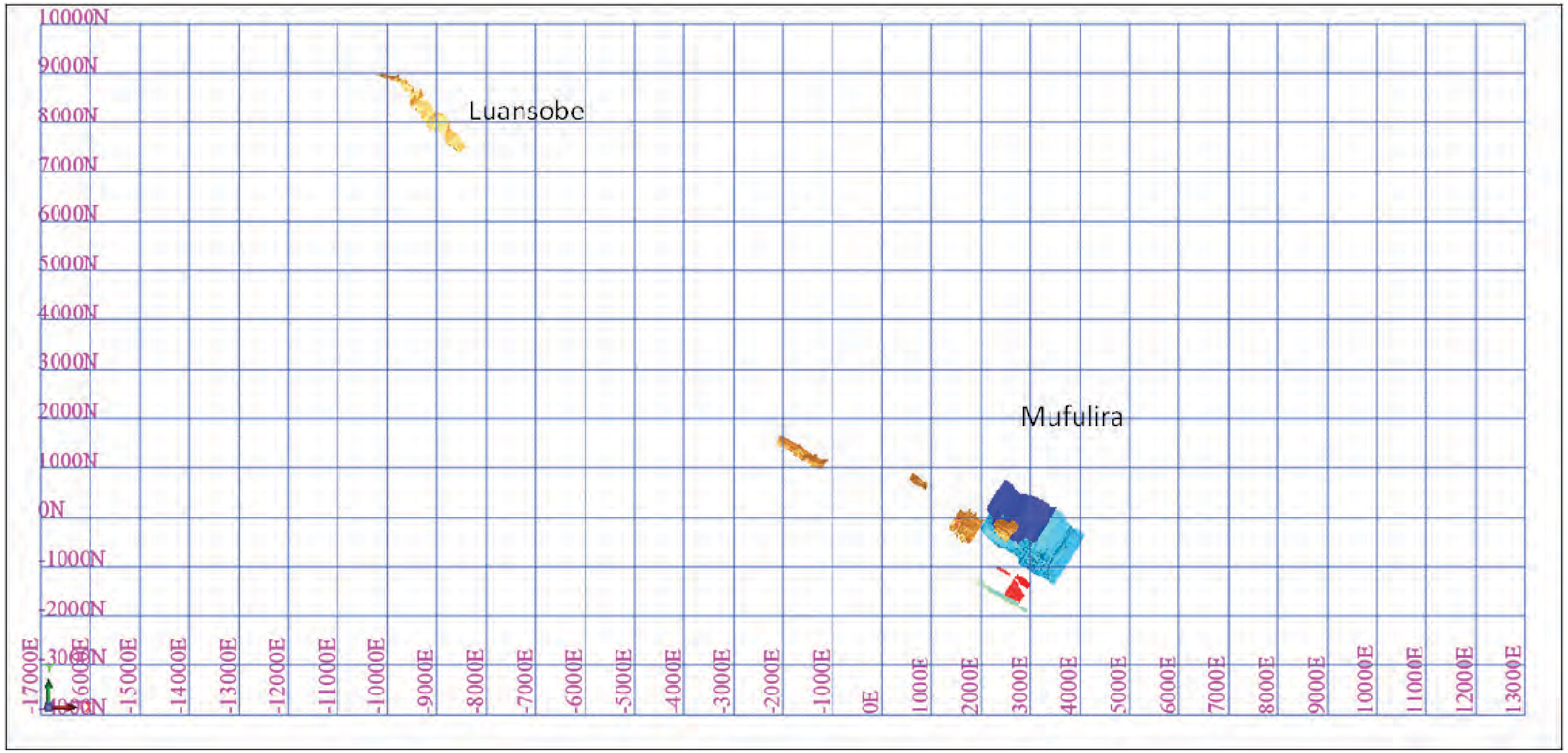

Figure 5 Mufulira Solids relative to the Luansobe Solids

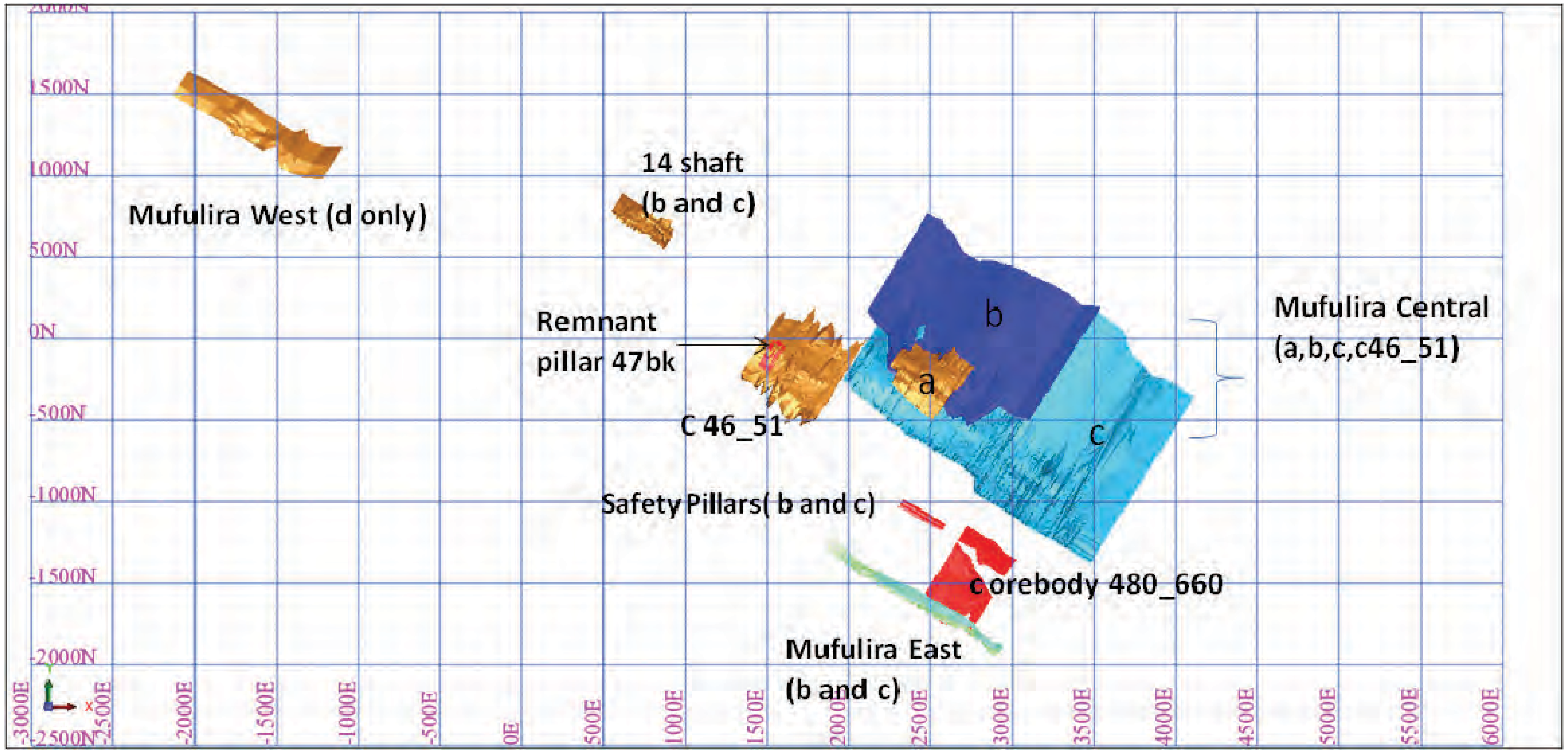

Figure 6 Solids for the mineralized areas in Mufulira

3.6 Variography Analysis

1

Table 3: Parameters Used for the Down hole Variogram Generation

Parameter	Value
	0
	0
	0
	0 5
	50

4 5

Table 4: Nkana Variogram Types

Project Area	Variogram Type

Table 5: Mufulira Variogram Types

Project Area	Variogram Type
	2
14	
14	
4 51	
4	
4 0 0	

3.6.1 Nugget Inference

1

1

3.6.2 Variography Results

N

Table 6: Nkana variography results for all the omni-directional variograms

Area	Domain	Variable	Nugget	Sill1	Range1	Sill2	Range2
			0 020	1 022		0 53	10
			0 001	0 01	10	0 003	101
			0 035	0 24	1	0 34	2 3
			0 002	0 00	20	0 001	
			0 0 3	1 341		0 3	150
			0 001	0 020	1	0 003	240
			0 05	1 0 5	11	0 123	15
			0 002	0 02		0 01	44
			0 115	1 020	12	0 32	215
			0 001	0 00	23	0 002	11
			0 2 3	1 04	15	0 531	
			0 001	0 00	1	0 001	11
			0 0	1	1	0 445	3
			0 000	0 004	20	0 005	4
			0 052	0 35	1	0 13	
			0 000	0 00	12	0 002	0
			0 01	0 3 2	42	0 1 1	3
			0 000	0 00	112		
			0 02	0 520	11	0 1	4
			0 000	0 001	4	0 001	0
	1		0 022	0 12		0 1 1	51
			0 000	0 004		0 00	121
	2		0 013	0 50		0 14	1
			0 000	0 003	10	0 002	1
			0 03	0 2	2	0 123	1
			0 000	0 003	4	0 002	41
			0 000	0 00	1	0 02	

Table 7: Nkana variography results for all the directional variograms

Area	Variable	Nugget	Major					Semi major			Minor		
			Sill1	Range1	Sill2	Range2	Maj-Dir	Range1	Range2	Semi-Dir	Range1	Range2	Minor-Dir
		0 250	2 55	30	0 0	200	130	15	125	40		30	0
		0 002	0 013	50	0 003	200	120	25	100	30	5	20	0
		0 1 0	2 0	5	0 4 0	200	150	25	5	0	5	22	0
		0 150	1 55	20	0 3 0	220	110	15	125	20		30	0
		0 002	0 013	50	0 003	200	120	25	100	30	5	20	0
		0 320	3 33	5	1 40	200	1 0	25	5	0	5	22	0
		2 20	2	35	0 200	200	130	30	200	40		30	0
		0 003	0 040	45	0 00	250	120	35	100	30		1	0
		2	4 0	30	0 00	225	120	30	0	30		30	0
		0 2 0	2 05	55	0 030	250	1 0	40	1 3	0	3	20	0
		0 002	0 00	55	0 004	250	1 0	50	200	0		30	0
		0 120	0 40	100	0 220	200	1 0	50	150	0	3	1	0

Table 8: Mufulira variography results for all the omni-directional variograms

Area	Domain	Variable	Nugget	Sill1	Range1	Sill2	Range2
			2				0 000
			2				0 000
			0 01	0 0	13 230	0 230	52 000
			0 00	0 430	3 0	0 2 0	55 000
14			0 05	0 120	2 0 0	0 2 0	34 000
			0 004	0 3 0	13 10	0 3 0	12 300
			0 032	100	3 10	0 5 0	00
			0 0 0	1 430	1 2 0	0 00	203 3 0
			0 130	1 3 0	14 30	1 100	2 1 0
	4 51		0 00	1 1 0	500	0 3 0	1 4 3 0
			0 000	12 1 0	2 0		
			0 013	0 0	300	0 220	4 00
			0 145	2 5 0	40	1 250	52 040
			0 00	1 50	40	0 5	33 1 0
			0 000	210	53 550		
			0 001	0 0	4 00	0 150	3 00
			0 002	0 1 0	3 1 0	0 220	1 00
0			0 00	1 400	5 40	0 320	3 200

3.7 Estimation Parameters

3.7.1 Block Model

10

Table 9: Summary of solid volumes versus block volumes for Nkana

Area	Wireframe Volume (cm³)	Block Model Volume (cm³)	% Difference
	201 4	201 310	0 00
	452 5	452 50	0 00
	23 201 325	23 20 24	0 03
	2 3 232	2 2 200	0 3
	45 01 32	44 3 300	0 3
	4 52 25	4 5 32	0 00
	1 1 4 1	1 50	1 2
	1 5	1 53 4 5	0 1
	5	5 0 4	0 0
	3 10 31	3 10 41	0 00
	1 4 0	1 50 4 5	0 04
	2 3 1 11	2 3 2 5	0 0

Table 10: Summary of solid volumes versus block model volumes for Mufulira

Area	Wireframe Volume (cm³)	Block Model Volume (cm³)	% Difference
	4 0 2 55	4 0 4 1 5	0 035
	210 405	210 313	0 00
14	1 0 3	1 0 3	0 00
14	2 25 4 2	2 5	1
	1 55 4	1 555 4	0 052
	3 52	14 13	0 252
	2 1 5 15	2 0 0 0	0 441
4 51	4 151 052	4 151 1	0 015
	23 441	23 1	0 11
	3 042	3 325	0 04
	1	31	0 01
	145 0	145 41	0 24
	110	110 00	0 0
4 0 0	4 053	4 0 3	0 00

N

20 20 4

5 5 1

10 10 4
2 5 2 5 1

3.7.2 Estimation Plan

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- 1 2 3
- 2
- 3 1 5
- 4

4 25

3.7.3 Density Assignment

N

1 45 35
2 3 2 5
3

2 5 3

1 2010
2 5 3
2 5 3

11

Table 11: Mufulira density values assigned for tonnage calculations

Project Area	Density t/m^3
	2 50
	2 50
14	2 5
14	2 5
	2 5
	2 5
	2 5
4 51	2 5
	2 50
	2 50
	2 5
	2 5
0	2 5

3.7.4 Block Model Validation

3.7.5 Nkana Grade Distribution

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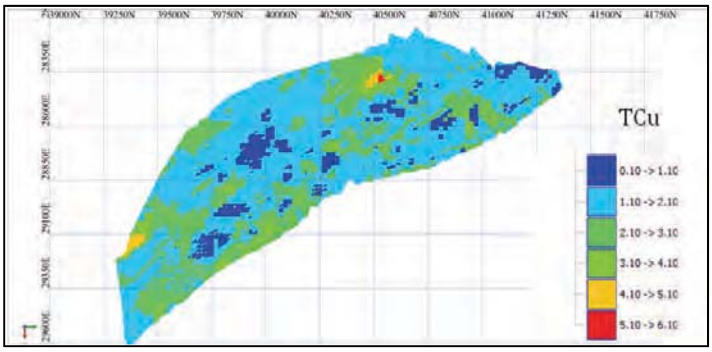


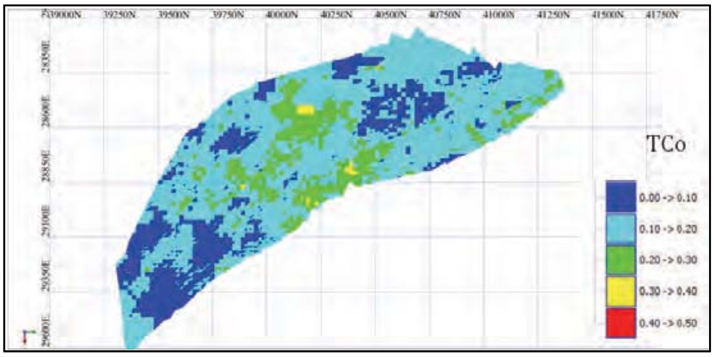
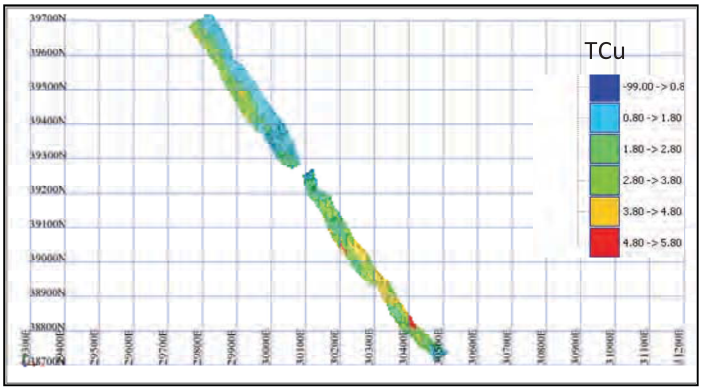
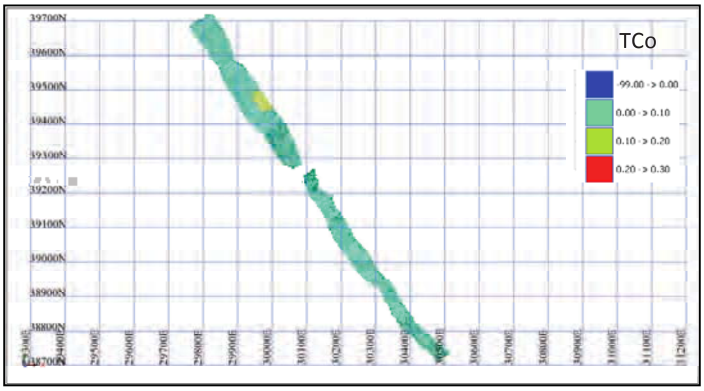


Figure 7 Distribution of TCu and TCo grades for Mindola North

A A





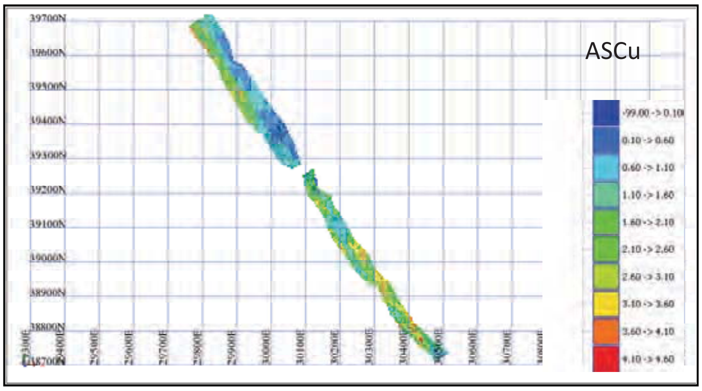


Figure 8 Distribution of TCu TCo and ASCu grades for Area A

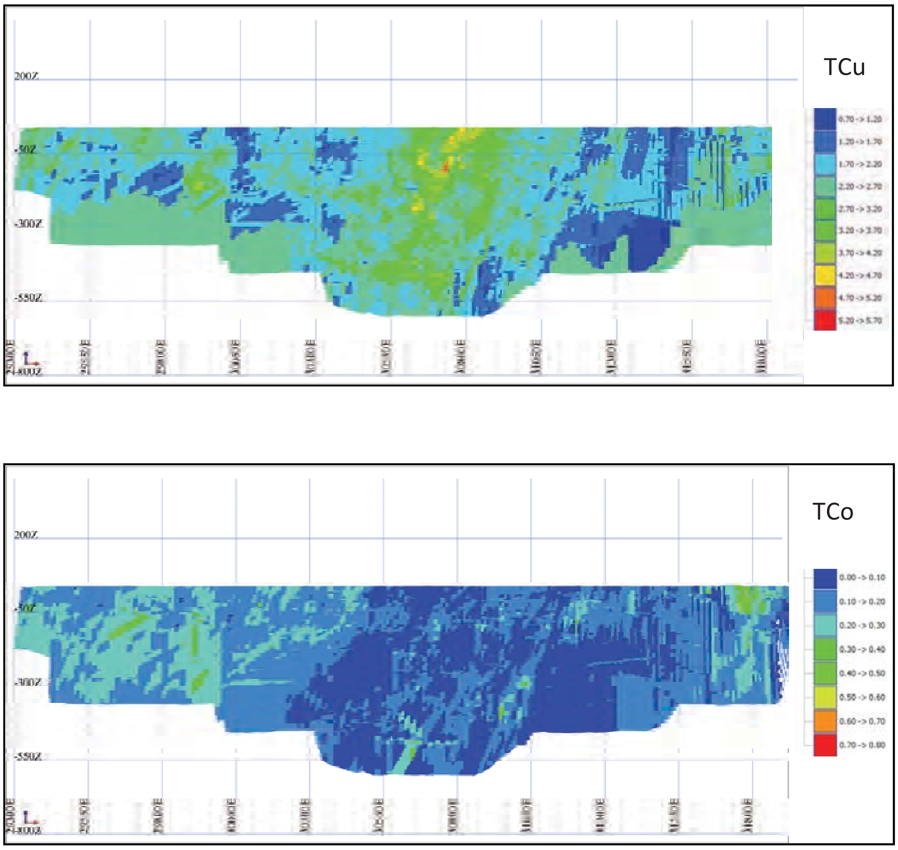


Figure 9 Distribution of TCu and TCo grades for Mindola

A D

10

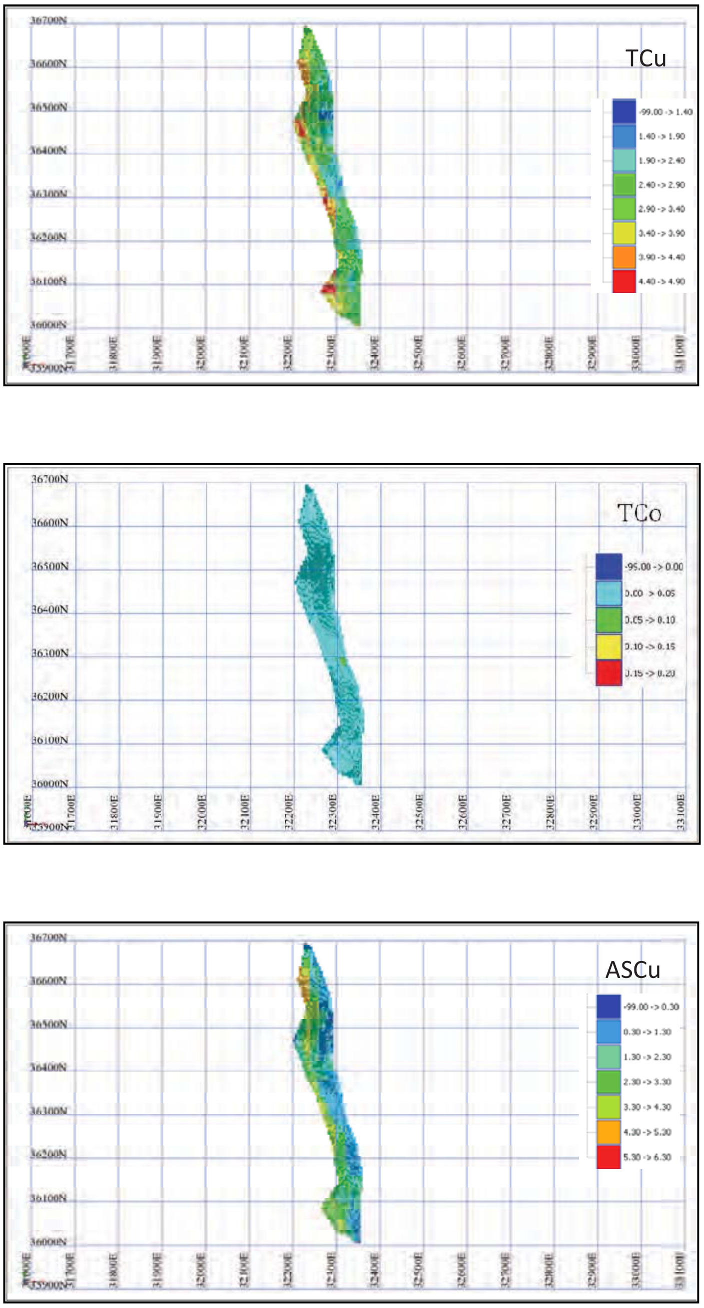
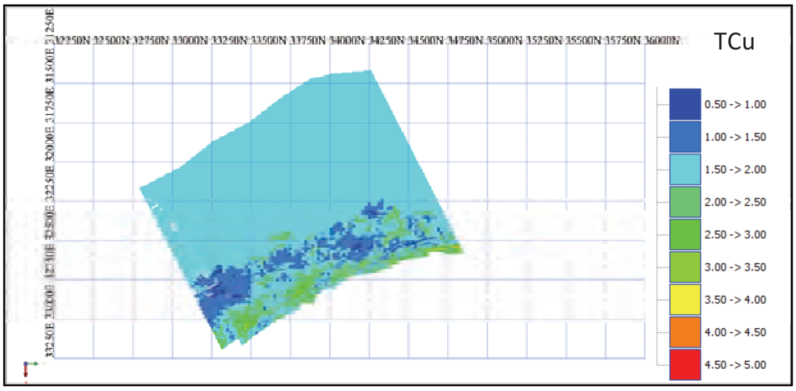


Figure 10 Distribution of TCu TCo and ASCu grades for Area D

N

11



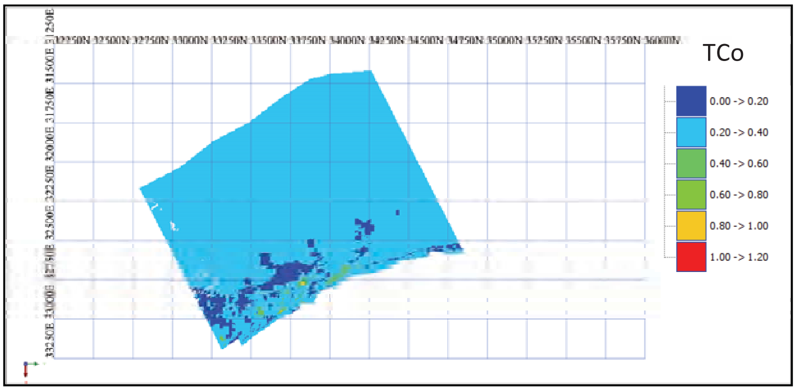
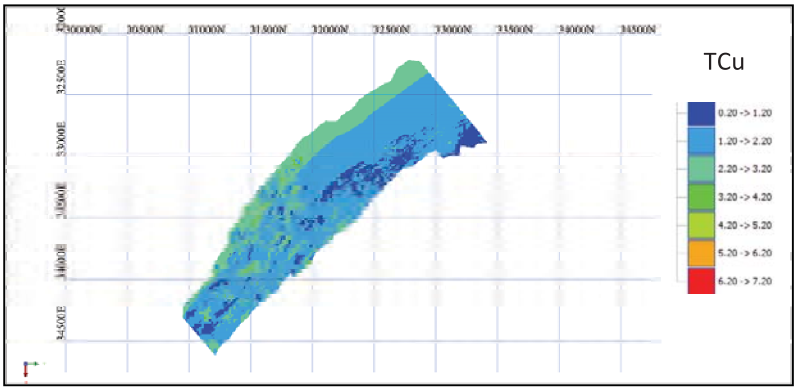


Figure 11 Distribution of TCu and TCo grades for Central North

12



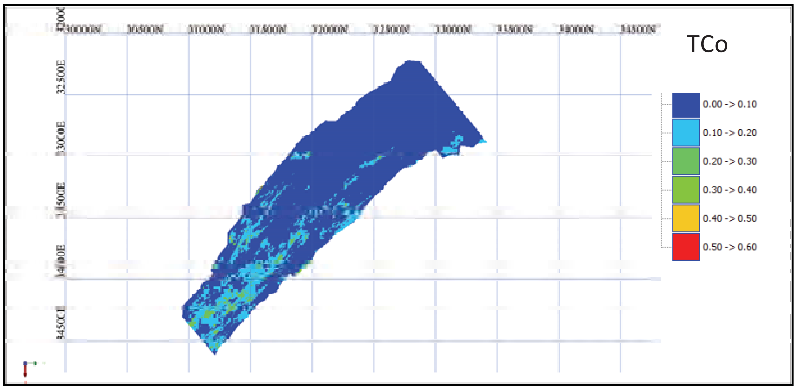
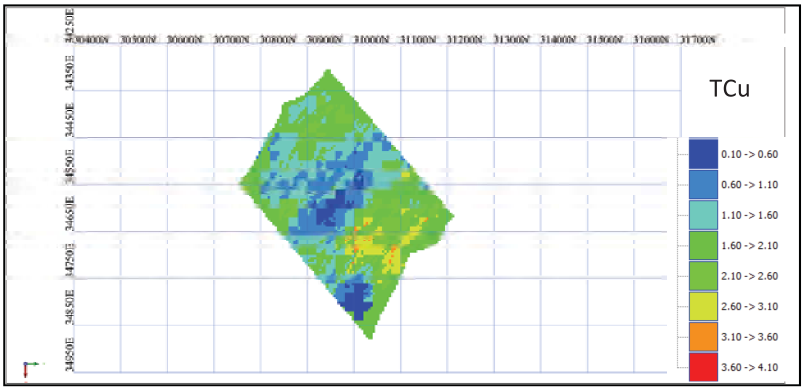


Figure 12 Distribution of TCu and TCo grades for SOB

13



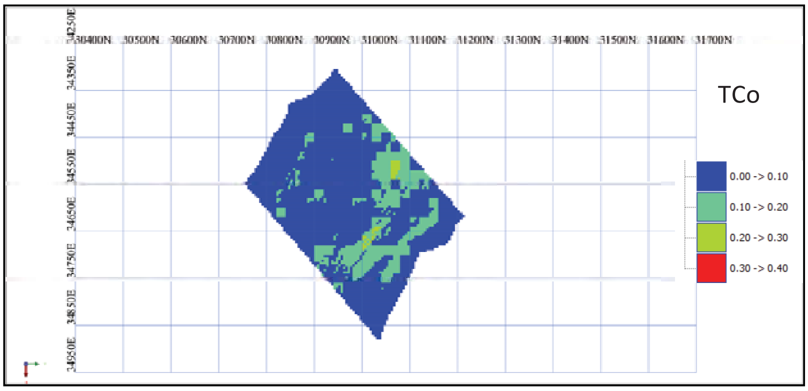
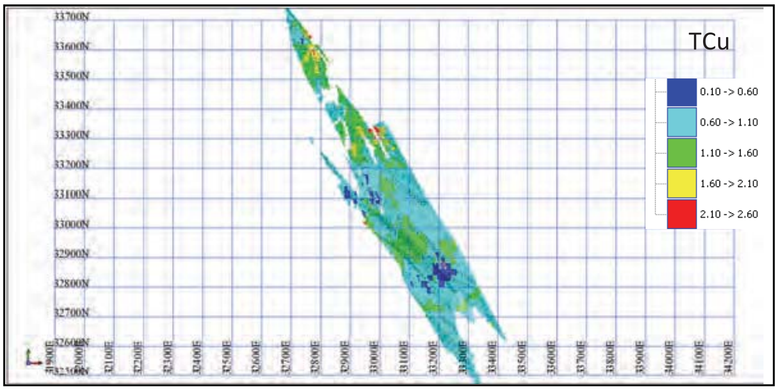


Figure 1 Distribution of TCu and TCo grades for South Syncline

L

14



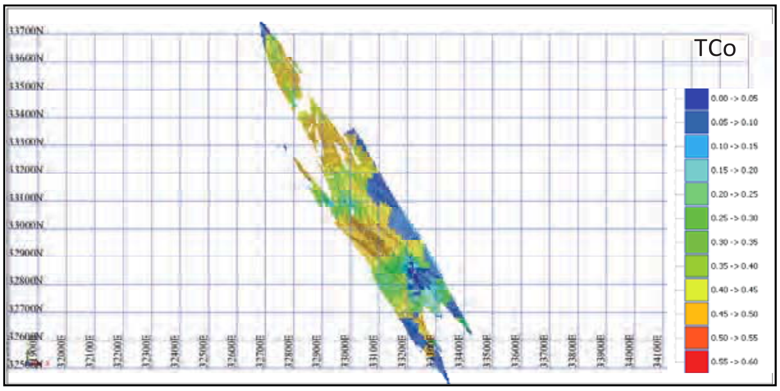


Figure 14 Distribution of TCu and TCo grades for ZJ Limb

A

15

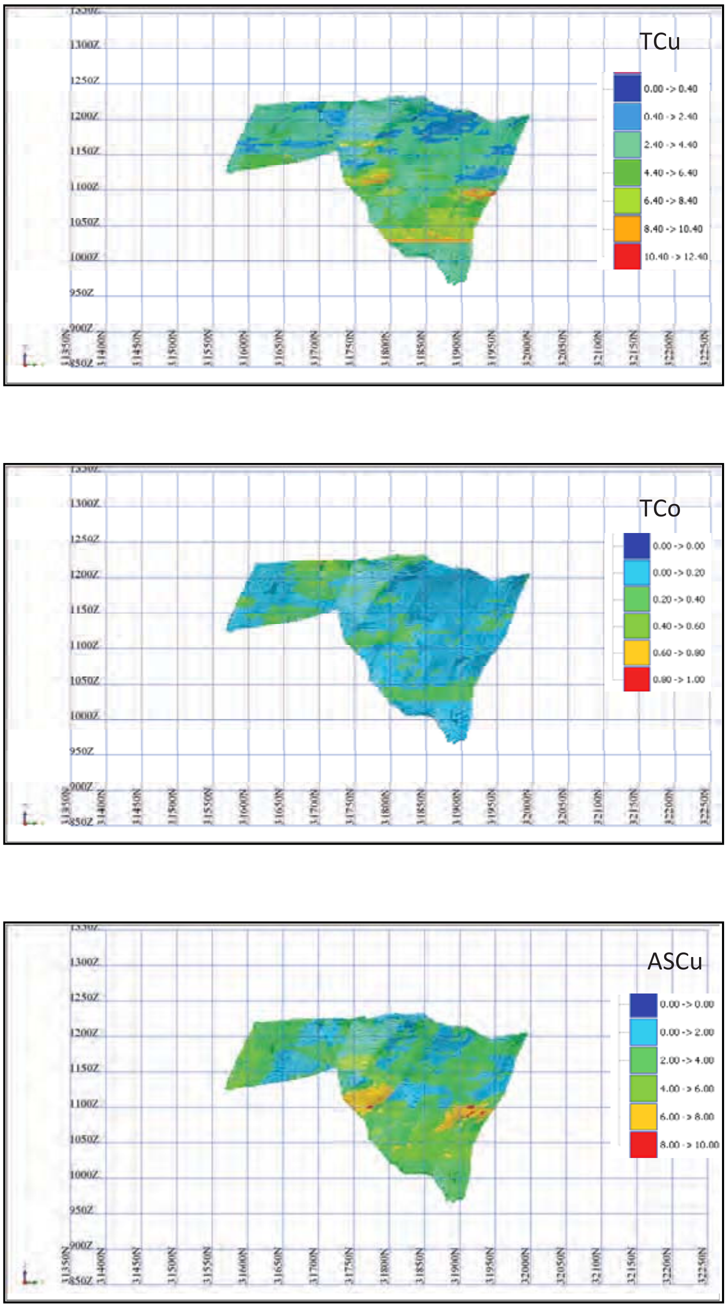
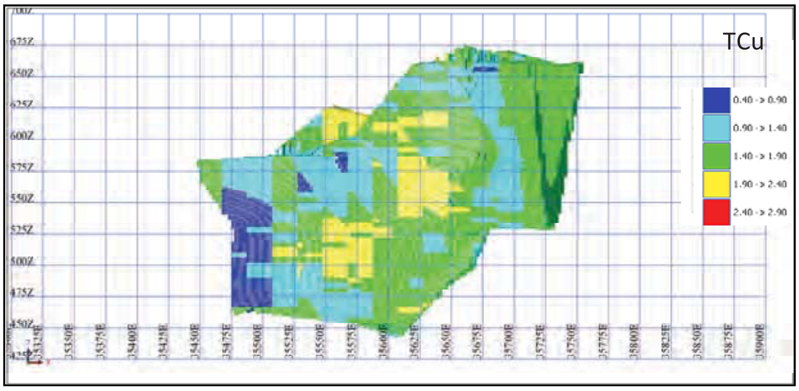


Figure 15 Distribution of TCu TCo and ASCu grades for Area J

1



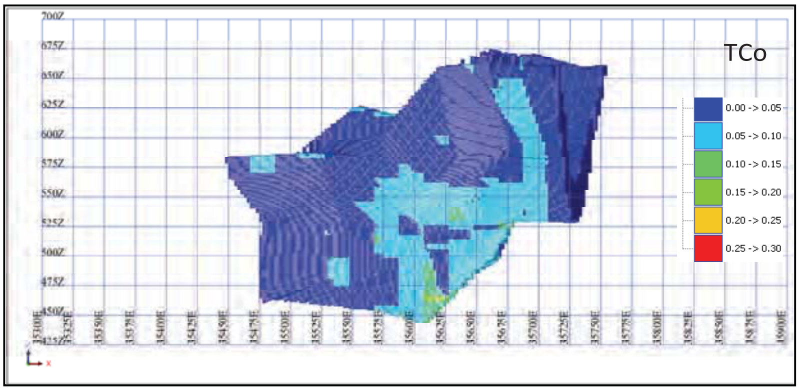
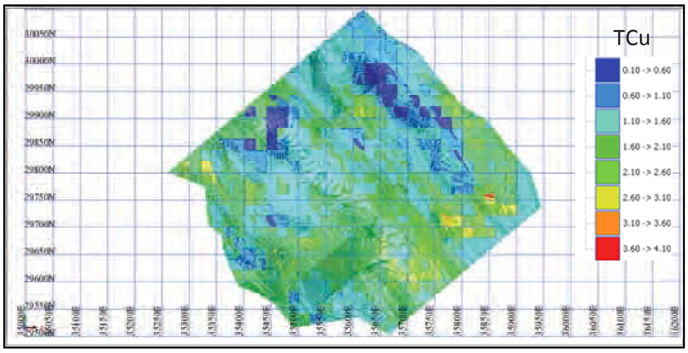


Figure 16 Distribution of TCu and TCo grades for C Syncline

D A

1



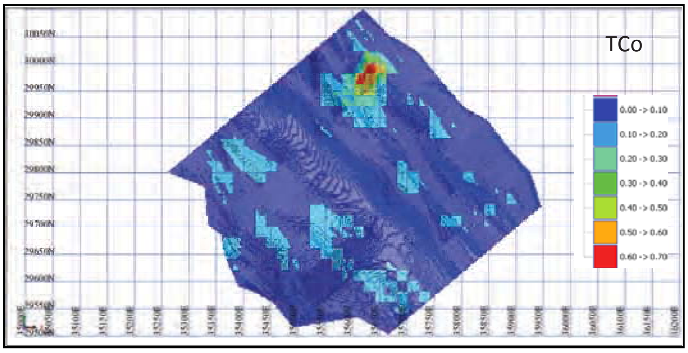


Figure 17 Distribution of TCu and TCo grades for D Anticline

1

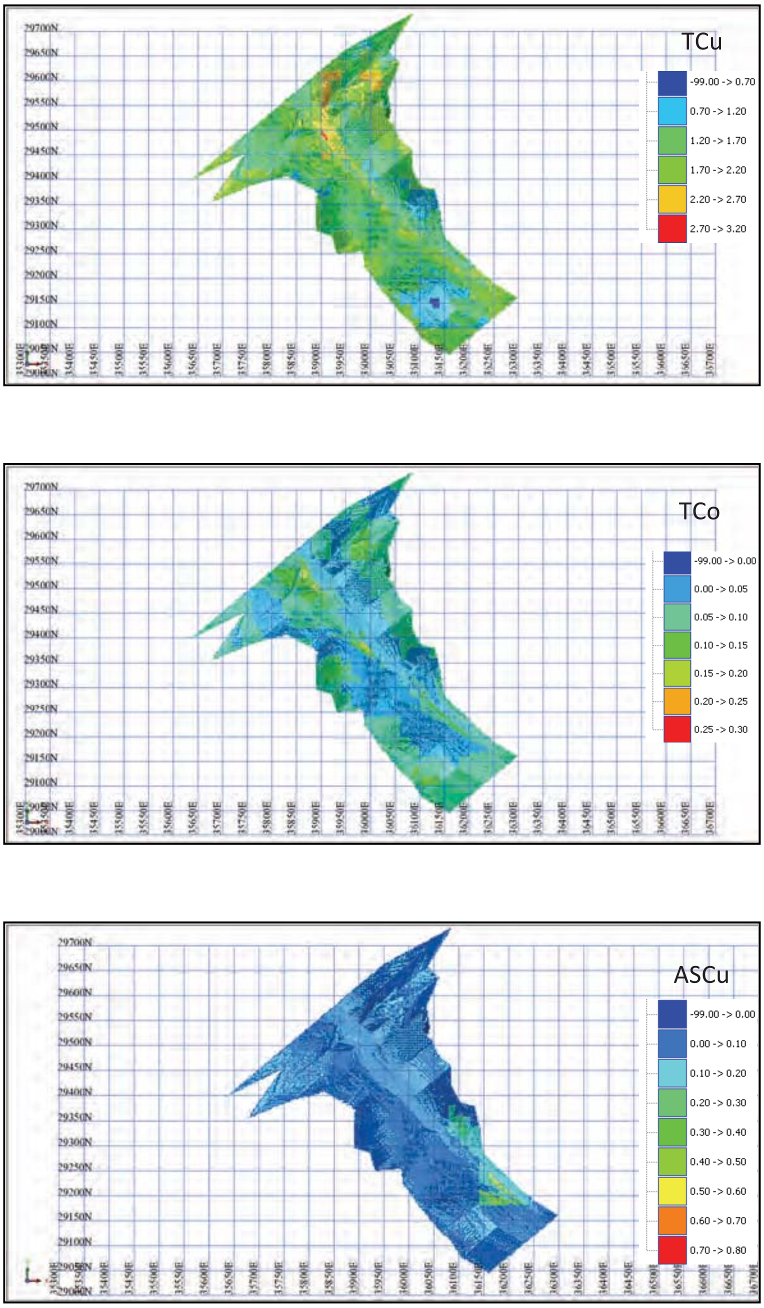


Figure 18 Distribution of TCu TCo and AScu grades for F Syncline

A

1

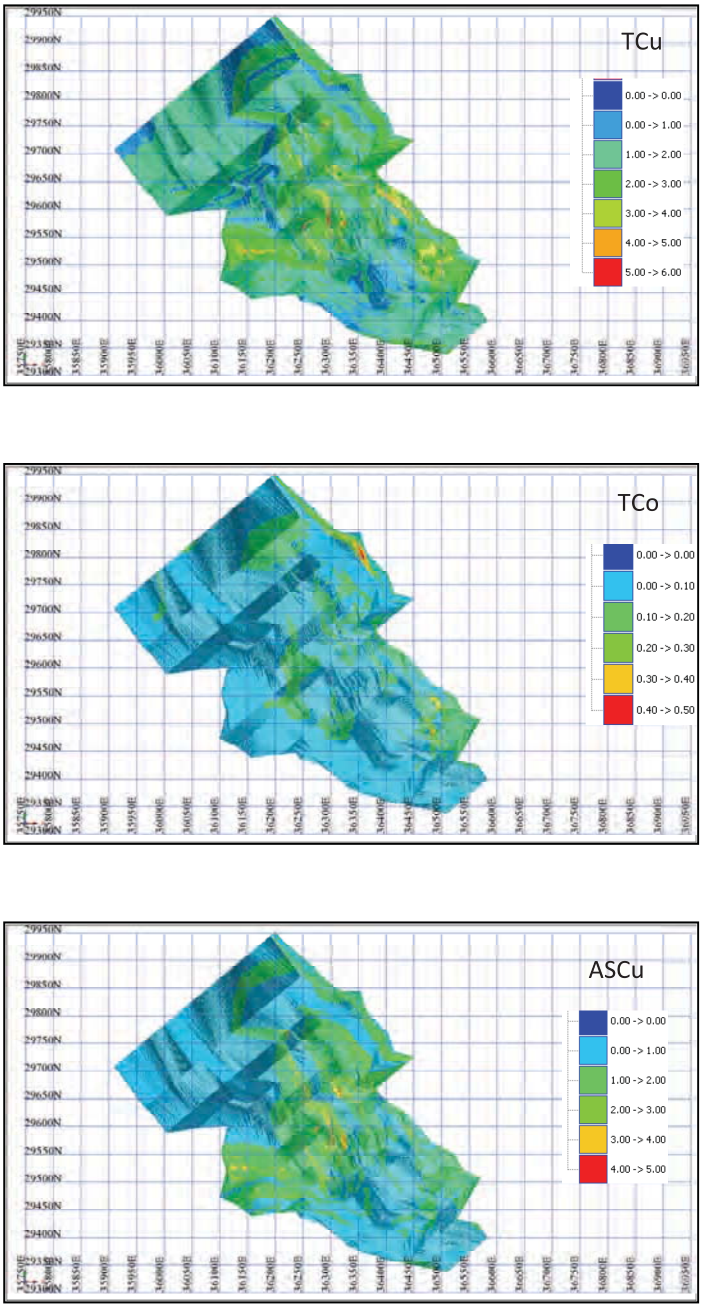


Figure 19 Distribution of TCu TCo and ASCu grades for Area

3.7.6 Mufulira Grade Distribution

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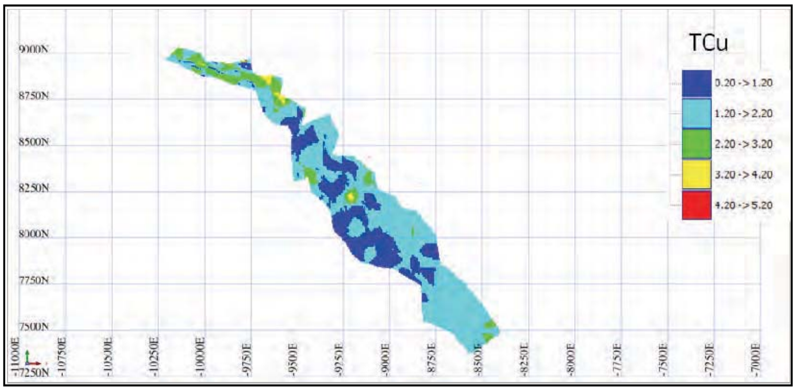


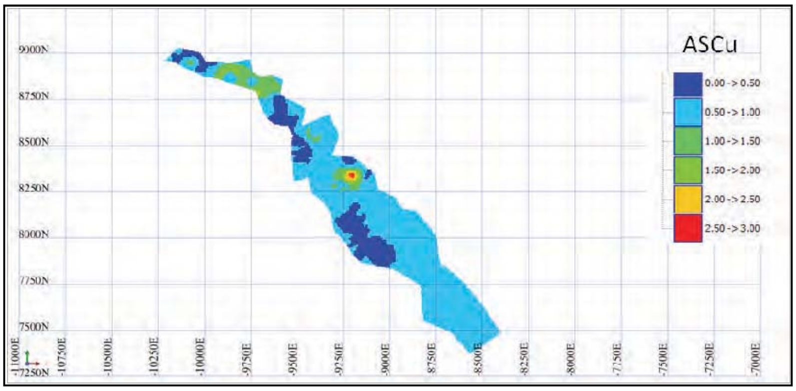


Figure 20 Distribution of TCu and ASCu grades for Luansobe

21

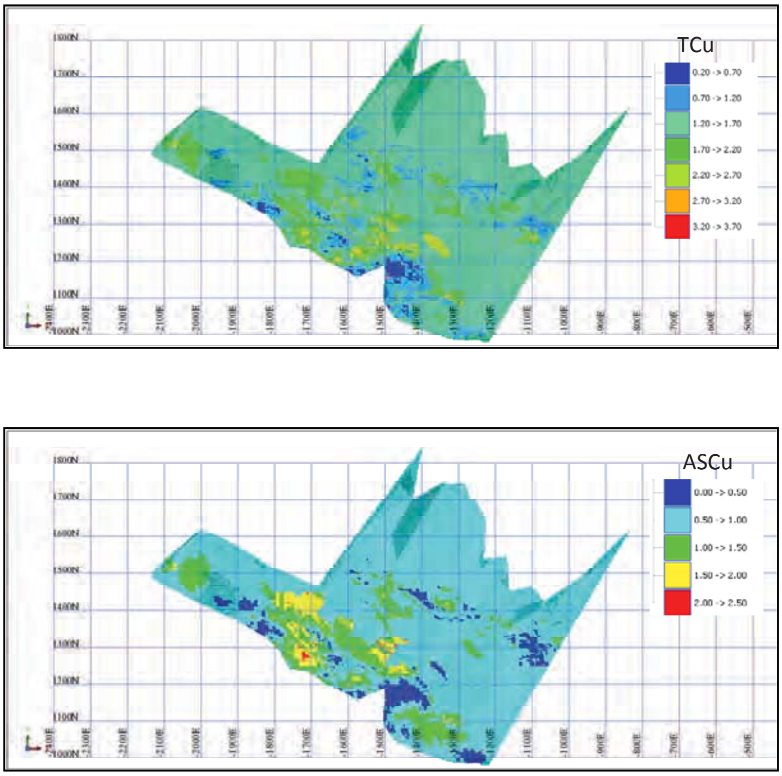


Figure 21 Distribution of TCu and ASCu grades for Mufulira West

14 22

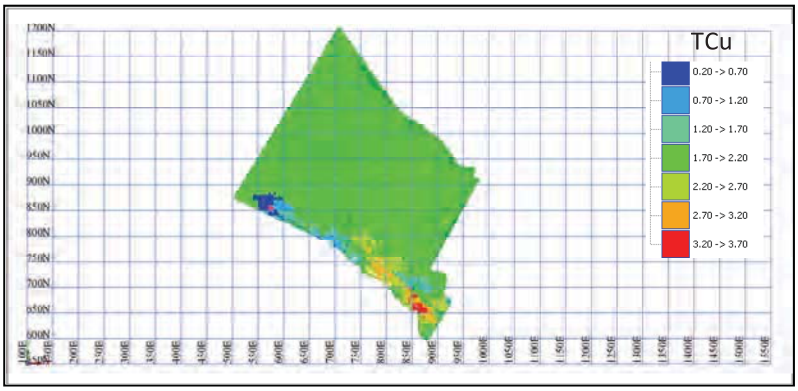


Figure 22 Distribution of TCu grades for 14 Shaft B Orebody

14 23

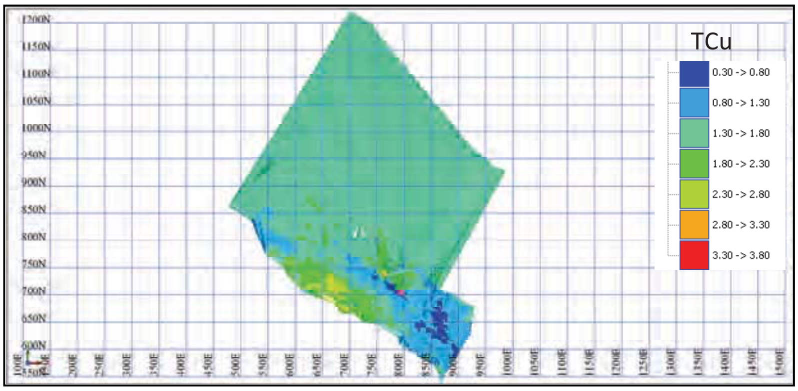


Figure 2 Distribution of TCu grades for 14 Shaft C Orebody

A

24

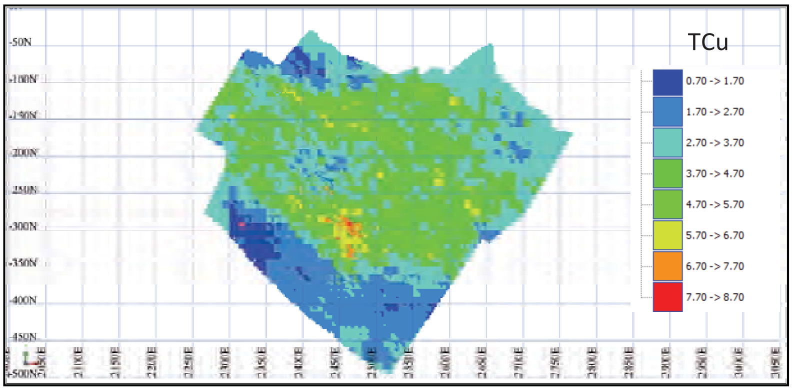


Figure 24 Distribution of TCu grades for Mufulira Central A Orebody

25

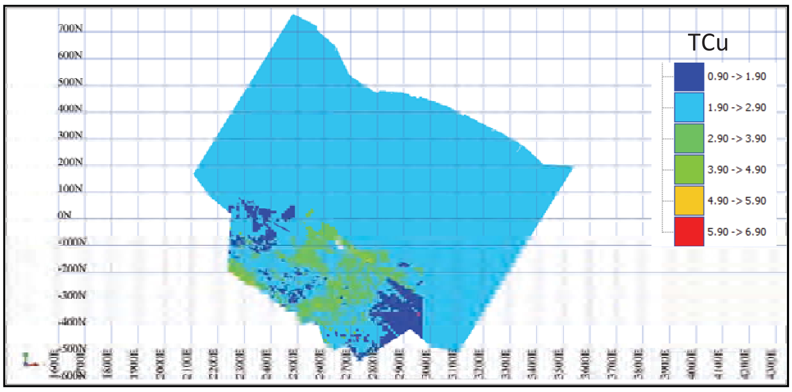


Figure 25 Distribution of TCu grades for Mufulira Central B Orebody

2

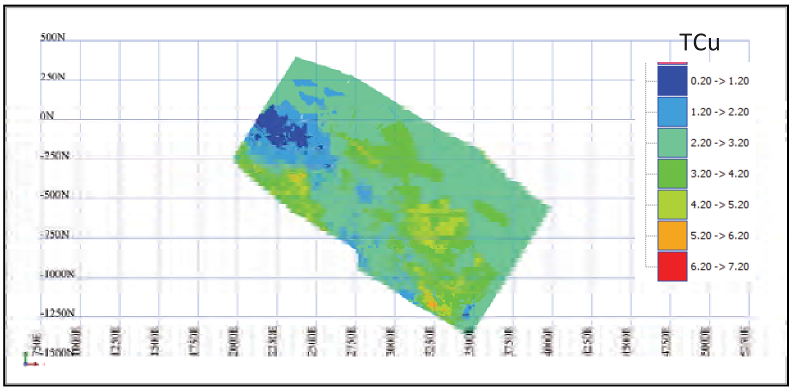


Figure 26 Distribution of TCu grades for Mufulira Central C Orebody

4 51 2

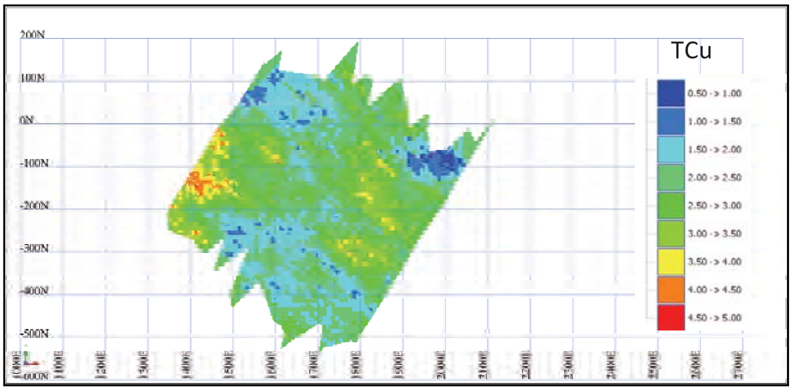
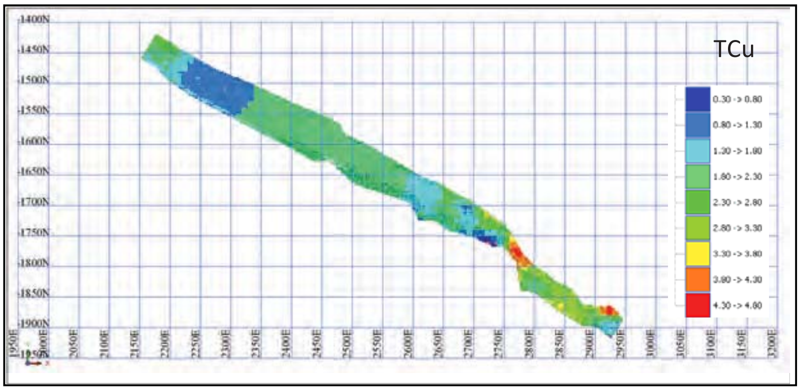


Figure 27 Distribution of TCu grades for Mufulira Central C46 51 Orebody

E

2



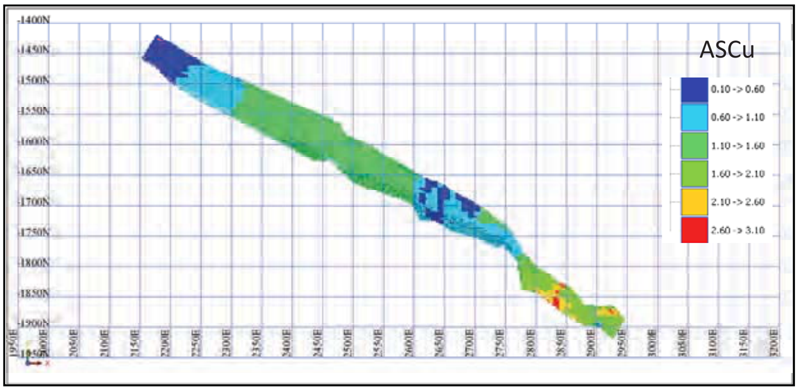


Figure 28 Distribution of TCu and ASCu grades for Mufulira East B Orebody

E

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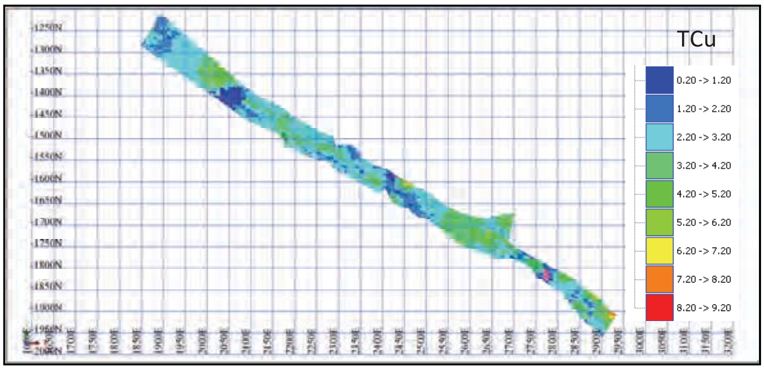

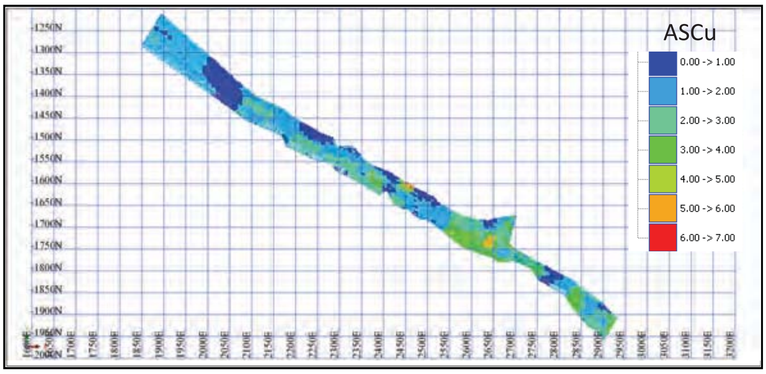

Figure 29 Distribution of TCu and ASCu grades for Mufulira East C Orebody

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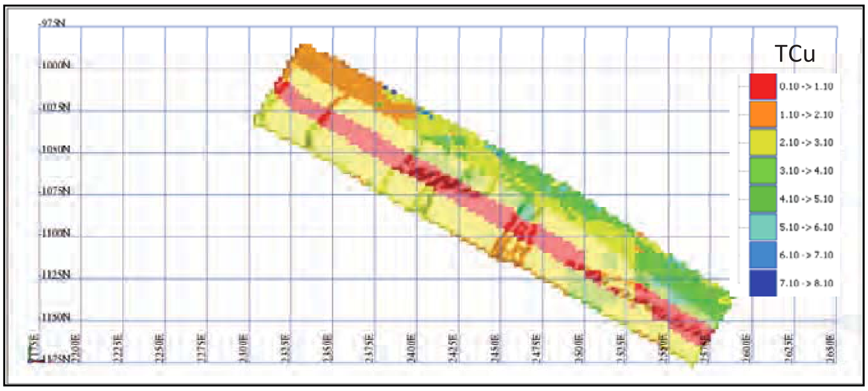

Figure 0 Distribution of TCu grades for Safety Pillar B and C

0 31

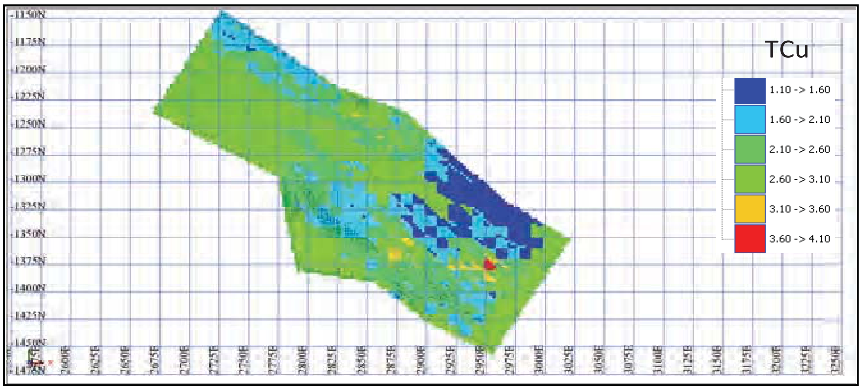

Figure 1 Distribution of TCu grades for C Orebody 660

3.8 Mineral Resource Classification

3.8.1 Criteria for Classification

A Mineral Resource is a concentration or occurrence of material of intrinsic economic interest in or on the Earth s crust in such form uality and uantity that there are reasonable prospects for eventual economic e traction. The location uantity grade geological characteristics and continuity of a Mineral Resource are known estimated or interpreted from specific geological evidence and knowledge. Mineral Resources are subdivided in order of increasing confidence into Inferred Indicated or Measured categories.

An Inferred Mineral Resource is that part of a Mineral Resource for which tonnage grade and mineral content can be estimated with only a low level of confidence. It is inferred from geological evidence and assumed but not verified geologically and or grade continuity. It is based on information gathered through appropriate techni ues from locations such as outcrops trenches pits workings and drill holes which may be limited or of uncertain uality and reliability.

An Indicated Mineral Resource is that part of a Mineral Resource for which tonnage densities shape physical characteristics grade and mineral content can be estimated with a reasonable level of confidence. It is based on e ploration sampling and testing information gathered through appropriate techni ues from locations such as outcrops trenches pits workings and drill holes. The locations are too widely or inappropriately spaced to confirm geological and or grade continuity but are spaced closely enough for continuity to be assumed.

A Measured Mineral Resource is that part of a Mineral Resource for which tonnage densities shape physical characteristics grade and mineral content can be estimated with a high level of confidence. It is based on detailed and reliable e ploration sampling and testing information gathered through appropriate techni ues from locations such as outcrops trenches pits workings and drill holes. The locations are spaced closely enough to confirm geological and grade continuity.

-
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3.9 Mineral Resource Statement

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Table 12: Summary of Mineral Resources for Nkana Mine at 31st December 2010

Underground Project Areas	Structure	Measured				Indicated				Inferred				Total			
		Mt	%TCu	%ASCu	%TCo	Mt	%TCu	%ASCu	%TCo	Mt	%TCu	%ASCu	%TCo	Mt	%TCu	%ASCu	%TCo
		1 0	1 5		0 13	2 50	2 2		0 13	0 50	1		0 14	4 0	2 03		0 13
		1 20	2 1		0 13	0	2 00		0 14	0	1		0 15	31 0	2 0		0 14
		23 20	1 2		0 14	10	1		0 23	0	1 1		0 23	3 00	1 1		0 1
		30	1		0 0	11 10	1 2		0 0	14 0	1 4		0 0	115 50	1 1		0 0
						1 0	1 00		0 3	1 0	1 03		0 2	3 0	1 02		0 33
		1 30	1 21		0 12	3 0	1 5		0 0	1 0	1 5		0 0	50	1 54		0 0
		0 30	1		0 04	0 0	1		0 05	0 50	1 2		0 04	1 50	1 54		0 04
	110	2 50	1 1		0 0	0 0	1 5		0 0	0 40	1 53		0 05	3 0	1 3		0 0
	110	0 05	1 4	0 14	0 05	0 0	1 53	0 05	0 1	0 00	1 4	0 0	0 13	0 14	1 51	0 0	0 12
SUBTOTAL		**136.60**	**1.94**	**0.14**	**0.10**	**34.30**	**1.79**	**0.05**	**0.14**	**35.30**	**1.65**	**0.06**	**0.14**	**206.20**	**1.86**	**0.08**	**0.12**

Oxide Caps		Measured				Indicated				Inferred				Total			
		Mt	%TCu	%ASCu	%TCo	Mt	%TCu	%ASCu	%TCo	Mt	%TCu	%ASCu	%TCo	Mt	%TCu	%ASCu	%TCo
		0 0	2 5	1 1	0 04	0 02	2	1	0 03	0 002	2 4	2 0	0 03	0 0	2 5	1 2	0 04
		0 40	3 32	2 4	0 02									0 40	3 32	2 4	0 02
		4 20	3 1	2	0 15	0 12	5	4 22	0 22	0 02	41	4	0 2	4 30	3	2 1	0 15
		2 0	1 4	1 0	0 0	0 0	1 0	0	0 10	0 0	1 4	1 0	0 10	3 10	1 5	1 0	0 0
SUBTOTAL		**8.40**	**2.93**	**2.04**	**0.11**	**0.21**	**4.12**	**2.95**	**0.16**	**0.08**	**3.31**	**1.97**	**0.14**	**8.70**	**2.96**	**2.06**	**0.11**
Remnant/Pillar s	Structure	Measured				Indicated				Inferred				Total			
		Mt	%TCu	%ASCu	%TCo	Mt	%TCu	%ASCu	%TCo	Mt	%TCu	%ASCu	%TCo	Mt	%TCu	%ASCu	%TCo
		0 0	2 0		0 11									0 0	2 0		0 11
SUBTOTAL		**0.80**	**2.09**		**0.11**									**0.80**	**2.09**		**0.11**
GRANDTOTAL		**145.80**	**2.00**	**0.25**	**0.10**	**34.50**	**1.80**	**0.07**	**0.14**	**35.4**	**1.65**	**0.06**	**0.14**	**215.70**	**1.91**	**0.16**	**0.12**

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Table 13: Summary of Mineral Resources for Mufulira at 31st December 2010

Project Area	Orebody	Measured			Indicated			Inferred			Total		
		Mt	%TCu	%ASCu	Mt	%TCu	%ASCu	Mt	%TCu	%ASCu	Mt	%TCu	%ASCu
		4 50	1 5	0	0 0	1 2	0	0 40	1 22	0	5 0	1 5	0
		2 20	1 3	0 1	1 0	1 1	1 2	2 0	1 4	1 04	0	1 5	1 05
14		0 30	2 02		0 20	1		0 30	1 0		0 0	1 4	
		1 30	1 22		0 30	1 5		0 30	1 50		1 0	1 32	
		0 50	3 3		0 20	3 40		0 20	3 3		0 0	3 5	
		2 50	2 5		1 00	2 45		50	2 54		13 00	2 54	
		12 40	2 42		4 0	3 22		23 10	2 4		40 30	2	
	4 51	1 0	2 03		0 30	2 43					2 30	2 0	
		0 20	2 4	1 43	0 03	1	0 0	0 40	1 5	0 3	0 0	1	1 0
		1 00	2 5	1	0 50	2	1 33	0 30	2 50	1 3	1 0	2	1
SUBTOTAL		**26.80**	**2.17**	**0.29**	**9.50**	**2.65**	**0.32**	**37.30**	**2.63**	**0.11**	**73.70**	**2.46**	**0.20**
Historical Blocks													
4	4 51	0 30	2								0 30	2	
50 51	4 51	0 10	3 10								0 10	3 10	
		0 20	3 41		0 03	2 30		0 05	1 5		0 30	2	
		0 30	2 31		0 05	2 1		0 0	2 15		0 40	2 2	
		0 20	0		0 03	0 3		0 04	0 1		0 30	0	
4 0 0		0 20	2 2		0 20	1 00		0 20	2 23		0 0	2 11	
SUBTOTAL		**1.30**	**2.37**	**-**	**0.30**	**1.86**	**-**	**0.37**	**2.19**	**-**	**2.00**	**2.21**	**-**
GRANDTOTAL		**28.20**	**2.18**	**0.29**	**9.90**	**2.62**	**0.31**	**37.6**	**2.62**	**0.11**	**75.70**	**2.46**	**0.20**

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3.10 Long term prospects

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Table 14: Upside Potential for Nkana at 31st December 2010

Project Areas	Structure	Upside Potential			
		Mt	%TCu	%ASCu	%TCo
		0 40	1 1		0 13
		40	2 23		0 1
		52	1		0 23
		5	2 1		0 0
		0 40	1 0		0 25
		1 00	1 1		0 0
		0 20	1		0 04
	110	0 0	1 2		0 0
	110	0 10	1 5	0 10	0 0
GRANDTOTAL		**150.10**	**2.05**	**0.10**	**0.14**

15

300

5 5

Table 15: Upside Potential for Mufulira at 31st December 2010

Project Area	Structure	Upside Potential		
		Mt	%TCu	%ASCu
		0 30	1 55	0
14		3 30	1	
		3 50	1 42	
		0 10	3 32	
		10 40	2 55	
		13 0	2	
SUBTOTAL		**31.50**	**2.54**	**0.77**
Historical Blocks				
4 0 0		0 0	2	
SUBTOTAL		**0.06**	**2.69**	**-**
GRANDTOTAL		**31.50**	**2.54**	**0.77**

3.11 References

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3 10

4.0 DESCRIPTION OF RESERVES

2010 1 2011

4.1 Nkana

1

400

2010

4.1.1 Mining methods

1 31

13 40 4
3 4
1 4 0 12

1 34 1 2
1 3 1 2 0
2 2 0
1 500
1 1

1 31
1 4 0
0 3

0 5
1 2 0 13

1 52 1
1000
1 2

1 5
25

200
1 12
2011 40 000 120 000

1
45 1
2010

40 000 220 000
2011

2010

4

4.1.2 Modifying Factors

Geotechnical

Economic

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Mining Efficiencies

-
-
-

Table 16: Nkana underground mining efficiencies

Mining operation	Structure	Mining method	Recovery	Dilution	Extraction
Synclinorium			5	15	100
			5	15	5
			5	5	5
SOB Upper levels			5	20	0
			5	20	0
			0	15	0
Central			5	15	100
Mindola	43 0		0	11	5
	4440		2	12	3
	4440		0	15	3
Mindola North			54		0

Geotechnical

200

Table 17: Nkana geotechnical parameters

Material	Parameter	Unit	Hanging Wall	Footwall
Weathered Material			3 0	3 0
			5 0	5 0
			0	0
Fresh Rock			4 0	
			0 0	2 45
			4 5	22 5
			50 4	45

Table 18: Nkana design pit slope angles

	Fresh	Weathered	Fresh	Weathered	Fresh	Weathered	Fresh
	30	35	30	35	2	35	4
	50	35	50	35	50	35	50

Mining efficiencies

Table 19: Nkana open pit efficiency factors

Mining operation	Mining method	Recovery	Dilution	Extraction
		100	5	100
		100	5	100
		100	5	100

Economic

Table 20: Pit optimisation parameters

Parameter	Details	Unit	Area A	Area D	Area
Recoveries			10	10	10
			5	5	5
			5	5	5
Capital					
	1 000 000		5 144	112 5	2 000
			12	12	12
Limits	3 00 000				
	0 000				
Mining costs	**VARIABLE**				
			3 4	3 4	3 4
			2 5	1 53	1 3
			6.50	**5.47**	**5.57**
	FIXED/TIME COSTS				
			0 35	0 35	0 35
Processing costs	**ROM**				
			5	5	5
			53	53	53
Realisation costs			330	330	330
			1,283	**1,283**	**1,283**
Selling price (copper)	2011		5	5	5
	2012		13	13	13
	2013		32	32	32
	2014		03	03	03
	2015				

Table 21: Pit optimisation results

Parameter	Value		
	Area A	Area D	Area
	30	35	32
	1 4 124	21 430	1 455
	1 12 1	4 2 1	5 4 1
	0 3	2 23	1
	1	1	2

4.1.3 Mining schedule

2
200 1 5
1 3 10 1 3 4
2 2035
2012 5 1
201 202 1 2 2014

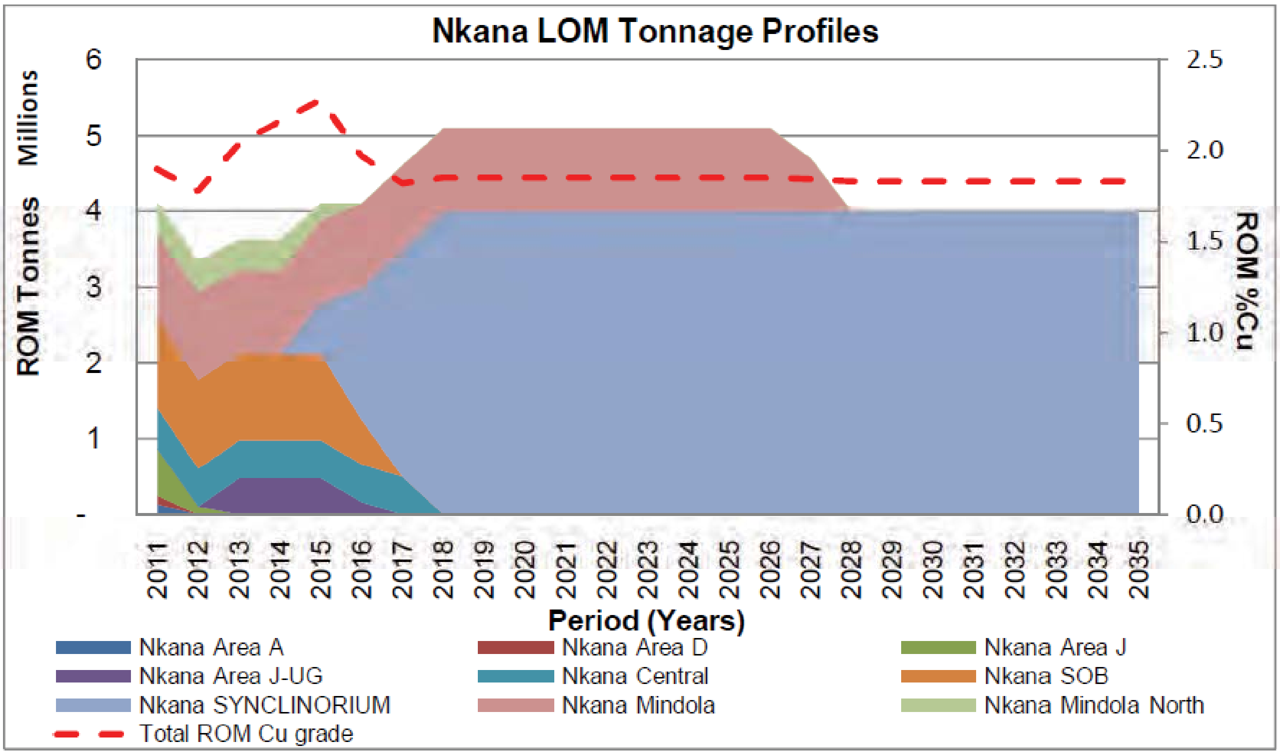

Figure 2 Nkana LOM schedule

4 3
5 1

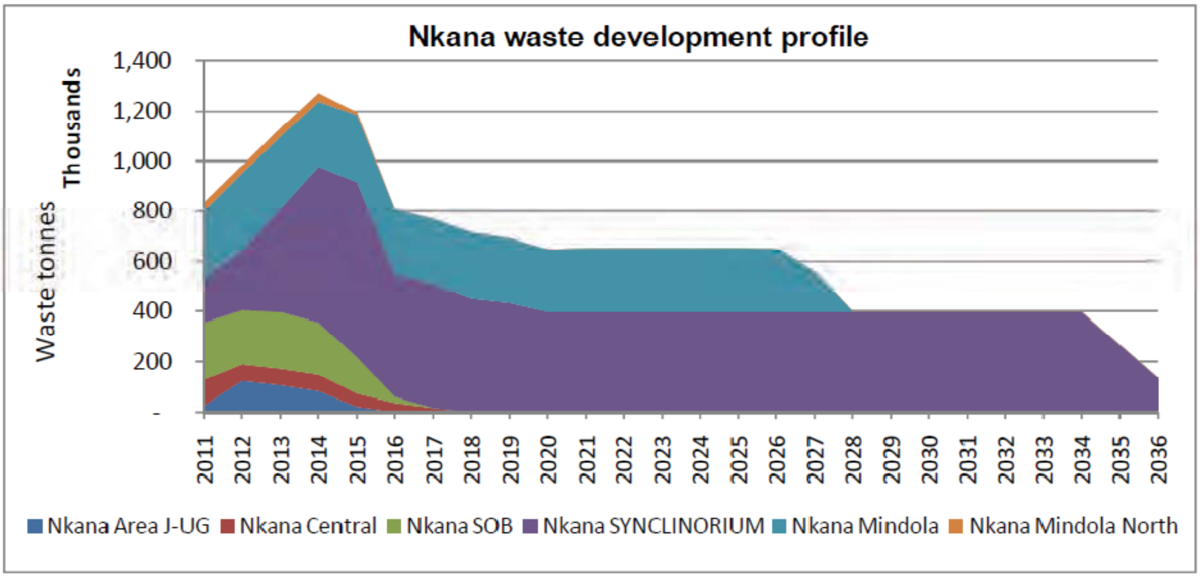

Figure Nkana underground development schedule

3

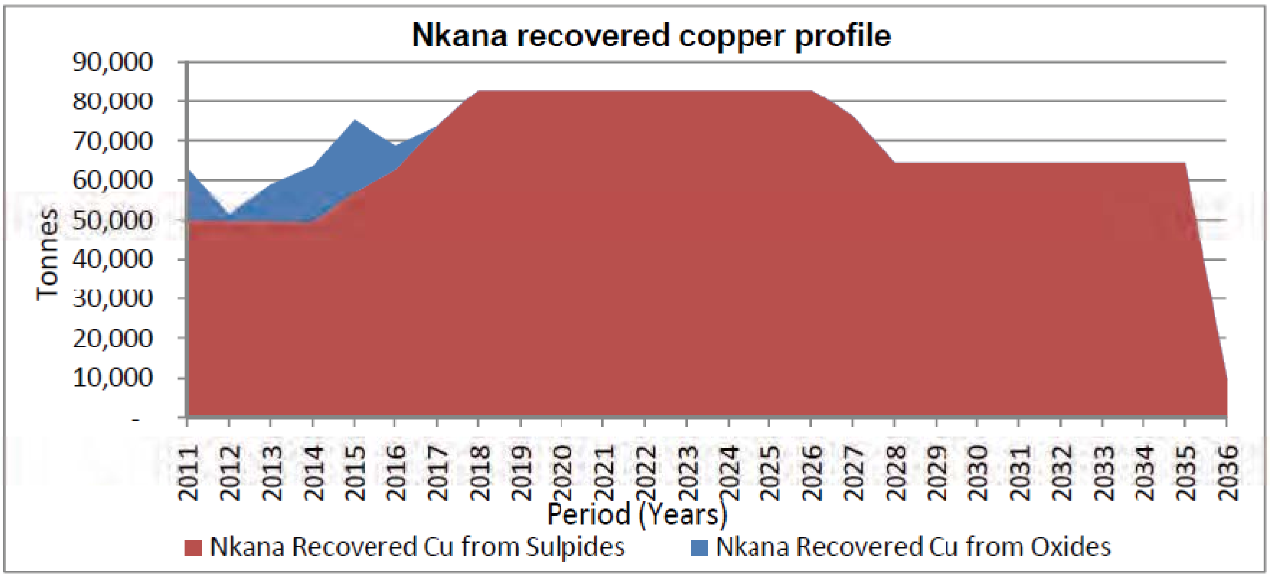

Figure 4 Nkana recovered copper profile

1 00

201 202

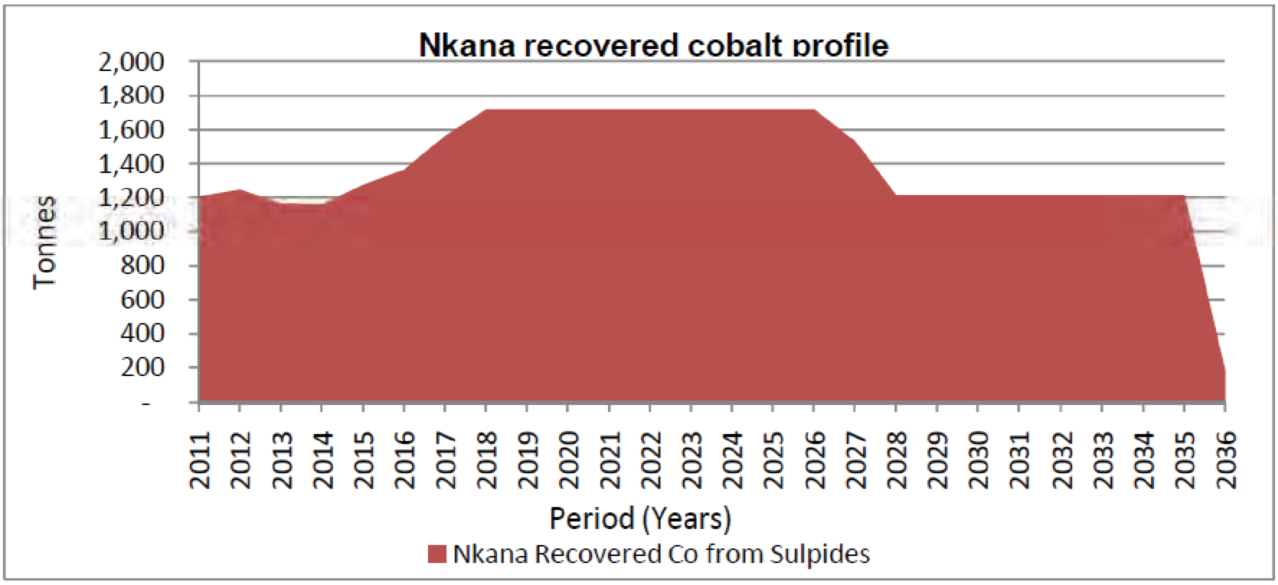

Figure 5 Nkana recovered cobalt profile

4.1.4 Reserve estimate

110

10 1 1 3

2 5 2 5

1

Table 22: Nkana Reserve Estimate

Mining operation	Structure	Proved				Probable			
		Mt	% TCu	% ASCu	% TCo	Mt	% TCu	% ASCu	% TCo
Area A (Open pit)		0 10	1 40	0	0 04				
Area D (Open pit)		0 10	2 1	2 30	0 03				
Area (Open pit)						0 0	2 54	1 1	0 0
Area (Underground)		1 50	4 33	3 12	0 1	0 10	5	4 52	0 24
Synclinorium	**SOB**	41 0	1 1		0 0	4 20	1 5		0 0
	Central	15 00	1		0 0	1 10	1 5		0 0
	South syncline	13 20	2 25		0 0	2 0	1		0 0
SOB Upper levels	**F - Syncline**	2 10	1 51		0 0	0 0	1 32		0 05
	D - Anticline	0 50	1 44		0 0	1 50	1 4		0 05
	C - Syncline	0 30	1 43		0 04	0 40	1 43		0 04
Central	**Central and Central North**	4 0	1 5		0 12				
Mindola		2 50	1		0 1	0 50	2 0		0 1
		1 00	1 2		0 14	0 30	1		0 1
		10 30	1		0 10	3 0	1		0 12
Mindola North		1 00	1 1		0 11	0 0	1 3		0 12
TOTAL		**94.10**	**1.88**	**2.89**	**0.10**	**16.6**	**1.83**	**2.21**	**0.22**

Table 23: Nkana Reserve Estimate Summary

	Proved Reserve				Probable Reserve			
Ore type	Mt	% TCu	% ASCu	% TCo	Mt	% TCu	% ASCu	% TCo
	1 0	4 02	2	0 14	0 0	2 4	2 10	0 10
	2 30	1 4		0 10	15 0	1 0		0 23
TOTAL	**94.10**	**1.88**	**2.89**	**0.10**	**16.60**	**1.86**	**2.10**	**0.23**

4.1.5 Recommendations

- 3 3 000 2012 2012 2011

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■

4.2 Mufulira

1250 10
1 23 1 33

4.2.1 Mining Methods

1 1 2 2

1
25 2
50
25

4

1
2 1

50

4.2.2 Modifying factors

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250 140

1 0

E

4 2

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Table 24: Mufulira mining efficiencies

Project Area	Ore body	Mining method	Recovery	Dilution	Extraction
Mufulira West		2	3	1	2
Mufulira Central		1	3	35	2
		1	3	13	2
		2	3	30	2
Mufulira East			3	1	4

4.2.3 Mining schedule

1 200 2 0
2 12 3
2022
1 0 2015 2022
0 3 2015

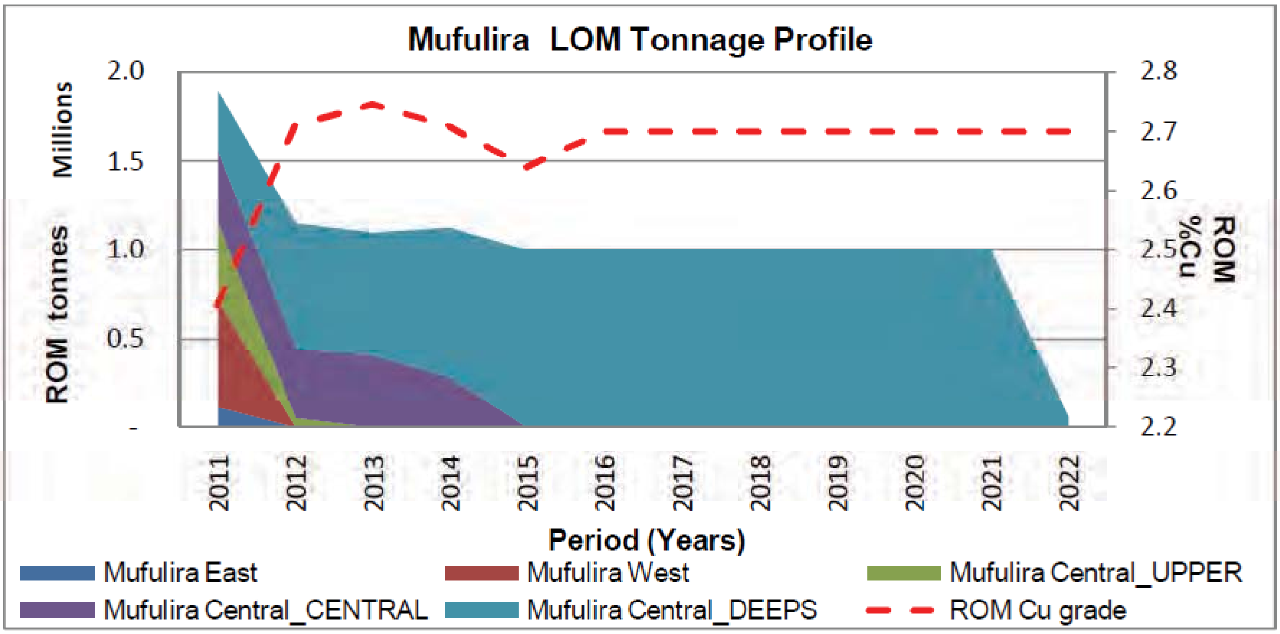

Figure 6 Mufulira LOM Tonnage Profile

2 2013
2 5
50
3

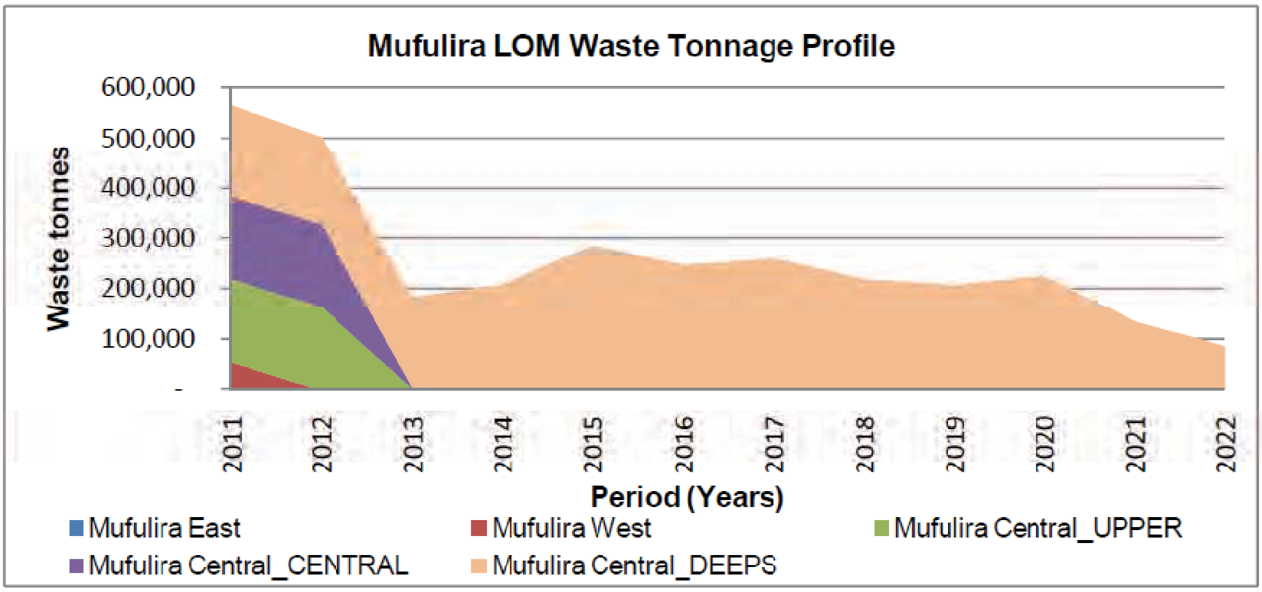

Figure 7 Mufulira waste development profile

0

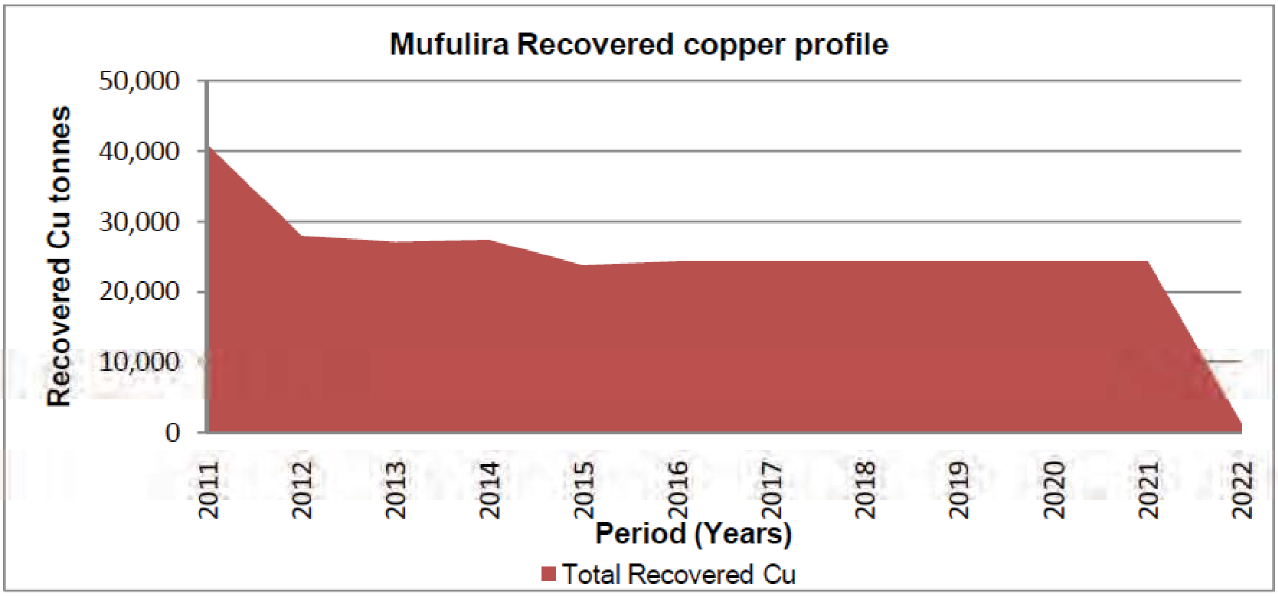

Figure 8 Mufulira recovered copper profile

4.2.4 Mineral Reserve

31 2010

1 2

10
2 1 0

Table 25: Mufulira Mineral Reserve Estimate

Project Area	Ore body	Mining method	Proved			Probable		
			Mt	% TCu	% ASCu	Mt	% TCu	% ASCu
Mufulira West		2	0 0	1 1	0			
Mufulira Central		1	0 40	2 3		0 20	2 4	
		1	1 20	2 2		0 30	2	
		2	5 0	2 5		2 00	2	
Mufulira East			0 10	3 01	2 03			
Total			**8.10**	**2.51**	**0.96**	**2.50**	**2.96**	

4.2.5 Recommendations

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5.0 PLANT AND EQUIPMENT

5.1 Mopani Mines General Process Commentary

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3 3 2 5

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2000

5.1.1 Valuation of the Plant

0

12 0

5.2 Nkana

5.2.1 Introduction

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2010

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1 30

5.2.2 The Process Plant

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Figure 9 Mill Building at Nkana

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30 0 4
10 1

200

Figure 40 Old and New Roaster at Nkana Cobalt Plant

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41

Figure 41 New Standard Crusher in Nkana Leach Plant

Figure 42 O ide Plant Mill Installation

Figure 4   The O ide Plant CCD Circuit

Figure 44 Solvent E traction (S) Building

5.2.3 Electrowinning

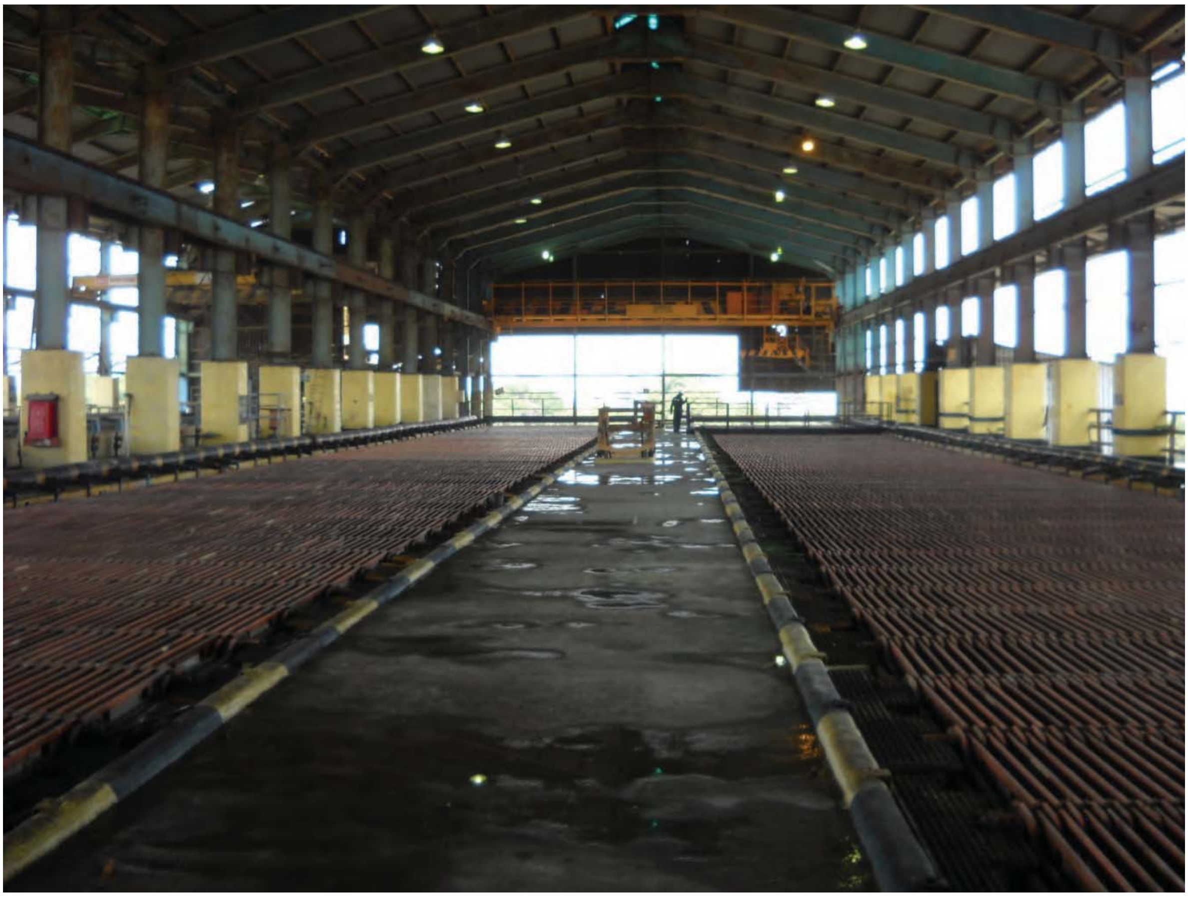

Figure 45 Nkana Copper Tank House

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5.2.4 Copper Cobalt Metal Transportation

5.2.5 Maintenance

5.2.6 Risk

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5.2.7 Flow Sheets and Aerial Photography

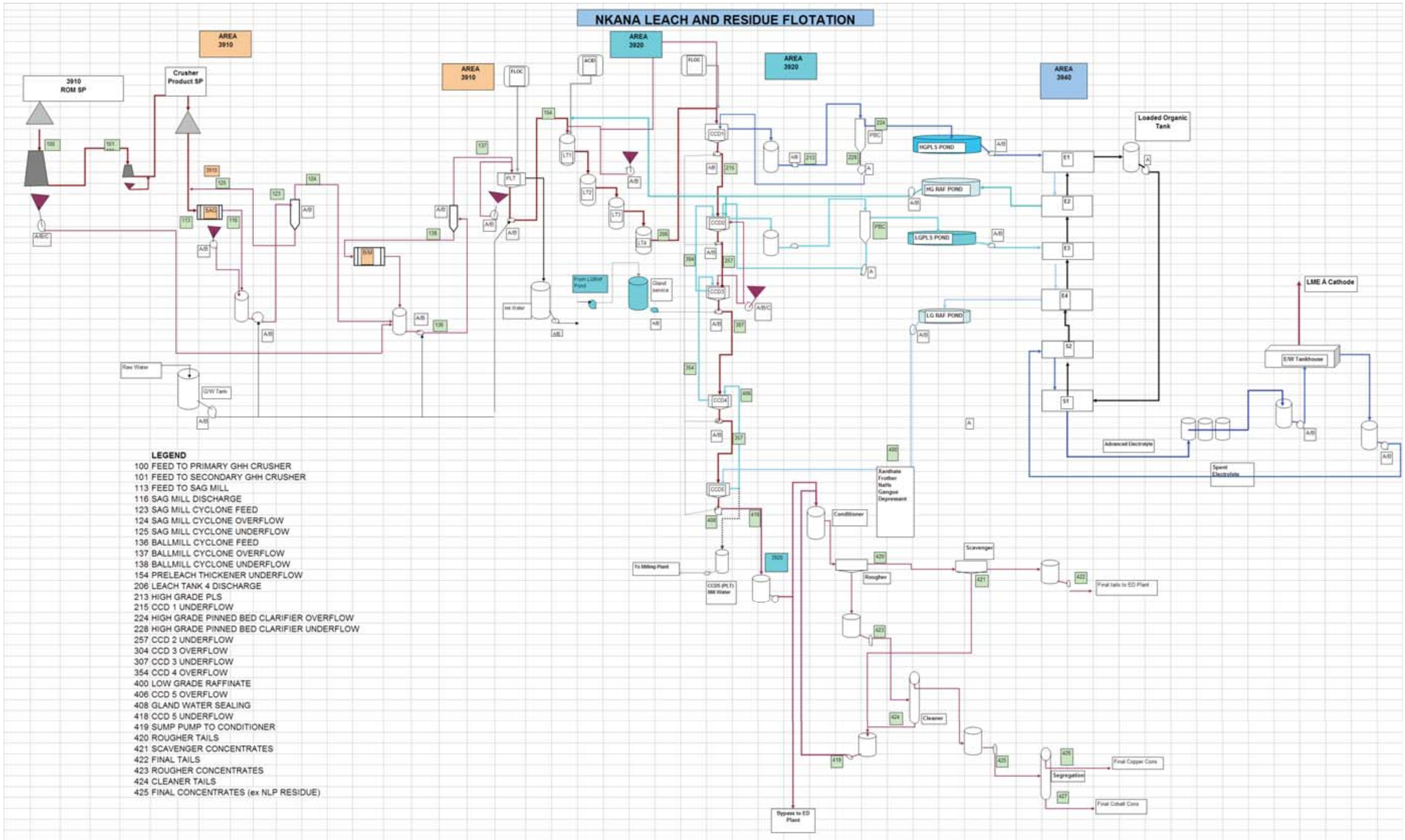

Figure 46 Nkana Leach and Residue Flotation

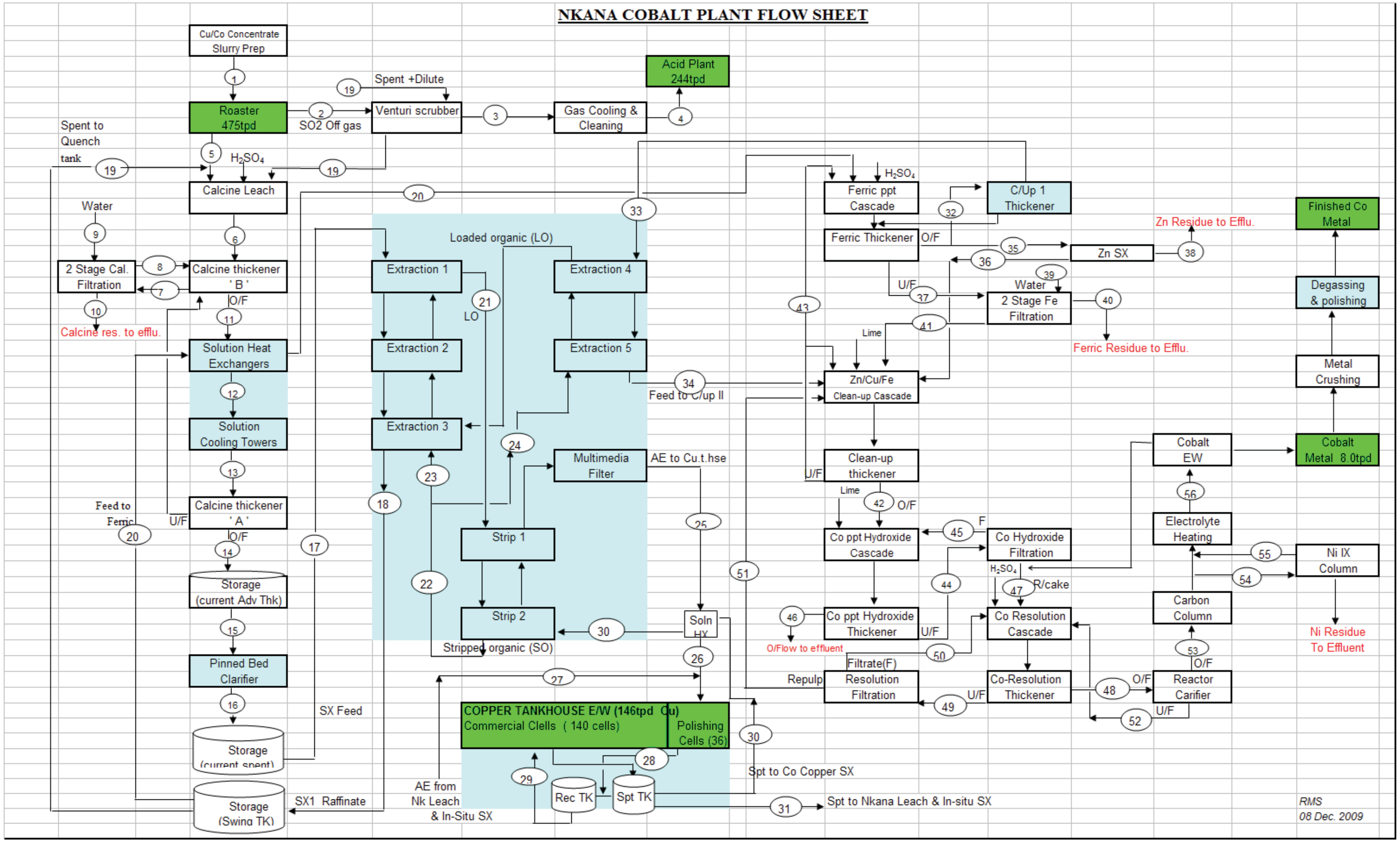

Figure 47 Nkana Plant Cobalt Recovery Flow Sheet

5.2.8 Summary

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5.3 Mufulira

5.3.1 Introduction

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2010

1 30

5.3.2 Process Description

5.3.3 Ore Reception and Crushing

5 14

2004 2005

2005 200

4

Figure 48 New SHD Hydrocone Crusher

Figure 49 Secondary and Tertiary Crusher Building

5.3.4 Milling

12 15

5

4 2 1

Figure 50 Mill Feed Bin

2

0

0 0

Flotation Plant

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Figure 51 Rougher and Cleaner Flotation (Photograph 1)

Figure 52 Concentrate Thickener

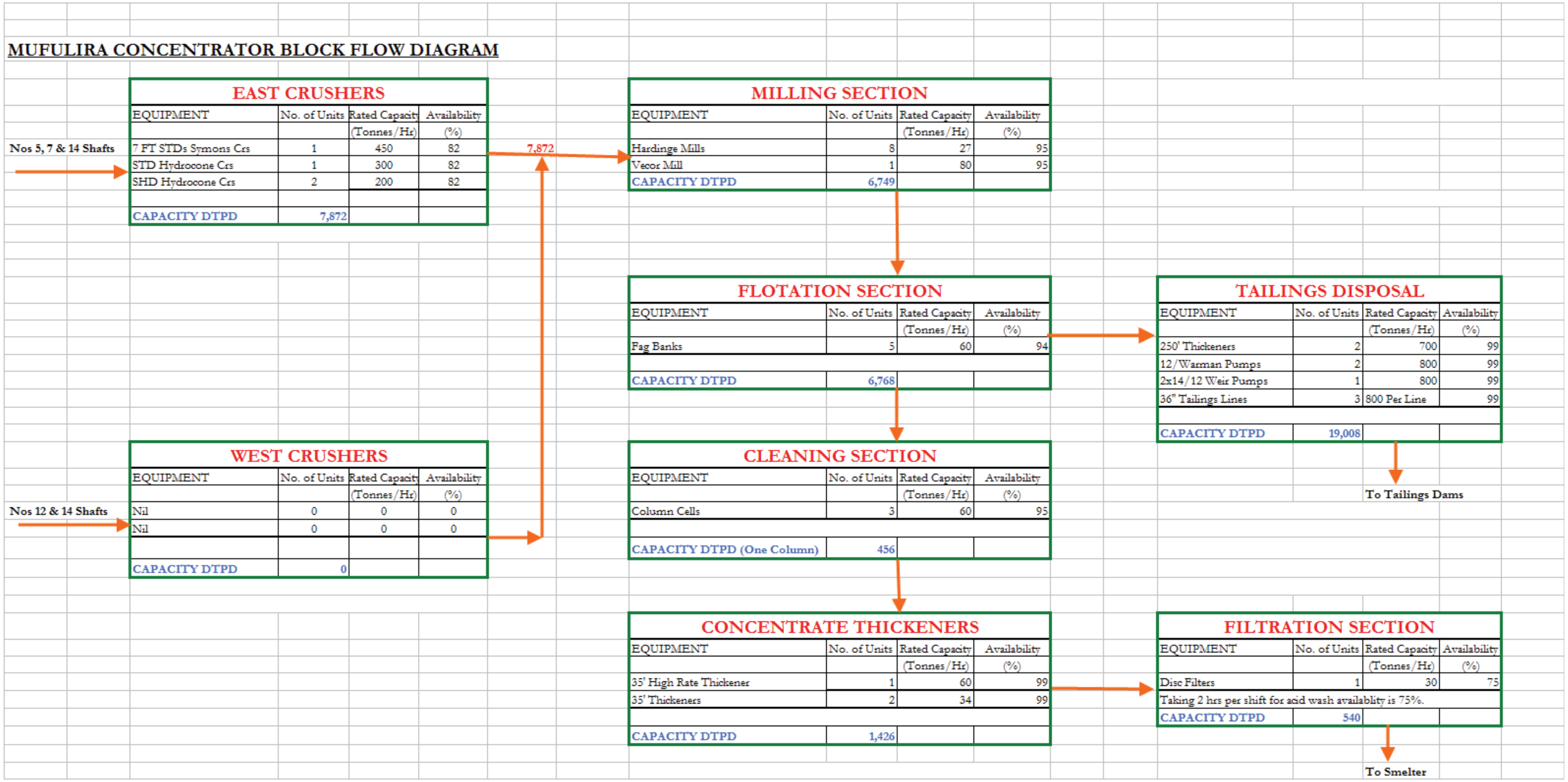

Figure 5 Mufulira concentrator Flow Diagram

5.3.5 Pyrometallurgical Section

A

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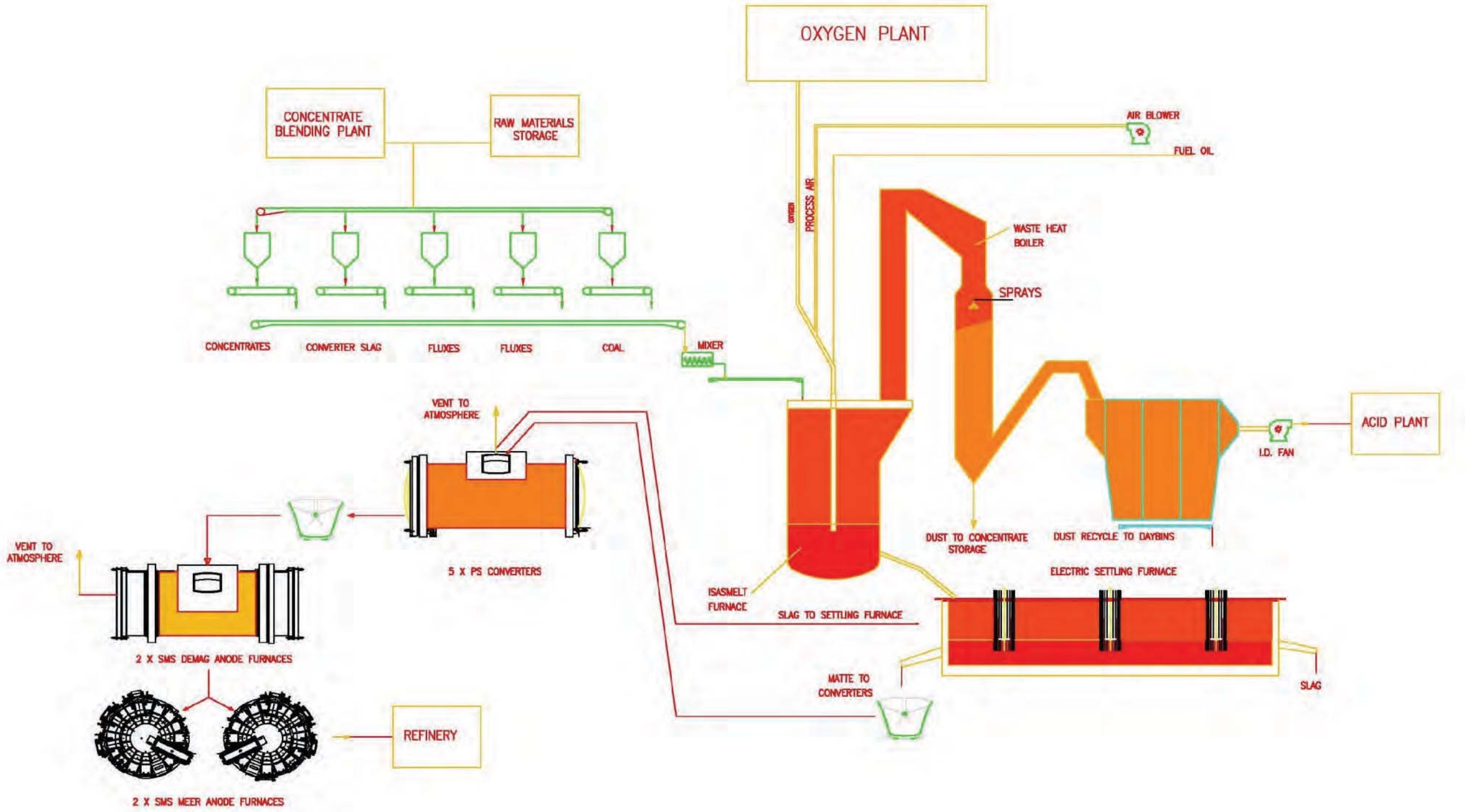


Figure 54 The Mufulira Smelting Plant

Figure 55 Molten Metal Matte being poured into the Converter

30

13 35 15

2011

2012

400

0

Figure 56 Old Converter in Operation

Figure 57 New Anode Furnaces each of 400T Capacity

Figure 58 New Twin Anode Casting Wheel (80 tph capacity)

5.3.6 Electro Refining Section

24 0 5 0

2005

5

24

5.3.7 Electro Refining

Figure 59 Cast Copper Anodes

Figure 60 Tank House

5.3.8 Tank House General

1 2 3 4
1 3 4 5
200 2
200
1 3 4 5
2

Figure 61 The Closed Module 2 of the Tank House

5.3.9 Other Processing

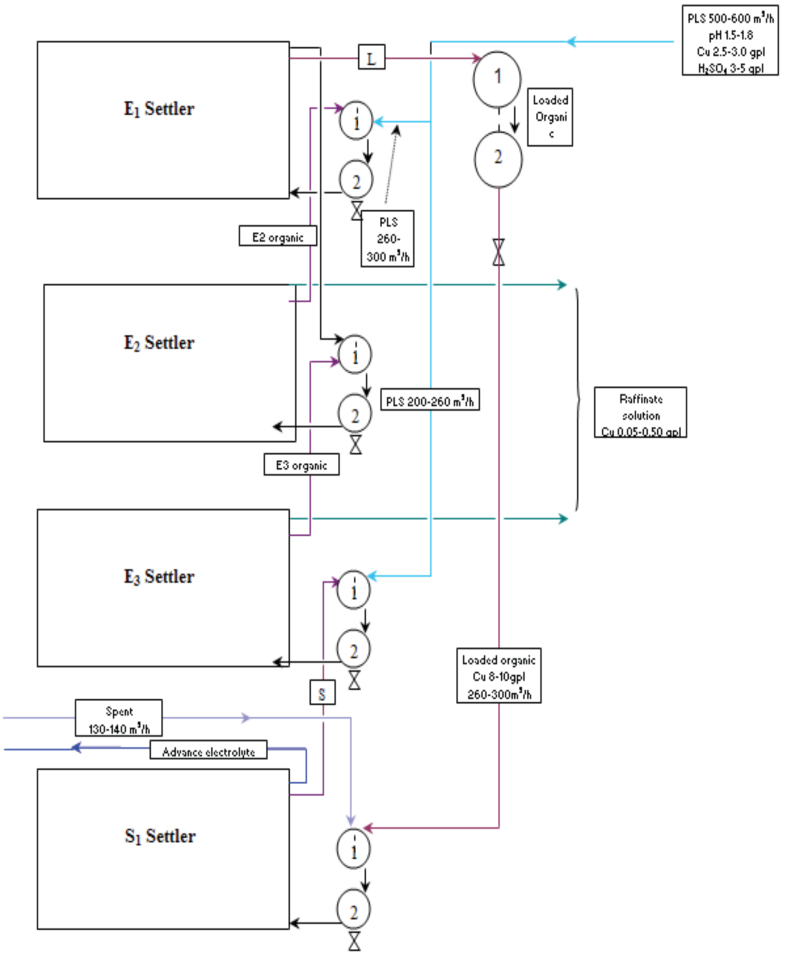
5

Figure 62 Leach Facility at Mufulira

MOPANI COPPER MINES PLC
REFINERY DEPARTMENT

SOLVENT EXTRACTION PLANT FLOW SHEET

Series-Parallel Extraction/Strip circuit



Description	FTE	PTE
Refinery	363	2
SX/EW	40	0
Muf Leach	18	9
Muf West	6	0
TOTAL	**427**	**11**

KEY
1 Primary mixer or mixer 1
2 Secondary mixer or mixer 2
LO Loaded organic
SO Stripped organic

Figure 6 Diagram showing the S Circuit for Recovery of the O ide Acid Soluble Copper

5

Figure 64 Electro Winning Cells in the Tank House

5.3.10 Solvent Extraction (SX)

5.3.11 Drawings and Annexures

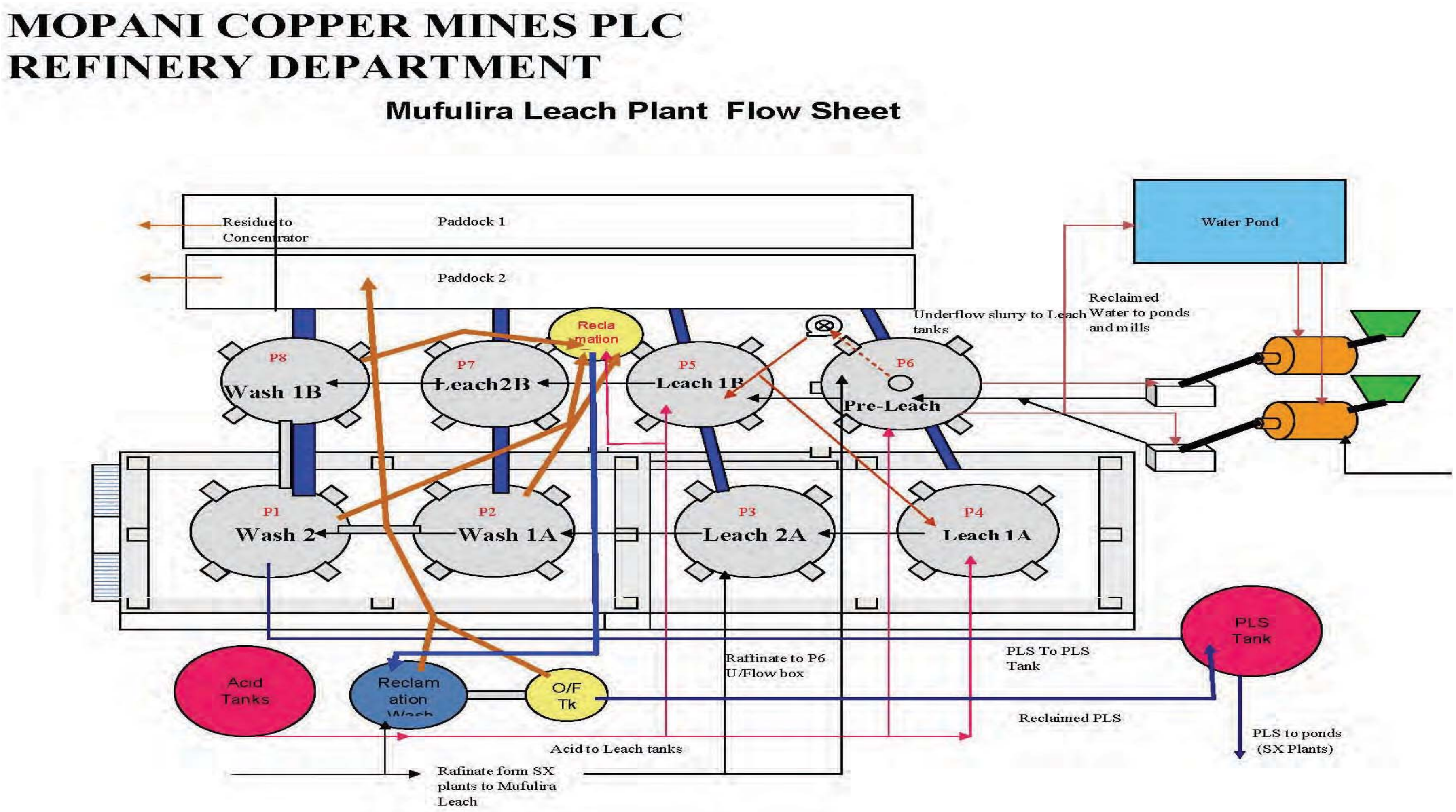


Figure 65 Mufulira Leach Plant Flow Sheet

5.3.12 Summary

6.0 TAILINGS AND WASTE

6.1 Phase 2 – Environmental, Health and Safety – Tailings Storage Compliance

6.1.1 Mufulira TD11 – Tailings Storage Dam

Figure 66 Mufulira tailings storage dam

1

1 3 0
2030

6.1.2 Desk top review of available environmental reports for Mufulira TD11

- 2003
- 11 2010
- 200
- 4 103
- 3 030

6.1.3 Assessment of compliance with statutory requirements

2010

1 2010 31 2010

6.1.4 Identifying the main areas of environmental risks and performance

- **Dust:**
- **Closure:**
- **Groundwater:**
- **Surface Water:**
- **Seepage:**
- **Freeboard:** 2
- **Stability:** 1 3

6.1.5 Review of rehabilitation provisions and liabilities

200

1 03

6.1.6 Summary and assessment of the health and safety management programmes

-

- 200

6.1.7 Details of injury and fatality statistics

Table 26: 31 December 2010 Mopani Headcount

December 2010 Mopani Headcount	
	3 4 5
	4
	2 22
	32
	420
Total	**7,522**
	4
Grand total	**8,010**

413

6.2 Nkana TD15a – Tailings Storage Dam

Figure 67 Nkana tailings dam

1

3 5 1 1
2030

6.2.1 Desk top review of available environmental reports for Nkana TD15a

- 2003
- 15 200
- 200
- 4 0 4
- 3 020

6.2.2 Assessment of compliance with statutory requirements

2010

1 2010 31
2010

6.2.3 Identifying the main areas of environmental risks and performance

- **Dust:**
- **Groundwater:**
- **Surface Water:**
- **Seepage:**
- **Freeboard:** 2
- **Stability:** 1 3
- **Closure:**

6.2.4 A review of rehabilitation provisions and liabilities

200

0 0

6.2.5 Summary and assessment of the health and safety management programmes

-
- 200

6.2.6 Details of injury and fatality statistics

7.0 CLOSURE

7.1 Nkana

7.1.1 Approach and Limitations to Closure Cost Review

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-
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-
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L

-

- 2010
- 2011

7.1.2 Available information

- 3
- 2010 131 04
- 11 0 20000 3 4
- 2 2010
- 11 25 0 2000

2 1

2003

7.1.3 Battery Limits

20 2011

- 101 5
- 3
- 5 3
- 53 5
- 522 0

Figure 68 Battery limits assumed for GAA s cost review

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15 15
52

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A *GAA*

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Areas excluded

2010

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■ 53 54 53
54

■ 33 35 3 3 3 3 40 41

■ 25 2 2

■ 3

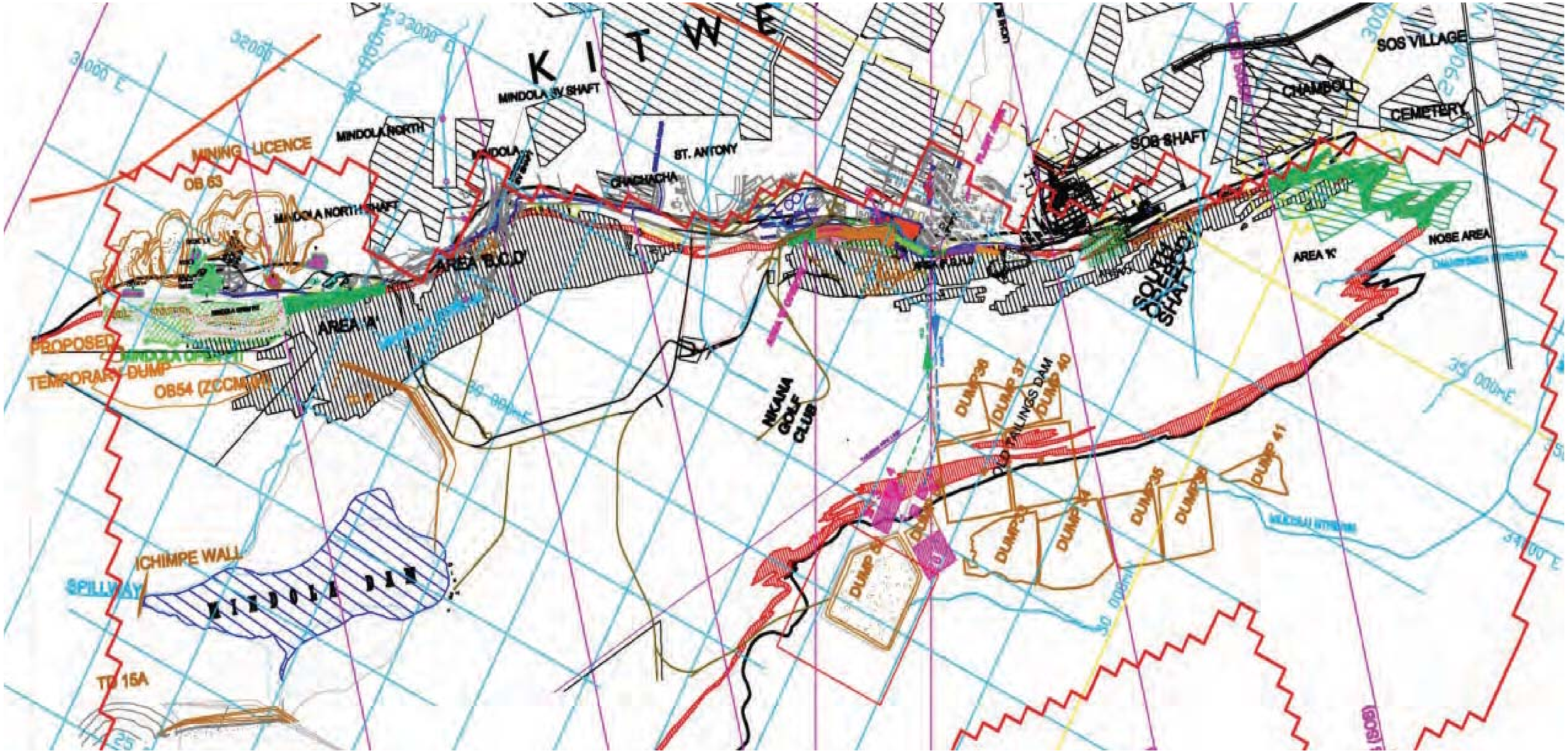

Figure 69 Nkana mine license area

7.1.4 Assumptions and Qualifications

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- *inter alia*

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400

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7.1.5 Closure Cost Comparison

2 1

2003

2 2

- 200

  5 5

Table 27: Overall cost comparison for Nkana

Closure component	Scott Wilson 2010 (USD Millions)	GAA 2010 (USD Millions)
1	4	1 21
2	3	5
3	2 20	1 5
4	0 00	0 11
Subtotal 1	**13.53**	**27.73**
5	0 4	0 3
Subtotal 2	**0.48**	**0.73**
	2 24	4 40
Subtotal 3	**2.24**	**4.40**
GRAND TOTAL	**16.25**	**32.86**

Table 28: Detailed comparison of closure measures and related costs

Category with sub-categories	Evaluation
■ ■ ■ ■ ■ ■ ■	■ ■ ■ 2003 2003 ■ ■
■ ■ ■ ■	■ 1 3 ■ ■

Category with sub-categories	Evaluation
■ ■ ■	■ ■ ■
G	
■ ■	■ 302 5 2 2 10 3 ■ 20 ■ 500 ■

Category with sub-categories	Evaluation
■ ■	■ ■ 5 3 ■ ■
■ ■ ■ ■ ■	■ 2 3 00 15 3 0 ■ ■
A	
■ ■	10

7.1.6 Matters Requiring Further Attention

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7.1.7 Conclusion

20 2011

USD 24 million

7.2 Mufulira

7.2.1 Approach and Limitations to Closure Cost Review

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L

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■
2010

2011

2011

7.2.2 Available information

■ 4

■ 2010

■ 1 2011

■ 2 200

2 1

7.2.3 Battery Limits

- 1341 3
-
- 5
- 11 4 10

5 12 0

Figure 70 Battery limits assumed for GAA s cost review

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- 11 12
-
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- 3 4 5 11 11
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200

A *GAA*

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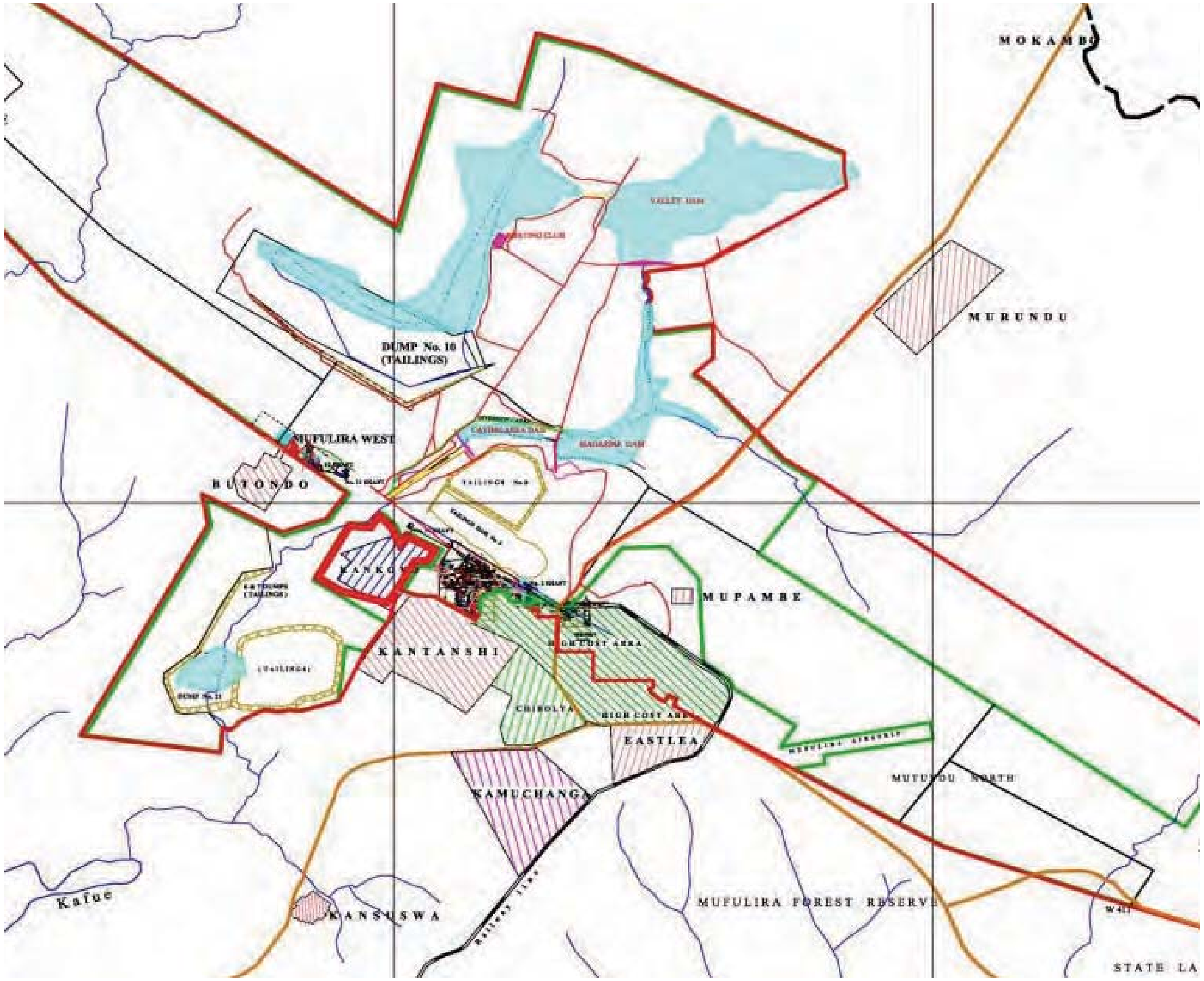

Figure 71 Surface and mining rights Mufulira

7.2.4 Assumptions and Qualifications

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- *inter alia*

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    - 400
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    -
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    -
    -
    -
- 20
-
- 20

  400
- 3

  10

7.2.5 Closure Cost Comparison

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2 1

2003

30 30

■ 3

244

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Table 29: Overall cost comparison for Mufulira

Closure component	Scott Wilson 2010 (USD Millions)	GAA 2010 (USD Millions)
1	10 05	1 53
2	4	3 32
3	0	5 3
4	0 00	0 3
Subtotal 1	**15.89**	**28.95**
5	0	1 03
Subtotal 2	**0.68**	**1.03**
	2 5	4 0
Subtotal 3	**2.65**	**4.80**
GRAND TOTAL	**19.22**	**34.87**

Table 30: Detailed comparison of closure measures and related costs

Category with sub-categories	Evaluation
■ ■ ■ ■ ■ ■ ■ ■	■ ■ ■ 2003 ■ ■
■ ■	■ 1 4 1 3

Category with sub-categories	Evaluation
■ ■ ■ ■ ■	■ ■ ■ 20 2011 ■ 50 ■ ■
G	
■ ■	■ 120 2 2 30 ■ 20

Category with sub-categories	Evaluation
	■ 500 ■
■ ■	■ ■ 5 ■ ■
■ ■ ■ ■	■ 2 3 00 15 ■ 3 1341 3 ■

Category with sub-categories	Evaluation
■	■
A	
■ ■	10

7.2.6 Matters Requiring Further Attention

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7.2.7 Conclusion

20 2011

USD 26 million

8.0 ENVIRONMENTAL, HEALTH AND SAFETY

8.1 Nkana

8.1.1 Terms of Reference

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8.1.2 The Nkana Mine Concession Area

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3 000 3 45 000 3

D

- 14
- 2

- 42
- 3
- 0
- 53

- 15
  15
  15
  12 30 51 2010
- 15 1
  33 30 000
- 52 2002
  04 000
- 1
  54 000
-
- 4 1
  200
-

15

15

A

8.1.3 Information Sources Reviewed

- 2010
- 2010

- 200 2010
- 4
- 200
- 200
- 2003
  - 1
  - 2

-
- 2010
- 2010
- 2010

- 200 200
- 012 1 1 2005
- 01 1 1 2005

-
-
-
-
-

2010

8.1.4 Limitations of the Audit

8.1.5 Results of the Audit

200 200 200 2010 2010 2011 2011 103 12 5

3 2011
2011

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■
■
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■
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■

200
2010

■
■ 2

31 2010

1 2 1 3

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5

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■ 15

Table 31: Summary of surface water discharges at Nkana Mine

Principal water source	Receiving water resource	Monitoring observations
15		
15		

15

1 000 3 2

Table 32: Compliance of Nkana Mine operations with Equator Principles and IFC requirements

Equator Principle	Requirement	Compliance Rating	Reasons for Compliance /Non Compliances
1			2003
2			200 200
3	1		
	2		■ ■ ■
	3		
	4		

			200
	4		
	5		

			■
4			■ ■ ■ ■ ■ ■ ■
5			■
			■
			■ 200 200 2010
	•		2004 3 3

	• • •		200
			■ 200 2010

8.1.6 Nkana key social aspects and risks

32

200

- **Social Assessment (Equator Principle 2):**

- **Social / Environmental permits (Equator Principle 2):**

2010

- **Community Health Safety and Security (Equator Principle 3, IFC PS 4):**

1

30

1000 2010 250 1000

0 000

- **Resettlement (Equator Principle 3, IFC PS 5):**

200 2010

- **Corporate Social Responsibility (Equator Principles 3 and 4):**

- **Consultation and Disclosure Equator Principle 5**

- **Community Grievances (Equator Principle 6):**

- **Overall compliance (social):** 5
2010
100

8.1.7 Health and Safety

002

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-
-
-
-
14001 1 001
200 2010

Table 33: Nkana Injury Trends: 2008 – 2010

	2008	2009	2010
	1 5	10	
	11	5	5
	1	3	4

8.1.8 Industrial Relations

200

8.1.9 Concluding Statements

-
-
  - 5

    5
  -
  - 1 000

    3 2
-
-

8.1.10 References

- 200 200

  200
- 2005

  012 1 1 2005
- 2005

  01 1 1 2005

- 200 2010
200 2010
- 200
- 200
- 2003
- 2001
- 15
- 200 15
- 15 200
- 200 200 200 2010

8.2 Mufulira

8.2.1 Terms of Reference

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-
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8.2.2 Mufulira Mine Facilities

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- 11
- 13
- 14
- 1

- 1
- 2
- 3 3
- 4 5
- 11

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-
-
-
-

8.2.3 Information Sources Reviewed

-
- 2010
- 2010

- 2003
  - 1

- 2

- 200

-

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-
-
-
-

2010

8.2.4 Limitations of the Audit

8.2.5 Results of the Audit

2010 2010
2011 200
200 200

-
-
-
-
-

-
-
-

2 2

2 51 2010 50
3 2015

- 2
- 11
-

2010

- 2010 0
- 5 0
0
- 0
- 2 0
2
3 2
2015

Impact of effluent discharges on river quality

Figure 72 Solids settling ponds for wastewater leaving plant area

2010

12

2 1 3

11 2011

Impact of tailings and raffinate management

11

2010

11

- 2011
- 11

Impact of Mufulira Smelter SO_2 and dust emissions

200 2
55 5 50 2015
2
1 2

200
3 2011
2012

1 141 1
2 125 µ 3 24

- 2011
- 11
- 2011
  2

Table 34: Compliance of Mufulira Mine operations with Equator Principles and IFC requirements

	Requirement	Compliance Rating	Reasons for Compliance /Non Compliances
1			2003
2			200 200
3	1		
	2		
	3		
	4		

			200
	4		
	5		

4			
5			
			200 200 2010
			2004 3 3 200

			2010
			200 2010

- 200
- 200

1

200

- **Social Assessment (Equator Principle 2):**
- **Social / Environmental permits (Equator Principle 2):**

2010

- **Community Health Safety and Security (Equator Principle 3, IFC PS 4):**

1

0

1000 2001 30 1000 2010 250

1000

0 000

- **Resettlement (Equator Principle 3, IFC PS 5):**

200 2010

- **Corporate Social Responsibility (Equator Principles 3 & 4):**

- **Consultation and Disclosure Equator Principle 5**

- **Community Grievances (Equator Principle 6):**

- **Overall compliance (social):** 5
2010

100

8.2.6 Health and Safety

002

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■

■
14001 1 001

■
200 151 2010 2 200 5 2010
3

Table 35: Mufulira Injury Trends: 2008 - 2010

	2008	2009	2010
	151	3	2
	152	4	
	5	1	3

8.2.7 Industrial Relations

200
2003 200

200

8.2.8 Concluding Statements

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▪ 5

- 2
-
-

8.2.9 References

- 2005
012 1 1 2005
- 2005
01 1 1 2005
- 200
- 2003
- 11
- 200
- 11 200
- 200 200 200 2010
-
012 1 1 2005
-
01 1 1 2005
- 2003
  - 1
  - 2

2001

9.0 MARKET OVERVIEW

9.1 Copper

15 200 5 4 35
0 3 0 3 1
200 1 4 2
1 2 1 2010

2011 1 1 3 2011

Table 36: Global refined copper market balance (Source: USGS):

Thousand Tonnes	2006	2007	2008	2009		2010 forecast	2011 forecast
	14 1	15 4 4	15 52	15 54	11 53	1 235	1 0
	14	15 1 1	15 3	15 4	11 2		
	2 13	2 43	2 23	2 11	2 513		
	1 2 1	1 34	1 222	1 3	14 242	1 2	20 4
	1 05	1 23	1 05	1 1	14	1 2	1 2
	2	12	52	5 1 4	1 5	543	

5 3
4 5 5 1 200
00 200 200 5 302
00
200 2 10
200 5
5 12 2011

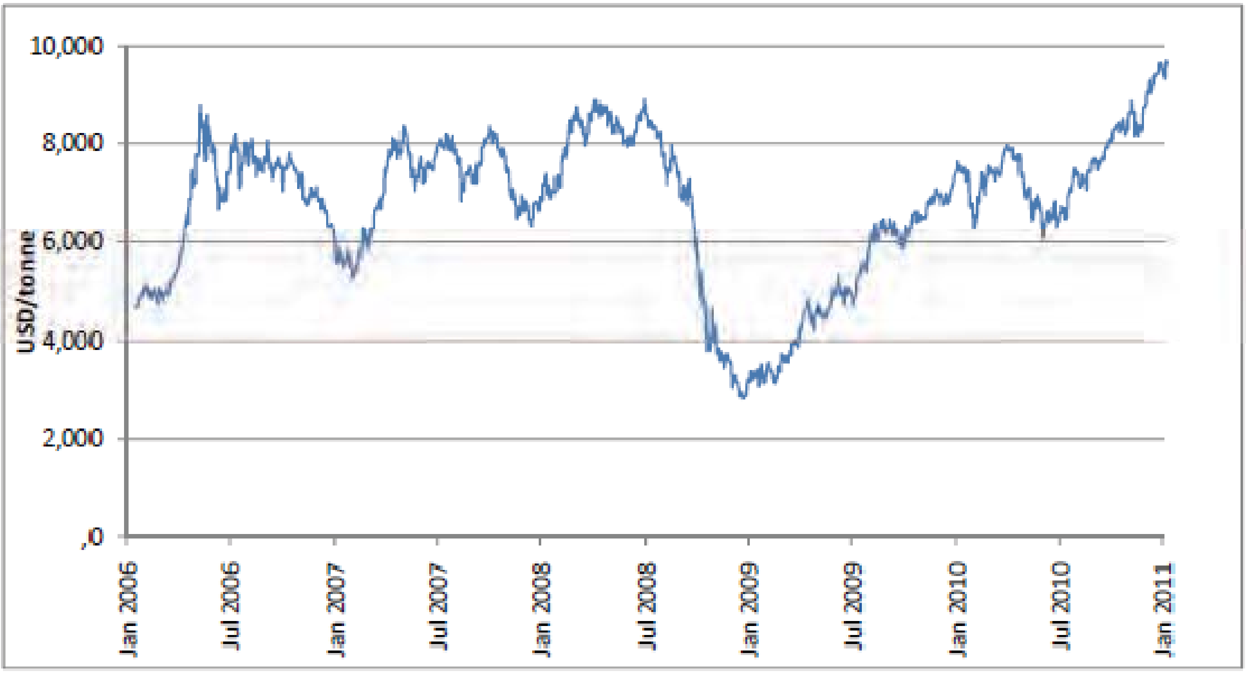

Figure 7 The London Metal E change copper price from January 2006 to date (Source LME)

3
201 .
2011
3
2011 00 00 201

Table 37: Copper price forecast

Copper price (USD/Tonnes)	2011	2012	2013	2014	2015	2016	2017	2018	2019	Long Term
Nominal	00	300	000	00	200	00	500	100	00	1
Real	00	20	22	34	0	240	5	3	03	000
US CPI	1 0	1 0	1 0	1 0	1 5	1 5	1 5	1 5	1 5	1 5

9.2 Cobalt

2 000 200
25 000 40
200 10 200 5 00
0 54 3

2 500 2011 2010

Table 38: Global refined cobalt market balance

Metric tonnes	2004	2005	2006	2007	2008	2009
	0 300	200	00	2 00	5 00	2 000
	4 500	54 100	53 00	53 300	5 00	
	51 400	54 5	54 5	5 250	0 54	5 000
	2 2	1 45	1 535	2 31	3 1	1 5

4 3 200
5 11 00 200
2010 1 55
1 4 15 4 4

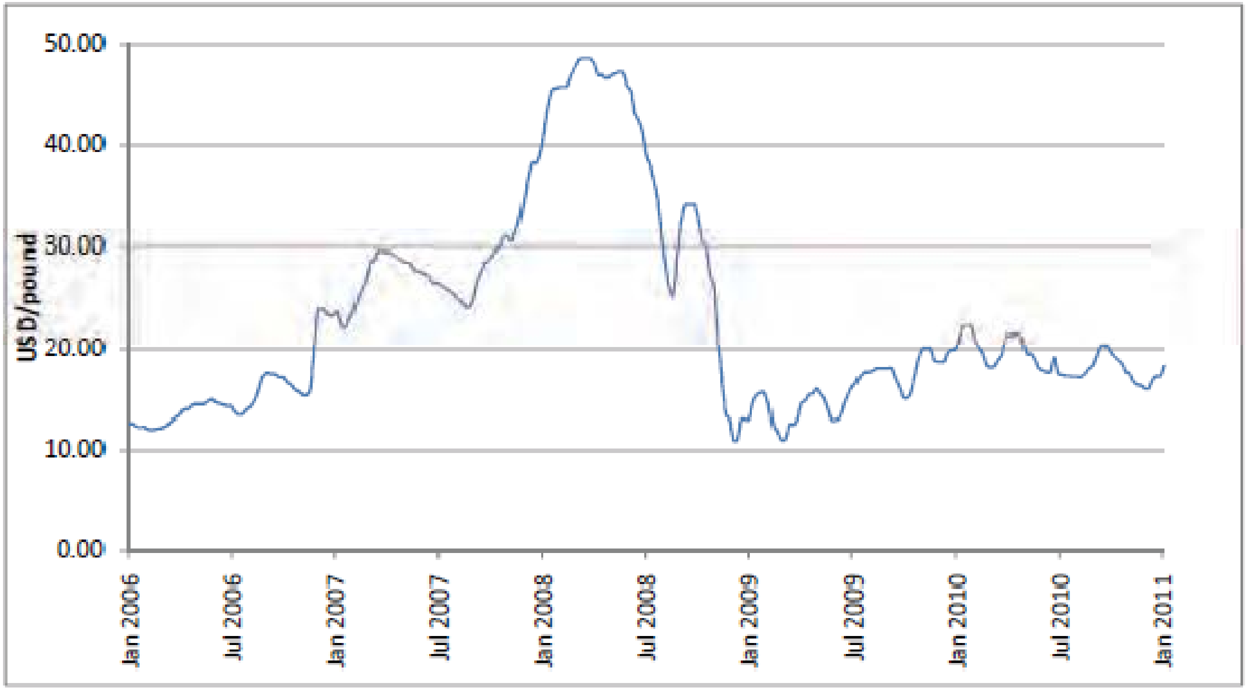

Figure 74 The cobalt price from January 2006 to date (Source Inet Bridge)

3

2011
3
2011 1 24 13 00 201

Table 39: Cobalt price forecast

Cobalt price (USD/pound)	2011	2012	2013	2014	2015	2016	2017	2018	2019	Long Term
Nominal	1 24	1	1 00	15 00	15 00	15 00	13 00	13 00	13 00	13 00
Real	1 24	1 2	15	14 5	14 41	13 2	11	11 1	11 54	11 00
US CPI	1 0	1 0	1 0	1 0	1 5	1 5	1 5	1 5	1 5	1 5

10.0 TECHNICAL AND ECONOMIC ASSUMPTIONS

10.1 Revenue assumptions

100

10.2 Capital Cost Estimate

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- **Primary Development:**
  200 0

2010 2011

- **Mining:**
- **Processing:**
- **Engineering:**
- **Services:**
- **Corporate:**
- **Special Projects:**
  - 2 4
  -
  -

Table 40: Capital Expenditure

USD Millions	2010 Actual	2011	2012	2013	2014	2015	2016 - 2035	Total 2011 – 2035
Primary Development ("PD")								
	0 5	2	2	3 4	1 1	1 4	0	21 0
		13 3	11 4	11 0	5 1	1 2	1	141
PD Subtotal	**9.3**	**19.5**	**14.3**	**14.4**	**6.2**	**20.6**	**87.7**	**162.7**
Mining								
	4	2	14 5	2	1		30 1	2
	24	12	1 4	1 2	10	10 1	22 1	2 4
	1 0	4	2	1 2	1 1	1 0	5 4	1 5
Mining subtotal	**34.0**	**25.8**	**35.8**	**26.6**	**18.1**	**17.7**	**263.6**	**387.6**
Processing								
	0 2	1 2	0	0	0	0 5	4	
	1 5	3	2 4	1 1	1 2	0	2 2	35 3
	21	4 1	1	1 3	0 5	0 3	20	2
	1	5	1 4	0	0 4	0	23 1	31
	2 5	4 3	2	2 4	1	2 0	4 1	0 4
	2	0	0 4	0	0 3	0 2	3	0
Processing subtotal	**35.8**	**19.5**	**9.5**	**6.9**	**5.0**	**4.4**	**126.0**	**171.3**
Other Cost Centres								
		1	13	10 1			112 5	1 0 4
	0	0	1 4	0	0 5	0 4	3	10
	1	1 1	0	0 5	0 5	0 5		10 0
Other subtotal	**12.0**	**21.3**	**15.7**	**11.3**	**7.9**	**8.5**	**126.6**	**191.3**
Special Projects								
	2	45	0 3	1 2	5	22 0	4 5	33 2
	1	2 4	31 0	2 1	30 0	0 0	5 5	1 3 0
	2 5	22 4	1 4	2	2 5	1 4	14 4	44
Special Projects subtotal	**38.5**	**96.5**	**102.7**	**91.9**	**120.0**	**23.4**	**129.4**	**563.9**
Total capital expenditure	**129.6**	**182.5**	**178.0**	**151.1**	**157.2**	**74.6**	**733.3**	**1,476.8**

10.3 Operating Cost Estimate

0 30
2012
2012

- **Open Pit and Underground Mining:**
  - **Mufulira Mine:**
    55
  - **Nkana Mine:**
    2 1
- **Processing**
  - **Mufulira concentrator:**
    13 12
  - **Nkana concentrator:**
    5
  - **Smelter:** 33
  - **Refinery:** 2
  - **Cobalt Plant:**
    11 015

41

Table 41: Operational Expenditure

USD Million	2010 Actual	2011	2012	2013	2014	2015	2016 - 2035	Total (2011 – 2035)
Operating Costs								
	25	2	215	214	213	212	2	4 020
	1 2	1 0	1 4	1 5	1 5	1 1	2	3 1
	1	1	1	1	1	1	30	3 0
	31	34	33	33	33	32	42	0
	1						103	135
	1	32	32	32	32	32	52	
Total Operating Costs	514	54	4	4	4	4	4 5	12

11.0 TAXATION AND ROYALTIES

42

Table 42: Royalty and tax assumptions

Description	Application	Rate
		3 0
		30

12.0 ECONOMIC ANALYSIS

12.1 Introduction

3 1
3 1

12.2 Valuation Methodology

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12.3 Valuation Assumptions

- 1 2011
- 10
- 20 2011 2030 2035
- 4 1 4 4 2 4
- 1 2
- 10 2
- 0
- 0
- 3 1

■

12.4 The Valuation of Glencore’s Interest in MCM

43

Table 43: Cash flows over the LOM

	Unit	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
		1 44	1 1 5	1 145	1 133	1 0	5		42	2	21
		35	2	2	2	2	2	2	30	30	31
		20	2	5	55	51	4	43	40	3	3
N	***D***										
		54	4	4	4	4	4	4	443	44	444
E DA	***D***										
			120	115	111	12	104	103	10	101	
		1 3	1	151	15	5		54	4	54	5
		33	30	2	2	2	24	23	23	22	22
Net Free Cash	**MUSD**	**439**	**301**	**289**	**277**	**315**	**258**	**250**	**254**	**239**	**232**
	Unit	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
		23	13			05	5	11	4		4
		3	33	32	32	32	32	2	2	2	2
		3	3	3	3	3	3	3	3	3	3
N	***D***										
		444	3 1	3	3	3	3 5	343	321	323	321
E DA	***D***										
		102	5	1		5	2		5	2	
		3	35	3	4	32	33	24	32	21	2
		22	1	1	1	1	1	15	15	15	15
Net Free Cash	**MUSD**	**240**	**224**	**216**	**203**	**224**	**218**	**187**	**178**	**195**	**183**

12.4.1 Base Case Valuation

1 2011 1 22

2 2 1 5
1 1 12 5

44 4

Table 44: Sensitivity of Glencore's Interest in MCM to discount rate and changes in metal prices

(USD million)		*Change in metal prices* -20%	-10%	0%	10%	20%
Discount Rate	**7.5%**	1 30	1 4	2 2 1	2 3	3 212
	10.0%	1 114	1 51	1 22	2 324	2 25
	12.5%	2	1 322	1 1	2 01	2 3 3

Table 45: Sensitivity of Glencore's Interest in MCM to discount rate and changes in operating costs

(USD million)		*Change in operating costs* -20%	-10%	0%	10%	20%
Discount Rate	**7.5%**	2 52	2 50	2 2 1	2 015	1
	10.0%	2 331	2 12	1 22	1 1	1 512
	12.5%	2 01	1 44	1 1	1 4	1 321

Table 46: Sensitivity of Glencore's Interest in MCM to discount rate and changes in capital expenditure

(USD million)		*Change in capital e penditure* -20%	-10%	0%	10%	20%
Discount Rate	**7.5%**	2 354	2 30	2 2 1	2 215	2 1
	10.0%	2 005	1 4	1 22	1 1	1 40
	12.5%	1 45	1 0	1 1	1 34	1 5

5

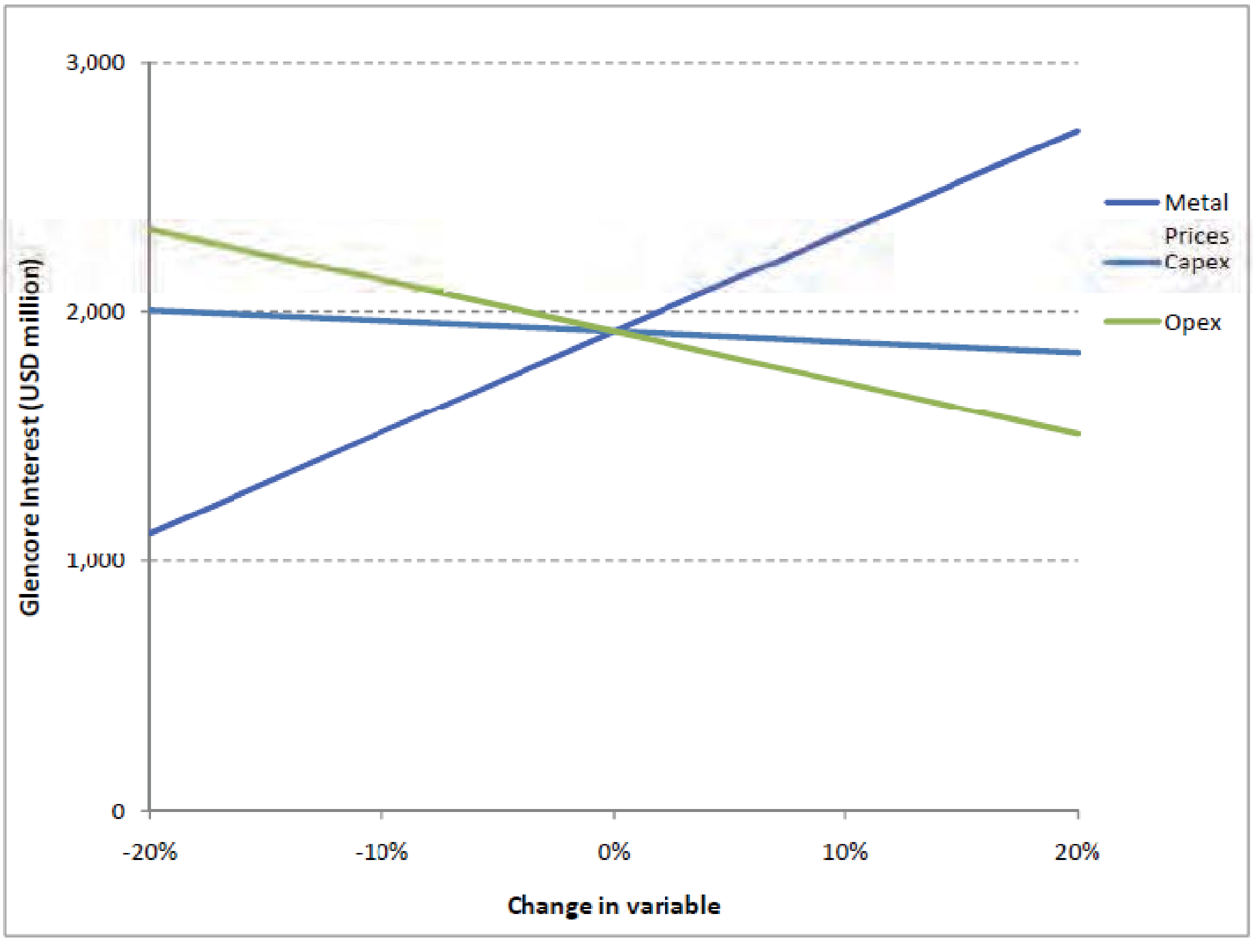

Figure 75 The sensitivity of Glencore s Interest in MCM to changes in metal prices ope and cape

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4

13.0 RISK ANALYSIS

13.1 Resource risk

Exploration:

13.2 Mining risks

Area underground:

New shafts:

4

13.3 Processing risks

Back-up power supply:

2011

13.4 Capital risks

Escalation of Costs:

13.5 Sovereign Risk

13.6 Economic and Market Risk

Commodity prices:

Operating costs:

13.7 Environmental and Social Risks

Post-closure water treatment:

Mining related spillages:

Effluent discharge:

SO_2 emissions:

2

1 000 3

2

Tailings:

Dust:

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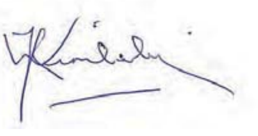
GOLDER ASSOCIATES AFRICA (PTY) LTD.



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APPENDIX A

Glossary and Abbreviations

LIST OF ABBREVIATIONS

Abbreviations

3	

Units

	1000

Chemical Elements

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GLOSSARY OF TECHNICAL TERMS AND DEFINITIONS

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Figure 78 Nkana Aerial Maps (Photograph)

Copper,Cobalt Sulphide Concentrator
Aerial Map

Figure 79 Nkana Aerial Maps (Photograph 4)

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At Golder Associates we strive to be the most respected global group of companies specialising in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organisational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.

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Golder Associates

SECTION XIV: INDEPENDENT TECHNICAL REPORTS

SUB-SECTION E: MUTANDA REPORT

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04 May 2011

GLENCORE INTERNATIONAL PLC

Mineral Expert's Report: Mutanda

Submitted to:
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REPORT

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04 May 2011 12971_Lett_009

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MINERAL EXPERT'S REPORT: MUTANDA MINING SPRL

Dear Sirs

PURPOSE OF REPORT

Golder Associates Africa (Pty) Ltd ("GAA") has been commissioned by Glencore International AG ("Glencore") on behalf of Glencore International plc (the "Company") which is expected to be the ultimate parent company of the group, to prepare a Mineral Expert's Report ("MER") in respect of the mining assets owned by and operated by Mutanda sprl (the "Material Assets") a company in which Glencore has an interest.

Glencore owns a 40% equity interest in Mutanda Mining Sprl which owns the Material Assets which are the subject of this MER.

The Material Assets comprise of the following:

- 3 Open Pit mines, East, Central and Central N/W;
- Hydrometallurgical plant;
- Acid plant and liquid SO_2 plant, and
- Dense media separation plant.

This MER has been prepared by a team of Competent Persons with each team member possessing the appropriate technical and professional qualifications.

This report, which summarises the findings of GAA's review, accords with the requirements set out in the United Kingdom Financial Services Authority's Prospectus Rules ("Prospectus Rules") and has been prepared having regard to the recommendations for the consistent implementation of the European Commission's Regulation on Prospectuses No. 890/2004 (the European Securities and Markets Authority ("ESMA") recommendations) published by the Committee of European Securities Regulators (now the

ESMA, as updated on 23 March 2011 following the publication of a consultation paper in April 2010 in relation to content of prospectuses regarding mineral companies) and Chapter 18 of the Hong Kong Listing Rules.

GAA understands that this MER will be included as part of the prospectus (the "Prospectus") to be published in connection with a global offering of shares and the admission of the ordinary shares of the Company to the Official List of the United Kingdom Financial Services Authority and the admission of such shares to trading on the London Stock Exchange plc's market for listed securities and the main board of the Hong Kong Stock Exchange Limited (together, "Admission").

This MER provides an audit of the mineral resource estimates, classification of resources and reserves (to the extent applicable) and evaluation of the Material Assets.

The practices and estimation methods undertaken by GAA are in accordance with the criteria for internationally recognised reserve and resource categories of the "Australasian Code for Reporting Mineral Resources and Ore Reserves" (2004) published by the Joint Ore Reserves Committee ("JORC") of the Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and the Minerals Council of Australia (the "JORC Code").

In addition, GAA is of the opinion that such practices and estimations accord with the requirements set out in the Prospectus Rules in conjunction with the ESMA recommendations (including proposed amendments thereto). In this report, all reserves and resources estimates, initially prepared by Mutanda in accordance with the JORC Code, have been substantiated by evidence obtained from GAA's site visits, interviews, own data collection, analysis and modelling. Where appropriate, reliance has been placed on the work of other experts. Only proven and probable reserves have been valued, which accords with the requirements set out in the Prospectus Rules in conjunction with the ESMA recommendations. Other assets of Glencore, which include extensive resources, have not been included in the valuation.

CAPABILITY AND INDEPENDENCE

GAA has 50 years of mining and engineering expertise built up on 6 continents. GAA operates as an independent technical consultant providing resource evaluation, mining engineering and mine valuation services to clients. GAA has received, and will receive, professional fees for its preparation of this report. However, neither GAA nor any of its directors, staff or sub-consultants who contributed to this report has any interest in:

- the Company, Glencore, Mutanda or any of their subsidiaries; or
- the Material Assets reviewed.

Drafts of this report were provided to Glencore and Mutanda, but only for the purpose of confirming both the accuracy of factual material and the reasonableness of assumptions relied upon in the report.

For the purposes of Prospectus Rule 5.5.3R(2)(f), GAA is responsible for this report as part of the Prospectus and declares that it has taken all reasonable care to ensure that the information contained in this report is, to the best of its knowledge, in accordance with the facts and contains no omission likely to affect its import. This declaration is included in the Prospectus in compliance with item 1.2 of Annex I and item 1.2 of Annex III of the Prospectus Directive Regulation.

This MER has been prepared based on a technical and economic review by a team of consultants and associates sourced from the GAA's Johannesburg offices. Details of the qualifications and experience of the consultants who carried out the work are included in the MER.

METHODOLOGY

The methodology used to compile this report consists of the following:

- site visits conducted by GAA representatives between October and December 2010 to inspect the mine site (open pits), plant and processing facilities, waste dumps and tailings facilities in order to audit technical content of previous Technical Reports and studies conducted for and on behalf of Glencore and where necessary for GAA staff to evaluate current requirements and future developments;

- interviews with various senior Mutanda managers;
- GAA own data analysis, engineering, financial, resource, mining and resource modelling; and
- reliance on previous technical studies and experts reports.

The information contained in this report is current and effective from 1 January 2011, unless otherwise indicated. The results of GAA evaluation are as set out in this MER.

All opinions, findings and conclusions expressed in this report are those of GAA and its sub-consultants.

DECLARATIONS

GAA will receive a fee for the preparation of this MER in accordance with normal professional consulting practice. This fee is not contingent on the outcome of Admission and GAA will receive no other benefit for the preparation of this report. GAA does not have any pecuniary or other interests that could reasonably be regarded as capable of affecting its ability to provide an unbiased opinion in relation to the mineral resources, ore reserves and the valuation of Material Assets.

GAA does not have, at the date of this report, and has not previously had any shareholding in or other relationship with the Company, Glencore, or Mutanda and consequently considers itself to be independent of the Company, Glencore, and Mutanda.

The results of the technical and economic reviews are summarised herein.

GLOSSARY OF TERMS

Defined and technical terms used in this report are set out in APPENDIX A of this MER.

QUALIFICATIONS OF CONSULTANTS

The individuals listed in the table below, have provided input to this MER are Qualified/ Competent Persons as defined in the JORC Code, the Prospectus Rules, the ESMA recommendations and Chapter 18 of the Hong Kong Listing Rules and have extensive experience in the mining industry and are members in good standing of appropriate professional institutions.

Name	Company	Qualification
Peter Onley	GAA	MBA MSc BSc(Hons) FAusIMM CP Peter Onley has more than 40 years experience in the mining industry holding qualifications in geology, geotechnical engineering and business. He has worked in a variety of roles, starting as an exploration geologist, a mining geologist, exploration manager, mineral industry consultant, business manager and director of two Australian listed companies. He has worked as a mining industry consultant for over 25 years. He was formerly a director of GAA employing more than 800 staff in Australia. He has consulted to the industry on a wide range of commodities including diamonds, gold, uranium, iron-ore, bauxite, base metals and both sulphide and lateritic nickel together with some minor commodities such as

Golder Associates

Name	Company	Qualification
		molybdenum and tungsten. He has for some years been a member of the Geological Survey Liaison Committee which reviews and advises on future work programs for the Geological Survey of Western Australia. He is also a member of the AusIMM Geoscience Committee.
Willem van der Schyff	GAA	BSc (Geology), GDE (Mine Engineering) Willem is an Associate with GAA, the Business Unit Leader for the Mining Services Business Unit and a geologist specialising in resource modelling and evaluation. He has 20 years experience on diverse commodities, ranging from Iron Ore, Coal, Heavy Mineral Sands, Base Metals, Gold, Bauxite and Industrial Minerals, on five continents. This experience includes exploration geology, mining geology and resource modelling and estimation. He is a registered Professional Geologist with the South African Council for Natural Scientific Professions and is a member of the Geological Society of South Africa.
Jaco Lotheringen	Ukwazi	B Eng Mining Engineering (UP), Mine Manager's Certificate of Competency Jaco is currently a director of Ukwazi Mining and it its senior mine engineer. He has 12 years mining experience and has been involved in resource estimates, mine feasibility and mine design studies for the past 6 years for major mining companies such as Kumba, BHP Billiton and Anglo Platinum. His professional memberships include: Registered as a Professional Engineer at Engineering Council of South Africa (20030022); Registered as a Member at South African Institute of Mining and Metallurgy (SAIMM) (701237). Member of the Institute of Directors in South Africa. Jaco has specific commodity experience in precious metals (gold, platinum), base metals (iron and copper) and minerals such as coal.
Anthony James Nieuwenhuys	SNC Lavlin	BSC (Eng) MDP Anthony James Nieuwenhuys is Managing Director – SNC-Lavalin South Africa with over 30 years of extensive experience in managing international multi-disciplinary projects in the mining, metallurgical and beverage sectors. This experience includes both technical and financial

Name	Company	Qualification
		aspects of major projects. Mr Nieuwenhuys' management capabilities include sourcing and arranging financing for projects, strong organizational and interpersonal skills, leadership, initiative, marketing, managing a multi-disciplinary engineering company and the ability to work in different business environments. On the technical side, James has extensive experience in the design, construction and operational aspects of most metallurgical facilities and has specific mining and commodity experience in respect of gold, nickel, diamonds and cobalt.

This report was prepared by GAA in order to support the mineral reserve and resource information contained in the Prospectus. The project manager of the MER was Spencer Eckstein and project director was Frank Wimberley.

Yours Faithfully,

GOLDER ASSOCIATES AFRICA (PTY) LTD.

Frank Wimberley
Project Director

Willem van der Schyff
Competent Person

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1.0 EXECUTIVE SUMMARY

1.1 Introduction

Golder Associates Africa (Pty) Ltd ("GAA") was commissioned by Glencore International AG ("Glencore") on behalf of Glencore Internation Plc (the "Company"), which is expected to the the ultimate parent company of the group, in November 2010 to prepare a Mineral Experts Report ("MER") in respect of the Material Assets (as described below) owned and operated by Mutanda Mining Sprl.

Glencore owns 40% of the equity interest in Mutanda which owns the Material Assets, which are the subject of this report

The Material Assets comprise of the following

- 3 Open Pit mines, East, Central and Central N/W;
- hydrometallurgical plant;
- acid plant and liquid SO_2 plant, and
- dense media separation plant.

Further details of the Material Assets are set out in the paragraphs below.

The purpose of the MER is to provide a technical report which evaluates the nature and value of the Material Assets held by Mutanda in order to assist the Company in listing on the London and Hong Kong stock exchange.

The MER also includes observations and comments from GAA following site audits conducted in December 2010 to determine environmental compliance with Equator Principles and to assess closure costs.

This MER has been prepared in accordance with the Australasian Code for Reporting of Exploration Results Mineral Resources and Ore Reserves (2004) published by the Joint Ore Reserves Committee ("JORC") of the Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and the Minerals Council of Australia. In respect of the valuations, they have been prepared under the guidelines of the Code for the Technical Assessment and Valuation of Mineral and Petroleum Assets and Securities for Independent Expert Reports (2005 edition), as prepared by the VALMIN Committee, a joint committee of the Australasian Institute of Mining and Metallurgy, the Australian Institute of Geoscientists and the Mineral Industry Consultants Association.

The methodology used to compile this report consists of the following:

- Site visits conducted by GAA representatives between October and December 2010 to inspect the mine site, plant and processing facilities, waste dumps and tailings facilities in order to audit technical content of previous technical reports and studies conducted for and on behalf of Mutanda and where necessary for GAA staff to evaluate current requirements and future developments;
- Interviews with various senior Mutanda managers;
- GAA own data analysis, engineering, financial, resource, mining and resource modelling
- Reliance on previous technical studies and experts reports.

The information contained in this report is current and effective from 1 January 2011, unless otherwise indicated. The results of GAA evaluation are set out below.

1.2 Project Description

Mutanda is a newly developed high grade copper and cobalt producer, with its operations located in the province of Katanga in the DRC. Mutanda is being developed to produce up to 110ktpa of copper and 23ktpa of cobalt contained in hydroxide as of 2012. Based on current oxide reserves and resources the LOM is expected to be at least 20 years.

The long term prospects of the Mutanda concession lies to the south of the East orebody where drill holes finished within the orebody at depth. Significant underground sulphide potential exists and in fact forms a large percentage of the Mutanda concession ore resource. Further oxide exploitation potential exists from underground to increase oxide processing life.

The Mutanda concession is situated approximately 40km from Kolwezi in the Western Katanga Province. It has easy access to the National Road and railway line between Kolwezi and Zambia, as well as abundant water supply for plant processes due to the location of the Kando River approximately 2.5km from the southern boundary. A new 120kV capacity power line capable of supplying power up to 120MW connects into the SNEL reticulation network 20km from the mine and from the on-site sub-station power is transferred to the plant along a 22kV reticulation network. Stand-by power generation of 13.5MW installed capacity automatically starts up in the event of network power failures.

As of 31 December 2010 Mutanda had 929 employees.

1.3 Ownership

Glencore holds a 50% interest in Samref Congo Sprl which in turn holds an 80% interest in Mutanda. The remaining 20% interest in Mutanda was recently acquired by Rowny Assets Limited (entities associated with Dan Gertler) from La Generale des Carrieres et des Mines (“Gecamines”), a State-owned mining company in the DRC.

1.4 Legal Tenure

Exploitation permits under the Mining Code of the DRC are renewable in accordance with the terms of the Mining Code for periods of 15 years.

An exploitation permit grants to its holder the exclusive right to carry out exploration and exploitation works for the minerals for which it has been granted. This right covers the construction of necessary facilities for mining exploration, the use of water and wood resources, and the free commercialisation of products for sale, in compliance with corresponding legislation.

Property	Exploitation Permit Number	Rights Granted	Valid Until
Mutanda	PE 662	Cu, Co, Au, Ni and associated minerals	26/05/2022 Renewable
Ki-kolwezi	PE 4959	Cu, Co and associated minerals	03/04/2024 Renewable

1.5 Resources

Geology

The Mutanda copper-cobalt deposit lies with the lower part of the Neoproterozoic Katangan sedimentary succession which extends over more than 700km from Zambia through the Katanga province of the DRC and is up to 150km wide. It is part of a thrust-and-fold belt known as the Lufilian Arc. It shares the same characteristics of most of the deposits within the Copperbelt in that it is stratiform and associated with carbonate or carbon-rich lithologies (Cailteux, et. al. 2005).

The Katangan copper-cobalt metallogenic province is bounded to the north by a major dislocation zone, but in the south rests unconformably on a pre-Katangan basement. Due to the increased disruption to the north of the Lufilian Arc, the unconformity between the basement and sediments has not been seen in the DRC and all contacts with the basement are tectonic.

Mineralisation

The main copper oxide minerals present are malachite and pseudomalachite, with heterogenite, the main Cobalt mineral. Quartz and chlorite dominate the gangue component in all the samples.

The sulphide minerals have yet to be subjected to a laboratory mineralogical analysis.

Mineral Resources

The consolidated Mineral Resources of the various areas of Mutanda as at 31 December 2010 are summarised in the table below:

Consolidated Resource Statement of Mutanda Mine as at 31 December 2010				
Central Orebody	Category	Mt	%TCu	%TCo
	Measured	7.8	1.62	0.81
	Indicated	5.3	1.16	0.67
	Inferred	7.6	0.95	0.91
	Total	20.7	1.28	0.81
East Orebody	Category	Mt	%TCu	%TCo
	Measured	29.0	2.67	1.13
	Indicated	18.4	1.65	0.87
	Inferred	164.6	1.03	0.45
	Total	212.0	1.34	0.60
Central Northwest Orebody	Category	Mt	%TCu	%TCo
	Measured	66.8	2.10	0.55
	Indicated	0.02	0.17	0.05
	Inferred			
	Total	66.8	2.10	0.55
Mutanda Total	Category	Mt	%TCu	%TCo
	Measured	103.7	2.22	0.73
	Indicated	23.8	1.54	0.82
	Inferred	172.1	1.03	0.47
	Total	299.5	1.48	0.59

1.6 Reserves

Mutanda Mine consists of two operational pits, a small dormant pit and a potential pit to be developed. The mine plan is based on the recovered copper target up to 110 000 tonnes per year, ramping up to steady state in 2013. An average Run of Mine ("ROM") plant feed grade of 4.13 %Cu is achieved up to 2015 from the pits with an average Life of Mine ("LOM") plant feed grade of 3.4 %Cu.

Various ROM stockpiles have been constructed since 2009 of which the "R5" high grade has been included in the mine plan. Two high copper and two low grade heap leach stockpiles have not been included in the LOM Plan though volumes have been verified by GAA. If included in the mine plan, it is expected that these current stockpiles will be depleted early in 2013 and will lower the risk of the mining ramp up. Surveyed and re-modelled grades were used to estimate stockpile levels. However volumes of high copper and low grade stockpiles mentioned above could not be included in the mining schedule and reserves statements,at this stage since the information required to verify the densities is not yet available. Accordingly these stockpiles have not been included in the financial valuation.

Some of the potential risks associated with Mutanda are:

- Mutanda has been a small operation, mining low volumes on a selective basis. With this LOM Plan the operation has to adjust to a higher volume operation with reasonable losses and dilutions.
- The dormant pit to the south of Central pit includes some limited underground workings that cannot be fully mapped. This could have a negative impact on mining rates in the area, though this does not impact any mining in the East and CNW pits.
- An additional waste dumping space of 4 km^2 is required for waste dumping on the Kansuki project area. This can be a potential high risk issue to the project, since the waste backfill opportunity is limited. However this may be mitigated by the processing of existing stock piles.
- A total of 5.6 million tonnes of sulphide ore is planned in the current LOM Plan. Dedicated stockpile areas are required. Due to the limited space available, this could increase mining cost should continuous re-handling be required.
- A total of 11.9 million tonnes of low grade ore is scheduled in the current LOM Plan. Dedicated stockpile and heap leach areas are required. Due to the limited space available, this could increase mining costs should continuous re-handling be required, though all ROM low grade material will be placed onto the heap when mined. Rehandling of “spent” ore and possible use of existing stockpiles will attract a rehandling cost.
- Waste stripping is allowed for and required on the Kansuki project area. This LOM Plan assumes that a suitable agreement could be reached which is likely as Glencore is a common shareholder. No ore from the Kansuki area has been included in this estimate.

Various opportunities exist at Mutanda that includes but is not limited to a situation where:

- Sulphide material contained in the transitional zone is mined and stockpiled over the life of the operation. This amounts to 5.6 million tonnes of sulphide material with a grade above the operational cut-off grade.
- As the depletion of the current oxide operation occurs, the sulphide orebody will become exposed. Material upside could exist at the end of life of the current operation, should copper sulphide processing capacity be established since most of the pre-stripping has been completed by the current copper oxide pits.
- Various high and low grade stockpiles exist, additional to the incorporated R5 high grade stockpile, that has not been included in the LOM Plan. Additional work is required on the re-modelling of loose density before it can be included in the LOM Plan and Reserve estimate in future.
- Potential for underground exploitation of the remaining oxide resource in CNW area.

A total of 1.5 million ROM tonnes was produced from the two pits in 2009 and 1.7 million tonnes planned for 2010. The pits and the current stockpiles deliver a plant feed head grade of 3.4 %Cu for a total of 60.5 million tonnes of ore up to the year 2030. Ore production from the Mutanda pits is primarily oxide material. An estimate of 30% copper sulphides is mined selectively from the mixed ore and stockpiled on a dedicated sulphide stockpile. The mineral Reserve is estimated at 55.9 million tonnes Proved and Probable Mineral Reserves at 3.4 %Cu and 1.0 %Co.

Table 1: Summary of Reserve Estimate

Mining operation	Proved			Probable			Total		
	Tonnes (*000)	% T Cu	% T Co	Tonnes (*000)	% T Cu	% T Co	Tonnes (*000)	% T Cu	% T Co
Mutanda pits	47,176	3.4	0.9	6,570	3.1	1.2	53,746	3.4	0.9
ROM High Grade Stockpile	2,227	3.4	2.3				2,227	3.4	2.3
TOTAL	49,403	3.4	1.0	6,570	3.1	1.2	55,973	3.4	1.0

1.7 Plant and Equipment

Mutanda is in the process of commissioning phase 1 of a 3-phased expansion project. This will ultimately deliver a processing plant able to produce up to 110,000t Cu and 23,000t of contained cobalt in the form of a hydroxide salt.

Phase 2 construction is well underway with mechanical completion targeted for 31st August 2011. A fast track project is underway to bring on line SX-EW #2 (20,000t capacity) in early April 2010 utilising the phase 1 copper circuit at a higher feed grade and SX-EW#3 (20,000t capacity) from a newly constructed heap leach. This heap leach is included as part of the phase 3 expansion which is being fast tracked to produce additional copper in 2011. By the time the phase 2 plant is commissioned it is targeted to have SXEW processes for phase 2 running at or close to nameplate capacity.

Phase 3 has been designed as a fast track 40,000t Cu expansion module which consists of upgrading transformer capacity in the tank-houses and increase copper production from 20,000t to 25,000t. In addition a 4th tankhouse rated at 35,000t will be installed for an overall tankhouse capacity of 110,000t Cu per annum. Additional investment in phase 2 SX plants in phase 3 will enable phase 2 to produce 80,000t per annum through its copper circuit, with phase 1 contributing 20,000t. The additional make up tonnage (up to 10,000t) is expected to come from the NW heap leach. Phase 3 completion is scheduled as Q1-2012.

The SX-EW plants include the following processes: crushing, screening, milling, pre-leaching, leaching, clarification and SX-EW.

As at 31st December, Mutanda has exceeded all budgeted copper targets for 2010.

Once phase 3 is fully commissioned, the heap leach will treat low grade Mutanda ore (0.5-0.85%Cu) and increase output of the Mutanda processing plant to up to 110,000tpa of copper cathode.

1.8 Closure

Closure costs are estimated at USD8,1 million. It should be noted that whilst this report deals with the oxide resource only, there is a significant sulphide resource to be exploited, which could delay the closure liability for a number of years.

1.9 Environmental, Health and Safety

This report presents the findings of an environmental and social audit conducted by GAA at Mutanda Mine concession on 9th December 2010.

Key Results of the Audit

In regard to authorisations required, it was demonstrated during the audit that:

- Mutanda holds an approved operating license for its concessions (PE662) in accordance with Article 64 of the DRC Mining Code (Law No 007/2002 of 11th July, 2002).

- Mutanda holds an approved operating license for its concessions (PE4959) in accordance with Article 64 of the DRC Mining Code (Law No 007/2002 of 11th July, 2002).
- An Environmental Impact Study ("EIS") and Environmental Management Plan ("EMP") were submitted and approved for the Feasibility Study. The EIS is updated annually and accordingly the EMP is updated annually as prescribed by the DRC legislation.
- Table 17 in the main body of the report summarises the extent to which Mutanda's environmental and social management complies with Equator Principles and the International Finance Corporation ("IFC") performance standards.
- Current and future site environmental impacts of potential risk include:
  - Low level risk of spillage from the Dense Media Separation ("DMS") Plant spirals product onto the neighbouring concession, settling ponds are monitored daily and any spillage is cleaned up as and when it occurs.
  - In so far as hazardous waste is disposed of, these are done in facilities which are lawfully operated and which are constructed in terms of industry norms and standards.
  - Uncertainty regarding the geochemical behaviour of mine geological and waste materials disturbed and/or deposited by Mutanda activities, these materials are sampled and tested to confirm their geochemical behaviour and acid drainage potential.
  - There may be a risk related to the migration of responsibility from the construction project to an operational plant in the SHEQ department, a full time Environmental Manager will be employed to monitor this.
- Social impacts from mining are limited.
- The social impacts of the Corporate Social Responsibilty ("CSR") projects associated with the Mutanda mine are substantive given the socio-economic circumstances of the local community.

Mutanda currently has a structured approach to CSR with a small department focusing on projects related to government initiatives.

1.10 Economic Evaluation

An economic evaluation of Glencore's interest in Mutanda was done using the discounted cash flow method. Revenue, capital expenditure and operating costs were projected over the life of mine and discounted to give the expected value of Mutanda.

Revenue, capital and operating cost estimates

Production levels of copper and cobalt for Mutanda were based on the mine plans for the operations and the expected recoveries from the processing plants. The price obtained for the production was derived from futures prices on the LME. Operating cost estimates were based on contractual, current and budgeted costs.

Capital expenditure is required for the completion of the existing phase 1 and 2, and the new phase 3 plans to enable annualised copper production of up to 110 ktpa, and associated support infrastructure. USD 35 million per annum is required as sustaining capital. The future capital requirements for Mutanda over the life of the mine are shown in the following table:

Capital Expenditure for Mutanda

USD Thousands	2011	2012	2013	2014	2015	2016 2030	LOM Total
Capital expenditure	382,596	51,000	59,000	43,000	85,000	492,000	1,112,596

Valuation

The valuation was done at a discount rate of 10%, base date 1 January 2011. The net present value ("NPV") of Mutanda is USD 3 089 million. The net present value ("NPV") of Glencore’s investment in Mutanda is USD 1 318 million.

1.11 Mutanda MER Extraction Table

* Capacities refer to annualized capacity at year end - 31 December

		2011E	2012E	2013E	2014E	2015E
Finished metal production capacity	Units					
Copper	t	60,000	110,000	110,000	110,000	110,000
Cobalt	t	23,000	23,000	23,000	23,000	23,000
Actual / forecast production						
Copper Conc.	t	17,133				
Copper Cathode	t	24,068	81,251	103,531	103,214	103,477
Cobalt	t	12,548	23,000	23,000	23,000	23,000
Cash cost (excl. royalties, realisation charges, before by-product revenues)	US$m	163	346	386	396	398
By-products revenues	US$m	384	590	557	517	511
Royalties (as a % of net revenue)	%	4.50	4.50	4.50	4.50	4.50
Depreciation & amortisation	US$m	284	117	63	53	47
StatutoryTax rate	%	30%	30%	30%	30%	30%
Capex						
Sustaining	US$m	31	25	35	35	35
Expansionary	US$m	352	26	24	8	50

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APPENDICES

2.0 DESCRIPTION OF RESOURCES

A full feasibility study was undertaken by Paradigm Project Management ("PPM") in November 2008. It describes in detail the resource estimation for portion of the Mutanda deposit, incorporating the report by SRK entitled "Report on the Geology and Exploration of Mutanda Property" produced in March 2008. Riaan Herman Consulting cc ("RHC") was requested to look in detail at the modeling, statistics and geostatistics of the Eastern and Central Lobes and estimate resources for use on the mine. This report "Resource Report on the Central and Eastern Lobes found on the Mutanda Deposit – November 2008" was compiled by RHC. GAA reviewed these parameters and agrees with the results.

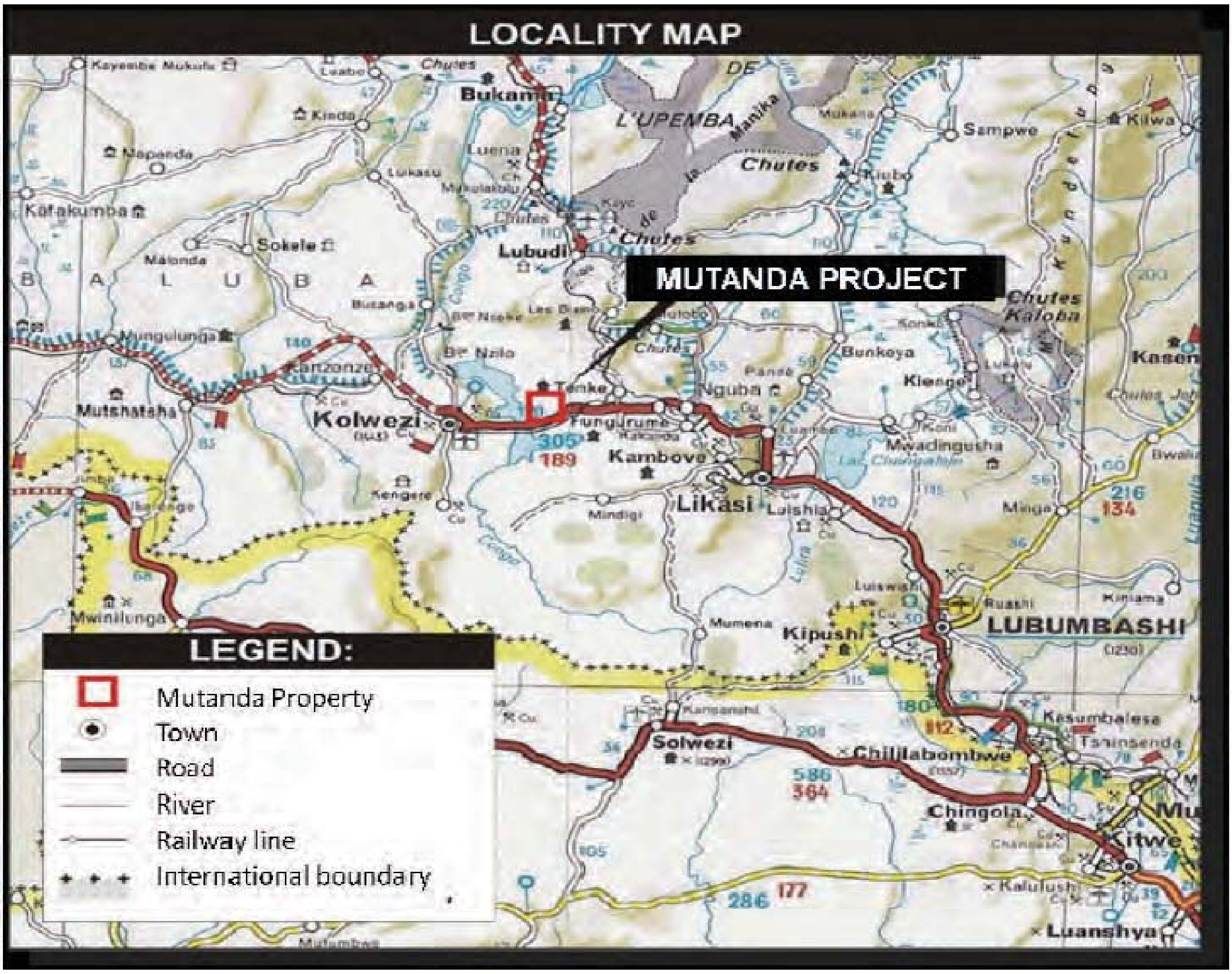

Figure 1: Mutanda Location Map

2.1 General Geology

The Mutanda copper-cobalt deposit lies with the lower part of the Neoproterozoic Katangan sedimentary succession which extends over more than 700km from Zambia through the Katanga province of the DRC and is up to 150km wide. It is part of a thrust-and-fold belt known as the Lufilian Arc (Figure 2). It shares the same characteristics of most of the deposits within the Copperbelt in that it is stratiform and associated with carbonate or carbon-rich lithologies (Cailteux, et. al. 2005).

The Katangan copper-cobalt metallogenic province is bounded to the north by a major dislocation zone, but in the south rests unconformably on a pre-Katangan basement (Figure 3). Due the increased disruption to the north of the Lufilian Arc, the unconformity between the basement and sediments has not been seen in the DRC and all contacts with the basement are tectonic.

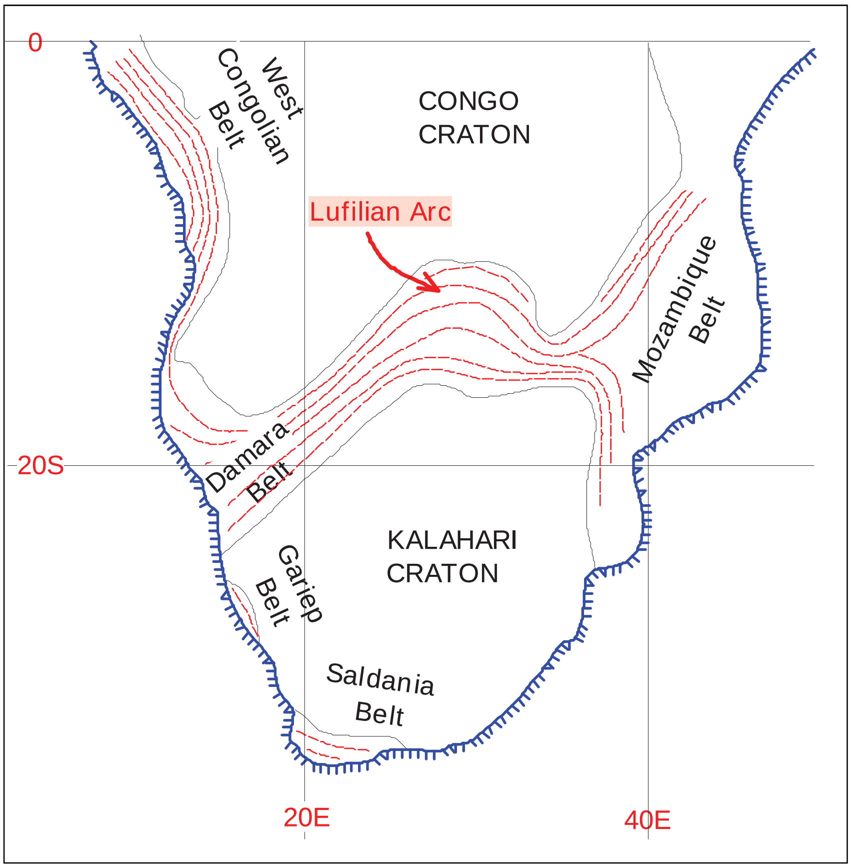

Figure 2: Tectonic Setting of the Katanga Copperbelt

2.1.1 Regional Structure

The Lufilian Arc has resulted from significant crustal shortening during closure of the basin now occupied by the Katangan sediments. The dominant sense of movement is from the south and the early ductile deformation forming north-verging recumbent folds. These have been disrupted by later brittle deformation in the form of thrust faults which have produced a number of displaced blocks. These are often associated with unusual breccias and it has been suggested that these formed from the dissolution of evaporite layers which formed a lubricant underneath these klippen. One of the largest of these is the Kolwezi Klippe which is surrounded by breccias of this type. Although sometimes stratiform, many of these breccias also form dykes cutting across the sedimentary layering.

2.1.2 Regional Stratigraphy

The Katangan supracrustal succession is 5 to 10km thick and has been subdivided into three main stratigraphic units, the Roan, Nguba and Kundelungu Groups (Table 2) each of which contain a number of subunits, designated by a letter prefix (denoting the Group) and numbers for the sub-groups and formations.

The Roan Group comprises siliciclastic and carbonate sedimentary rocks of fluviatile/lacustrine/marine origin with minor, mafic, igneous rocks, emplaced in a continental rift. The Nguba assemblage also consists of siliciclastic and carbonate sedimentary rocks with igneous rocks emplaced in a proto-oceanic rift similar to the Red Sea. The uppermost Kundelungu succession represents syn- to post-orogenic deposits. There are two phases of the Kundelungu: The tabular Kundelungu is a continental molasse sequence with a folded part affected by the waning stages of basin closure during the Lufilian Orogeny leading to the development of predominantly north-verging folds, thrusts and nappes. All of the Roan exposed in Katanga (except for the basal conglomerate), the Nguba and the folded Kundelungu (excluding the tabular part) are allochtonous tectonic sheets. The Mwashya Subgroup (R4) at the top of the Roan conformably overlies the Dipeta (R3) and is conformably overlain by the Grand Conglomérat (Table 2), although stratigraphic contacts can be occupied by syntectonic breccias which have also been interpreted as sedimentary conglomerates.

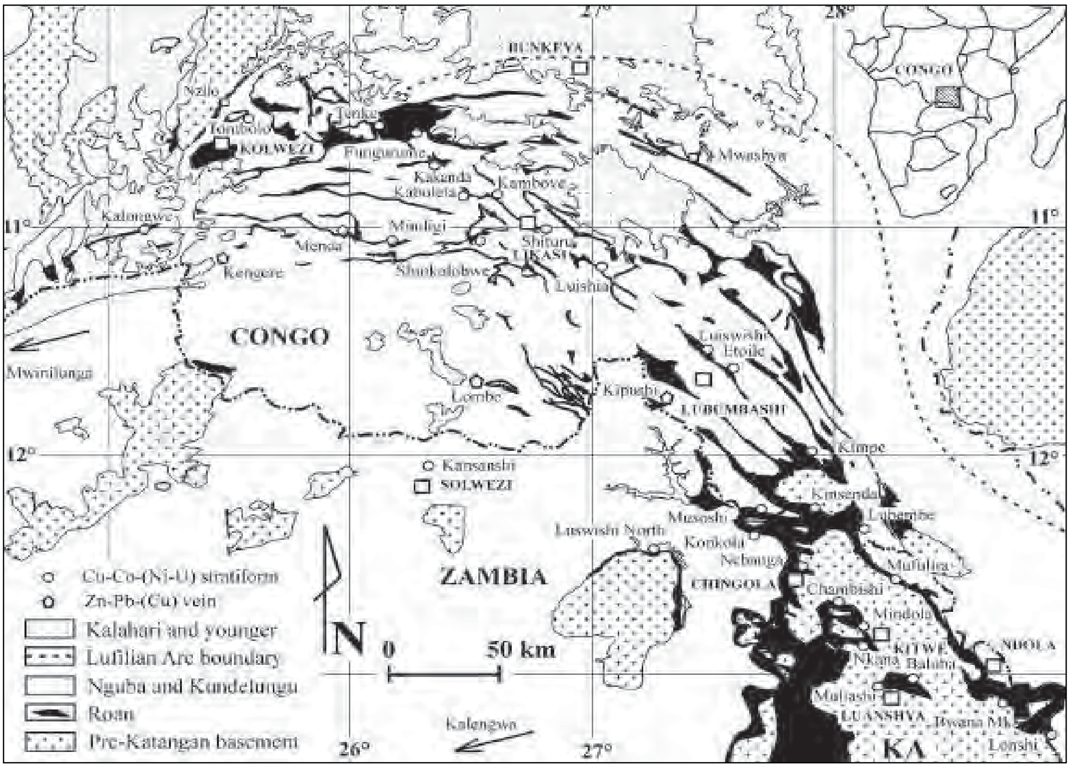

Figure 3: Geological Map of the Zambia Katanga Copperbelt

The DRC stratiform copper–cobalt orebodies all occur in the (Mines (R2) and Mwashya (R4) Subgroups of the Roan Group (Table 3) which displays a regional facies variation between Zambia-type and Congo-type successions. In Zambia and southeast Congo, the deposits are mainly hosted by para-autochthonous rocks close to the basement which define two parallel trends on either side of the Kafue anticline (Figure 3). The deposits off these trends (e.g. Western Province in Zambia) are assumed to be of minor economic importance but this could be a function of less exploration in these areas.

The lowermost Roan rocks rest unconformably on the pre-Katangan basement in Zambia but in the DRC, the Cu-Co deposits are associated with thrust sheets, nappes and klippen formed during the Lufilian Orogeny.

The dominant lithologies of the lowermost RAT (Roches Argilo-Talqueuses – DRC) and Mindola (Zambia) Sub-groups (R1) are dolomites and dolomitic shales. These were deposited in an oxic environment and in Zambia, a basal, boulder conglomerate is overlain by aeolian quartzites and immature braided stream/alluvial fanglomerates, arkoses and upward-fining sandstones. In DRC, the base of the RAT Subgroup is unknown, but a probable boulder conglomerate correlative occurs in places above the Kibaran basement. RAT correlatives in the DRC include red, chlorite-rich dolomitic rocks with variable fine-grained sand and silt components.

The Musoshi (Zambia) and Mines (Congo) Sub-groups (R2) represent a transgressive succession deposited in a reducing evaporitic environment. They include a succession of arenites, silty to sandy argillites and shales exposed north of the Kafue Anticline in Zambia, and dolomitic shales and dolomites south of the Kafue Anticline, and in the DRC. A carbonate unit forms a marker at the top of the mineralised successions in both DRC and Zambia. The bulk of the copper-cobalt mineralisation occurs in the lower parts of these Sub-groups and was deposited before the Lufilian deformation in both DRC and Zambia.

The correlative Kirilabombwe (Zambia) and Dipeta (Congo) Sub-groups (R3) have strong similarities and both lithological successions include arkoses, conglomerates, siltstones, dolomitic shales and dolomites.

The Mwashya Subgroup (R4) is characterized by platform carbonates (Lower Mwashya) grading to more open marine dolomitic shales, black shales or sandstones in the Upper Mwashya.

Gabbros intruding the Dipeta Sub-group (but not the Mwashya) and mafic lavas and pyroclastic rocks in the Lower Mwashya belong to a single syn-Lower Mwashya igneous event (760 ± 5Ma).

The Upper Mwashya is overlain by a glacial diamictite known as the Grand Conglomérat, which forms the base of the Nguba Group (previously the Lower Kundulungu) which is succeeded by the Kundulungu Group, the two being separated by a second diamictite, the Petit Conglomérat. Both of these stratigraphic units are dominated by siliclastic carbonate rocks and dolomites, and are devoid of mineralisation.

2.1.3 Local Geology

2.1.3.1 Mines Sub-group Deposits

The majority of the primary copper-cobalt deposits are stratigraphically controlled and occur in the Kamoto Dolomite (R2.1) and Dolomitic Shale Formations (R2.2) of the Mines Subgroup (R2) (DRC) and in the Zambian correlative known as the Ore Shale Formation at the base of the Musoshi Subgroup. Within these lithostratigraphic units, the orebodies extend for hundreds of metres to several kilometres along strike, but are often interrupted by faults related to the Lufilian orogeny. Typically there is lateral variation of the sulphides within the mineralised layers which grade from copper-rich into copper-poor and finally barren pyritic zones. Primary Cu-Co sulphide mineralisation also occurs in dolomites of the lower Mwashya Subgroup (R4) in the DRC and the Mutanda deposit is one of these hosted by small tectonic slices abutting against the Kansuki Fault, a major east-west trending dislocation (Figure 4).

The Mines Subgroup stratiform deposits stretch from Kolwezi in the west, around the Lufilian Arc to Kimpe in the southeast (Figure 4). They are characterised by two orebodies, with a 15 to 55m cumulative thickness (average of between 20 to 25m). The mineralisation is hosted in a transgressive supratidal to subtidal sedimentary sequence deposited under quiet, shallow-water conditions. The host rocks contain blebs, nodules and lenticular beds of dolomite–quartz pseudomorphs after anhydrite and gypsum, and high contents of Mg, Ba, Sr, Li, B and Br can be linked to the deposition of sediments under saline evaporitic conditions.

The lower orebody host-rocks include massive chloritic-dolomitic siltstones known as the Grey RAT, a fine-grained stratified dolostone (DStrat. – Dolomie Stratifié) and laminated, silicified, stromatolitic dolomites (RSF – Roches Siliceuses Feuilletés). The Upper Orebody host-rocks include the basal Dolomitic Shales (SDB – Shales Dolomitiques de Base), an intermittent overlying coarse-grained impure dolostone (BOMZ Black Ore Mineralised Zone) with a generally barren stromatolitic dolomite (RSC – Roches Siliceuses Cellulaires) between the two. The RSC is mineralised in some areas near the contact with the lower and upper orebodies.

In some deposits the primary mineralisation extends into the overlying carbonaceous dolomitic shales. The organic matter content of these rocks is variable and generally low but locally sufficient to form black shales and dolomites. The DRC mineralised succession is remarkably regular along strike, showing the same lithological succession for more than 350km from Kolwezi to Lubembe (Figure 3).

2.1.3.2 Mwashya Sub-group Deposits

The Mwashya Sub group (R4) is exposed for several hundred kilometres along major Lufilian thrust zones between Kolwezi and Kimpe (Figure 2). Along this trend there are several copper deposits in the Lower Mwashya but the Shituru deposit near Likasi is the only one that has been mined. It occurs on the southern flank of an anticline faulted along the fold axial plane. Mineralisation occurs in two stratiform bodies with high grades in the supergene zone and lower grades at the deeper levels. Most of the ore lies within laminated dolomite and dolomitic shales (lithologically similar to RSF/DStrat rocks of the Mines Sub-group) and interbedded with low-grade, massive stromatolitic dolomite. There appears to be no direct link between the pyroclastic rocks interbedded with the Lower Mwashya and this mineralisation. The Mutanda deposit appears to be very similar to Shituru.

2.1.3.3 Property Geology

The Mutanda deposit lies with a small thrust slice abutting against the Kansuki Fault, a major dislocation zone which stretches from Kolwezi to beyond Kalumbwe Myunga deposits over a distance of 75km. A number of Roan klippe lie along this fault, with the Kolwezi block by far the largest of these. To the west of Mutanda lie the Tilwezembi and Deziwa deposits and to the east Kalumbwe Myungwa (Figure 4).

The stratigraphic units at Mutanda include the Dipeta R3 and Mwashya R4 of the Roan Group, and the Ng 1.1 and Ng 1.3 of the Nguba Group. As with the Shituru deposit the stratigraphy is overturned and contacts between the three main units underlying the property are tectonic and in places occupied by breccias. Exposure over the property is generally poor particularly of the Roan Group rocks with the topographic highs underlain by clastic sediments of the Nguba Ng 1.1. The bulk of the mineralisation lies under a cover of red soil (terre rouge) and laterite (sol laterite) and locally these contain nodules of heterogenite.

The concession has been subdivided on the geographical location of three ore zones known as the West, Central and East Zones which all lie within the northern third of the property, with the South Zone devoid of mineralisation – at least near surface.

In describing the geology of the property the terms “above” and “below” refer to stratigraphic position and not the current spatial position, which is the reverse of this. Thus, while the Nguba Ng 1.3 is deepest stratigraphic unit, it is the youngest.

2.1.3.4 Stratigraphy and Lithology

The Dipeta R3 consists of argillite, which is highly weathered and has a distinctive talcose feel on broken and jointed surfaces. Many of the exposures are massive and can be red to purple, ochreous yellow or grey and more rarely white. In places this rock has a brecciated appearance with a black manganese oxide or red/yellow (iron) staining on the multitude of random joints within the body of the rock. These are probably not tectonic and may be due to the presence of expanding clays.

The second common lithology is banded rock, possible tuff which is green in fresher exposures and pink when highly weathered. A common feature of this lithology is the presence of multihued alteration spots, generally spherical and of variable size up to 30mm across. The meso-scale banding is diffuse and ranges from darker green to a cream/green in colour. This rock has the appearance of a fine-grained pyroclastic but according to Cailteux et. al. (2005) there are no volcanic rocks in the R3. The origin of this lithology will be confirmed by the petrographic study currently in progress. The R3 is typically weathered to greater depths than the other units and no fresh rock has been intersected in any of the coreholes, partly because all of these pass through this unit on the way to the R4 mineralisation.

The R3 is in contact with the Nguba 1.1, Nguba 1.3 (in depth) and the R4 and typically these contacts are the locus for a breccia which has been infiltrated and cemented by silica and iron/magnesium oxides. Where in contact with the R4, the breccias locally contain heterogenite.

Near surface the Lower Mwashya R4 is highly weathered and contains significant copper and cobalt oxide mineralisation. Normally the malachite and heterogenite occur together but in very different proportions, with lenticular zones much richer in one or other of these minerals. The intense alteration near surface includes silicified, friable iron-rich oxide material (with some magnesium oxides) and other zones of malachite and heterogenite. In one part of the western pit of the Central Zone there appears to be a recent collapse breccia filled with iron altered rock.

In the fresh core the R4 presents a very different aspect and largely consists of a recrystallised stromatolitic dolomite with veinlets and disseminations of chalcocite and carrollite and more rarely bornite. In the lower parts of this dolomite are interlayered dolomitic argillites which are finely bedded and contain fine disseminations and veinlets of copper and cobalt sulphides along bedding planes and coarser disseminations of these minerals (particularly euhedral carrollite) are dispersed throughout. In the upper part of this unit there are two distinctive and consistent marker beds: a persistent specular haematite layer often in close proximity to a thin jaspilite layer and a more diffuse band of oolitic dolomite.

Above the dolomite is a black shale layer which has only been intersected in five holes to date. This unit is locally highly mineralised.

Above the R4 is a chaotic breccia which is interpreted to be a collapsed remnant of an original evaporite removed by hydrothermal fluids.

The Nguba Ng 1.1 (the Grand Conglomérat) at Mutanda is a greenish diamictite when fresh, altering to pink, pale yellow or grey-white near surface. The clasts within this unit tend to be widely dispersed and in some areas there are none. The clasts are of variable composition and size, but many are of crystalline rock – presumably from the basement to the Katangan. This unit is restricted to the Central, Southern and West Zones in the northern part of the property. It forms the footwall to the R4 mineralisation in the western part of the Central Zones but terminates against a fault to the east. Where the Ng 1.1 is in contact with the R4 it is typically mineralised and near surface appears as veinlets of malachite along joint planes, but there is very little cobalt in these. This mineralisation has also been encountered in RC drill holes to 60m from surface.

Other rocks encountered in the South Zone include a succession of repeated fining-upward sedimentary beds with a thin, intermittent, matrix-supported conglomerate below more continuous beds of grit, sandstone, siltstone and shale. In addition recent excavations have exposed a very finely banded argillite which, though highly weathered, appears to be of glacial origin. These lithologies have tentatively been assigned to the Ng 1.1.

The Ng 1.2 is missing at Mutanda and the Nguba Ng 1.3 is normally in contact with the Ng 1.1 and the Roan lithologies. The ubiquitous lithology of this unit is a very distinctive purple argillaceous siltstone, which forms the “basement” to the mineralisation at Mutanda.

2.1.3.5 Structure

The dominant dislocations appear to be thrust controlled and abut against the Kansuki Fault. The Mutanda block is allochthonous and the strata are overturned and therefore it is assumed that these thrusts have exploited the axial plane of an early tight recumbent fold with the lower limb dislocated to some unknown part of the Lufilian Arc and certainly outside the property boundary. The faults appear to branch off a sole thrust, steepen to the north and form the bounding surfaces of the stratigraphic units. Each of these normally has a tectonic breccia along the contact. On the eastern boundary, the R4 has been terminated to the north by a strike slip fault.

There is also a collapse breccia at the top of the Roan Group which is interpreted to be the remnant of an evaporite layer. These may have formed in the early stages of deformation and have acted as a lubricating layer during deformation.

2.1.4 Mineralisation

2.1.4.1 Oxides

The main copper oxide minerals present are malachite (Cu2CO3(OH)2) and pseudomalachite (a hydrated phosphate of copper - Cu5(PO4)2(OH)4), with heterogenite (CoO.OH) the main Cobalt mineral. Quartz and chlorite dominate the gangue component in all the samples, with some samples containing illite and one (S03) containing minor talc. Other gangue minerals identified are Fe-oxyhydroxides (haematite and goethite), Al-oxyhydroxides (gibbsite) and kaolinite. There but no significant uranium in the oxides (the sulphides have yet to be tested).

Although individual samples differ in the mineralogical make-up, most contained variable amounts of malachite, pseudomalachite and heterogenite associated with fragments of quartz, quartz and chlorite, quartz and illite or intergrowths of some, or all, of these minerals. Malachite generally occurs as:

- fragments attached to quartz;

- liberated fragments;
- fragments attached to or included in finely intergrown quartz and chlorite; and
- intimately intergrown with Fe-oxyhydroxides and may also form a botryoidal crust with Fe-oxyhydroxides;

The heterogenite occurs as:

- fragments in finely intergrown quartz and chlorite;
- large liberated fragments with a characteristic sponge-like texture;
- less-porous fragments attached to quartz; and
- intimately intergrown with Fe-oxyhydroxides

Malachite and pseudomalachite are the principal copper minerals present, with the relative amounts of these varying from sample to sample. Both are bright green and difficult to differentiate in hand specimen. In general malachite is more abundant, and although the two phases may vary slightly with respect to their solubility, both are expected to be amenable to acid leaching. Very small amounts of chalcocite (Cu2S) are present usually as remnant inclusions in malachite. Traces of chalcopyrite are only found as occluded grains in quartz, and can be disregarded since they represent isolated, non-reactive particles.

Heterogenite (or more accurately lithiophorite [(Co,Mn)O(OH)] based on the Mn-content of the mineral) is the principal cobalt mineral.

Quartz is the major gangue component, with minor amounts of chlorite, mica (illite) and Fe-oxyhydroxides (mainly goethite). The clay minerals kaolinite, gibbsite and talc are present in varying, but generally trace amounts. Malachite and pseudomalachite are generally intergrown with quartz, chlorite and goethite.

Table 1: Stratigraphy of the Katangan Copperbelt

	Group	Sub-group	Formation		Lithologies
+ 500 Ma	Kundelungu formerly Upper Kundelungu	Plateaux Ku 3			Arkose, conglomerate, sandstone, shale
		Kiubo Ku 2			Sandstone, carbonated siltstone or shale, limestone
		Kalule Ku 1			Ku 1.3 Carbonated siltstone and shale, grey to pink oolitic limestone at base ("Calcaire Rose Oolitique")
					Ku 1.2 Carbonated siltstone and shale; pink to grey dolomite at base ("Calcaire Rose")
					Ku 1.1"Petit Conglomerat": glacial diamictite
+ 620 Ma	Nguba formerly Lower Kundelungu	Mongwezi Ng 2			Dolomitic Sandstone siltstone or shale
		Likasi Ng 1			Ng 1.3 Carbonated siltstone and shale
					Ng 1.2 Dolomite limestone dolomitic shale and siltstone
					Ng 1.1 "Grand Conglomerat": glacial diamictite
+ 750 Ma	Roan	Mwashya R-4	Upper	R-4.2	Shales, carbonaceous shales or sandstones
			Lower	R-4.1	Dolomites, jasper beds, pyroclastics and haematite, local stratiform Cu-Co mineralisation
		Dipeta R-3		R-3.4	Dolomites interbedded with argillaceous to dolomitic siltstone and feldspathic sandstone; intrusive bodies
				R-3.3	
				R-3.2	
			RGS	R-3.1	Dolomitic Siltstones
		Mines R-2	Kambove	R-2.3	Laminated, stromatolitic, talcose dolomites and dolomitic siltstone local stratiform Cu-Co mineralisation
			Dolomitic shale	R-2.2	Dolomitic shales, carbonaceous shales, dolomite and occasional sandstone or arkose
					Dolomitic shales, sandy dolomite at top; stratiform Cu-Co mineralisation (Upper Ore Body)
		Kamoto		R-2.1	R-2.1.3 "Roches Silicueuses Cellulaire": stromatolitic dolomite with interbedded siltstone; Cu-Co mineralisation at top and base
					R-2.1.2 bedded dolomites with siltstones; silty dolomite in the lower part; Cu-Co mineralisation (Lower Orebody)
					R-2.1.1 "R.A.T. grises": dolomitic siltstone; Cu-Co at top
		RAT R-1		R-1.3	Pink lilac haematitic chloritic dolomite, massive siltstone
				R-1.2	Pink to purple grey haematitic chloritic siltstone; sandstone in the lower part; stromatolitic dolomite at top
				R-1.1	Purple-red haematitic slightly dolomitic bedded siltstone
	Base of R.A.T. sequence unknown				
<900Ma	Basal Conglomerate				

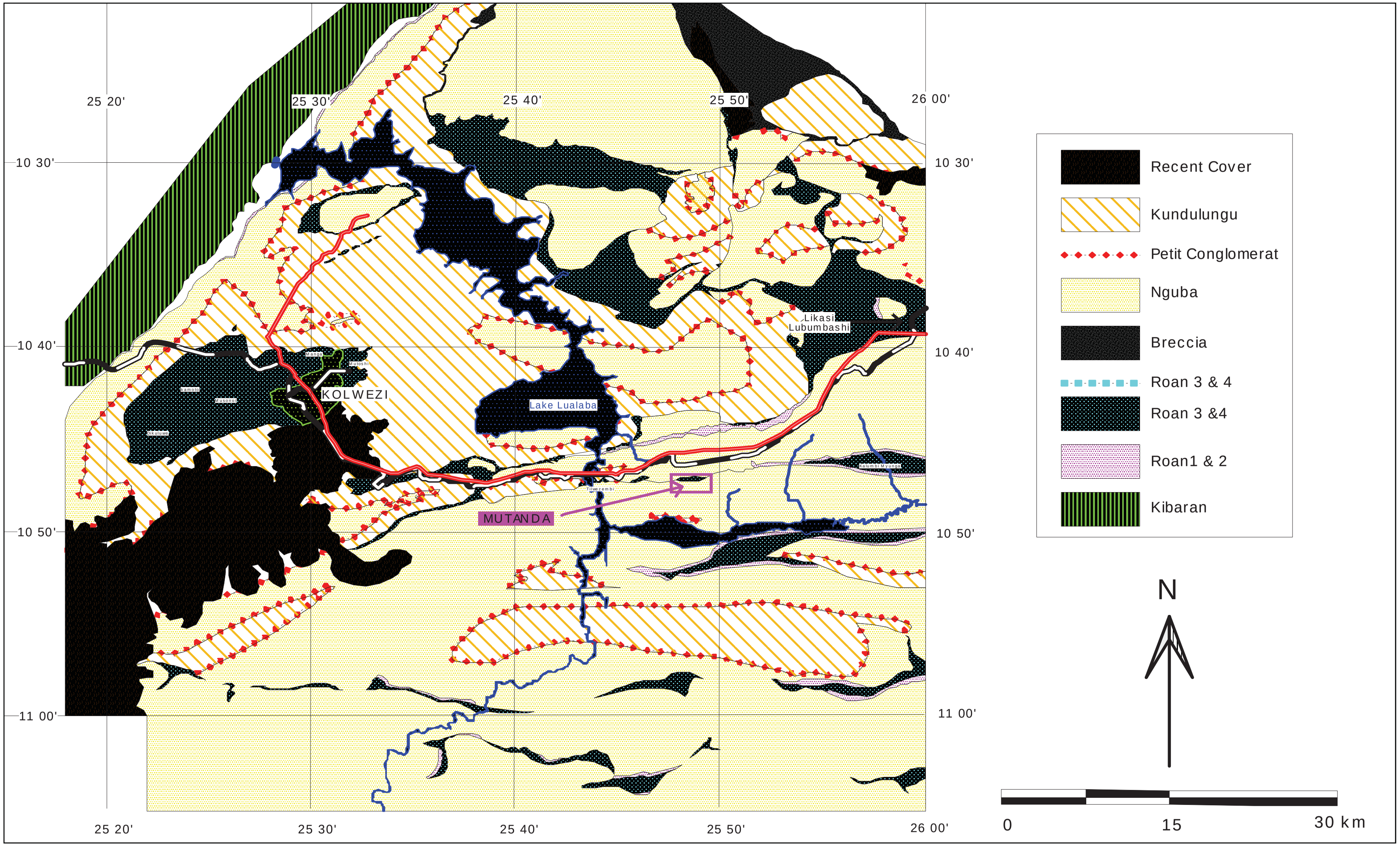

Figure 4: Regional Geological Plan Kolwezi Area

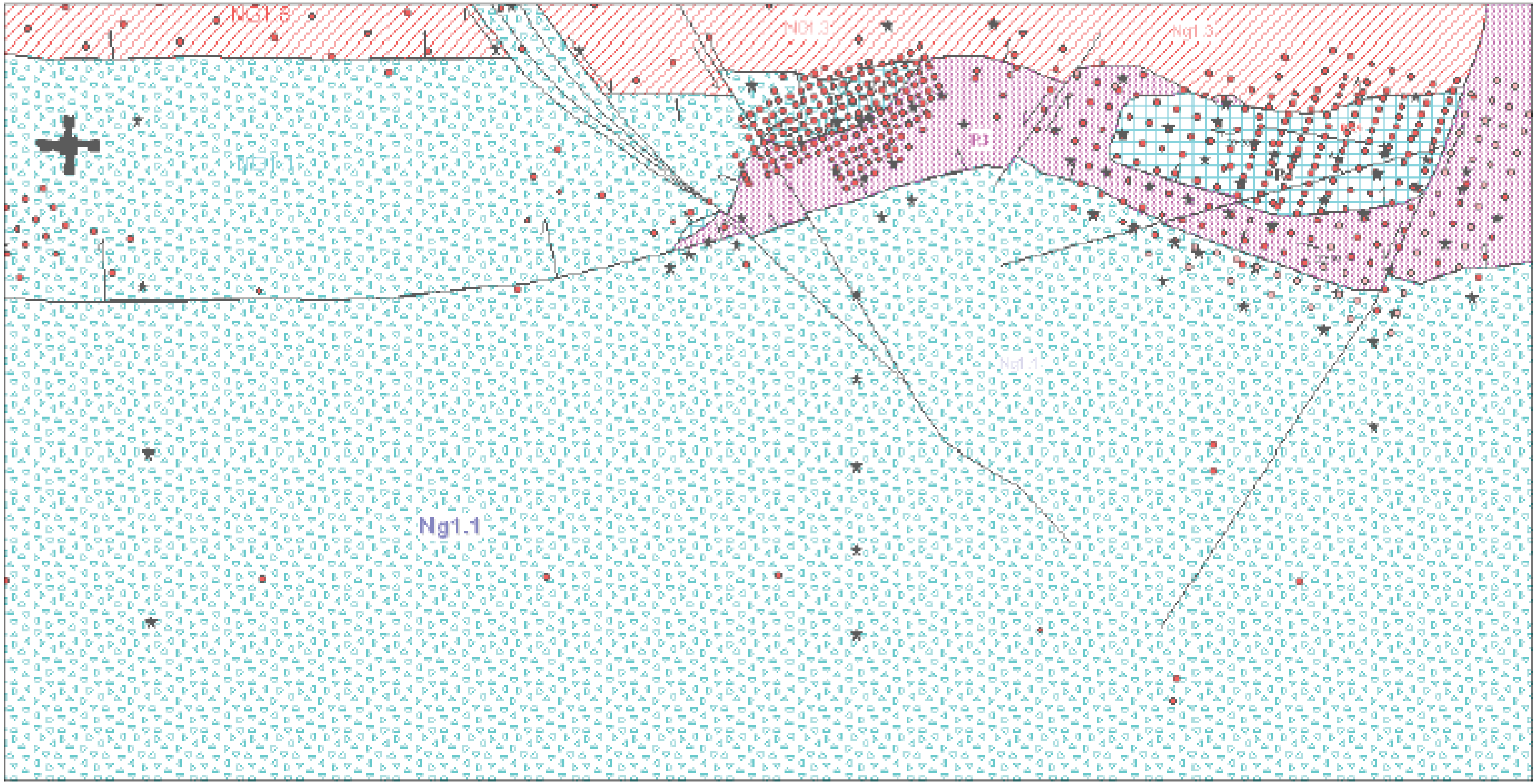

Figure 5: Geological Map of the Mutanda License Area

Generally, both the Cu-rich and Co-rich samples can be classified as oxide-type ore, with minor secondary sulphides.

2.1.4.2 Sulphides

The sulphide minerals have yet to be subjected to a laboratory mineralogical analysis but the major copper minerals are, in order of decreasing abundance, chalcocite, bornite with minor chalcopyrite. No pyrite has been encountered and the only other sulphide is carrollite. The copper sulphides tend to finely disseminated along bedding planes in the dolomitic argillites and more coarsely so in the dolomite. They also occur in narrow (1mm) veinlets which cross-cut the bedding. Carrollite has a similar habit and can be difficult to distinguish from the copper minerals where fine-grained. However sub- to euhedral carrollite does occur as larger, disseminated crystals (up to 3mm) in both the dolomite and more argillic rocks. In some of the oolitic dolomites the sulphides preferentially replace the oolites.

A less common style of sulphide occurrence is in coarse quartz breccias where there are clasts of very coarse chalcopyrite associated with coarser quartz fragments.

In addition to the sulphides there are very sporadic nuggets of native copper.

2.1.4.3 Orebodies

Four mineralised bodies have been delineated at Mutanda. The largest of these lies in the East Zone which extends along an east-west strike for 900m and down dip for 500m. It lies within the R4 dolomites and dolomitic shales and is up to 50m thick near surface. This body dips at 35° to the south and plunges towards to southeast. Although sulphides have been intersected at depth these are more sparsely drilled and have yet to be investigated in detail. The down-plunge extensions of this mineralisation have yet to be drilled.

This mineralised zone has been drilled on a 25m x 25m grid and sampled at 1m intervals throughout. The Central Zone has been drilled on a 25m grid but only a part of the Eastern Zone has been drilled on a 25m grid, with the majority of it drilled on a 50m grid. The bulk of the mineralisation is oxidised although portions contain sulphides.

A second carbonaceous shale-hosted mineralised zone lies stratigraphically above the main mineralisation (some 60m vertically below) and has been intersected in only seven drillholes. It appears to be variable in thickness and intensity of the mineralisation but visually the grades for both copper and cobalt appear to be higher than those in the carbonate hosted sulphide zone.

The Central Northwest orebody has been drilled on a 50m x 50m grid. The bulk of the mineralization is oxidised.

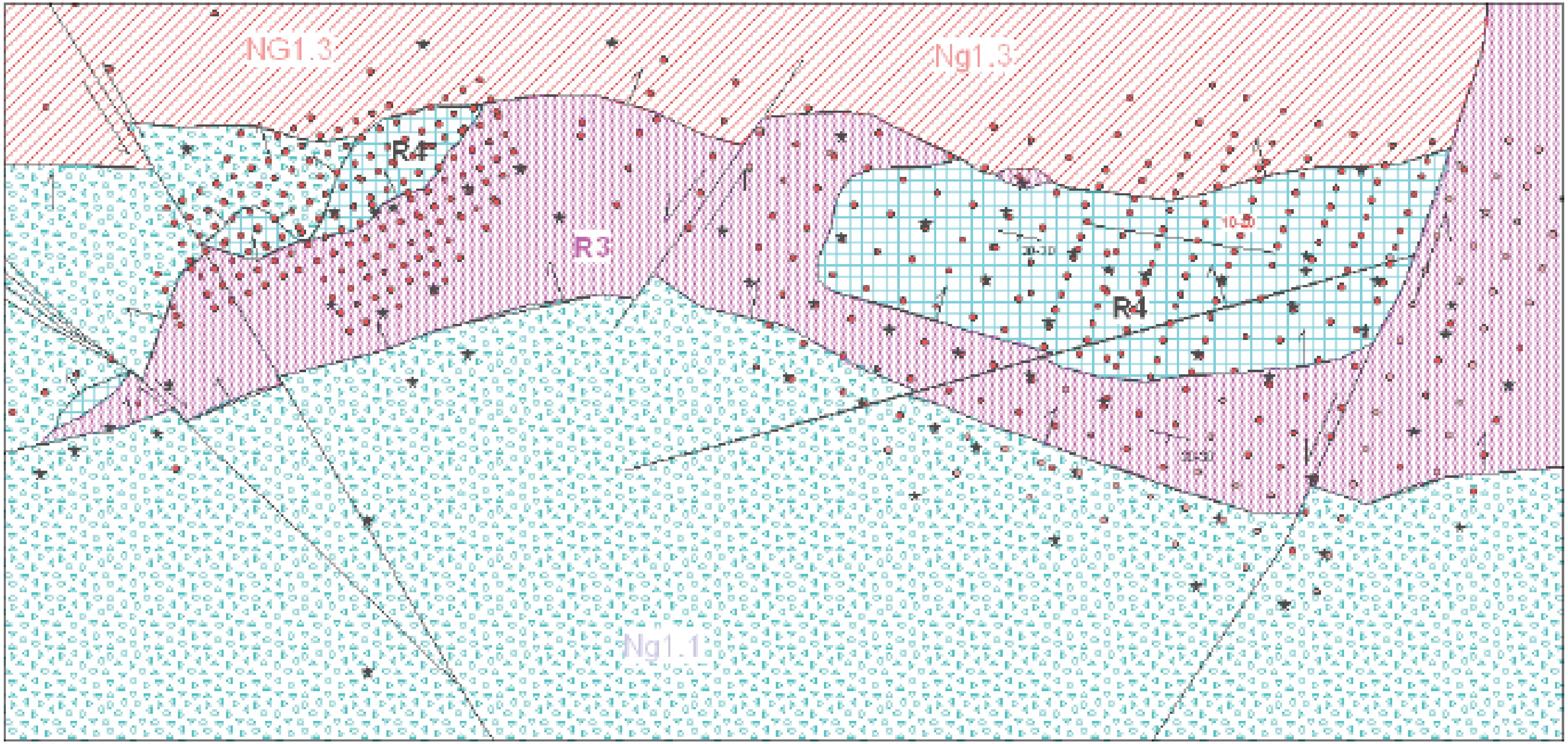

Figure 6: Geological Map of the Mutanda Orebodies

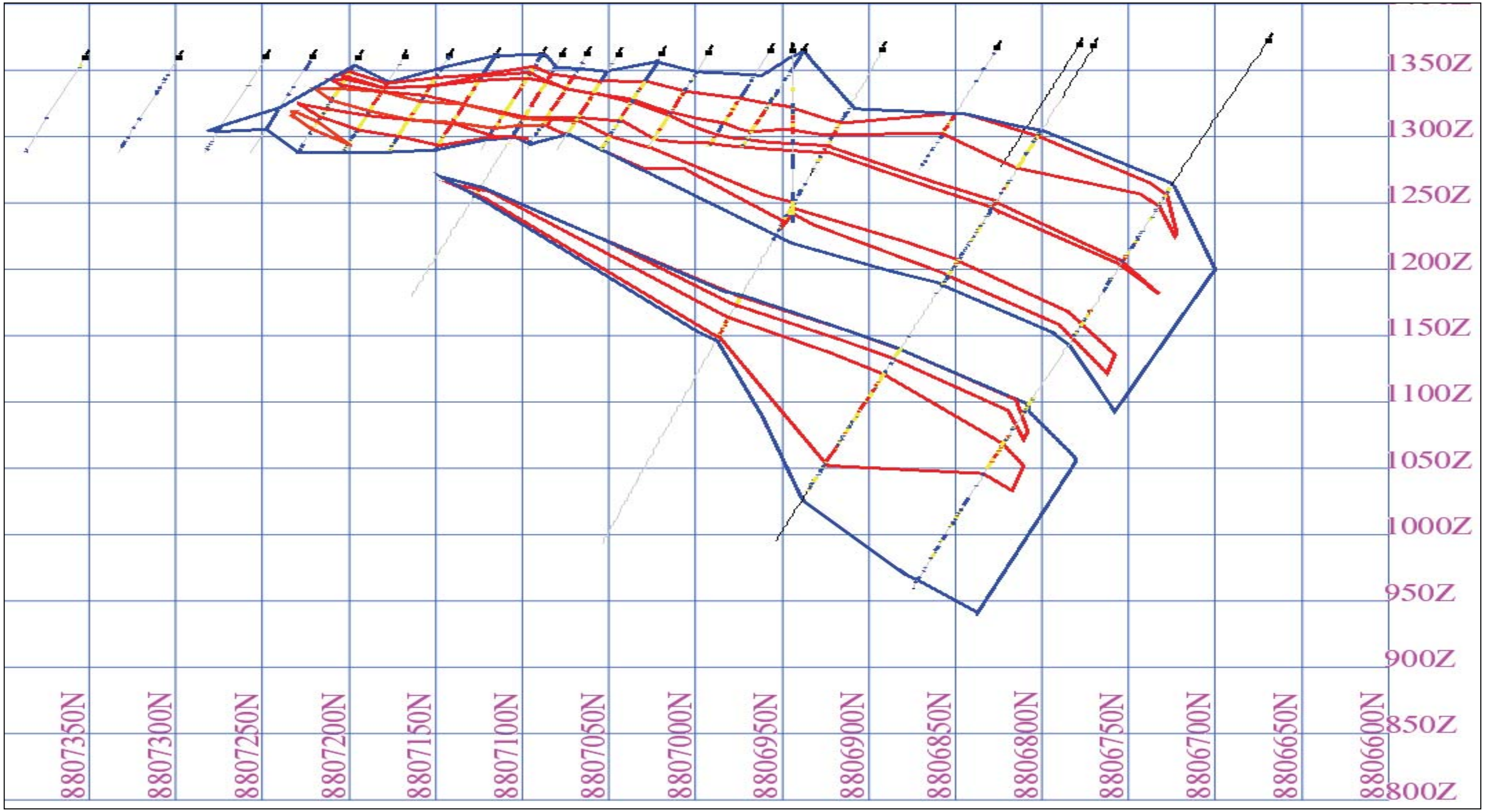

Figure 7: Cross Section through the Mutanda East Orebody

Note: the lower blue contact is the 0.4% Cu interpretation and the red the 1% Cu interpretation and grid lines are 50 meters apart

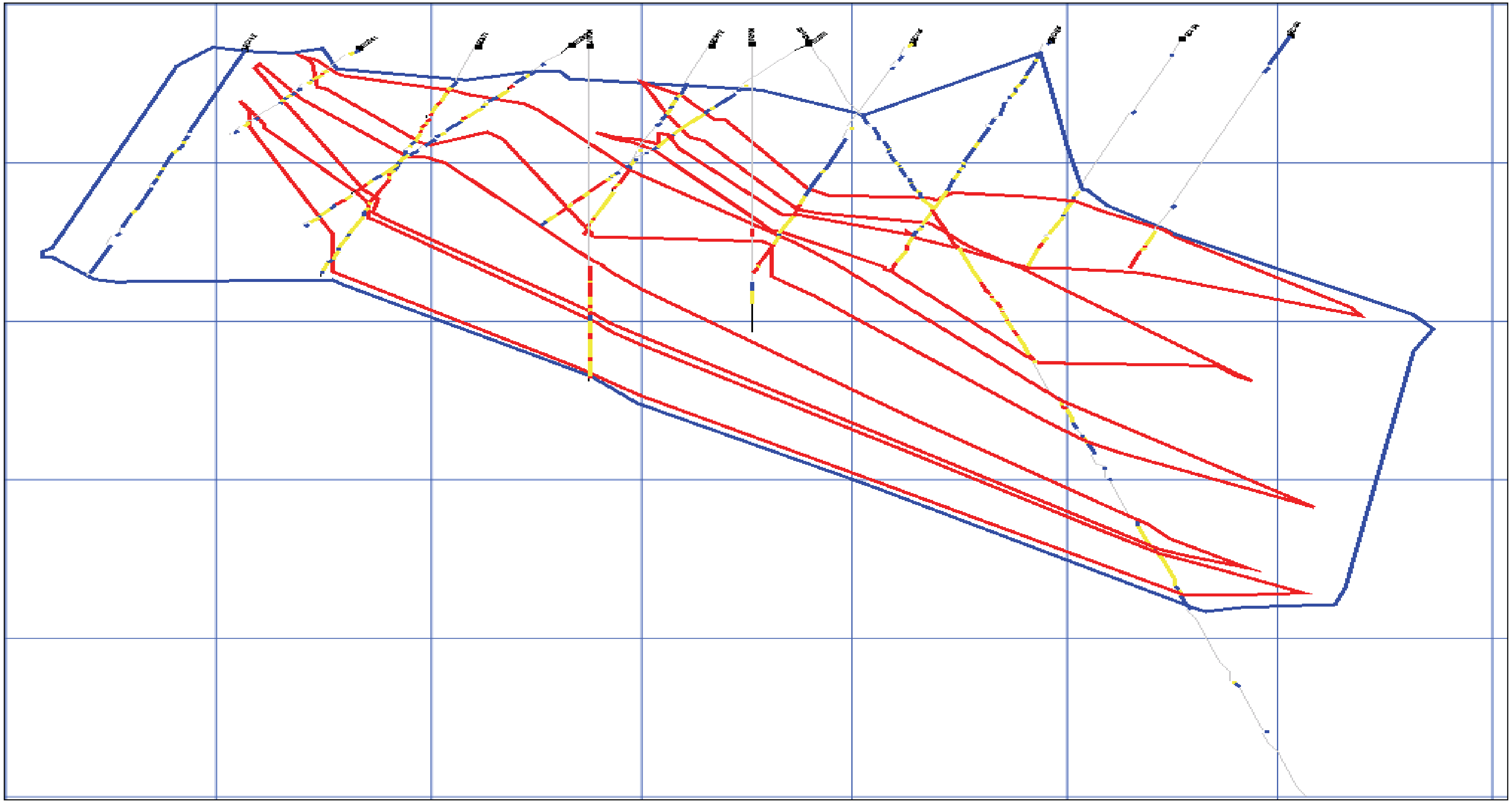

Figure 8: Cross Section through the Mutanda Central Orebody

Note: the lower blue contact is the 0.4% Cu interpretation and the red the 1% Cu interpretation and grid lines are 50 meters apart

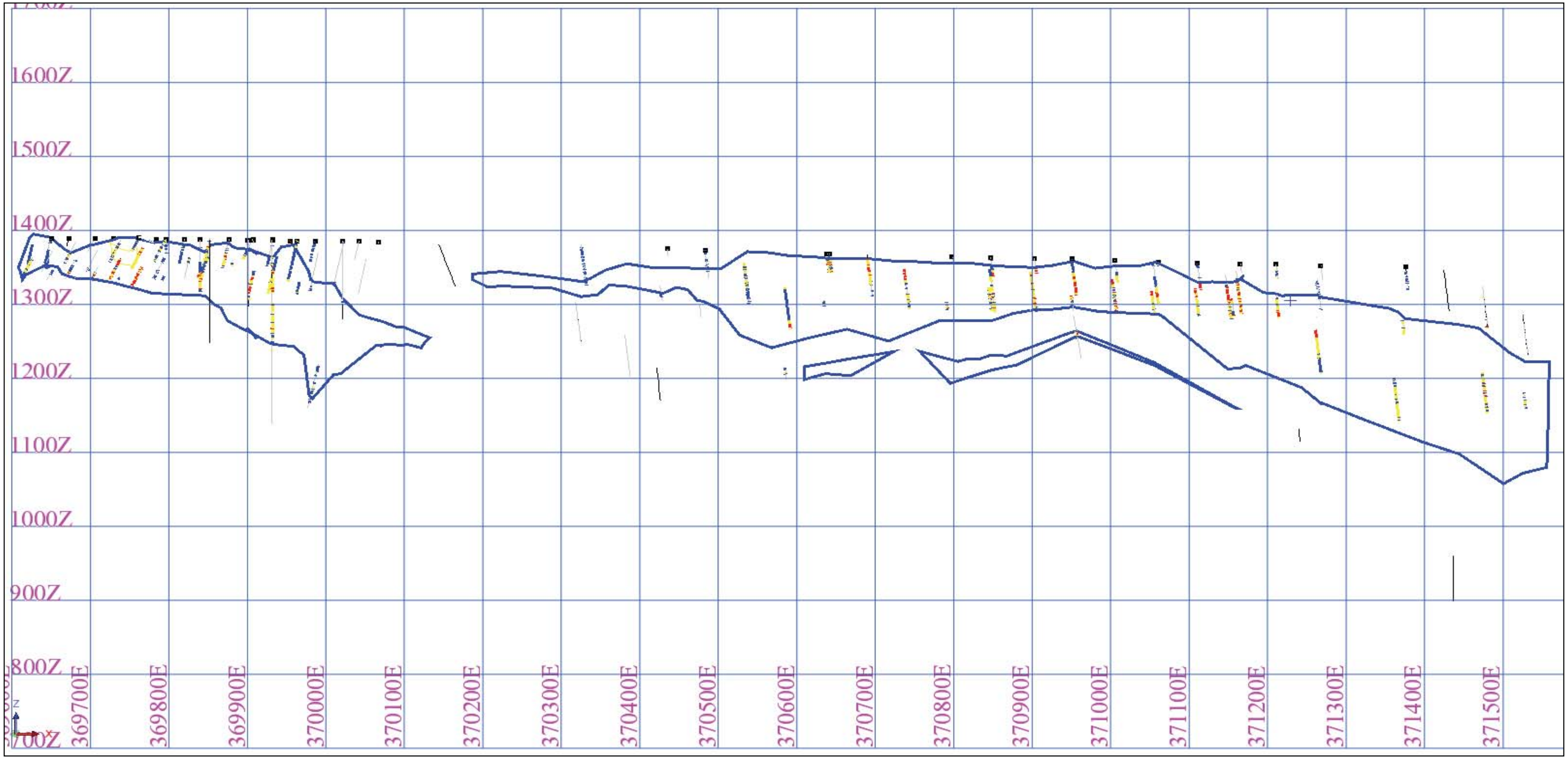

Figure 9: Vertical Long Projection through the Mutanda Central and East Orebodies

Note: the lower blue contact is the 0.4% Cu interpretation and grid lines are 100 meters apart

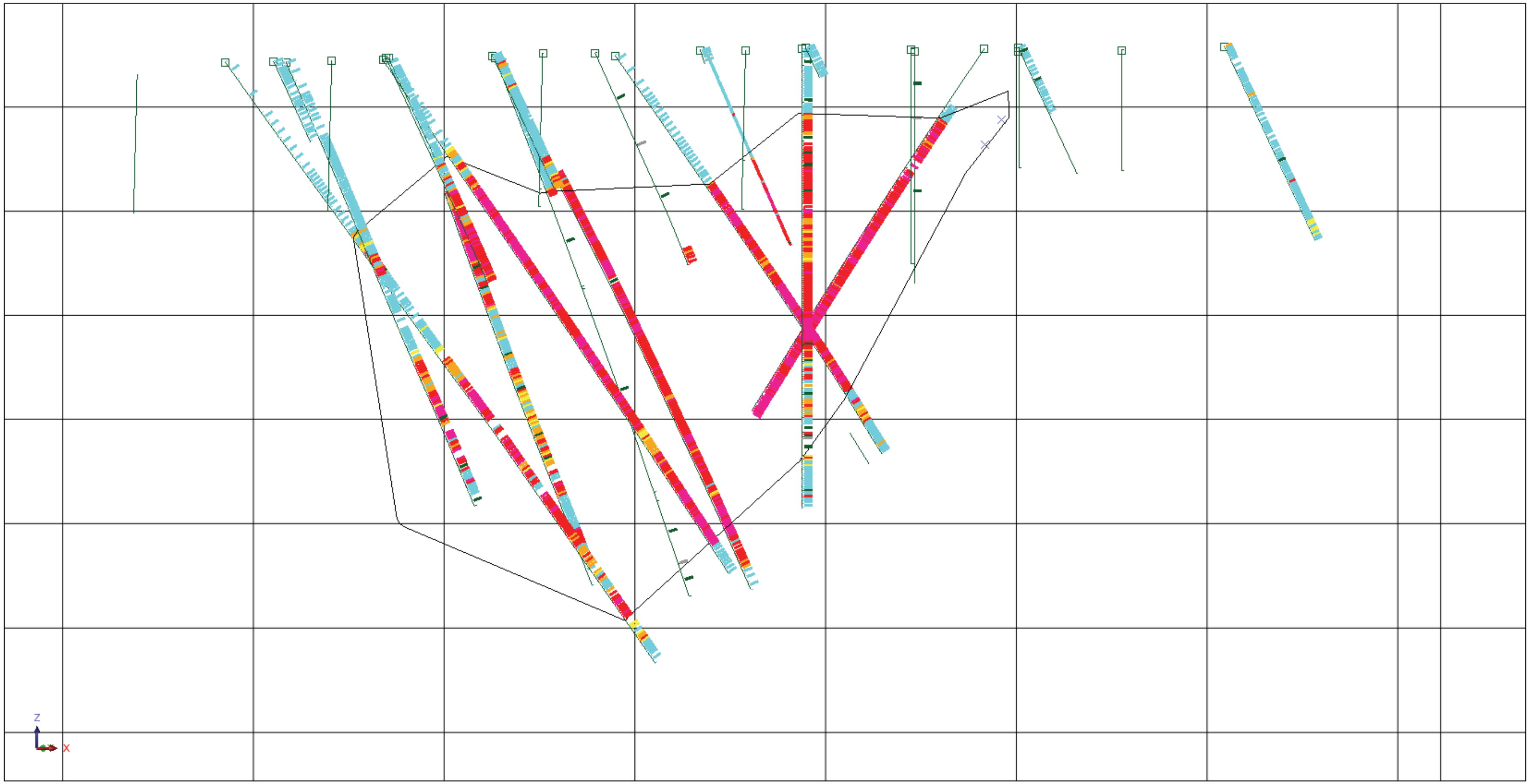

Figure 10: Vertical cross section through the Mutanda Central Northwest Orebody

2.2 Mineral resource estimation methodology

2.2.1 Exploration and Data

2.2.1.1 History

The Mutanda concession was first explored by Gecamines in the 1980s when they excavated a number of pits and from these mapped the stratigraphy and confirmed that the Roan 4 stratigraphic interval was present and that it contained mineralisation. In 2004 a programme of core drilling ("DD") was undertaken and followed by Reverse Circulation drilling ("RC"), soil sampling and geophysical work. All of the significant near surface (to 100m) mineralisation has been defined.

2.2.1.2 Artisanal Mining

After the concession was awarded to Groupe Bazano, artisanal miners exploited a mineralised zone from the northern flank of the Mutanda Hill. This working subsequently became the platform for underground stoping. It is understood that these working eventually extended for some 70m beyond the bottom of the pit at an angle of 70°. This working was ultimately declared unsafe and mining stopped in 2005.

2.2.1.3 Soil Geochemistry

A soil sampling program was completed in June 2006 and the results showed a significant anomaly over the known mineralised areas which cover the northern third of the concession. There was also a strange anomaly running across the regional strike over two lines adjacent to a break in the southern range of hills. This was followed up by four holes with negative results and the source of this anomaly remains unknown.

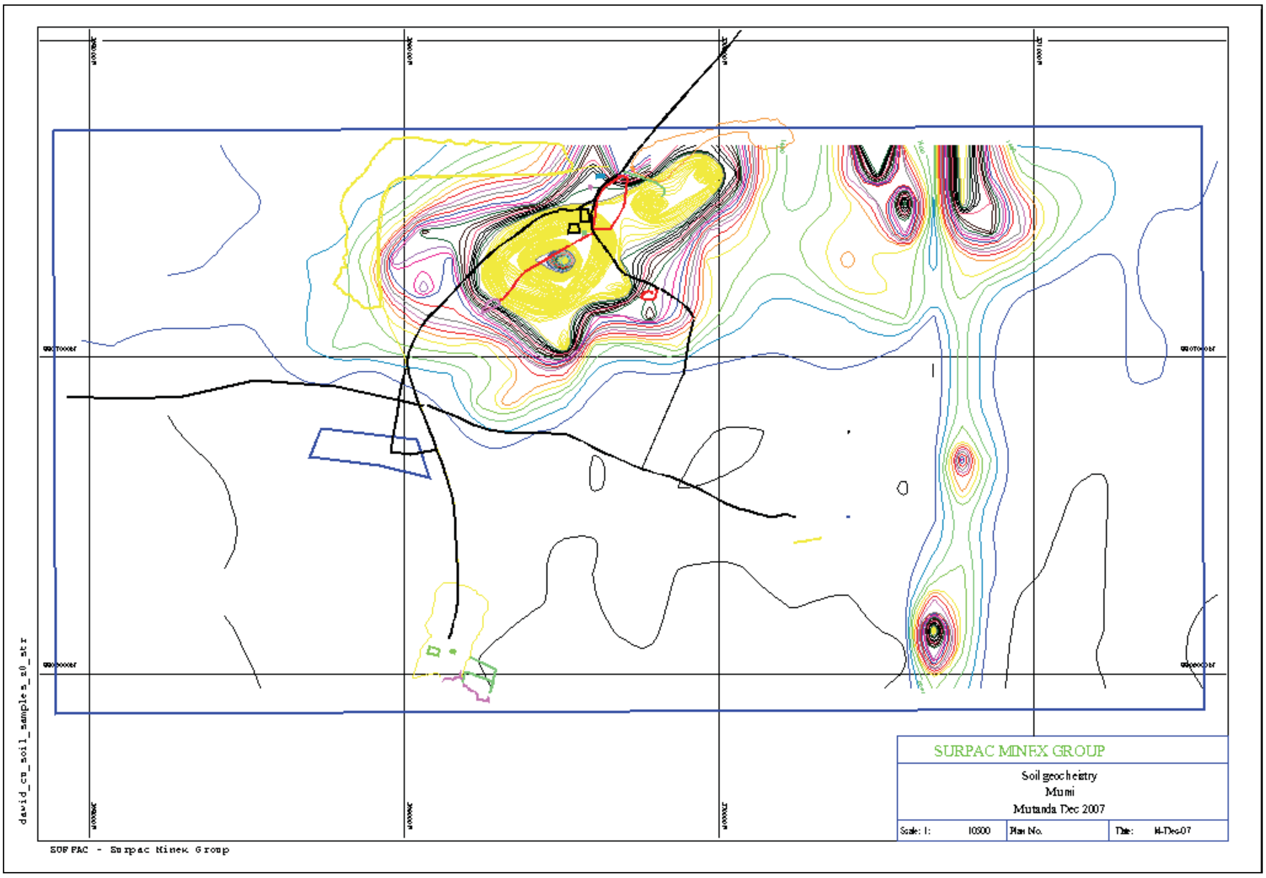

Figure 11: Soil Geochemistry Contours

2.2.1.4 Drilling

In 2005 Mutanda Mining contracted Gecamines to mount a drilling program around and to the east of the artisanal pit and 33 DD were drilled (1,780m). Part of this programme was targeted down dip of the artisanal pit and adjacent to old exploration pits to the east. These holes intersected ore-grade mineralisation over what is now known as the Central Zone, and the East Zone where four holes gave very good results. Only one hole indicated an extension of the artisanal pit mineralisation and it appears that this zone terminates not far from the bottom of the pit. Gecamines drilled 28 holes which proved to be very useful in planning the subsequent RC and later DD exploration campaigns.

Given the scattered indication of mineralised zones from the Gecamines exploration, a more systematic RC programme was initiated by Groupe Bazano in November 2005 and over a four week period 47 holes were drilled to an average inclined depth of 80m. Work was essentially complete over the Central Zone by September 2006 and the RC rig was moved to the East Zone and started work around the four Gecamines holes which obtained good results. This drilling was supplemented with a DD rig in June 2007 and the work over the up-dip portions of the Central and Eastern Zones is now complete.

The drilling grid over the Central Zone was nominally 25m by 25m. A similar pattern was established for the initial five lines of the Eastern Zone and this was widened to a 100m line spacing to the strike extents of the mineralisation and subsequently in-filled to 50m. The core drilling initially twinned the RC holes, partly to obtain samples for metallurgical tests and also to get better depth penetration which was limited to 80m with the main rig available through 2006 and into 2007. Other holes were drilled to obtain hydrological and geotechnical data. Most of the holes were inclined at 65° to the south and against the regional dip.

In addition to this work, condemnation and other RC drilling probed various parts of the concession and all of the holes drilled to end-2007 are shown on Figure 12 for the RC holes and Figure 13 for the core holes with the condemnation holes shown in Figure 14.

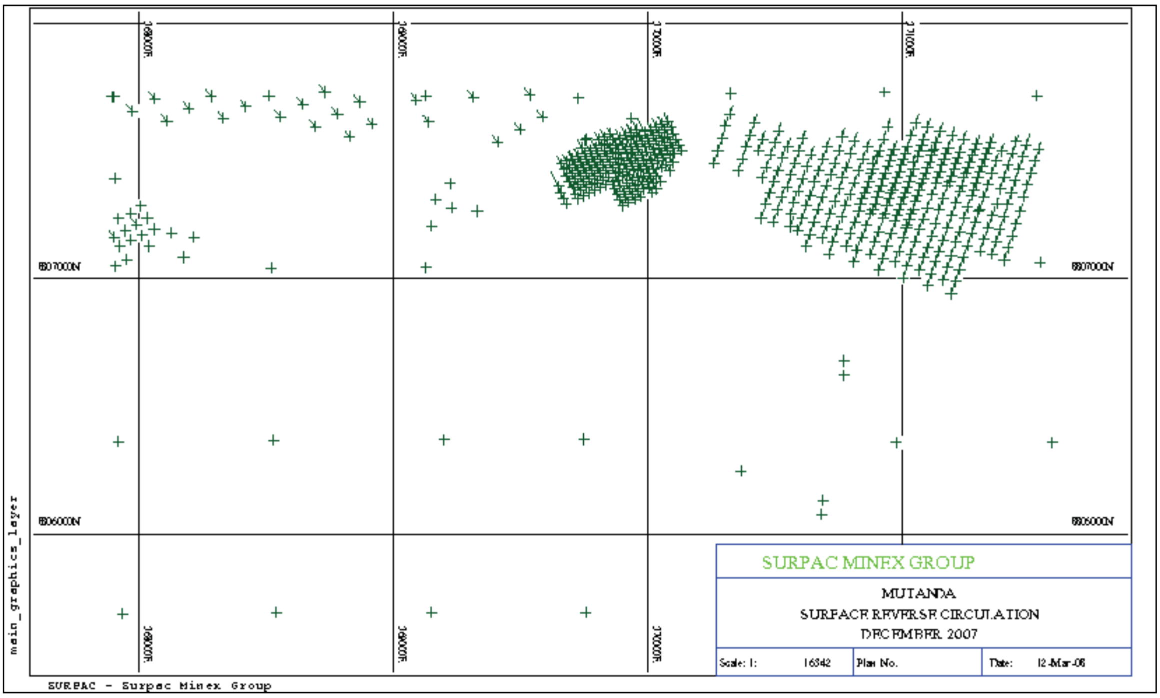

Figure 12: Reverse Circulation Drilling Layout

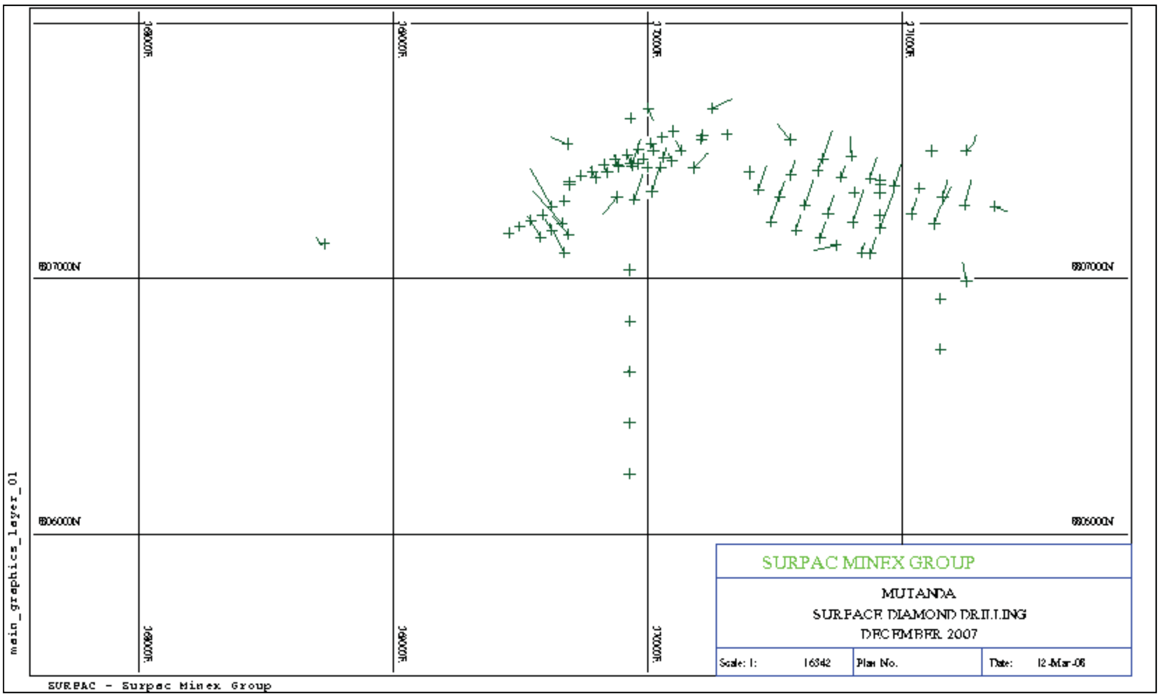

Figure 13: Core Drilling Layout

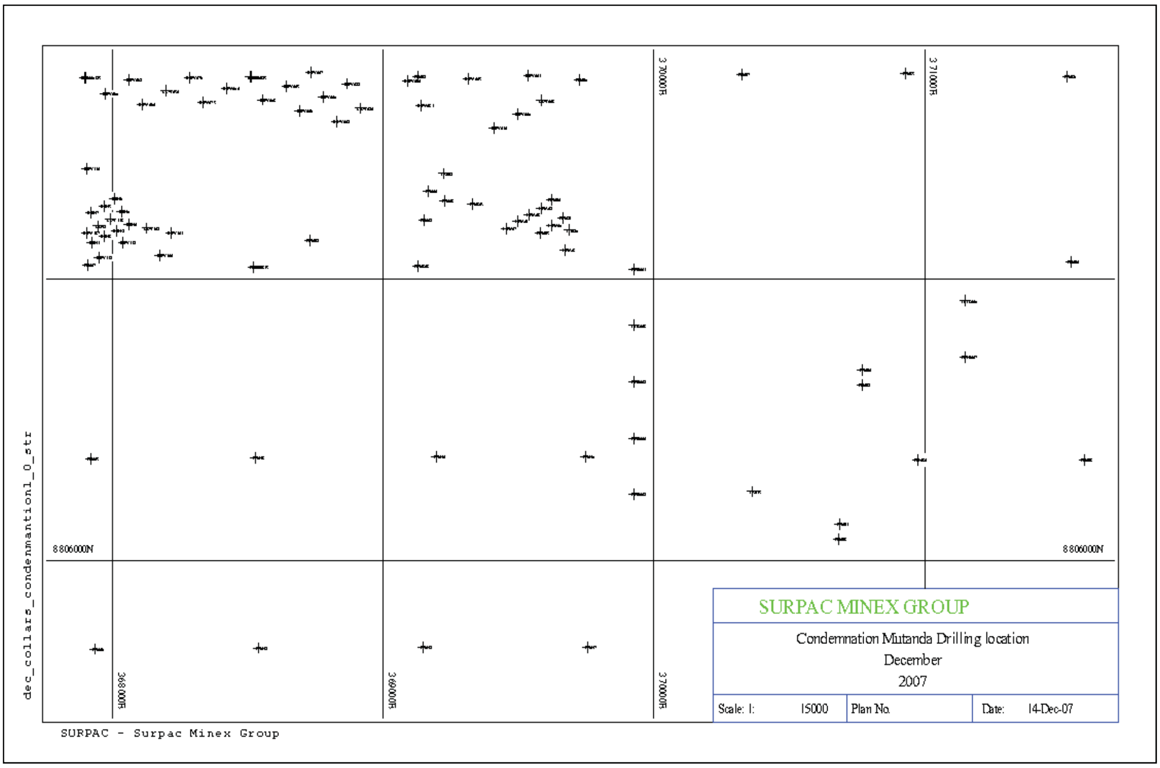

Figure 14: Condemnation Drilling Layout

To the end of December 2007 a total of 610 RC and 66 DD holes had been drilled for a grand total of 68,818m and the breakdown of these are shown in Table 2.

Table 2: Summary of Drillholes to December 2007

Area	DD	Meters	RC	Meters
South Area	-	-	4	320
Hydrological	-	-	6	1,200
Metallurgical	6	621	-	-
Geotechnical	12	1,908	-	-
West Zone	-	-	88	7,040
Condemnation	14	3,662	38	3,214
Central Zone	13	3,007	186	13,950
East Zone	21	5,097	288	28,800
Total	66	14,294	610	54,524

Eight of the DD holes collared within 5m of RC holes were drilled parallel to them to confirm the geology and mineralisation obtained from the RC drill chips (Table 3). The correlations between most of these holes were very good in terms of definition of the mineralised intervals and grades, and also confirmed the RC chip logging. Given the short-range variability of the oxide mineralisation where narrow high grade veins are known to exist, the grade variability in two of the areas (DD008/RC201 and DD016/RC268) does not detract from the fact that in both of these twinned holes the same mineralised intervals were identified, and both are relatively low grade.

Table 3: Comparison of Twinned RC and DD Holes

Hole ID	from	to	Interval.	TCu Ave.	TCo Ave.
	m	m	m	%	%
DD001	71.9	79.6	7.7	1.32	0.68
RC253	72.0	80.0	8.0	1.41	1.70
DD003	54.3	80.5	26.3	8.42	1.22
RC248	54.0	80.0	26.0	5.99	0.86
DD008	0.0	18.0	18.0	1.75	1.27
RC201	0.0	18.0	18.0	0.29	0.94
DD008	33.8	65.4	31.5	5.65	1.87
RC201	34.0	65.0	31.0	4.91	1.56
DD009	0.0	80.0	80.0	2.47	1.43
RC234	0.0	80.0	80.0	3.20	1.65
DD010	10.1	80.0	69.9	3.48	1.56
RC230	10.0	80.0	70.0	4.84	1.64
DD012	0.0	12.9	12.9	8.02	5.58
RC256	0.0	13.0	13.0	7.83	3.33
DD012	54.0	80.0	26.0	0.58	0.08
RC256	54.0	80.0	26.0	0.67	0.73
DD016	19.0	58.0	39.0	0.86	1.39
RC268	19.0	58.0	39.0	1.61	2.00
Average DD Holes				3.32	1.51
Average RC Holes				3.54	1.57

A further targeted phase 2 exploration programme continued from 2008 to expand the resource base in the Central and East ore zones. In addition to this holes were drilled around the original artisanal workings and a third major ore zone was discovered. The Central North West (CNW) deposit exploration drilling programme was completed in Nov 2010 increasing the number of exploration metres drilled to a total of 104,664 metres. This is split 800 RC holes and 184 DD holes.The CNW was drilled on a 25m x 50m spacing and has added significant resource to the Mutanda concession.

Table 4: Number of holes per project area

Area	**Total drilled (m)**	**Number**
Central	26,414	292
Central NW	20,931	126
East	42,122	411
South	7,348	68
West	7,850	87
Grand Total	104,664	984

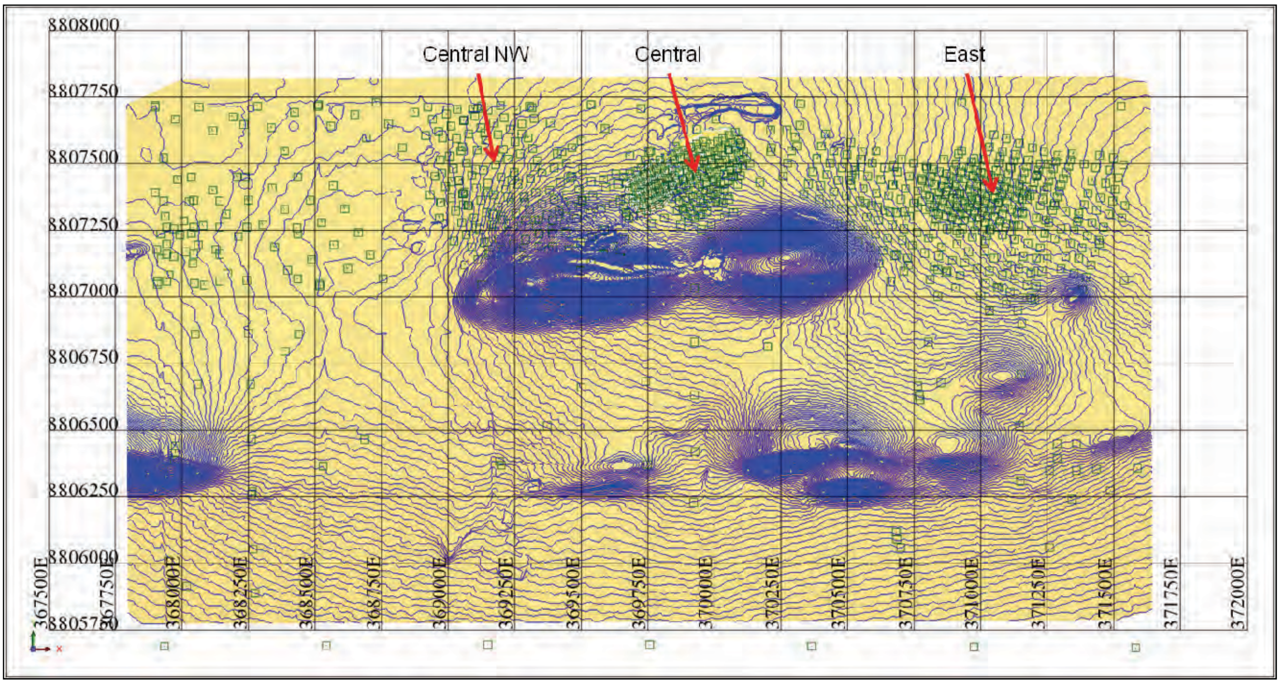

Figure 15: Drillhole distribution throughout the Mutanda concession

2.2.1.5 Condemnation and other drilling

Condemnation drilling was undertaken over the whole property on a 650-m grid and closer-spaced drilling has been completed over the plant site. On average, condemnation holes were drilled to 200m depth.

2.2.2 Geophysical Surveys

2.2.2.1 Magnetic Survey

A magnetic survey was conducted at Mutanda Mine from 25 August to 16 September 2007. The aim of this survey was to map the geological units and reveal any structural features that may be associated with, or control, the mineralisation.

The survey covered 35 lines running north south in the western parts of the concession and northeast southwest over the eastern parts. In addition six east-west tie lines were surveyed and one down the ramp of the pit. The survey lines were located on the ground using a GPS and 93 line kilometres were completed with readings taken at 10m intervals

The equipment consisted of two Envimag magnetometers manufactured by Scintrex from Canada. One magnetometer operated at a base station to monitor diurnal variations throughout each survey day and the other as a field magnetometer. The field measurements were corrected for diurnal variations using the base station data and all the data collected over three days were reduced to a single day.

Geosoft software was used to process the data and interpolated at a 35m grid cell size. A small upward continuation filter of 15m was applied to the data to suppress near surface noise such as boulders. The Magnetic data are presented as following images;

A survey conducted showed a significant magnetic high to the south of the mineralised zone but the results did not highlight any anomaly over the mineralisation, but several magnetic lineaments were visible on the magnetic image and they are interpreted as structural breaks.

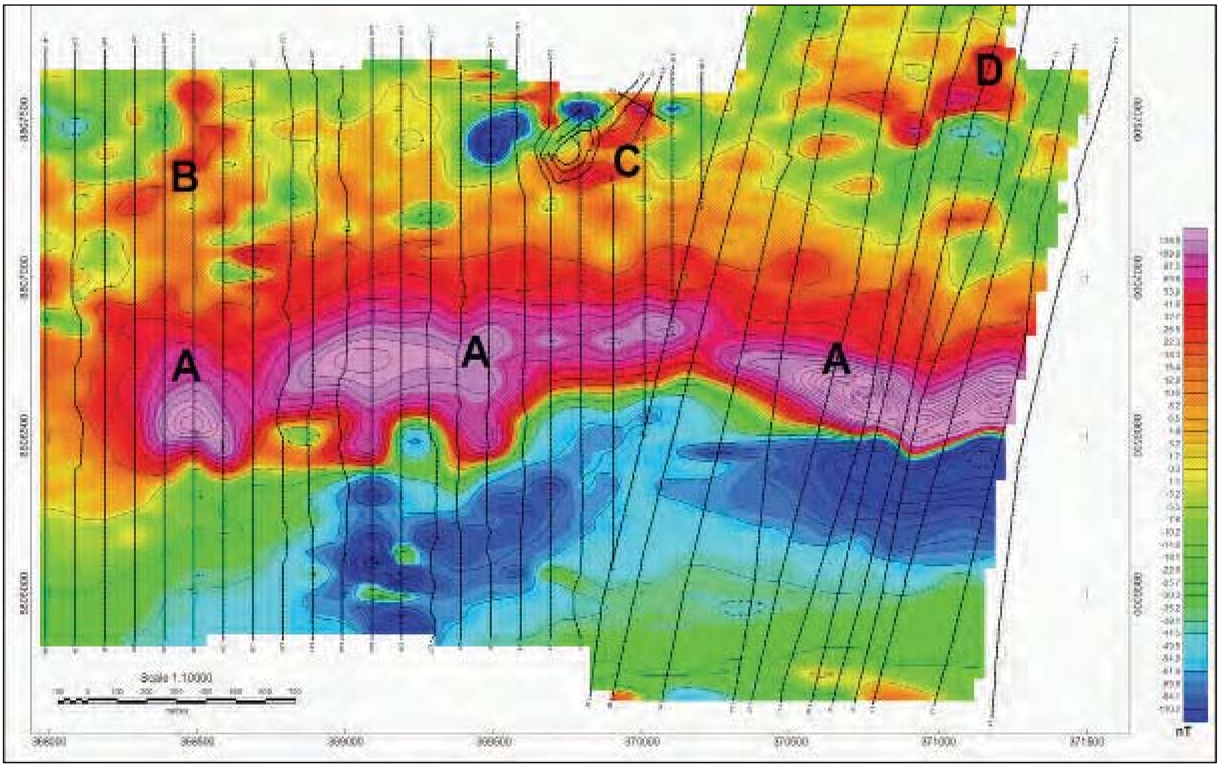

Figure 16: Total Magnetic Field Colour Contour

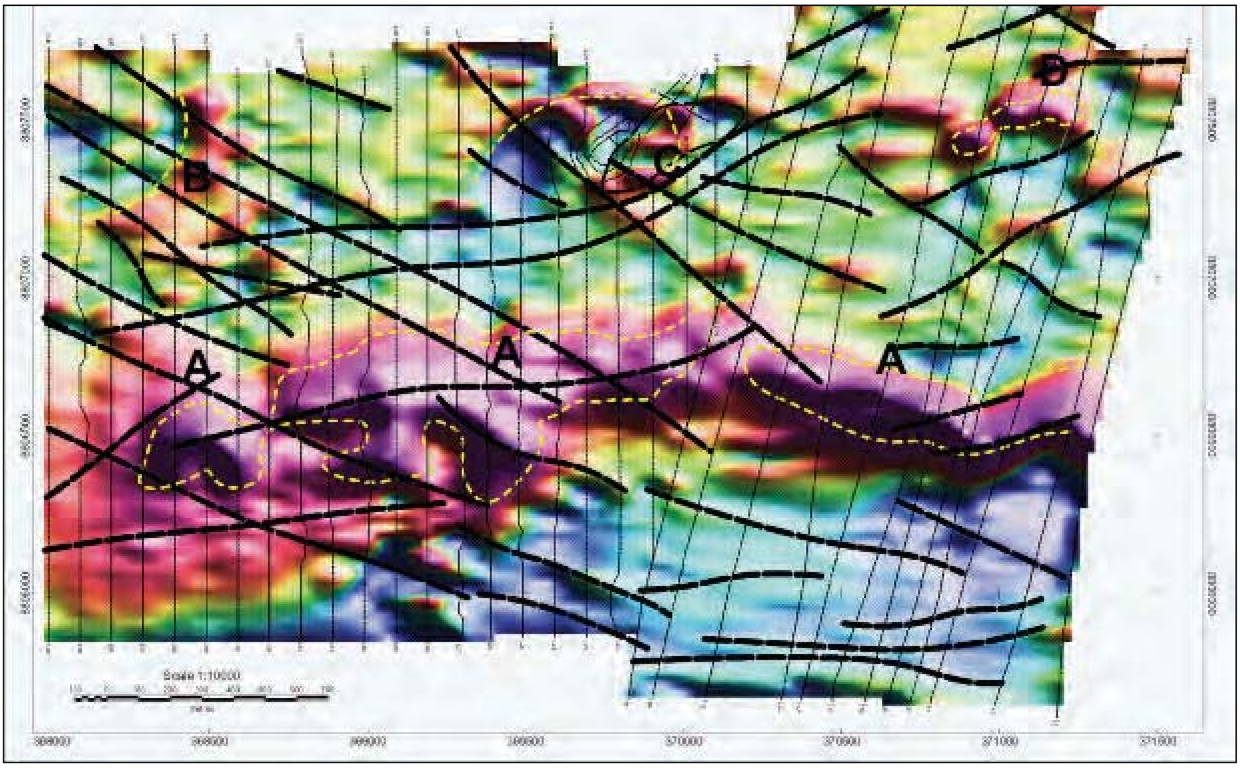

Figure 17: Pole Reduced Colour shaded with Fault Interpretation

The Total Field Colour image (Figure 18) was contoured at 20nT (or Gamma) intervals. The Pole Reduced Colour shaded images (Figure 19) give higher resolution between very close bodies and brings the causative body directly over the anomaly. They also enhance linear features such as faults, shear zones, dykes and contacts. The interpretation of the structural features is superimposed on the pole reduced colour shaded image (Figure 19).

The total field magnetic image (Figure 18) indicates a broad and highly magnetic anomaly (A) that runs east-west across the entire grid. Other magnetic highs (B, C, and D) were mapped in the northern and north-eastern parts of the grid. The geological source of these anomalies has yet to be confirmed but anomaly A indicates a lithological unit with high magnetite content.

Figure 19 shows extensive faulting interpreted from the magnetic anomalies, but there is insufficient resolution to determine displacements along these lineaments. Two major fault directions are evident: a NW-SE trend and one to the NE-SW. The former dominates the western and southern parts of the concession, whereas the latter prevails over the eastern and northern parts of the grid.

2.2.2.2 Induced Polarisation

Following the magnetic survey, a preliminary Induced Polarisation ("IP") survey was initiated to detect possible sulphide zones at depth. This was completed in November 2007 and gave encouraging results but with the onset of the rains the work was deferred to March/April 2008. The real section surveys tested different electrode separations to investigate penetration depth levels from 50m, to 500m and electrode dipole separations of 25m and 50m were used.

The initial results over a previously drilled area indicated that the sulphide zones give medium amplitude (about 10mV/V) chargeability anomalies while carbonaceous shales exhibit very strong (20mV/V) anomalies.

The readings at each station were stacked at least ten times on average to ensure high quality readings and these were used to produce the pseudo-section.

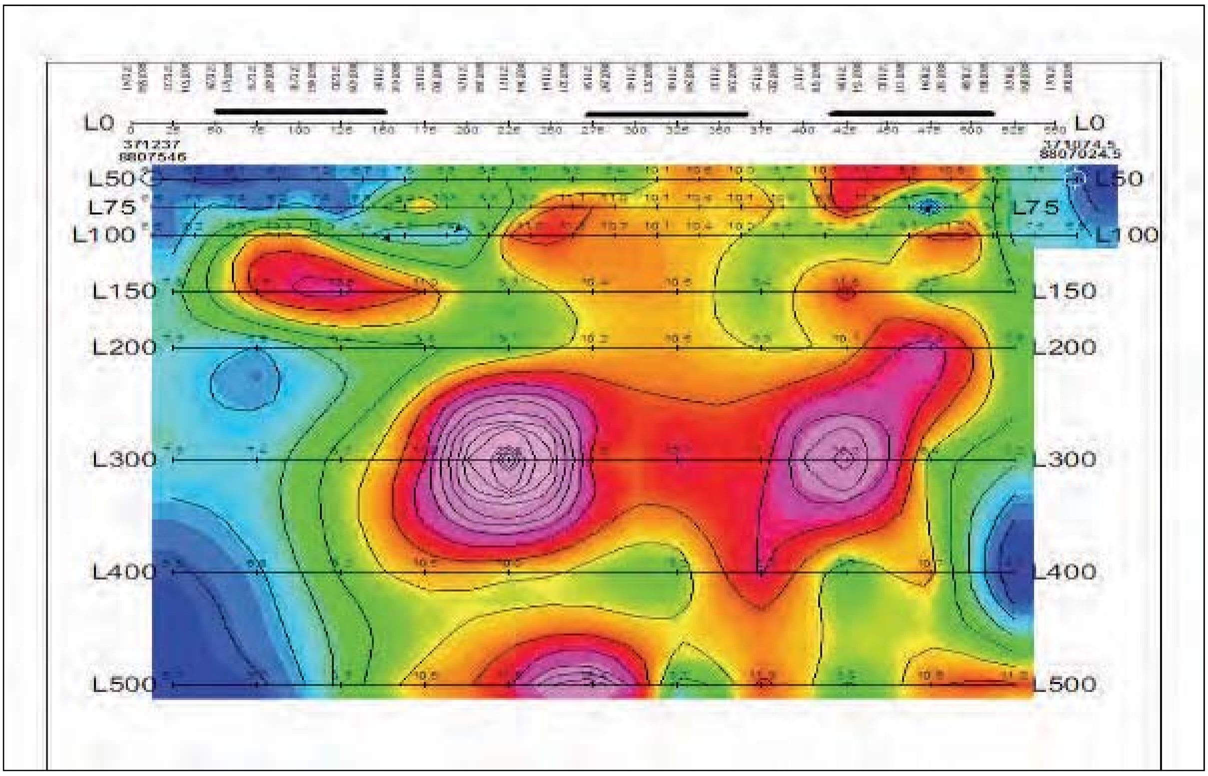

Figure 18: Real Section Chargeability of the Mutanda East Zone

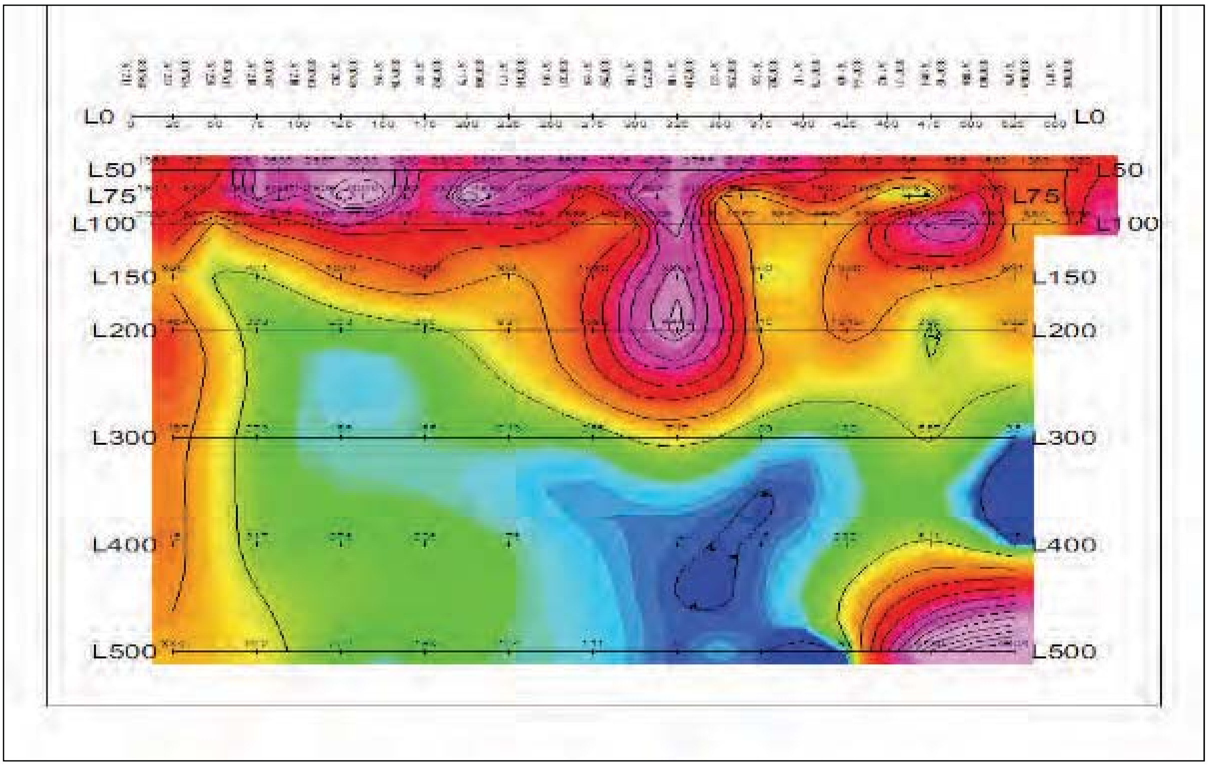

Figure 19: Real Section Resistivity Pseudosection of the Mutanda East Zone

These initial IP tests over a drilled area indicate that the method would be effective in mapping out the sulphide and shale zones, both of which contain mineralisation.

2.2.2.3 Digital Elevation Model

A Lidar airborne survey was flown by Southern Mapping in April 2007 to provide an accurate plan of the concession area with 0.5-m contours. The digital elevation model ("DTM") has been imported into MapInfo™ and Surpac™ software and now forms part of the Resource estimation database. This DTM was at a stated RMS accuracy of 0.3m and in addition ortho-rectified photographs of the whole area were also supplied by the company. The DTM has been imported into Surpac to provide the upper limits of the Resource model and also into MapInfo.

2.2.2.4 Data Collection

Survey Data

Al digital survey data on the mine has been converted to the UTM WGS84 (35 South) system. An aerial survey was performed by Southern Mapping in April 2007 using Lidar survey method was used to obtain a digital terrain model (DTM). This survey was processed to a 0.5 meter resolution. The survey in the pit has been done by using ground survey techniques and involved picking the crest and toe positions of the benches as well as using spot-height positions for pit floors.

Drillholes were surveyed using ground survey methods, and reduced to the map coordinates. There were a good correlation between the topographical survey and the drillhole collars.

Drilling Methods

A total 984 holes were drilled on the concession, of which 800 were RC and 145 DD with 38, a combination of RC and DD holes. These have all been captured in the database. The database is updated regularly and maintained on site.

Downhole Surveys

There were 94 DD holes drilled of which only the vertical MDA and DDMET sequence were not surveyed down the hole (39 holes). Of the downhole surveys, 29 were deemed to be incorrect because of large changes in the azimuth. These discrepancies were probably due to magnetic deviations down the hole, and were taken out of the calculations. The majority of these samples were in DD001-DD004, which could also be explained by calibration errors. A total of 475 downhole surveys were accepted for the 55 holes.

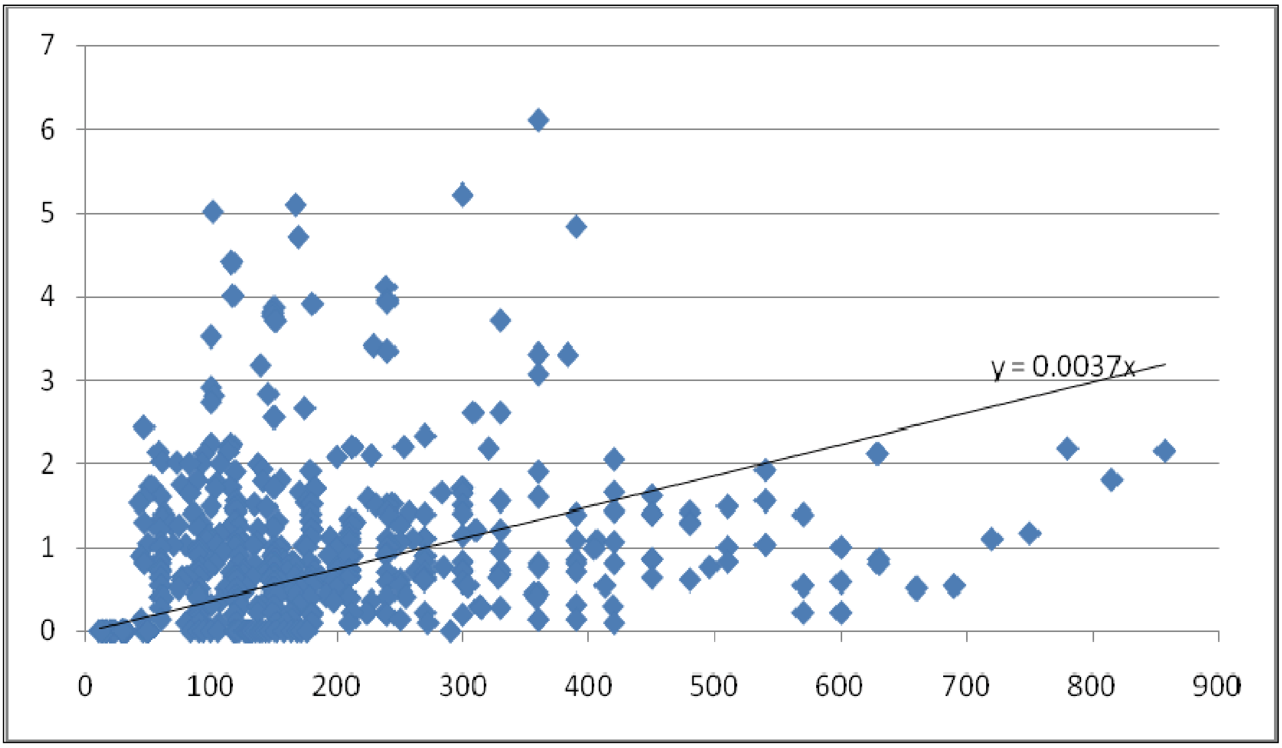

Figure 20: Total deviations measured for the 55 holes plotted vs depth

In our opinion these deviations are not excessive, and the total deviation at 900m is not expected to be more than 5m.

Drilling Procedures

The collars of the planned RC holes are plotted using Mapinfo or Surpac software and the coordinates extracted in WGS 84, UTM format for staking in the field using a combination of survey tools including a hand-held GPS, theodolite or tape measure with ranging rods. Upon completion of drilling the final collar coordinates are measured by a qualified surveyor using a total station theodolite and incorporated into the database.

Downhole surveys of the core holes are taken every 30m by the driller using a multi-shot electronic instrument and checked by the field technician while the survey is in progress, and these data are entered into the database and Surpac. Very few of the RC holes are deeper than 80m and these holes are not surveyed.

Sample Collection

RC samples are taken at one metre intervals and the hole and air hoses are blown clean and the cyclone is thumped with a hammer to minimise contamination between samples.

For the RC holes a geological technician is present at all times during drilling to ensure that the sample collection is done according to the standard procedures and that the hole number and sequential from – to values are written on each 50-litre sample bag and recorded on a standard sheet.

After completing a hole, samples are transferred by truck to a central preparation/logging facility at Mutanda.

Logging Procedures

The RC drill holes are logged using washed chips stored in the chip trays. During logging the chips are assigned to a specific stratigraphic unit and where possible any marker beds like the haematite layer or carbonaceous shale are logged. The oxide, sulphide and mixed zones are also logged. All the logs are captured into a central database using Geolog and more recently, Sable software. After logging is completed identification labels are placed in the chip trays at appropriate metre intervals corresponding to the logging data which are captured and imported into Sable software.

Core logs are recorded on a standard log sheet using standard lithological and stratigraphic codes which include structure, alteration, mineralisation and sample allocation against the drilled interval. In addition the core recoveries and RQD indices are recorded on a separate sheet. These logs are typed into Excel for export into Sable software and filed.

Sampling and Sample Storage Procedures

At the logging/preparation facility the RC sample receipts are recorded along with the mass of each bag.

The samples are riffle split into 300-g and 5-kg sub-samples, with the former sent for assay and the larger reference split retained in covered storage yards at Kolwezi and on site. The bags for the sample splits are numbered on the bag and those sent to the laboratory include a ticket inserted into the bag and one stapled to the bag using pre-numbered commercial ticket books. These numbers are recorded on a standard sheet showing hole number, drill interval and sample number. A portion of each sample is washed and the chips are placed in numbered plastic chip trays for logging and storage.

Core is taken from the field and transported on trucks to the sampling facility, where it is logged and photographed.

The core is halved longitudinally using a diamond blade saw following the sample marks on the core made by the geologist. One half is tagged, bagged and shipped for analyses by Mintek in South Africa and the remaining half of the core is returned to the core tray and stored.

Core samples are normally taken at metre intervals except where narrower intervals are dictated by the geology; samples are not taken across geological contacts.

The retained split core is stored in the covered shed in well marked core boxes indicating the hole number, box number as well as the metre marks, written on the core blocks. The core trays are placed on storage racks.

As part of the SRK QA/QC checks a random selection of sample numbers in the database were tracked back to the sample ticket books and the assay results. A few discrepancies were detected in the recent batches of samples sent to Zambia and these were corrected. None were detected in the samples sent to the Bazano laboratory.

Assay Procedures

The 300g samples are tagged and bagged before being sent to the laboratory at Bazano offices in Kolwezi where it is dried and pulverised before a 2-g aliquot is dissolved and analysed, using an Atomic Absorption Spectrometer (AAS).

Density

Density measurements were made on 399 samples of solid fresh core at Mutanda using a water displacement method and a commercial density balance. Three of these were anomalously high and removed from the database. The remainder had an average density of 2.75 t/m^3 with a standard deviation of 0.23. Forty-seven samples were above 3.0t/m^3 but these are considered to be realistic as checks showed that they are all well mineralised with malachite or heterogenite or both. However, this applies to the fresher parts of the ore zone.

A few density measurements were done by Mintek in Johannesburg as part of the ongoing metallurgical tests and by CSIR in Pretoria for the geotechnical assessment. These two laboratories record widely discrepant results and 2.5 t/m^3, the lower of these average values (CSIR), has also been considered to obtain an average value for the Resource mass estimation.

It proved to be difficult to determine the density of the near surface material given the friable nature of this material and the poor recoveries of solid core. In addition most of the samples were taken using an RC rig.

To address this gap in the database holes were dug in the floors of the existing pits and all material removed and placed in a sample bag with the recovered material dried and weighed to obtain the mass. The volume was measured by lining the hole with a thin sheet of plastic which was filled from a graduated bottle of water. The average density for 65 samples was 1.43 t/m^3 with a range from 1.83 to 1.00 t/m^3. This result is very similar to the reference density for unconsolidated silt provided by the AusIMM's Field Geologists Manual and therefore the results obtained appear to be low. The bulk of the samples were from the unmineralized R3 stratigraphic unit and samples with high heterogenite and malachite contents will be higher and perhaps around 1.6 t/m^3 to 1.7 t/m^3. Compounding the problem of assigning an accurate density is the unknown proportions of hard and soft rock.

Therefore SRK have assigned what they consider to be a reasonable weighted average density between 1.43 t/m^3 and 2.75 t/m^3, associated with unmineralised soft rock and hard rock respectively. Therefore an average of 2.25 t/m^3 is considered acceptable and comparable to other deposits in the DRC.

Data recording

All field data apart from survey measurements are recorded on paper and transferred to computer spreadsheets. This includes all drill holes with from-to intervals, lithological and stratigraphic logs, and sampled intervals against sample numbers. These are matched to electronic assay data when results are received and blank and repeat results are extracted to a separate file for assessment and the sample results are also kept separately for export into Surpac software.

In the early days of the program, laboratory results were received on hard copy and inputted manually into the computer. From the start Geolog software was used to store the main database and more recently the Sable package has been used. The latter has recently been commissioned, (January 2008) and is being modified to allow the software to extract QA/QC data into easily accessible files and to undertake the routine QA/QC checks which were previously done on spreadsheets.

2.3 Quality Assurance/Quality Control ("QA/QC") Practices

A QA/QC programme was initiated from the start of the RC drilling programme and for all DD holes drilled by Mutanda. While this mainly applied to the analytical results, systems were also set up to record the normal checks on field data such as weighing the RC drill chips over each sampled interval and recording core loss and marking these intervals in the core trays.

The weight of RC samples and DD core loss is very variable. The general ground conditions at Mutanda are reasonable but the mineralised zones are generally highly weathered, in places to a considerable depth, and fractured and brecciated portions exacerbated the problem of sample recovery. This is particularly true in some of the high cobalt zones where the heterogenite occurs as an earthy wad which produces very low sample returns from the RC drilling and is washed out of the hole during core drilling. The average recoveries of all holes to an 80m drilled depth are 68.6% for the RC and 63.5% for the DD holes. For the twinned holes shown in Table 3 the average recoveries were 41% for the RC and 57% for the DD holes to 40m, and 68% (RC) and 70% (DD) for the 40 to 80m intervals. Therefore sample integrity in some areas is poor, but given the ground conditions this is considered to be unavoidable.

In order to minimise contamination between RC samples the hole was thoroughly blown out and the collection cyclone beaten with a hammer to remove any caked material. All samples were transferred to a splitting shed were they were split through an appropriately sized riffle to produce approximately a 3kg aliquot sent for analysis. The riffles were cleaned with a paint brush between each split.

The bulk of the samples have been analysed at the Bazano laboratory in Kolwezi, which is not an accredited facility. However blanks were inserted into the sample stream after every seventh sample and a drill chip repeat after every twentieth sample.

Finding suitable blank material proved to be a challenge: the river sand initially used was found to be contaminated and barren drill chips obtained from condemnation holes also contained random non-zero values. Almost invariably the sporadic high blank values followed a lower grade sample suggesting that contamination was not causing the problem and the analyses were initially accurate. Eventually barren cement was inserted and when this material returned unacceptably high values the laboratory was suspected to be giving spurious results.

Similarly with the repeat samples there was initially very good correlation between the two sets of values with a coefficient of 98% for Cu and 99% for Co, Half Absolute Relative Difference ("HARD") values of 0.1% and 1.6% on the averages, acceptable bias for Cu at 98% and no bias for Co, and a tight spread of values around the regression line (Pearson's Correlation Coefficient Cu 97% and Co 98%). As much as anything these repeats are a measure of the quality of the splitting and sample homogeneity. As the programme progressed, the correlations between the repeats deteriorated slightly and although the averages between two sample sets were acceptable, the problem with the blanks remained. Part of this stemmed from sample overload at the laboratory but in addition to that the AAS machine developed a slow drift which was not detected by the laboratory's internal quality control systems, but was reported to them by the project geologist.

In March 2007 a set of 132 samples of milled pulp rejects from the Bazano laboratory were sent to SGS Lakefield in Johannesburg for umpire assays. These RC samples were obtained over the December 2006 period. There were large discrepancies with 12 samples, considered to be due to incorrect sample numbers and these were removed from this database. Scatter plots of the remaining 120 samples showed a bias of 5% for Cu and 14% for Co. In both instances the Bazano laboratory reported higher results.

A second set of 421 samples were sent to SGS Lakefield in Johannesburg and these showed biases of 5% and 11% but with SGS now reporting higher results. The averages of the samples were almost identical (Cu 2.97% Bazano and 3.01% SGS, Co 1.14% Bazano and 1.22% SGS) with correlation coefficients of 99% and 100% for Cu and Co respectively.

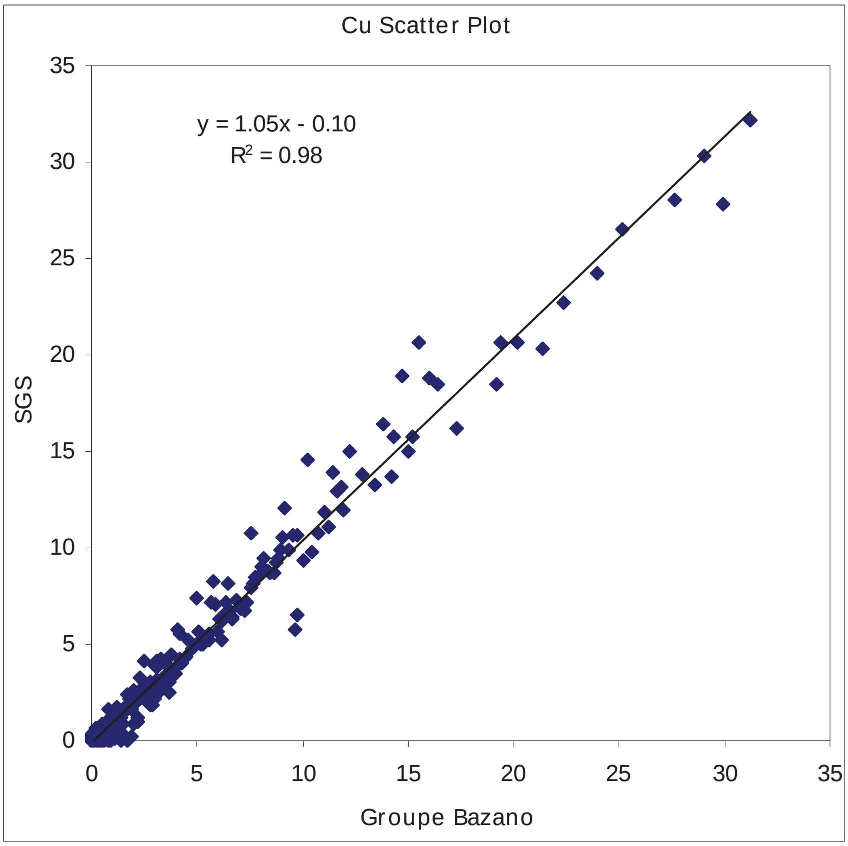

Figure 21: Depicts Copper Scatter Plot SGS vs. Groupe Bazano

These umpire samples covered all of the Central Zone drilling and most of the East Zone.

In both sets there were widely discrepant results (overall 4% of samples) which indicate transposition of sample numbers and these were removed from the comparative database. Similar problems have been experienced throughout the program and these can be detected where blanks report very high values and adjacent samples have near-zero values within a robust mineralised interval. Elsewhere they are difficult to detect but transposition of samples within a mineralised interval will not affect the grade averages. Where they may have an effect is on samples marginal to the mineralised zone. Given that over 40,000 samples have been analysed some errors of this nature are bound to occur.

In late 2007 an independent audit of the Bazano laboratory highlighted some problems associated with the laboratory and in particular a malfunctioning AAS which caused the instrument to lose sensitivity over a period of time. Accuracy was affected, particularly at lower concentrations and this was the most likely reason for the poor returns on the blanks and also the wide scatter of the correlation between repeat samples in the latter part of 2007.

In January 2008 an exercise to check the assays was initiated using the SGS laboratory in Kalalushi, Zambia for over 4500 results. These indicated that at lower grades (less than 1%) the Bazano laboratory is generally reporting higher results whereas at higher grades (plus 1%) the same laboratory reported lower values. The averages for the two laboratories for all values are almost the same with SGS at 1.85% Cu vs. 1.81%Cu for Bazano. The Co results showed a far greater discrepancy with 0.63% and 0.91% for SGS and Bazano respectively. In both cases the scatter plots showed very low regression slopes around 0.49 and low Pearson's correlation coefficients (R2) of 0.43 indicating a wide spread of values around the regression line. Inspection of these plots shows an unacceptable large number of values stretching along the SGS axis with high SGS results matched by very low Bazano equivalents. A smaller number of comparative values also lie along the Bazano axis. Between these spurious results there is a clearly discernable trend suggesting that a majority of the values show a reasonable comparison with far less bias. There are a number of reasons for these discrepancies and whilst sample number transposition has undoubtedly occurred, there were also problems with the AAS instruments. The most obvious clue to the inadequate laboratory performance was the high average value of the blanks submitted. It was for these reasons that a large number of samples were sent to the SGS umpire laboratory in Zambia.

Of the 4500 samples sent to SGS Zambia, a selection of 320 milled pulp duplicates were sent to the Alfred Knight laboratory in Zambia for re-assay. These umpire repeats showed a high degree of precision with a very acceptable average comparison of 8.15% Cu for Alfred Knight vs. 7.95% for SGS and a regression slope of 1.00 but with a slightly low Pearson's R2 value of 0.93. Similar results were obtained for Co with 1.30% and 1.31% for Alfred Knight and SGS respectively. The bias between the two sets of results at 0.97 was lower than for Cu but still very acceptable, although the R2 value, also at 0.97 was higher.

A decision was made on the phase 2 drilling from 2008 that all samples would be sent to SGS in Kalalushi (Zambia) for assay. The last of these samples was received back in late November 2010. There are currently no more assays outstanding from the exploration programme. Check samples were sent to Alfred Knight (Zambia).

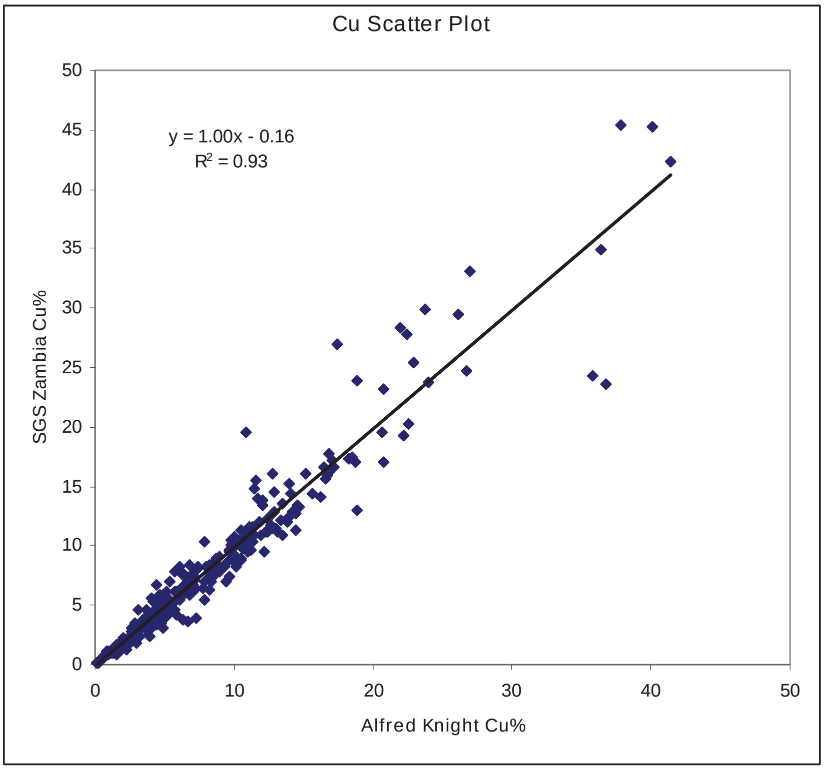

Figure 22: Depicts Copper Scatter Plot SGS vs. Alfred Knight

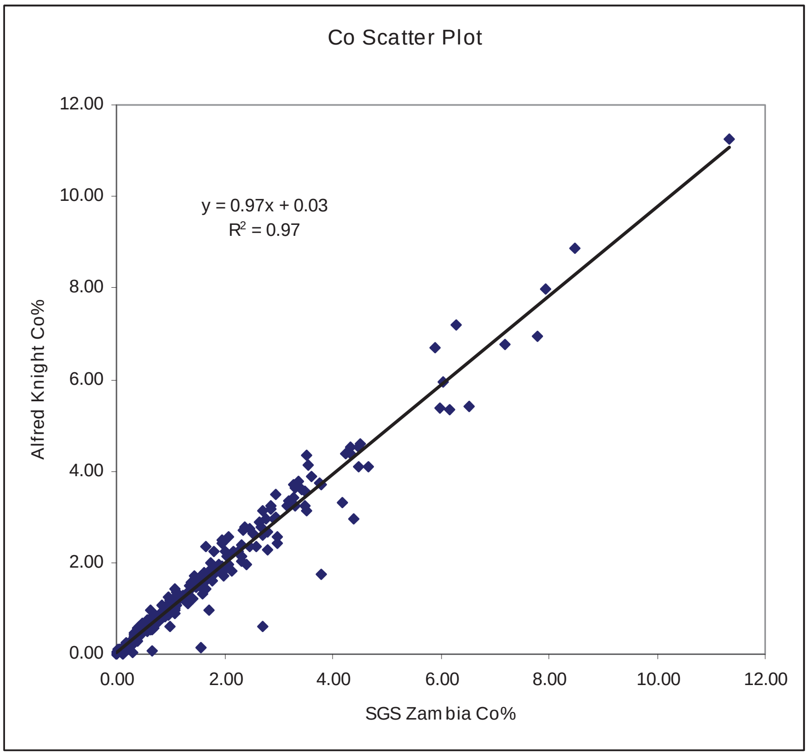

Figure 23: Depict Cobalt Scatter Plot SGS vs. Alfred Knight

The analyses accepted into the Resource database have given priority to SGS and where these were unavailable, to the Groupe Bazano results.

An inspection of the transverse sections plotted for stratigraphic unit and sample grade show few discrepancies and the integrity of the outline of the mineralised zones appears to be sound.

Although not perfect, the results from the Bazano analyses, where these have been used, are of sufficient quality to support the Resource estimates contained in this study and SRK do not believe that the overall integrity of the Resource is in doubt. This conclusion is further supported by the good correlation between the Bazano RC and Mintek DD results. GAA agrees with the methodology employed by SRK.

2.3.1 Variographic Analysis

2.3.1.1 Variography Results

The results for the variography to be used in the estimation are shown Table 5, and were derived from the statistical and geo-statistical study completed.

Table 5: Estimation Parameters used during estimation

Area	ME				MC				CNW	
Cut-off	0.4%cutoff		1.0% cutoff		0.4%cutoff		1.0% cutoff		0.5% cutoff	
Variable	%TCu	%TCo	%TCu	%TCo	%TCu	%TCo	%TCu	%TCo	%TCu	%TCo
Search Type	Ellipsoid									
Min Samples In Block Estimation	5	5	5	5	5	5	5	5	4	4
Max Samples In Block Estimation	15	15	15	15	15	15	15	15	15	15
Maximum Search Distance For Block Estimate XYZ	91.727	114.693	77.559	48.842	158.236	108.051	67.265	169.552	66	66
Bearing For Major Axis	0	0	25	25	0	0	330	330	160	160
Plunge For Major Axis	0	0	20	20	0	0	20	20	0	0
Dip For Major Axis	0	0	25	25	0	0	0	0	60	60
Anisotropy: Semi Major / Major	1	1	1.5	1	1	1	1.5	1.5	1.5	1.5
Anisotropy: Semi Major / Major	1	1	3	1	1	1	3	3	3	3
Max number samples per drillhole	5	5	5	5	5	5	5	5	5	5
Interpolation Method	Ordinary Kriging									
Discritisation: Y	2	2	2	2	2	2	2	2	4	4
Discritisation: X	2	2	2	2	2	2	2	2	4	4
Discritisation: Z	1	1	1	1	1	1	1	1	4	4
Number of Structures	2	2	2	2	2	2	2	2	2	2
Nugget - C0	0.20536	0.17102	2.073121	0.83982	0.100827	0.227825	3.073465	0.75592	4.2	1.1
Sill - C1	0.215551	0.240437	14.01513	1.154885	0.144164	0.421375	9.489304	1.331542	13	1.27
Range - R1	10.75	48.571	18.519	9.111	6.318	60.041	11.671	34.869	25	18
Bearing :	0	0	25	25	25	0	330	330	160	160

Area	ME				MC				CNW	
Cut-off	0.4%cutoff		1.0% cutoff		0.4%cutoff		1.0% cutoff		0.5% cutoff	
Variable	%TCu	%TCo	%TCu	%TCo	%TCu	%TCo	%TCu	%TCo	%TCu	%TCo
Structure 1										
Plunge : Structure 1	0	0	20	20	20	0	20	20	0	0
Dip : Structure 1	0	0	-25	-25	-25	0	0	0	60	60
Anisotropy: Semi Major / Major 1	1	1	1.5	1	1	1	1.5	1.5	1.5	1.5
Anisotropy: Semi Major / Major 1	1	1	3	1	1	1	3	3	3	3
Sill - C2	0.229818	0.226342	4.167792	1.450856	0.1029	0.241535	2.110826	1.742701	2.3	1.95
Range - R2	91.727	114.693	77.559	48.842	158.236	108.051	67.265	169.552	100	85
Bearing : Structure 2	0	0	25	25	25	0	330	330	160	160
Plunge : Structure 2	0	0	20	20	20	0	20	20	0	0
Dip : Structure 2	0	0	-25	-25	-25	0	0	0	60	60
Anisotropy: Semi Major / Major 2	1	1	1.5	1	1	1	1.5	1.5	1.5	1.5
Anisotropy: Semi Major / Major 2	1	1	3	1	1	1	3	3	3	3
Pass 2 : Factor	91.727	114.693	77.559	48.842	158.236	108.051	67.265	169.552	100	85
Pass 3 : Factor	137.5905	172.0395	116.3385	73.263	237.354	162.0765	100.8975	254.328	200	150
Pass 4 : Factor	183.454	229.386	155.118	97.684	316.472	216.102	134.53	339.104	300	200
Pass 5: Factor	229.3175	286.7325	193.8975	122.105	395.59	270.1275	168.1625	423.88	500	500

2.3.2 Estimation Parameters

2.3.2.1 Estimation Plan

The resources for three orebodies modelled, East ("ME"), Central ("MC") and Central Northwest ("CNW"), were estimated using Ordinary Kriging as estimation method. The estimation parameters used for the estimations, as shown in Table 5, were derived from the statistical and geo-statistical study completed. Block sizes used for the block modelling in all cases were:

- Parent block of 40m x 40m x 10m in the X, Y and Z directions respectively; and
- Sub-block of 5m x 5m x 2.5m

2.4 Mineral Resource Classification

The Australian Code for reporting of Exploration Results, Mineral Resources and Ore Reserves, more commonly known as the JORC Code was used for Mineral Resource Classification. It describes a Mineral Resource as follows:

"A 'Mineral Resource' is a concentration or occurrence of material of intrinsic economic interest in or on the Earth's crust in such form, quality and quantity that there are reasonable prospects for eventual economic extraction. The location, quantity, grade, geological characteristics and continuity of a Mineral Resource are known, estimated or interpreted from specific geological evidence and knowledge. Mineral Resources are subdivided, in order of increasing confidence, into Inferred, Indicated or Measured categories."

It further describes an Inferred, Indicated and Measured Resource as follows:

"*An 'Inferred Mineral Resource' is that part of a Mineral Resource for which tonnage, grade and mineral content can be estimated with only a low level of confidence. It is inferred from geological evidence and assumed but not verified geologically and/or grade continuity. It is based on information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes which may be limited or of uncertain quality and reliability."*

"An 'Indicated Mineral Resource' is that part of a Mineral Resource for which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a reasonable level of confidence. It is based on exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes. The locations are too widely or inappropriately spaced to confirm geological and/or grade continuity but are spaced closely enough for continuity to be assumed."

A 'Measured Mineral Resource' is that part of a Mineral Resource for which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a high level of confidence. It is based on detailed and reliable exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes. The locations are spaced closely enough to confirm geological and grade continuity."

2.5 Mineral Resource Statement

The results from the JORC Compliant resource estimation is summarised in Table 6. For the two operating pits, ME and MC, the surveyed compilation plan per pit layout as at 31 October 2010, as received from Mutanda, were used to deplete the resources of the areas.

Table 6: Consolidated Resource Statement of Mutanda as at 31 December 2010

Consolidated Resource Statement of Mutanda Mine as at 31 December 2010				
Central Orebody	Category	Mt	%TCu	%TCo
	Measured	7.8	1.62	0.81
	Indicated	5.3	1.16	0.67
	Inferred	7.6	0.95	0.91
	Total	20.7	1.28	0.81
East Orebody	Category	Mt	%TCu	%TCo
	Measured	29.0	2.67	1.13
	Indicated	18.4	1.65	0.87
	Inferred	164.6	1.03	0.45
	Total	212.0	1.34	0.60
Central Northwest Orebody	Category	Mt	%TCu	%TCo
	Measured	66.8	2.10	0.55
	Indicated	0.02	0.17	0.05
	Inferred			
	Total	66.8	2.10	0.55
MUMI Total	Category	Mt	%TCu	%TCo
	Measured	103.7	2.22	0.73
	Indicated	23.8	1.54	0.82
	Inferred	172.1	1.03	0.47
	Total	299.5	1.48	0.59

1) Mineral Resources have been reported in accordance with the classification criteria of the Australian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves, 2004 Edition (The JORC Code).

2) Mineral Resources are inclusive of Ore Reserves.

3) Mineral Resources are not Ore Reserves and do not have demonstrated economic viability.

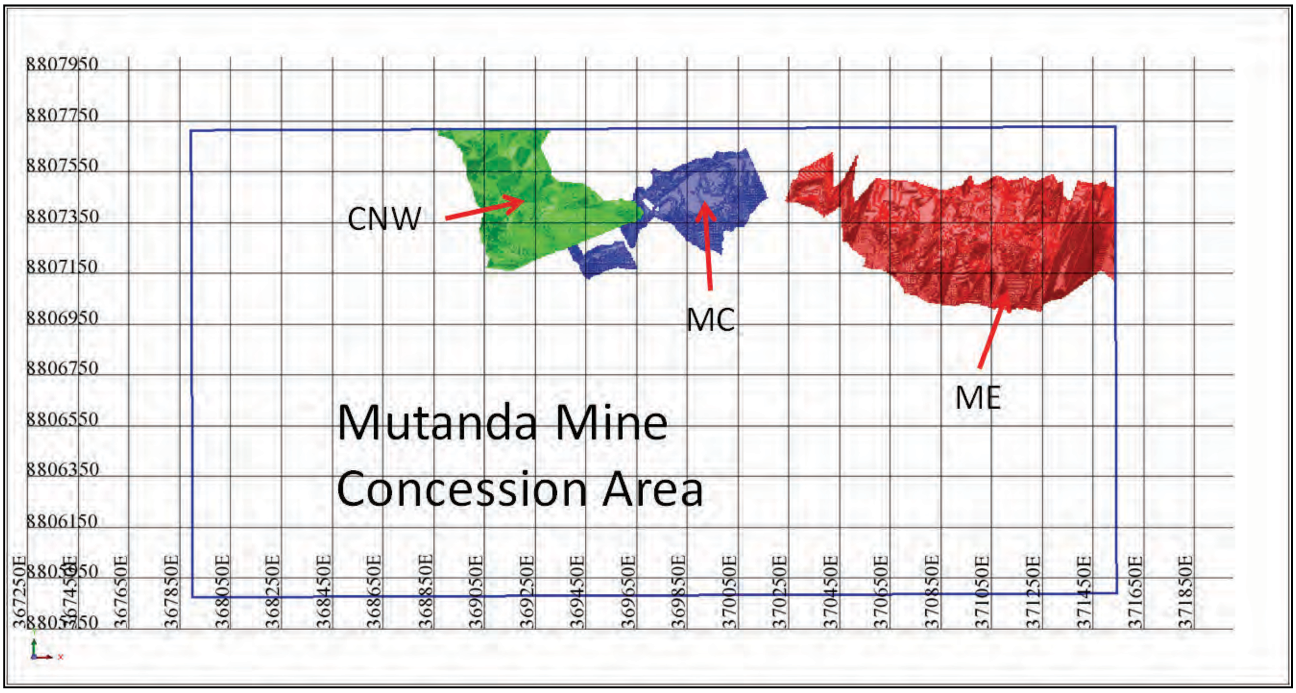

Figure 24: Long Term Prospects at Mutanda

2.5.1 Long term prospects

The long term prospects on the Mutanda concession lies to the south of the East orebody where drill holes finished within the orebody at depth. Significant underground sulphide potential exists and in fact forms a large percentage of the Mutanda concession ore resource.

3.0 RESERVES AND MINING

3.1 Surface Mining

3.1.1 Life of Mine ("LOM") Planning Process

The LOM planning process for surface mining operations can be summarised in the following steps:

- selective mining unit ("SMU") selection;
- pit optimisation;
- pit design;
- scheduling unit selection and design; and
- production planning.

The pits considered for the LOM Plan are Mutanda East, Mutanda Central and Central North-West of which the latter is not currently active.

3.1.1.1 SMU Model / Mining Model

The SMU is defined as the smallest mining unit that can be mined as a complete unit. The outcome of the SMU selection aims to determine an appropriate SMU enabling an informed decision on a modelling strategy that most realistically estimates actual practice and lower the overall mining risk.

Factors considered in determining a realistic SMU includes:

- mining equipment;
- structural complexity of the ore body in terms of dip, thickness and structural continuity;
- ore block continuity and the way it was modelled;
- mining rate;
- degree of continuity above the cut-off grade; and
- mining strategy consisting of blending (in-pit blending versus stockpile blending) and volume requirements.

This process usually includes resource block model re-blocking of a number of scenarios. It is important to note that the SMU can vary per pit at a single operation, based on the defined SMU drivers. Although the purpose of the SMU is not to determine dilutions and losses, it does support the appropriate modelling of dilutions and losses, based on the dips and structure of the ore. Outcomes of the SMU selection process should include:

- SMU models and cut-off grade strategy;
- initial indication on mining losses and dilutions; and
- scheduling and blending approach.

SMU's applied to the various resource block models are tabled below.

Table 7: Selected SMU dimensions

Mining Operation	Unit	SMU
Mutanda Mine	m	10 x 10 x 5

Dilution

Dilution is defined as the waste material intentionally added during the mining process. The site-specific dilutions are added to the Mineral Resources, defining a practically mineable unit. The methodology applied in determining the dilution is as follows:

- On the ore contacts (where the resource block consists of a percentage ore material and a percentage waste material) the tonnage and grade of the reserve block is defined as the weighted average tonnage and grade of the materials contained in the original resource block.
- In cases where the total resource block is ore, the corresponding reserve block is defined as a 100% ROM block with the same grade attributes as the blocks.

Mining loss

Mining loss is defined as those reported mineral resources which are contained in planned blocks that are not defined as Ore Reserve type blocks, in other words if scheduled these blocks are destined for waste dumps.

The methodology used in determining mining loss is as follows:

- Mining loss is addressed through the application of a Cu cut-off to the diluted ore material; and
- The ore blocks that originally had a high percentage of ore will normally fall above the cut-off grade, while ore blocks that originally had a low percentage of ore will fall below the cut-off.

Dilution and mining loss curves on a diluted SMU cut-off grade basis were produced for each of the pits and detailed later in this report.

3.1.1.2 Pit optimisation

One of the outputs of the pit optimisation process is to determine the position and extent of the final pit boundary. The GEMCOM Whittle pit optimisation software is employed for this purpose. For brevity the software will be referred to as “Whittle”.

Whittle uses the Lerchs-Grossmann algorithm to determine the optimal shape for an open pit in three dimensions. The method is applied to a block model of the ore body, and progressively constructs lists of related blocks that should, or should not, be mined. The final lists define a pit outline that has the highest total relative value, subject to the required pit slopes. This outline includes every block that "adds value" when waste stripping is taken into account and excludes every block that "destroys value". It takes into account all revenues and costs as well as mining and processing parameters.

Although a detailed description of the Whittle methodology is beyond the scope of this report, the following provides a brief summary. The optimisation process can be divided into two processes:

- Creation of a range of nested pit shells of increasing sizes. This is done by varying the product price and generating a pit shell at each price point.
- Selection of the optimal pit shell. This is achieved by generating various production schedules for each pit shell and calculating the net present value for each schedule. The output of this process is a series of “pit-versus-value” curves.

Three pit-versus-value curves are generated:

- Best case: corresponds to minimum stripping in which mining follows the sequence of nested pit shells. Although this method will give you the highest net present value, it is not practical. It serves to provide the upper limit with regards to pit size.
- Worst case: waste material is removed level for level corresponding to the maximum stripping scenario and therefore lowest relative value. It serves to provide the lower limit with regards to pit size.
- Specified case: a case between the best and worst cases and models the influence of pre-stripping on the value curve.

The optimum specified Whittle shell is identified where the specified case is maximised. A simplified illustration of the definitions can be seen below.

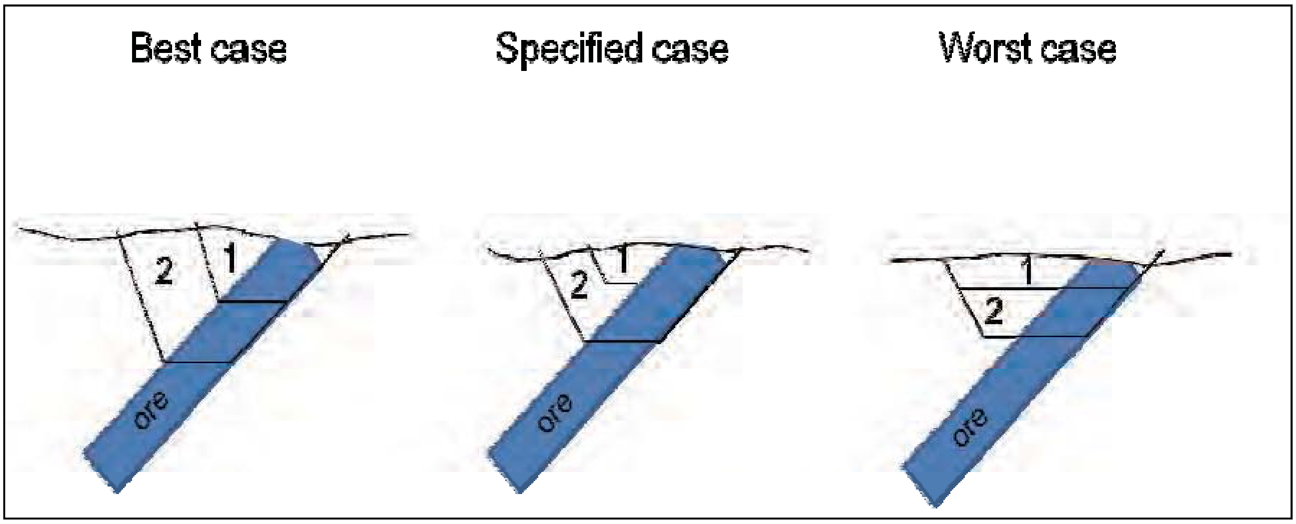

Figure 25: Best case, specified case and worst case illustration

Processing recoveries to determine the revenues required during the optimisation process, are tabulated below. These are based on the designed and planned recoveries of the phased processing plant currently being built.

Table 8: Processing recoveries

Processing Recovery	Cu	Co
Oxides	90%	80%
Mixed (70% oxide portion)	90%	80%
Mixed (30% Sulphide portion)	Not processed	Not processed
Sulphides	Not processed	Not processed

3.1.1.3 Pit Design

The mining method applied is conventional open pit mining, consisting of drilling, blasting, loading and hauling. All historic mining is currently being done by a mining contractor. All future mining is planned based on contractor mining.

A pit design is undertaken once an optimal pit shell has been selected. The pit design process considers:

- safe operations;
- continuous access to individual blocks and the working benches;
- equipment units and movement requirements;
- geotechnical recommendations;
- water handling;
- backfill opportunities; and
- the phasing of operations or pre-stripping.

Design work was performed in GEMCOM Surpac mine planning software. The selected optimum pit shell is used as the design limits. All the input parameters are incorporated to create a three dimensional pit design. The pit design is used to evaluate the tonnage and grades of the different ore types.

Pit designs were created based on the current mining methodology that includes mining at 5m or 10m benches. Ramp and pit access designs considered the largest envisaged hauler dimension specifications ensuring safe and practical execution. Pit designs were conducted based on the optimum pit shell. All pit designs adhere to current geotechnical requirements.

3.1.1.4 Scheduling units

Block designs are conducted based on typical blast block or practical bench and production block dimensions. Ramps are designed and scheduled separately at appropriate rates. The block designs simulate the scheduling units. Each block could contain a range of material types that could be selectively loaded to separate locations (ROM stockpile, various stockpiles or waste dumps etc.). The figure below is a representation of a typical block design with ramps indicated in blue.

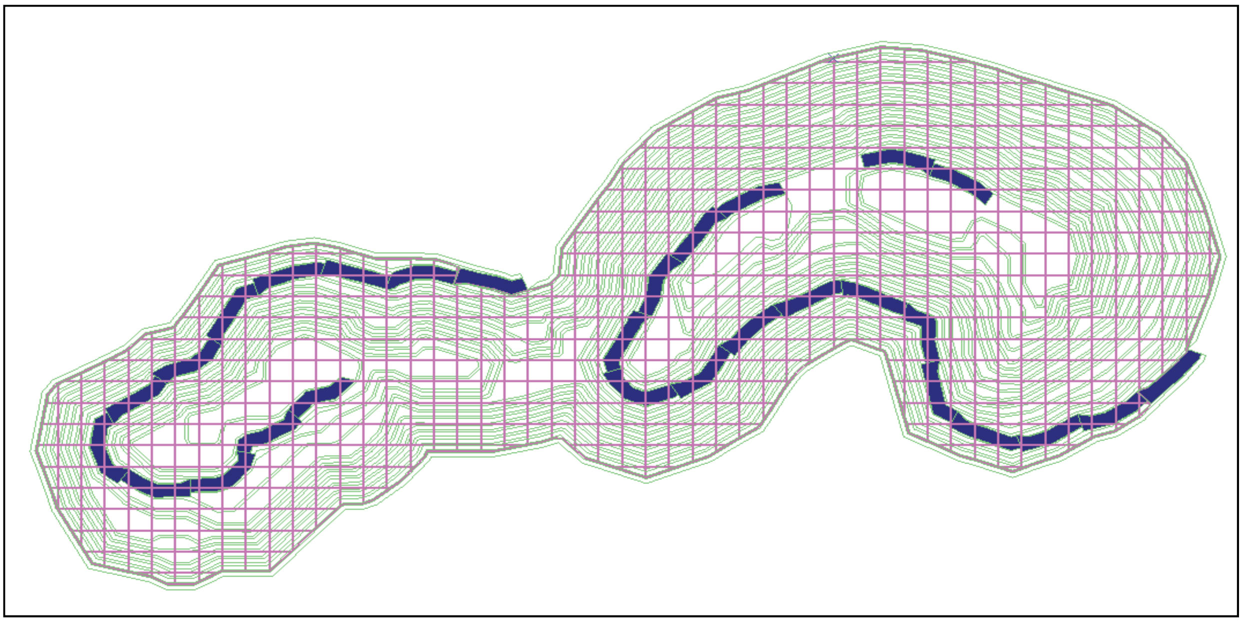

Figure 26: Typical block and ramp design

3.1.1.5 Production Scheduling

Schedules were produced in RUNGE Xpac. Operating slope angles for each pit are maintained and increased when the ultimate pit is reached. Schedules consider the available pit space, number and size of excavators required and the practical constraints of each pit.

3.1.2 Stockpiles

A range of stockpiles have been constructed from January 2009 to December 2010 in preparation for the commissioning of the process plant. These stockpiles are classified into low grade stockpiles with an average copper grade of less than 1 %Cu, high grade stockpiles of ore above the cut-off grade and high copper stockpiles that is a result of stringent in-pit grade control practices applied by Mutanda.

3.1.2.1 High Grade Stockpile

The “R5” high grade stockpile has been incorporated into the LOM Plan and Reserve statement. Volumes were determined from supplied survey digital terrain model (“DTM”). The survey DTM was verified against recent local aerial surveys to confirm the location thereof. A drilling programme of the stockpile was undertaken by Mutanda to confirm the average grades. Samples were taken in 2.5m intervals up to the final stockpile height at the point. Drill hole collar elevation were checked spatially relative to the survey DTM for a reasonable match. The figure below shows the drill hole collar match of the "R5" high grade stockpile (in purple) relative to the aerial survey DTM.

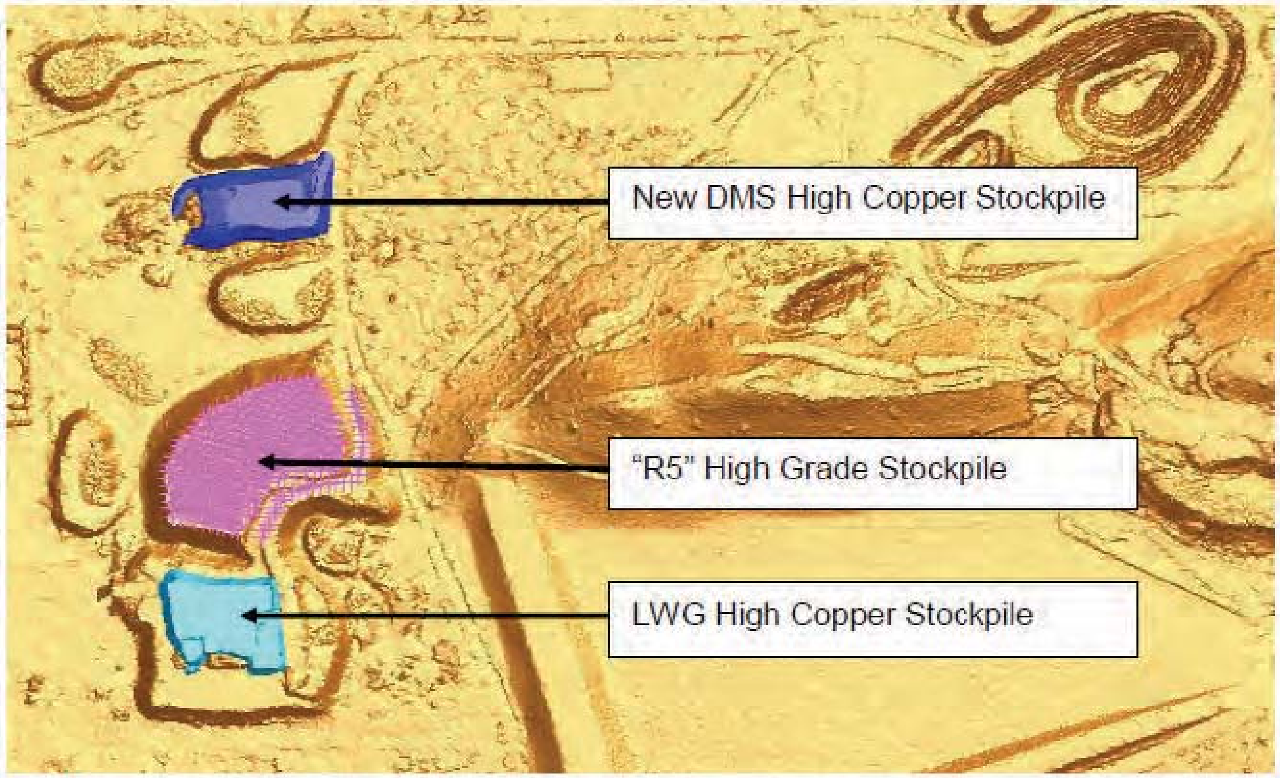

Figure 27: High grade stockpile

Weighted average grade calculations on the stockpile assays resulted in an average grade of 3.37 %Cu and 2.31 %Co assigned to the survey volume of 1.31 million m^3. A swell factor of 1.3 was applied which is in line with the Mutanda density testing for the "R5" high grade stockpile. A histogram of the sample distributions on a copper and cobalt sample grade basis is shown in the figure below.

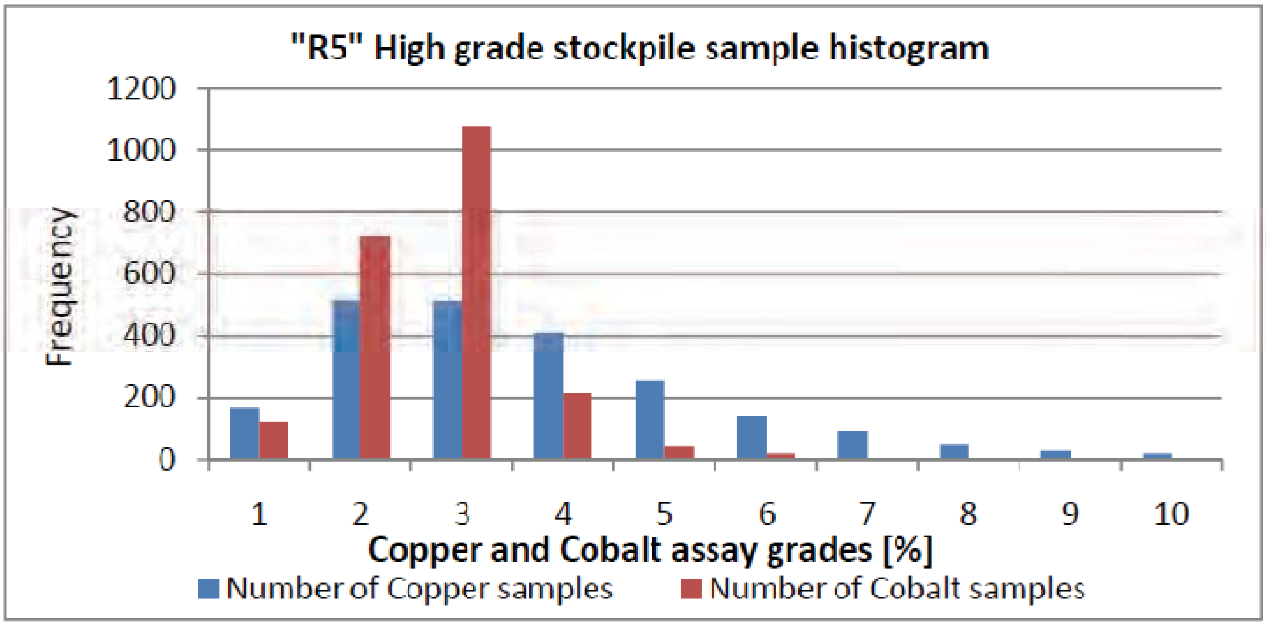

Figure 28: Stockpile High grade stockpile histogram

3.1.2.2 High Copper Stockpiles

Volumes were estimated from a survey DTM and verified with the recent aerial surveys. A reasonable match was achieved. The two stockpiles in question are the New DMS stockpile to the north (160 500 m3) shown in dark blue in the figure above and the LWG high copper stockpile (109 100m3) shown in light blue. Whilst volumes could be verified, there was not enough information to verify loose density therefore this could not be included in the schedule or reserve model and consequently the financial valuation.

No stockpile drilling information was available to estimate average grades. To verify the grades, the material mined was tracked back to the pit for 2009 and 2010 in the Central pit and 2010 in the East pit. The grade control and short term block model was evaluated to estimate the total high grade material that exists in the pits over the established time period. Assuming that grade control practices are enforced during the mining process, it was found that the Mutanda estimate of 9.7 %Cu and 3.0 %Co, including 5% dilutions, was reasonable.

3.1.2.3 Low Grade Heap Leach Stockpiles

Volumes were determined from supplied survey digital terrain model (DTM). The survey DTM was verified against recent local aerial surveys to confirm the location thereof. A drilling programme of the stockpile was undertaken by Mutanda to confirm the average grades. A sample was taken and assayed for each 10m grid point. Drill hole collar elevations were checked spatially relative to the survey DTM for a reasonable match. The figure below shows the drill hole collar match of the two low grade stockpiles relative to the aerial survey DTM for a combined volume of less than 1 million m^3. Whilst volumes could be verified, there was not enough information to verify loose density therefore this could not be included in the schedule or reserve model and consequently the financial valuation.

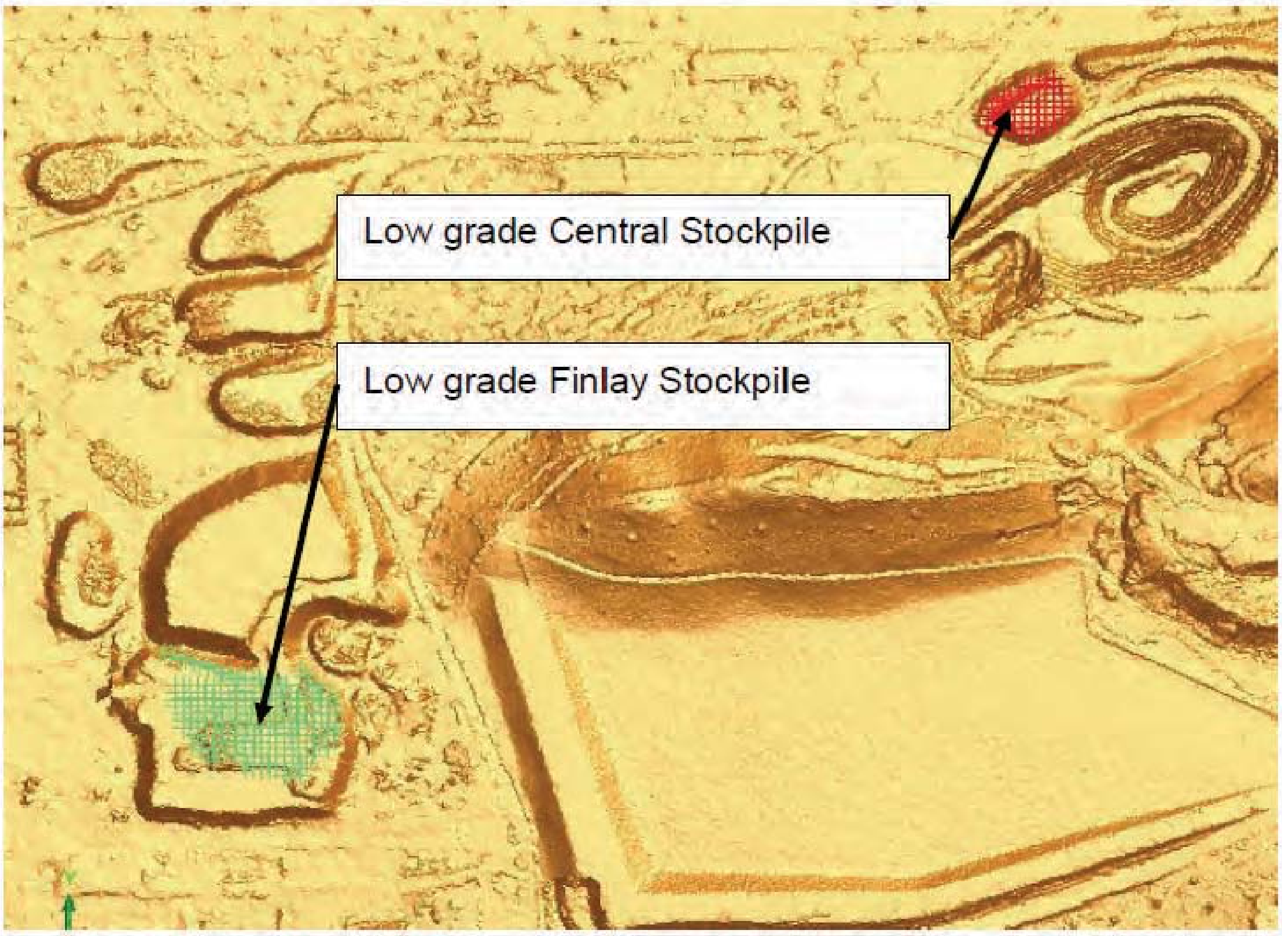

Figure 29: Low grade heap leach stockpiles

Average stockpile grades were estimated by weighted average grade calculations of the stockpile assays. This resulted in an average grade of 0.7 %Cu. This material is scheduled as heap leach ore at an overall copper recovery of 70%. A histogram of the sample distributions on a copper and cobalt sample grade basis is shown in the figure below.

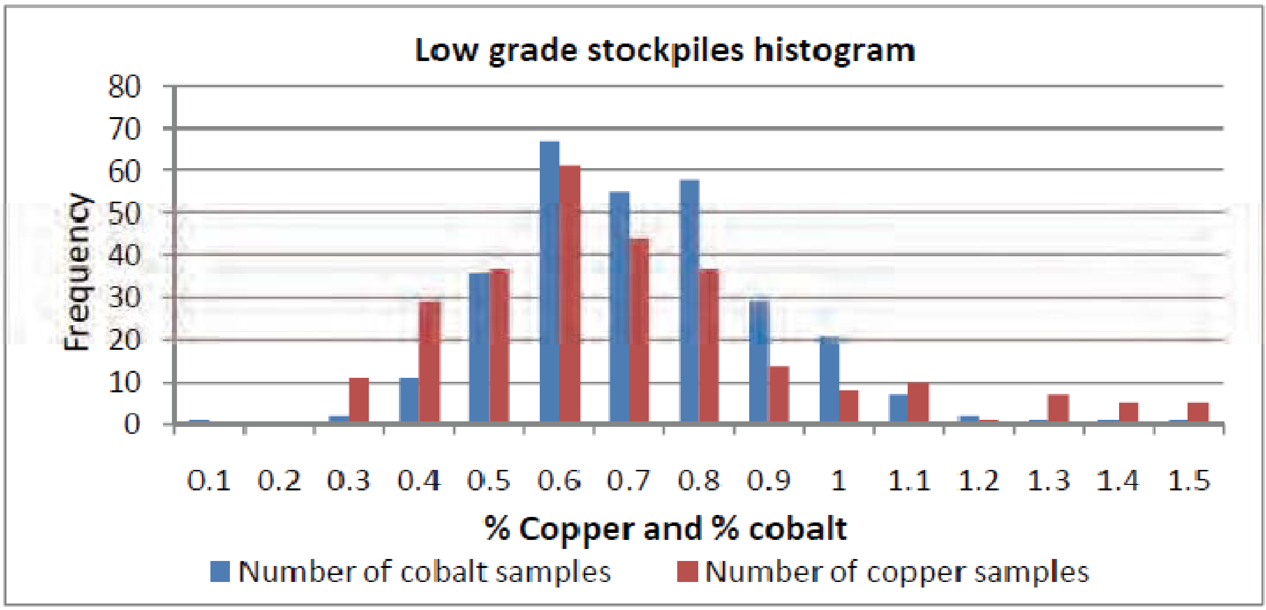

Figure 30: Low grade stockpiles histogram

3.1.3 Pit Development

The figure below is a graphical representation of the various production areas for the Mutanda operation. The available area for dumps and surface infrastructure is limited and careful consideration is required. The impact on potential high wall stability of the proximity of the planned workings to the tailings dam should be studied further.

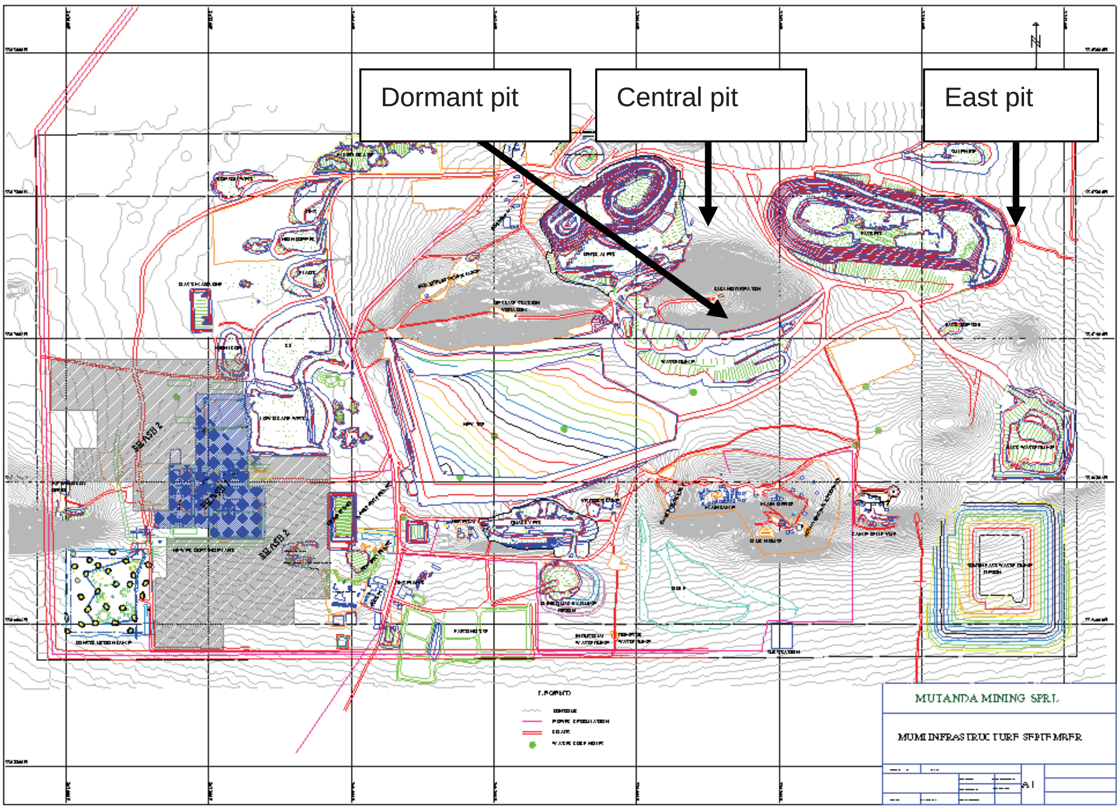

Figure 31: Locality plan with current design of surface infrastructure

3.1.3.1 Modifying factors

A total of 5% geological losses have been applied. This implies that 5% of the material modelled as ore are mined as waste due to structural Resource losses. This is a tonnage loss that does not impact the ROM head grade.

Dilution and losses are applied on an SMU basis. Due to the high production requirement and size of the loading and hauling units planned (and other factors considered), a SMU unit of 10mx10mx5m was selected. This project is unique as no sulphide processing capacity exists. This implies that all sulphide material is stockpiled as future opportunity. It is assumed that 70% of the ore in the mixed zone consist of oxide ore and the balance is sulphide ore. This indicates significant upside should a sulphide process facility be installed.

Tonnage and grade profiles were constructed to illustrate the effect of material below the stated cut-off grades, the impact of dilution and the impact of the inclusion of sulphide material. These tonnage and grade profiles were constructed on an unconstrained basis over the complete ore body.

The figure below is a tonnage and grade profile, unconstrained for the complete available resource that illustrates the undiluted resource portion (green) with the dilution portion (brown) in a cumulative area profile for the Mutanda ore body, considering only oxide and 100% of the mixed material in the first graph and including sulphides in the second graph. The effect of the dilutions can be seen in the difference between the diluted ROM %Cu (black) head grade line profile and the undiluted resource grade line profile in green.

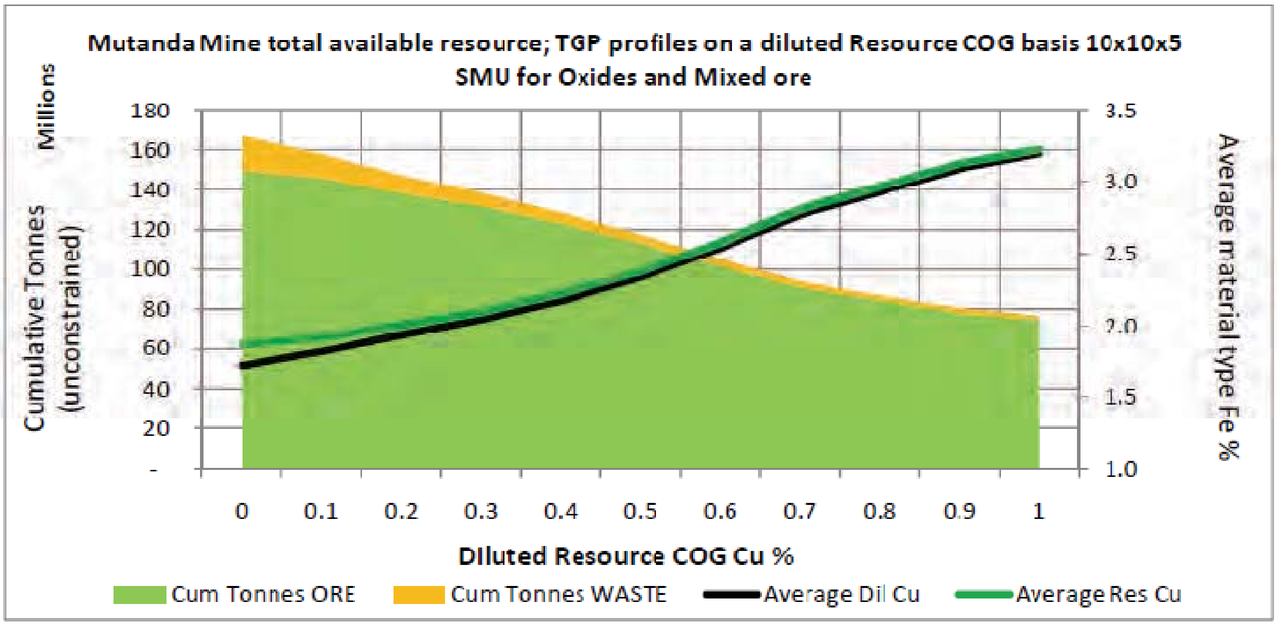

Figure 32: Mutanda tonnage and grade profile excluding sulphides

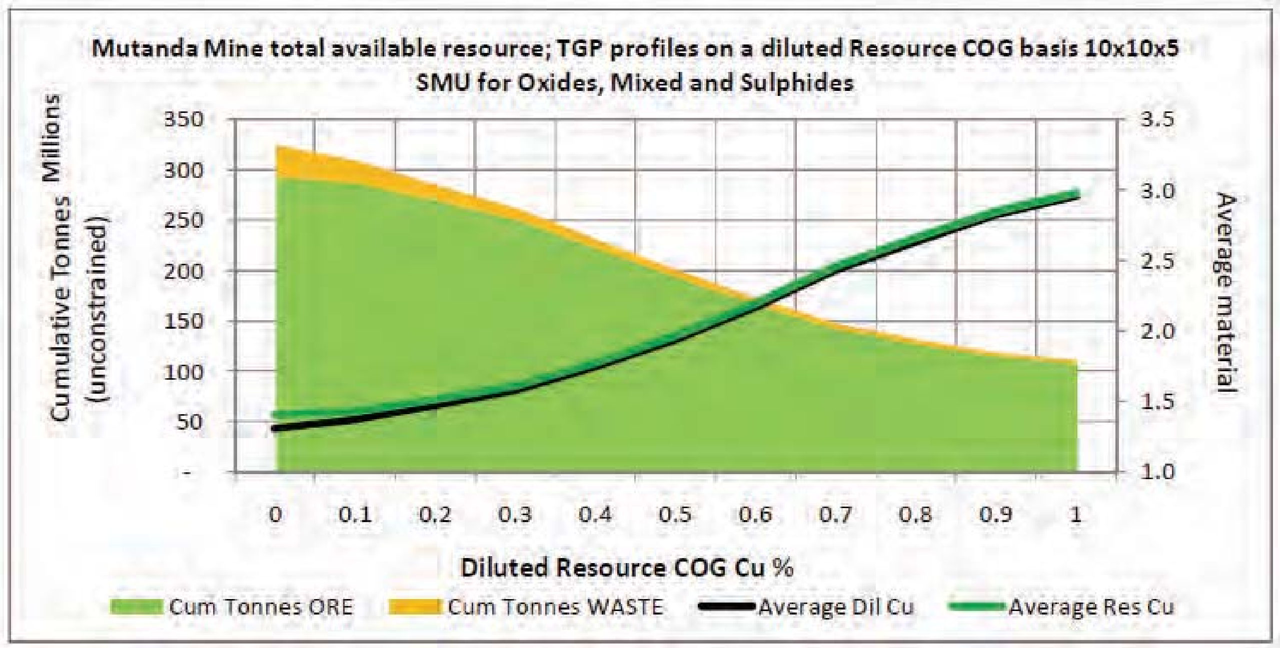

Figure 33: Mutanda tonnage and grade profile including sulphides

A cut-off grade of 0.85 %Cu was applied at the Mutanda pits. The basis of the cut-off grade calculation is to determine the break even cost, based on selling, processing and royalty costs. The cut-off grade considers revenues generated from copper and cobalt with the appropriate processing recoveries applied.

A total of 46% resource losses of material below the SMU cut-off grade are estimated, while 3% mining dilutions are expected in the planning case (excluding sulphides). The first graph shows oxide and mixed material while the second includes sulphide material.

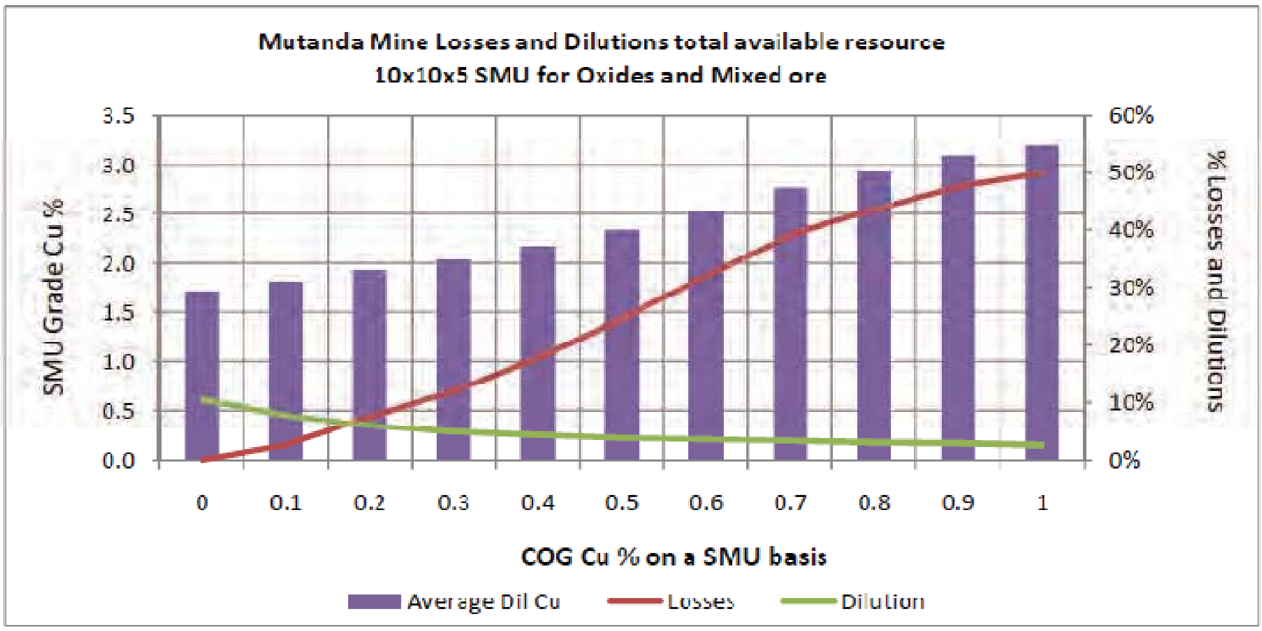

Figure 34: Mutanda dilution and loss curves excluding sulphides

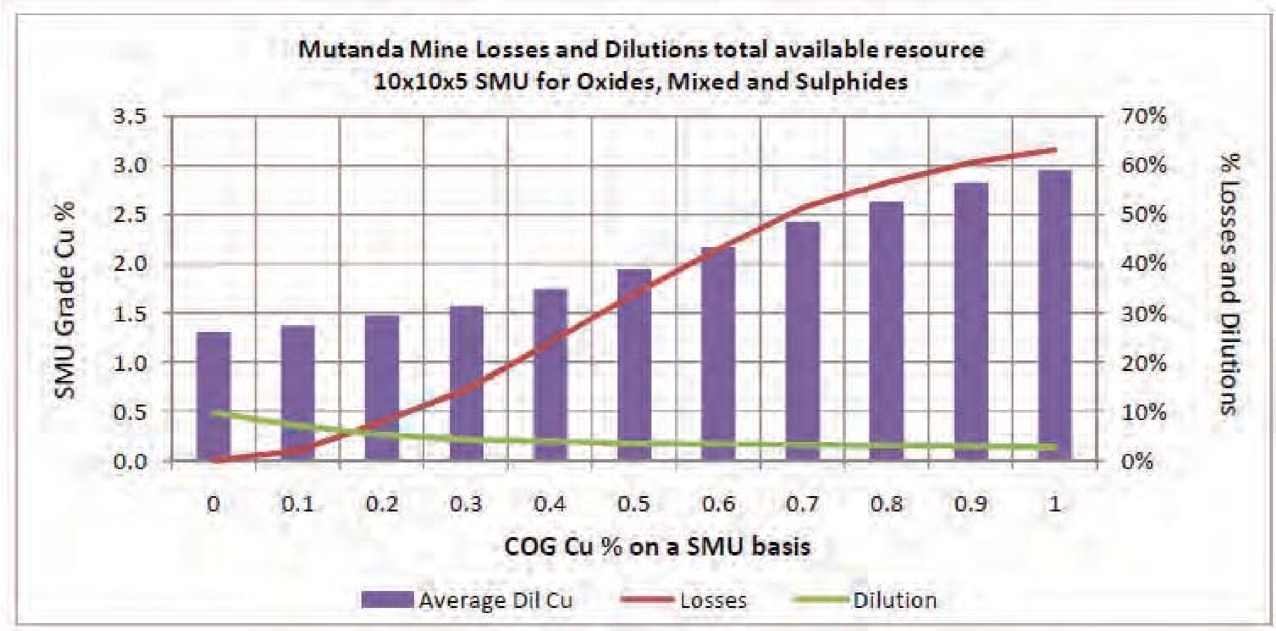

Figure 35: Mutanda dilution and loss curves including sulphides

It can be seen that material upside exists to increase the reserve estimate, if processing capacity for the sulphide material can be established towards the end of the current oxide mine life. It should be noted that the average copper grade in the sulphide material is lower, which would result in more resource losses below the stated cut-off grades, although the dilution would remain unchanged.

Continuous grade control is essential to achieve or improve on the assumed losses and dilutions, to maximise the value of the mining operation. Grade control functions are performed by mine personnel. Various grade demarcations are pegged on the production blocks indicating the material boundaries and destinations of the specific mined materials.

A picture of an active bench grade control demarcations is shown in the figure below.

Figure 36: Grade control demarcation

3.1.3.2 Pit Optimisation

The Mutanda technical team supplied a Whittle pit optimisation project where three scenarios were modelled. The scenario that is constrained by the current mining area and allows resources from the Measured, Indicated and Inferred Recourse classifications to be considered, were used.

The Whittle software package was used to conduct an open pit optimisation as part of the review process.

The pit optimisation parameters assumed for Mutanda are tabled below.

Table 9: Mutanda optimisation parameters

Optimisation Parameter	Unit	Mutanda Parameter
Reference mining cost	US$/t	3.93
Processing cost	US$/t	89
Selling cost - Cu	US$/t Cu	1 487
Selling cost - Co	US$/t Co	7 054
Discount rate	%	10
Cu recovery	%	90
Co recovery	%	80
Cu Price	US$/t	5 500
Co Price	US$/t	24 250

3.1.3.3 Pit design

The Central pit contained areas with small slope failures from the original workings by the previous owners. The selected optimal Whittle shell was used to design the final pit. The bulk of the material is mined by free digging and benches are well maintained. A picture of the Central pit taken in a southern direction is shown in the figure below.

Figure 37: Picture of the Central pit

The picture below is of the East pit taken in a eastern direction. The footprint area of this pit is larger than the Central pit. All pits have dual access ramps to ensure safety and reduce the risk of production losses caused by small slope failures.

Figure 38: Picture of the East pit

A graphical representation of the current face positions of the East and Central pits are shown in the figure below.

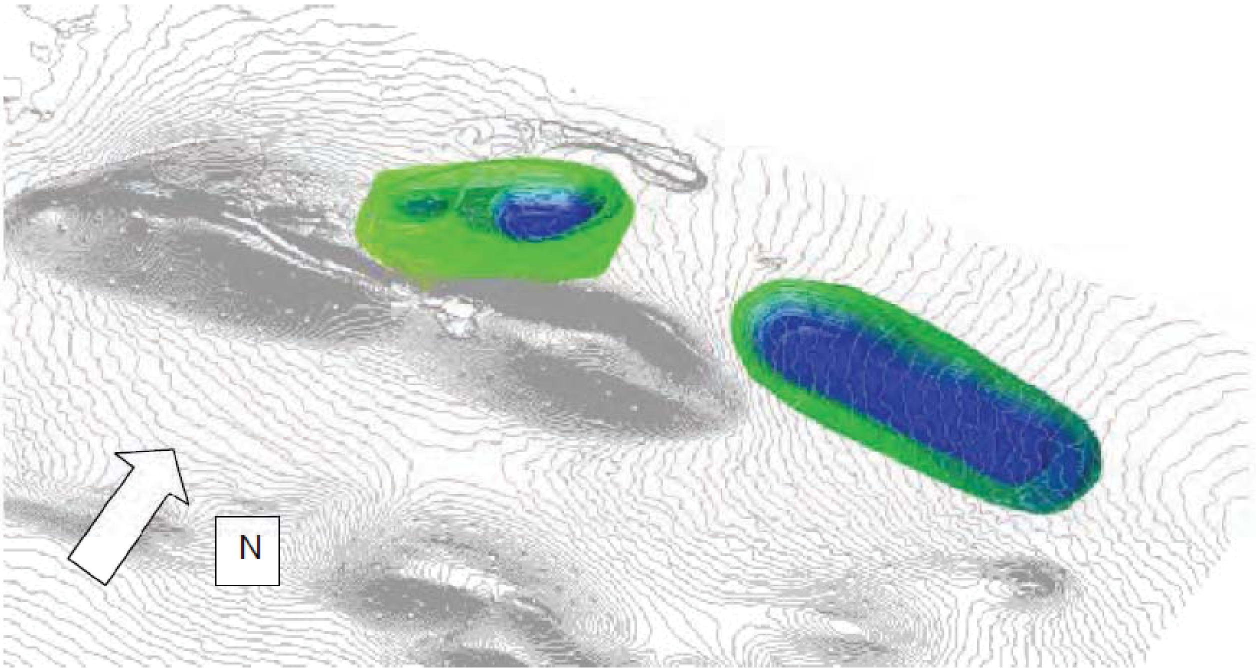

Figure 39: Mutanda current pit survey

A graphical representation of the final pit design with current topography is shown in the figure below. This design is based on the pit design criteria applied to the optimum Whittle pit shell. It should be noted that this pit design includes only the sulphide ore mined as a result of exploiting the oxide reserves. Significant sulphide resource exists in addition to this and is included in the resource model.

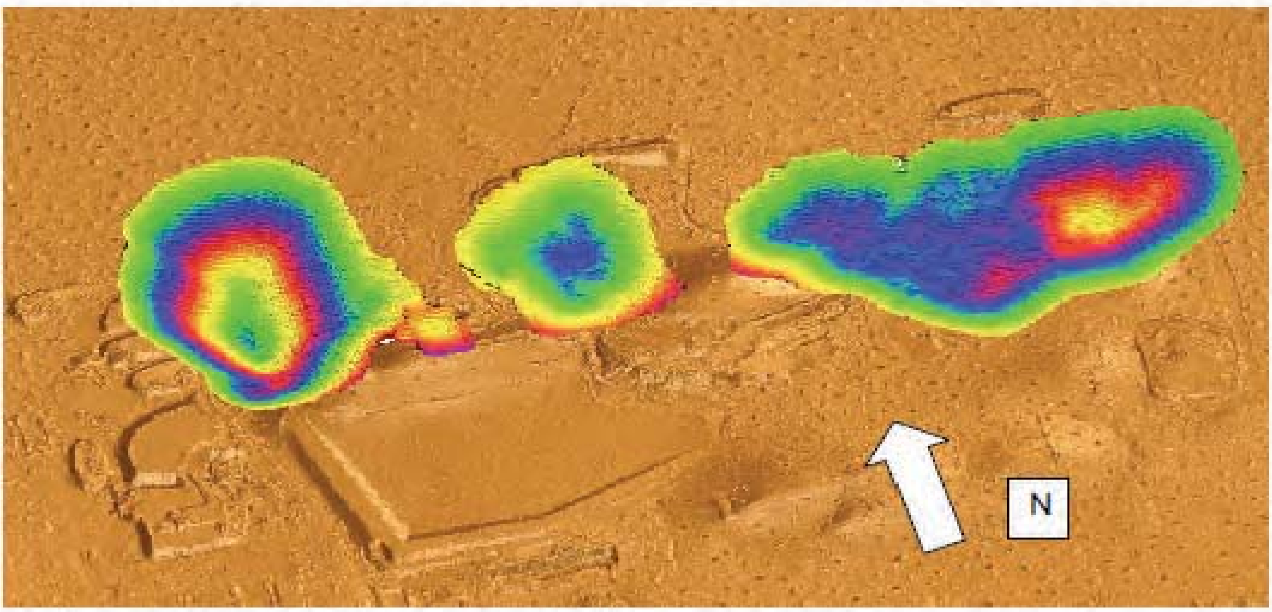

Figure 40: Mutanda pit design

The pit design criteria are based on current practice and can be seen in the table below.

Table 10: Mutanda pit design criteria

Pit Design Criteria	Unit	Mutanda
Bench height	m	5.0
Berm width	m	4.0
Batter angle	degrees	65.0
Ramp width	m	20.0
Ramp gradient	degrees	5.2 (1 in 11)

3.1.4 Production Scheduling

3.1.4.1 Process Plant

Production capacity from the Mutanda pits is planned up to 110 000 tonnes of recovered copper with a processing constraint of 23 000 tonnes of recovered cobalt. A total of 59.9 million tonnes of ore is processed with a maximum of 4.2mtpa ex-pit ore in 2022. Copper production is achieved from current stockpiles in 2011 and 2012. A total of 2.2 million tonnes of ore is processed from the high grade stockpile. The high copper and low grade stockpiles (sections 3.1.2.2 and 3.1.2.3 respectively) have been excluded from the scheduling (and therefore the overall reserve estimate and financial model) until loose density information can be verified to convert volume into tonnes is complete. This represents significant upsides as there are an additional 269 600m^3 grading 9.7% Cu, 3% Co and approximately 1 million m^3 at 0.7% Cu not included in the current schedule. This will in effect smooth the waste stripping requirement in early years as more immediate plant feed will be available to meet process plant requirements. The mine planning criteria is tabulated below.

Table 11: Mutanda scheduling criteria

Scheduling criteria	Unit	Mutanda
Production rate (Recovered Copper constraint excluding heap leach)	ktpa	100
Production rate (Recovered Cobalt constraint)	ktpa	23
Schedule start date		2011

The LOM Plan plant feed production profile including stockpiles is tabulated below.

Table 12: Mutanda LOM production profile (including high grade stockpiles)

Mutanda	Unit	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Ore tonnes	*000t	706	2 247	2 389	2 751	2 774	3 241	3 208	3 622	3 173	3 507
Recovered Cu	*000t	24	80	100	100	100	100	100	100	100	100
Recovered Co	*000t	13	23	23	23	23	23	23	16	15	19
Waste tonnes	*000t	6 952	12 484	14 286	13 903	13 880	13 389	13 423	12 988	13 460	13 108
Cu grade	%	3.78	3.96	4.65	4.04	4.01	3.43	3.46	3.07	3.50	3.17
Co grade	%	2.22	2.03	1.45	1.18	1.40	1.22	1.29	0.56	0.59	0.66
Cu content	*000t	27	89	111	111	111	111	111	111	111	111
Co content	*000t	16	46	35	33	39	40	41	20	19	23

Mutanda	Unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Ore tonnes	*000t	3 906	4 185	3 756	3 211	3 465	3 850	3 265	2 794	3 302	278
Recovered Cu	*000t	100	100	100	100	100	100	100	100	100	8
Recovered Co	*000t	23	23	21	14	11	23	23	21	23	3
Waste tonnes	*000t	12 688	8 985	1 908	1 899	4 243	5 503	5 237	1 799	2 291	65
Cu grade	%	2.84	2.66	2.96	3.46	3.21	2.89	3.06	3.98	3.36	3.35
Co grade	%	0.86	1.00	0.69	0.55	0.41	1.11	1.23	0.95	1.13	1.35
Cu content	*000t	111	111	111	111	111	111	111	111	111	9
Co content	*000t	34	42	26	18	14	43	45	26	37	4

The graph below shows the plant feed tonnages from the R5 highgrade stockpile, the ex-pit oxide ore and the 70% oxide material in the mixed ore. The average plant feed grade over the first 5 years of the operation is 4.14 %Cu. Stripping to expose sufficient oxide material and to open sufficient pit room for a relatively large operation requires waste production of more than 13 million tonnes per annum up to 2021.

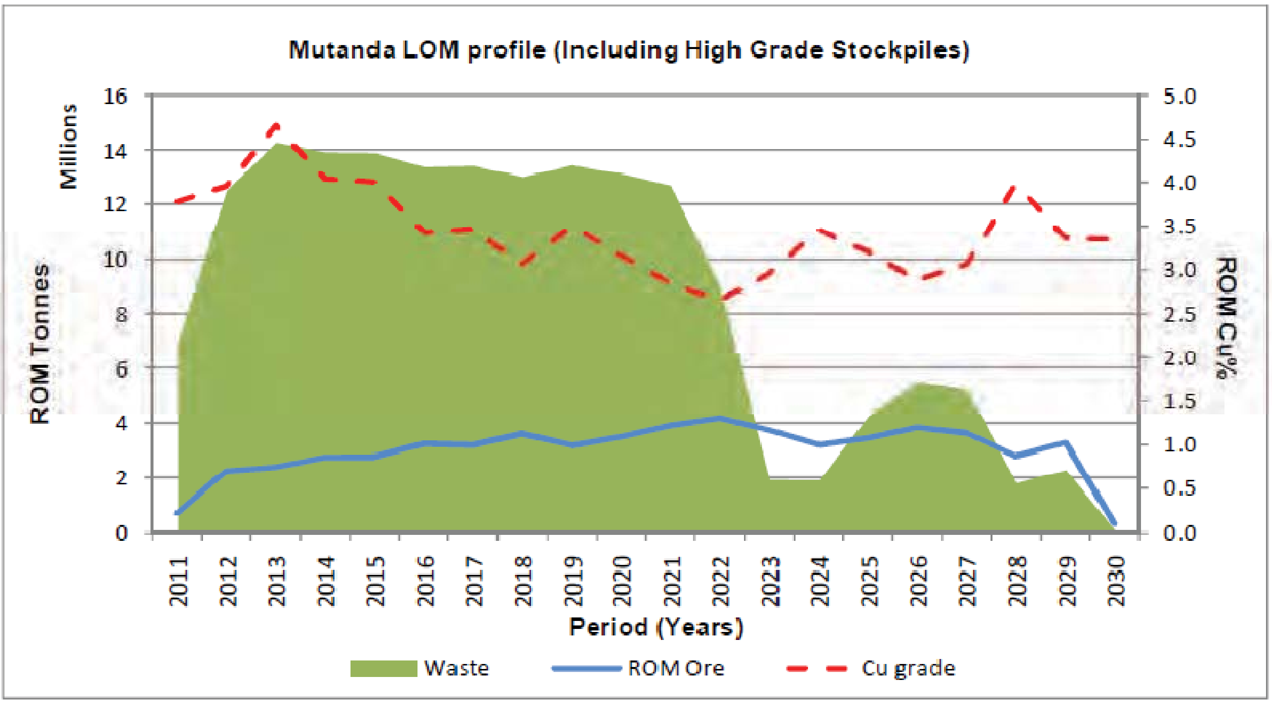

Figure 41: Mutanda production profile including high grade stockpiles

Full ore production from the pits commences in 2013, with the bulk of the plant feed material in the initial two years coming from the existing stockpiles.

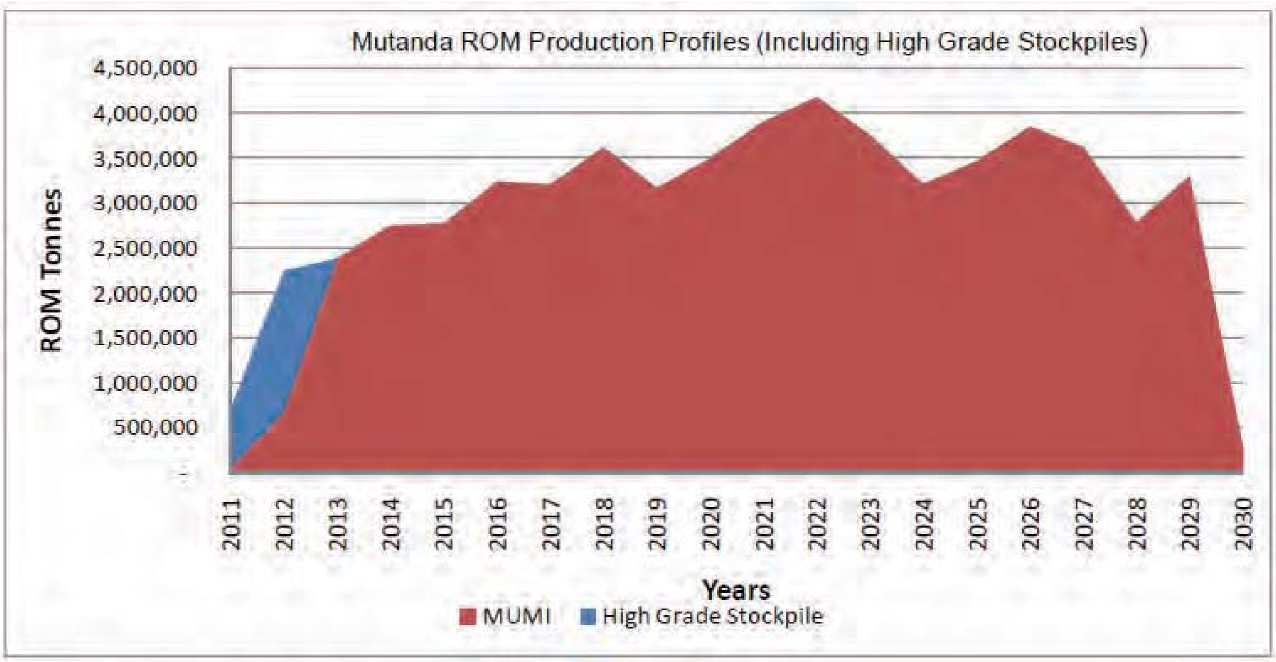

Figure 42: Mutanda plant feed tonnage profile

Sulphide material generated from the mining operation is from sulphide ore within the optimised pit shell and pit design and 30% of the mixed ore. Selective mining is required in the mixed ore where the 30% sulphide material is loaded and hauled on a selective basis. Existing sulphide stockpiles are used and expanded.

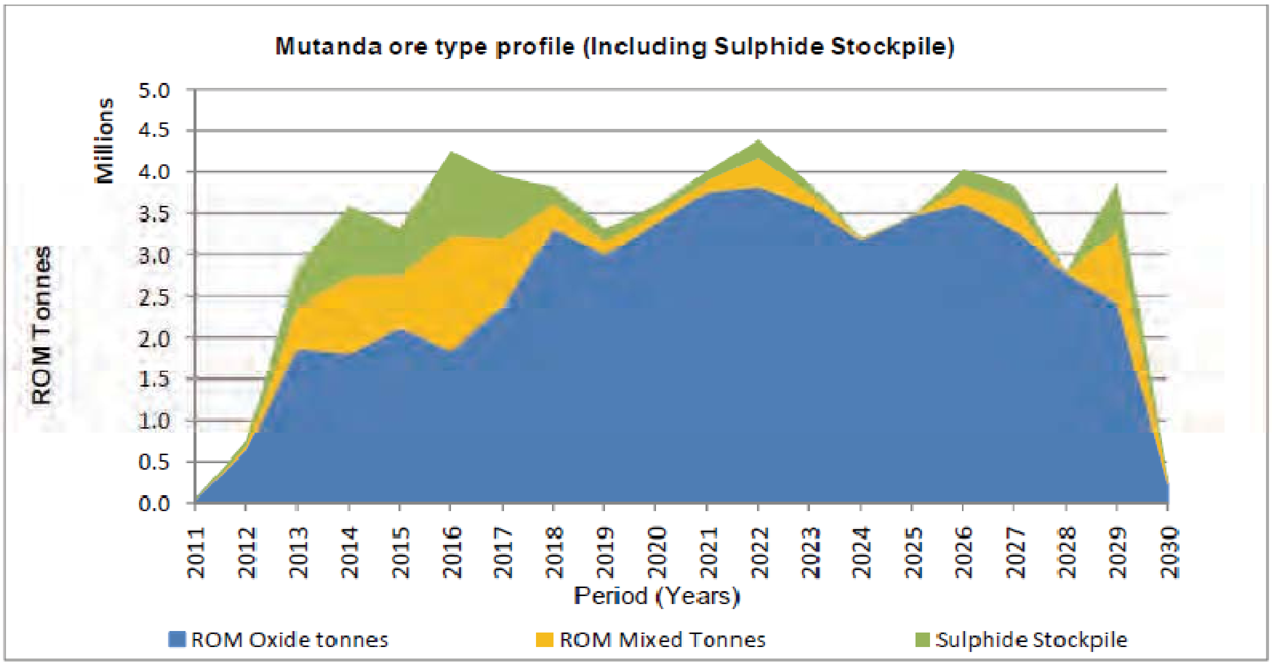

Figure 43: Mutanda operation ore type profile

Production at Mutanda is planned based on a recovered copper processing constraint of 100 000 tpa, excluding heap leach of recovered copper. Full production is achieved in 2013.

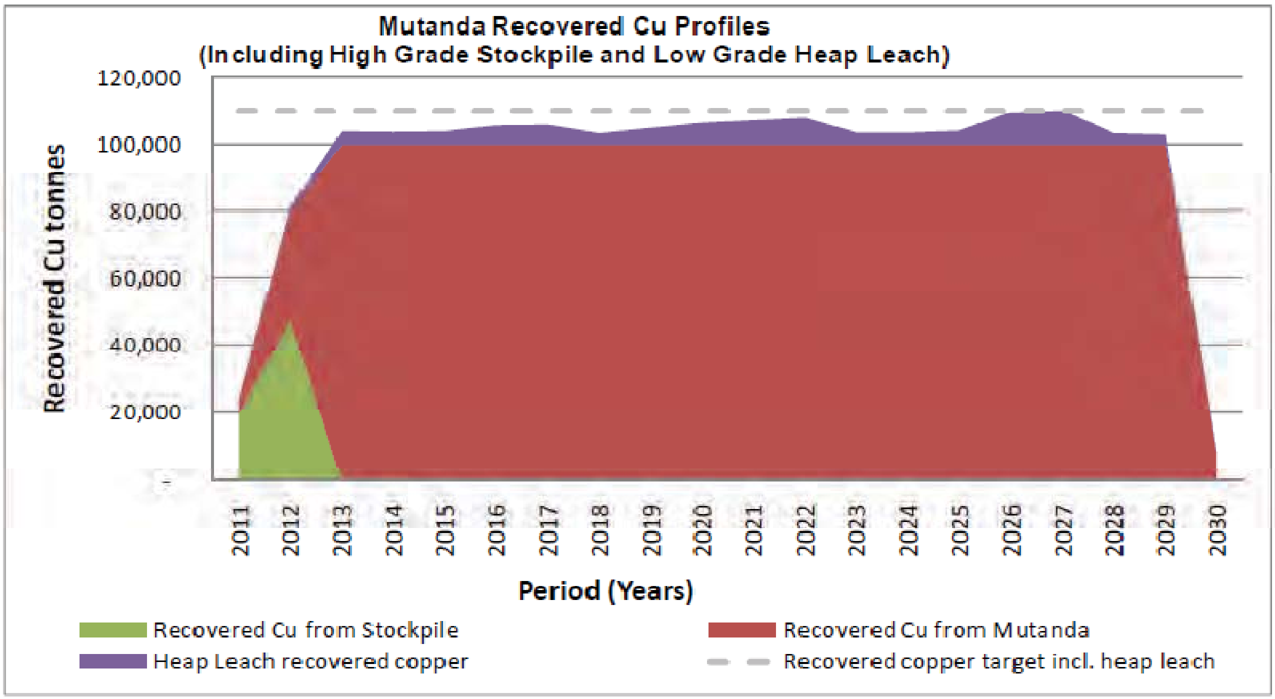

Figure 44: Mutanda operation recovered copper profile

The scheduling driver for the LOM Plan is copper. Cobalt is recovered based on the mining sequence established to sustain up to 100 000 tpa, excluding heap leach of recovered copper. It can be seen that the effect of the copper and cobalt ratio that declines with an increase in depth, results in a cobalt recovered tonnes of less than the processing target. There are numerous options available to resolve this issue, which would include:

- utilisation of low grade stock pile material;
- utilisation of spent ore from the copper heap leach; and
- stock piling separately ore which does not meet copper cut off grades, but has a colbalt value deemed suitable for plant feed.

Further investigations and modelling is required to optimise the schedules and hence this has not been included in this MER.

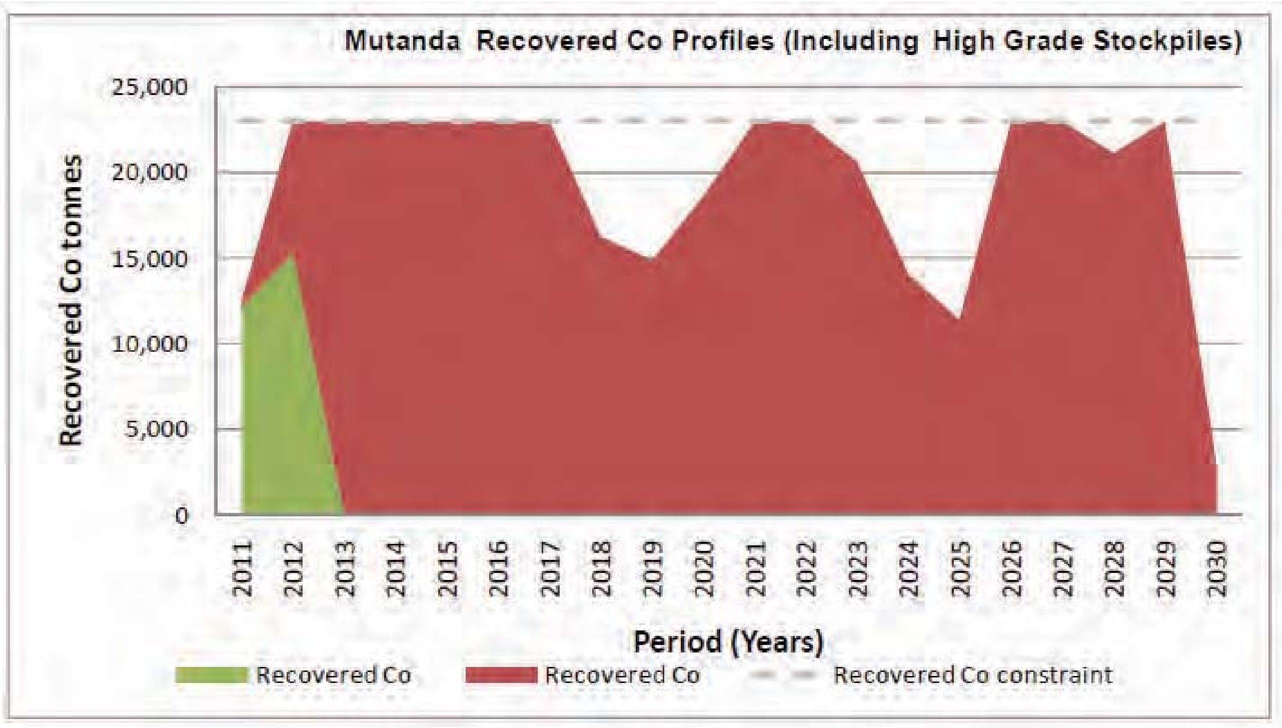

Figure 45: Mutanda operation recovered cobalt profile

Reserves are declared on the stockpiles and ROM production. It is clear that the material from the Inferred Resource category is mined at very low volume.

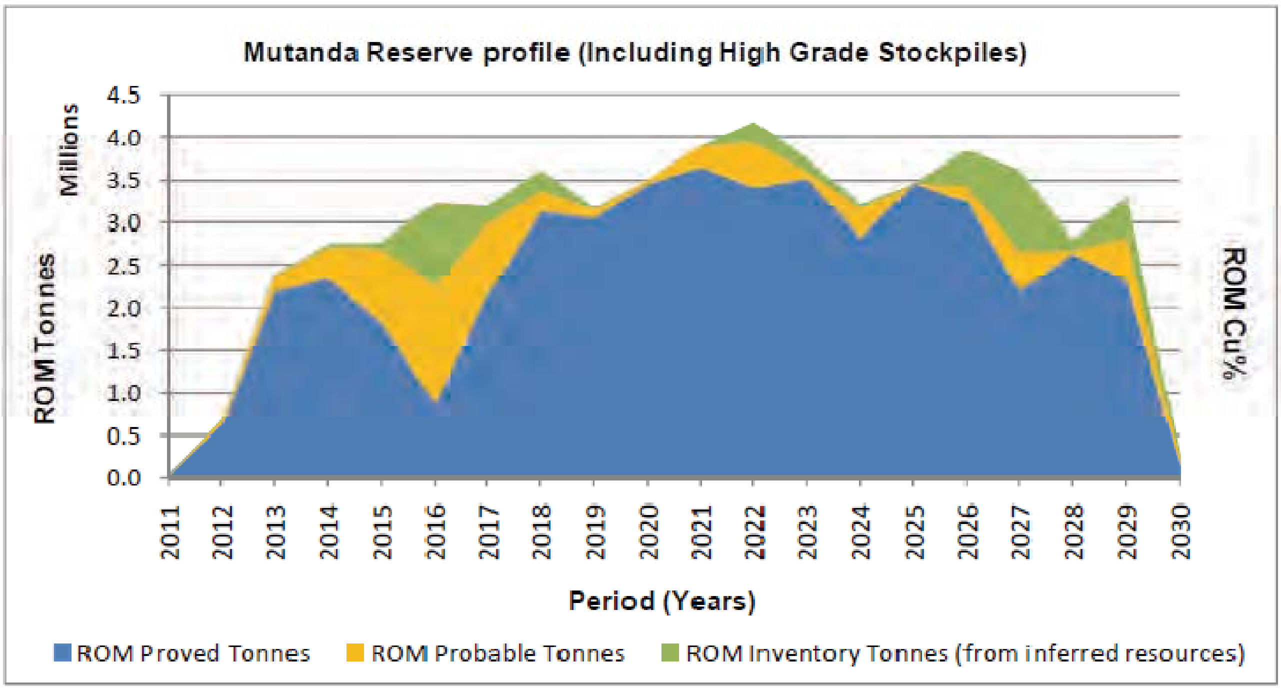

Figure 46: Mutanda Reserve profile

3.1.4.2 Heap leach

The ex-pit and low grade stockpile for planned heap leach processing is tabled below.

Table 13: Mutanda heap leach LOM production profile (including low grade stockpiles)

Heap Leach stockpile	Unit	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Low Grade Ore	*000t	20	314	880	765	852	1265	1300	670	1075	1399
Heap Leach Cu%	%	0.49	0.57	0.57	0.60	0.58	0.58	0.59	0.61	0.58	0.59
Heap Leach recovered copper	t	68	1 255	3 537	3 217	3 481	5 111	5 351	2 867	4 373	5 807
Heap Leach recovered copper target	t	10 000	10 000	10 000	10 000	10 000	10 000	10 000	10 000	10 000	10 000

Heap Leach stockpile	Unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Low Grade Ore	*000t	1517	1717	708	722	896	2187	2164	700	610	21
Heap Leach Cu%	%	0.63	0.60	0.63	0.62	0.58	0.58	0.63	0.60	0.61	0.65
Heap Leach recovered copper	t	6 679	7 254	3 105	3 136	3 646	8 955	9 504	2 937	2 608	98
Heap Leach recovered copper target	t	10 000	10 000	10 000	10 000	10 000	10 000	10 000	10 000	10 000	10 000

It can be seen that the average recovered copper tonnages for the heap leach operation is 5 000 tonnes of recovered copper per annum.

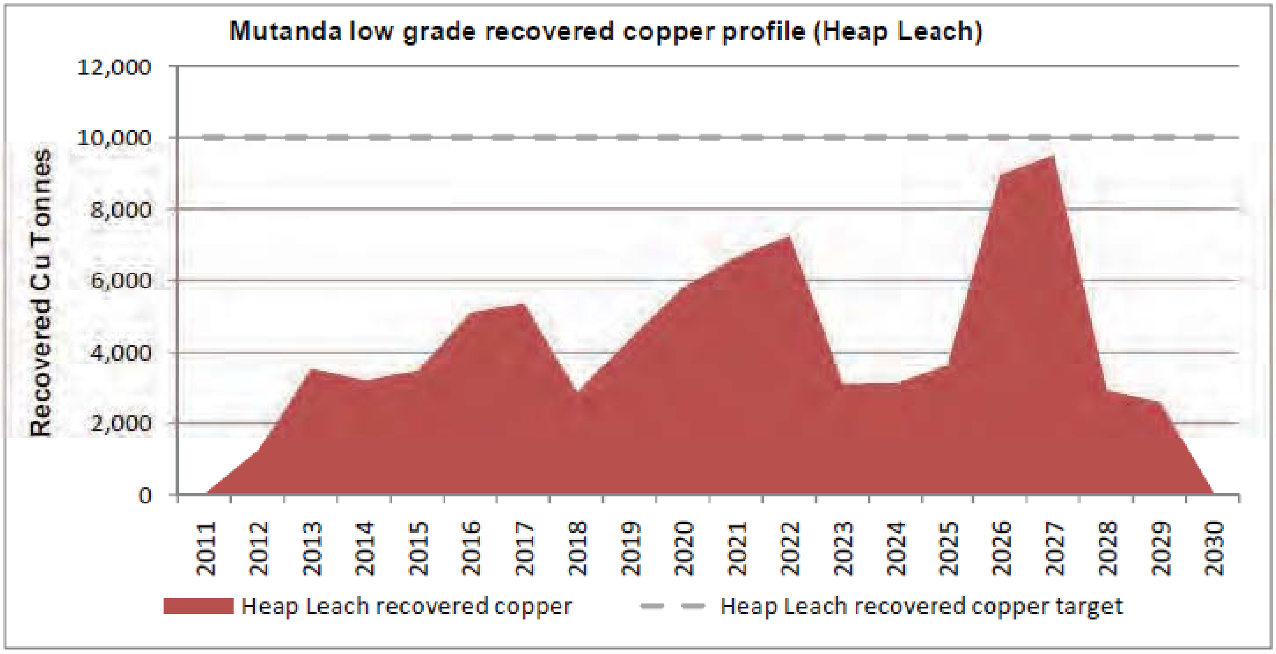

Figure 47: Mutanda heap leach Recovered Copper production profile

3.2 Reserve Estimate

The reserve estimation at Mutanda is based on the 2010 pit optimisation, pit designs and production schedules generated with a 31 December 2010 base date. The Mineral Reserve estimate is tabled below.

Table 14: Mutanda combined reserve table

Mining operation	Proved			Probable			Total		
	Tonnes (*000)	% T Cu	% T Co	Tonnes (*000)	% T Cu	% T Co	Tonnes (*000)	% T Cu	% T Co
Mutanda pits	47,176	3.4	0.9	6,570	3.1	1.2	53,746	3.4	0.9
ROM High Grade Stockpile	2,227	3.4	2.3				2,227	3.4	2.3
TOTAL	49,403	3.4	1.0	6,570	3.1	1.2	55,973	3.4	1.0

3.3 Opportunities

There are several opportunities which reflect potential upside such as:

- Sulphide material contained in the transitional zone is mined and stockpiled over the life of the operation. This amounts to 5.6 million tonnes of sulphide material with a grade above the operational cut-off grade.
- As the depletion of the current oxide operation occurs, the sulphide orebody will become exposed. Material upside could exist at the end of life of the current operation, should copper sulphide processing

capacity be established since most of the pre-stripping has been completed by the current copper oxide pits.

- Various high and low grade stockpiles exist, additional to the incorporated R5 High Grade stockpile, that has not been included in the LOM Plan. Additional work is required on the re-modelling of grades and loose density before it could be included in the LOM Plan and Reserve estimate.
- Potential for underground exploitation of the remaining oxide resource in CNW area.

3.4 Risk

The potential risks associated with Mutanda are:

- Mutanda has been a small operation, mining low volumes on a selective basis. With this LOM Plan the operation has to adjust to a higher volume operation with reasonable losses and dilutions.
- The dormant pit to the south of Central pit includes some limited underground workings that cannot be fully mapped. This could have a negative impact on mining rates in the area, although this does not impact any mining in the East and CNW pits.
- An additional waste dumping space of 4 km^2 is required for waste dumping on the Kansuki project area. This can be a potential high risk issue to the project since the waste backfill opportunity is limited. However this may be mitigated by the processing of existing stock piles.
- A total of 5.6 million tonnes of sulphide ore is planned in the current LOM Plan. Dedicated stockpile areas are required. Due to the limited space available, this could increase mining costs should continuous re-handling be required.
- A total of 11.9 million tonnes of low grade ore is scheduled in the current LOM Plan. Dedicated stockpile and heap leach areas are required. Due to the limited space available, this could increase mining costs should continuous re-handling be required, though all ROM low grade material will be placed onto the heap when mined. Rehandling of “spent” ore and possible use of existing stockpiles will attract a rehandling costs.
- Waste stripping is allowed for and required on the Kansuki project area. This LOM Plan assumes that a suitable agreement could be reached. No ore from the Kansuki area has been included in this estimate.

4.0 PLANT AND EQUIPMENT

4.1 General Process Commentary

The Mutanda ore deposits appear to offer considerable upside potential for the exploitation and recovery of the valuable copper and cobalt components of the surface deposits discovered to date; with considerable further potential from underground exploitation of the oxide resource.

At the time of our visit the initial process module to produce 20 000 tons per annum (“tpa”) of copper metal was well into the construction phase with full copper plant start up programmed for mid November 2010, this seems a realistic target but is dependent upon the availability of materials and the performance of the contractor’s construction work force on site. As of 1st January 2011, the plant was ramping up according to the commissioning schedule and 2010 copper targets were exceeded, with a total of 1,851 mt of copper cathodes produced in 2010.

The process plant will produce copper cathode sheets to commercial quality and a cobalt salt in the form of hydroxide at 40% grade.

At the time of our visit the Solvent Extraction (“SX”) and Electro-winning (“EW”) plant was in the process of being commissioned using Pregnant Liquor Solution (“PLS”) generated from a small heap leach operation to meet budgeted copper production targets, with first copper cathode being produced on budget.

The plant has been established on a Greenfields site with the benefit of unrestricted access within the Mutanda concession upon an area with no known mineralisation.

From the initial breaking of ground in May 2009, the plant will have taken only 18 months to construct and put into operation.

Mutanda is in the process of commissioning phase 1 of a three phased expansion project. This will ultimately deliver a processing plant able to produce up to 110,000t Cu and 23,000t of contained cobalt in the form of a hydroxide salt.

Phase 2 construction is well underway with mechanical completion targeted for 31st August 2011. A fast track project to bring on line SX-EW #2 (20,000t capacity)in early April 2010 utilising the phase 1 copper circuit at a higher feed grade and SX-EW#3 (20,000t capacity) from a newly constructed heap leach by July 2011. This heap leach is included as part of the phase 3 expansion which is being fast tracked to produce additional copper in 2011. By the time the phase 2 plant is commissioned it is targeted to have SX-EW processes for phase 2 running at or close to nameplate capacity.

Phase 3 has been designed as a fast track 40,000t Cu expansion module which consists of upgrading transformer capacity in the tankhouses and increase copper production from 20,000t to 25,000t in EW#1, EW#2 and EW#3 respectively. In addition a 4th tankhouse rated at 35,000t will be installed for an overall tankhouse capacity of 110,000t Cu per annum. Additional investment in phase 2 SX plants in phase 3 will enable phase 2 to produce 80,000t per annum through its copper circuit, with phase 1 contributing 20,000t. The additional make up tonnage (10,000t) is expected to come from the NW heap leach. Phase 3 completion is scheduled as Q1-2012.

As at 1st January 2011, Mutanda has exceeded all budgeted copper targets for 2010.

Once phase 3 is fully commissioned, the heap leach will treat low grade Mutanda ore (0.5-0.85%Cu) and potentially increase output of the Mutanda processing plant to 110,000tpa of copper cathode.

The phase 1 cobalt circuit is anticipated to be mechanically complete by end-January 2011 with commissioning to take place in February.

A 390tpd acid plant and 73tpd liquid SO2 plant is under construction with completion date forecast for 31st August 2011. Whilst Mutanda maintains acid stock levels of more than 30 days in acid, and supply from Zambia is reliable, the cost of production of acid / SO2 at Mutanda will translate to significant operational cost savings.

Engineering design for all plants was modelled in 3D as can be seen for the detailed model of the 20K plant. The schematic of the integrated phase 1 and phase 2 plant as shown in Figure 48.

Figure 48: 3D Model – 20 000 tpa Copper Plant

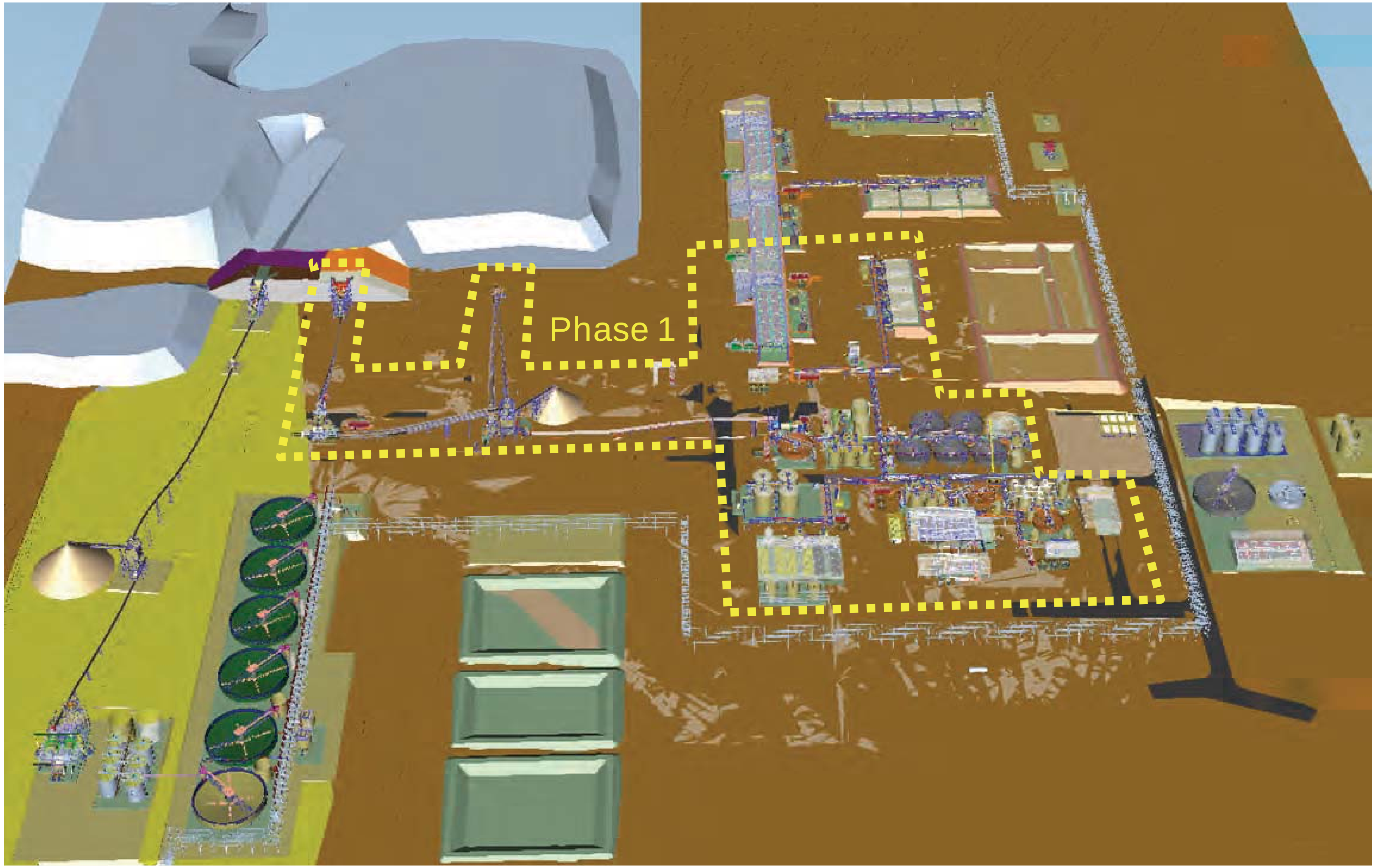

Figure 49: Schemaic integrated phase 1 and phase 2 layout

Figure 50: Electrowinning Building under Construction with phase 2 building in background

4.2 Plant Valuation

As the process plant has not yet run the current costs must be considered as a liability on the balance sheet until production occurs to offset the Capex and ongoing Opex costs. However a plant does effectively exist with which to exploit the deposits and this should be viewed as a positive for the project.

The project has been split into capital and operating cost budgets. The capital cost budget incorporates all elements of an EPCM project including owner's costs as well as first fill spares and first fill reagents. Due to the remote location of the plant it was decided to carry a minimum of 30 days reagents as first fill. An operating cost budget has been submitted for 2010 and 2011 based upon the plant process design criteria, developed from test work and industry standards on consumption.

The value of the plant and equipment has been taken into account in the economic evaluation set out in Section 10.0.

4.3 The 20 000 tpa Process Plant

The initial 20 000 tpa Cu production plant was under construction at the time of our visit and it is intended to start this plant in mid November 2010. Construction was well advanced with the proposed start date appearing a reasonable assumption.

The proposed plant is scoped, assuming the treatment of 0.56 million tpa of Run of Mine ("ROM") ore at a design head grade of 4% copper and 2% cobalt. This plant throughput is expected to give an annual copper production of approximately 20 000 tpa commercial copper cathodes and 11 000 tpa of contained cobalt as a hydroxide salt.

The proposed process facility comprises the following sections:

- crushing and Scrubbing;
- milling and Classification;
- pre Leach Thickening;
- leaching;
- counter Current Decantation (CCD) and PLS Clarification;
- solution Storage;
- tailings Disposal;
- copper Solvent Extraction;
- copper Electrowinning;
- iron/Manganese Precipitation, Thickening and Filtration;
- cobalt Precipitation, Thickening and Filtration;
- cobalt Hydroxide Cake Drying and Packaging;
- reagents Services; and
- air and Water Services.

The 20 000 tpa Cu flow sheet is shown overleaf.

MUTANDA MINING 20 kta COPPER/COBALT PROCESS

BLOCK DIAGRAM

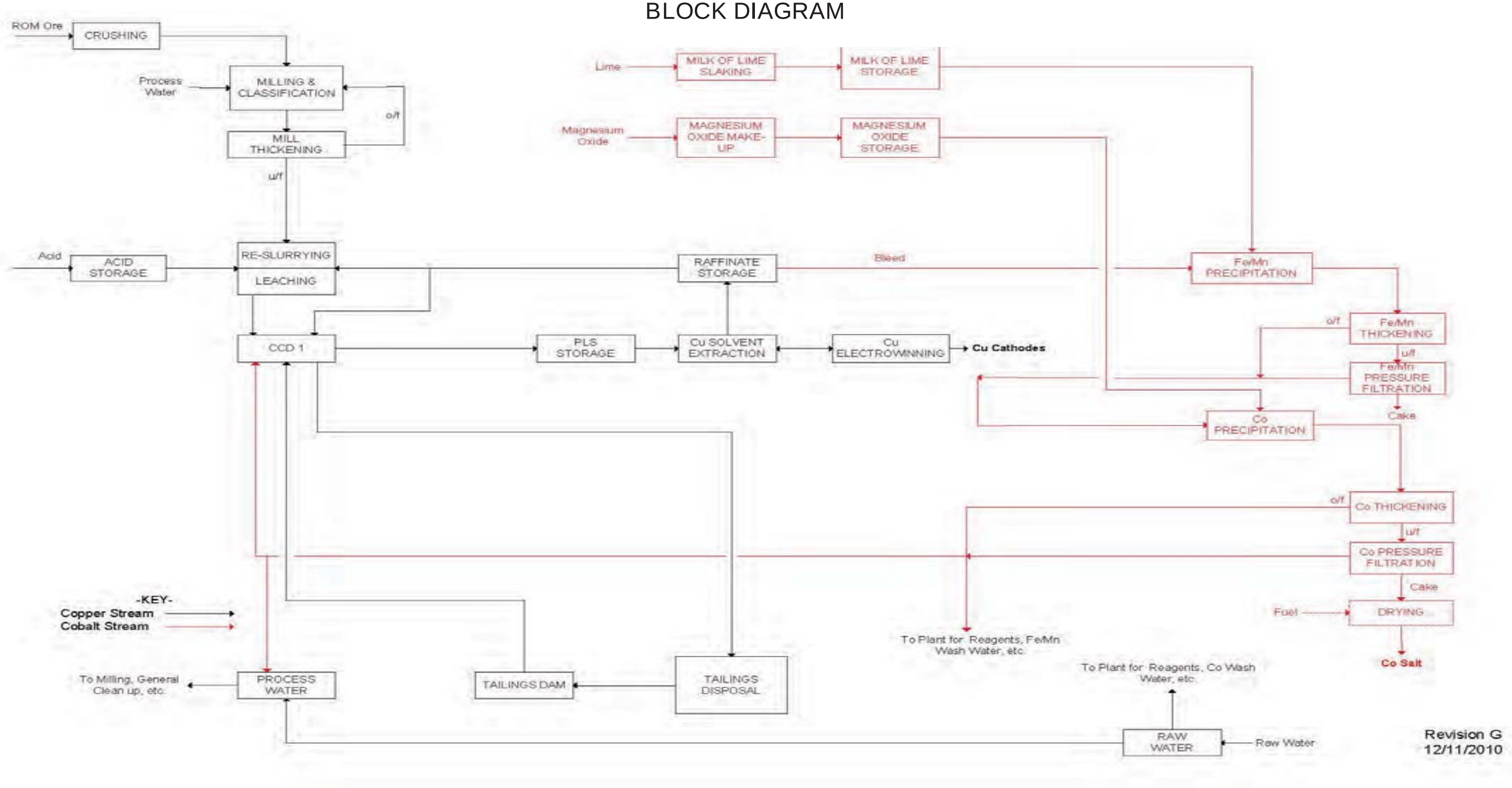

Figure 51: 20 000 tpa Cu Flow Sheet

4.4 Crushing and Milling

The ROM ore will be tipped into a ROM tip bin equipped with a static grizzly which will ensure that oversize material will not report to the primary crusher (oversize material can choke the crusher). Ore will be withdrawn from the ROM tip bin using a variable speed apron feeder to a vibrating grizzly feeder (to scalp off fines) ahead of the primary crusher. A single toggle jaw crusher will be sized for the purpose of primary crushing.

Ore from the primary crusher will be scrubbed ahead of secondary and tertiary crushing to remove clay associated with the ore. The scrubber will be equipped with a trommel screen and oversize material from this screen will be crushed using an open circuit secondary impact crusher while trommel undersize will be wet screened on a double deck screen. Oversize from this screen will be crushed using a tertiary impact crusher, intermediate product will be conveyed to the mill feed bin and the undersize slurry pumped to the mill discharge sump. Both products from secondary and tertiary crushers will be screened on a single deck screen, with the oversize recycled to the tertiary crusher for further size reduction and the undersize reporting to the mill feed bin. A feed bin will be installed ahead of each impact crusher to ensure consistent feed to the crushers.

A dust suppression system will be incorporated in the design of the crushing area. A water spray system will be used to control both process and fugitive dust emissions.

The comminution characteristics of the ore were used as a basis for the design of the crushing circuit. Conveyors will be designed to transport the wet equivalent of the rated dry capacity at the design bulk density.

Figure 52: Primary Crusher

Figure 53: Feed Preparation

Figure 54: Milling Area

A bin with a six hour storage capacity will be installed ahead of the milling circuit for the storage of crushed material. A two way splitter will be located above the bin to divert crushed product to a stockpile during periods when the bin is full. Material can be reclaimed from this stockpile back into the milling facility using a front end loader.

Milling and classification of the crushed ore will be through an overflow discharge wet ball mill operating in closed circuit with a hydrocyclone cluster. Crushed ore will be fed to the ball mill using a variable speed belt feeder and mill feed conveyor. The primary screen undersize will be pumped to the mill discharge sump to join the ball mill discharge. The mill discharge together with the primary screen undersize will be pumped to a hydrocyclone cluster. The overflow from the hydrocyclone cluster will be the circuit product and will gravitate to pre leach thickening while the underflow from the hydrocyclone cluster will gravitate to the ball mill for further size reduction.

The design of the milling area will incorporate a hoist which will be used for grinding media addition into the mills.

The comminution characteristics of the ore were used as a basis for the design of the milling and classification circuit.

4.5 Pre Leach Thickening

The hydrocyclone cluster overflow will gravitate to a thickening facility. Due to the need to further dilute the cyclone cluster overflow in the thickener before thickening to ensure optimum settling of solids, a high rate thickener with auto feed dilution will be incorporated in the design. Thickener overflow will gravitate to a process water tank. This water will be reused as process water to reduce the amount of fresh water introduced to the plant. The thickener underflow will be pumped to the leach circuit.

Bench Top thickening and rheology test work results were used to design the pre leach thickening circuit.

4.6 Leaching

The pre leach thickener underflow will be mixed with acidified raffinate from solvent extraction in a mechanically agitated mixing tank in order to dilute it to the required percent solids concentration for optimum leaching as well as to utilise the free acid in the raffinate. Use of acidified raffinate will also reduce the amount of fresh water introduced to the plant.

Leaching, using acidified raffinate and/or sulphuric acid, will take place in four mechanically agitated tanks operating in a series overflow cascade configuration under atmospheric conditions. A 25% W/w Sodium Metabisulphite solution will be also added to the leach tanks to facilitate the leaching of the Co3+ species by reducing the Co3+ to Co2+.

Results from the leach test work on similar ore supplied by Mutanda Mining and information from similar operating plants were used as a basis for the leach design.

Golder Associates

Figure 55: Leach Tanks

4.7 Counter Current Decantation ("CCD") Circuit

The slurry from the final leach tank will be washed, with cobalt effluent solution topped up with return dam solution, and then thickened in a series of five counter current decantation CCD thickeners. Alternate wash water will be sourced in order of preference from process water, raw water or raffinate.

The overflow from the first CCD thickener will be treated in a clarifier to reduce the amount of suspended solids in the pregnant leach solution ("PLS"). Overflow from the clarifier will gravitate to the PLS pond while the underflow from the final CCD thickener will be pumped to the tailings disposal tank. The clarifier underflow will be pumped back to the CCD circuit or the clarifier feed tank. Due to the need to further dilute the discharge from the final leach tank in the CCD thickeners before thickening to ensure optimum settling of solids, high rate thickeners with auto feed dilution will be incorporated into the design.

Figure 56: Counter Current Decantation Vessels with PLS ponds in the background

4.8 Solution Storage

Clarifier overflow will be stored in a lined pond and pumped to solvent extraction (SX). Raffinate from solvent extraction will be stored in another lined pond and pumped to leaching. Part of the raffinate will also be bled to the cobalt circuit.

An emergency solution pond will be incorporated in the design to capture overflow from the PLS pond and the raffinate pond thus preventing discharge to the environment. A provision will be included for the emergency pond to receive solution from solvent extraction as a result of an SX fire event. A plant catchment pond will also be included in the design.

The basis of the design of the solution storage ponds was to have adequate storage between leaching and solvent extraction to ensure 24 hours operation per day in the solvent extraction and the cobalt circuit. Residence times of 24 hours and 30 hours for the pregnant leach solution pond and for the raffinate pond were therefore used respectively.

4.9 Solvent Extraction (“SX”)

The PLS (aqueous phase) will be pumped to two extraction mixer settlers where it will be mixed with an organic solvent solution consisting of an extractant and diluent (organic phase). The solvent solution will extract the copper from the PLS producing a copper loaded organic stream (loaded organic) and a copper depleted aqueous stream (raffinate).

The loaded organic will be mixed with a solution from electrowinning (spent electrolyte) in two stripping mixer settlers where it will be stripped of the copper producing an advance electrolyte. This advance electrolyte will be filtered using dual media filters to remove entrained organic solution, to prevent ‘organic burn’ on the deposited copper. The advance electrolyte will then be heated using a heat exchanger prior to it being fed to electrowinning. The stripped solvent solution (stripped organic) will be returned to the extraction mixer settlers.

Crud will be treated in a tricanter centrifuge. The organic and aqueous phases will be returned to the circuit. The solid phase will be disposed of. Two fire traps on the lines from solvent extraction to the emergency ponds will be included in the design.

Information from previous projects and similar operating plants was used as the basis for the solvent extraction design.

Figure 57: The Solvent Extraction (SX) Plant

4.10 Electrowinning

Figure 58: Tank House External

Figure 59: Tank House Inside during construction

Advance electrolyte will be pumped to 16 polishing cells before being pumped to 66 commercial cells. Each cell will have 48 cathodes and 49 anodes. Copper will plate onto the cathodes by the process of electroplating. Blank stainless steel cathodes and lead anodes will be used in the cells. The spent electrolyte from the electrowinning banks will be pumped back to the strip section of solvent extraction. After the plating cycle, the cathodes will be removed from the electrowinning cells, washed in a hot water tank, the deposited copper stripped from the cathodes using a semi automatic stripping machine and the blank cathodes returned to the cells. The copper stripped from the cathodes will be the finished copper product.

In order to meet first copper and year end production targets, a number of cells eighteen (18) were brought on line in conjunction with the heap leach and SX plant. This enabled fast commissioning of rectifiers and tank house whilst generating revenue.

Figure 60: Lead Anodes being fitted to the Electrowinning Cells during construction

Figure 61: Copper Cathode from the Heap Leach Operation in September 2010

4.11 Cobalt Circuit

The cobalt circuit will have two sections, namely iron manganese removal and cobalt hydroxide recovery. Both sections will treat solution at elevated temperatures.

4.11.1 Iron and Manganese Removal

A portion of the raffinate solution from the storage pond will be recycled to leach and the balance will contacted with lime slurry and a sodium metabisulphite solution in a series of four mechanically agitated tanks at a pH of 3.5. Steam will be directly introduced into the tanks to heat the solution to approximately 40 degrees Celsius. Low pressure air will also be introduced in the tanks using a low pressure air blower. Iron, manganese, some aluminium and a little copper will be precipitated under these oxidising conditions. The slurry from the last tank will be thickened and filtered with the resulting solution pumped to cobalt precipitation and the residue disposed of. Some of the thickener underflow will be recycled to the first iron manganese precipitation tank as a reseed to promote crystal growth during precipitation.

Test work results and information from previous projects and operating plants were used as the basis for the Iron and Manganese Removal Circuit design.

4.11.2 Cobalt Hydroxide Recovery

The combined thickener overflow and filtrate from the iron manganese circuit will be contacted with 20% m/m magnesium oxide slurry in a series of five mechanically agitated tanks at a pH of 8.2. Steam will be directly added to the tanks to heat up the solution to 50 degrees Celsius. Cobalt and remaining copper in solution will be precipitated under alkaline conditions. The slurry from the last tank will be thickened and filtered in filter presses. Some of the thickener underflow will be recycled to the first cobalt precipitation tank. The resulting effluent solution will be pumped to a lined storage pond for plant use distribution. The resultant cobalt hydroxide cake will be dried in a belt dryer and packaged in bulk bags as the finished cobalt product.

Test work results and information from previous projects and operating plants were used as the basis for the Iron and Cobalt Hydroxide Recovery Circuit design.

4.12 Reagents and Consumables

Facilities to make up, store and distribute reagents and consumables will be allowed for in the design. These reagents and consumables will include concentrated sulphuric acid, hydrated lime, sodium metabisulphite, magnesium oxide, flocculants, extractant, diluents, crusher liners, grinding media and mill liners. The reagent consumptions obtained during test work and information from previous projects were used to estimate the size of the equipment associated with mixing, storage and distribution of most of the reagents.

4.12.1 Sodium Metabisulphite

Partitioned tanks have been incorporated in the design to cater for mixing and storage of Sodium Metabisulphite. The design of make up and storage facility will be based on three make ups per day and approximately 10 hours storage and dosing.

4.12.2 Magnesium Oxide

The design of the make up and storage facility will be based on 673 make ups per day and approximately 4 minutes storage and dosing.

4.12.3 Flocculants

Except for the larger flocculant tanks, partitioned tanks have been incorporated in the design to cater for mixing and storage of flocculants.

Cobalt Sulphate solution will be obtained from a small bleed off the stream after iron manganese precipitation. Capacity of the storage tank will be one day.

4.12.4 Diluent and Extractant

The diluents will be stored in a single storage tank which will hold approximately 40% of the organic inventory of the solvent extraction circuit. The diluent will be periodically added to the solvent extraction circuit.

The extractant will be stored in the iso containers it is delivered in and will be periodically added to the solvent extraction circuit directly from the containers using a pump.

4.12.5 Grinding Media

The ball mill grinding media consumption is based on Bond's estimating method using abrasion index results obtained from comminution test work.

The ball mill liner consumption has been based on Bond's estimating method using abrasion index results obtained from comminution test work.

4.13 Air and Water Services

4.13.1 Air Services

High pressure air will be supplied to the plant in general plus iron manganese thickening and filtration, Cobalt thickening and filtration and instrument air by four screw compressors, three working and one standby.

Low pressure air is required in iron/manganese precipitation and will be supplied by four low pressure compressors. A bare shaft low pressure air compressor will be procured and installed in the event that one of the duty low pressure air compressors breaks down.

4.13.2 Water Services

A breakdown of the water requirements is shown below and will be used as the basis for sizing of the transfer pumps. The water streams to be catered for are:

- process water;
- raw water (raw water and fire water);
- potable water;
- gland Water; and
- safety Shower header tank.

4.14 Other Mineral Processing Activities

A 50 tph Dense Media Separation ("DMS") plant has been in operation for three and a half years producing a low grade cobalt/copper concentrate. This is shipped out in 1t Bulk Bags and has contributed significantly to the project cash flow and enabled the establishment of infrastructure on site prior to the hydrometallurgical plant coming on stream.

The intention is to continue to use the 50tph plant during the 2011 financial year to supplement the ramp up in copper cathode by producing 17,133 mt of copper contained in a 25% copper oxide concentrate which will be shipped to Zambia.

4.14.1 Acid Plant

A 390 tpd sulphuric acid plant and 73 tpd liquid SO^2 plant is under construction, with a planned completion date of August 2011. This will offset the requirement to truck in sulphuric acid by road and will limit the amount of trucks required to carry the acid plant reagents. The liquid SO^2 plant will substitute Sodium Metal bisulphite in the liberation of cobalt. This will enable significant cost savings of ± USD30 million per annum based upon the current costs of importing these reagents.

Figure 62: Cobalt DMS Plant

Figure 63: Screening Plant

4.15 Expansion Programme

The next phase of 40 000 tpa of additional Cu and 12 000 tpa of Co (Phase 2) is already under construction, with civils and mechanical erection well underway. This is due for completion in August 2011.

Figure 64: 40 000 tpa Module Electrowinning Cells Already in Position

The plant is similar in construction to the 20 000 t plant, though has been designed to be robust and flexible to significantly expand production ultimately up to 80 ktpa Cu through the second phase plant as part of the phase 3 expansion project.

A Phase 3 plant design is underway to utilise flexibility in the Phase 2 plant to expand production up to 110 ktpa Cu with no envisaged expansion in Cobalt. This is expected to cost USD103 million and completion is anticipated in Q1-2012. Phase 3 and Phase 2 will be constructed concurrently.

From the block flow diagram overleaf, it can be seen that the phase 1 and phase 2 plants are integrated and where possible exact "copy and paste" designs have been used to minimise engineering design costs and fast track construction.

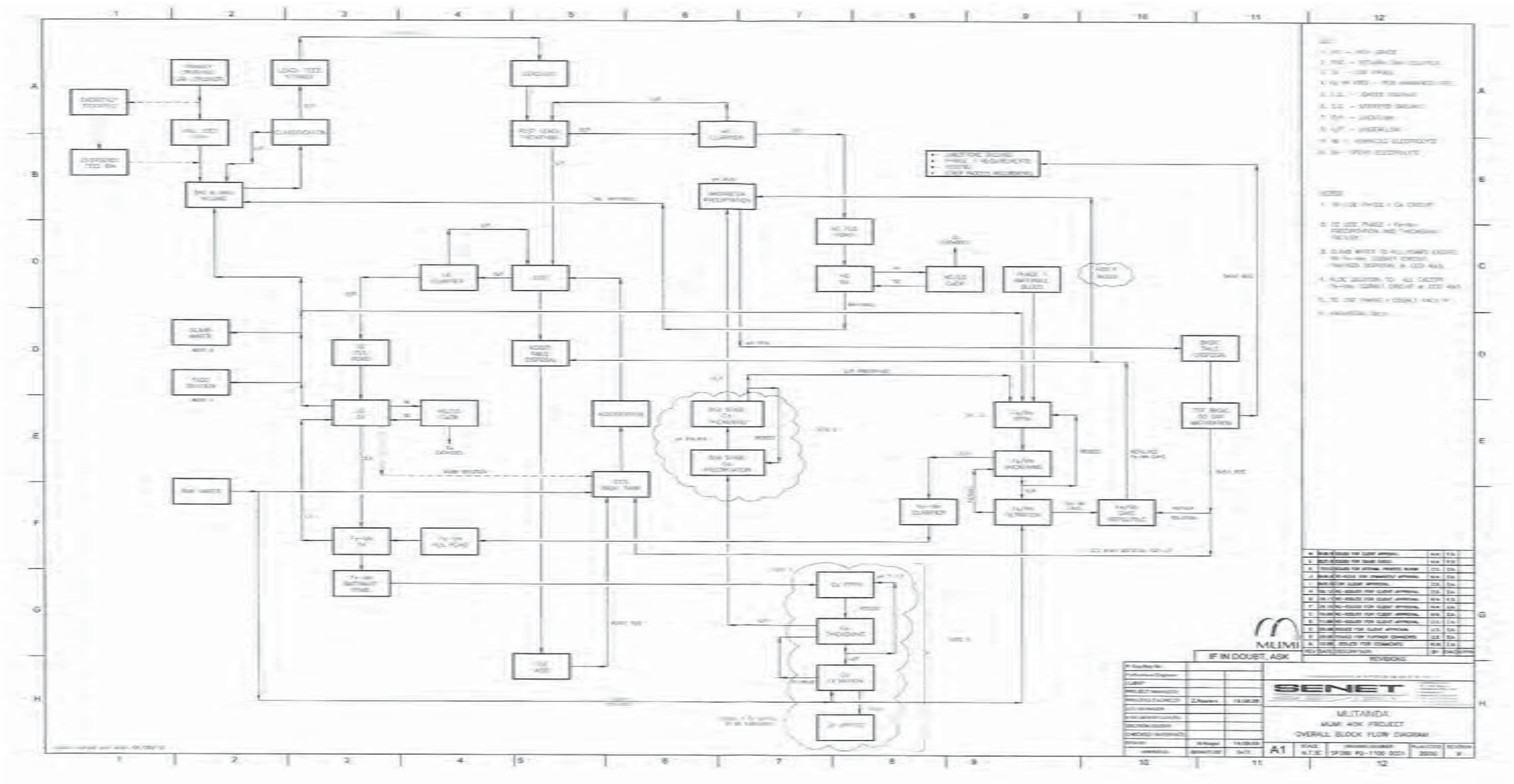

Figure 65: 40 000 Block Flow Diagram

4.16 Risk

One significant risk to the operation is the logistics associated with bringing materials into the country. Mutanda has gained valuable experience in both inbound and outbound logistics, as a result of the capital expansions (inbound freight) and concentrate exports (outbound freight). Mutanda, through its partners expedite approximately 400 - 500 trucks per month out of the DRC and manages 300 - 400 trucks coming in with consumables and capital items. There are other potential risks in transporting by road and where possible Mutanda attempts to mitigate these as they occur. In addition 3 000 - 4 000t per month of outbound exports are transported via rail to Ndola and then trans-shipped by road to South Africa.

Power, whilst supply has been negotiated and agreed, actual power delivery still has a level of associated risk which the project team have worked hard to integrate.

Social risks, the DRC cannot be considered stable in the first world sense and may be subjected to various levels of labour unrest. It should be noted, however, that to date Mutanda has not had one day of labour related unrest on site and works to employ from local villages to enhance the quality of life in the surrounding area. Mutanda is involved in a large number of social projects including projects in healthcare, agriculture, water and infrastructure, as part of its ongoing commitment to social responsibility.

4.17 Summary

The first 20 000 tpa Cu and 11 000 tpa Co production phase for Mutanda was nearing completion at the time of our visit. At the same time, the 40 000 tpa Cu and 12 000 t Co production expansion was also underway with an estimated start date of August 2011 and with further expansion planned to ultimately take copper production to 100 000 tpa by Q1-2012.

The plant design utilises modern technology coupled with the selection and installation of industry proven equipment.

Once copper and cobalt production commences, the revenue generated can be used to not only cover the ongoing Opex costs but commence payback of the Capex.

5.0 TAILINGS AND WASTE

5.1 Background

The Mutanda Mine's Tailings Storage Facility ("TSF") covers an area of approximately 65 ha. Construction of the dam is still in progress and December 2010 is the expected date of completion of Phase 1. Phased construction of the embankment is being implemented with the initial construction up to elevation 1392 metres above mean sea level (mamsl). This will provide two years of storage for 1 million dry tonnes of tailings. The embankment will be raised by 10.6 m, increasing the life of the TSF to ten years. After ten years the TSF is expected to store approximately 5.0 million dry tonnes of copper tailings. The rate of deposition is therefore expected to be 500 000 tonnes per annum. The downstream method of phased construction will be used to raise the embankment. The embankment spans from the western flank, all the way around to the south eastern corner (see Figure 66). The northern part of the dam is formed by a natural hill, higher than the starter wall. Due to some of the acidic properties of the tailings, the TSF is fully lined with a composite liner consisting of a 1.5 mm HDPE geomembrane (see Figure 67 and Figure 68) overlaying a 300 mm thick layer of compacted clay. A series of toe drains below the liner, for seepage detection, are located at the upstream toe of the embankment. These drain to a sump on the south eastern part of the embankment.

The main delivery pipeline will be a NB 160 carbon steel pipe. A spigot system will be used to deposit slurry into the dam from the upstream edge of the starter embankment. The rate of rise for the tailings dam deposition is to be limited to between 1.8 to 2.0m per annum. A pump barge will be installed to pump supernatant water from the TSF into the return water pond ("RWP") located at the south western corner of the TSF (see Figure 66). The supernatant water will be returned back into the plant for re-use. Due to the acidic nature of the water, the same composite liner system will also be adopted in the RWP. The drainage and seepage interception trenches in the TSF lead to a sump on the south part of the embankment. This water is then pumped into the RWP.

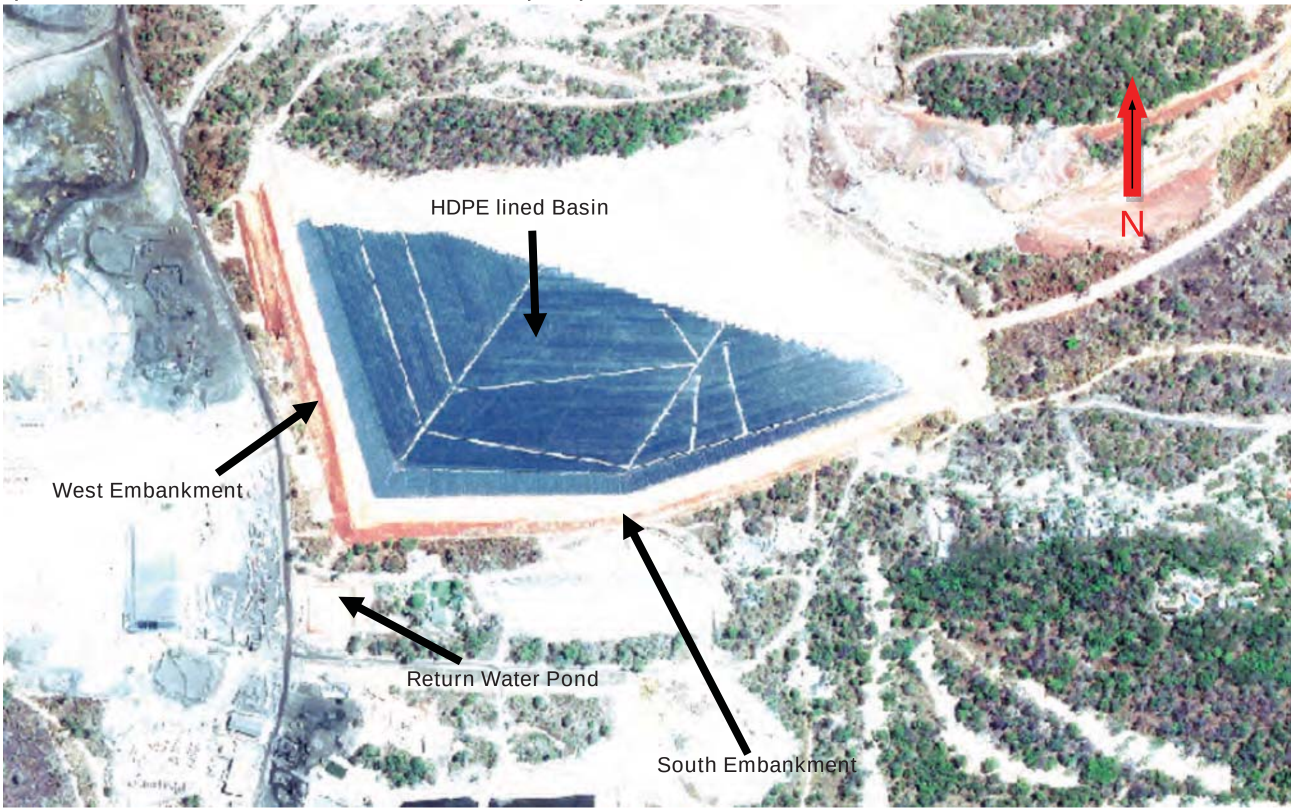

Figure 66: Layout of the Mutanda Tailings Storage facility

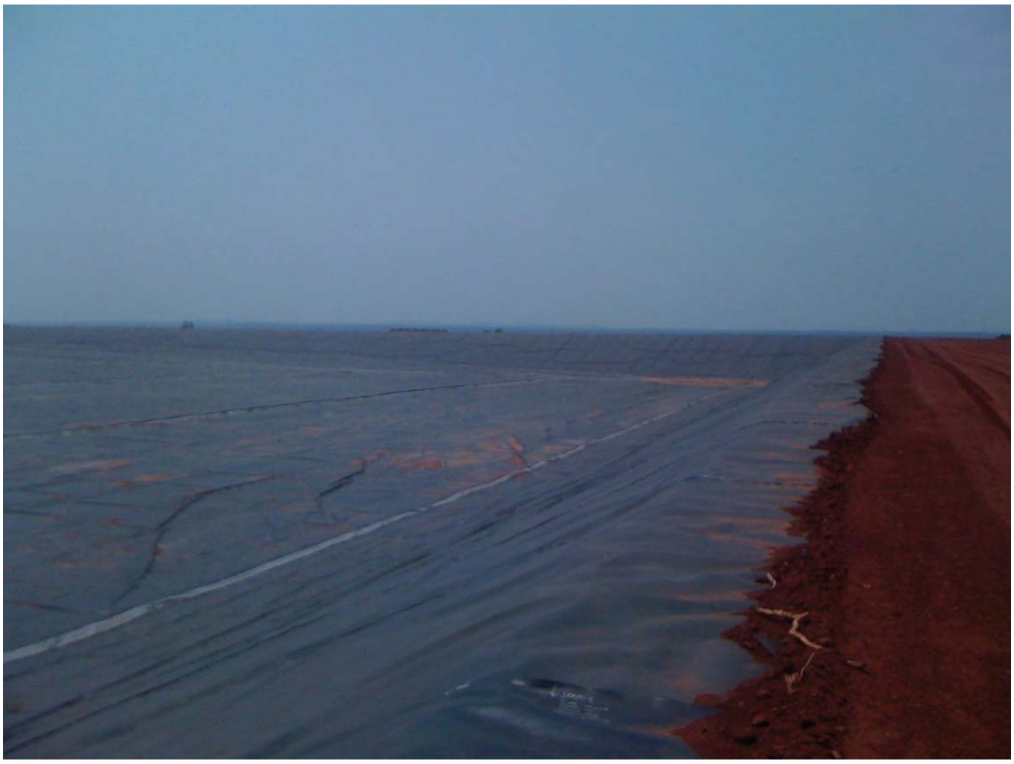

Figure 67: Basin of Mutanda Tailings Dam as seen from the western embankment

Figure 68: Mutanda Tailings Dam during liner installation

5.2 Desktop Review of Available Environmental Reports

The following reports were presented for the review of the operation, maintenance and closure of the Mutanda Tailings Storage Facility:

- Mutanda Tailings Storage Facility: Design and Initial Operation Requirements, Report No. 01 Final, December 2009, Metago Environmental Engineers (Metago 2009).
- Mutanda Ya Mukonkota Project Environmental Adjustment Plan, Report No. MUTANDA/CG/LM/002/07, 2007, MUTANDA SPRL.

5.3 Assessment of Compliance with Statutory Requirements

According to Article 64 of the Democratic Republic of Congo's ("DRC:) mining code, to own and operate a tailings facility, a mine only requires an operating license or "Certificate d'Exploitation" for the concession on which it intends to construct a tailings storage facility. As part of the process of obtaining this license, the method of tailings containment or effluent discharge must be referenced in either the Feasibility Study or Environmental Impact Statement ("EIS"), submitted by the mine to the Ministry of Mines ("CAMI"). Mutanda submitted an Environmental Adjustment Plan ("EAP"), which is also acceptable . Mutanda has an operating license for concession PE662, which is the concession on which the Mutanda Tailings Storage Facility is constructed. Article 64 then allows for Mutanda to mine the resource and develop / construct the necessary supporting infrastructure (i.e. tailings facilities), effectively rendering Mutanda the license to own and operate the Mutanda Tailings Storage Facility.

Due to the fact that the tailings dam is still under construction, assessment of the tailings dam can only be based on the design report (Metago 2009) and the measures that are put in place to operate the dam once it is commissioned.

The following routine operation procedures are listed in the design report:

- repair any erosion damage on the outside of the embankments;
- rotate and reverse the tailings delivery pipeline every three or four years;
- reinstate any signs;
- remove and reinstate any damaged or blocked valves, pipes and spigots;
- ensure firebreaks are maintained, as necessary; and
- movement of HDPE pipes.

The above operating procedures are the responsibility of Mutanda.

5.4 Identifying the Main Areas of Environmental Risk and Performance

The main areas of environmental risks associated with the operation of the facility are listed below. Some of the planned mitigation measures are listed, as stated in the design report of the tailing dam.

- Dust: Dust monitoring along the perimeter of the TSF should be implemented once the TSF is operational.
- Groundwater: Installation of monitoring boreholes has been planned, as stated in the design report, in order to monitor the groundwater quality around the TSF.
- Seepage/Leakage: Leakage detection drains have been installed underneath the HDPE at the upstream toe of the embankment. The flow rate at the outlets to these drains is to be measured weekly.
- Surface water: Stormwater trenches will be constructed on the upstream side of the northern and eastern access roads to intercept any stormwater and ensure the separation of clean and dirty water.
- Freeboard: A minimum freeboard of the 900 mm between the pool and the crest of the outer embankment is to be maintained throughout the life of the dam. The pump barge that will be installed will help pump the supernatant pool water out of the tailings dam into the RWP, to maintain the specified freeboard level.
- Stability: Piezometers are to be installed at the south west corner of the tailings dam and will be extended as the level of the embankment increases. They are to be monitored on a weekly basis.
- Closure: Careful attention has to be paid to the downstream slopes of the embankment. The gullies that may form must be repaired as soon as they appear, until vegetation has started for long term rehabilitation of the embankment. The southwest corner is of importance since it is the highest part of the embankment. Short term vegetation should be implemented to prevent the erosion of the slopes.

5.5 Review of Rehabilitation Provisions and Liabilities

The closure and rehabilitation objectives for the Mutanda tailings dam are included in the TSF design report (Metago 2009). The closure plan has not yet been completed but this is standard practice for a facility that has not yet been commissioned. A detailed closure plan and cost estimate for the TSF is therefore required. The plan can then be incorporated into the mine's overall closure plan which has been completed and submitted as part of the EAP but currently excludes the TSF.

5.6 Summary of Assessment of Health and Safety Management Programmes

As part of the EAP, a health and safety management plan was drawn up for the mine, which includes the Mutanda tailings storage facility. The responsible personnel are listed for the safety of the people and infrastructure on the site. An emergency preparedness plan is to be prepared and included as part of the operating and maintenance manual.

5.7 Details of Injury and Fatality Statistics

There are no statistics of injury and fatality for the tailings dam available because it is still under construction.

6.0 CLOSURE

6.1 Approach and Limitations to Closure Cost Review

6.1.1 Approach

An indicative closure cost estimate, based on available information, was conducted to serve as a basis for the review of the provided closure costs. The approach followed is summarised as follows:

- Identification and delineation of the relevant mining areas and associated infrastructure, primarily from Google Earth imagery and limited available plans;
- Identification of infrastructure and land use sub-categories within the above mining operations area characterised by similar conditions, for example light, medium or heavy infrastructural areas, waste rock and spoils stockpiles, and moderately or severely disturbed surface conditions, etc;
- Interpretation of the type, nature and sizes of structures from available information and measurement of the delineated areas in AutoCAD;
- Determination/verification of unit rates for plant dismantling and demolition, as well as associated reclamation, as per recent tenders available to GAA, similar work conducted recently in Africa, as well as consultation with demolition practitioners;
- Application of the above unit rates and associated quantities in spreadsheets arranged into sub-categories to illuminate the respective closure cost components for the cost review;
- Objectively determining the indicative closure cost based on the approach and criteria adopted by GAA for this review and comparing the findings from this costing to the existing closure costs conducted by the other consultants; and
- Compilation of a report reflecting the approach applied by GAA in determining the closure costs, as well as the cost comparison. Matters requiring attention to ensure that future closure costing is improved and more realistic are also listed.

6.1.2 Limitations

- This review of the existing closure costs was conducted as a desktop assessment as a result, the closure cost estimation provided by GAA is indicative only, acting as a basis for comparison of the available costs and to assess whether these are appropriate (order of magnitude). An overall one day site visit to the mine site in support of the overall project, also addressing closure cost aspects, was conducted. This time on site was not sufficient to gain a full understanding of the closure related site aspects;
- Maps delineating the exact areas under control of the mine and/or that have to be covered by their closure cost provision were not available at the time of this review. Hence assumptions had

to be made, reflecting GAA's "best" understanding of the closure cost related battery limits of the mine and related sites.

6.2 Available Information

The sources of information used for the closure cost estimate were as follows:

- closure Cost Schedule of Quantities.xls, by Knight Piesold Consulting; and
- Mutanda Copper and Cobalt Mine, 2010 Closure Cost Assessment for Mutanda Mining, by Knight Piesold Consulting. Report no 301-00293/02.

The above Knight Piesold report primarily focuses on the break down and delineation of sub-areas and/or closure cost components for calculation purposes, with limited information on the approach and methodology applied with the determination of the closure costs.

6.3 Battery Limits

The above reports and associated information do not clearly stipulate the battery limits for which the documented closure costs apply. Battery limits were assumed from the available information and the interpreted Google Earth imagery.

These limits are described below and reflected on (Figure 69). The infrastructure description obtained from the available information is listed separately from those aspects inferred from the imagery.

The key surface areas identified from the imagery can be summarised as follows:

- developed and fugitive disturbed areas: 266ha;
- main infrastructural area and related areas : 7ha;
- tailings storage facilities overall delineation: 53.2ha; and
- tailings storage facilities already filled by tailings: 0ha (under construction).

Figure 69: Battery limits assumed for GAA's cost review

6.3.1 Available information

The infrastructure inventory and description obtained from the existing closure costs are as follows:

- administrative offices and accommodation;
- open pit mining operation;
- 20K plant;
- 40K plant;
- TSF (under construction);
- stores area;
- DMS plant;
- heap leach dump;
- general areas; and
- electrical sub-station.

6.3.2 Additions by GAA

The following closure costing components and related activates were also considered by GAA in the determination of the indicative closure cost estimate:

  - handling and disposal of demolition waste;
  - reclamation of disturbed areas, including the collection, handling and disposal of contaminated soil as well as the removal and disposal of fugitive concrete.
  - additional allowances, including preliminaries and general (“P&Gs”) and contingencies.

- Although there could be the possibility of ongoing management of contaminated excess mine water arising from the reclaimed mine workings, involving collection, handling, treatment and safe disposal of the treated mine water, the need and nature of this is unknown and hence has been omitted from the closure cost estimate. If required, this could add a notable additional cost.

6.4 Assumptions and Qualifications

The assumptions and qualifications listed below have been made with respect to the closure cost estimate.

6.4.1 General

- The closure costs for the plant site could comprise a number of cost components. This report only addresses the decommissioning and reclamation/restoration costs, equating to an outside (third party) contractor establishing on-site and conducting the decommissioning and reclamation-related work. Other components such as staffing of the plant site following decommissioning, the infrastructure and support services (e.g. power supply, etc.) for the staff, as well as workforce matters such as separation packages, re-training/re-skilling, etc., are outside the scope of this report;
- Based on the above, dedicated contractors would be commissioned to conduct the demolition and work on the mining site and associated areas. This would *inter alia* require establishment costs for the demolition and reclamation contractors and hence, the allowance of P&Gs in the cost estimate. Allowance has also been made for third party contractors and consultants to conduct post closure care and maintenance work, as well as compliance monitoring;

- It is foreseen that demolition waste, such as concrete and building rubble, would be largely inert and that a dedicated waste disposal facility will be licensed and constructed for the purpose of disposal of demolition waste. Provision has also been made for the reclamation and closure of the waste disposal site. Steel and related material from the plant demolition which has salvage value will remain on-site for sale to third parties;
- Although the existing plant and related surface infrastructure could have salvage or resale value at closure, no cost off-sets due to possible salvage values were considered in terms of accepted practice and thus only gross closure costs are reported;
- Concrete footings and bases would be demolished to a maximum of 1 000 mm below the final surface topography;
- All useable stockpiles of raw and/or saleable material would have been processed and removed off-site at closure and none of these would remain on site, thus requiring reclamation; and
- The existing villages would not be demolished, but would be transferred to third parties. This also applies to the services related to the village such as water supply and sewage treatment.

6.4.2 Site specific

It has been assumed that at mine closure the mine site and associated disturbed areas will be reclaimed to a sustainable predetermined final land use. This will not only require the dismantling of the physical infrastructure and addressing the aesthetic effects of the reclaimed mine site, but also addressing the residual impacts of the operations on the receiving environment. Therefore, the GAA closure cost estimate addresses, as far as reasonable, the possible latent and residual effects. In this regard the following site-specific closure measures have also been included in the cost estimate:

- The rehabilitation of evaporation/pollution control ponds will include the following:
  - removal of sediment up to a depth of 400mm;
  - removal of synthetic liner;
  - removal of contaminated soil that could have occurred in those places the liner has leaked; and
  - collection, transport and disposal of the contaminated sediment and soil.
- Different shaping, levelling and re-vegetation methods will apply for disturbed areas based on the nature, extent and severity of disturbance. The following categories have been assumed:
  - generally disturbed areas, characterised by transformation or partial absence of vegetation with limited erosion or soil contamination;
  - areas from which infrastructure has been removed, characterised by severe transformation of the landscape and significant soil contamination and harmful material; and
  - severely disturbed areas characterised by excessive erosion and complete transformation of the land cover.
- Dedicated rates for the shaping, levelling and reclamation have been applied for the above categories.
- Removal of contaminated soil from disturbed areas as part of general surface reclamation is required for approximately 2 percent of the reclaimed infrastructural footprint areas;
- Allowance has been made for a nominal amount of fugitive concrete to be removed and disposed of; and

- Allowance has been made for care and maintenance as well as surface and groundwater quality monitoring to be conducted for a minimum period of 5 years to ensure and assess success of the implemented reclamation and closure measures;

6.4.3 Additional allowances

- Fixed ratios for P&Gs (12 percent) and contingencies (10 percent) have been applied;

6.5 Closure Cost Comparison

To provide a structure for the cost comparison, the costs are presented in a format routinely used for closure cost determinations, addressing the following categories:

- infrastructural areas;
- mining areas;
- general surface reclamation;
- water management;
- post closure aspects; and
- additional allowances.

The closure costs determined by Knight Piesold Consulting and GAA are reflected in Table 15 and Table 16. Table 15 provides an overall summary of the cost comparison, whilst Table 16 provides a comparison of closure measures and related costs. The indicative costs by GAA indicate that the costs by Knight Piesold are most likely too low. This could mainly be due to the following:

- a general discrepancy in the battery limits adopted for the respective closure cost estimates;
- over emphasis on the demolition of the surface infrastructure by Knight Piesold and too little attention to reclamation of disturbed areas;
- allowance for the safe disposal of demolition waste and the creation and final reclamation of a dedicated site for this purpose by GAA; and
- clean-up and safe disposal of contaminated soils and fugitive contamination.

Table 15: Overall cost comparison

Closure component	Knight Piesold Consulting 2010 (NPC 2010)	GAA 2010
1. Infrastructural areas	$1,283,515.58	$1,700,869.38
2. Mining areas	$1,559,985.22	$1,545,574.44
3. General surface reclamation	$683,176.95	$3,045,152.00
4. Water management	$0.00	$93,100.00
Subtotal 1 (for infrastructure and related aspects)		$6,384,695.82
5. Post closure aspects	$0.00	$313,320.00
Subtotal 2 (for post-closure aspects)		$313,320.00
6. Additional allowances	$352,667.78	$1,404,633.08
Subtotal 3 (for additional allowances)		$1,404,633.08
GRAND TOTAL	$4,302,546.86	$8,102,648.89

Table 16: Detailed comparison of closure measures and related costs

Category with sub-categories	Evaluation
6.5.1 Infrastructural areas	
■ Dismantling of processing plant and related structures; ■ Demolition of steel buildings and structures; ■ Demolition of reinforced concrete buildings and structures; ■ Reclamation of access roads, railways and power lines; ■ Demolition of offices, workshops and residential buildings; ■ Stream diversions; ■ Fencing; and ■ Disposal of demolition waste.	■ The respective battery limits for the surface infrastructure appears to be different. Since no map was supplied with the Knight Piesold costing this could not be clarified; ■ The Knight Piesold costing for dismantling of processing plant is to a greater level of detail than the GAA costs. However, it appears that the costs associated with general surface reclamation for each battery area was included with the infrastructural area. Hence, it is difficult to compare the infrastructural areas. The GAA costing was based on the extrapolation/adaptation of verified costs for similar mining/industrial complexes; ■ The GAA costing includes the establishment, operation and closure of a dedicated waste disposal site for the decommissioning and restoration as it is assumed that another suitable site is not available; and ■ The GAA costing for infrastructural areas is more expensive than the Knight Piesold costing mainly due to the waste collection, handling and disposal that was included in the GAA costs.
6.5.2 Mining areas	
■ Opencast reclamation including final voids and ramps; ■ Excavations; ■ Sealing of shafts, adits and inclines; ■ Shaping of stockpiles, waste rock and overburden dumps; ■ Vegetation of stockpiles, waste rock and overburden dumps; ■ Reclamation of processing waste deposits and evaporation ponds; and	■ The Knight Piesold appears to have costed for reclamation of overburden and spoils. However, these costs are compounded into different battery areas and thus difficult to compare to the GAA costs; ■ The Knight Piesold costing allows for the reclamation of infrastructure, a tailings dam and a golf course which has not yet been constructed, whereas the GAA costing does not. ■ The Knight Piesold costing allows for the reclamation of a heap leach which is not evident from the Google image; ■ GAA costs allow for the reclamation of all generally disturbed areas and the

Category with sub-categories	Evaluation
■ Reclamation of subsided areas.	clean-up of possible contamination over these areas; and ■ GAA costing is more expensive due to the greater attention to surface rehabilitation
6.5.3 General surface reclamation	
■ Shaping of disturbed areas; and ■ Vegetation of disturbed areas.	■ The Knight Piesold costs allow for the general surface reclamation at an inclusive rate per battery area, whereas the GAA costs allow for the reclamation (shaping and vegetation) of 266 hectares of disturbed areas as identified and delineated from the aerial imagery; ■ The GAA costs allow for clean-up of contaminated soils over 20 percent of the infrastructural area, which appears to not be included in the Knight Piesold costs; ■ In addition, the GAA costs allow for the removal and disposal of 500m^3 of fugitive concrete; and ■ The GAA cost is less expensive, which could be attributed to differences in reclamation assumptions.
6.5.4 Water management	
■ Reinstatement of drainage lines; and ■ River reclamation.	■ The costs under this cost category cannot be compared, because there are no drainage lines.
6.5.5 Post closure aspects	
■ Surface water quality monitoring	■ GAA cost allows for surface, groundwater and reclamation monitoring, as well as care and maintenance for a minimum period of 5 years over an area of 266

Category with sub-categories	Evaluation
■ Groundwater quality monitoring ■ Reclamation monitoring ■ Care and maintenance ■ Ongoing water treatment	hectares; ■ GAA has not made any allowance for ongoing water treatment, but due to the nature and extent of contamination this could be required. This could have a notable effect on the computed closure costs. ■ The costs cannot be compared, because the Knight Piesold costing appears to have omitted post-closure aspects.

6.5.6 Additional allowances

■ Preliminary and general ■ Contingencies	Both the Knight Piesold and GAA costs allow 12 percent for preliminaries and general and 10 percent for contingencies.

6.6 Conclusions

The findings as reflected in this report have primarily been based on the interpretation of Google Earth images of the respective sites, with limited input from the supporting information provided by the mine. Moreover, in those instances where the required information was not available, estimates were made based on experience. Unit rates for the purpose of the review were obtained from GAAs' existing data base and/or from demolition practitioners. Where required, these were adapted to reflect site-specific conditions.

The review of the existing closure costs as well as recommendations in this regard has been completed from a risk-averse perspective and mainly errs on the side of caution. This approach allows for the costs to be refined as appropriate information becomes available, as opposed to possible under-estimation and associated provision that could lead to liability shortfalls.

This review concludes that the Knight Piesold Consulting closure costs estimate (US$ 4,3 million) are most likely not adequate to address the envisaged decommissioning and restoration requirements, albeit that a large portion of the site is still under construction. GAA believe that fair and reasonable closure estimate would be approximately US$ 8,1 miilion.

7.0 ENVIRONMENTAL, HEALTH AND SAFETY

The key objective of this audit was to identify major environmental or social impacts and stakeholder concerns associated with Mutanda Mine operations which might represent a significant liability in regard to the proposed listing of Glencore International plc on the London and Hong Kong Stock Exchanges.

Specifically this involved assessing the following items:

- the scope and content of the Environmental and Social Impact Assessment ("ESIA") and EMP;
- the status of environmental authorisations;
- compliance with permit and statutory conditions;
- compliance with the Equator Principles where sufficient site information was available to do so;
- major environmental and social risks and liabilities, specifically in regard to mine closure.

The geographical extent of the audit was limited to mining-related facilities and activities in the Mutanda Mine concession Area as defined in Section 3.0 of this report.

7.1 Mining Infrastructure

Mining assets associated with the Mutanda Mine include:

- the East Pit, which is currently being mined at a depth of approximately 40 m below surface;
- the Central Pit, which is currently being mined at a depth of approximately 60 m below surface;
- the Central Northwest ("CNW") Pit which will be mined in 2011; and
- the Clinic Quarry Pit which is mined for aggregate.

The estimated LOM has been provisionally set at 20 years.

7.2 Mineral Processing Infrastructure

Mutanda is in the process of constructing a treatment plant to recover copper and cobalt from the feed being obtained from the open pits. The process plant at Mutanda will produce copper cathode sheets and a cobalt salt. Current and proposed mineral processing facilities are discussed in the subsections that follow.

7.2.1 Phase I (20 000 tpa processing plant)

The first module is a 20 000 tpa plant, of which the Cu Plant had been operational since September 2010 whilst the Co Plant was expected to be commissioned in February 2011. The planned feed grade for the Phase I plant is 4% Cu and 2% Co, with a copper recovery of 90%.

The process flow for the 20 000 tpa plant includes: crushing and milling; leaching with sulphuric acid and recycled raffinate; counter-current decantation (“CCD”); solvent extraction (“SX”) and electrowinning (“EW”).

7.2.2 Small-scale site processing facilities

The following small-scale mineral processing facilities were operational on site at the time of the audit:

- A Dense Media Separation (“DMS”) plant which upgrades the cobalt content to produce cobalt concentrate. Significantly increased production against budgeted targets had resulted in bags of concentrate being stacked all over the site at the time of the audit. The DMS plant was operational before the formation of the Joint Venture and will be decommissioned at the end of 2011 (pers. comm. A van der Merwe).
- A heap leach operation had been established to provide a copper-rich solution to the electrowinning circuit prior to the plant being commissioned. Mutanda intends establishing a second heap leach facility in the northwest corner of the concession to feed to the third electrowinning tank house which was under construction at the time of the audit. Both heap leach facilities will operate on a permanent basis as and when suitable ore is available. (pers. comm. A van der Merwe).

7.2.3 Phase II (40 000 tpa processing plant)

Construction of the Phase II expansion plant (at a 40 000 tpa of copper production) was underway at the time of the audit, with commissioning expected by the end of the third quarter of 2011. The 40 000 tpa flow sheet is similar to that of the 20 000 tpa plant, with the addition of up-front SAG milling for the increased throughput.

A phase 3, 40,000t copper expansion module is being constructed concurrently with phase 2, and is due for mechanical completion in Q1-2012 to push production up to 110,000 tonnes of copper cathode and 23,000t of cobalt in the form of a cobalt hydroxide.

7.2.4 Tailings storage facilities (TSFs)

The following TSFs are present on the Mutanda site:

- old tailings associated with the DMS plant; and
- a new 65 ha TSF which was established for the project processing plant (Mutanda TSF).

The DMS tailings will be recovered into the new processing plant and all further discussion below therefore relates to the Mutanda TSF.

The current design life of the TSF is 10 years and it is expected that 5.0 million dry tonnes of Cu tailings will be deposited during that period. The starter wall spans from the western flank all the way around to the south eastern corner. The northern part of the dam is formed by a natural hill, higher than the starter wall. The TSF is in the process of being raised approximately 10m higher than at the time of the audit to draw level with this hill.

Deposition is via a spigot system, with the main delivery pipe being located on the higher northern side of the TSF. A pump barge will be installed to pump the water into the fully lined return water dam (RWD). TSF seepage interception trenches lead to a sump on the southern extent of the embankment and this water is also then pumped to the RWD. RWD water will be recycled back to the processing plant. The TSF is fully lined with one layer of 1.5mm HDPE on top of a compacted 300mm natural clay layer to prevent the possibility of acid seepage.

In terms of Article 64 of the DRCs' Mining Code, no specific permits are required to own and operate a TSF provided that:

- an operating license or "Certificate d'Exploitation" has been issued by the DRC Mining Ministry ("CAMI") for the concession on which the tailings facilities or discharge effluent have been constructed.; and
- the method of tailings containment or effluent discharge is referenced in either the Feasibility Study or Environmental Impact Statement ("EIS") which has been received by CAMI.

7.2.5 Stockpiles and mine residue deposits

Numerous mine stockpiles and mine residue deposits occur on the Mutanda concession, including:

- two topsoil dumps, located towards the eastern and western extent of the concession respectively;
- a sulphide dump located northeast of the East pit;
- three waste rock dumps ("WRDs") serving the East and Central open pits and one WRD serving the Clinic Quarry Pit;
- the following stockpiles: Low grade stockpiles (West and Central); mixed grade stockpile; New DMS stockpile; High grade Cu stockpile; float stockpile; old DMS stockpile and high iron stockpile.

7.2.6 Additional site infrastructure

Site infrastructure that is ancillary to mining and processing activities includes:

- the following camps: Main camp, single quarters, management residence, Camp Bellevue, visitors camp, old exploration camp and the construction camp;
- the following office complexes: Main offices, main gate security office and weighbridge, the old and new Groupe Bazano offices, mine technical offices and the metallurgy office;
- the mine clubhouse;
- an electrical substation;
- a mine golf course;
- the mine stores, store yard and core shed;
- the Groupe Bazano dispatch area;
- the mine hospital including a morgue, waste incinerator and waste pit;
- an explosives magazine; and
- an industrial waste dump and a domestic waste dump (at which domestic waste is dumped to the pit and burned).

7.3 Information Sources Reviewed

The information sources on which the audit was based included:

- site documentation provided to GAA;
- limited interviews which GAA conducted with site personnel on 9th December 2010; and
- GAA observations during the site visit of 9th December 2010.

These sources are discussed further below.

7.3.1 Site documentation

Site documents which provided background to the Mutanda Mine audit included:

- Interim Feasibility Study Report for Mutanda ya Mukonkota Project PE 662, including:
  - Environmental Impact Study ("EIS");
  - Environmental Management Plan ("EMP");
  - Environmental Adjustment Plan ("EAP");
  - Environmental Opinion No. 403/CPE/2007, issued by the DRC Ministry of Mines: Permanent Evaluation Committee. Letter dated 20th January 2007; and
  - Decision No. 404/CPE of 22/01/2007: Approval of Mutanda Sprls' EAP for PE662 by the DRC Ministry of Mines: Permanent Evaluation Committee. Letter dated 22nd January 2007.
- EMP compiled by SiVEST as a component (Section 12) of the Mutanda Mining Feasibility Study dated March 2008.
- A social needs assessment for Mutanda Mine, compiled by Paradigm Project Management as a component of the Mutanda Mining Feasibility Study dated March 2008.
- A technical report on the geology and exploration of the Mutanda Property compiled by SRK in March 2008.
- Mutanda Mining SPRL technical drawing: "Mutanda Infrastructure November 2010", dated 1st November 2010 (Rev. A1).
- Mutanda spreadsheet of accident / incident reports for 2010 (updated 2nd December 2010). No environmental incidents were reported in 2010.

7.3.2 Interviews with site personnel

The following site personnel participated in the audit interviews and site visit:

- Mr. Danny Callow: Mutanda Project Manager;
- Mr. André van der Merwe: Mutanda Mining Manager;
- Mr. Dawid Myburgh: Chief Geologist; and
- Ms. Kasia Murawiecka: Community Development and Liaison.

7.3.3 Site areas visited

A site visit of the Mutanda Mine concession was conducted on 9th December 2010. Emphasis was placed on visiting specific areas and facilities of the concession which were identified in the site documentation and/or site interviews as presenting potentially significant environmental liabilities of concern.

7.4 Limitations of the Audit

This report is based on a high level overview of the Mutanda mine operations by GAA staff. The review involved a one day visit to the mine, with the time divided between travel, the identification and review of available documents, discussion with key personnel and a brief visit to areas of greatest concern on site. The review therefore focuses only on critical environmental and social issues, so as to identify risks that could be major liabilities. Wherever possible, existing documentation has been used as a basis for conclusions drawn.

7.5 Results of the Audit

The results of the environmental audit of Mutanda operations and activities are presented in the subsections that follow.

7.5.1 Authorisations

7.5.1.1 Operating licences

Article 64 of the DRC Mining Code (Law No 007/2002 of 11th July, 2002) requires a mine to hold an operating license or "Certificate d'Exploitation" from the DRC Mining Ministry ("CAMI") before mining the resource or developing the necessary supporting infrastructure.

Mutanda holds an approved operating licence for concessions PE662 and PE4959. In terms of this licence, Mutanda may mine the ore resources and develop the necessary supporting infrastructure (such as TSFs and WRDs), provided that the method of containment or effluent discharge is referenced in either the Feasibility Study or Environmental Impact Statement ("EIS") which has been received by the Ministry of Mines.

7.5.1.2 Environmental Impact Study and Environmental Management Plan

In terms of the DRC Mining Code and the DRC Mining Regulations (Decree No 038/2003 of March 2003) the applicant of an exploitation licence is required to submit an EIS and Environmental Management Plan ("EMP") to the Department for the Protection of the Mining Environment ("DPEM").

The consulting firm Des Amenageurs de la DRC ("GAC SPRL") compiled the EIS, EMP and Environmental Adjustment Plan (EAP) components of the Interim Feasibility Study Report for the Mutanda ya Mukonkota Project (PE 662) dated February 2007. Approval was received from the DRC Ministry of Mines: Permanent Evaluation Committee per Approval Decision No. 404/CPE.

The subsequent Feasibility Study Report for the Project, dated March 2008, contained a revised EMP compiled by SiVEST. The management actions listed in the EMP were of a generic nature relevant to the level of project knowledge available in the feasibility phase and may now require revision to account for subsequent changes made during detailed design.

7.5.2 Compliance against Equatorial Principles

Table 17 set out below provides an account of Mutanda's compliance with Equator Principles and IFC requirements for environmental and social management.

Table 17: Compliance of Mutanda operations with Equator Principles and IFC requirements

Equator Principle	Requirement	Compliance Rating	Reasons for Compliance /Non Compliances
Principle 1: Review and Categorisation	Projects are categorised on the basis of the magnitude of potential impacts and risks	Compliant	At the time of the Feasibility Study and the preparation of the EIS, the project was correctly identified as Category A which is the most stringent of three project categories recognised by the IFC.
Principle 2: Social and Environmental Assessment	Social and Environmental Assessment Process required to address impacts and risks of construction, operation and closure. Mitigation required which is appropriate and implementable	Partial Compliance	Interim Feasibility EIS, EMP and EAP (GAC SPRL, 2007) and Feasibility EMP (Sivest, 2008) were completed. Limitations are as follows: ■ EIS had a number of apparent flaws and inaccuracies identified by SiVEST (2008) during preparation of the EMP. Since 2009, the EIS is updated annually and once approved the EMP is updated ■ Feasibility Phase EMP was based on preliminary information that has changed over time (acknowledged to be likely in the EMP). An updated EMP is budgeted for 2011 to coincide with the hydrometallurgical plants coming on line as part of the ongoing submissions to government by Bureau d'Assistance et d'Expertise Environnementale Minière ("BAEEM"); ■ No formalised EMS in place to structure ongoing environmental management and monitoring, although Mutanda has a full set of environmental policies and procedures in place The following are noted in regard to the assessment, management and mitigation of site environmental impacts and risks: ■ There are no licensed hazardous waste disposal sites in the DRC, however Mutanda may lawfully operate a waste disposal site, provided they are constructed according to industry norms and standards. ■ Water and waste management was taken into account as part of the development of the Mutanda site and the current expansion projects in the form of a water balance incorporating raw water demand, potable and process water demands. ■ The potential for mine geological and waste materials (TSF, WRDs, sulphide and ore stockpiles, deeper sulphide ores which may be mined in future, etc.) to pollute water resources has not been adequately quantified. Testing and monitoring are required to characterise the geochemical behaviour of these materials and particularly to confirm their acid generation potential, though the host rock offers significant neutralisation potential. ■ Currently, DMS Plant effluent is discharged into dedicated tailings facilities. During the

			rainy season (November to April), spillage from the spirals plant discharges overland to a small silt settling facility located on the Mutanda concession. Any overflow of this into a neighbouring concession not owned by Mutanda is cleared up as and when spillage occurs. At present there is no evidence of this effluent (which consists of a fine grained ore and minute traces of Ferro Silicon which is used as a reagent in the separation process) discharging into the Kando River. This arrangement represents a moderate risk to Mutanda. ■ Environmental monitoring data provided to GAA for review was limited at the time of the site visit, though weekly samples at all potable water sources are taken and analysed for bacterial, sulphides, nitrates and heavy metals. Historically the lack of a robust site environmental monitoring programme, and the implementation thereof, represented a significant risk to Mutanda as the DPEM has previously expressed concern at the inadequacy of the environmental monitoring / reporting programme proposed in the EAP (Environmental Opinion No. 403/CPE/2007 of 20th January 2007). Since early-2009 Mutanda has implemented a more systematic approach to environmental monitoring. ■ There appeared to be no formal system of progressive rehabilitation of the TSF. Resultant dust fall impacts represent a risk to Mutanda operations, though it should be pointed out that the tailings dam is in the process of phase 2 construction to extend the west and south walls by an additional 10.6m in vertical height. This should be completed by 2012 and thereafter rehabilitation can begin.
Principle 3: Applicable Social and Environmental Standards	IFC PS 1: Social and Environmental Management System	Compliant	■ A SHEQ department was established in November 2007. The current staff complement for the SHEQ department is 15 people. ■ The SHEQ department is assisted by the Corporate Social Responsibility department which has 4 staff members. ■ While the Mutanda site is being expanded, and additional infrastructure being added to the site, the SHEQ requirements for the construction is managed by the Engineering, Procurement, Construction and Management ("EPCM") contractor on site. On completion and handover of the plants, Mutanda SHEQ department will assume responsibility and therefore will need to be expanded and its personnel capacity increased accordingly. ■ The SHEQ department is responsible for implementing the EMS system. ■ The company's Corporate Social Responsibility programme, albeit relatively newly structured, is in the process if undertaking a number of ambitious projects, related to the Governments key strategic initiatives. Additional CSR work on behalf of Mumi

			employees who donate into a Trust fund is carried out by a motivated single volunteer. ■ No reporting system is in place to systematically document interactions with the community, issues raised, requests and grievances and the company actions taken, however this has always been handled through regular meetings with the local village Chiefs who represent the communities in the area. All correspondence between the Chief and Mutanda (and vice versa) is kept as a record of the interaction.
	IFC PS 2: Labour and worker conditions	Compliant	■ All employee contracts meet all legal requirements, salaries are above the DRC legal minimum and contracts are approved and signed off by the regional Labour Inspector. Likewise all benefits required by DRC law (as well as additional benefits provided by Mutanda) are included as part of the overall employee employment contract. ■ It is noted that the company employed a progressive approach to the management of issues relating to artisanal miners at the start of construction, all of whom were offered jobs and training as an alternative to having to find employment elsewhere. Approximately 200 of these miners are currently employed by the mine in various capacities. Detailed documentation in this regard was not available for review or requested due to time constraints.
	IFC PS3: General requirements	N/A	N/A
	IFC PS 4: Community Health, Safety and Security – Community Health and Safety	Compliant	■ Mutanda has built two community clinics since 2009 and has a weekly mother and baby clinic that have significantly reduced the infant mortality rate in the local area. In addition both clinics are registered with the Department of Health to administer vaccinations for key childhood illnesses. Mutanda has also built a new 200 student primary school in 2009 which provides education to the local village where a large proportion of Mutanda employees come from. ■ Mutanda also provides boreholes for potable water, HIV education, farming skills and has a 10 hectare farming project to teach villagers farming techniques. ■ Mutanda is in the process of constructing a fish farm to feed 3000 villagers and to reduce the reliance upon the river Kando as a sole source of food, therefore allowing the river to replenish its fish population. ■ Health and Safety impacts in communities near the mine are limited by its isolation and the relatively small scale of the operations. Nevertheless, while there are few negative impacts at the mine that will affect neighbouring villages, traffic along the main access road creates the potential for a significant safety hazard, due to the large number of heavy vehicles employed by the mine to transport materials and product. It is understood that while incident reports are prepared, the reporting of this is independent of on-mine incidents. In the event of an accident along the National road,

			Mutanda treats the injured personnel in the Mutanda hospital as a social responsibility. ■ Contracts with hauliers do not enforce particular safety codes and standards in respect of driver competence and performance nor is there any mechanism for monitoring driver behaviour or auditing compliance with performance standards.
	IFC PS 4: Community Health, Safety and Security – Security	Partially Compliant	■ Where staff is screened for criminal records it is virtually impossible from this evidence alone to ascertain whether the individual has been implicated in human rights abuses.
	IFC PS 5: Land Acquisition and Involuntary Resettlement – general requirements	N/A	■ No resettlement has been required by mining activities to date. The mining area is perimeter fenced so that there is no direct interaction between mining activities and the community, except along the main road.
	IFC PS 7: Protection of Indigenous Peoples	N/A	■ Indigenous peoples are not affected by the mining activities.
	IFC PS 8: Cultural Heritage – protection of cultural heritage in project design and execution	N/A	■ Not cultural heritage issues were applicable during the project design or execution of current mining operations.
	IFC PS 8: Cultural Heritage – project's use of cultural heritage	Compliant	■ The mine does not use cultural heritage resources.
Principle 4: Action Plan and Management System	Environmental and Social Action Plan	Compliant	■ EMP provides a basis for more detailed procedures (Action Plans) that are required to manage performance. A revision of the existing (Feasibility Phase) EMP is recommended and has been budgeted in the 2011 financial year to coincide with the start up of the processing plants.
Principle 5: Consultation and Disclosure	Ongoing consultation with affected communities in a structured and appropriate manner	Compliant	■ Systematic minutes of community interactions are not maintained, however monthly meetings with the local Chief occurs on a formal basis. All projects undertaken in local villages are with the consent and approval of the local Chief.
Principle 6: Grievance Mechanism	Formal grievance mechanism required as part of the management system	Compliant	■ A formal community grievance procedure is not in place nor is a register kept that logs grievances or complaints and the actions taken to address them, however these grievances are brought up in the regular meetings with the Chief whereby documented grievances are raised requiring action from Mumi.
Principle 7: Independent Review	Independent social or environmental expert not directly associated with the borrower to review the assessment, consultation process and Equator Principle compliance	N/A	N/A

Principle 8: Covenants	The following covenants to be included in financing documentation: The borrower will: ■ Comply with all host country social and environmental laws, regulations and permits; ■ Comply with the action plan during construction and operation in all material respects; ■ Provide reports (not less than annually) to document compliance with laws, regulations and permits; and ■ Decommission the facilities in accordance with an agreed decommissioning plan	N/A	N/A
Principle 9: Independent Monitoring and Reporting	An independent, experienced external expert to verify monitoring information on a regular basis	Compliant	■ An annual review of the environmental practice by a DRC registered company is in place to ensure that Mutanda meets all DRC legal requirements.

7.5.3 Mutanda key environmental aspects and risks

In regard to current environmental management at Mutanda, the following is noted:

- Environmental issues are currently managed by the Safety, Health, Environment and Quality ("SHEQ") Manager. There is a budgeted full time Environmental Manager position for 2011 to tie in with the hydrometallurgical plants coming into operation. Prior to the recruitment of an Environmental Manager, this represented a risk to Mutanda, particularly as site operations expand.

- The EIS and EMP compiled during the Feasibility Study will require revision to include subsequent changes to the current operations or infrastructure. Submission and approval of these documents by DPEM will assist Mutanda in managing environmental aspects to meet DRC regulatory requirements, Equator Principles and the IFC performance standards. A DRC registered company BAEEM are submitting the revised EIS and annual environmental report as per the requirements.

- The 2011 budget makes appropriate provision to support site implementation of an EMS to drive the EMP.

- There are full environmental monitoring processes in place for hazardous chemicals, waste disposal, water monitoring, however dust and noise emission monitoring is not in place at this stage

- Currently most site environmental impacts appear to be of relatively low risk to Mutanda operations, though this is largely due to the fact that construction and commissioning of processing facilities is still underway.

Current and future site environmental impacts of potentially significant risk include:

- Current discharge of effluent from the DMS plant is into tailings dams fit for purpose. Overflow from the bunded area of the spirals plant is by way of a trench and settling pond system located on the Mutanda concession; the settling ponds are monitored daily and any spillage is cleaned up as and when it occurs.

- The handling and disposal of site hazardous wastes represents a low level environmental and safety risk to Mutanda, however these facilities are operated lawfully and according to industry standards.

- Mine geological and waste materials (including deeper sulphide ores which may be mined in future) should be sampled and tested to confirm their geochemical behaviour and acid drainage potential.

7.5.4 Mutanda key social aspects and risks

With reference to Table 17, it is pertinent to note that the negative social impacts associated with the Mutanda mine appear to be limited. Conversely, there have been a number of positive impacts resulting from various company initiatives to fund CSR projects, motivated mainly through the voluntary commitment and initiative of the partner of one of the expatriates working at the mine. The company's relationship with these villages is consequently extremely good.

7.6 Concluding Statement

To reduce the environmental and social risks of operation, and to maintain compliance with statutory requirements and Equator Principles, Mutanda will need to invest resources into site environmental management, and to actively drive and support environmental management programmes. Additional capacity will be required as the construction of the plant is completed and responsibility is handed over to Mutanda. Given the current and projected expansion of site operations it is suggested that these initiatives start as soon as possible to avoid incurring environmental and social liabilities that may affect financial provision for closure.

7.7 References

- DPEM (20 January 2007). Environmental Opinion No. 403/CPE/2007 in regard to the Environmental Adjustment Plan ("EAP") compiled for the Interim Feasibility Study Report for Mutanda ya Mukonkota

Project (PE 662). Letter authored by the DRC Ministry of Mines ("DPEM"): Permanent Evaluation Committee: 20th January 2007.

- DPEM (22 January 2007). Decision No. 404/CPE of 22/01/2007 in regard to approval of Mutanda SPRLs' EAP (PE662). Letter authored by the DRC Ministry of Mines ("DPEM"): Permanent Evaluation Committee: 22 January 2007.
- GAC SPRL (2007). Environmental Impact Study ("EIS"), Environmental Management Plan ("EMP") and Environmental Adjustment Plan ("EAP"). (Compiled for the Interim Feasibility Study Report for Mutanda ya Mukonkota Project PE 662).
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- Mutanda Mining SPRL (2010). Spreadsheet of accident / incident reports for 2010 (updated 2nd December 2010).
- Paradigm Project Management (2008). Social needs assessment for Mutanda Mine. (Compiled as a component of the Mutanda Mining Feasibility Study dated March 2008).
- SiVEST (2008). Mutanda Mining Project environmental management plan (EMP). (Section 12 of the Project Feasibility Study Report dated March 2008).
- SRK (2008). Geology and exploration of the Mutanda Property.

8.0 MARKET

8.1 Copper

Copper is a major industrial metal (ranking third after iron and aluminium by consumption) because it is highly conductive (electrically and thermally), highly ductile and malleable, and resistant to corrosion. Electrical applications of copper include power transmission and generation; building wiring; motors; transformers; telecommunications; electronics and electronic products; and renewable energy production systems. Copper and brass (an alloy of copper) are the primary metal used in plumbing pipes, taps, valves and fittings. Further applications of copper include decorative features; roofing; marine applications; heat exchangers; and in alloys used for gears, bearings and turbine blades.

Global copper mine production was 15.7Mt in 2009, with 5.4Mt (or 35%) produced in Chile, by far the largest producer. Zambia and the DRC produced 0.6Mt (3.8%) and 0.3Mt (1.9%) respectively. Global refinery production in 2009 was 18.4Mt, including 2.9Mt of secondary refined production. Global consumption was slightly lower at 18.2 Mt. The International Copper Study Group (1 October 2010) estimates global mine production for 2011 at 17Mt, with global consumption at 19.7Mt. Table 18 shows the historical and 2011 forecast global refined copper market balance.

Table 18: Global refined copper market balance (Source: USGS)

Thousand metric tonnes	2006	2007	2008	2009	*2010 Jan-Sept*	2010 forecast	2011 forecast
Global Mine Production	14 991	15 474	15 528	15 754	*11 853*	16 235	17 076
Primary Refined Production	14 678	15 191	15 399	15 466	*11 729*		
Secondary Refined Production	2 613	2 743	2 823	2 911	*2 513*		
Total World Refined Production	17 291	17 934	18 222	18 377	*14 242*	19 278	20 498
Consumption	17 058	18 239	18 056	18 198	*14 678*	18 882	19 729
LME Copper Price (USD/t avg)	6 727	7 126	6 952	5 164	*7 175*	7 543	

The copper price has demonstrated significant volatility in the last 5 years, as shown in Figure 70. The price was USD4 585/tonne on 1 January 2006, at that point a near-record high. The price rapidly increased, reaching a high of USD8 800 /tonne in May 2006. By February 2007 it had declined to USD5 302 /tonne. In the immediate wake of the collapse in the housing bubble that precipitated the global financial crisis, the price of copper increased, reaching a new high of USD8 900 /tonne by July 2008. Thereafter, as the financial crisis took effect on the global economy, the price declined to USD2 810 /tonne in December 2008, the lowest level in almost 5 years. Since then, the price has generally trended upward, reaching a new record high of USD9 695 /tonne on 12 January 2011.

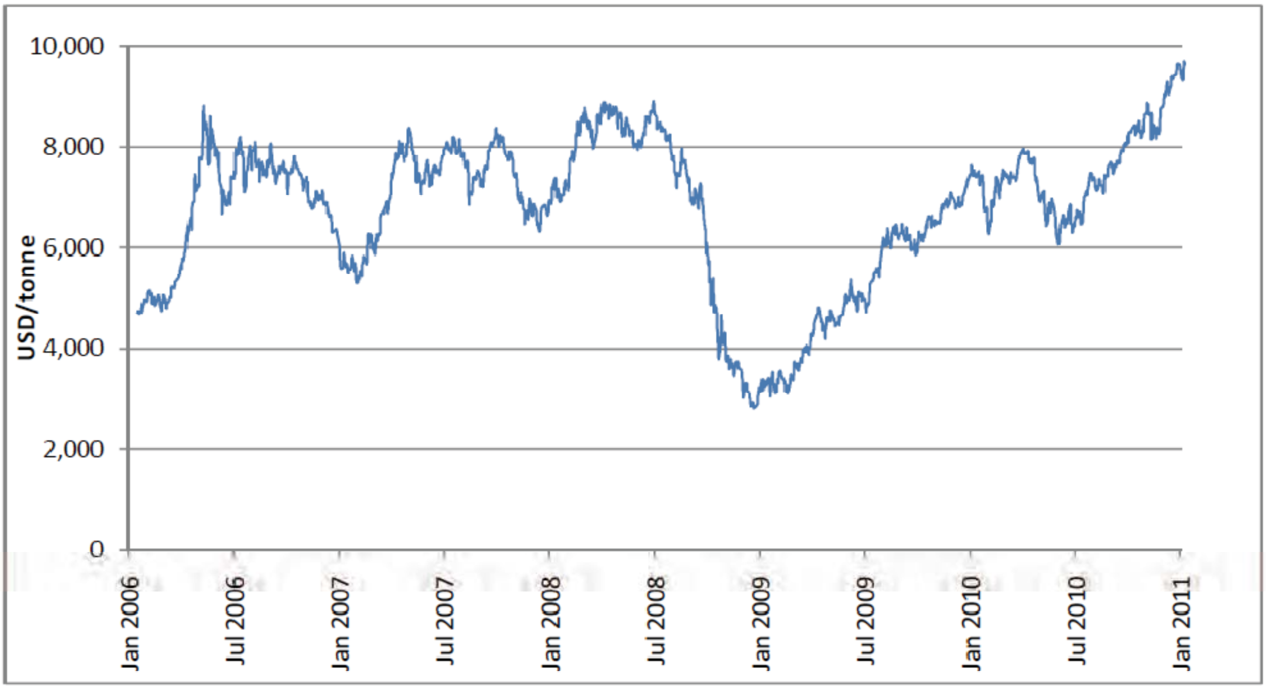

Figure 70: The London Metal Exchange copper price from January 2006 to date (Source: LME)

The copper price forecast used in the economic evaluation of the project is shown in Table 19. The forecast is based on published London Metal Exchange ("LME") monthly futures prices, using the June contracts as the basis for each respective year through to 2019. These publically available prices are quoted in nominal terms. The financial model used for the economic evaluation is in real terms (2011 USD), and the real copper price forecast is derived from the nominal prices using the US CPI estimates in Table 19. The forecast nominal average price for 2011 is USD9 600 /tonne, declining to USD6 800 /tonne in 2019.

Table 19: Copper price forecast

Copper Price (USD/tonne)	2011	2012	2013	2014	2015	2016	2017	2018	2019	Long Term
Nominal	9 600	9 300	9 000	8 600	8 200	7 800	7 500	7 100	6 800	6 861
Real	9 600	9 208	8 822	8 347	7 880	7 240	6 859	6 397	6 036	6 000
US Inflation Rate	1.0%	1.0%	1.0%	1.0%	1.0%	1.5%	1.5%	1.5%	1.5%	

8.2 Cobalt

Cobalt has many commercial, industrial and military applications. The leading use of cobalt is in rechargeable battery electrodes. The temperature stability and heat- and corrosion-resistance of cobalt-based superalloys makes them suitable for use in turbine blades for jet turbines and gas turbine engines. Other uses of cobalt include vehicle airbags; catalysts for the petroleum and chemical industries; cemented carbides and diamond cutting and abrasion tools; drying agents for paints, varnishes, and inks; dyes and pigments; ground coats for porcelain enamels; high-speed steels; magnetic recording media; magnets; and steel-belted radial tyres.

Far less cobalt is produced than copper: global mine production of cobalt was 62 000 tonnes in 2009, with 25 000 tonnes (or 40%) produced in the DRC, the largest producer. Australia, China and Russia each produced about 6 200 tonnes (10%). Global refinery production in 2008 was 57 600 tonnes, with global consumption slightly higher at 60 654 tonnes. Table 20 shows the historical global refined cobalt market balance. Roskill Information Services, a mineral industry information research group, has forecast cobalt demand of 72 500 tonnes in 2011 (October 2010).

Table 20: Global refined cobalt market balance

Metric tonnes	2004	2005	2006	2007	2008	2009
Global Mine Production	60 300	66 200	69 800	72 600	75 900	62 000
Total World Refined Production	48 500	54 100	53 800	53 300	57 600	No publicly available data
Consumption	51 400	54 685	54 685	56 250	60 654	59 000
Cobalt Price (USD/t avg)	22.77	14.56	15.35	28.31	36.16	15.89

Source Cobalt News (Oct 2005 – Jan 2011) Published by the Cobalt Development Institute

The cobalt price reached a record of USD48.63 /pound in March 2008, falling in line with other commodities to a 5-year low of USD11 /pound in December 2008. The price has recovered, and since cobalt started trading on the LME in May 2010, the price has averaged USD17.55 /pound, with a maximum of USD19.64 /pound and a minimum of USD15.94 /pound.

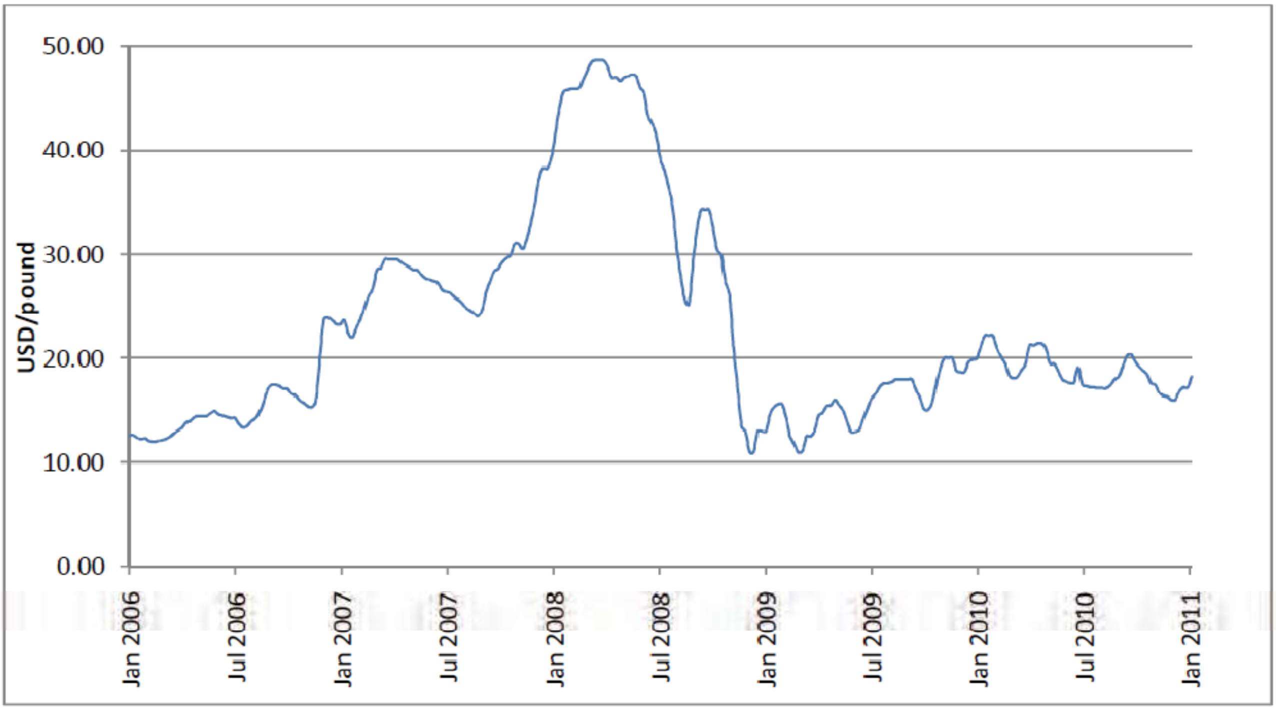

Figure 71: The cobalt price from January 2006 to date (Source: Inet Bridge)

The cobalt price forecast used in the economic evaluation of the project is shown in Table 21. The forecast is based on the Metal Bulletin 99.8%Co USD/pound price (in nominal terms) available for the next spot delivery. The forward curve is assumed to gradually decline for the next three years, before falling to its long term value. The financial model used for the economic evaluation is in real terms (2011 USD), and the real cobalt price forecast is derived from the nominal prices using the US CPI estimates in Table 21. The forecast average price for 2011 is USD17.24 /pound, declining to USD13.00 /pound in 2019.

Table 21: Cobalt price forecast

Cobalt Price (USD/pound)	2011	2012	2013	2014	2015	2016	2017	2018	2019	Long Term
Nominal	17.24	16.78	16.00	15.00	15.00	15.00	13.00	13.00	13.00	13.00
Real	17.24	16.62	15.68	14.56	14.41	13.92	11.89	11.71	11.54	11.00
US Inflation	1.0%	1.0%	1.0%	1.0%	1.0%	1.5%	1.5%	1.5%	1.5%	

9.0 TECHNICAL AND ECONOMIC ASSUMPTIONS

9.1 Revenue assumptions

Glencore has the life of mine offtake for 100% of all Mutanda Cu and Co production pursuant to which Glencore will purchase 100% of the quantities of Cu and Co produced by Mutanda.

9.2 Capital Cost Estimate

A summary of the capital cost estimate by major cost items is presented in Table 22 below. The capital expenditure items are as follows:

- Phase 1 Plant: Remaining capital expenditure for the completion of cobalt circuit on the 20ktpa plant;
- Phase 2 Plant: Capital expenditure for the completion of the 40ktpa plant;
- Phase 3 Plant: Capital expenditure to expand the combined phase 1 and phase 2 Plants to produce 110ktpa. Additional investment in 2015 on the plant will be spent to compensate for the drop in copper feed grade in 2016;
- Acid Plant: This capital expenditure relates to the construction of the 390 tpd sulphuric acid plant and 73 tpd liquid SO2 plant;
- General Power Plant: Capital expenditure for the development and refurbishment of power supply infrastructure as described in Section 9.2;
- Operational: Capital expenditure is for unallocated infrastructure of a general nature required to sustain the operations of Mutanda.

Table 22: Capital Expenditure

USD Thousands	2011	2012	2013	2014	2015	2016 - 2030	Total
Processing							
Phase 1	16,425	-	-	-	-	-	16,425
Phase 2	174,532	-	-	-	-	-	174,532
Phase 3	103,763	-	-	-	50,000	-	153,763
Acid Plant	31,293	-	-	-	-	-	31,293
Electricity Plant	26,000	26,000	24,000	8,000	-	-	84,000
Processing subtotal	352,018	26,000	24,000	8,000	50,000	-	460,018
Other Cost Centres							
Operational	30,578	25,000	35,000	35,000	35,000	492,000	652,578
Other subtotal	30,578	25,000	35,000	35,000	35,000	492,000	652,578
Total capital expenditure	382,596	51,000	59,000	43,000	85,000	492,000	1,112,596

9.3 Operating Cost Estimate

The major operating costs are as follows:

- Mining: costs are based on contractual mining contractor rates charged by Groupe Bazano, a mining contractor, and includes USD 8.5/bcm for mining which includes mining and haulage.;
- Phase 1 Plant: the LOM weighted average cost per pound of finished Cu is $1.29. The average LOM cost directly attributable to Co production is $2.93 per pound of finished cobalt. This includes plant costs for reagents, consumables and electricity;
- Phase 2 and Phase 3 Plant: LOM weighted average cost per pound of finished Cu is $1.06. The average LOM cost directly attributable to Co production is $1.17 per pound of finished cobalt. Reduced cobalt production costs in phase 2 and 3 are attributable to use of Sulphur dioxide ("SO2") as the leaching agent of cobalt as opposed to Sodium Metabisulphite in phase 1. The SO2 is a product of Mutanda's Acid Plant. These costs includes plant costs for reagents, consumables and electricity;
- Heap Leach Plant: the LOM weighted average cost per pound of finished Cu is USD1.67. This includes plant costs for reagents, consumables and electricity; and
- Other: includes costs associated with transport, clearance costs, sampling and assaying, and export tax.

The major operating items are detailed on an annual basis in Table 23 below.

Table 23: Major Operational Expenditure

USD Thousands	2011	2012	2013	2014	2015	2016-2030
Operating Costs						
Mining	36,788	67,005	84,204	84,110	84,105	820,047
Phase 1 Plant	92,106	89,996	86,577	89,114	89,394	1,320,376
Phase 2 and Phase 3 Plant	33,132	183,834	201,655	210,701	211,137	3,235,460
Heap Leach	594	4,951	13,516	11,852	13,117	261,223
Other	44,102	102,190	115,001	114,818	114,970	1,528,731
Total Operating Costs	206,721	447,976	500,953	510,595	512,723	7,165,837

9.4 Taxation, Royalties and Other Business Parameters

The major parameters which govern royalties, tax capital allowances and import duties applicable to the project are shown in Table 24.

Table 24: Royalty, tax and import duty assumptions

Description	Application	Rate
DRC Royalty	% of revenue less selling expenses	2.0%
Rowny Royalty	% of revenue	2.5%
DRC Corporate Tax		30%
DRC Capital Allowance:		
Year 1		60%
Years 2 - 10	Reducing balance	12% to 1%
Import Duty	Charged on certain imported items	3% to 5%

According to DRC legislation, taxation can be offset against capital and deferred. All capital expenditure is subject to a DRC Capital Allowance of 60% in the first year and is depreciated on a reducing balance each year thereafter.

10.0 ECONOMIC ANALYSIS

This section presents a valuation of Glencore's interest in Mutanda. Glencore owns 40% of Mutanda via various joint venture agreements. It is understood that Rowny Assets Limited (as a successor to Gecamines) is entitled to receive royalty, dividend and Pas de Porte payments from Mutanda over the life of the mining project. The valuation presented is of the value of Mutanda attributable to Glencore, comprising the 40% shareholding and shareholder's loans.

10.1 Valuation Methodology

Mutanda is an operational mining company. Its resources and reserves are well-defined, and a comprehensive body of technical information on its current and planned operations is available. This information allows the future cash flows of Mutanda throughout the life of the mine to be projected. This is compatible with the discounted cash flow ("DCF") methodology, which determines the value of an asset by calculating the net present value of the future cash flows over the useful life of that asset.

The DCF valuation approach provides a "going concern" value, which is the value indicated by a company's future economic capabilities. Using this technique, value is calculated by the summation of the present value of projected cash flows, both income and expenditure, for a determined period, plus the present value of the residual or terminal value at the end of the projection period. When using the DCF technique, the following four key areas must be assessed for accuracy and appropriateness:

- the assumptions underlying the projection of cash flow;
- the length of the projection period, in this case the life of mine; and
- the discount rate, which is usually the risk adjusted weighted average cost of capital ("WACC") of the project.

The valuation was based a financial model provided by Glencore. GAA verified the integrity and structure of the model to ensure that calculations are performed correctly and that the model is comprehensive and fully accounts for all cash flows of the project. The input assumptions of the model were checked against contracts and the results of the studies by the Competent Persons who produced this report to ensure that the assumptions are reasonable. Historical results are available but were not relied on in the valuation due to the change in operational scope that results in historical and forecast amounts not being comparable..

Additional analysis was added to the model to produce some of the results, graphs and tables presented in this report.

10.2 Valuation Assumptions

The following assumptions were used in the valuation model:

- the valuation date is 1 January 2011;
- the discount rate is set at 10% in real terms, which is the discount rate used by Glencore across its portfolio. The valuation model was prepared on a quarterly basis.
- mining and processing production rates, head grades and recoveries are as described in Sections 3.0 and 4.0:
- commodity prices are as described in Section 8.0;
- capital expenditure is as described in Section 9.2;
- operating expenditure is as described in Section 9.3;
- royalties, tax, capital allowances and exchange rates are as described in Section 9.4;
- Glencore's equity share in Mutanda is 40%; and
- Glencore's attributable economic interest in Mutanda is derived after taking into account the repayment of loans from Mutanda's free cash flow and Glencore's attributable portion of Mutanda's free cash flow.

10.3 The Valuation of Glencore's Interest in Mutanda

The results of the DCF model are shown in

Table 25, presenting the free cash flow attributable to Mutanda. The cash flow projections are based on expected future mining, production, metal sales, capital expenditure, operating costs and other expenses over the life of the project.

10.4 Mutanda MER Extraction Table

* Capacities refer to annualized capacity at year end - 31 December

		2011E	2012E	2013E	2014E	2015E
Finished metal production capacity	Units					
Copper	t	60,000	110,000	110,000	110,000	110,000
Cobalt	t	23,000	23,000	23,000	23,000	23,000
Actual / forecast production						
Copper Conc.	t	17,133				
Copper Cathode	t	24,068	81,251	103,531	103,214	103,477
Cobalt	t	12,548	23,000	23,000	23,000	23,000
Cash cost (excl. royalties, realisation charges, before by-product revenues)	US$m	163	346	386	396	398
By-products revenues	US$m	384	590	557	517	511
Royalties (as a % of net revenue)	%	4.50	4.50	4.50	4.50	4.50
Depreciation & amortisation	US$m	284	117	63	53	47
Statutory Tax rate	%	30%	30%	30%	30%	30%
Capex						
Sustaining	US$m	31	25	35	35	35
Expansionary	US$m	352	26	24	8	50

Table 25: Project cash flows over the LOM

Cash Flow Analysis	Unit	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Revenue	KUSD	616,501	1,341,922	1,473,677	1,383,329	1,330,029	1,258,362	1,148,554	956,103	900,157	954,958
Freight, insurance and Sales Costs	KUSD	(44,102)	(102,190)	(115,001)	(114,818)	(114,970)	(115,910)	(116,046)	(98,430)	(95,970)	(105,769)
Royalties	KUSD	(26,860)	(58,343)	(64,015)	(59,953)	(57,552)	(54,308)	(49,364)	(41,056)	(38,588)	(40,858)
Net Revenue	KUSD	545,539	1,181,389	1,294,661	1,208,558	1,157,507	1,088,144	983,144	816,617	765,599	808,331
Operating Costs	KUSD	(162,619)	(345,786)	(385,952)	(395,777)	(397,753)	(418,761)	(418,330)	(421,073)	(412,768)	(428,767)
Change in Working Capital	KUSD	51,059	(45,792)	(10,042)	(2,456)	(494)	(5,252)	108	(686)	2,076	(4,000)
Total Expenses	KUSD	(111,560)	(391,578)	(395,994)	(398,233)	(398,247)	(424,013)	(418,222)	(421,759)	(410,692)	(432,767)
Taxation	KUSD	0	(15,253)	(187,902)	(243,250)	(227,161)	(213,586)	(185,416)	(155,985)	(105,266)	(93,550)
Capital Expenditure	KUSD	(382,596)	(51,000)	(59,000)	(43,000)	(85,000)	(35,000)	(35,000)	(35,000)	(35,000)	(35,000)
Net Free Cash	KUSD	51,382	723,558	651,765	524,074	447,099	415,546	344,505	203,873	214,642	247,014
Cash Flow Analysis	Unit	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Revenue	KUSD	1,034,384	1,037,847	973,019	861,164	819,056	1,048,104	1,051,448	980,089	1,009,802	102,162
Freight, insurance and Sales Costs	KUSD	(116,808)	(117,138)	(109,099)	(93,200)	(87,074)	(118,115)	(118,434)	(110,151)	(114,467)	(12,120)
Royalties	KUSD	(44,211)	(44,360)	(41,604)	(36,888)	(35,116)	(44,8020	(44,946)	(41,901)	(43,1520	(4,355)
Net Revenue	KUSD	873,365	876,349	822,316	731,075	696,866	885,187	888,068	828,037	852,183	85,687
Operating Costs	KUSD	(443,941)	(438,950)	(372,904)	(352,176)	(375,209)	(416,598)	(407,018)	(336,790)	(356,800)	(45,123)
Change in Working Capital	KUSD	(3,793)	1,248	16,512	5,182	(5,758)	(10,347)	2,395	17,557	(5,003)	79,945
Total Expenses	KUSD	(447,734)	(437,702)	(356,392)	(346,994)	(380,967)	(426,945)	(404,622)	(319,233)	(361,803)	34,822
Taxation	KUSD	(99,989)	(115,227)	(119,328)	(127,688)	(103,294)	(82,982)	(125,814)	(133,491)	(276,972)	(27,323)
Capital Expenditure	KUSD	(35,000)	(35,000)	(35,0000	(35,000)	(35,000)	(35,000)	(35,000)	(35,000)	(35,000)	(2,000)
Net Free Cash	KUSD	290,642	288,419	311,596	221,393	177,605	340,259	322,631	340,314	178,409	91,185

The base case DCF model uses the values of the input parameters as described in Section 3.0. The valuation of Mutanda as a whole is USD 3,089. The base case valuation of Glencore's interest in Mutanda is USD 1,318 million, with an upper limit of USD 1,483 million (discount rate of 8%, reflecting a high outlook) and a lower limit of USD 1,067 million (discount rate of 14%, reflecting a low outlook).

Table 26 to Table 28 present the sensitivity of the NPV to changes in the discount rate applied and revenue, capital expenditure and operating costs respectively.

Table 26: Sensitivity of NPV to discount rate and changes in metal prices

NPV (USD million)		*Change in metal prices*				
		-20%	-10%	0%	10%	20%
Discount Rate	8.0%	929	1,197	1,483	1,771	2,059
	10.0%	829	1,064	1,318	1,572	1,826
	12.0%	746	954	1,181	1,408	1,635
	14.0%	676	862	1,067	1,272	1,476

Table 27: Sensitivity of NPV to discount rate and changes in operating costs

NPV (USD million)		*Change in operating costs*				
		-20%	-10%	0%	10%	20%
Discount Rate	8.0%	1,691	1,587	1,483	1,380	1,276
	10.0%	1,499	1,408	1,318	1,227	1,137
	12.0%	1,341	1,261	1,181	1,101	1,021
	14.0%	1,209	1,138	1,067	996	925

Table 28: Sensitivity of NPV to discount rate and changes in capital expenditure

NPV (USD million)		*Change in capital expenditure*				
		-20%	-10%	0%	10%	20%
Discount Rate	8.0%	1,541	1,512	1,483	1,454	1,434
	10.0%	1,372	1,345	1,318	1,290	1,272
	12.0%	1,233	1,207	1,181	1,155	1,139
	14.0%	1,116	1,091	1,067	1,042	1,027

The sensitivity of the base case valuation to all three factors is shown graphically in Figure 72.

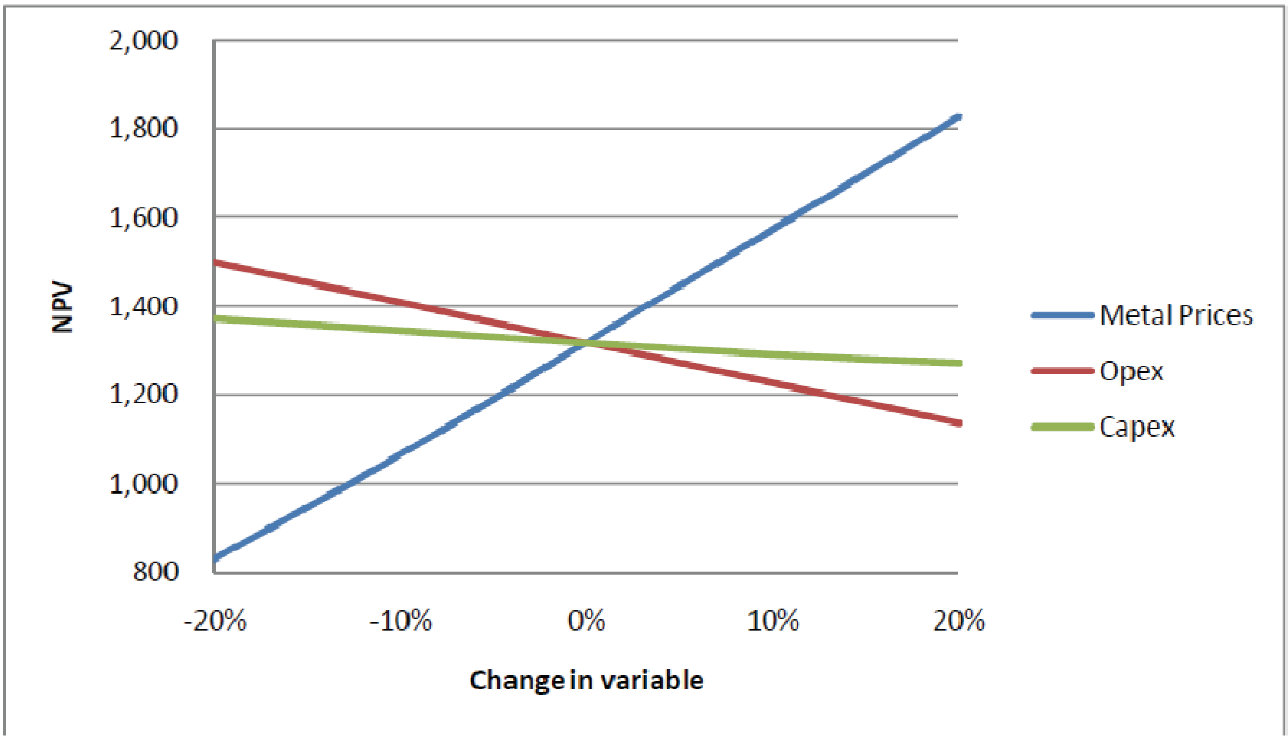

Figure 72: The sensitivity of Base Case NPV to changes in metal price, opex and capex

The project is most sensitive to metal prices – a 1% increase/decrease in metal prices causes a USD 25 million increase/decrease in NPV. A 1% increase/decrease in operating costs causes a USD 9 million decrease/ increase in NPV. The project is least sensitive to changes in capital expenditure – a 1% increase/decrease causes a USD 3 million decrease/ increase in NPV.

11.0 RISK ANALYSIS

The Competent Persons involved in the technical analysis of the project were briefed to identify and document project risks during the course of their work.

11.1 Mining risks

The major risks that could have a negative impact on the planned production profile are:

- access and slope failures,
- available pit space,
- available waste dumping space, and
- grade control considered low risk as all mining areas (except soft waste) is drilled and reconciled to resource model monthly.

11.2 Processing risks

Unavailability and Quality of Key Reagents for Metallurgical Processing:

There is a risk that critical process reagents (such as lime) may not be available in the required quantities or quality, leading to reduced production of copper and cobalt. This risk has a high rating, but can be managed with a detailed supply management plan

Power Availability and Supply Fluctuations:

Power requirements to operate at the scheduled production profile are approximately 80-100MW and there are risks that this power may not be available through the national grid and may lead to power disruptions or supply fluctuation. Mutanda has entered into an agreement with the state utility, Société Nationale d'Electricité ("SNEL"), to refurbish the DC link between Kinshasa and Kolwezi SCK / RO stations to increase power availability to Mutanda to a minimum 60MW in 2011. Mutanda is also in advanced negotiation with SNEL to provide capital to refurbish additional power infrastructure within the DRC to increase to availability of power supply from the Inga hydroelectricity facility to 450MW to the Katanga Province by 2015.

11.3 Capital risks

Escalation of Costs:

Projects in the mining industry world-wide have recently experienced unpredictable capital cost overruns due to various macroeconomic and microeconomic factors that cannot be predicted with any reliable degree of certainty. Capital cost overruns require more funding and reduce project returns. This risk is rated as high but is being mitigated by management through regular reviews of capital cost estimates by the Mutanda project team and their appointed independent engineers who provide certified project control software and an extensive an up-to-date database of capital costs for many aspects of the development.

11.4 Operating risks

Poor Condition of Railway Line:

The poor condition of the railway line may impede production by not allowing the efficient, on-time delivery of finished products or the supply of key input materials on time, leading to reduced production of copper and cobalt and higher logistics costs. This risk is rated very high. Possible mitigation measures include:

- rescheduling production plans to match rail capacity;
- engaging with governments and railway operators;
- engaging with other potential rail users; and.
- resorting to road transportation (at a higher cost) for logistics, although road costs have been factored into the financial model.

Availability of Rolling Stock:

Locomotives and wagons may not be available on time to transport the planned increases in finished products and key input materials, also leading to reduced production of copper and cobalt and higher logistics costs. This risk is rated very high. This risk may be mitigated by establishing required capacity and negotiating with SNCC (the rail operator) and other railway groups to ensure sufficient capacity.

Logistics to and from site present an issue which needs to be carefully planned around and will result in Mutanda holding a larger than normal critical spares holding, however this has also been factored into the financial model.

It should be noted that no rail transport was planned for inbound logistics for any of the projects, with minimal export of cobalt and copper concentrate by rail planned. Any improvement in the rail network and rolling stock will lower costs of inbound and outbound logistics significantly.

Underdeveloped in-country institutional infrastructure and capacity:

The DRC's national and local governments and their agencies may not have the ability to deliver on the infrastructure requirements of the Project, reducing the project feasibility or causing delays. This risk is rated high, and may be mitigated by developing relationships with other stakeholders, governments and agencies; and supporting capacity development initiatives.

Senior Management and Technical Expertise:

Recruiting and retaining senior management and operation-critical technical expertise to manage and operate the mines and processing plants is an issue, rated as a high risk. It potentially affects the ability of the project to run optimally and comply with legislation. Mitigation measures include reviewing the company's employment strategy, recruitment and retention plan; and facilitating the provision of contractor's services with Government and other service providers. Glencore has appointed a significant proportion of expatriate employees amongst its management level.

Artisanal Miners:

There are a large number of artisanal miners working within a 10km radius of Mutanda, though none in the immediate vicinity adjacent to Mutanda. There is a chance of injury or loss of life to artisanal miners as a result of Mutanda (or contractor) vehicles travelling in the vicinity of these artisanal mining communities.

11.5 Sovereign risk

The DRC has in the past been subject to political and civil unrest. Although such unrest has historically taken place in parts of the country away from Mutanda's operations which are located in the Kolwezi District of the Katanga Province in the DRC, the DRC (as a whole) continues to be at risk of being affected by varying degrees of political and economic instability in the future which is outside of Mutanda's control and which may adversely affect Mutanda's operations in this region. Furthermore, the developing legal system in the DRC may expose Mutanda's operations in this region to changing new laws and regulations, which may lead to increased operational risks and/or compliance costs.

11.6 Economic and Market risk

Commodity prices:

Copper and cobalt market prices are significant drivers of the profitability for Mutanda and the value of Glencore’s interest in Mutanda. These prices are subject to wide fluctuations beyond the control of the company due to factors such as demand for the commodities caused by global economic conditions and prospects, supply from various sources, currency and interest rate changes, and speculative activities. Sustained commodity prices below the costs of production may cause the curtailment or suspension of operations. There is some scope to manage market risk through hedging, but this may lead to loss of upside during periods of high commodity prices.

Operating costs:

Project operating costs also affect the profitability of Glencore and the value of the Mutanda project. These are subject to a wide range of pressures such as energy prices, oil prices, chemical prices, labour costs and inflation.

Currency risk:

Project revenues are in USD, but input costs may be in other currencies, specifically South African Rand. Variations in currency exchange rates can affect production costs and affect project profitability.

11.7 Environmental and Social risks

These risks were identified during an environmental and social audit conducted by GAA at Mutanda on 8th December 2010 and are covered in Section 7.0.

GOLDER ASSOCIATES AFRICA (PTY) LTD.

Frank Wimberley Project Director	Willem van der Schyff Competent Person

SE/WvdS/kf

Reg. No. 2002/007104/07
Directors: FR Sutherland, AM van Niekerk, SAP Brown, L Greyling

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APPENDIX A

List of Abbreviations and Glossary of Technical Terms

LIST OF ABBREVIATIONS

Abbreviations

3D	Three dimensional
AAS	Atomic Absorption Spectroscopy
ASCu	Acid Soluble Copper
BAEEM	Bureau d'Assistance et d'Expertise Environnementale Minière
CAMI	DRC Ministry of Mines
CCD	Counter Current Decantation
CNW	Central North West
CSR	Corporate Social Responsibility
CV	Coefficient of variation
DCF	Discounted Cash Flow
DD	Diamond Drilling
DDMET	Diamond Drilling Metallurgical Hole
DMS	Dense Media Separation
DPEM	Department for the Protection of the Mining Environment
DRC	Democratic Republic of Congo
DTM	Digital Elevation Model
EAP	Enviromental Assessment Plan
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EPCM	Engineering Procurment Consturction and Management
ESIA	Environmental and Social Impact Assessment
GAA	Golder Associates Africa (Pty) Ltd
HARD	Half Absolute Relative Difference
HDPE	High Density Polyethylene
HG	High Grade
IFC	International Finance Corporation
IP	Induced Polarisation
JORC	Australian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves, 2004 Edition
JVA	Joint Venture Agreement
LG	Low Grade
LOM	Life Of Mine
MC	Modelled Central
ME	Modelled East
MER	Mineral Experts Report
MW	Megawatt
NPV	Net Present Value
P&Gs	Preliminaries and General
PE	permis d'exploitation
PLS	Pregnant Liquor Solution

PPM	Paradigm Project Management
QA/QC	Quality Assurance and Quality Control
QC	Quality control
R 1	RAT Lilas
R 2	RAT Grises
R 3	Greyish to dark red or brown stratified shales and micaceous schist
R 4	Altered stratified greyish siliceous dolomitic rock with oolitic horizons and a few bands of light-yellow, talcose schist. Nodules of hematite often occur.
RC	Reverse Circulation
RHC	Riaan Herman Consulting
ROM	Run of Mine
RWP	Return Water Pond
SG	specific gravity
SHEQ	Safety, Health Environment and Quality
SI	International System of Units
SRK	SRK Consulting (South Africa) (Proprietary) Limited
SX-EW	Solvent Extraction - Electrowinning
TSF	Tailing Storage Facility
WACC	Weighted Average Cost of Capital
WRD	Waste Rock Dumps

Units

%	percentage
%ASCu	percentage Acid Soluble copper
%CaO	percentage calcium oxide
%Cu	percentage copper
%CuO	percentage copper as oxide
%TCo	percentage total cobalt
%TCu	percentage total copper
±	plus or minus
°	Degrees
ha	hectare
ha/yr	hectare per year
kg	Kilogram
kg/t	kilogram per tonne
km	kilometre
km/h	kilometres per hour
km2	square kilometres
kt	kilo tonne
m	metre
m3	cubic metres

Ma	Million years before present
mg/l	milligram per litre
mm	millimetre
Mm3	Million cubic metres
Mt	Million tonnes
Mt	Million tonnes
Mtpa	Million tonnes per annum
sec	second
sq. km	square kilometres
T	tonne (1000 kg)
t/m3	tonnes per cubic metre
tpa	tonnes per annum
tph	tonnes per hour
USD	United States Dollars

Chemical Elements

$(Co,Cu)_2S_4$	Chemical composition of carrolite
$(Co,Cu,Mn,Fe)O(OH)$	Chemical composition of heterogenite
$(Cu,Co)_2(CO_3)(OH)_2$	Chemical composition of kolwezite
$(Fe,Co)O(OH)$	Chemical composition of goethite
$(Mg,Fe)_5Al(Si_3Al)O_{10}(OH)_8$	Chemical composition of chlorite
As	Chemical composition of arsenic
$Ca,Mg(CO_3)_2$	Chemical composition of dolomite
$CaCO_3$	Chemical composition of limestone
CuO	Chemical composition of copper oxide
CaO	Chemical composition of lime
Co	Chemical composition of cobalt
$Co(OH)_2$	Chemical composition of cobalt hydroxide
Cr	Chemical composition of chrome
Cu	Chemical composition of copper
$Cu_2(OH)PO_4$	Chemical composition of liberthenite
$Cu_2CO_3(OH)_2$	Chemical composition of malachite
Cu_2O	Chemical composition of cuprite
Cu_2S	Chemical composition of chalcocite
$Cu_3(PO_4)(OH)_3$	Chemical composition of cornetite
$Cu_5(PO_4)_2(OH)_4.H_2O$	Chemical composition of pseudomalachite
Cu_5FeS_4	Chemical composition of bornite
CuS	Chemical composition of covellite
Fe	Chemical composition of iron
Fe_2O_3	Chemical composition of hematite
H_2S	Chemical composition of hydrogen sulphide
H_2SO_4	Chemical composition of sulphuric acid
K-Al-Mg-Fe silicate hydroxides	Chemical composition of clay

$KMg_3Si_3AlO_{10}(F,OH)_2$	Chemical composition of mica
MgO	Chemical composition of magnesium oxide
Mn	Chemical composition of manganese
NaHS	Chemical composition of sodium hydrogen sulphide
Ni	Chemical composition of nickel
NO_2	Chemical composition of nitrogen dioxide
Pb	Chemical composition of lead
Se	Chemical composition of selenium
SiO_2	Chemical composition of Silica / quartz
SO2	Chemical composition of sulphur dioxide

GLOSSARY OF TECHNICAL TERMS AND DEFINITIONS

Argillaceous	Term describing sedimentary rock with modal grain size in the silt fraction
Assay	The chemical analysis of mineral samples to determine the metal content
Assaying	The chemical analysis of mineral samples to determine the metal content
Basal conglomerate	A conglomerate formed at the earliest portion of a stratigraphical unit
Capital expenditure	All other expenditure not classified as operating costs
Concentrate	A metal-rich product resulting from a mineral enrichment process such as gravity concentration or flotation, in which most of the desired mineral has been separated from the waste material in the ore
Crushing	Initial process of reducing ore particle size to render it more amenable for further processing
Dip	Angle of inclination of a geological feature/rock from the horizontal
Dolomite	The name of a sedimentary carbonate rock and a mineral, both composed of calcium magnesium carbonate
Drill-hole	Method of sampling rock that has not been exposed
D Strat (Stratified Dolomite or Dolomie Stratfie)	This is a well bedded to laminated, argillaceous dolomite, which forms the base of the traditional "Lower Ore Zone" in Gécamines' nomenclature
Effective Date	Effective date of the Technical Report
Fault	The surface of a fracture along which movement has occurred
Filtration	Process of separating solid material from a liquid
Geochronological	The measurement of time intervals on a geological scale
Gecamines	La Generale des Carrieres et des Mines
Grade	The measure of concentration of copper or cobalt within mineralized rock
Hanging wall	The overlying side of an ore body or slope
Haulage	A horizontal underground excavation which is used to transport mined ore or the transport of mined ore from an open pit to a treatment plant

Hydrogeology	A science that deals with sub-surface water and with related geologic aspects of surface water
Indicated Mineral Resource	The part of a mineral resource for which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a reasonable level of confidence. It is based on exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes. The locations are too widely or inappropriately spaced to confirm geological and/or grade continuity but are spaced closely enough for continuity to be assumed
Intrusives	A body of igneous rock which has forced itself onto pre-existing rocks, either along some definite structural feature or by defamation or cross-cutting of the invaded rocks
Lithology or lithogical	Geological description pertaining to different rock types
LoM plans	Life-of-mine plans
Material Assets	Collectively, East, Central and Central North West pits, Hydrometallurgical plant, Acid Plant and Liquid SO2 Plant and Dense Media Separation Plant.
Measured Mineral Resource	The part of a mineral resource for which tonnage, densities, shape, physical characteristics, grade and mineral content can be estimated with a high level of confidence. It is based on detailed and reliable exploration, sampling and testing information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes. The locations are spaced closely enough to confirm geological and grade continuity
Meta-sedimentary	Metamorphosed sedimentary rock
Mica	Layer-lattice minerals of the three-layer type, and may be divided into the dioctahedral muscovite group and the trioctahedral phlogopite-biotite group
Milling	A general term used to describe the process in which the ore is crushed and ground and subjected to physical or chemical treatment to extract the valuable metals to a concentrate or finished product.
Mineral Reserve	The economically mineable material derived from a measured and/or indicated mineral resource. It is inclusive of diluting materials and allows for losses that may occur when the material is mined. Appropriate assessments, which may include feasibility studies, have been carried out, including consideration of, and modification by, realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction is reasonably justified. Mineral reserves are sub-divided in order of increasing confidence into probable mineral reserves and Proved Mineral Reserve
Mineral Resource	A concentration or occurrence of material of economic interest in or on the earth's crust in such form, quality and quantity that there are reasonable and realistic prospects for eventual economic extraction.

	The location, quantity, grade, continuity and other geological characteristics of a mineral resource are known, estimated from specific geological evidence and knowledge, or interpreted from a well constrained and portrayed geological model. Mineral resources are sub-divided in order of increasing confidence, in respect of geoscientific evidence, into inferred, indicated and measured categories
Mining Code	DRC Law No. 007/2002 of 11 July 2002
Mwashya or R4	Altered stratified greyish siliceous dolomitic rock with oolitic horizons and a few bands of light yellow talcose schist
Orogeny	An orogeny is a period of mountain building leading to the intensely deformed belts which constitute mountain ranges
Probable Mineral Reserve	The economically mineable material derived from a measured and/or indicated mineral resource. It is estimated with a lower level of confidence than a Proved Mineral Reserve. It is inclusive of diluting materials and allows for losses that may occur when the material is mined. Appropriate assessments, which may include feasibility studies, have been carried out, and including consideration of, and modification by, realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction is reasonably justified.
Proterozoic	Era of geological time between $2,5x10^9$ and $570x10^6$ years ago
Proved Mineral Reserve	The economically mineable material derived from a Measured Mineral Resource. It is estimated with a high level of confidence. It is inclusive of diluting materials and allows for losses that may occur when the material is mined. Appropriate assessments, which may include feasibility studies, have been carried out, including consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction is reasonably justified
Roches Argilleuses Talceuse (RAT)	The RAT is considered the boundary between the R2 and R1 units and consists of an upper RAT Grises (R2) and a lower RAT Lilas (R1)
Roches Siliceuses Feuilletées Foliated (Laminated) and Silicified Rocks (RSF)	This is a grey to light brown thinly bedded laminated and highly silicified dolomites
Roches Silicieuses Cellulaires or Siliceous Rocks with Cavities (RSC)	Vuggy and infilled massive to stromatolitic silicified dolomites
SAMREC code	South African code for reporting of Mineral Resources and Mineral Reserves
Samref Congo	Samref Congo Sprl
Schist/s	A regionally metamorphased rock characterised by a parallel arrangement of the bulk of the constituent minerals
Schistes De Base or Basal	Reddish-brown to grey silty and nodular dolomite to siltstone

Schists (SDB)	
Sedimentary	Rocks formed by the accumulation of sediments, formed by the erosion of other rocks
Shales Dolomitiques Superieurs or Upper Dolomitic Shales (SDS)	Yellowish, cream to red bedded laminated dolomitic siltstones and fine-grained sandstones.
Stratigraphy	Study of stratified rocks in terms of time and space
Schistes De Base or Basal Schists (SDB)	Reddish-brown to grey silty and nodular dolomite to siltstone
Sedimentary	Rocks formed by the accumulation of sediments, formed by the erosion of other rocks
Tailings	Finely ground waste rock from which valuable minerals or metals have been extracted
Volcanics	One of three groups into which rocks have been divided. The volcanic assemblage includes all extrusive rocks and associated intrusive ones
Volcanoclastics	One of the three groups into which rocks have been divided. The volcanic assemblage includes all extrusive rocks and associated intrusive ones

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SECTION XIV: INDEPENDENT TECHNICAL REPORTS

SUB-SECTION F: KAZZINC REPORT

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ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING, QUARRYING AND MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

KAZZINC LIMITED

Mineral Resource and Ore Reserve estimations in accordance with the guidelines of the JORC Code (2004), and provision of a Competent Person's Report for the Assets held by Kazzinc Limited in both Kazakhstan and Russia

4 May 2011

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KAZZINC LIMITED

Mineral Resource and Ore Reserve estimations in accordance with the guidelines of the JORC Code (2004), and provision of a Competent Person's Report for the Assets held by Kazzinc Limited in both Kazakhstan and Russia

March 2011

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your earth our world

4 May 2011

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Dear Sirs

Competent Person's Report for the Assets held by Kazzinc Limited in Kazakhstan and Russia

Background

Kazzinc Limited (the "Client" or "Kazzinc") commissioned Wardell Armstrong International Ltd ("WAI") to prepare a Competent Person's Report (the "CPR") on its gold mining, development and exploration assets held in Kazakhstan and Russia. WAI understands that the CPR will be included as part of a prospectus (the "Prospectus") to be published in connection with a proposed offering of ordinary shares by Glencore International plc ("Glencore") to be admitted to the premium listing segment of the Official List of the United Kingdom Financial Services Authority and to trading on the main market for listed securities of the London Stock Exchange Main Listing and the main board of the Hong Kong Exchange (together, "Admission").

WAI hereby consents to the inclusion of this letter and the CPR in the Prospectus, with the inclusion of its name, in the form and context in which it appears in the Prospectus, to be published in connection with Admission.

WAI understands that Glencore International plc will be the ultimate parent company of the group.

For the purposes of Item 1.1 and 23.1 of Annex I and Item 1.1 and 10.3 of Annex III to Commission Regulation (EC) No. 809/2004 of 29 April 2004 (the "Prospectus Directive Regulation") WAI is responsible for this letter and the CPR as part of the Prospectus and declares that it has taken all reasonable care to ensure that the information contained in this letter and the CPR is, to the best of its knowledge, in accordance with the facts and contains no omission likely to affect its import. This declaration is included in the Prospectus in accordance with Item 1.2 of Annex 1 and 1.2 of Annex III to the Prospectus Directive Regulation**.**

The principal Mineral Assets in which the Client is interested comprise of production sites at Vasilkovskoye Open Pit, Maleevskoye Mine, Ridder-Sokolniy Mine, Tishinskiy Mine, Shubinskiy Mine, Shaimerden Open Pit, and reclamation of tailings from the Staroye (Old) tailings dam facility; together with advanced exploration properties at Dolinnoe & Obruchevskoe and Chekmar, all of which are located near to Ridder-Sokolniy in Kazakhstan. A further underground production mine, Novoshirokinskoye is located in the Chita region of the Russian Federation. Additional unexploited resources are to be found in tailings dam facilities (TMF's) of Chashinskoye located close to Ridder-Sokolniy Mine; and Tishinskiy TMF, located at Tishinskiy Mine, both in Kazakhstan.

In addition Kazzinc has three exploration licences located in Kazakhstan, namely, Solovievskiy Block which is located to the south of Ridder-Sokolniy Mine, Butachikhinsko-Kedrovskiy Block located west of Ridder-Sokolniy Mine; and Western Torgai located in the Kostanai region of north western Kazakhstan.

These projects are at various stages of exploration, development and mining, all of which are discussed in detail in the CPR. WAI considers that the relevant areas have sufficient technical merit to justify proposed programmes and associated expenditures.

The Prospectus contains an appropriate summary of each of the assets, and WAI is satisfied with the integrity of the information contained in the Prospectus based on the limited validation work performed by WAI, but more importantly, reliance on the legal due diligence performed by Kazzinc and its subsidiaries in the projects geographical locations.

WAI has been requested to provide an Independent valuation of the individual assets, although it has not been asked to comment on the fairness and reasonableness of any vendor or promoter considerations.

Requirement and Structure of the CPR

This report has been prepared by WAI in accordance with the requirements of the "Prospectus Rules" published by the UK Financial Services Authority from time to time and governed by the UK Listing Authority, the "Prospectus Directive" (2003/71/EC/) and the Prospectus Regulations (809/2004), "CESR's (now the European Securities and Markets Authority) recommendations for the consistent implementation of the European Commissions Regulation on Prospectuses No. 809/2004" (as updated by the European Securities and Markets Authority on 23 March 2011 following the publication of a consultation paper in 2010, in relation to the content of the prospectuses regarding mineral companies) and Chapter 18 of the Hong Kong Listing Rules.

WAI has prepared independent resource and reserve estimates for Kazzinc's material assets in accordance with the 2004 edition of the "Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves" (the "JORC Code (2004)"), all of which are shown in the CPR.

The CPR has been structured on a technical discipline basis into sections on Geology, Mineral Resources and Ore Reserves, Mining Engineering, Mineral Processing, Infrastructure, Occupational Health and Safety, Environmental Management, and a Financial Assessment for each of the Mineral Assets.

Site visits were made by WAI to all the assets mentioned above.

Verification, Validation and Reliance

The CPR is dependent upon technical, financial and legal input. The technical information as provided by Kazzinc to, and taken in good faith by, WAI has not been independently verified by means of re-calculation, but all reserve and resource estimates as presented have been re-modelled, by evidence from WAI's site visits and observations, are supported by details of exploration results, analyses and other evidence and take account of all relevant information supplied by Kazzinc. WAI has conducted a review and assessment of all material technical issues likely to influence the future performance of the Mineral Assets which included the following:

- Inspection visits to the mining operations, processing facilities, surface structures and associated infrastructure, undertaken in the last quarter of 2010, with:
  - discussion and enquiry following access to key on-site and corporate personnel;
  - an examination of historical information and results made available by Kazzinc in respect of the mining;
  - re-modelling Kazzinc's resource and reserve estimates where appropriate; and
  - a review of the Kazzinc's production forecasts and costs and undertaken all necessary investigations to ensure compliance with the Prospectus Directive Regulation in conjunction with the CESR (now the European Securities and Markets Authority) Recommendations (as updated by the European Securities and Markets Authority on 23 March 2011) and the JORC Code (2004), (where appropriate) in terms of the level of disclosure.

The resource and reserve estimates presented in the CPR for the principal mineral assets have been prepared in accordance with the guidelines of the JORC Code (2004).

WAI has placed reliance on Kazzinc that the following information provided by Kazzinc to WAI is both valid and accurate for the purpose of compiling the CPR:

- all technical information; and
- that the legal ownership of all mineral and surface rights has been verified and save as disclosed in the CPR that no significant legal issues exists which would affect the likely viability of a project and/or the mineral resources and ore reserves as reported herein.

Limitations, Declarations, Consent and Copyright

Limitations

Kazzinc has confirmed to WAI that to its knowledge the information provided by Kazzinc was true, accurate and complete and not incorrect, misleading or irrelevant in any aspect. WAI has no reason to believe that any facts have been withheld.

The achievability of production forecasts and costs are neither warranted nor guaranteed by WAI. The forecasts as presented and discussed herein have been proposed by Kazzinc management and adjusted where appropriate by WAI, based on up-to-date reserve estimates, and cannot be assured. They are necessarily based on economic assumptions, many of which are beyond the control of Kazzinc.

Declarations

WAI will receive a fee for the preparation of the CPR in accordance with normal professional consulting practice. This fee is not contingent on the outcome of the Admission or value of Glencore and WAI will receive no other benefit for the preparation of the CPR.

None of WAI or its directors, staff or subcontractors who contributed to the CPR have, at the date of this letter, and has not had within the previous two years, any shareholding in or other relationship with Glencore, Glencore International AG, Kazzinc or the principal current assets in which Kazzinc is interested which include the Vasilkovskoye Open Pit operation, Maleevskoye Mine, Ridder-Sokolniy Mine; (and its satellites which include Tishinskiy Mine, Shubinskiy Mine, Dolinnoe & Obruchevskoe development projects and Chekmar exploration project) and Shaimerden Open Pit operation, all of which are located in Kazakhstan.

WAI considers itself to be independent of Glencore, Glencore International AG and Kazzinc. None of WAI or its directors, staff or subcontractors who contributed to the CPR has any interest in the proposed offering of ordinary shares in the capital of Glencore.

In the CPR, WAI provides assurances to the Directors of Glencore and the Directors of Kazzinc that certain Technical and Economic data including production profiles, operating expenditures and capital expenditures, of the Mineral Assets as provided to WAI by Kazzinc and reviewed and where appropriately modified by WAI are reasonable.

The CPR includes technical information, which requires subsequent calculations to derive subtotals, totals and weighted averages. Such calculations may involve a degree of rounding and consequently introduce an error. Where such errors occur; WAI does not consider these to be material.

Furthermore, WAI is responsible for this letter and the CPR as part of the Prospectus and declares that it has taken all reasonable care to ensure that the information contained in this letter and the CPR is, to the best of its knowledge, in accordance with the facts and contains no omission likely to affect its import.

Consent and Copyright

WAI consents to the inclusion of its name and all references to WAI in the Prospectus, the issuing of this letter and the CPR in the form and content in which it is to be included in the Prospectus.

Neither the whole nor any part of this letter and the CPR nor any reference thereto may be included in any other document without the prior written consent of WAI regarding the form and context in which it appears.

Copyright of all text and other matter in this document, including the manner of presentation, is the exclusive property of WAI. It is an offence to publish this document or any part of the document under a different cover, or to reproduce and or use, without written consent, any technical procedure and or technique contained in this letter and the CPR. The intellectual property reflected in the contents resides with WAI and shall not be used for any activity that does not involve WAI, without the written consent of WAI.

Responsibility for the Competent Person's Report and No Material Change

WAI accepts responsibility for the CPR for the purposes of Item 1.2 of Annex 1 and 1.2 of Annex III to the Prospectus Directive Regulation. The CPR is complete up to and including 4 May 2011. Having taken all reasonable care to ensure that such is the case, WAI confirms that, to the best of its knowledge, the information contained in the CPR is in accordance with the facts, contains no omission likely to affect its import, and no material change has occurred from 4 May 2011 to the date hereof that would require any amendment to the CPR.

Qualification of Consultants

WAI comprises over 50 staff, offering expertise in a wide range of resource and engineering disciplines. WAI's independence is ensured by the fact that it holds no equity in any project. This permits WAI to provide its clients with conflict-free and objective recommendations on crucial judgment issues. WAI has a demonstrated track record in undertaking independent assessments of resources and reserves, project evaluations and audits, MER's and CPR's, and independent feasibility evaluations to bankable standards on behalf of exploration and mining companies and financial institutions worldwide.

The CPR has been prepared based on a technical and economic review by a team of consultants sourced from the WAI offices in Europe over a 4 month period. These consultants are specialists in the fields of geology, resource and reserve estimation and classification, open pit mining, rock engineering, mineral processing, hydrogeology and hydrology, tailings management, infrastructure, environmental management and mineral economics.

The individuals listed below have provided input to the CPR and have extensive experience in the mining industry and are members in good standing of appropriate professional institutions:

- Phil Newall, MCSM, BSc, PhD , CEng, FIMMM, is Director of Minerals and Geologist with WAI and has practised his profession as a mine and exploration geologist for over 25 years for both base and precious metals;
- Mark Owen, BSc, MSc, (MCSM), CGeol, EurGeol, FGS, is a Technical Director and Geologist with WAI and has over 28 years international experience as a mine and exploration geologist in both surface and underground mining operations;
- Che Osmond, BSc, MSc (MCSM), ProfGradMIMMM, CGeol, Euro Geol, FGS; is a Principal Geologist with WAI and has over 15 years experience in mining and exploration geology;
- Adam Wheeler, BSc MSc CEng EurIng, MIMMM; is Principal Resource Analyst and Mining Engineer, with WAI specialising in the application, customisation and management of mining and geological software systems;
- Richard Ellis, MCSM BSc MSc FGS; is a Senior Resource Geologist with WAI who has some 8 years operational experience within the industrial minerals sector in the UK;
- Colin Taylor, MA, Pr.Sci.Nat, is an Associate Geologist with WAI who has over 40 years of international experience in exploration and resource geology, initially in South Africa and Namibia before being based in the UK.
- Owen Mihalop, BSc (Hons), MSc, MCSM, CEng, MIMMM, is a Technical Director of Mining with WAI with 15 years broad based experience in the mining and quarrying industries. He has gained experience in grass-roots exploration through to large scale open-pit and underground mining projects across Ireland, Bulgaria, Spain and Canada;
- Bruce Pilcher, BE(Mining)Syd, MAusIMM(CP), MIMMM, CEng, Eur Ing is an Associate Director and Principal Mining Engineer with WAI with 25 years experience in underground and surface mining operations in South Africa, Australia and UK. Bruce has served as Mine Superintendent, Regional and Technical Services Manager. He has considerable experience in production management, mine design and planning, and contract management in the coal and metalliferous mining industries
- Lewis Meyer, BEng, ACSM, MSc, MCSM, PhD, CEng, FIMMM is a Principal Mining Engineer with WAI who has over 18 years experience in mining, underground civil construction and rock mechanics of surface and underground mining operations;
- Daniil Lunev, DipEng (SPMI), PhD (SPMI) is a Mining Engineer with WAI whose specialist area is with NPV© scheduler mining software and mining machinery.
- Stuart Richardson, BEng, ACSM, GradMIMMM is a Mining Engineer with WAI who joined Wardell Armstrong in early 2007 as a Graduate Mining Engineer who now assists in the production of of pre-feasibility and feasibility studies using Mine 2-4D software;
- Colin Hunter, BSc (Hons), PhD, is an Associate Consultant with WAI who has 32 years minerals processing experience ranging from laboratory test work and pilot plant operations through to plant commissioning, operations and trouble-shooting;
- Phil King, ARSM, BSc, FIMMM is a Technical Director and Metallurgist with WAI and has over 25 years experience within the minerals industry in both process testwork and design for metallic and industrial minerals worldwide;

- Chris Broadbent, BSc, PhD, CEng, FIMMM, is a Partner with Wardell Armstrong and is a well-recognised authority on pyrometalurgical processing and the treatment and disposal of wastes from mining and metallurgical plants;
- Andrei Kudrin, BS (Hons), MEng (Hons), as a mature student has recently graduated from the University of Exeter with an engineering degree in Renewable Energy. Before joining WAI he has had placements with various companies such as Scottish and Southern Energy and Cornwall Sustainable Energy Partnership;
- Nick Coppin, BSc, MSc, is Managing Director of WAI and an Environmental Scientist with over 30 years of broadly based experience in the mining and minerals industry. He has worked extensively with government and regional authorities and institutions for mineral planning, mining administration, environmental protection, industrial development and finance. He is fully conversant with national and international guidelines, procedures, regulations and standards for the mining and quarrying sector
- Kim-Marie Clothier, BSc (Hons) MRes AIEEM, MIEMA, Grad IMMM, ACMI; is a Senior Environmental Scientist with WAI working on Environmental and Social Impact Assessments on mining projects overseas in Uzbekistan, Macedonia, Kyrgyzstan;
- Kathy Hicks, BSc (Hons) MSc MCSM FGS is a Geo-Environmental Scientist with WAI, Kathy specialising in the field of mineral extraction and the remediation of land affected by past mining activities;
- Christine Blackmore, BSc, MSc, CEnv, FIMMM is a Principal Environmental Geologist with WA who has over 10 years of experience in environmental work both in the UK and overseas. Her expertise is focused in environmental management (EMS, EIA ect) and environmental auditing within the mining industry; and
- Julia Boiko, BSc, Regional Manager – Kazakhstan for WAI, has worked for Western mining companies in Kazakhstan on nickel and gold projects as logistics manager and technical translator.

The Competent Person who has supervised the production of the CPR is Dr Phil Newall who is Director of Minerals with WAI and a Geologist with over 25 years experience in the mining industry.

Yours faithfully
for and on behalf of
Wardell Armstrong International Ltd

P. N

P Newall
Director of Minerals

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EXECUTIVE SUMMARY

Kazzinc Limited (the "Client" or "Kazzinc") commissioned Wardell Armstrong International Ltd ("WAI") to prepare a Competent Person's Report (the "CPR") on its gold mining, development and exploration assets held in Kazakhstan and Russia. WAI understands that the CPR will be included as part of a prospectus (the "Prospectus") to be published in connection with a proposed offering of ordinary shares by Glencore International Plc ("Glencore") to be admitted to the premium listing segment of the Official List of the United Kingdom Financial Services Authority and to trading on the main market for listed securities of the London Stock Exchange Main Listing and the main board of the Hong Kong Exchange (together, "Admission").

WAI understands that Glencore International plc will be the ultimate parent company of the group.

Kazzinc has acquired a significant portfolio of mineral assets in Kazakhstan and Russia. These vary from mature mining operations through to grass-roots exploration terrain and are summarised below.

Glencore owns 50.69% of Kazzinc. The remainder of the business is owned by Verny Capital JSC (48.73%), a Kazakh investment fund unrelated to Glencore, with certain small shareholders accounting for the remaining 0.58%.

Production Mines

Kazakhstan

- Vasilkovskoye Mine;
- Maleevskoye Mine and satellite including Grechovsky Mine;
- Ridder-Sokolniy Mine; and satellites including Tishinskiy Mine and Shubinskiy Mine;
- Staroye (Old) tailings management facility (TMF);
- Ridder Smelter; and
- Shaimerden Open Pit.

Russia

- Novoshirokinskoye Mine.

Advanced Exploration Properties

Kazakhstan

- Dolinnoe & Obruchevskoe;
- Chekmar;
- Chashinskoye TMF; and
- Tishinskiy Slimes Ponds.

Exploration Licences

Kazakhstan

- Solovievskiy Block located south of Maleevskoye;
- Butachikhinsko-Kedrovskiy Block located west of Tishinskiy ; and
- Western Torgai located in the Kostanai region of northern western Kazkahstan.

In addition to these mineral assets Kazzinc also operates smelters and a hydroelectric power station (which are included in this report as part of the operational structure).

These assets are described in more detail below. All Resource and Reserve estimates presented in the CPR have been prepared by WAI and in accordance with the JORC Code (2004).

Production Mines

Vasilkovskoye

The world-class Vasilkovskoye gold deposit is located in northern Kazakhstan, 17km north of the city of Kokshetau. It represents a stockwork located at the junction of gabbro/gabbrodiorite and granite/granodiorite rocks, recognising that the ore control was the intersection of faulting parallel to the NW trending Dongulagashsky fault with the NE trending Vasilkovskoye fault. The mineralisation forms a flattened zone, partially pinching out at depth, although an aggressive in-pit exploration programme is underway to properly test the depth extension to the mineralisation.

Au mineralisation is spatially associated with quartz and quartz-arsenopyrite veins and veinlets of hydrothermal origin.

Exploration within the licence area has led to the discovery of other, nearby exciting targets which are, and will be, the focus of future exploration activity.

The mineral resource estimate for the Vasilkovskoye Gold Project is based on the Ordinary Kriging model prepared by Kazakhstan Mineral Company (KMC) in October 2009, which has been depleted upto a pit survey dated 01 January 2011.

Vasilkovskoye Mineral Resource Estimate (WAI 01.01.2011)
(In accordance with the Guidelines of the JORC Code (2004))

Cut Off Grade Au (g/t)			0.4	0.9	1.5	2.0
Measured	**Tonnage (Mt)**		45.23	30.77	19.52	13.71
	Au (g/t)		1.75	2.28	2.92	3.41
	Metal	**kg**	79,331	70,089	56,924	46,780
		oz	2,550,552	2,253,406	1,830,142	1,504,002
Indicated	**Tonnage (Mt)**		141.56	97.72	58.96	39.95
	Au (g/t)		1.72	2.21	2.89	3.44
	Metal	**kg**	243,862	215,792	170,309	137,371
		oz	7,840,344	6,937,853	5,475,553	4,416,563
Measured + Indicated	**Tonnage (Mt)**		186.80	128.49	78.48	53.66
	Au (g/t)		1.73	2.22	2.90	3.43
	Metal	**kg**	323,193	285,880	227,233	184,150
		oz	10,390,893	9,191,256	7,305,694	5,920,566
Inferred	**Tonnage (Mt)**		99.08	68.63	39.74	26.21
	Au (g/t)		1.77	2.27	3.07	3.77
	Metal	**kg**	175,747	156,032	122,157	98,883
		oz	5,650,405	5,016,526	3,927,426	3,179,143

Notes:
1) Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility Study or Pre-Feasibility Study. 2) Mineral Resources are reported inclusive of any reserves. 3) The contained Au represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery. 4) Mined areas removed from evaluation

The Vasilkovskoye open pit mine was originally developed during the early 1980's to exploit an oxide gold resource. Mining of the oxide material continued from 1980 until 2005, when the resource was finally depleted. In total 14Mt of oxide ore were mined and processed by heap leaching. A significant primary sulphide resource is present below the oxide layer and the decision to re-develop the mine and build a sulphide processing facility was made during 2006.

The new plant was designed to process up to 8Mtpa of sulphide ore and a mining study was completed by AMC Consultants in order to design a mining operation to feed the plant at this rate. AMC re-estimated the resources in accordance with the JORC Code (2004) guidelines and undertook geotechnical, hydro-geological, pit optimisation and preliminary mine design studies. The initial AMC pit design was to a depth of 360m but following re-optimisation at higher gold prices, the final pit design by Tomsk Institute was for a 440m deep pit.

Waste stripping, ore stockpiling and construction of the in-pit crushing facilities commenced during 2007. Production itself officially began with the completion of the processing facilities in November 2009. Due to problems with the processing plant, however, the mine is currently running at less than half of the design capacity, producing in the region of 270kt of ore per month rather than 600kt per month.

The Vasilkovskoye mine is a conventional open pit mine. The ore and waste rock is drilled and blasted prior to excavation by diesel-hydraulic excavators. The ore is loaded into diesel powered off-highway rigid dump trucks and hauled to either one of three in-pit stockpiles, depending on grade, or dumped directly into an in-pit crusher. The waste rock is hauled to one of two waste dumps depending on which side of the pit is being excavated. The mining fleet is owned and operated by VasGold.

Reserve estimations, related to pit design and scheduling, may be summarised as:

- **Pit Optimisation**: Pit optimisation runs were completed on the available KMC and WAI resource block models, based on parameters supplied by Vasgold;
- **Pit Design**: Based on the optimisation results, a new pit design was completed. This goes beyond the existing 'final design (Cutback #4) and incorporates a significant pit extension to the west. A summary of the reserves from this revised pit design estimated in accordance with the guidelines of the JORC Code (2004) is shown in the table below.

Vasilkovskoye Ore Reserve Estimate (WAI 01.01.2011) (In Accordance with the Guidelines of the JORC Code (2004))						
Classification	**Tonnes Mt**	**Au g/t**	**Au Contained t**	**Rock Mt**	**Waste Mt**	**Strip Ratio**
Proven	33.3	1.95	64.95	-	-	-
Probable	90.7	1.94	175.76	-	-	-
Total	***123.97***	***1.94***	***240.71***	***870.65***	***746.68***	***6.02***
Notes: Reserves determined with 0.9g/t Au cut-off, using KMC resource block model Mining factors applies of 17.5% dilution and 95% mining recovery Waste includes 38Mt of Inferred material at ore grades						

- **Scheduling**: A life-of-mine schedule was developed, based on an 8Mtpa mill production rate. Material from the final cutback is not mined until year 5, with the bulk of production from this final cutback coming after year 6.

For processing, ore is subjected to primary crushing in the open pit and the -550mm fraction is conveyed to a coarse ore stockpile by overland conveyors. Further cone crushing reduces this material to 80% passing 5.2mm.

From here, the ore is ground in two parallel circuits, each using a single stage 6.7 x 11.3m Outukumpu ball mills. Further treatment involves flotation and gravity concentration using Knelson units.

The gravity and flotation concentrates are combined and ground in a 3.6 x 5.5m ball mill to achieve a product size of 95% passing 45µm.

The combined concentrates are then subjected to ultrafine grinding, using Deswick mills, to achieve a product grading 80-90% passing 4µm.

The gold in the gravity and flotation concentrates is partially refractory and the sulphide minerals need to be oxidised to ensure maximum gold recovery. This is achieved via the "Leachox Process", supplied by Maelgwyn Minerals Services (MMS). This is followed by Detox.

Gold is recovered from carbon using the standard Zardra method at 140-150°C and 2.5 atmospheres. The electrolysis product is smelted to produce doré assaying 85-92% Au in 12kg bars.

The technological recoveries for the process plant for 2010 show that there was a gradual increase in recovery throughout the year. The maximum recovery was 67.2% in August and it appears that recoveries generally range between 60-67%. The plant head grade has generally increased throughout the period, ranging from 1.65ppm Au (January) to 2.28ppm Au (December).

The tonnage throughput peaked in May and April, but decreased again in August and September before reaching 556kt in October. However, throughput decreased during November and December due to refurbishment of the Outotec mills.

In summary, the Plant has experienced a long ramp up period due to problems with equipment and lower than expected process recoveries. However, recent initiatives by the company have addressed many of these issues to allow plant production and recovery to approach design parameters, although optimal conditions have yet to be reached.

Vasilkovskoye has a very high standard of environmental, social, health and safety management. It is compliant with Kazakh licences, permits and norms. Both the environmental and labour safety functions of the company are of high quality and well organised, and supported by a strong corporate policy, commitment and team.

There are no known social, community or cultural issues or impacts that need to be addressed, and no displacement or compensation requirements. The mine appears to have a good relationship with the local communities, and does not put undue pressure on the social infrastructure of the District or Oblast.

Maleevskoye

The Maleevskoye underground polymetallic mine is situated some 17km to the north of the town of Zyryanovsk (where the concentrator is located) which in turn is situated 186km east of Ust-Kamenogorsk, northeastern Kazakhstan.

The deposit comprises seven gently dipping stratabound zones of lead-zinc-copper-gold-silver mineralisation: Rodnikovaya, Maleevskaya, Octyabrskaya, Holodnaya, Lugovaya, Bobrovskaya and Platovskaya, confined to broad mushroom-shaped brecciated domes passing downwards into steeply dipping stockwork feeder channels, which are generally aligned along NW-trending fractures. The largest and richest mineralised zones (Maleevskaya, Rodnikovaya, Holodnaya and Lugovaya) occur within a 150-200m thick Maleevsky Member of the Maslovskaya Formation. Strike lengths exceed 1km in Orebody 3 at Maleevskaya zone and in the Rodnikovaya zone.

Mineralisation is divided into polymetallic (lead-zinc with >0.6% Pb) and copper-zinc (<0.6% Pb and high Cu). In general, polymetallic mineralisation, accompanied by barite, occurs on the flanks and on the hangingwall side of the lenses, whilst copper-zinc mineralisation tends to prevail in the central parts of the lenses and on the footwall side.

The main metalliferous minerals are pyrite, sphalerite, chalcopyrite and galena, whilst the main gangue minerals are quartz, chlorite, calcite, barite, actinolite, tremolite and less common sericite, albite, epidote and biotite.

The main recoverable by-products are gold and silver. Gold occurs in its native form as very fine grains (5-8 microns) dispersed mainly in pyritic copper mineralisation and barite-bearing lead-zinc mineralisation. A small percentage of gold occurs as larger visible grains of up to 0.8mm across. The fineness of gold is 794.

For resources, WAI has prepared a Mineral Resource estimate dated 01.01.2011 for Maleevskaya in accordance with the guidelines of the JORC Code (2004), with grade estimation carried out using Ordinary Kriging (OK) as the principal interpolation method with Inverse Power of Distance (IPD) used for comparative purposes. For orebodies 3b in the Maleevskaya Zone, 18 and 19 in the Octyabrskaya Zone and orebody 5 in the Rodnikovaya Zone, IPD was used as the principal interpolation method.

The results of this study are shown in the table below:

Maleevskoye Mineral Resource Estimate - For All Orebodies
(WAI 01.01.2011)
(In Accordance with the Guidelines of the JORC Code (2004))

Classification	Type	Tonnage (Mt)	Density	Pb		Zn		Cu		Au		Ag		Ba		Sp		EQV
				%	t	%	t	%	t	g/t	oz	g/t	oz	%	t	%	t	%
Measured	CuZn	5.16	3.57	0.31	16,118	3.17	163,709	2.37	122,268	0.46	76,838	45.78	7,592,815	2.34	12,074	20.83	107,488	6.62
	PbZn	7.77	3.81	1.68	130,483	9.41	730,724	2.39	185,584	0.73	181,078	98.97	24,707,132	5.19	40,308	18.06	140,209	13.44
	Total	12.92	3.71	1.13	146,601	6.92	894,433	2.39	307,852	0.62	257,917	77.74	32,299,948	4.05	52,382	19.17	247,696	10.71
Indicated	CuZn	3.68	3.22	0.35	12,826	3.28	120,504	1.65	60,638	0.39	45,517	41.84	4,943,748	2.30	8,438	11.46	42,095	5.71
	PbZn	7.36	3.62	1.55	114,356	8.59	631,546	2.10	154,476	0.65	154,837	76.29	18,043,611	3.78	27,792	11.49	84,529	12.15
	Total	11.03	3.49	1.15	127,182	6.82	752,050	1.95	215,114	0.56	200,354	64.82	22,987,359	3.28	36,231	11.48	126,625	10.00
Measured + Indicated	CuZn	8.83	3.43	0.33	28,944	3.22	284,213	2.07	182,906	0.43	122,355	44.14	12,536,563	2.32	20,512	16.93	149,583	6.24
	PbZn	15.12	3.72	1.62	244,838	9.01	1,362,270	2.25	340,060	0.69	335,915	87.94	42,750,744	4.50	68,101	14.86	224,738	12.81
	Total	23.96	3.61	1.14	273,783	6.87	1,646,483	2.18	522,966	0.60	458,271	71.79	55,287,307	3.70	88,613	15.63	374,321	10.39
Inferred	CuZn	1.77	3.06	0.29	5,047	2.80	49,408	1.22	21,533	0.18	10,145	24.28	1,377,707	1.15	2,038	5.80	10,234	4.55
	PbZn	3.11	3.21	2.31	71,746	6.23	193,725	0.84	26,099	0.29	28,611	60.67	6,061,129	2.75	8,538	5.83	18,101	8.55
	Total	4.87	3.16	1.58	76,794	4.99	243,133	0.97	47,632	0.25	38,756	47.49	7,438,836	2.17	10,576	5.82	28,334	7.10

Maleevskoye is the largest underground mine in the Kazzinc group in terms of ore production. Operations at Maleevskoye started in 2000 at a rate of 1.5Mtpa, with full scale production of 2.25Mtpa being reached in 2002. Two ore types are mined at Maleevskoye, copper-zinc ore and polymetallic ore. Both products are transported by road to the Zyryanovskiy Mining and Concentrating Complex ("ZGOK") located some 25km to the south of the mine site. The mine utilises modern high capacity trackless mining methods combined with a traditional tracked haulage system. The main mining methods in operation are sub-level caving, which accounts for approximately 5% of production, and sub-level open stoping with backfill, which accounts for the remaining 95% of production.

Both mining methods utilise mechanised development with electric-hydraulic face-jumbos and diesel LHDs for drilling and ore extraction. Ore and waste is transported either directly to ore/waste passes using LHDs or loaded into trucks and transported to a central ore/waste pass. Tailings are used for backfill.

Despite the fact that the mine is located 25km from the processing facility, the modern high productivity mining methods allow a good overall mining cost (approximately US$18/t of ore mined). The reserves appear sufficient to maintain operations at the present level until 2015, but after that production rate drops as a result of fewer faces being available.

WAI has carried out a mine design, and produced Ore Reserves for the Maleevskoye deposit, based upon the most recent Mineral Resource Block Model (WAI 2010). WAI has used GijimaAST Mine2-4D® software to prepare the mine design, and EPS® software to produce Ore Reserves.

During the mine design process, losses (4-8%) and dilution (10-12%) were applied to the mined tonnages at Maleevskoye. The stope blocks for Maleevskoye have been designed to a minimal average block grade of 4% Zn, or 4% Zinc Equivalent (ZnEQV).

Ore Reserves for the Maleevskoye deposit have been calculated in accordance with the guidelines of the JORC Code (2004). A summary of the Ore Reserves is presented below with the production schedule. It should be noted that the production schedule includes 171,010t of Inferred material (at 5.14% Zn, 1.31% Cu, 0.93% Pb, 0.30g/t Au and 41.8g/t Ag), which have not been reported as Ore Reserves. This material has been included in the production schedule, as it is not realistic to leave this material in-situ.

Maleevskoye Ore Reserve Estimate (WAI 01.01.2011)
(In Accordance with the Guidelines of the JORC Code (2004))

Classification	Tonnage (kt)	Grade					Contained Metal (t)				
		Zn (%)	Cu (%)	Pb (%)	Au (g/t)	Ag (g/t)	Zn (t)	Cu (t)	Pb (t)	Au (oz)	Ag (oz)
Proven	5,042	6.46	1.92	1.00	0.56	68.13	325,627	96,770	50,358	90,779	11,044,289
Probable	7,061	6.29	1.69	1.04	0.51	56.23	444,011	119,630	73,522	115,777	12,764,963
Total	***12,103***	***6.36***	***1.79***	***1.02***	***0.53***	***61.19***	***769,638***	***216,400***	***123,880***	***260,233***	***23,810,222***

Maleevskoye Production Schedule (WAI 01.01.2011)

Year	Units	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Total Mined Tonnage	kt	2,313	2,137	2,196	1,710	822	899	420	393	386	328	352	200	118	**12,274**
Zinc Grade	% Zn	5.22	6.14	6.57	7.41	6.69	7.10	6.90	6.41	6.44	7.15	5.27	4.74	5.08	**6.34**
Copper Grade	% Cu	1.75	1.66	1.60	1.59	1.62	1.76	1.97	2.05	2.42	2.55	2.82	1.94	2.82	**1.78**
Lead Grade	% Pb	0.89	1.00	1.00	1.16	0.94	1.04	1.22	1.10	1.18	1.53	0.88	0.85	0.85	**1.02**
Gold Grade	g/t Au	0.42	0.48	0.42	0.64	0.50	0.56	0.67	0.55	0.71	0.77	0.82	0.48	0.63	**0.52**
Silver Grade	g/t Ag	68.07	58.03	49.82	58.55	55.97	56.58	77.36	78.25	79.81	69.70	68.14	59.65	59.42	**60.92**

The concentrator at Zyryanovskiy was constructed in 1953 and has undergone several stages of refurbishment. The plant utilises the standard processes of crushing, heavy media concentration (HMS) and froth flotation to produce copper, lead, zinc concentrates as well as a gold rich gravity concentrate. The plant went through a substantial upgrade in 2000 when all sections of the plant were refurbished and the grinding and flotation sections were renewed. The plant was originally designed to treat 1.5Mtpa but by 2001 the throughput had increased to 2.25Mtpa. The maximum plant throughput is reported to be 3.5Mtpa.

The plant treats ore from three sources:

- Maleevskoye mine copper-zinc and polymetallic ores;
- Grekovskoe mine – polymetallic ore; and
- "Foreign" ores.

All ore types contain copper, lead, zinc, silver and gold. The gold is present predominantly in the native form and can therefore be recovered using gravity processing methods.

The zinc concentrates are transported by rail to either the zinc smelters at Ridder or Ust-Kamenogorsk. The lead and gravity gold concentrates are sent to smelters in Ust-Kamenogorsk. The copper concentrates are shipped to customers in China. The company is in the process of constructing an IsaSmelt furnace in Ust-Kamenogorsk and this is scheduled for completion in 2011. This facility will be able to process the copper concentrates.

The metallurgical balance shows a high degree of metallurgical efficiency with low losses of metals to the HMS tailings and satisfactory grades of base metal concentrates at good recovery levels. The recovery of gold to the gravity concentrates was 37.1% with a further 34% reporting to the copper concentrate.

Copper recovery to the copper concentrate was 86.1% and the concentrate assayed 24.6% Cu, 3.63% Pb, 2.92% Zn, 2.63ppm Au and 572ppm Ag. The lead concentrate was rather low at 46% Pb, 2.3% Cu and 8.5% Zn at a lead recovery of 58.2%. The zinc concentrate assayed 55.4% Zn, 0.92% Cu and 0.46% Pb at a zinc recovery of 88.9%.

The average grade of ore treated was 1.98% Cu, 0.91% Pb, 6.28% Zn, 0.53ppm Au and 59.3ppm Ag.

For the most part, the Zyryanovskiy Complex and Maleevskoye Mine have a very high standard of environmental, social, health and safety management. It is compliant with Kazakh licences, permits and norms. Both the environmental and labour safety functions of the company are of high quality and well organised, and supported by a strong corporate policy, commitment and team.

There are no known social, community or cultural issues or impacts that need to be addressed, and no displacement or compensation requirements. The mine appears to have a good relationship with the local communities, and does not put undue pressure on the social infrastructure of the District or Oblast.

Ridder-Sokolniy

Kazzinc own and operate three polymetallic deposits within the Ridder Area including Ridder-Sokolniy, Tishinskiy, Shubinskiy, and are planning to develop a further three at Chekmar, Dolinnoe and Obruchevskoe.

The Ridder-Sokolniy deposit was discovered in 1786 and has been worked since 1789, initially exploiting silver and gold-bearing ore, before producing gold-polymetallic ore from surface and underground workings since 1920.

The deposit is situated in the northern part of the Ridder mining district in the Rudnyi Altay. Geologically, this district coincides with an unusual graben structure oriented perpendicular to the regional north west structural trend and preserving Silurian to Middle Devonian volcano-sedimentary sequences almost in the same position as they were laid down. The graben is filled with four volcano-sedimentary formations with the

Kriukovskaya Formation hosting most of the polymetallic mineralised ore. The deposit is a cluster of approximately 20 ore zones of veinlet-type and disseminated sulphide mineralised ore found at the same stratigraphic position within the Middle Devonian volcano-sedimentary Kriukovskaya Formation. Four other ore zones are known from deeper stratigraphic levels. The mineralised ore covers an area of approximately $20km^2$ and extends down to a depth of at least 700m.

The most distinguishing feature of the Ridder-Sokolniy mineralised ore is the dominance of zinc over copper and lead. The average ratio of Cu:Pb:Zn is 0.2:1:2.4, except in copper and zinc-copper veins where copper predominates. The other characteristic feature is the presence of substantial quantities of gold and, to a lesser degree, silver.

Significant exploration has been conducted at Ridder-Sokolniy and Kazzinc continues to investigate extensions to mineralisation both on the flanks and at depth to known deposits. In 2010 over 62,000m of drilling was completed from surface and a further 77,200m completed underground.

Ridder-Sokolniy has a long mining history with underground operations commencing in 1791. Originally there were three separate mines: '40 Years of VLKSM', 'Ridder' and 'Leninogorskiy', which eventually merged into one operation to enable a combined access to the ore. Mining operations have been conducted in the 17 major lodes and future plans are to develop the eastern flank of the Perspectivnaya Lode at the Bakhrushinsky deposit. The mine has an extensively developed underground infrastructure on 11 haulage levels and in 11 different deposits. The deposits are accessed by 12 shafts (10 in operation), with a maximum depth of 460m. The main hoisting shafts are Skipovaya (for Pb-Zn ore) and Novaya (for Cu ore and development waste).

The mine has a staffing of approximately 1,500 and most of the production is performed using hand-held equipment and scrapers and the main haulage is tracked. Trackless methods have been approached recently, and are now focused in the Pobeda area (narrow high-grade gold vein) in the southern part of the mine. It is proposed to implement 30% trackless mining machinery (especially in development and haulage) in 2011 and to increase utilisation to 50% of overall production by 2013. The majority of the ore is extracted using Sub-Level Open Stoping method or Open Stoping method, which are relatively similar. Where conditions require, Sublevel Open Stoping with Backfill is used to prevent caving of empty stopes or where the risk of potential damage to buildings on surface exists. Shrinkage stoping (<5% of production) is applied in thin steeply dipping ore bodies.

The Ridder mining and metallurgical complex employs some 600 staff and treats ore from several sources including Ridder-Sokolniy mine, Tishinskiy mine, Shubinskiy mine, Staroye tailings, Aged and Fresh slimes from crushing, and Shaimerden zinc oxide and other oxide ores. The latter is transported some 1,200km by rail. All but the zinc oxide ores are initially sent for crushing at one of three crushing facilities with one ore type, a high gold grading silica rich ore from the Ridder-Sokolniy mine, dispatched to Ust-Kamenogorsk (smelter) directly after crushing. The remaining ores are further treated by crushing, milling, gravity and froth flotation in one of two concentrator buildings.

The copper concentrate is sold to a Chinese smelter and the lead concentrate is dispatched to the Kazzinc lead smelter in Ust-Kamenogorsk. The gold concentrate is also dispatched to Ust-Kamenogorsk where it is fed into the lead smelter. The zinc concentrate is transported by truck a few kilometres to the Kazzinc zinc smelter (located in Ridder) and several other ores and concentrates, including Shaimerden and other oxide ores, are also treated at the zinc smelter. Tailings from the complex are pumped some 5km to the Talovskoye TMF that has a remaining capacity of 50Mt.

There has been mining activity at Ridder since 1786, via surface and underground workings, with concentration facilities since the 1920s. Prior to 1991, mining and processing at Ridder-Sokolniy was State owned and operated; Kazzinc started operating in 1997. The mineral rights for Ridder-Sokolniy mine remain State owned, and operations take place under the Subsoil Use Contract with the government. Kazzinc is responsible only for liabilities generated via their current operations and does not have any liabilities associated with contaminations prior to 1997.

Mineral Resources for individual Ridder-Sokolniy ore zones have been calculated in accordance with the guidelines of the JORC Code (2004) and are shown in the tables together with a summary below.

Centralny Resource Estimate (WAI 01.01.11)
Total In-Situ Resources At COG of 1.7% ZnEQV for PbZn Ore and 0.6% CuEQV for Cu Ore
(In Accordance with the Guidelines of the JORC Code (2004))

Classification	Tonnage (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (Pb)		Zinc (Zn)	
		Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Measured	20.09	1.00	648,768	8.43	5,446,956	0.9	18,020	0.31	61480	0.8	160,800
Indicated	36.21	1.23	1,437,071	8.46	9,847,050	0.44	15,950	0.36	130750	0.85	308,310
Measured + Indicated	56.30	1.15	2,085,839	8.45	15,294,006	0.60	33,970	0.34	192,230	0.83	469,110
Inferred	1.53	0.83	40,763	3.74	183,365	0.45	690	0.15	2320	0.71	10,880

Notes:
1. Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility Study or Pre-Feasibility Study.
2. Mineral Resources are reported inclusive of any reserves.
3. Grade represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery.

Bystrushinskoe Resource Estimate (WAI 01.01.11)
Total In-Situ Resources At COG of 1.7% ZnEQV for PbZn Ore and 0.6% CuEQV for Cu Ore
(In Accordance with the Guidelines of the JORC Code (2004))

Classification	Tonnage (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (Pb)		Zinc (Zn)	
		Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Measured	-	-	-	-	-	-	-	-	-	-	-
Indicated	16.98	2.72	1,486,264	12.29	6,711,147	0.28	48,064	0.42	71,510	0.90	152,812
Measured + Indicated	16.98	2.72	1,486,264	12.29	6,711,147	0.28	48,064	0.42	71,510	0.90	152,812
Inferred	0.04	1.53	1,768	3.44	3,922	0.18	63	0.15	53	0.33	118

Notes:
1. Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility Study or Pre-Feasibility Study.
2. Mineral Resources are reported inclusive of any reserves.
3. Grade represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery.

North Bystrushinskoe Resource Estimate (WAI 01.01.11)
Total In-Situ Resources At COG of 1.7% ZnEQV for PbZn Ore and 0.6% CuEQV for Cu Ore
(In Accordance with the Guidelines of the JORC Code (2004))

Classification	Tonnage (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (Pb)		Zinc (Zn)	
		Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Measured	-	-	-	-	-	-	-	-	-	-	-
Indicated	1.75	1.26	70,796	5.63	317,328	1.02	17,890	0.29	5,140	1.08	18,868
Measured + Indicated	1.75	1.26	70,796	5.63	317,328	1.02	17,890	0.29	5,140	1.08	18,868
Inferred	0.09	2.46	7,106	6.90	19,997	0.86	776	0.29	264	1.03	925

Notes:
1. Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility Study or Pre-Feasibility Study.
2. Mineral Resources are reported inclusive of any reserves.
3. Grade represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery.

Belkina Resource Estimate (WAI 01.01.11)
Total In-Situ Resources At COG of 1.7% ZnEQV for PbZn Ore
(In Accordance with the Guidelines of the JORC Code (2004))

Classification	Tonnage (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (Pb)		Zinc (Zn)	
		Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Measured	3.76	1.26	152,331	18.98	2,294,630	0.09	3,384	0.47	17,670	0.98	36,850
Indicated	4.77	1.11	170,126	16.85	2,582,538	0.08	3,814	0.41	19,550	0.85	40,520
Measured + Indicated	8.53	1.18	322,456	17.79	4,877,168	0.08	7,200	0.44	37,220	0.91	77,370
Inferred	0.52	0.88	14,669	23.42	390,393	0.28	1,450	0.32	1,660	0.90	4,670

Notes:
1. Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility Study or Pre-Feasibility Study.
2. Mineral Resources are reported inclusive of any reserves.
3. Grade represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery.

Perspectivnaya Resource Estimate (WAI 01.01.11)
Total In-Situ Resources At COG of 1.7% ZnEQV for PbZn Ore
(In Accordance with the Guidelines of the JORC Code (2004))

Classification	Tonnage (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (Pb)		Zinc (Zn)	
		Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Measured	4.59	1.55	228,476	16.01	2,359,940	0.13	5,960	0.57	26,130	1.07	49,060
Indicated	3.94	1.36	172,076	16.79	2,124,381	0.13	5,120	0.53	20,860	1.03	40,530
Measured + Indicated	8.52	1.46	400,552	16.37	4,484,321	0.13	11,080	0.55	46,990	1.05	89,590
Inferred	2.03	1.19	77,607	12.08	787,806	0.14	2,840	0.49	9,940	0.95	19,270

Notes:
1. Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility Study or Pre-Feasibility Study.
2. Mineral Resources are reported inclusive of any reserves.
3. Grade represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery.

Sokolok Resource Estimate (WAI 01.01.11)
Total In-Situ Resources At COG of 1.7% ZnEQV for PbZn Ore
(In accordance with the Guidelines of the JORC Code (2004))

Classification	Tonnage (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (Pb)		Zinc (Zn)	
		Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Measured	-	-	-	-	-	-	-	-	-	-	-
Indicated	0.29	1.36	12,839	120.84	1,140,808	0.13	380	1.00	2,940	1.89	5,550
Measured + Indicated	0.29	1.36	12,839	120.84	1,140,808	0.13	380	1.00	2,940	1.89	5,550
Inferred	0.37	1.40	16,715	15.27	182,315	0.14	520	1.48	5,500	1.98	7,350

Notes:
1. Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility Study or Pre-Feasibility Study.
2. Mineral Resources are reported inclusive of any reserves.
3. Grade represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery.

New Glubokaya Resource Estimate (WAI 01.01.11)
Total In-Situ Resources At COG of 1.7% ZnEQV for PbZn Ore
(In Accordance with the Guidelines of the JORC Code (2004))

Classification	Tonnage (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (Pb)		Zinc (Zn)	
		Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Measured	-	-	-	-	-	-	-	-	-	-	-
Indicated	0.32	0.18	1,867	2.48	25,723	0.06	190	0.67	2,160	1.80	5,810
Measured + Indicated	0.32	0.18	1,867	2.48	25,723	0.06	190	0.67	2,160	1.80	5,810
Inferred	0.07	0.14	314	2.68	6,004	0.31	220	0.74	520	2.10	1,460

Notes:
1. Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility Study or Pre-Feasibility Study.
2. Mineral Resources are reported inclusive of any reserves.
3. Grade represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery.

Glubokaya Resource Estimate (WAI 01.01.11)
Total In-Situ Resources At COG of 1.7% ZnEQV for PbZn Ore
(In Accordance with the Guidelines of the JORC Code (2004))

Classification	Tonnage (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (Pb)		Zinc (Zn)	
		Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Measured	-	-	-	-	-	-	-	-	-	-	-
Indicated	-	-	-	-	-	-	-	-	-	-	-
Measured + Indicated	-	-	-	-	-	-	-	-	-	-	-
Inferred	0.51	0.10	1,640	1.48	24,277	0.08	410	0.83	4,230	1.91	9,740

Notes:
1. Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility Study or Pre-Feasibility Study.
2. Mineral Resources are reported inclusive of any reserves.
3. Grade represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery.

Dalnaya Resource Estimate (WAI 01.01.11)
Total In-Situ Resources At COG of 1.7% ZnEQV for PbZn Ore
(In Accordance with the Guidelines of the JORC Code (2004))

Classification	Tonnage (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (Pb)		Zinc (Zn)	
		Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Measured	-	-	-	-	-	-	-	-	-	-	-
Indicated	3.14	0.31	31,104	3.49	352,551	0.68	21,281	0.22	6,975	2.31	72,368
Measured + Indicated	3.14	0.31	31,104	3.49	352,551	0.68	21,281	0.22	6,975	2.31	72,368
Inferred	1.16	0.18	6,855	3.18	118,984	0.51	5,958	0.40	4,620	2.07	24,083

Notes:
1. Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility Study or Pre-Feasibility Study.
2. Mineral Resources are reported inclusive of any reserves.
3. Grade represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery.

Zavodskaya Resource Estimate (WAI 01.01.11)
Total In-Situ Resources At COG of 1.7% ZnEQV for PbZn Ore
(In Accordance with the Guidelines of the JORC Code (2004))

Classification	Tonnage (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (Pb)		Zinc (Zn)	
		Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Measured	1.78	0.82	46,922	22.60	1,293,223	0.12	2,111	0.79	14,105	1.53	27,187
Indicated	0.51	0.97	15,816	21.62	352,524	0.10	509	0.67	3,397	1.29	6,523
Measured + Indicated	2.29	0.85	62,739	22.38	1,645,747	0.12	2,620	0.76	17,502	1.48	33,710
Inferred	0.33	1.00	10,567	21.10	222,961	0.14	459	0.60	1,958	1.21	3,991

Notes:
1. Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility Study or Pre-Feasibility Study.
2. Mineral Resources are reported inclusive of any reserves.
3. Grade represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery.

Kazzinc Mineral Resources Ridder-Sokolniy Mine (WAI 01.01.2011)
(In Accordance with the Guidelines of the JORC Code (2004)

Deposit	Resources	Cut Off Grade	Date	Tonnes (Mt)	Gold (Au) Grade (g/t)	Gold (Au) Metal Content (oz)	Silver (Ag) Grade (g/t)	Silver (Ag) Metal Content (oz)	Copper (Cu) Grade (%)	Copper (Cu) Metal Content (t)	Lead (Pb) Grade (%)	Lead (Pb) Metal Content (t)	Zinc (Zn) Grade (%)	Zinc (Zn) Metal Content (t)
Centralniy	**Measured**	1.7% ZnEq for PbZn ore and 0.6% CuEq for Cu ore	01-Jan-11	20.09	1.00	648,768	8.43	5,446,956	0.9	18,020	0.31	6,1480	0.8	160,800
	Indicated			36.21	1.23	1,437,071	8.46	9,847,050	0.44	15,950	0.36	130,750	0.85	308,310
	Measured + Indicated			56.30	1.15	2,085,839	8.45	15,294,006	0.60	33,970	0.34	192,230	0.83	469,110
	Inferred			1.53	0.83	40,763	3.74	183,365	0.45	690	0.15	2,320	0.71	10,880
	Total			57.83	1.14	2,126,602	8.33	15,477,371	0.60	34,660	0.34	194,550	0.83	479,990
Bystrushinskoe	**Measured**	1.7% ZnEq for PbZn ore and 0.6% CuEq for Cu ore	01-Jan-11	-	-	-	-	-	-	-	-	-	-	-
	Indicated			16.98	2.72	1,486,264	12.29	6,711,147	0.28	48,064	0.42	71,510	0.90	152,812
	Measured + Indicated			16.98	2.72	1,486,264	12.29	6,711,147	0.28	48,064	0.42	71,510	0.90	152,812
	Inferred			0.04	1.53	1,768	3.44	3,922	0.18	63	0.15	53	0.33	118
	Total			17.02	2.72	1,488,032	12.28	6,715,069	0.28	48,127	0.42	71,563	0.90	152,930
Bystrushinskoe North Flank	**Measured**	1.7% ZnEq for PbZn ore and 0.6% CuEq for Cu ore	01-Jan-11	-	-	-	-	-	-	-	-	-	-	-
	Indicated			1.75	1.26	70,796	5.63	317,328	1.02	17,890	0.29	5,140	1.08	18,868
	Measured + Indicated			1.75	1.26	70,796	5.63	317,328	1.02	17,890	0.29	5,140	1.08	18,868
	Inferred			0.09	2.46	7,106	6.90	19,997	0.86	776	0.29	264	1.03	925
	Total			1.84	1.31	77,902	5.69	337,325	1.01	18,666	0.29	5,404	1.07	19,793
Belkina_RSM_WA	**Measured**	1.7% ZnEq	01-Jan-11	3.76	1.26	152,331	18.98	2,294,630	0.09	3,384	0.47	17,670	0.98	36,850
	Indicated			4.77	1.11	170,126	16.85	2,582,538	0.08	3,814	0.41	19,550	0.85	40,520
	Measured + Indicated			8.53	1.18	322,456	17.79	4,877,168	0.08	7,200	0.44	37,220	0.91	77,370
	Inferred			0.52	0.88	14,669	23.42	390,393	0.28	1,450	0.32	1,660	0.90	4,670
	Total			9.05	1.16	337,125	18.11	5,267,561	0.10	8,650	0.43	38,880	0.91	82,040
Perspectivnaya	**Measured**	1.7% ZnEq	01-Jan-11	4.59	1.55	228,476	16.01	2,359,940	0.13	5,960	0.57	26,130	1.07	49,060
	Indicated			3.94	1.36	172,076	16.79	2,124,381	0.13	5,120	0.53	20,860	1.03	40,530
	Measured + Indicated			8.52	1.46	400,552	16.37	4,484,321	0.13	11,080	0.55	46,990	1.05	89,590
	Inferred			2.03	1.19	77,607	12.08	787,806	0.14	2,840	0.49	9,940	0.95	19,270
	Total			10.55	1.41	478,159	15.55	5,272,127	0.13	13,920	0.54	56,930	1.03	108,860
Sokolok	**Measured**	1.7% ZnEq	01-Jan-11	-	-	-	-	-	-	-	-	-	-	-
	Indicated			0.29	1.36	12,839	120.84	1,140,808	0.13	380	1.00	2,940	1.89	5,550
	Measured + Indicated			0.29	1.36	12,839	120.84	1,140,808	0.13	380	1.00	2,940	1.89	5,550
	Inferred			0.37	1.40	16,715	15.27	182,315	0.14	520	1.48	5,500	1.98	7,350
	Total			0.67	1.38	29,554	61.94	1,323,123	0.14	900	1.27	8,440	1.94	12,900
New Glubokaya	**Measured**	1.7% ZnEq	01-Jan-11	-	-	-	-	-	-	-	-	-	-	-
	Indicated			0.32	0.18	1,867	2.48	25,723	0.06	190	0.67	2,160	1.80	5,810
	Measured + Indicated			0.32	0.18	1,867	2.48	25,723	0.06	190	0.67	2,160	1.80	5,810
	Inferred			0.07	0.14	314	2.68	6,004	0.31	220	0.74	520	2.10	1,460
	Total			0.39	0.17	2,181	2.51	31,727	0.10	410	0.68	2,680	1.85	7,270

Glubokaya	**Measured**	1.7% ZnEq	01-Jan-11	-	-	-	-	-	-	-	-	-	-	-
	Indicated			-	-	-	-	-	-	-	-	-	-	-
	Measured + Indicated			-	-	-	-	-	-	-	-	-	-	-
	Inferred			0.51	0.10	1,640	1.48	24,277	0.08	410	0.83	4,230	1.91	9,740
	Total			0.51	0.10	1,640	1.48	24,277	0.08	410	0.83	4,230	1.91	9,740
Dalnaya	**Measured**	1.7% ZnEq	01-Jan-11	-	-	-	-	-	-	-	-	-	-	-
	Indicated			3.14	0.31	31,104	3.49	352,551	0.68	21,281	0.22	6,975	2.31	72,368
	Measured + Indicated			3.14	0.31	31,104	3.49	352,551	0.68	21,281	0.22	6,975	2.31	72,368
	Inferred			1.16	0.18	6,855	3.18	118,984	0.51	5,958	0.40	4,620	2.07	24,083
	Total			4.30	0.27	37,959	3.41	471,535	0.63	27,239	0.27	11,595	2.24	96,451
Zavodskaya	**Measured**	1.7% ZnEq	01-Jan-11	1.78	0.82	46,922	22.60	1,293,223	0.12	2,111	0.79	14,105	1.53	27,187
	Indicated			0.51	0.97	15,816	21.62	352,524	0.10	509	0.67	3,397	1.29	6,523
	Measured + Indicated			2.29	0.85	62,739	22.38	1,645,747	0.12	2,620	0.76	17,502	1.48	33,710
	Inferred			0.33	1.00	10,567	21.10	222,961	0.14	459	0.60	1,958	1.21	3,991
	Total			2.62	0.87	73,305	22.22	1,868,709	0.12	3,079	0.74	19,460	1.44	37,701
Ridder-Sokolny Mine	**Measured**			30.21	1.11	1,076,497	11.73	11,394,749	0.64	29,475	0.40	119,385	0.91	273,897
	Indicated			67.91	1.55	3,397,959	10.74	23,454,050	0.38	113,198	0.40	269,542	0.95	645,031
	Measured + Indicated			98.12	1.42	4,474,456	11.05	34,848,799	0.46	142,675	0.40	388,927	0.94	918,928
	Inferred			6.64	0.83	178,004	9.09	1,940,024	0.29	13,386	0.59	39,365	1.12	74,187
	Total			104.76	1.38	4,652,459	10.92	36,788,824	0.45	156,061	0.41	428,292	0.95	993,115

Ore Reserves for individual ore zones at Ridder-Sokolniy have been calculated in accordance with the guidelines of the JORC Code (2004) and are shown in the table below.

Ridder-Sokolniy Ore Reserve Estimate
(WAI 01.01.2011)
(In Accordance with the Guidelines of the JORC Code (2004))

Deposit	Reserves	Ore (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (Pb)		Zinc (Zn)	
			Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Centralny	**Proven**	5.02	0.71	114,830	5.19	837,614	0.69	34,566	0.18	9,076	0.52	26,208
	Probable	9.17	1.03	303,446	5.95	1,756,434	0.26	23,699	0.34	31,365	0.64	58,683
	Total	**14.19**	**0.92**	**418,276**	**5.69**	**2,594,048**	**0.41**	**58,264**	**0.28**	**40,440**	**0.60**	**84,891**
Belkina	**Proven**	2.24	0.98	70,492	25.38	1,826,106	0.07	1,541	0.45	9,960	0.93	20,814
	Probable	1.22	0.82	31,972	13.16	514,297	0.06	672	0.29	3,499	0.61	7,369
	Total	**3.46**	**0.92**	**102,463**	**21.08**	**2,340,403**	**0.06**	**2,213**	**0.39**	**13,459**	**0.82**	**28,183**
Perspectivnaya	**Proven**	1.45	1.54	71,946	18.55	864,235	0.11	1,632	0.52	7,501	0.97	14,126
	Probable	0.83	1.33	35,682	13.82	369,402	0.09	785	0.37	3,086	0.69	5,711
	Total	**2.28**	**1.47**	**107,628**	**16.82**	**1,233,637**	**0.11**	**2,416**	**0.46**	**10,587**	**0.87**	**19,837**
Zavodskaya	**Proven**	0.24	0.72	5,511	21.73	165,757	0.13	299	0.86	2,050	1.71	4,047
	Probable	0.03	1.56	1,278	19.65	16,120	0.10	26	0.70	179	1.28	326
	Total	**0.27**	**0.80**	**6,789**	**21.53**	**181,876**	**0.12**	**324**	**0.85**	**2,228**	**1.66**	**4,373**
North Bestrushinskoye	**Proven**	-	-	-	-	-	-	-	-	-	-	-
	Probable	0.80	1.05	26,971	23.76	612,977	0.12	971	0.85	6,791	1.54	12,387
	Total	**0.80**	**1.05**	**26,971**	**23.76**	**612,977**	**0.12**	**971**	**0.85**	**6,791**	**1.54**	**12,387**
Total	***Proven***	*8.95*	*0.91*	*262,779*	*12.85*	*3,693,712*	*0.43*	*38,038*	*0.32*	*28,587*	*0.73*	*65,195*
	Probable	*12.05*	*1.03*	*399,349*	*8.44*	*3,269,230*	*0.22*	*26,153*	*0.37*	*44,920*	*0.70*	*84,476*
	Total	***21.00***	***0.98***	***662,127***	***10.32***	***6,962,941***	***0.31***	***64,188***	***0.35***	***73,505***	***0.71***	***149,671***

Tishinskiy

The Tishinskiy deposit is situated 18km south west of Ridder. The Tishinskiy mine is linked by rail and asphalt road, which lies adjacent to the mine with Ridder and Ust-Kamenogorsk.

The Tishinskiy deposit was discovered in 1958. Preliminary and detailed exploration of the new discovery was completed in mid-1963. Mine development and detailed underground exploration began in July 1963. Whilst underground work was in progress, drilling from surface continued until the end of 1983 focusing primarily on deep levels of the deposit. The central part of the Main Lode and its eastern flank were delineated to depth of 1,200m and the western flank to a depth of 900m (Tishinsky Shaft collar being at 644m).

The Tishinskiy deposit is situated in the central portion of the Butachihinsko-Kedrova shear zone, which adjoins the south-western flank of the Ridder graben. The Palaeozoic host rocks have undergone strong polyphase folding and intense shearing. The deformed formations comprise high grade metamorphic Ordovician basement rocks and weakly metamorphosed volcanogenic-sedimentary Devonian-Upper Carboniferous rocks.

Tishinskiy is a stratabound deposit developed along the E-W trending subvertical contact between the Ilinskaya and Sokolnaya Formations, both of Middle Devonian (Eifelian) age.

The Main Orebody, also known as Orebody No 1 extends over a strike length of 1,250m from surface to a depth of 1,270m corresponding to Level 22 at the absolute elevation of minus 590m. The central part of this body, about 500m in strike length and up to 60m in width, contains three subvertical lenses of massive sulphides (Western, Central and Eastern) with a combined strike length of about 200m, enveloped in disseminated mineralised ore. The Western and Central lenses peter out downwards on Levels 14 to 18 at the absolute elevations of -110m and -350m respectively and the Eastern lens pinches out at about the zero datum (10m below Level 12). Average widths range from 6.5m to 17m. Lower grade disseminated mineralised ore with much reduced widths (generally less than 10m) occurs in the Western Shaft section of the mine on the western flank of the deposit above Level 8 and on the eastern flank, where it peters out rapidly towards a major transverse fault.

Orebody No 67 has a strike length of 1,000m, dip extent of 700m and an average width of 3.7m. Orebody No.1011 has a strike length of 550m, dip extent of 400m and an average width of 1.7m. On its flanks, the Main Lode divides into a number of parallel tapering branches to the east and west and gradually fades out. Lenses and small vein-like bodies on the flanks of the deposit range from 25m to 50m in strike length and from 40m to 150m in down dip extent.

Four primary and two secondary mineral associations have been recognised at the Tishinskiy deposit. The prevalent associations are: (1) A polymetallic (chalcopyrite-galena-pyrite-sphalerite) association, and (2) A copper-zinc (chalcopyrite-sphalerite-pyrite) association. Disseminated veinlet-type polymetallic mineralised ore predominates, but massive sulphide lenses of various sizes occur in the central parts of mineralised bodies.

The resources for the Tishinskiy deposit are classified in accordance with the guidelines of Australian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves JORC Code (2004). Criteria for defining resource categories were also derived from the geostatistical studies.

The grades in the final resource model were derived from the Ordinary Kriging estimation method for all elements, using a cut–off grade of 2.2% Zn equivalent:

Tishinskiy Mineral Resource Estimate - At COG of 2.2% ZnEqv (WAI 01.01.2011) (In Accordance with the Guidelines of the JORC Code (2004))													
Classification	**Tonnes (Mt)**	**Density**	**Zn**		**Pb**		**Cu**		**Au**		**Ag**		**ZNEQV**
			%	**Kt**	**%**	**kt**	**%**	**kt**	**g/t**	**oz**	**g/t**	**oz**	**%**
Measured	21.23	3	4.7	1,000	1.0	212	0.6	125	0.60	412,000	9.02	6,154,000	7.4
Indicated	7.01	3	4.3	305	0.9	66	0.4	31	0.46	104,000	9.75	2,072,000	6.3
Inferred	5.19	3	4.5	231	1.4	70	0.6	29	0.33	55,000	11.94	2,380,000	9.4

Notes:

1. Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility Study or Pre-Feasibility Study.
2. Mineral Resources are reported inclusive of any reserves.
3. Grade represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery.

Mining operations at the Tishinskiy mine started in 1975 using both surface and underground mining methods. To date, approximately 49Mt of ore have been extracted (including open pit ore).

Historically, the main mining method employed in the underground mine has been underhand open stoping with hydraulic cemented backfill. Trackless mining equipment is employed for the development and stoping activities, but a track haulage system is used to transport ore and waste from drawpoints, and ore passes to the main hoisting shaft. The current ore production rate is between 1,300-1,400ktpa.

The mining method utilises jumbo development, electric over hydraulic production drilling and diesel load haul dump (LHD) loaders. The mine has its own backfill preparation plant, where backfill is mixed and pumped to a pipeline connected to the underground infrastructure. From this pipeline the backfill is distributed to stopes via backfill boreholes (normally one for the backfill, and an additional borehole for control) and pipeline extensions.

With depletion of the ore reserves from the central part of the deposit, the mine will be developed towards its flanks, and towards the bottom. Current exploration programmes are aimed at bringing the levels between 18 Level to 22 Level into production. An additional resource estimation study is currently being conducted for the eastern flank of the deposit, with production from this area due to commence in 2012.

WAI has performed an evaluation of the Tishinskiy mine Ore Reserves in accordance with the requirements of the JORC Code (2004). The evaluation has been performed using a geological block model produced by WAI dated 01.01.2011 and considers modifying factors, such as dilution and losses, with respect to the current mining operations and methods.

The stope boundaries were generated to correspond with the standardised dimensions of the existing stopes and development in the mine, and also to be above the minimum cut-off grade for exploitation.

A total of 2,725 stopes was produced to justify the Tishinskiy ore reserves. The greatest part of the reserve is contained in the central part of the deposit, but there is a significant portion of reserves located in the western part of the deposit. A summary of ore reserves is given in the table below.

Tishinskiy Ore Reserve Estimate (WAI 01.01.2011) (In Accordance with the Guidelines of the JORC Code (2004))											
	Ore	Zinc		Copper		Lead		Gold		Silver	
	kt	%	kt	%	kt	%	kt	g/t	kg	g/t	kg
Proven	18,886	4.22	797	0.52	98	0.91	172	0.54	10,198	8.12	153,353
Probable	4,928	4.13	204	0.4	20	0.88	43	0.47	2,316	9.36	46,124
Total Proven and Probable	***23,814***	***4.20***	***1,001***	***0.50***	***118***	***0.90***	***215***	***0.53***	***12,514***	***8.38***	***199,477***
Inferred material within stopes	*156*	*11.17*	*17*	*0.45*	*1*	*1.2*	*2*	*0.45*	*70*	*11.05*	*1,728*

Tishinskiy mine is a mature operation. Despite relatively unfavourable rock conditions, resulting in the requirement for additional ground support, mining is performed to a high standard. The utilisation of modern western underground mining equipment and qualified personnel provide confidence that production targets are being met. The remaining Ore Reserve together with available Mineral Resources estimated by both internal and independent sources, show long-term potential for this operation.

Kazzinc's environmental management and monitoring are performed in line with national requirements, and Kazzinc has achieved accreditation under international environmental, quality and health and safety management systems. Further reviews of requirements to achieve international compliance should be undertaken. These should include a review of monitoring and closure request. A key area for attention is water recycling and management.

In 2010 an independent environmental audit was conducted at Kazzinc including Tishinskiy Mine. During the audit all environmental aspects, risks, targets and environmental management programmes applied by these operations and the efficiency of planned impact mitigation actions were assessed. The first step in moving towards best practice, would be to review all procedures against international standards.

Shubinskiy

The Shubinskiy deposit is situated in the Glubokovskoe region of East Kazakhstan province 14km north-east of Ridder from which it is readily accessible by an all weather graded road.

The mine development consists of five underground levels connecting two vertical shafts located on the north-western and south-eastern flanks of the deposit.

The deposit covers an area of 600*110m extending from north west to south east along the contact of the Uspenskaya Formation, comprising volcanogenic-sedimentary rocks and the Beloubinskaya Formation terrigenous sediments.

The deposit consists of two clusters of sub-parallel, tabular and lenticular mineralised bodies, the North-Western Lode and the South-Eastern Lode respectively.

Five ore bodies and 24 lenses of pyritic polymetallic mineralisation have been identified at Shubinsky. The majority of the reserves (78.7%) are concentrated in the No.1 and No.2 ore bodies, and 63.9% in these bodies in the NW Lode where the grades are higher.

The ore bodies and lenses themselves, dip 65-80° NE and strike 320-340°. They vary from 100-130m to 200-220m in length, extend down dip from 190m to 500-725m with widths between 0.26-0.40m to 21-28m and average values from 1.6-9.0m.

The primary sulphide and mixed zones are defined by the degree of oxidation.

In the oxide zone, base metal grades are low and for this reason the oxide zone is not included in the reserves.

Gold grade is usually low (average 0.2-0.6g/t), although higher values have been recorded occasionally, in the upper part of the deposit.

Underground production began at Shubinskiy with trial mining in 1990/1991 and continued intermittently at low output rates for over six years. In 1999 the production exceeded 100,000t and has since risen to reach its full capacity of 200,000tpa in 2009. During the period 1992-2009, the mine produced 1.6 Mt of ore grading 0.66 g/t Au, 17.9 g/t Ag, 1.74% Cu, 0.28% Pb and 2.25% Zn. The mine is operated by TOO Shubinskoye, who had worked as Kazzinc's mining contractors prior to April 2009.

Ore is extracted from the stopes on the 1-5 Levels, it is loaded in rail wagons and hauled by electric locomotives to the hoisting shaft. The ore is hauled by road trucks to the Ridder processing plant, where it is stockpiled for separate treatment.

The mining method is chamber mining with backfill and is used down to 5 Level. It employs conventional handheld pneumatic machine drift development and stope production drilling, electric scraper mucking and electric locomotive haulage. Drifting is carried out with handheld portable rock drills using compressed air. Blast holes for the stopes are drilled with handheld drill rigs using compressed air. In the stoping operations, the ore from the drifts and stopes is mucked using 30LC-2CM and 55LC-2CM scraper winches.

The chamber mining with backfill method is also known as sublevel open stoping with classified cemented tailings backfill. The extraction sequence is top-down (under hand), working from the centre of each lode to the strike flanks.

It is intended that mining below 5 Level will be via a decline and will use rubber tyred diesel mining equipment.

The Shubinsky mine uses a zinc equivalent (ZnEq) cut-off for the polymetallic lodes. The ZnEq grade is calculated as Zn% + 0.4Pb% + 1.7Cu%. The cut-off grades are based on historic metal prices used for the 1989 TEO for the Shubinsky project. The ZnEq cut-offs are unlikely to be optimal, from an economic perspective, for 2010 costs, metal prices and process terms.

The mining reserves currently used at the Shubinskiy mine site have been estimated using conventional Soviet methods. At present no Mineral Resources or Ore Reserves have been prepared for Shubinskiy in accordance with the guidelines of the JORC Code (2004).

Staroye (Old) Tailings Management Facility (TMF)

The Staroye tailings dam, adjacent to the Ridder-Sokolniy Mine, was in operation from 1926 to 1953 inclusive accepting material from the Leninogorsk Polymetallic Concentrator (LPC). The feed during this period was derived exclusively from processing polymetallic ore of the Ridder-Sokolny deposit. Kazzinc commenced a reprocessing operation in 1991 that by September 2010 had reprocessed almost 6Mt returning an average head grade (from concentrator reports) of 1.41g/t Au, 12.70g/t Ag, 0.08% Cu, 0.31% Pb and 0.79% Zn. The process involves a two stage grind followed by a gravity flotation scheme with the recovery of gravity concentrate, auriferous concentrate and zinc concentrate.

WAI has performed a resource and reserve evaluation for Staroye TMF in accordance with the guidelines of the JORC Code (2004). The details of this evaluation are given in tables below.

Staroye Tailings Mineral Resource Estimate (WAI 01.01.2011) (In Accordance with the Guidelines of the JORC Code (2004))							
Category	**Tonnes**	**Au**	**Ag**	**Cu**	**Pb**	**Zn**	**AuEq**
	t	**g/t**	**g/t**	**%**	**%**	**%**	**g/t**
Indicated	824,258	2.01	18.78	0.05	0.48	1.11	3.19
Inferred	5,899,119	0.91	11.16	0.04	0.30	0.63	1.72

Notes:

- AuEq calculation based on prices of
  - Au 1287 US$/oz
  - Ag 23 US$/oz
  - Cu 7341 US$/t
  - Pb 2422 US$/t
  - Zn 2420 US$/t

WAI has calculated Ore Reserves based upon the above Mineral Resource Estimate. WAI has applied losses of 4.4% based upon historical data, and dilution of 0.5% to take into account minimal dilution from the bunds and floor.

Staroye Tailings Ore Reserve Estimate (WAI 01.01.2011) (In Accordance with the Guidelines of the JORC Code (2004))											
Reserves	**Ore (Mt)**	**Gold (Au)**		**Silver (Ag)**		**Copper (Cu)**		**Lead (pb)**		**Zinc (Zn)**	
		Grade (g/t)	**Metal Content (koz)**	**Grade (g/t)**	**Metal Content (koz)**	**Grade (%)**	**Metal Content (kt)**	**Grade (%)**	**Metal Content (kt)**	**Grade (%)**	**Metal Content (kt)**
Proven	-	-	-	-	-	-	-	-	-	-	-
Probable	0.79	2.00	50.97	18.69	475.89	0.05	0.38	0.48	3.80	1.10	8.72
Total	***0.79***	***2.00***	***50.97***	***18.69***	***475.89***	***0.05***	***0.38***	***0.48***	***3.80***	***1.10***	***8.72***

Ridder Smelter

Kazzinc operates integrated metallurgical complexes in Ust-Kamenogorsk and Ridder in Eastern Kazakhstan. At Ust-Kamenogorsk there is a currently operational lead plant (traditional sinter plant-blast furnace-refinery); a conventional electrolytic zinc plant; sulphuric acid plants and a precious metals refinery. At the time of the site visits (October 2010) a copper Isa-smelt furnace and tank house; a lead Isa-smelt furnace and a dual contact sulphuric acid plant were under construction with commissioning and production scheduled for 2011. At Ridder there is an operational, conventional electrolytic zinc plant with associated conventional sulphuric acid plant.

In 2009 at Ust-Kamenogorsk lead metal production was almost 75kt, although the plant can and has produced over 100kt per annum and zinc production (metal and zinc alloy) was over 190kt. The precious metals refinery can produce over 170,000kg silver and 18,500kg gold. The Ridder zinc refinery utilises essentially the same process flowsheet as the plant at Ust-Kamenogorsk and produced over 110kt saleable zinc, in 2009.

The lead Isa-smelt furnace under construction currently will eventually replace the existing Dwight-Lloyd sinter plant. The copper Isa-smelt furnace and tank house will offer potential for Kazzinc to become a low cost copper producer and provide opportunities to toll smelt third party copper ores/concentrates.

Shaimerden

The Shaimerden structure was discovered in 1956 during prospecting for bauxite and in 1989 a programme to investigate scandium levels in the bauxite deposits revealed anomalous lead and zinc concentrations in the Shaimerden area.

In 1996 the deposit was taken over by the Zinc Corporation of Kazakhstan (ZCK) and in 2001 ZincOx acquired a 95% interest which, due to the deteriorating market conditions, was sold to Kazzinc in 2003.

ZincOx had envisaged mining over 17 years averaging 250,000t/year whilst Kazzinc planned to complete the development of the same volume within 5.5 years (averaging up to 1Mt/year). Latest projections indicate that stockpiled ore will provide raw material to the Ridder Zinc Plant until 2019.

Shaimerden is located some 200km SSW of the city of Kostenay in northern Kazakhstan with access via metalled roads, initially of a reasonable standard comprising a four lane highway to Rudnay but deteriorating thereafter, whilst rail links are excellent, connecting the Kostenay district with Russia and the rest of Kazakhstan at Tobol and Arka stations, and there also exists a short spur to the mine loading site.

Shaimerden is located on the eastern side of the north-south trending transcontinental Urals Orogenic belt within the 700km long Valerianovsky belt, characterised by Carboniferous sediments and volcanics, and the southern end of the Kostenay megasyncline and on the eastern limb of the Krasnoktyabr syncline.

The deposit is hosted in a massive, clean Carboniferous limestone and has resulted from the in-situ oxidation during the Triassic-Cretaceous period of a body of massive sphalerite mineralisation. The deposit occurs within a weathered depression measuring 450m E-W and 150m N-S with mineralisation occurring to a depth of 240m below surface.

Emplacement of the orebody is thought to have resulted from the circulation of ore-bearing geothermal solutions in the period after deposition of the rocks and prior to a period of Triassic weathering.

The main Shaimerden orebody comprises supergene oxidised zinc ores with remnant sulphides towards the centre, indicating oxidation from the outside margins to the centre of the deposit. There is an outward zoning comprising five categories:

- Massive sulphides – (2.8% of the reserves) preserved in the centre of the orebody and consisting mainly of remnant massive sulphides-90% sphalerite with minor galena and pyrite and an average grade of 46% Zn, 1.2% Pb, 6.1g/t Ag;
- Massive hemimorphite-smithsonite – (11.7% of the reserve) surrounding and intimately related to the massive sulphides. This ore type assays 30 to 45% Zn, with an average resource grade of 35.2% Zn;
- Stony ore – (8.2% of the reserve) dark green to dark red weathered, with a relict breccia texture. It is an intermediate weathered material between the massive hemimorphite-smithsonite and the mineralised clays;
- Mineralised clays – characterised by their grey/green and brown colour and high percentage of gritty and fragmental material, comprising CL3 - (38.1% of the reserve) with grades averaging 24.9% Zn, CL2 - (28.8% of the reserve) with grades averaging 13.1% Zn and CL1 - (4.5% of the reserve) with grades averaging 1.8% Zn; and
- Mineralised limestone – (5.9% of the reserve) occurs along the margin of the weathered trough and consists of intervals of mineralised clays within the limestone.

115 boreholes were drilled to investigate the deposit itself; the grid was 25-50x12.5-25m for the C_1 category reserves and 50 x 100m for the C_2 category:

The Shaimerden mine has been in production since 2005, but is expected to cease mining in May 2011. The near surface zinc orebody has meant it is suitable for conventional truck and shovel open pit mining. Zinc ore is mined from a single pit, hauled to stockpiles, crushed and transported by rail to Ridder in east Kazakhstan.

All material with a Zn grade less than 2% is hauled to the waste dump.

The remaining 'in pit' reserves at the time of the WAI visit (October 2010) (estimated using a mine based Datamine® programme) Comprises 883,842t @21.05% Zn. At the time of the issue of this report, WAI believes that the in-pit reserves will be exhausted or near to exhaustion.

The remaining Shaimerden Resources and Reserve Estimate in accordance with the guidelines of the JORC Code (2004) will thereafter be those of the dry stockpiles which equate to a total of 1,631kt with a grade of 22.33% Zn containing 364.1kt of metal (WAI 01.01.2011).

Shaimerden Total Stockpile Mineral Resource Estimate (WAI 01.01.2011) (In Accordance with the Guidelines of the JORC Code (2004)			
Category	**Tonnage (t)**	**Grade (% Zn)**	**Metal (t)**
Indicated	2,483.86	21.71	539,143

Shaimerden Total Stockpile Ore Reserve Estimate (WAI 01.01.2011) (In Accordance with the Guidelines of the JORC Code (2004)			
Category	**Tonnage (t)**	**Grade (% Zn)**	**Metal (t)**
Probable	2,483.86	21.71	539,143

Novoshirokinskoye

The Novoshirokinskoye underground gold-polymetallic mine is located in East Zabaykal in the Gazimuro region of Chita province, Russian Federation. Transport to the mine is via a 10km long un-metalled road which joins the Sretensk - Nerchinsk provincial highway. The total distance to the railway siding at Priiskovaya where concentrates are loaded for transport to Ust-Kamenogorsk is some 230km.

The Novoshirokinskoye area is characterised by a sequence of Jurassic sediments folded into a synclinal structure with variable dip. Sediments are cut by many faults with hydrothermal alteration and brecciation associated with their development.

Economic mineralisation at Novoshirokinskoye is constrained within broader zones of hydrothermal alteration, which in turn are related to several fracturing systems. Mineralisation within the alteration zones is seen as lensoid and can be continuous over several hundred metres along strike and has been traced to over 900m in depth where the structure remains open in some parts of the system.

Orebodies are generally oxidised in their upper parts (where close to surface), followed by a thin transition zone grading into sulphide where the predominant economic mineralisation comprises galena and sphalerite with associated gold and silver.

The Main ore zone is the most persistent, and in the central part, 16 orebodies have been identified. In the footwall of the Main orebody are found orebodies 5, 11, 7, 4, 3, 2, 1, 13, 14 and 16, whilst in the hangingwall 8, 6 and 12 are located.

The Novoshirokinskoye tectonic zone is characterised by strong metasomatism of quartz-micaceous-dolomite composition. The width of the metasomatic zone varies from 20-300m, and has been traced down-dip for more than 750m. Ore mineralisation is concentrated in the centre of the zone.

Disseminated mineralisation which is developed along the systems of small fractures predominates, whilst brecciated mineralisation is also common as is massive ore which is found within the breccias.

Overall, the Novoshirokinskoye zone can be considered a linear stockwork with a strike varying from 255-335°, and dipping generally to the southwest at angles from 30-90°. The zone extends for 50-1,450m along strike, and from 40-760m (Main orebody) down-dip, and economic mineralisation has been proven down to the 450m level.

The principal orebodies within the Novoshirokinskoye mineralised area are Main, 5 and 7. The Main orebody typically pinches and swells, but in the centre is persistent over considerable distance, with an overall length of 1,330m, maximum down-dip depth of 760m, strike of 290-300°, and dip of between 33-82°. Thickness varies from 0.20 to 22.1m. At a 3g/t Au equivalent cut-off grade, the average thickness is 4.52m.

Orebody 7 is the second largest and occurs in the central and southeastern part of the deposit on the footwall of the Main and Orebody 5. The orebody thins to the southeast and northwest both along strike and down-dip. At the surface, the length of the orebody is some 480m, whereas at the 700m level, strike length approaches 1,510m, with a maximum down-dip extension of 460m. The general dip is to the southwest, varying from 54-80°, and averaging 65°. Thickness varies from 0.26-15m, with an average thickness at a 3g/t Au equivalent cut-off grade of 2.73m.

Orebody 5, which is the third most important orebody at Novoshirokinskoye, lies in the central part of the area, in the footwall of the Main orebody, some 5-50m away from it, although sometimes merging, although down dip, the orebodies become more separate.

The maximum strike length (270-335° azimuth) of Orebody 5 is some 1,060m, and has been traced down-dip for some 775m. Thickness is highly variable from 0.19 – 18.15m, with an average of 3.04m using the 3g/t Au equivalent cut-off grade.

More than 60 ore and vein minerals have been identified at Novoshirokinskoye. Principal mineralogy comprises galena, pyrite and sphalerite, with hydroxides of iron and manganese, lead ochres, quartz, dolomite and sericite. The typical average grades are 3.72% lead, 1.79% zinc, 3.51g/t Au and 96.91g/t Ag.

In November 2010, WAI produced a new resource and reserve estimate for five of the ore bodies (Main, 5, 7, 8 and 16), prepared in accordance with JORC (2004) guidelines and updated as of 01.01.2011.

The resource estimate for Novoshirokinskoye based on Inverse Power Distance Cubed (IPD^3) method is given below.

Novoshirokinskoye Mineral Resource Estimate at COG of 3g/t Au_{eq}
(WAI 01.01.2011)
(In Accordance with the Guidelines of the JORC Code (2004))

JORC Classification	Volume (m^3)	Ore Tonnes (t)	Density (t/m^3)	Au (g/t)	Ag (g/t)	Pb (%)	Zn (%)
Measured	835,326	2,425,050	2.90	4.43	87.74	3.43	1.47
Indicated	1,603,523	4,636,718	2.89	4.30	94.82	3.07	1.15
Measured + Indicated	2,438,849	7,061,767	2.89	4.34	92.39	3.19	1.26
Inferred	525,673	1,510,303	2.87	2.08	57.02	2.44	1.81

Mining operations at Novoshirokinskoye mine started relatively recently with industrial scale production first achieved early in 2010. Currently the mine is producing around 35-38kt of ore per month, targeting 450kt annual production.

The original mine design dates to the late 1960's when the deposit was intensively studied and pilot underground mine design took place. In 2004 an updated design was performed, considering the requirement for rehabilitation works (as the underground workings remained abandoned for some time) and modernised infrastructure facilities. According to this design, the mine is accessed via two shafts. One of the shafts "Skiovaya" is used to hoist the ore (In skips), whilst the other "Kletievaya" is used for man, materials and waste hoisting (cage), providing an annual production rate of 450kt.

Currently, the majority of production comes from sub-level stoping (79% of production) and ore shrinkage stoping (conventional short hole shrinkage stoping). Expected dilution and mining losses are 12.5% and 8.8% for sublevel stoping respectively; and 21.7% and 6.1% for shrinkage stoping respectively.

The shafts extend to the 750m level (with skip loading and weighing facilities below that level). First production from the mine took place in January 2010.

Mining works, based on a tracked system, are progressing from the centre of the deposit to the flanks, extracting reserves on the top levels first. Currently, one of the most developed levels is the 850m level. It is intended that the current production rate of 450ktpa be maintained in 2011 and increased it to 550ktpa by 2013.

Novoshirokinskoye ore reserves are given in table below.

Novoshirokinskoye Ore Reserve Estimate (WAI 01.01.2011)
(In Accordance with the Guidelines of the JORC Code (2004))

	Ore (kt)	Au_{Eq} (g/t)	Au_{Eq} (kg)	Ag (g/t)	Ag (kg)	Au (g/t)	Au (kg)	Pb (%)	Pb (t)	Zn (%)	Zn (t)
Proven	2,438	7.89	19,233	77.0	187,676	3.89	9,473	2.98	72,601	1.28	31,089
Probable	4,427	7.78	34,463	84.3	373,276	3.89	17,200	2.69	118,896	0.99	43,912
Total Proven and Probable	***6,865***	***7.82***	***53,695***	***81.7***	***560,953***	***3.89***	***26,673***	***2.79***	***191,498***	***1.09***	***75,000***
Inferred material within stopes	48	5.16	249	53.3	2,577	1.5	74	1.94	937	1.14	549

The plant at Novoshirokinskoye began treating ore in December 2009. Construction of the plant buildings commenced in the early 1990's but work was stopped due to the break up of the Soviet Union. The plant uses the standard minerals processing techniques of SAG-ball milling, gravity and flotation to produce a gold-rich lead concentrate and a zinc concentrate. Current plant performance is broadly in line with planned values.

The environmental, social and H&S matters are generally being addressed in a competent and locally compliant manner.

Advanced Exploration Properties

Dolinnoe and Obruchevskoe

The Dolinnoe and Obruchevskoe deposits in east Kazakhstan are located 7.5 and 11km respectively from Ridder, the nearest railhead. The deposits are situated in the centre and deepest south-eastern portions respectively of the Ridder mining district in the Rudnyi Altay geotectonic block

The Dolinnoe deposit, which lies at a depth of between 450-650m, was discovered in 1987 and was followed up by integrated deep drilling, geophysical prospecting and geochemical investigations.

The Obruchevskoe deposit is situated at a depth of 800-1,000m and was discovered by DDH 1798 which was drilled in March 1987 to follow up a geochemical anomaly.

Geologically, the Ridder mining district coincides with an unusual graben structure preserving Silurian to Middle Devonian volcano-sedimentary sequences.

The two lodes comprising the Dolinnoe deposit are centred on anticlinal structures with gentle to moderate dips in all directions (domes) separated by a shallow trough. Each lode contains discrete mineralised bodies of two contrasting forms:

- Conformable, stratabound, mineralised mound-like bodies in altered calcareous siltstones; and
- Moderately to steeply dipping cross-cutting lenticular vein-like bodies in the gravelites which underlie the calcareous siltstone horizon.

The stratabound North-Eastern Lode is represented by a single mineralised body, Orebody 3 and a few small and isolated lenses. The underlying mineralisation is represented by a swarm of twelve moderately to steeply dipping north-northwest trending veins.

The South Western Lode occurs at a depth of 495-580m below surface and steeply dipping feeder veins extend to deeper levels. Grades tend to be lower than those recorded in the North-Eastern Lode.

The Obruchevskoe stratabound polymetallic sulphide mineralisation was outlined by drilling on two cupola-shaped lodes, Northern and Southern, and traced over the intervening ground, the Central Prospect, within the same lithological unit of the Kryukovskaya Formation.

The mineralisation occurs as tabular and lenticular veinlet-disseminated and massive sulphide bodies on three horizons (Nos.1, 2 and 3) in both Southern and Northern Lodes.

Mineralogically, the ores comprise sphalerite, galena, chalcopyrite and pyrite which, depending on their content in different ores, can constitute major, abundant or accessory minerals, although in solid sulphide polymetallic ores they may all be major components. Accessory minerals include tetrahedrite and tennantite with a high zinc content (fahlores which can be present in varying amounts); rare minerals consist of free gold, gold-silver alloy (electrum), pyrrhotite and, specifically at Obruchevskoe, bornite and some chalcopyrite and arsenical pyrite.

Gold is the main mineral of economic interest at Dolinnoe; veinlet-disseminated polymetallic mineralisation predominates at Obruchevskoe.

The 2008 Technical Economic Assessment (TEO) or Feasibility Study considered three scenarios for accessing the Dolinnoe and Obruchevskoe deposits:

- Option 1: Three shafts from surface independent of Ridder-Sokolniy mine;
- Option 2, 2A and 2B: Opening jointly with Ridder-Sokolniy mine, and
- Option 3: Using two shafts from surface but independent of Ridder-Sokolniy mine.

Kazzinc has chosen Option 3 because this option provides the greatest NPV and Internal Rate of Return and the lowest Discounted Payback Period.

Mineral resource estimates which have been performed for the Dolinnoe and Obruchevskoe ore zones are based on the models prepared by Kazakhstan Mineral Company (KMC) in January and February 2011 and have been calculated in accordance with the guidelines of the JORC Code (2004). The mineral resource models considers drilling available to this date and the effective date of this resource estimate is 02/02/2011.

Dolinnoe & Obruchevskoe Mineral Resource Estimate - COG 1.7% EqvZn (WAI 02.02. 2011) (In Accordance with the Guidelines of the JORC Code (2004))							
Classification	**Tonnage (kt)**	**EqvZn %**	**Au**	**Ag**	**Cu**	**Pb**	**Zn**
			g/t	**g/t**	**%**	**%**	**%**
Dolinnoe							
Measured	5,043	10.65	3.85	50.47	0.20	0.74	1.39
Indicated	2,707	6.60	2.32	28.05	0.14	0.48	1.00
Measured + Indicated	7,750	9.24	3.32	42.64	0.18	0.65	1.25
Inferred	6,907	4.84	1.59	15.88	0.12	0.48	0.86
Obruchevskoe							
Measured	1,154	17.75	1.62	40.68	0.88	4.02	8.87
Indicated	7,783	9.61	0.67	25.36	0.73	1.78	4.64
Measured + Indicated	8,937	10.66	0.79	27.34	0.75	2.07	5.18
Inferred	5,500	4.56	0.5	24.97	0.41	0.64	1.75

Ore Reserves for the Dolinnoe and Obruchevskoe deposits have been calculated in accordance with the guidelines of the JORC Code (2004). A summary of the Ore Reserves is presented in the table below.

Dolinnoe* & Obruchevskoe Ore Reserve Estimate
(WAI 01.01. 2011)
(In Accordance with the Guidelines of the JORC Code (2004))

Deposit	Reserves	Ore (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (pb)		Zinc (Zn)	
			Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Dolinnoe**	**Proven**	3.66	3.93	462,258	53.76	6,325,710	0.20	7,385	0.75	27,351	1.41	51,730
	Probable	0.96	2.38	73,822	29.82	923,296	0.14	1,338	0.50	4,849	1.02	9,792
	Total	***4.62***	***3.61***	***536,080***	***48.77***	***7,249,006***	***0.19***	***8,723***	***0.70***	***32,380***	***1.33***	***61,523***
Obruchevskoe	**Proven**	0.89	1.73	49,363	42.80	1,219,753	0.81	7,161	4.27	37,829	8.98	79,581
	Probable	3.25	0.90	94,019	33.21	3,466,977	0.83	26,845	2.66	86,520	6.50	211,092
	Total	***4.14***	***1.08***	***143,382***	***35.26***	***4,686,731***	***0.82***	***34,006***	***3.01***	***124,349***	***7.03***	***290,673***

*Dolinnoe Reserve estimate includes only Measured and Indicated Resources, and excludes 43,000t of Inferred material at 3.52g/t Au, 18.42g/t Ag, 0.13% Cu, 0.68%Pb & 1.24%Zn

**Dilution of 20% and losses of 5% applied

Chekmar

The deposit is situated 46km north of Ridder and linked with Ridder by a graded road.

The Chekmar deposit comprises three polymetallic ore zones, Chekmar, South-Eastern and Gusliakov. They are located in close proximity to each other in the centre of an 8km long mineralised trend.

The Chekmar ore zone contains about 40 mineralised bodies, predominantly of stockwork and stringer type ore.

The South Eastern ore is a blind zone of which only the top part has been explored. The structure is a NW-trending tight to isoclinal anticline with a moderate to steep (40-60°) NW plunge. Eleven lenses of stockwork and stringer mineralisation have been delineated with strike lengths in the range of 175-290m.

The Gusliakov Ore Zone occurs in a NW-trending double plunging tight to isoclinal anticline, which is correlated with the anticline of the South-Eastern ore zone. Due to faulting, this area is lifted up at least 200m in relation to the South-Eastern ore zone. Mineralisation at Gusliakov is polymetallic with barite-rich lenses at high stratigraphic levels. Stockwork, stringer and disseminated mineralisation predominates, but massive sulphide lenses are more abundant than at the South-Eastern deposit and account for over 5% of the mineralised volume. Twenty four mineralised lenses have been delineated with strike lengths of 60-150m. Down dip dimensions vary from 100-375m and widths from 7-10.5m.

The ore zones were explored by core drilling from surface augmented by underground exploration from two adits at Chekmar (Adit No.1 at +800m level and Adit No.2 at +670m level) and from another adit at Gusliakov (at +600m level).

At present no Mineral Resources or Ore Reserves have been calculated in accordance with the guidelines of the JORC Code (2004) for the Chekmar deposit.

Chashinskoye TMF

The Chashinskoye tailings dam, located some 3.5km to the east of the Ridder-Sokolniy Mine, was in operation from 1953 to 1978 inclusive, taking over from the Staroye tailings dam in containing material from the LPC and processed ore predominantly from the Ridder-Sokolny deposit. Although much larger, covering an area of some 250ha, the grade of the tailings is much lower as a result of reduced head grade to the LPC and improved recovery over time.

A summary results of the evaluation of the resources in accordance with the guidelines of the JORC Code (2004) are shown in the table below.

Chashinskoye Tailings Mineral Resource Estimate
(WAI 01.01.2011)
(In Accordance with the Guidelines of the JORC Code (2004))

Classification	Tonnes (Mt)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)	AuEq* (g/t)
Indicated	57.8	0.67	5.16	0.05	0.15	0.38	1.15
Inferred	30.0	0.50	4.57	0.06	0.19	0.45	1.06

WAI has calculated Ore Reserves based upon the above Mineral Resource Estimate and in accordance with the guidelines of the JORC Code (2004). WAI has applied losses of 4.4% based upon historical data, and dilution of 0.5% to take into account minimal dilution from the bunds and floor.

Chashinskoye Tailings Ore Reserve Estimate (WAI 01.01.2011) (In Accordance with the Guidelines of the JORC Code (2004))												
Deposit	Reserves	Ore (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (pb)		Zinc (Zn)	
			Grade (g/t)	Metal Content (koz)	Grade (g/t)	Metal Content (koz)	Grade (%)	Metal Content (kt)	Grade (%)	Metal Content (kt)	Grade (%)	Metal Content (kt)
Chashinskoye Tailing Dam	Proven	-	-	-	-	-	-	-	-	-	-	-
	Probable	55.53	0.70	1,245	5.37	9,589	0.05	28.9	0.16	86.7	0.40	219.6
	Total	***55.53***	***0.70***	***1,245***	***5.37***	***9,589***	***0.05***	***28.9***	***0.16***	***86.7***	***0.40***	***219.6***

Tishinskiy Slime Ponds

The Tishinskiy slimes ponds, located at the Tishinskiy Mine, are the accumulation of 'fines' deposited via a pipeline from the Ridder concentrator where, prior to August 2002, sulphide ore from the Tishinskiy deposit was processed. In August 2002 a filter press was commissioned at the Ridder Mining and Concentrating Complex (RMCC) which allowed dewatering of the slimes to occur and to be re-processed. Pond №1 is currently used as an emergency discharge facility for the Ridder complex and is flooded, whereas Pond №2 has been evaluated and is currently being reprocessed.

WAI has performed an evaluation of mineral resources and ore reserves for Tishinskiy Slime Ponds in accordance with the guidelines of the JORC Code (2004). The details of the evaluation are given in the tables below.

Tishinskiy Slimes Mineral Resource Estimate (WAI 01.01.2011) (In Accordance with the Guidelines of the JORC Code (2004))								
CLASS	**Volume**	**Tonnes ***	**Au**	**Ag**	**Cu**	**Pb**	**Zn**	**AuEq**
	m^3	**t**	**g/t**	**g/t**	**%**	**%**	**%**	**g/t**
Indicated	378,744	333,295	0.33	9.93	0.22	0.76	2.46	2.77
Inferred	50,909	44,800	0.58	8.73	0.23	0.56	2.64	3.01

* Based on volume and an average density value (mean volumetric weight) of 0.88t/m3.

WAI has calculated Ore Reserves based upon the above Mineral Resource Estimate. WAI has applied losses of 4.4% based upon historical data, and dilution of 0.5% to take into account minimal dilution from the bunds and floor.

Tishinskiy Slimes Ore Reserve Estimate (WAI 01.01.2011) (In Accordance with the Guidelines of the JORC Code (2004)											
Reserves	**Ore (Mt)**	**Gold (Au)**		**Silver (Ag)**		**Copper (Cu)**		**Lead (pb)**		**Zinc (Zn)**	
		Grade (g/t)	**Metal Content (koz)**	**Grade (g/t)**	**Metal Content (koz)**	**Grade (%)**	**Metal Content (kt)**	**Grade (%)**	**Metal Content (kt)**	**Grade (%)**	**Metal Content (kt)**
Proven	-	-	-	-	-	-	-	-	-	-	
Probable	0.32	0.33	3.41	9.89	101.79	0.22	0.71	0.76	2.42	2.44	7.82
Total	***0.32***	***0.33***	***3.41***	***9.89***	***101.79***	***0.22***	***0.71***	***0.76***	***2.42***	***2.44***	***7.82***

Exploration Licences

Solovievskiy Block

The Solovievskiy Block, covering 4,300km^2 and registered under Contract No.2114 dated 25.07.2006, is located in the eastern Kazakhstan region, Katon-Karagaiskiy District, some 100km south-southeast of Ridder and 140km east southeast of Ust-Kamenogorsk. The nearest large town is Zyryanovsk where Kazzinc operate the Maleevskoye mine and processing plant. The Solovievskiy Block is the most advanced exploration licence currently in operation by Kazzinc and the only one to possess a valid exploration licence (at the time of the site visits in 2010).

The Solovievskiy Block lies within the Rudny Altai Palaeozoic province, or belt, and predominantly comprises Carboniferous and Devonian geological units. Kazzinc are undertaking a comprehensive and thorough exploration programme within the Solovievskiy block that commenced in 2005. This structured work has resulted in the identification of three targets; Novokhairuzovskoie (Au), Khairuzovskoie (Cu-Zn) and Greizenovoie, which are all located in the south-southwest of the licence block. The most advanced of these, Novokhairuzovskoie, is currently being drilled.. To date (01.07.2010) some 30,510m of surface trenching and 16,544.8m of diamond drilling (plus 41,180m of Reverse Circulation drilling has been completed).

Butachikhinsko-Kedrovskiy

The Butachikhinsko-Kedrovskiy Block is located in the East Kazakhstan Oblast, some 40km northeast of Ust-Kamenogorsk and to the southwest of Ridder. The licence block covers an area of 700km^2 and a contract was sent to the Ministry of Industry and New Technologies for approval, the receipt of which is awaiting by Kazzinc.

It should be noted that the Tishinskiy deposit/mine is enclosed within this licence block. The Butachikhinsko-Kedrovskiy Block lies within the Rudny Altay (VMS) province and predominantly comprises Lower to Upper Devonian geological units, with a small area of Carbonaceous in the extreme west of the block.

Regional prospecting has been conducted within the block since the early 1900's, initially involving geological mapping and later through geochemical and geophysical surveys. Since 2005 Kazzinc has undertaken a limited amount of exploration within the block, prior to the issuing of the licence but with State agreement. Initial work comprised the collation of available historic data, including drillholes and trench data, along with a confirmatory programme with sampling that identified elevated levels of mineralisation, particularly copper. Although preliminary in nature the work identified several promising targets.

Western Torgai

The Western Torgai exploration asset, comprising the Karabaitalsky and Sakharovsko-Adaevskiy sites, lies immediately to the southwest of the original Shaimerden exploration licence and contracts are in the process of registration at the Ministry of Industry and New Technologies. At the Karabaitalsky site a 3 year programme of drilling (19,000m) and geophysics is planned to investigate previously identified anomalies representing porphyry gold and polymetallic deposits; at the Sakharovsko-Adaevskiy site a similar 3 year programme has been drawn up to investigate the Klochkovskoye quartz diorite porphyry Cu/Mo deposit (intersected in old soviet boreholes) with 13,000m drilling and geophysics.

Bukhtarma Hydroelectric Power Plant

The plant was constructed in stages between 1953 and 1968. The Standard design life for hydro stations is generally in the region of 30 years. Currently the Bukhtarma Hydro Station is in the last stage of major refurbishment works, which are expected to be completed in 2011. The reconstruction programme has led to the increase in capacity from 675MW to 720MW. The dam is a reinforced concrete gravity type dam. The Bukhtarma reservoir is located in East Kazakhstan and Semipalatinsk oblasts of Kazakhstan and has an area of 5,500km^2.

Valuations

WAI has undertaken a valuation of the Kazzinc operations using discounted cash flow analysis to determine the Net Present Value ("NPV") of both the operations as a whole and each individual mine. A post-tax un-geared cash flow model was constructed for each operation based on the Ore Reserves compliant with the guidelines of the JORC Code (2004) estimated by WAI.

Ore production rates, operating costs and metallurgical recoveries for each mine were estimated on the performance over the last 3 years along with Kazzinc's forecast for 2011 production. Capital expenditure for 2011 to 2016 is based on Kazzinc's 5 year plan; thereafter, WAI has estimated likely capital expenditure based on the 2008 to 2016 expenditure.

In order to derive an individual valuation for each mine, a Net Smelter Return ("NSR") has been assumed for each concentrate product based on typical refining and treatment charges for that concentrate type. For the combined operations scenario, Kazzinc smelts its own concentrate and therefore benefits from the sale of by-products and other penalty elements, which are not included in the individual mine valuations. Third party concentrates smelted by Kazzinc are also included in the combined scenario but not in the individual mine valuations.

Kazzinc Life of Mine Production and Valuation

Operation	Ore Mined/Concentrate Processed (Mt)	Metal Production					Revenue (US$M)	Total Operating Costs (US$M)	EBIT (US$M)	NPV (US$M)
		Zn (kt)	Pb (kt)	Cu (kt)	Au (koz)	Ag (koz)				
Combined Kazzinc Operations including Smelters and Third Party Concentrates*	**263.2/9.9**	**2,628.0**	**610.9**	**314.1**	**8,650.0**	**48,993.8**	**21,330.8**	**9,941.5**	**10,186.1**	**4,513.8**
Vasilkovskoye	124.0	-	-	-	5,617.8	-	5,675.7	2,072.1	3,028.8	1,466.6
Maleevskoye	12.1	744.6	149.8	131.5	158.0	19,574.0	2,393.3	633.0	1,825.4	1,075.3
Shaimerden	2.5	539.2	-	-	-	-	804.7	216.6	535.5	287.3
Chashinskoye Tailings	55.5	-	-	-	1,076.5	3,659.2	1,040.1	515.1	461.3	188.4
Tishinskiy	25.1	1,015.4	125.6	75.5	338.0	5,234.9	2,601.8	1,877.3	473.9	220.6
Novoshirokinskoye	7.3	84.3	176.0	17.2	650.3	13,029.9	1,136.8	569.3	392.7	187.3
Ridder-Sokolniy	21.1	100.2	57.9	63.5	837.2	5,592.8	1,469.5	1,028.5	304.6	134.4
Obruchevskoe	4.1	281.8	115.3	33.5	107.5	94.0	849.9	235.0	426.0	65.8
Staroye Tailings	6.9	23.5	9.4	2.0	132.3	1,454.8	207.7	99.8	64.7	36.0
Dolinnoe	4.6	53.4	28.0	7.7	169.3	221.4	285.7	255.5	-78.8	10.2
Total	**263.2**	**2,842.4**	**662.0**	**330.9**	**9,086.9**	**48,861.0**	**16,465.2**	**7,502.2**	**7,434.1**	**3,671.9**

*Includes Net Revenue from third party concentrates but not volumes processed. Smelter recovery factors applied.

A summary of the combined Kazzinc operations cash flow forecast, including third party concentrates, between 2011 and 2027 is provided in the table below. Total operating costs for the operations are estimated at US$9,941.5M with a cumulative operating free cash flow of US$8,395.2M and EBIT of US$10,186.1M. The operations generate a positive NPV of **US$4,513.8M.**

Kazzinc Combined Operations - Summary Economic Statistics		
Summary	**Units**	**Value**
Ore Mined	**Mt**	263.2
Zn Concentrate Produced	**kt**	6,490.1
Pb Concentrate Produced	**kt**	1,127.1
Cu Concentrate Produced	**kt**	1,209.6
Au Concentrate Produced	**kt**	1,085.4
Zinc Metal Recovered	**kt**	2,628.0
Lead Metal Recovered	**kt**	610.9
Zinc Metal Recovered	**kt**	314.1
Gold Metal Recovered	**t**	278.1
Silver Metal Recovered	**t**	1,523.9
Gross Revenue Generated	**US$M**	21,330.8
Operating Costs	**US$M**	9,941.5
Capital Expenditure	**US$M**	1,323.2
Depreciation	**US$M**	1,203.2
Cash Taxes	**US$M**	1,671.0
Total Operating Free Cash Flow	**US$M**	**8,395.2**
EBIT	**US$M**	**10,186.1**
NPV	**US$M**	**4,513.8**

CONSULTANTS AND INTERESTS

Wardell Armstrong International ("WAI") is an internationally recognised, independent minerals industry consultancy. All consultants used in the preparation of this report are employed directly by WAI or are Associates of WAI and have relevant professional experience, including prior field experience of the geology and mineralisation of gold and polmetallic deposits in Kazakhstan and Russia.

Details of the principal consultants involved in the preparation of this document are as follows:

Phil Newall, BSc (ARSM), PhD (ACSM), CEng, FIMMM, **Director of Minerals**, ***Geology and Project Management***
Phil is a Mining Geologist with over 25 years experience of providing consultancy services to minerals companies throughout the world, with particular specialisation in CIS, Europe, Central and West Africa, and China. He has developed an extensive portfolio of exploration and mining-related contracts, from project management through to technical audits of a large variety of metalliferous and industrial mineral deposits. In particular, Phil has recently managed the Kempirsai Pre-feasibility Study for Bekem Metals on a Ni laterite in Kazakhstan, ARICOM's London CPR on their Fe assets in Russia, CPR for Kazakhaltyn for their London listing, PHM's London MER report, a large technical Due Diligence for Kazakhmys and the Feasibility Study for Oriel Resources on their Shevchenko Ni project.

Mark Owen, BSc, MSc (MCSM), CGeol, FGS, EurGeol, **Technical Director*, Geology and Mineral Resources***
Mark has over 27 years as a Mining Geologist, in both the metalliferous and industrial mineral mining sectors. He has considerable expertise of front line production mining, both in the underground and exploration environments, working on mines in the UK, Saudi Arabia and Venezuela. Throughout his experience he has had responsibility for technical teams addressing resource estimation, exploration planning and management, mining and process issues and environmental impact assessment. At WAI over the last 11 years, he has gained considerable experience of completing gold projects in Russia and the CIS, from scoping level through to full Bankable Feasibility Study and at the same time is fully conversant with the requirements of both the London and North American stock exchanges both acting as a Competent Person and author of numerous NI 43-101 reports.

Che Osmond, BSc, MSc (MCSM), ProfGradMIMMM, CGeol, Euro Geol, FGS; **Principal Geologist**, ***Exploration Geology***
Che is a Geologist with over 15 years experience of implementation and management of geological, geotechnical, environmental and civil engineering contracts. Upon completion of his MSc in Mining Geology he undertook a position with CSMA to plan and supervise nickel and copper exploration projects in Southern Africa before going on to other projects including exploration programmes for Cyprus-type VMS deposits within the ophiolite belt in the Sultanate of Oman. Che is also experienced with Datamine® modelling software. Since joining WAI in 2005, Che has been involved with exploration programme proposals, mineral resource estimation and audits, technical audits and CPR's as well as preparation of NI 43-101 Technical Reports of industrial and metalliferous minerals in Eastern Europe, CIS, North and West Africa and the Middle East.

Colin Taylor, BA (Hons), MA, Pr. Sci Nat, **Associate Consultant**, ***Exploration Geology***
Colin has some 40 years of international experience in exploration and resource geology, initially in South Africa and Namibia before being based in the UK. Colin has held such positions as Exploration, Mine and Chief Geologist and is widely versed in a variety of mineral commodities, including base and precious metals, industrial minerals and coal. Colin continues to contribute to technical studies, due diligence reviews and competent persons reports in the CIS, Europe and Africa and is fully conversant with the JORC Code (2004) and in the preparation of NI 43-101 reports.

Adam Wheeler, BSc MSc CEng Eur Ing, **Manager of Resources**, ***Resource Modelling and Estimation***
Adam is a Mining Engineer specialising in the application, customisation and management of mining and geological software systems. He has particular expertise relating to general mining/geological software systems used in the geostatistical resource and reserve assessment for both open pit and underground

optimisation. His skills include undertaking geostatistical studies, ore reserve estimation, geological modeling and mine planning, and training of personnel. Adam has broad international experience, but has been more involved in projects in CIS, Europe, Africa and South America.

Richard Ellis, MCSM, BSc, MSc, FGS; **Senior Resource Geologist**, ***Database & Resource Modelling***
Richard is a Geologist with nearly 10 years operational experience within the industrial minerals sector in the UK. He has conducted reserve and resource reports for annual corporate financial reporting and has been responsible for pit optimisation, production scheduling, grade control and reconciliation. As a resource modelling geologist with WAI, Richard has worked on numerous resource modelling projects including the Koksay Cu-Mo porphyry deposits, Kazakhstan, the Bapy iron ore deposit, Kazakhstan and recently conducted resource auditing of the Mount Nimba, iron ore deposit, Guinea.

Owen Mihalop, BSc (Hons), MSc, MCSM, CEng, MIMMM, **Technical Director**, ***Mining Engineering and Financial Modelling***
Owen is a chartered mining engineer with 15 years broad based experience in the mining and quarrying industries. He has gained experience in grass-roots exploration through to large scale open-pit and underground mining projects across Ireland, Bulgaria, Spain and Canada. He has worked as an operations manager in industrial mineral mining and quarrying operations in the UK and has gained considerable project management and financial evaluation experience through these roles.

Bruce Pilcher, BE(Mining)Syd, MAusIMM(CP), MIMMM, CEng, Eur Ing A**ssociate Director - Principal Mining Engineer**, ***WAI, Mining and Infrastructure***
Bruce is a Chartered Mining Engineer with 25 years experience in underground and surface mining operations in South Africa, Australia and UK. Bruce has served as Mine Superintendent, Regional and Technical Services Manager. He has considerable experience in production management, mine design and planning, and contract management in the coal and metalliferous mining industries. Bruce also has worked within the explosives industry focussing on drilling & blasting applications and contracting which included managing optimisation projects in Australasia, UK, France, Spain, Germany, Poland and Kyrgyzstan. Since joining WAI, Bruce has worked on several metal projects including the Macusani uranium deposit in Peru, the Namib lead and zinc mine in Namibia, the Bjorkdal gold mine in Sweden and the Kemparsai nickel mines in Kazakhstan

Lewis Meyer, BEng, ACSM, MSc, MCSM, PhD, CEng, FIMMM, **Principal Mining Engineer**, ***Geotechnics and Mine Design***
Lewis is a Chartered Mining Engineer with 18 years experience in mining, underground civil construction and rock mechanics of surface and underground mining operations. The early part of his career was spent in production mining in the platinum mines of South Africa. On returning to the United Kingdom, he completed a MSc, before joining a civil engineering consultancy gaining experience in project and contract management of various tunneling projects in London. Following completion of a PhD in geomechanics, Lewis spent 6 years working as a consultant rock mechanics engineer specializing in underground excavation and support design, on mining projects located in South Africa, India, Bangladesh, Kazakhstan, Indonesia and the UK. Since joining WAI in 2007, Lewis has specialised in open pit and underground mine design using Mine 2-4D software.

Stuart Richardson, BEng, ACSM, GradMIMMM, **Mining Engineer**, ***Mine Design and Scheduling***
Stuart is a mining engineer, graduating from Camborne School of Mines in 2006. He was employed as a student mining engineer by Deno Gold, Republic of Armenia, in 2005 gaining experience in metalliferous mining methodologies. He joined Wardell Armstrong in early 2007 as a Graduate Mining Engineer and has been involved in several projects, including the analysis of coal resources in Kentucky, USA. He has also gained experience in managing site works, acting as the Resident Engineer for a project at the Great Laxey Mine on the Isle of Man and as CQA Engineer for drilling works at Sutton Courtenay Landfill Site, Oxfordshire. In 2008, Stuart transferred to Wardell Armstrong International, working as a mining engineer and assisting in the production of a number of pre-feasibility and feasibility studies using Mine 2-4D software.

Daniil Lunev, DipEng (SPMI), PhD (SPMI) **Mining Engineer**, ***Mine Design and Scheduling***
Daniil is a specialist in mining machinery. His skills include the following: optimisation of schemes of underground and land mining equipment; calculations of mining transport systems and estimation of efficiency and reliability of mining machinery. He is particularly experienced in belt conveyor system development, modernisation of construction, and resolving conveyor application problems. He has 5 patents related to belt conveyor innovation. His has recently been involved in the Bapy Fe Ore Project in Kazakhstan, which involved the review of a feasibility study, advising on mining operation and scheduling, and the Feasibility Study of the Akbakai gold project in the same country.

Philip King, BSc (Eng) Mineral Technology (Hons), **Technical Director**, ***Processing***
Phil has 20 years minerals processing experience ranging from laboratory test work and pilot plant operations through to plant commissioning, operations and trouble-shooting. He has considerable experience in the technical and financial evaluation of many mining projects through the completion of both pre-feasibility and feasibility studies, and has been involved in process design and engineering studies, equipment selection, and capital and operating cost estimates. He has also participated in a number of multi-disciplinary projects throughout Central Asia, Africa and Europe involving base and precious metals, industrial minerals and coal. In particular, Phil has considerable experience of the metallurgy and extraction from gold ores.

Colin Hunter, BSc (Hons), PhD, **Associate Consultant**, ***Processing***
Colin has 32 years minerals processing experience ranging from laboratory test work and pilot plant operations through to plant commissioning, operations and trouble-shooting. He has considerable experience in the technical and financial evaluation of many mining projects through the completion of both pre-feasibility and feasibility studies, and has been involved in process design and engineering studies, equipment selection, and capital and operating cost estimates. He has also participated in a number of multi-disciplinary projects throughout Russia, Western Australia, West Africa, Central Asia, and Europe involving base and precious metals. In particular, Colin has considerable experience of commissioning and operation of Biox plants and bacterial leaching technology.

Chris Broadbent, BSc, PhD, CEng, FIMMM, **Partner, Wardell Armstrong**, ***Pyrometallurgy***
Chris is a well-recognised authority on pyrometalurgical processing and the treatment and disposal of wastes from mining and metallurgical plants. He has worked on R & D projects at universities as well as with ISP Ltd, RTZ Technical Services Ltd and Billiton (Shell) Research B.V. Whilst at Shell he chaired the Nickel Research Group and managed the FeNi R&D team. He has also published widely on the pysio-chemistry of nickel smelting slags. Since 1994, as head of the pollution group in Wardell Armstrong, he has become experienced in assessing the environment consequences of general industrial pollution and the use of environmental chemistry in contaminated land investigations. In the UK he works closely with the metallurgical industries, especially the ferrous foundry sector and was a member of the Environment Agency Working Parties revising Process Guidance to the Ferrous Foundry, non-ferrous metal and glass making sectors.

Andrei Kudrin, BS (Hons), MEng (Hons), **Engineer**, ***Renewable Energy***
Andrei, as a mature student has recently graduated from the University of Exeter with an engineering degree in Renewable Energy. Before joining Wardell Armstrong International he has had placements with various companies such as Scottish and Southern Energy and Cornwall Sustainable Energy Partnership. He is a member of the Institute of Engineering and Technology and the Energy Institute. Andrei has worked on various wind and solar farm development projects, CHP and hydro schemes. He continues to contribute to technical, economical and environmental assessments within Wardell Armstrong.

Nick Coppin, Bsc, MSc, **Managing Director WAI**, ***Environmental Scientist, Environment, Social and Health & Safety***
Nick is an environmental scientist with over 30 years of broadly based experience in the mining and minerals industry. He has worked extensively with government and regional authorities and institutions for mineral planning, mining administration, environmental protection, industrial development and finance. He is fully conversant with national and international guidelines, procedures, regulations and standards for the mining and quarrying sector.

Kim-Marie Clothier, BSc (Hons) MRes AIEEM, MIEMA, Grad IMMM, ACMI; **Senior Environmental Scientist**, ***Environment, Social and Health & Safety***
Kim-Marie is a Senior Environmental Scientist, mainly dealing with Environmental and Social Impact Assessments on mining projects overseas. She has worked with the company for over 5 years on projects located in Uzbekistan, Macedonia, Kyrgyzstan, Portugal, DRC, Sierra Leone, Greenland, Russia and Kazakhstan, providing environmental and social impact assessments of mining projects as part of feasibility studies and CPR or due diligence processes. She has contributed to projects for improving environmental performance and implementing Environmental Management Systems and plans as well as ESIAs. She also regularly undertakes environmental audits for UK mineral sites and has extensive experience in the assessment and remediation of contaminated land and has a strong interest in sustainable treatment options for Brownfield sites.

Kathy Hicks BSc (Hons) MSc MCSM FGS **Geo-Environmental Scientist**, ***Environment***
Kathy is a Geo-environmental Scientist specialising in the field of mineral extraction and the remediation of land affected by past mining activities. After graduating from Camborne School of Mines, Kathy has worked as a Geotechnical Engineer with Fugro Engineering Services Ltd on sites with a range of issues throughout the UK. As a Mining Consultant for a further 4½ years, Kathy has acquired further experience in the assessment and remediation of mining impacted land. Since working for WAI, Kathy has worked as part of a multidisciplinary environmental team on a wide range of mining and development projects and has acquired experience in the remediation of contaminated land, risk assessment, gas, soils, water and environmental condition monitoring. Kathy has also worked on specific mining related projects within the UK, EU and CIS. She is conversant with OVOS/ESIA procedures and writing environmental reviews. Kathy has been responsible for formulating on-site health and safety guidance and is conversant with health and safety, environmental management and permitting requirements.

Christine Blackmore, BSc, MSc, CEnv, FIMMM, **Principal Environmental Geologist**, ***WA, Enviroment***
Christine has over 10 years of experience in environmental work both in the UK and overseas. Her expertise is focused in environmental management (EMS, EIA ect) and environmental auditing within the mining industry, with some of the work including aspects of health and safety procedures and protocols. Her recent experience has included work in Mauritania (Copper and Gold), Burkina Faso (Gold), Mexico (Gold), Kazahkstan (Zinc/Copper) and China (Silca). Clients include mining companies, investment bankers, government departments and design institutes. She has experience in design and construction using both natural and geosynthetic materials for tailings dams, lagoons, landfills, together with the design of environmental monitoring programmes. Lately she has been involved in transportation of dangerous goods audits for cyanide and waste oil, which have involved preparing accompanying management plans.

Elena Bagayeva, BA, **Regional Manager and Translator**, ***WAI Kazakhstan - Logistics***
Elena joined the WAI Kazakhstan team at the end of 2009 as Executive Secretary/ Technical Translator. She has gained her diversified professional experience in mineral mining sector through working with a number of international mining companies, including 4 years full-time employment in UK-based Central Asia Metals Ltd which holds exploration/mining properties across Kazakhstan and Mongolia. Elena's wealth of knowledge in both the mining industry and the technical terminology thereof is a valuable asset for WAI.

Yelena Borovikova, **Senior Translator**, ***WAI Kazakhstan***
Yelena has recently joined the WAI Kazakhstan team as Senior Translator. Her previous experience was gained through working with a number Western consultancies operating in FSU.

Timur Mussin, MA, **Technical Manager*, WAI Kazakhstan***
Timur currently works at WAI's Kazakhstan office to assist the Regional Manager in technical aspects of liaison with clients and technical translation for many of our FSU projects, as well as support in reconciliation of FSU standards and practices with international ones. He has 12 years experience in various aspects of the minerals and mining industry of the FSU. Previously, he has worked in R&D Dept of ALROSA (Russian diamond producer) and several Western mining companies in Kazakhstan on manganese, gold and copper projects as a project manager and an operations manager and has gained considerable project management and evaluation

experience through these roles, as well as good understanding of both FSU and Western standards and practices.

Neither WAI, its directors, employees nor company associates hold any securities in Glencore, Glencore International AG or Kazzinc, its subsidiaries or affiliates, nor have they:

- any rights to subscribe for any Glencore, Glencore International AG or Kazzinc securities either now or in the future;
- any vested interest or any rights to subscribe to any interest in any properties or concessions, or in any adjacent properties and concessions held by Kazzinc; or
- been promised or led to believe that any such rights would be granted to WAI.

The only commercial interest WAI has in relation to Glencore, Glencore International AG or Kazzinc is the right to charge professional fees to Glencore, Glencore International AG or Kazzinc (as applicable) at normal commercial rates, plus normal overhead costs, for work carried out in connection with the investigations reported herein.

Disclaimer/Reliance on Experts

The observations, comments and results of technical analyses presented in these reports represent the opinion of WAI as of 4 May 2011 and are based on the work as stated in the report. While WAI is confident that the opinions presented are reasonable, a substantial amount of data has been accepted in good faith. Although WAI has visited all of the assets described in this report, WAI did not conduct any verification or quality control sampling. WAI cannot therefore accept any liability, either direct or consequential, for the validity of such information accepted in good faith.

1 SITE VISITS

1.1 Background

In order to prepare the Competent Person's Report, WAI personnel undertook site visits to the various assets as follows:

Kazakhstan

Vasilkovskoye Open Pit and Maleevskoye Mine

A team of WAI consultants visited the Vasilkovskoye open pit operation during the period 12 and 15 October 2010 and Maleevskoye Mine during the period 16 and 18 October 2010. During the site visit the WAI team inspected current exploration, production and process activities, discussed many aspects of the project with Kazzinc technical staff and collected sufficient data to complete the studies.

The team from WAI visiting the project comprised Phil Newall, Director of Minerals and Mining Geologist; Richard Ellis, Resource Geologist, Owen Mihalop, Technical Director and Mining Engineer; Phil King, Technical Director and Processing Engineer; and Nick Coppin, Managing Director of WAI and Environment Scientist. All the technical team are full time employees of WAI.

Ridder-Sokolniy Mine and Satellite Mines and Advanced Exploration Properties

A large team of WAI consultants visited the Ridder-Sokolniy, Shubinskiy and Tishinskiy mines, Dolinnoe & Obruchevskoe development projects and Chekmar exploration licence during the period 12 to 22 October 2010. During the various site visits the WAI team inspected current exploration, production and process activities, discussed many aspects of the project with Kazzinc technical staff and collected sufficient data to complete the studies.

The team from WAI visiting the project comprised Mark Owen, Technical Director and Mining Geologist; Adam Wheeler, Resource Geologist; Owen Mihalop, Technical Director and Mining Engineer; Bruce Pilcher, Lewis Meyer, Stuart Richardson and Daniil Lunev, Mining Engineers; Coin Hunter, Processing Engineer; and Chris Broadbent, Director of WA and Pyrometallurgist. All the technical team are full time employees of WAI or WAI.

A separate visit was made by Kim-Marie Clothier, Kathy Hicks and Christine Blackmore, all Environmental Scientists with WAI on 10-21 November 2010.

Kazzinc Smelters – Ust-Kamenogorsk

The Kazzinc smelters in Ust-Komenogorsk were visted by Chris Broadbent, Director of WA and Pyrometallurgist during the period 12 to 22 October 2010. During the visit he inspected the processing activities, discussed many aspects of the project with Kazzinc technical staff and collected sufficient data to complete the study.

Shaimerden Open Pit

WAI personnel Bruce Pilcher (Mining Engineer), Colin Taylor (Geologist) and Colin Hunter (Process Engineer) visited the Shaimerden mine and offices during the period 12 to 14 October 2010.

A separate visit was made by Anne Mihalop, Environmental Scientist with WAI on 23 to 25 November 2010.

Solovievskiy Exploration Block

On 06 October 2010, Che Osmond, Senior Geologist with WAI visited the TOPAZ Mining Co. LLP analytical laboratory in Ust-Kamenogorsk where the fire assay analysis is conducted for the current Solovievskiy Block exploration works.

Che Osmond visited the Solovievskiy Block licence area on 07 and 08 November 2010, specifically the Novokhairuzovskoie deposit, and the Kazzinc Geological Camp where core is logged, prepared and stored from the current exploration work. The Kazzinc sample preparation laboratory in Zyryanovsk was also inspected as well as the Kazzinc analytical laboratory located in the Zyryanovskiy Mining and Processing Complex.

The Plazma Analit LLP analytical laboratory (Ust-Kamenogorsk) was also visited on the 08 October 2010, where polymetallic ore is analysed by ICP methods.

Tishinskiy Slimes Ponds & Staroye and Chanshinskoye TMF's

From 09 to 11 October 2010, Che Osmond visited the Tishinskiy slimes ponds, Staroye and Chanshinskoye TMF's as well as the Kazzinc office in Ridder to review data with senior technical staff. The Kazzinc 'Technical Control Dept.' sample preparation and analysis laboratory in Ridder was also visited where samples from the mining and process plant are analysed.

Bukhtarma Hydroelectric Power Plant

Andrei Kudrin visited the Bukhtarma Hydroelectric Power Plant between 17 and 18 November 2010.

RUSSIA

Novoshirokinskoye Mine

A team of WAI consultants visited the Novoshirokinskoye Mine during the period 10 and 11 November 2010. During the site visit the WAI team inspected current exploration, production and process activities, discussed many aspects of the project with Kazzinc technical staff and collected sufficient data to complete the studies.

The team from WAI visiting the project comprised Phil Newall, Director of Minerals and Mining Geologist;, Owen Mihalop, Technical Director and Mining Engineer; Phil King, Technical Director and Processing Engineer; and Chris Broadbent, Director of WA and Environment Scientist. All the technical team are full time employees of WAI or WA.

1.2 Study Strategy

The basic strategy for this CPR has been to examine and report on the existing information available on the properties held globally by the Client, which includes geological, resources/reserves, mining and metallurgical data and basic economic parameters. All resource and reserve estimates presented in the CPR have been prepared by WAI in accordance with the JORC Code (2004).

During the visits, further information was gathered on infrastructure, equipment, costs, potential mining methods, permitting and environmental issues.
Locally-based and publicly available documentation was viewed by WAI and in addition, WAI held meetings with key staff at the project sites.

For the environmental aspects of the projects WAI has adopted the following strategy throughout the study:

- Carry out a review of environmental and social issues associated with each mine and processing facilities development in line with national and international requirements;

- Provide a preliminary evaluation of the project in this respect and to identify the main issues likely to affect valuation, viability, and access to funds from international financial institutions; and
- Identify and comment on areas of particular risk or exemplary practice.

The methodology used by WAI for the environmental study has been to:

- Review project information and seek further clarification of project description as necessary;
- Review the environmental studies previously undertaken;
- Visit the sites and make a visual inspection of the project area and its surroundings;
- Review and comment on key environmental and social issues;
- Assess projects in line with international requirements (generally including the Equator Principles, IFC Performance Standards and World Bank EHS guidelines);
- Advise on recommendations to satisfy 'best practice environmental management'; and
- Assess the adequacy of planned rehabilitation and closure costs.

2 OVERVIEW OF THE ASSETS

2.1 Introduction

This CPR covers all the main project technical areas including geology, resources, mining methods, processing, infrastructure, markets, Capex, Opex and environmental. The core assets form the basis of the CPR and comprise the following assets as shown in Figure 2.1 and Figure 2.2 below.

Figure 2.1: Location of Kazzinc Assets in Kazakhstan
(Note: Ridder-Sokolniy & Satellites includes: Ridder-Sokolniy Mine, Tishinskiy Mine, Shubinskiy Mine; Dolinnoe, Obruchevskoe and Chekmar advanced exploration projects; and Staroye and Chashinskoye TMF's and Tishinskiy Slime Ponds)

Figure 2.2: Location of Novoshirokinskoye Mine in the Russian Federation

2.2 Summary of Assets

A summary of the assets is provided in Table 2.1 below.

Table 2.1: Summary of Assets - Kazakhstan

Asset	Holder	Interest	Status	Licence		Comments
				Expiry Date	Area (km²)	
Vasilkovskoye Deposit Contract No.1185 dd. 07.07.2003	Kazzinc	100%	Mining	07 July 2025	28.3	Valid for 20 years Permit for mining to depth of 660m
Maleevskoye Deposit Contract No.95 dd 21.05.1997	Kazzinc	100%	Mining	21 May 2022	7.703	Valid for 25 years Permit for mining to depth of 1,100m
Ridder-Sokolniy Deposit Contract No.91 dd. 21.05.1997	Kazzinc	100%	Mining	21 May 2022	8.558	Valid for 25 years Permit for mining to depth of Level 18
Ridder-Sokolniy Deposit Contract No.91 dd. 21.05.1997	Kazzinc	100%	Mining	21 May 2022	11.5	Valid for 25 years Permit for mining to depth of Level 24
Ridder-Sokolniy Deposit Contract No.91 dd. 21.05.1997	Kazzinc	100%	Exploration	21 May 2022	12.1	Valid for 19 years
Tishinskiy Deposit Contract No.92 dd. 21.05.1997	Kazzinc	100%	Mining	21 May 2022	3.8k	Valid for 25 years Permit for mining to depth of 590m
Shubinsky Deposit Contract No. 1296 dd. 30.12.2003	Kazzinc (indirectly through TOO Shubinskiy)	100%	Mining	7 April 2015	0.97	Valid for 25 years Permit for mining to depth of 510m
Staroye TMF Contract No.559 dd. 07.11.2000	Kazzinc	100%	Mining	07 November 2030	0.615	Valid for 30 years Permit for mining to a depth of 14m
Chashinskoye TMF Contract No.559 dd. 07.11.2000	Kazzinc	100%	Mining	07 November 2030	2.65	Valid for 30 years Permit for mining to a depth of 60m
Slimesdumps No.1 and No.2 Contract No.2693 dd. 19.06.2008	Kazzinc	100%	Mining	19 May 2013	0.3	Valid for 30 (5) years Permit for mining to a depth of 12m
Shaimerden Deposit Contract No.298 dd. 04.03.1999	Kazzinc (indirectly through Shaimerden JSC)	100%	Mining	04 March 2024	3.23	Valid for 25 years Permit for mining to depth of 245m
Dolinnoe Contract No.2450 dd. 20.08.2007	Kazzinc	100%	Exploration	20 August 2026	3.3	Valid for 19 years Permit for mining to depth of 520m
Obruchevskoe Contract 450 dd. 20.08.2007	Kazzinc	100%	Exploration	20 August 2026	1.61	Valid for 19 years Permit for mining to depth of 1,015m
Novoshirokinskoye Deposit Licence ЧИТ 12697 ТЭ dd. 30.09.2004	Kazzinc (indirectly through OAO Novoshirokinskoye Rudnik)	48.3%	Mining	01 October 2024	1.4	Valid for 20 years Permit for mining to depth of 660m

Note:
The Chekmar subsoil use contract is expected to be finalised and registered with the relevant Kazakhstan authority by the end of 2011. The Chekmar mining plan, which was submitted by Kazzinc to the relevant Kazakhstan authority, is currently going through the approval process.

As of 1 January 2011, those Mineral resources estimated in accordance with the guidelines of the JORC Code (2004) held by Kazzinc in Kazakhstan and Russia are provided in Table 2.2, whilst Ore reserves estimated in accordance with the the guidelines of the JORC Code (2004) and derived from these are given in Table 2.3 and Table 2.4 below.

Table 2.2: Summary of all Kazzinc Mineral Resource Estimates (WAI 01.01.2011) (In Accordance with the Guidelines of the JORC Code (2004))

Deposit	Resources	Cut Off Grade	Date	Tonnes (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (Pb)		Zinc (Zn)	
					Grade (g/t)	Metal Content (oz)***	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Vasilkovskoye	Measured	0.4g/t Au	01 January 2011	45.23	1.75	2,550,552								
	Indicated			141.56	1.72	7,840,344								
	Measured + Indicated			186.80	1.73	10,390,893								
	Inferred			99.08	1.77	5,650,405								
	Total			285.87	1.74	16,041,301								
Maleevskoye	Measured	n/a	01 January 2011	12.92	0.62	257,917	77.74	32,299,948	2.39	307,852	1.13	146,601	6.92	894433
	Indicated			11.03	0.56	200,354	64.82	22,987,359	1.95	215,144	1.15	127,182	6.82	752050
	Measured + Indicated			23.96	0.59	458,271	71.79	55,287,307	2.19	522,966	1.14	273,783	6.87	1,646,483
	Inferred			4.87	0.25	38,756	47.79	7,438,836	0.97	47,632	1.58	76794	4.99	243133
	Total			28.83	0.53	497,027	67.73	62,726,143	1.98	570,598	1.21	350,577	6.56	1,889,616
Novoshirokinskoye	Measured	3g/t AuEq*	01 January 2011	2.43	4.43	345,395	87.74	6,840,843			3.43	83,179	1.47	35,648
	Indicated			4.64	4.30	641,022	94.82	14,135,204			3.07	142,347	1.15	53,322
	Measured + Indicated			7.06	4.34	985,356	92.39	20,976,337			3.19	225,270	1.26	88,978
	Inferred			1.51	2.08	100,985	57.02	2,768,726			2.44	36,851	1.81	27,336
	Total			8.57	3.95	1,086,341	86.18	23,745,063			3.06	262,121	1.36	116,314
Shaimerden (Stockpiles)	Measured	n/a	01 January 2011											
	Indicated			2.48									21.71	539,143
	Measured + Indicated			2.48									21.71	539,143
	Inferred													
	Total			2.48									21.71	539,143
Tishinskiy	Measured	2.2% ZnEq**	01 January 2011	21.23	0.60	412,348	9.02	6,153,840	0.587	124,635	1.00	212,031	4.71	1,000,316
	Indicated			7.01	0.46	103,607	9.75	2,072,238	0.446	31,289	0.95	66,298	4.35	304,634
	Measured + Indicated			28.24	0.57	515,956	9.20	8,226,078	0.552	155,924	0.99	278,329	4.62	1,304,950
	Inferred			5.19	0.33	55,131	11.94	2,379,670	0.554	28,748	1.36	70,285	4.46	231,443
	Total			33.43	0.53	571,087	9.87	10,605,748	0.553	184,672	1.04	348,614	4.60	1,536,393
Dolinnoe	Measured	1.7% ZnEq	01 January 2011	5.04	3.85	624,252	50.47	8,183,378	0.20	10,090	0.74	37,320	1.39	70,100
	Indicated			2.70	2.32	201,879	28.05	2,440,821	0.14	3,790	0.48	12,990	1.00	27,070
	Measured + Indicated			7.74	3.32	826,131	42.64	10,624,199	0.18	13,880	0.65	50,310	1.25	97,170
	Inferred			6.90	1.59	353,085	15.88	3,526,405	0.12	8,290	0.48	33,150	0.86	59,400
	Total			14.64	2.50	1,179,216	30.03	14,150,604	0.15	22,170	0.57	83,460	1.07	156,570
Obruchevskoe	Measured	1.7% ZnEq	01 January 2011	1,154	1.62	60,105	40.68	1,509,308	0.88	10,155	4.02	46,391	8.87	102,360
	Indicated			7,783	0.67	167,654	25.36	6,345,814	0.73	56,816	1.78	138,537	4.64	361,131
	Measured + Indicated			8,937	0.79	226,992	27.34	7,855,636	0.75	67,028	2.07	184,996	5.18	462,937
	Inferred			5,500	0.50	88,415	24.97	4,415,423	0.41	22,550	0.64	35,200	1.75	96,250
	Total			14,437	0.68	315,407	26.44	12,271,059	0.62	89,578	1.53	220,196	3.87	559,187
Chashinskoye Tailing Dam	Measured	n/a	01 January 2011	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Indicated			57.80	0.67	1,245,000	5.16	9,589,000	0.05	28,900	0.15	86,700	0.38	219,640

	Measured + Indicated			57.80	0.67	1,245,000	5.16	9,589,000	0.05	28,900	0.15	86,700	0.38	219,640
	Inferred			30.00	0.50	482,261	4.57	4,407,861	0.06	18,000	0.19	57,000	0.45	135,000
	Total			87.80	0.61	1,727,261	4.96	13,996,861	0.05	46,900	0.16	143,700	0.40	354,640
Tishinskiy Tailing Dam	Measured	n/a	01 January 2011											
	Indicated			0.33	0.33	3,536	9.96	106,407	0.22	733	0.76	2,533	2.46	8,199
	Measured + Indicated			0.33	0.33	3,536	9.96	106,407	0.22	733	0.76	2,533	2.46	8,199
	Inferred			0.04	0.58	835	8.73	12,574	0.23	103	0.56	251	2.64	1,183
	Total			0.38	0.36	4,372	9.79	118,981	0.22	836	0.74	2,784	2.48	9,382
Staroye Tailing Dam	Measured	n/a	01 January 2011											
	Indicated			0.82	2.01	53,266	18.78	497,680	0.05	412	0.48	3,956	1.11	9,149
	Measured + Indicated			0.82	2.01	53,266	18.78	497,680	0.05	412	0.48	3,956	1.11	9,149
	Inferred			5.90	0.91	172,592	11.16	2,116,618	0.04	2,360	0.3	17,697	0.63	37,164
	Total			6.72	1.04	225,858	12.09	2,614,297	0.04	2,772	0.32	21,654	0.69	46,314
Ridder-Sokolniy	Measured	1.7% ZnEq for PbZn ore and 0.6% CuEq for Cu Ore	01 January 2011	30.21	1.11	1,076,497	11.73	11,394,749	0.64	29,475	0.40	119,385	0.91	273,897
	Indicated			67.91	1.55	3,397,959	10.74	23,454,050	0.38	113,198	0.40	269,542	0.95	645,031
	Measured + Indicated			98.12	1.42	4,474,456	11.05	34,848,799	0.46	142,675	0.40	388,927	0.94	918,928
	Inferred			6.64	0.83	178,004	9.09	1,940,024	0.29	13,386	0.59	39,365	1.12	74,187
	Total			104.76	1.38	4,652,459	10.92	36,788,824	0.45	156,061	0.41	428,292	0.95	993,115

*Gold plus other metals expressed in 'equivalent ounces' of gold use a conversion ratio dependent on prevailing gold and metal prices, or as stated.
**Zinc equivalent is the zinc grade plus other metals in equivalent units, using a conversion ratio dependent on prevailing zinc and other metal prices, or those stated.
***Metal content is based on tonnage and grade with no account of mining losses and dilution, and metallurgical recoveries.

Table 2.3:Kazzinc Mineral Resources Ridder-Sokolniy Mine
(WAI 01.01.2011)
(In Accordance with the Guidelines of the JORC Code (2004)

Deposit	Resources	Cut Off Grade	Date	Tonnes (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (Pb)		Zinc (Zn)	
					Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Centralny	Measured	1.7% ZnEq for PbZn ore and 0.6% CuEq for Cu ore	01-Jan-11	20.09	1.00	648,768	8.43	5,446,956	0.9	18,020	0.31	6,1480	0.8	160,800
	Indicated			36.21	1.23	1,437,071	8.46	9,847,050	0.44	15,950	0.36	130,750	0.85	308,310
	Measured + Indicated			56.30	1.15	2,085,839	8.45	15,294,006	0.60	33,970	0.34	192,230	0.83	469,110
	Inferred			1.53	0.83	40,763	3.74	183,365	0.45	690	0.15	2,320	0.71	10,880
	Total			57.83	1.14	2,126,602	8.33	15,477,371	0.60	34,660	0.34	194,550	0.83	479,990
Bystrushinskoe	Measured	1.7% ZnEq for PbZn ore and 0.6% CuEq for Cu ore	01-Jan-11	-	-	-	-	-	-	-	-	-	-	-
	Indicated			16.98	2.72	1,486,264	12.29	6,711,147	0.28	48,064	0.42	71,510	0.90	152,812
	Measured + Indicated			16.98	2.72	1,486,264	12.29	6,711,147	0.28	48,064	0.42	71,510	0.90	152,812
	Inferred			0.04	1.53	1,768	3.44	3,922	0.18	63	0.15	53	0.33	118
	Total			17.02	2.72	1,488,032	12.28	6,715,069	0.28	48,127	0.42	71,563	0.90	152,930
Bystrushinskoe North Flank	Measured	1.7% ZnEq for PbZn ore and 0.6% CuEq for Cu ore	01-Jan-11	-	-	-	-	-	-	-	-	-	-	-
	Indicated			1.75	1.26	70,796	5.63	317,328	1.02	17,890	0.29	5,140	1.08	18,868
	Measured + Indicated			1.75	1.26	70,796	5.63	317,328	1.02	17,890	0.29	5,140	1.08	18,868
	Inferred			0.09	2.46	7,106	6.90	19,997	0.86	776	0.29	264	1.03	925
	Total			1.84	1.31	77,902	5.69	337,325	1.01	18,666	0.29	5,404	1.07	19,793
Belkina_RSM_WA	Measured	1.7% ZnEq	01-Jan-11	3.76	1.26	152,331	18.98	2,294,630	0.09	3,384	0.47	17,670	0.98	36,850
	Indicated			4.77	1.11	170,126	16.85	2,582,538	0.08	3,814	0.41	19,550	0.85	40,520
	Measured + Indicated			8.53	1.18	322,456	17.79	4,877,168	0.08	7,200	0.44	37,220	0.91	77,370
	Inferred			0.52	0.88	14,669	23.42	390,393	0.28	1,450	0.32	1,660	0.90	4,670
	Total			9.05	1.16	337,125	18.11	5,267,561	0.10	8,650	0.43	38,880	0.91	82,040
Perspectivnaya	Measured	1.7% ZnEq	01-Jan-11	4.59	1.55	228,476	16.01	2,359,940	0.13	5,960	0.57	26,130	1.07	49,060
	Indicated			3.94	1.36	172,076	16.79	2,124,381	0.13	5,120	0.53	20,860	1.03	40,530
	Measured + Indicated			8.52	1.46	400,552	16.37	4,484,321	0.13	11,080	0.55	46,990	1.05	89,590
	Inferred			2.03	1.19	77,607	12.08	787,806	0.14	2,840	0.49	9,940	0.95	19,270
	Total			10.55	1.41	478,159	15.55	5,272,127	0.13	13,920	0.54	56,930	1.03	108,860
Sokolok	Measured	1.7% ZnEq	01-Jan-11	-	-	-	-	-	-	-	-	-	-	-
	Indicated			0.29	1.36	12,839	120.84	1,140,808	0.13	380	1.89	5,550	1.00	2,940

	Measured + Indicated			0.29	1.36	12,839	120.84	1,140,808	0.13	380	1.89	5,550	1.00	2,940
	Inferred			0.37	1.40	16,715	15.27	182,315	0.14	520	1.98	7,350	1.48	5,500
	Total			0.66	1.38	29,554	61.94	1,323,123	0.14	900	1.94	12,900	1.27	8,440
New Glubokaya	Measured	1.7% ZnEq	01-Jan-11	-	-	-	-	-	-	-	-	-	-	-
	Indicated			0.32	0.18	1,867	2.48	25,723	0.06	190	1.80	5,810	0.67	2,160
	Measured + Indicated			0.32	0.18	1,867	2.48	25,723	0.06	190	1.80	5,810	0.67	2,160
	Inferred			0.07	0.14	314	2.68	6,004	0.31	220	2.10	1,460	0.74	520
	Total			0.39	0.17	2,181	2.51	31,727	0.10	410	1.85	7,270	0.68	2,680
Glubokaya	Measured	1.7% ZnEq	01-Jan-11	-	-	-	-	-	-	-	-	-	-	-
	Indicated			-	-	-	-	-	-	-	-	-	-	-
	Measured + Indicated			-	-	-	-	-	-	-	-	-	-	-
	Inferred			0.51	0.10	1,640	1.48	24,277	0.08	410	1.91	9,740	0.83	4,230
	Total			0.51	0.10	1,640	1.48	24,277	0.08	410	1.91	9,740	0.83	4,230
Dalnaya	Measured	1.7% ZnEq	01-Jan-11	-	-	-	-	-	-	-	-	-	-	-
	Indicated			3.14	0.31	31,104	3.49	352,551	0.68	21,281	0.22	6,975	2.31	72,368
	Measured + Indicated			3.14	0.31	31,104	3.49	352,551	0.68	21,281	0.22	6,975	2.31	72,368
	Inferred			1.16	0.18	6,855	3.18	118,984	0.51	5,958	0.40	4,620	2.07	24,083
	Total			4.30	0.27	37,959	3.41	471,535	0.63	27,239	0.27	11,595	2.24	96,451
Zavodskaya	Measured	1.7% ZnEq	01-Jan-11	1.78	0.82	46,922	22.60	1,293,223	0.12	2,111	0.79	14,105	1.53	27,187
	Indicated			0.51	0.97	15,816	21.62	352,524	0.10	509	0.67	3,397	1.29	6,523
	Measured + Indicated			2.29	0.85	62,739	22.38	1,645,747	0.12	2,620	0.76	17,502	1.48	33,710
	Inferred			0.33	1.00	10,567	21.10	222,961	0.14	459	0.60	1,958	1.21	3,991
	Total			2.62	0.87	73,305	22.22	1,868,709	0.12	3,079	0.74	19,460	1.44	37,701
Ridder-Sokolny Mine	Measured			30.21	1.11	1,076,497	11.73	11,394,749	0.64	29,475	0.40	119,385	0.91	273,897
	Indicated			67.91	1.55	3,397,959	10.74	23,454,050	0.38	113,198	0.40	269,542	0.95	645,031
	Measured + Indicated			98.12	1.42	4,474,456	11.05	34,848,799	0.46	142,675	0.40	388,927	0.94	918,928
	Inferred			6.64	0.83	178,004	9.09	1,940,024	0.29	13,386	0.59	39,365	1.12	74,187
	Total			104.76	1.38	4,652,459	10.92	36,788,824	0.45	156,061	0.41	428,292	0.95	993,115

**Table 2.4: Kazzinc Ore Reserve Estimates
(WAI 01.01.2011)
(In Accordance with the Guidelines of the JORC Code (2004))**

Deposit	Reserves	Ore (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (pb)		Zinc (Zn)	
			Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Vasilkovskoye	Proven	33.30	1.95	2,087,709					-	-	-	-
	Probable	90.70	1.94	5,657,181	-	-	-	-	-	-	-	-
	Total	124.00	1.94	7,744,890	-	-	-	-	-	-	-	-
Maleevskoye	Proven	5.04	0.56	90,779	68.13	11,044,289	1.92	96,770	1.00	50,358	6.46	325,627
	Probable	7.06	0.51	115,777	56.23	12,764,963	1.69	119,630	1.04	73,522	6.29	444,011
	Total	**12.10**	**0.53**	**206,233**	**61.19**	**23,810,222**	**1.79**	**216,400**	**1.02**	**123,880**	**6.36**	**769,638**
Novoshirokinskoye	Proven	2.44	3.89	304,564	77.00	6,033,915	-	-	2.98	72,601	1.28	31,089
	Probable	4.43	3.89	552,992	84.30	12,001,085	-	-	2.69	118,896	0.99	43,912
	Total	**6.87**	**3.89**	**857,556**	**81.70**	**18,035,032**	**-**	**-**	**2.79**	**191,498**	**1.09**	**75,000**
Ridder-Sokolniy	Proven	8.95	0.91	262,779	12.85	3,693,712	0.43	38,038	0.32	28,587	0.73	65,195
	Probable	12.05	1.03	339,349	8.44	3,269,230	0.22	26,153	0.37	44,920	0.70	84,476
	Total	**21.00**	**0.98**	**662,127**	**10.32**	**6,962,941**	**0.31**	**64,188**	**0.35**	**73,505**	**0.71**	**149,671**
Shaimerden (Stockpiles)	Proven	-	-	-	-	-	-	-	-	-	-	-
	Probable	2.48	-	-	-	-	-	-	-	-	21.71	539,143
	Total	**2.48**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**21.71**	**539,143**
Tishinskiy	Proven	18.89	0.54	330,299	8.12	4,930,099	0.52	98,415	0.91	172,093	4.22	796,457
	Probable	4.93	0.47	74,056	9.36	1,482,209	0.40	19,621	0.88	43,139	4.13	203,681
	Total	**23.81**	**0.53**	**405,782**	**8.38**	**6,415,955**	**0.50**	**119,068**	**0.90**	**214,323**	**4.20**	**1,000,174**
Dolinnoe	Proven	3.66	3.93	462,258	53.76	6,325,710	0.20	7,385	0.75	27,351	1.41	51,730
	Probable	0.96	2.38	73,822	29.82	923,296	0.14	1,338	0.50	4,849	1.02	9,792
	Total	**4.62**	**3.61**	**536,080**	**48.77**	**7,249,006**	**0.19**	**8,723**	**0.70**	**32,380**	**1.33**	**61,523**
Obruchevskoe	Proven	0.89	1.73	49,363	42.80	1,219,753	0.81	7,161	4.27	37,829	8.98	79,581
	Probable	3.25	0.90	94,019	33.21	3,466,977	0.83	26,845	2.66	86,520	6.50	211,092
	Total	**4.14**	**1.08**	**143,382**	**35.26**	**4,686,731**	**0.82**	**34,006**	**3.01**	**124,349**	**7.03**	**290,673**
Chashinskoye Tailing Dam	Proven	-	-	-	-	-	-	-	-	-	-	-
	Probable	55.53	0.70	1,245,070	5.37	9,588,896	0.05	28,900	0.16	86,700	0.40	219,640
	Total	**55.53**	**0.70**	**1,245,070**	**5.37**	**9,588,896**	**0.05**	**28,900**	**0.16**	**86,700**	**0.40**	**219,640**
Tishinskiy Tailing Dam	Proven	0.00	-	-	-	-	-	-	-	-	-	-
	Probable	0.32	0.33	3,410	9.89	101,790	0.22	710	0.76	3,420	2.44	7,820
	Total	**0.32**	**0.33**	**3,410**	**9.89**	**101,790**	**0.22**	**710**	**0.76**	**3,420**	**2.44**	**7,820**
Staroye Tailing Dam	Proven	0.00	-	-	-	-	-	-	-	-	-	-
	Probable	0.79	2.00	51,000	18.69	475,900	0.05	380	0.48	3,800	1.10	8.720
	Total	**0.79**	**2.00**	**51,000**	**18.69**	**475,900**	**0.05**	**380**	**0.48**	**3,800**	**1.10**	**8.720**

2.3 Extraction Table

Extraction tables for each of the deposits are shown in Table 2.5: Kazzinc Group Extraction to Table 2.17 below.

Table 2.5: Kazzinc Group Extraction

		2008A	2009A	2010A	2011E	2012E	2013E	2014E	2015E
Finished metal production capacity	t								
Zinc	t	300,900	300,900	300,900	300,900	300,900	300,900	300,900	300,900
Lead	t	130,000	130,000	130,000	130,000	172,500	172,500	172,500	172,500
Copper	t	-	-	-	70,000	87,500	87,500	87,500	87,500
Gold	oz	1,511,084	1,511,084	1,511,084	1,511,084	1,511,084	1,511,084	1,511,084	1,511,084
Silver	oz	46,297,041	46,297,041	46,297,041	46,297,041	46,297,041	46,297,041	46,297,041	46,297,041
Finished metal actual / forecast production									
Total									
Zinc	t	299,443	301,104	300,750	300,800	300,800	300,800	300,800	300,800
Lead	t	90,240	79,041	100,789	99,249	160,135	169,054	171,848	171,523
Copper	t	55,956****	59,420****	49,782****	47,700	70,000	87,500	87,500	87,500
Gold	oz	183,428	238,226	347,778	625,068	762,417	815,583	803,270	791,934
Silver	oz	7,617,831	6,285,871	6,730,970	6,470,494	19,349,636	22,857,937	24,375,092	25,212,401
From own mines' concentrate									
Zinc	t	261,904	226,853	239,050	259,543	205,756	253,246	242,516	182,752
Lead	t	43,276	46,472	33,142	42,086	51,986	51,706	44,532	33,748
Copper	t	55,956	57,324	47,955	45,308	30,945	31,456	29,805	19,574
Gold	oz	179,293	232,674	326,315	619,663	542,060	614,432	636,135	598,832
Silver	oz	5,312,570	5,335,199	5,182,404	5,899,184	5,221,692	5,063,672	4,829,110	3,348,772
From third party concentrate*									
Zinc	t	37,538	74,251	61,700	41,257	95,044	47,554	58,284	118,048
Lead	t	46,964	32,570	67,647	57,163	108,149	117,348	127,316	137,775
Copper	t	0	2,096	1,827	2,392	39,055	56,044	57,695	67,926
Gold	oz	4,135	5,552	21,463	5,405	220,357	201,151	167,135	193,102
Silver	oz	2,305,262	950,672	1,548,566	571,310	14,127,944	17,794,265	19,545,982	21,863,629
Cash cost (excl. royalties, before by-product revenues) ***	US$M	997	725	1,040	1,500	2,077	2,460	2,415	2,444
By-products revenues	US$M	411	368	542	491	523	552	477	495
Royalties (as a % market price)									
Zinc		3.5%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
Lead		3.5%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
Copper		3.5%	5.70%	5.70%	5.70%	5.70%	5.70%	5.70%	5.70%

Gold		4.0%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Silver		4.0%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Royalties	US$M	19.05	67.71	101.61	123.77	106.98	119.39	117.74	97.37
Depreciation & amortisation	US$M	116	147	236					
Tax rate %		30.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%	20.00%
Capex	US$M	**568****	**367****	**350****	**345**	**299**	**190**	**174**	**312**
Sustaining		199	86	95	243	248	164	139	208
Expansionary		369	280	256	102	51	26	35	104

Note:

* Kazzinc will purchase third party concentrate to load all available capacity in smelters.

**Kazzinc's CapEx for 2008-2010 excludes development loans to Novoshirokinskoye and VasGold in the amount of US$642 million (US$277 million in 2008, US$324 million in 2009, and US$41 million in 2010)

***Cash cost calculations include the cost of purchased concentrates.

****Copper contained in copper concentrates and blister copper

Table 2.6: Maleevskoye Deposit

		2008A	2009A	2010A	2011E	2012E	2013 E	2014E	2015E
Milled Capacity	t	2,250,000	2,250,000	2,250,000	2,250,000	2,250,000	2,250,000	2,250,000	2,250,000
Milled actual / forecast	t	2,216,329	2,357,243	2,230,246	2,250,000	2,137,000	2,196,000	1,710,000	822,000
Grades	g/t								
Zinc	%	6.90	6.71	6.37	6.31	6.14	6.57	7.41	6.69
Lead	%	1.14	1.00	0.99	0.97	1.66	1.6	1.5	1.4
Copper	%	2.06	1.90	1.96	2.01	1	1	1.16	0.94
Gold	g/t	0.61	0.57	0.56	0.55	0.48	0.42	0.64	0.5
Silver	g/t	65.69	59.22	59.73	62.58	58.03	49.82	58.55	55.97
Concentrate produced									
Zn Conc	dmt	248,148	257,050	229,644	225,739	212,647	233,822	205,353	89,122
Metals in concentrate									
Zinc	t	137,603	141,601	126,616	127,087	117,435	129,128	113,406	49,218
Lead	t	1,256	1,302	1,264	1,038	1,703	1,687	1,231	552
Copper	t	2,144	2,052	2,230	1,672	791	813	734	286
Gold	oz	3,379	3,495	3,151	2,396	1,979	1,779	2,111	793
Silver	oz	274,968	297,461	277,138	247,569	219,310	193,481	177,062	81,363
Pb Conc	dmt	33,318	31,452	28,462	29,564	49,214	48,745	35,585	15,965
Metals in concentrate									
Zinc	t	2,632	2,669	2,485	2,513	2,321	2,552	2,241	973
Lead	t	15,642	13,680	12,765	13,599	22,194	21,983	16,048	7,200
Copper	t	773	1,177	1,015	579	274	282	254	99
Gold	oz	1,353	2,113	1,704	2,289	1,888	1,698	2,014	756
Silver	oz	867,105	969,074	878,877	1,066,158	970,770	856,437	783,759	360,153
Cu Conc	dmt	155,254	166,036	157,137	158,225	77,402	79,539	71,846	27,986
Metals in concentrate									
Zinc	t	4,687	5,240	4,853	3,501	3,233	3,555	3,122	1,355
Lead	t	5,510	5,849	5,477	4,400	7,182	7,113	5,193	2,330
Copper	t	39,126	37,798	36,730	38,917	18,407	18,915	17,085	6,655
Gold	oz	14,920	15,134	12,687	12,760	10,526	9,464	11,230	4,217
Silver	oz	3,015,129	2,696,398	2,640,619	2,630,407	2,320,573	2,047,266	1,873,532	860,925
Au Conc	dmt	4,812	4,778	5,341	4,731	4,697	4,826	3,758	1,807

Metals in concentrate									
Zinc	t	151	126	114	165	152	167	147	64
Lead	t	347	295	377	438	715	709	517	232
Copper	t	42	35	30	49	23	24	22	8
Gold	oz	15,846	13,786	14,374	14,256	11,759	10,574	12,546	4,712
Silver	oz	36,193	33,835	44,117	30,399	27,640	24,385	22,316	10,255
Cash cost (excl. royalties, before by-product revenues)	US$M	92.76	89.69	100.13	120.86	115.29	117.21	101.54	72.90
By-products revenues	US$M	323.44	271.33	388.54	342.36				
Royalties (as a % of market price)									
Zinc		2.17%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
Lead		1.95%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
Copper		2.62%	5.70%	5.70%	5.70%	5.70%	5.70%	5.70%	5.70%
Gold		2.07%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Silver		1.56%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Total Royalty	US$M	16.80	37.46	52.25	47.96	42.79	43.89	37.31	15.45

Table 2.7: Vasilkovskoye Deposit

		2008A	2009A	2010A	2011E	2012E	2013 E	2014E	2015E
Milled Capacity	t			3,520,650	8,000,000	8,000,000	8,000,000	8,000,000	8,000,000
Milled actual / forecast	t			3,520,650	7,470,000	8,000,000	8,000,000	8,000,000	8,000,000
Grade	g/t								
Gold				1.93	2.19	2.03	2.05	2.11	1.97
Concentrate produced				977	0	0	0	0	0
Metals in concentrate	oz								
Gold				5,977	0	0	0	0	0
Alloy Doré	t			4.954	14.587				
Metals									
Gold	oz			117,982	402,296	365,490	369,091	379,893	354,687
Cash cost (excl. royalties, before by-product revenues)	US$M			106.93	123.89	132.68	132.68	132.68	132.68
By-products revenues	US$M			0	0	0	0	0	0
Royalties (as a % of market price)									
Gold				5%	5%	5%	5%	5%	5%
Total Royalty	US$M			15.17	31.63	24.55	24.66	25.26	23.46

Table 2.8: Ridder-Sokolniy Deposit

		2008A	2009A	2010A	2011E	2012E	2013 E	2014E	2015E
Milled Capacity	t	2,354,000	2,150,000	2,300,000	2,125,000	2,125,000	2,125,000	2,125,000	2,125,000
Milled actual / forecast	t	2,126,780	2,086,024	2,036,102	2,125,000	2,125,000	2,125,000	2,125,000	2,125,000
Grades									
Zinc	%	0.51	0.46	0.52	0.47	0.71	0.71	0.71	0.71
Lead	%	0.25	0.24	0.27	0.20	0.35	0.35	0.35	0.35
Copper	%	0.23	0.34	0.30	0.35	0.31	0.31	0.31	0.31
Gold	g/t	1.98	2.22	2.23	1.99	0.98	0.98	0.98	0.98
Silver	g/t	10.35	7.78	13.10	13.98	10.35	10.35	10.35	10.35
Concentrate produced									
Zn Conc	dmt	10,515	8,452	8,947	8,802	13,366	13,366	13,366	13,366
Metals in concentrate									
Zinc	t	5,904	4,590	4,858	4,753	7,217	7,217	7,217	7,217
Lead	t	120	140	247	110	196	196	196	196
Copper	t	144	278	294	256	226	226	226	226
Gold	oz	2,018	2,159	2,137	2,395	1,180	1,180	1,180	1,180
Silver	oz	27,603	20,674	34,083	37,134	27,495	27,495	27,495	27,495
Pb Conc	dmt	0	0	0	20,588	17,700	17,700	17,700	17,700
Metals in concentrate									
Zinc	t	0	0	0	1,222	1,380	1,380	1,380	1,380
Lead	t	0	0	0	2,633	4,850	4,850	4,850	4,850
Copper	t	0	0	0	519	690	690	690	690
Gold	oz	0	0	0	19,798	10,084	10,084	10,084	10,084
Silver	oz	0	0	0	256,434	177,788	177,788	177,788	177,788
Cu Conc	dmt	5,484	24,393	24,341	27,777	24,505	24,505	24,505	24,505
Metals in concentrate									
Zinc	t	166	552	751	853	1,295	1,295	1,295	1,295
Lead	t	65	234	974	304	543	543	543	543
Copper	t	1,351	2,891	2,710	5,768	5,089	5,089	5,089	5,089
Gold	oz	1,149	10,744	17,036	34,871	17,183	17,183	17,183	17,183
Silver	oz	18,792	48,960	124,070	409,761	303,397	303,397	303,397	303,397
Au Conc	dmt	30,805	36,988	32,055	8,170	7,208	7,208	7,208	7,208
Metals in concentrate									
Zinc	t	2,305	1,988	2,420	455	691	691	691	691

Lead	t	4,154	3,262	3,458	327	584	584	584	584
Copper	t	2,765	2,835	2,215	185	163	163	163	163
Gold	oz	83,801	72,718	70,317	31,463	15,504	15,504	15,504	15,504
Silver	oz	486,102	304,866	542,346	79,830	59,108	59,108	59,108	59,108
Ore Flux	dmt	44,470	60,316	59,820	104,394	65,433	65,433	65,433	65,433
Metals in concentrate (oz)									
Zinc	t	365	351	401	417	411	411	411	411
Lead	t	132	147	223	268	196	196	196	196
Copper	t	110	274	369	227	242	242	242	242
Gold	oz	28,332	52,012	37,906	34,444	38,174	38,174	38,174	38,174
Silver	oz	13,908	26,818	37,700	28,431	26,714	26,714	26,714	26,714
Cash cost (excl. royalties, before by-product revenues)	US$M	86.27	65.16	90.25	112.03	112.03	112.03	112.03	112.03
By-products revenues	US$M	26.89	32.36	50.70	47.18				
Royalties (as a % of market price)									
Zinc		0.27%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
Lead		0.21%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
Copper		0.27%	5.70%	5.70%	5.70%	5.70%	5.70%	5.70%	5.70%
Gold		0.16%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Silver		0.16%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Total Royalty	US$M	0.39	10.89	13.10	13.34	12.83	12.60	12.34	12.06

Table 2.9: Tishinskiy Deposit

		2008A	2009A	2010A	2011E	2012E	2013 E	2014E	2015E
Milled Capacity	t	1,400,000	1,187,500	1,330,000	1,330,000	1,330,000	1,330,000	1,330,000	1,330,000
Milled actual / forecast	t	1,421,038	1,262,510	1,476,486	1,330,000	1,187,500	1,187,500	1,187,500	1,187,500
Grades									
Zinc	%	5.01	5.23	4.61	4.81	5.08	5.08	5.08	5.08
Lead	%	0.72	0.79	0.63	0.55	0.57	0.57	0.57	0.57
Copper	%	0.40	0.43	0.41	0.38	0.35	0.35	0.35	0.35
Gold	g/t	0.81	0.87	0.82	0.78	0.70	0.65	0.65	0.60
Silver	g/t	10.06	10.83	9.69	9.00	9.00	9.00	9.00	9.00
Concentrate produced									
Zn Conc	dmt	115,908	110,061	113,758	106,918	99,834	99,834	99,834	99,834
Metals in concentrate									
Zinc	t	64,703	61,234	60,956	58,245	54,924	54,924	54,924	54,924
Lead	t	1,352	1,497	1,654	1,136	1,060	1,060	1,060	1,060
Copper	t	605	498	784	573	477	477	477	477
Gold	oz	9,369	8,974	10,742	8,578	6,873	6,382	6,382	5,891
Silver	oz	166,658	172,497	181,645	144,389	133,315	133,315	133,315	133,315
Pb Conc	dmt	9,839	9,649	8,747	6,827	6,583	6,583	6,583	6,583
Metals in concentrate									
Zinc	t	762	758	820	660	622	622	622	622
Lead	t	6,993	6,821	5,700	4,693	4,541	4,541	4,541	4,541
Copper	t	80	84	121	72	52	52	52	52
Gold	oz	3,784	3,274	3,659	2,733	2,190	2,033	2,033	1,877
Silver	oz	85,065	81,292	69,038	56,585	52,245	52,245	52,245	52,245
Cu Conc	dmt	15,453	15,211	15,458	13,268	11,322	11,322	11,322	11,322
Metals in concentrate									
Zinc	t	881	837	950	896	845	845	845	845
Lead	t	350	409	434	288	269	269	269	269
Copper	t	4,357	4,020	4,363	3,754	3,127	3,127	3,127	3,127
Gold	oz	8,938	8,644	9,172	8,552	6,853	6,363	6,363	5,874
Silver	oz	89,662	91,003	88,149	70,249	62,844	62,844	62,844	62,844
Au Conc	dmt	445	1,247	421	1,851	753	753	753	753
Metals in concentrate									

Zinc	t	25	117	35	72	72	72	72	72
Lead	t	81	158	68	85	84	84	84	84
Copper	t	6	79	13	24	22	22	22	22
Gold	oz	839	2,051	762	4,463	3,682	3,419	3,419	3,156
Silver	oz	1,807	4,798	1,604	3,537	3,381	3,381	3,381	3,381
Cash cost (excl. royalties, before by-product revenues)	US$M	81.852	50.674	72.105	86.782	77.93	77.93	77.93	77.93
By-products revenues	US$M	46.538	42.266	64.228	54.842				
Royalties (as a % of market price)									
Zinc		0.74%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
Lead		0.57%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
Copper		0.74%	5.70%	5.70%	5.70%	5.70%	5.70%	5.70%	5.70%
Gold		0.44%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Silver		0.44%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Total Royalty	US$M	1.40	12.94	16.34	14.19	14.54	14.16	13.86	13.39

Table 2.10: Shubinskiy Deposit

		2008A	2009A	2010A	2011E	2012E	2013 E	2014E	2015E
Milled Capacity	t	190,000	200,000	190,000	190,000	190,000	190,000	190,000	190,000
Milled actual / forecast	t	179,457	211,650	194,414	190,000	190,000	190,000	190,000	190,000
Grades									
Zinc	%	1.66	1.74	1.65	1.66	1.66	1.66	1.66	1.66
Lead	%	0.19	0.23	0.22	0.23	0.23	0.23	0.23	0.23
Copper	%	1.15	1.37	0.91	1.00	1.00	1.00	1.00	1.00
Gold	g/t	0.54	0.72	0.55	0.31	0.31	0.31	0.31	0.31
Silver	g/t	12.49	13.94	11.51	8.48	8.48	8.48	8.48	8.48
Concentrate produced									
Zn Conc	dmt	4,947	6,331	5,709	5,196	5,316	5,316	5,316	5,316
Metals in concentrate									
Zinc	t	2,333	2,873	2,432	2,400	2,395	2,395	2,395	2,395
Lead	t	37	57	43	53	53	53	53	53
Copper	t	116	179	127	171	171	171	171	171
Gold	oz	211	330	218	132	134	134	134	134
Silver	oz	9,226	12,782	9,091	6,494	6,491	6,491	6,491	6,491
Cu Conc	dmt	8,084	11,290	6,593	7,025	7,000	7,000	7,000	7,000
Metals in concentrate									
Zinc	t	303	367	330	302	301	301	301	301
Lead	t	249	368	312	310	307	307	307	307
Copper	t	1,821	2,526	1,475	1,568	1,570	1,570	1,570	1,570
Gold	oz	885	1,388	739	402	408	408	408	408
Silver	oz	33,364	42,870	39,989	24,049	24,037	24,037	24,037	24,037
Au Conc	dmt	13	44	0	0	0	0	0	0
Metals in concentrate									
Zinc	t	0	1	0	0	0	0	0	0
Lead	t	1	1	0	0	0	0	0	0
Copper	t	0	1	0	0	0	0	0	0
Gold	oz	8	100	0	0	0	0	0	0
Silver	oz	28	100	0	0	0	0	0	0
Cash cost (excl. royalties, before by-product	US$M	10.35	7.73	10.00	10.30	10.30	10.30	10.30	10.30

revenues)									
By-products revenues	US$M	12.31	11.44	12.85	10.20				
Royalties (as a % of market price)		0.50%							
Zinc			7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
Lead			8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
Copper			5.70%	5.70%	5.70%	5.70%	5.70%	5.70%	5.70%
Gold			5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Silver			5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Total Royalty	US$M	0.04	1.52	1.46	1.38	1.53	1.48	1.42	1.37

Table 2.11: Staroye Tailing Deposit

		2008A	2009A	2010A	2011E	2012E	2013 E	2014E	2015E
Milled Capacity	t	500,000	1,100,000	1,100,000	1,100,000	1,100,000	1,100,000	1,100,000	1,100,000
Milled actual / forecast	t	421,885	936,966	414,636	660,850	660,850	660,850	660,850	660,850
Grades									
Zinc	%	0.92	0.97	0.72	0.67	0.67	0.67	0.67	0.67
Lead	%	0.37	0.35	0.26	0.31	0.31	0.31	0.31	0.31
Copper	%	0.07	0.15	0.06	0.04	0.04	0.04	0.04	0.04
Gold	g/t	1.64	1.76	1.12	1.05	1.05	1.05	1.05	1.05
Silver	g/t	16.56	14.99	11.16	12.25	12.25	12.25	12.25	12.25
Concentrate produced									
Zn Conc	dmt	2,190	6,842	1,635	3,824	3,824	3,824	3,824	3,824
Metals in concentrate									
Zinc	t	771	2,178	354	1,109	1,109	1,109	1,109	1,109
Lead	t	84	303	69	122	122	122	122	122
Copper	t	40	291	54	60	60	60	60	60
Gold	oz	1,324	5,393	941	1,720	1,720	1,720	1,720	1,720
Silver	oz	18,166	49,135	11,950	30,448	30,448	30,448	30,448	30,448
Cu Conc	dmt	0	2,127	3,419	0	0	0	0	0
Metals in concentrate									
Zinc	t	0	234	68	0	0	0	0	0
Lead	t	0	63	50	0	0	0	0	0
Copper	t	0	29	26	0	0	0	0	0
Gold	oz	0	1,364	805	0	0	0	0	0
Silver	oz	0	6,181	6,236	0	0	0	0	0
Au Conc	dmt	11,123	20,838	6,673	8,713	8,713	8,713	8,713	8,713
Metals in concentrate									
Zinc	t	970	2,510	769	1,145	1,145	1,145	1,145	1,145
Lead	t	563	1,411	320	780	780	780	780	780
Copper	t	176	842	123	133	133	133	133	133
Gold	oz	14,129	28,655	6,707	10,950	10,950	10,950	10,950	10,950
Silver	oz	117,585	195,988	57,338	108,900	108,900	108,900	108,900	108,900
Cash cost (excl. royalties, before by-product revenues) ()	US$M	6.30	11.55	7.14	12.16	12.16	12.16	12.16	12.16
By-products revenues	US$M	2.08	10.50	2.24	3.41				

Royalties (as a % of market price)									
Zinc		0.58%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
Lead		0.58%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
Copper		0.58%	5.70%	5.70%	5.70%	5.70%	5.70%	5.70%	5.70%
Gold		0.88%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Silver		0.68%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Total Royalty	US$M	0.27	4.91	1.71	2.19	1.72	1.70	1.68	1.65

Table 2.12: Shaimerden Deposit

		2008A	2009A	2010A	2011E	2012E	2013 E	2014E	2015E
Milled Capacity	t	305,000	74,711	212,898	276,386	276,386	276,386	276,386	276,386
Milled actual / forecast	t	305,519	74,711	212,898	276,386	100,000	280,000	296,270	300,000
Grades	g/t								
Zinc	%	20.64	21.23	20.66	20.71	21.71	21.71	21.71	21.71
Concentrate produced		305,519	74,711	212,898	287,856	104,154	291,630	308,578	312,461
Metals in concentrate									
Zinc	t	63,074	15,861	43,980	60,001	21,710	60,788	64,321	65,130
Cash cost (excl. royalties, before by-product revenues)	US$M	13.35	0.53	7.04	18.16	7.70	18.37	19.34	19.56
By-products revenues	US$M	0.000	0.02	0.80	1.23				
Royalties (as a % of market price)									
Zinc		1.50%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
Total Royalty	US$M	0.17	0.00	0.00	9.06	3.76	10.34	10.75	10.60

Table 2.13: Novoshirokinskoye Deposit

		2008A	2009A	2010A	2011E	2012E	2013 E	2014E	2015E
Milled Capacity	t	-	-	450,000	450,000	450,000	450,000	450,000	450,000
Milled actual / forecast	t	-	-	392,720	450,000	450,000	450,000	450,000	450,000
Grades		-	-						
Zinc	%	-	-	0.81	1.27	1.23	1.23	1.23	1.23
Lead	%	-	-	2.04	2.80	2.70	2.70	2.70	2.70
Copper	%	-	-	0.14	0.00	0.17	0.17	0.17	0.17
Gold	g/t	-	-	3.30	3.48	3.36	3.36	3.36	3.36
Silver	g/t	-	-	60.37	64.90	62.48	62.48	62.48	62.48
Concentrate produced									
Zn Conc	dmt	-	-	4,003	6,723	6,723	6,723	6,723	6,723
Metals in concentrate									
Zinc	t	-	-	1,752	3,051	3,051	3,051	3,051	3,051
Lead	t	-	-	68	0	0	0	0	0
Copper	t	-	-	21	0	0	0	0	0
Gold	oz	-	-	673	1,660	1,660	1,660	1,660	1,660
Silver	oz	-	-	16,459	15,953	15,953	15,953	15,953	15,953
Pb Conc	dmt	-	-	19,136	26,634	26,634	26,634	26,634	26,634
Metals in concentrate									
Zinc	t	-	-	850	2,131	2,131	2,131	2,131	2,131
Lead	t	-	-	6,992	10,823	10,823	10,823	10,823	10,823
Copper	t	-	-	450	1,057	1,057	1,057	1,057	1,057
Gold	oz	-	-	32,087	38,356	38,356	38,356	38,356	38,356
Silver	oz	-	-	634,379	785,571	785,571	785,571	785,571	785,571
Cash cost (excl. royalties, before by-product revenues)	US$M	-	-	33.23	39.84	39.84	39.84	39.84	39.84
By-products revenues	US$M	-	-	22.73	31.85				
Royalties (as a % of market price of concentrate)		-	-	6.0%	6.0%	6.0%	6.0%	6.0%	6.0%
Total Royalty	US$M	-	-	1.57	4.02	5.27	5.21	5.14	5.07

Table 2.14: Dolinnoe Deposit

		2014E	2015E	2016E	2017E	2018E	2019E	2020E	2021E
Milled Capacity	t	100,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000
Milled actual / forecast	t	100,000	250,000	250,000	250,000	250,000	250,000	250,000	250,000
Grades	g/t								
Zinc	%	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33
Lead	%	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Copper	%	0.19	0.19	0.19	0.19	0.19	0.19	0.19	0.19
Gold	g/t	3.61	3.61	3.61	3.61	3.61	3.61	3.61	3.61
Silver	g/t	48.77	48.77	48.77	48.77	48.77	48.77	48.77	48.77
Zn Conc	dmt	1,793	4,483	4,483	4,483	4,483	4,483	4,483	4,483
Metals in concentrate									
Zinc	t	1,004	2,510	2,510	2,510	2,510	2,510	2,510	2,510
Lead	t	21	52	52	52	52	52	52	52
Copper	t	12	30	30	30	30	30	30	30
Gold	oz	20	49	49	49	49	49	49	49
Silver	oz	392	980	980	980	980	980	980	980
Pb Conc	dmt	2,842	5,683	2,323	2,323	2,323	2,323	2,323	2,323
Metals in concentrate									
Zinc	t	53	133	133	133	133	133	133	133
Lead	t	511	1,278	1,278	1,278	1,278	1,278	1,278	1,278
Copper	t	4	10	10	10	10	10	10	10
Gold	oz	25	62	62	62	62	62	62	62
Silver	oz	858	2,146	2,146	2,146	2,146	2,146	2,146	2,146
Cu Conc	dmt	1,873	3,745	1,273	1,273	1,273	1,273	1,273	1,273
Metals in concentrate									
Zinc	t	11	27	27	27	27	27	27	27
Lead	t	9	23	23	23	23	23	23	23
Copper	t	138	344	344	344	344	344	344	344
Gold	oz	63	157	157	157	157	157	157	157
Silver	oz	1,444	3,609	3,609	3,609	3,609	3,609	3,609	3,609
Au Conc	dmt	938	2,344	2,344	2,344	2,344	2,344	2,344	2,344
Metals in concentrate									
Zinc	t	285	571	184	184	184	184	184	184
Lead	t	206	411	139	139	139	139	139	139

Copper	t	46	93	26	26	26	26	26	26
Gold	oz	3,554	8,885	8,885	8,885	8,885	8,885	8,885	8,885
Silver	oz	2,096	5,239	5,239	5,239	5,239	5,239	5,239	5,239
Cash cost (excl. royalties, before by-product revenues)	US$M	5.36	13.39	13.39	13.39	13.39	13.39	13.39	13.39
By-products revenues	US$M								
Royalties (as a % of market price)									
Zinc		7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
Lead		8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%	8.0%
Copper		5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%	5.7%
Gold		5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Silver		5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Total Royalty	US$M	4.48	8.85	1.48	1.41	1.24	1.21	1.20	1.20

Table 2.15: Chashinskoye Tailings

		2013E	2014E	2015E	2016E	2017E	2018E	2019E	2020E
Milled Capacity	t	3,869,000	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000
Milled actual / forecast	t	3,869,000	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000	4,000,000
Grades	g/t								
Zinc	%	0.40	0.40	0.40	0.40	0.40	0.40	0.40	0.40
Lead	%	0.16	0.16	0.16	0.16	0.16	0.16	0.16	0.16
Copper	%	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Gold	g/t	0.70	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Silver	g/t	5.37	5.37	5.37	5.37	5.37	5.37	5.37	5.37
Au Conc	dmt	10,240	10,585	10,585	10,585	10,585	10,585	10,585	10,585
Metals in concentrate									
Zinc	t	-	-	-	-	-	-	-	-
Lead	t	-	-	-	-	-	-	-	-
Copper	t	-	-	-	-	-	-	-	-
Gold	oz	74,571	77,089	77,089	77,089	77,089	77,089	77,089	77,089
Silver	oz	254,606	261,899	261,899	261,899	261,899	261,899	261,899	261,899
Cash cost (excl. royalties, before by-product revenues)	US$M	36.94	35.59	35.59	35.59	35.59	35.59	35.59	35.59
By-products revenues	US$M								
Royalties (as a % of market price)									
Zinc		7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
Lead		8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
Copper		5.70%	5.70%	5.70%	5.70%	5.70%	5.70%	5.70%	5.70%
Gold		5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Silver		5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Total Royalty	US$M	**5.35**	**5.50**	**5.47**	**5.31**	**4.85**	**3.56**	**3.51**	**3.46**

Table 2.16: Obruchevskoe Deposit

		2016E	2017E	2018E	2019E	2020E	2021E	2022E	2023E
Milled Capacity	t	70,000	350,000	350,000	350,000	350,000	350,000	350,000	350,000
Milled actual / forecast	t	70,000	350,000	350,000	350,000	350,000	350,000	350,000	350,000
Grades	g/t								
Zinc	%	7.03	7.03	7.03	7.03	7.03	7.03	7.03	7.03
Lead	%	3.01	3.01	3.01	3.01	3.01	3.01	3.01	3.01
Copper	%	0.82	0.82	0.82	0.82	0.82	0.82	0.82	0.82
Gold	g/t	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08
Silver	g/t	35.26	35.26	35.26	35.26	35.26	35.26	35.26	35.26
Concentrate produced		13,513	67,563	67,563	67,563	67,563	67,563	67,563	67,563
Zn Conc	**dmt**	7,988	39,939	39,939	39,939	39,939	39,939	39,939	39,939
Metals in concentrate									
Zinc	t	3,071	22,366	22,366	22,366	22,366	22,366	22,366	22,366
Lead	t	63	314	314	314	314	314	314	314
Copper	t	36	180	180	180	180	180	180	180
Gold	oz	4.1	21	21	21	21	21	21	21
Silver	oz	198.4	992	992	992	992	992	992	992
Pb Conc	**dmt**	3,082	15,410	15,410	15,410	15,410	15,410	15,410	15,410
Metals in concentrate									
Zinc	t	197	984	984	984	984	984	984	984
Lead	t	1,818	9,092	9,092	9,092	9,092	9,092	9,092	9,092
Copper	t	13	63	63	63	63	63	63	63
Gold	oz	5	26	26	26	26	26	26	26
Silver	oz	434	2,172	2,172	2,172	2,172	2,172	2,172	2,172
Cu Conc	**dmt**	1,786	8,932	8,932	8,932	8,932	8,932	8,932	8,932
Metals in concentrate									
Zinc	t	41	203	203	203	203	203	203	203
Lead	t	27	136	136	136	136	136	136	136
Copper	t	509	2,546	2,546	2,546	2,546	2,546	2,546	2,546
Gold	oz	13	66	66	66	66	66	66	66
Silver	oz	731	3,653	3,653	3,653	3,653	3,653	3,653	3,653
Au Conc	**dmt**	656	3,282	3,282	3,282	3,282	3,282	3,282	3,282
Metals in concentrate									
Zinc	t	285	285	285	285	285	285	285	285

Lead	t	206	206	206	206	206	206	206	206
Copper	t	46	46	46	46	46	46	46	46
Gold	oz	1,799	8,994	8,994	8,994	8,994	8,994	8,994	8,994
Silver	oz	229	1,145	1,145	1,145	1,145	1,145	1,145	1,145
Cash cost (excl. royalties, before by-product revenues)	US$M	3.08	15.38	15.38	15.38	15.38	15.38	15.38	15.38
By-products revenues	US$M								
Royalties (as a % of market price)									
Zinc		7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%	7.00%
Lead		8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%	8.00%
Copper		5.70%	5.70%	5.70%	5.70%	5.70%	5.70%	5.70%	5.70%
Gold		5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Silver		5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%	5.00%
Total Royalty	US$M	1.52	6.98	6.68	6.52	6.43	6.43	6.43	6.43

Table 2.17: Kazzinc Smelter

		2008	2009	2010	2011	2012	2013	2014	2015
Concentrate Processed actual / forecast	t	-	-	-	-	752,903	973,591	947,940	778,971
Finished Metal									
Zinc	t	-	-	-	-	205,756	253,246	242,516	182,752
Lead	t	-	-	-	-	51,986	51,706	44,532	33,748
Copper	t	-	-	-	-	30,945	31,456	29,805	19,574
Gold	oz	-	-	-	-	542,060	614,432	636,135	598,832
Silver	oz	-	-	-	-	5,221,692	5,063,672	4,829,110	3,348,772
Smelter Cash cost (excl. royalties, before by-product revenues)	US$M	-	-	-	-	144.2	163.8	154.3	114.8

3 VASILKOVSKOYE DEPOSIT

3.1 Introduction

3.1.1 Location & Access

The Vasilkovskoye gold deposit is located in northern Kazakhstan, 17km north of the city of Kokshetau. Its geographical coordinates are 53° 26' 13.8´´ North and 69° 14´ 59.33´´ East (Figure 3.1).

Figure 3.1: Location of Vasilkovskoye, Northern Kazakhstan

Kokshetau city is the administrative centre of Akmola Oblast and has a population of approximately 147,000 (2010), and is some three hours by car northwest of Astana (approximately 300km), the State capital, which is served by regular international and internal flights.

Road connections are excellent, as are power, water and communications. Overall, the district is economically developed and has well established infrastructure.

The deposit was discovered in 1963, but it was not until 1980-1986 that a pilot open pit mining project was undertaken, where some of the ore was processed through a pilot plant, although most was stacked.

Due to the complicated economic situation within the country, mining was suspended, but then continued again in 1995 until the end of 2007, mining the oxide ores which were treated using heap leach technology. Production up to this time is believed to be approximately 14Mt.

3.1.2 Topography & Climate

The Vasilkovskoye mine lies in an area of typical Kazakh steppe, with little or no change in elevation, dominated by grasslands with occasional isolated scrub and small trees. The area is drained by the Ishim and Nura rivers.

Kokshetau exhibits a typical harsh continental climate with hot summers and cold winters. Average January temperature is -16 to -18°C, and +19 to +21°C in July. Annual precipitation is some 250-400mm.

3.1.3 Infrastructure

Kokshetau city was established on the edge of Kopa Lake, a major feature of the town. There are urban light industries such as food production, whilst the region produces low grades of wheat and other crops such as potatoes, vegetables and sunflower.

The world's only power line with a voltage greater than 1000kV is installed near Kokshetau, connecting the town of Ekibastuz with the central part of Russia.

In terms of mineral resources, some 19 ore deposits and 155 non-metallic deposits have been described in the region, including 6 operating gold mines, 4 uranium, 1 titanium, 1 antimony, 2 ornamental stone, 6 coal, 6 limestone, 14 mortar sand and 16 building stone deposits.

3.1.4 Mineral Rights & Permitting

In August 2002, JSC Vasilkovskoye Zoloto obtained a Mining Allotment for the extraction of gold ores from an area of 2.65km^2 to a depth of 660m (level 425m).

In July 2003 a contract with the Kazakhstan Government was awarded granting the right to extract gold bearing ore within the abovementioned Mining Allotment till 2022. Moreover, a mining allotment was obtained for development of the whole mine infrastructure.

In 2010, the existing Mining Contract was amended by a Supplementary Agreement which mainly resulted in the following:

- Extended Mining Allotment of 28.3km^2 (see co-ordinates in Table 3.1);
- Ore processing expanded up to 8Mtpa;
- Extended validity of the Contract till 2025;
- Assignment of the contractual right from JSC "JV "Vasilkovskoye Zoloto" in favour of Kazzinc Ltd.

Table 3.1: Mining Licence Coordinates		
Co-ordinate	Easting	Northing
1	69° 12' 54.70"	53° 27' 34.35"
2	69° 15' 34.32"	53° 27' 32.33"
3	69° 18' 10.02"	53° 28' 01.22"
4	69° 18' 30.13"	53° 27' 37.79"
5	69° 17' 26.32"	53° 27' 05.03"
6	69° 17' 48.06"	53° 26' 18.84"
7	69° 16' 02.33"	53° 24' 30.80"
8	69° 12' 50.14"	53° 24' 39.50"

WAI Comment: *The licence documentation has been inspected and is in order. Moreover, the conditions of the licence are sufficient for the life of mine, particularly now that the Mining Allotment has been extended around the property and which now also includes adjacent exploration properties.*

3.2 Geology & Mineralisation

3.2.1 Regional Tectonics

The Vasilkovskoye deposit is located within the Altai-Sayan Orogenic Belt, more precisely within the endo-exocontact of the Zerendinsky Granitoid Complex Massif, which intruded Pre-Cambrian metamorphic rocks. Both are overlaid by Paleozoic and Cenozoic sediments (the Mesozoic period is represented by a weathering phase).

The Altai-Sayan Orogenic Belt extends from northern Kazakhstan, through China, Mongolia and into Russia. In Kazakhstan the western extension of this belt is referred to as the Charsk Gold Belt, which hosts numerous gold deposits. The belt forms part of the Altaids orogen, which is at the same time included in the Central Asia orogenic region.

Central Asia is an orogenic supercollage consisting of three generations of orogenic collages that are grouped into the Timanides-Baikalides, Altaids and Mongolides. The supercollage is separated by the giant Trans-Eurasian fault system into the Altai-Mongolian and Kazakhstan-Khingan domains.

The Altaids have significant metallogenic importance (including world-class Au, Ag, Cu-Mo, Pb-Zn, and Ni, of late Proterozoic to Mesozoic age). It is widely accepted that subduction-related orogenesis of the Altaids started in the late Precambrian and gradually migrated southward (present co-ordinates).

3.2.2 Regional Stratigraphy

3.2.2.1 General

The regional geology of Vasilkovskoye deposit comprises a Precambrian metamorphic basal complex, intruded by Ordovician granitoids, and overlain by later Paleozoic sediments. The area was subjected to Mesozoic weathering and overlain by Cenozoic sand and clay sediments. Figure 3.2 shows the geology of Vasilkovskoye and the surrounding area.

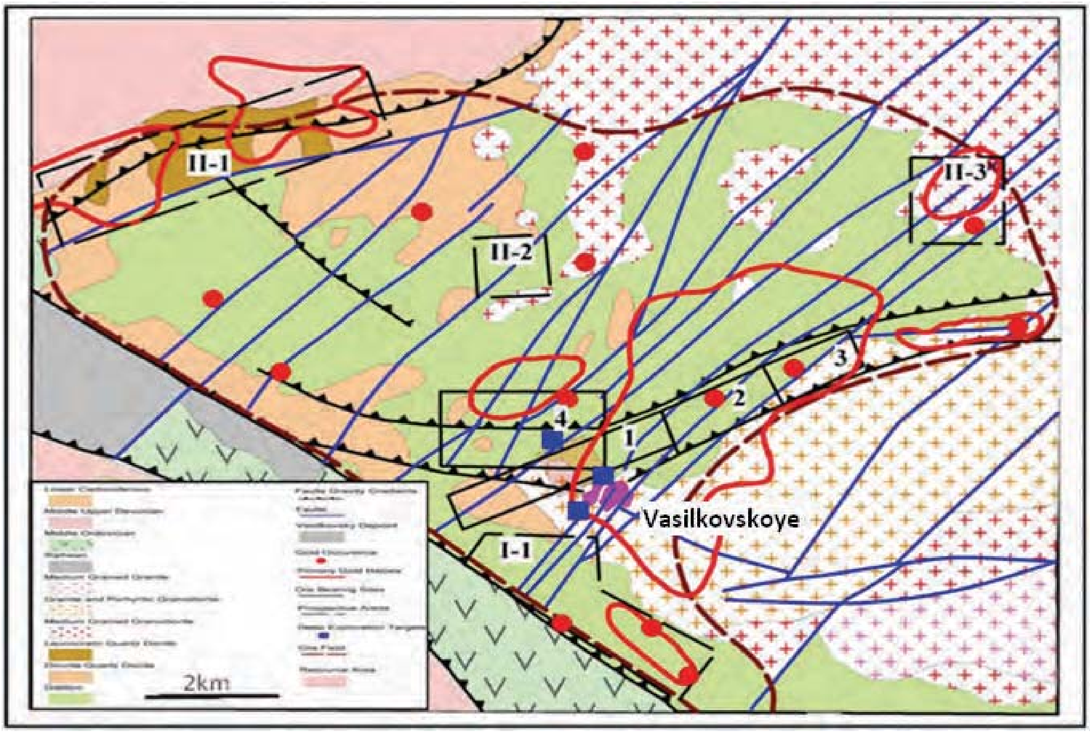


Figure 3.2: Geology of Vasilkovskoye and Surrounding Area

3.2.3 Mine Geology

The Vasilkovskoye deposit belongs to the group of intruded-related Au deposits. It is located in the western part of the Shatskaya metaliogenic zone of the North Kazakhstan province, with a northwest trend.

The deposit is located in the endo-exo contact of the Altybaysky granite intrusion (part of the Zerendinsky Complex) with the Precambrian metamorphic rocks. Within this contact occurs a large gold gas chemical halo, which represents a thermal aureole caused by the granitic intrusion, and where the gold enrichment took place.

The Altybaysky intrusion is crossed by a considerable number of faults, with main directions being NW and NE. These two main faults are the Vasilkovskoye fault (NE strike) and a major northwest trending structure parallel to the Dongulagashsky fault (NW strike). The deposit is situated in the northeast quadrant of this intersection.

The Altybaysky granite intrusion is represented by two major units at the Vasilkovskoye deposit; a diorite/gabbrodiorite unit and a granite/granodiorite unit. Planar and sharp contacts between the two units are common, although sometimes contacts are different.

The diorite/gabbrodiorite unit is located in the northern part of the deposit, and shows generally weak mineralisation. This unit represents the transitional zone between the metamorphic host rocks and the Altybaysky intrusion granite rocks. The Granite/Granodiorite Unit occupies the majority of the deposit and hosts the mineralised body.

In the southern part of the deposit, at depths of 400-500m, quartz diorites, diorites and gabbro-diorites have been intersected which may be related to the Stepnyaksky Complex (the main gold deposits of North Kazakhstan province are paragenetically related to this complex).

3.2.4 Mine Structure

The deposit's area is characterised by the presence of intense faulting and sheared zones. First, second and third order faults can be distinguished, with the main first order faults represented by the NW major structure parallel to the Dongulagashsky fault and the NE trending Vasilkovskoye fault. The rest of the faults trend in various directions such as N, NW or NE.

After detailed structural mapping, seven dislocation orientations have been identified:

- North Western (NW 300-320°) of variable dip, widespread and occur as isolated fractures and zones of jointing. They are 2-10cm wide, rectilinear, contain ferruginous fault gouge and fine schistosity along vein margins. They are related to the Dongulagashsky regional fault. They are pre-ore but were reactivated during the ore forming event;
- North Western (NW 330-350°) dipping steeply NE and SW (relatively uncommon);
- North (N 350-10°) vertical and rarely dip steeply to the NE and SW. These are numerous and occur as thick (5-7m) zones of schistosity, lenses of brecciated rocks and narrow zones of tectonic fault gouge. They are curvilinear and were reactivated into shear zones;
- North Eastern (NE 15-30°) dipping steeply to vertical, predominantly SE (65 to 90°). These are predominant and may be part of a very thick zone of a large regional fault. Steeply dipping (75 to 90°), narrow fractures (0.5 to 25-30cm) control the distribution of ore veins of the deposit. The longest of these veins is 143m, but they generally pinch out between 1-2m and tens of metres. Quartz-arsenopyrite and arsenopyrite veinlets (0.5 to 3cm) develop at the contacts of the quartz veins. The frequency of the veins and veinlets varies from one per 5-7m to hundreds per metre. The frequency is determined by intersecting fractures. The highest frequency occurs in blocks bounded by submeridional dislocations. At the intersection of the NE veins and veinlets with NW dislocations, clusters of veinlets merge into veins along NW fractures;
- North Eastern (NE 40-60°), dipping 30 to 55°. They are predominant and may be part of a very thick zone of a large regional fault. The thickness of isolated schistosity zones is up to 5-10m. Rectilinear surfaces, considerable extension and do not enclose productive assemblages;
- East (E 80-100°) various dips predominantly to the north (45°). Uncommon; and
- North Western (NW 290-310°), gently dipping to the northeast at 10 to 15°. They are up to 30cm wide and are related to the ore phase.

3.2.5 Alteration

Alteration zones exist in the deposit area and are seen as steeply dipping lenticular zones.

The different types of alteration are: chlorite; chlorite-albite; albite; carbonate (known as listvenite, a term used for CO_2 metasomatism of an ultramafic rock); quartz-sericite (known as beresite); quartz-k-feldspar; k-feldspar; argillite alteration.

The bodies decrease in frequency with increasing distance from the centre of the mineralisation. The most intensive alteration is confined to areas of increased fracturing.

Syn-mineral alteration accompanying the sulphide-quartz auriferous stockwork and veins are on beresitised rocks. It comprises grey quartz, the filling of vesicles and minor recrystallisation of rock minerals (sericite, carbonate etc).

The post mineralisation stage comprises the development of argillite alteration comprising 2-5cm veins, predominantly of carbonate composition.

3.2.6 Style of Mineralisation

Vasilkovskoye represents a stockwork located at the junction of the gabbro/gabbrodiorite and the granite/granodiorite rocks, recognising that the ore control was the intersection of faulting parallel to the NW trending Dongulagashsky fault with the NE trending Vasilkovskoye fault. The mineralisation forms a flattened zone, pinching out at depth.

3.2.7 Mineralogy

Au mineralisation is spatially associated with quartz and quartz-arsenopyrite veins and veinlets of hydrothermal origin. The dominant sulphides are arsenopyrite (which occurs as sulphide veinlets, with quartz veins and as disseminations), with minor pyrite plus chalcopyrite (which occur only in trace amounts), bismuth sulphides and bismuth tellurides. Uranium mineralisation is spatially associated with the Au mineralisation, but is younger than the main Au mineralising event. Minor Au occurs within carbonate and silicates,

Uranium mineralisation is present within the deposit, and in the area of the pit, values over 0.1% uranium can be found, with rare, narrow higher grades. Outside of the pit envelope, uranium grades >1% occur.

All the sulphides occur in both major rock units, but pyrite and chalcopyrite are more common in the mafic rocks. Due to the extensive weathering in the upper levels of the pit (now mined out) the sulphides were typically altered to various oxide minerals.

Microcrystalline grey quartz veins and veinlets carry the higher grade Au mineralisation. The veins are commonly high angle, either en echelon or slightly oblique to the direction of the main faults, and relatively thin (< 3cm). In the ore zones the concentration of veinlets ranges from 1-5/m to >10/m. Au ranges in size from 1 to 63 microns, and the average size in the gabbro is 2.5 microns and in granodiorite 4 microns. Detailed mineralogy has indicated that most of the gold occurs as less than 10 micron grains within arsenopyrite.

Mineralisation has been divided into early and late stages. All stages include some sulphides, especially arsenopyrite, complicating interpretation of element associations within the ore deposit, especially the As and Au relationships.

<u>Pre Ore Phase</u>: The earliest sulphides include chalcopyrite-pyrrhotite-pyrite, arsenopyrite-pyrite and Au assemblages. The sulphides are well developed within the gabbro suite, especially adjacent to the contact with the granitic suite and in strongly jointed areas. The chalcopyrite-pyrrhotite-pyrite assemblage is usually associated with the development of mafic minerals.

<u>Early Ore Phase</u>: The early ore phase is dominated by the introduction of quartz, carbonates, sericite and pyrite (listvenite and beresite alteration).

<u>Main Ore Phase</u>: The main ore phase is essentially a quartz, carbonate and chalcophile mineral assemblage, with the introduction of complex copper, bismuth, antimony, arsenic and tellurium minerals.

<u>Post Ore Phase</u>: The post ore phase is a waning of the system with the introduction of silica, carbonate and minor complex sulphides. Uranium was deposited during the post ore phase.

3.2.8 Exploration Potential

In February 2010, the Company expanded its Mining Allotment to 28.3km^2 to include some surrounding exciting exploration projects.

Geophysical exploration has indicated that the Vasilkovskoye deposit appears localised on an IP Gradient area, particularly noticeable from chargeability, but also from resistivity.

A limited volume of geophysical works (IP-R) was undertaken at Promozutichnoye, located 2km to the northeast of the main deposit in 2008. This followed on from a small hydrocore drilling and trenching (1,100m) programme undertaken in 2002 where trenching revealed 36 samples with "industrial grades", with a maximum grade of 5.6g/t, and drilling revealed 39 samples with a maximum grade of 7.7g/t.

In 2010, some 13,943m of hydrocore drilling was undertaken, producing 6,400 samples from 462 holes. Chemical analysis is being undertaken at Vasilkovskoye, although only some 2,200 sample assays have been returned with values up to 0.3g/t Au.

Although not spectacular, the geophysical signatures still appear promising for the delineation of deeper-seated mineralisation (historic Soviet deep drilling (>200m) had picked up some high grades in this area).

A budget for this 2010 programme was set at US$1.3M which included geophysical and topographical baseline works (180km and 190km respectively), trenching, hydrocore drilling and analytical work. Results are awaited from this work.

In addition, the Company has designed an exploration programme for some 8 years within an expanded 1,600km^2 area which includes Turan in the west which is currently being explored by Kostanai Expedition (a sub-contractor to Kazakhstan Mineral Corporation).

> ***WAI Comment:*** *The geology and mineralisation of the Vasilkovskoye deposit are well known through years of exploration and development. Importantly, controls to mineralisation are also well defined, and are clearly related to prominent fracture systems. Thus, WAI has a high degree of confidence in the magnitude, tenor and morphology of mineralisation.*
>
> *Furthermore, this understanding has led to the discovery of other, nearby exciting targets which are, and will be, the focus of future exploration activity. WAI believes that the potential of the Vasilkovskoye area for further significant discoveries is high.*

3.3 Exploration History

3.3.1 General

During the 1960s, the deposit was explored on a 60m x 60m rectangular grid, with a more detailed 30m x 30m grid in the central part of the deposit.

The deposit has been investigated by means of core drilling from surface along 18 exploration profiles (azimuth 315°) each 60m apart, as well as from underground. All surface holes are inclined, and the underground holes are drilled directionally.

Between 360-400m, the drill grid was 60 x 60m, from 360-600m, the grid was 60 x 60m and 120 x 120m, with a maximum exploration depth of between 800-1,000m.

Three shafts were sunk to depths of 60m and 180m, with horizontal drives on three levels at 60m intervals (60m, 120m and 180m elevations) from which raises and drilling chambers were developed. Cross-cuts were developed from the longitudinal drives every 60m along the exploration profiles of core drilling. The length of the cross-cuts was selected so as to intersect the whole width of the mineralised zone.

Within the central part of the deposit short longitudinal drives were developed to detail the deposit structure and grade. All the exploration works (Table 3.2 and Table 3.3) have been surveyed in a local grid coordinate system, with no UTM equivalent coordinates provided.

Table 3.2: Historical Exploration Works Up To 1990

Work types	Unit	Years					Total
		1966 -1970	1971-1975	1976-1980	1980-1987	1988-1990	1971-1990
Core drilling from surface	m	36,500	27,900	48,000	73,308	4,471	190,179
Underground core drilling	m	5,495	7,305	3,729	1,303	-	17,832
Exploration shafts	m	60	180	180	-	-	420
Raises	m	-	436	260	121	-	817
Test pits 4m^2 size	m	-	403	93		-	496
Drives from the shafts	m	2,439	5,394	9,615	1,015	-	18,463
Lateral drives from the test pits	m	-	1,018	-	-	-	1,018

* From KMC's Resource Estimation report 2009

Table 3.3: Historical Sampling Methods

Sampling Method	Year	Number of holes	Metres drilled	Metres sampled	Number of samples
Drillholes	1966-2007	580	212,969	176,482	99,707
Channel	1966-1987	1,129	32,125	31,755	31,230
Blastholes	1995-2007	65,628	196,884	196,884	65,628

* 2009 drillholes not included

3.3.2 Core Drilling

3.3.2.1 Historical Drilling

The deposit has been drilled using core drilling on profiles oriented at an azimuth of approximately 315°. This direction is approximately 90° to the orientation of the contact between the two main rock units and the main NE trending fault (Vasilkovskoye fault).

The drillholes were drilled at a diameter of either 59mm or 76mm for the majority of the deposit. All holes were drilled conventionally, and most of them sub-vertical (approximately 80°) for the first 200m or so, and then gradually deviated to a dip of 45°. The holes were drilled on 60m spaced sections with some widening of this spacing at the edges of the drill pattern. Spacing of collars along drill sections is generally between 30m and 60m, reducing to 5m or less on some profiles.

Up until 2009, a total of 580 holes has been drilled over the mine area, of which 192 were drilled from underground. A current drilling campaign is underway to extend and infill the resource, details of which are provided below. For the historic data, the average core recovery is 84.3% for Soviet holes (1975-1990). Placer Dome's core recovery was reported in AMC Consultant's report as 100%. Micromine's report (2005) indicates that drillholes completed prior to 1975 had core recoveries of 70% applied to all samples.

From 1963 to 1995 a total of 570 drillholes was drilled (including four geotechnical drillholes) and 96,358 samples collected. Most of the core samples were assayed for Au, As and Bi.

In 2007, 10 more drillholes were drilled, under the advice of the AMC Consultants (Australia), and 3,349 samples collected, as a part of a validation campaign.

3.3.2.2 Current Drill Programme

During 2009, a further programme of core drilling was undertaken to update the Mineral Resources (within the open pit to 450m depth) currently classified in the Inferred Category to Indicated status, under the guidelines of the JORC Code (2004).

Following this, starting in April 2010, an extensive drilling programme has been taking place for detailed exploration of the deeper levels of the deposit. Currently, 8 rigs are operating in the pit, provided by the contractor Iscander, managed by KMC, with samples going to both Ridder laboratory and Stewart Group laboratories, Karabalta, Kyrgyzstan.

The rigs comprise one LF 90 (LongYear), five XY44 (Chinese) and two Brasilian (BBS56). Another rig is planned to join the programme shortly. All rigs drill NQ core, with holes planned to variable depths, with a maximum of 1,050m.

Holes are drilled on a 315° azimuth, but with variable inclination, usually 60° although some future holes are planned to be drilled at 115°. Hole spacing is 60m.

A total of 31,457m of drilling was undertaken inside the open pit and 17,946m was drilled outside the confines of the pit in 2010 and a further 25,000m is scheduled in 2011. However, full results from this deep drilling programme are not expected until November 2011. The budget for this work is some US$12M.

3.3.2.3 Sampling Methodology

WAI inspected several of the drill rigs operating in the pit. The quality of both the drilling and core handling appeared good. All drilling utilised wireline techniques with LongYear tools.

Core is collected on site in well built and labelled six-row wooden trays. These are then transported to the core storage facility where the core is logged, photographed and marked up for sampling. The Company uses "Ballmark" core orientation system for downhole structural control.

Samples are usually 1m in ore and 3m in waste. Once samples are marked up, they go to the core cutting room for splitting. Currently, three core saws are in operation. From here, samples are placed into large sacks for transportation to either the Ridder laboratory, or Alex Stewart in Kyrgyzstan.

3.3.2.4 Sample Analysis

The Company has currently sent some 22,187 samples to the Stewart Group laboratories and has received some 4,000 results back.

To accelerate results, the Kyrgyzstan laboratory has sent 2,500 samples to the Ridder laboratory as well as 5% check samples comprising standards (0.5, 1.52 and 6.0g/t Au) and blanks. The Company has also used repeat samples as standards in an effort to test the competence of the Ridder facility.

3.3.3 Channel Sampling

The surface and underground workings were sampled by channel sampling, with a length of 0.1-2.5m and an average sample length of 1.0m. The channel size was 10x3cm and a 1 metre-long sample typically weighted 8kg. In total, some 31,230 samples were collected, 94% of them 1.0m long.

The drive faces were sampled every 2-3 blasts. The long cross-drives were continuously sampled on both walls, while the shorter drives on one wall only. In raises, samples were collected from two opposite walls every metre.

3.3.4 Core Sampling

During the Soviet period, sectional core sampling was performed with a section length of 3.0-3.2m, average length of sample was 1.6-1.7m. Typically one drilling run core comprised one sample. All the mineralised core intervals were fully sampled with sampling of inter-mineral intervals of enclosing rocks. Unaltered rocks beyond mineralised ore zones were not sampled – the total volume of non-sampled core was 25.4%.

For drilling diameter 76mm and more, a half core was taken as a sample, for 59mm, the core was fully sampled. The average weight of core sample ranged from 2.2kg to 11.0kg depending on drilling diameter and sample length. Slimes were not sampled.

Core holes drilled in 1994-95 by Placer Dome and in 2007 by AMC (drilling diameter 76mm), were cut into two parts. One half was sent to PDI (Canada) and Alex Stewart (Kyrgyzstan) laboratories. The second half was used for metallurgical testwork, whilst the remaining part was stored.

3.3.5 Blastholes

65,628 blastholes to 7.5m depth have been drilled on different bench levels, from the level 226mRL to the level 175mRL.

The vertical blastholes were spaced between 5x5 to 7x7m. Up to 2009, blastholes were sampled by one sample to the whole depth of 7.5m, but since 2009, three samples are taken from the hole, 2.5m in length, as ore is mined on 2.5 flitches. Generally the material size is -10mm, with a sample weight of 8-10kg.

In 2009-10, tests on operational sampling using RC inclined holes were performed, in an attempt to better delineate the predominantly vertical/sub-vertical mineralisation.

In order to develop the RC drilling procedure and compare the RC drilling with blastholes, a trial block (167-2) has been drilled on the south-western flank of the Main ore zone. Blastholes were drilled using a ROC-L8 rig with a simple air hammer. All the holes were vertical. RC drillholes were drilled using a ROC-L8 with a reverse flushing and automated sampling setup. All the drillholes were 53° inclined to ensure maximum ore intersections. The inclined drillholes azimuth complies with the exploration grid of 315°.

Each borehole was sampled by sections (three samples for each section). Sample length was 2.5m in the vertical drillholes, and 3m in the inclined drillholes. The results of this work are shown in Table 3.4 below.

Table 3.4: Inclined RC vs Vertical Blasthole Comparison

	Drilling with ROC L-8 RC			Drilling with ROC L-8 DBH			RC/ DBH	
	ore, tons	**grade, g/t**	**Au, g**	**ore, tons**	**grade, g/t**	**Au, g**	**grade, g/t**	**Au, g/t**
1 level	24 411	3.06	74 746	24 411	1.90	46 305	1.61	1.61
2 level	24 411	2.80	68 418	24 411	1.74	42 484	1.61	1.61
3 level	24 411	2.41	58 843	24 411	1.89	46 093	1.28	1.28
Total	73 233	2.76	202 006	73 233	1.84	134 882	1.50	1.50

The comparison was carried out within the RC drilling outlines. The results showed that the vertical blastholes underestimate the grade by approximately 30%.

As a result of this work, from the end of January 2011, a 10x15m spacing RC drilling programme, at 53°, will be implemented when the Company will principally use the inclined data for grade control.

3.3.6 Density

WAI Comment: *The Vasilkovskoye project has been well studied with historic exploration works done to a high standard. WAI has, as part of the resource estimation process, conducted a detailed audit of the data and in general, been satisfied of the procedures used and results received.*

The latest on-going drilling works are also being undertaken to a good standard, but the current problems of getting analysis done is of concern, as has been experienced by many other explorers and producers in Kazakhstan who have historically used the Alex Stewart facility in Kyrgyzstan.

Although no assays are available for the deep drilling project, preliminary geological interpretation does indicate that overall resources are likely to be increased.

3.4 Mineral Resource

3.4.1 Introduction

In 2006, AMC prepared a test resource model ("the 2006 Model") using an interpretation provided by Vasgold (operator of Vasilkovskoye Mine), and recommended that Vasgold should drill ten more diamond drillholes for resource confirmation. On completion of these holes AMC compared the results with the previous drilling and updated the resource model where required.

The confirmation drill holes were completed in late 2007 and the assay results sent to AMC in June 2008. AMC compared the results with the previous drilling and found that although there were differences in the data sets, globally the new data supported the older data and as such they were satisfied that the old data was suitable for use in resource estimation at Vasilkovskoye.

AMC revised the interpretation of the mineralisation outline, as defined by a 0.4g/t Au cut-off, with more emphasis placed on the new data where there was discordance between the old and new data. The directional variography was updated to reflect the trend of the higher grades in the primary grade domain (called "the Main Zone") and was oriented with the major axes sub-parallel to the Vasilkovskoye fault.

In situ bulk density for the Main Zone was updated, with the additional information provided by the 2007 drilling and the density for the Main Zone was set at 2.75t/m^3. The density of 2.68t/m^3 used in the 2009 Model was used for all other domains.

Ordinary kriging was used to estimate Au and As grades into the block model (2008 Model) and the reported Mineral Resource above a 0.4g/t Au cut-off was 150Mt @ 1.90g/t Au (*Indicated*) and 120Mt @ 1.50g/t Au (*Inferred*).

The tonnes and grade above a 0.0g/t Au cut-off within the interpretation wireframe for the 2009 Model were compared to the 2006 Model:

2006 Model 310Mt @ 1.5g/t Au; and
2009 Model 296Mt @ 1.6g/t Au.

3.4.2 WAI 2010 Resource Estimate

3.4.2.1 Introduction

The mineral resource estimate presented here for the Vasilkovskoye Gold Project is based on the model prepared by Kazakhstan Mineral Company (KMC) in October 2009, which has been depleted up to a pit survey dated 01 January 2011.

Database Compilation

Three distinct sampling techniques have been used at the Vasilkovskoye deposit; diamond drilling, underground channel sampling and blasthole sampling. A summary of these data can be found in Table 3.5.

Table 3.5: Summary of Assay Data by Type

Sampling Method	Year	Number of Collars	Total Metres	Total Assays	Number of Au Assays
Drillholes	1966-2009	633	236,117	122,838	120,128
Blastholes	1995 - 2007	64,990	194,970	65,628	65,628
Channel Samples	1966 - 1987	1,129	33,321	31,260	31,197

The drillholes have mainly been drilled on profiles orientated at an azimuth of 315°. This orientation is at approximately 90° to the NE trending Vasilkovskoye fault. Most of the holes are vertical to sub-vertical within the first 200m and thereafter deviate gradually towards 45°. The profiles are 60m apart and although in general the collars are spaced 30-60m along the section there are some collars less than 5m apart. Ten of the holes were drilled in 2008 as twinned holes to verify the older data. Forty seven of the holes were drilled in 2009.

Three shafts were sunk with horizontal drives on three levels at 60m intervals (60, 120 and 180m levels).

Cross-cuts were developed every 60m from horizontal workings along the survey profiles of core drilling. Cross-cut lengths were sufficient to cross the whole length of the mineralised area.

Short longitudinal workings were developed in the central part of the deposit in order to get more detailed information about structure and content.
These underground workings were sampled by channel sampling with the drive faces sampled every 2-3 blasts, the longer drives sampled on both walls and the shorter drives sampled on one wall only. Samples were also taken from raises connecting the three levels.

In addition, the upper levels of the pit were sampled by channel sampling (sample length was 2.0m and section was 10x3cm).

Blasthole details are provided above.

> ***WAI Comment****: WAI has checked and verified the individual assay files for duplicate samples, overlapping samples and missing collar and survey data. The database verifies correctly and is organised in a sensible and professional manner.*

3.4.2.2 Domaining

The gold mineralisation at the Vasilkovskoye deposit is associated with steeply dipping vein sets and associated alteration. The alteration halo is associated with a 0.4g/t Au cut-off and this grade was used to construct wireframes defining the mineralisation outlines.

As the mineralisation at Vasilkovskoye depends on the concentration of quartz veining, veinlets and sulphide mineralisation, the interpretation is based on the outer edge of the alteration halo rather than the interpretation of individual veins.

An indicator approach was used to define the edges of mineralisation at 0.4g/t Au. The gold assay values were converted to one or zero to indicate that the original grade was above or below the chosen cut-off and an indicator kriged block model was created using these data that estimated the probability of a block having an Au grade greater than 0.4g/t. Blocks that had a greater than 50% probability were subsequently used to guide the interpretation to define the outer limits of the mineralised zones. The outline strings were then modified to fit drillhole data more accurately and the final strings were used in the creation of domain wireframes. KMC created 27 domains based on the cut-off grade of 0.4g/t Au. These domains were separated in to 4 ore zones. Figure 3.3 below is an isometric view of the wireframes delineating these four ore zones.

In addition to the grade shell, wireframes of the two main lithological units, diorite and granite, were created by KMC. These were created from a combination of drillhole logging and underground mapping. These wireframes were used to control density assignation.

> ***WAI Comment:*** *The methodology behind the creation of the mineralised zone wireframes is appropriate to the situation at Vasilkovskoye. Attempting an interpretation of individual veins considering distances between boreholes is more than likely to give a wrong interpretation. During snapping of strings to boreholes, where there is ambiguity over interpretation, preference was given to the more recent assay information. Wireframes were verified within Datamine Studio 3 to check for crossovers and open edges and were found to verify correctly.*

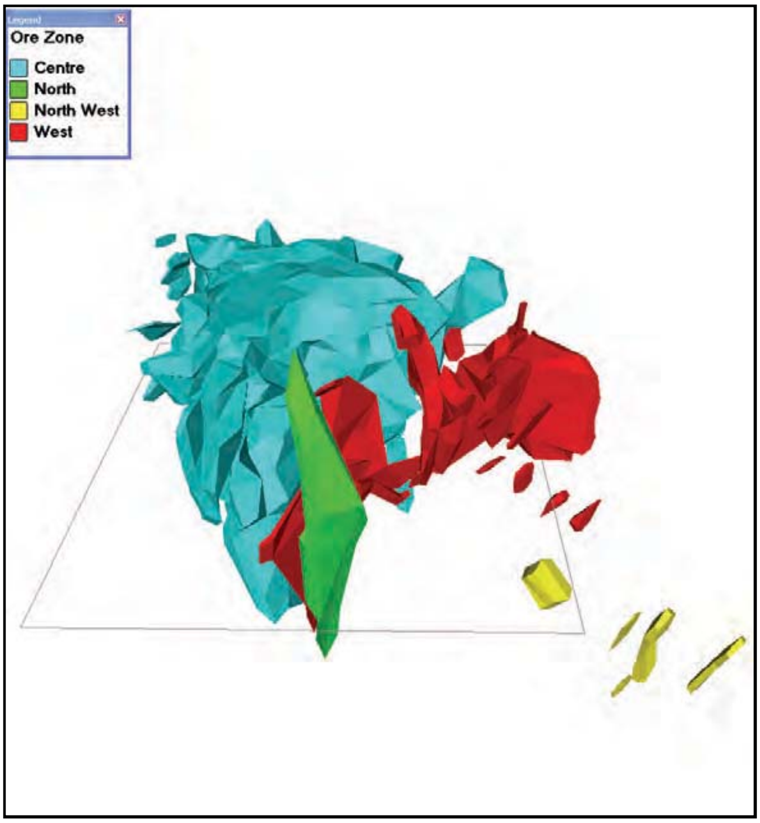


Figure 3.3: Isometric View Looking Towards South of Wireframes Delineating the Four Ore Zones

3.4.2.3 Geostatistical Analysis

Log probability plots of Au in the individual files were constructed before amalgamation of the files to form a complete database. The population of assay values in the blast holes was significantly different from the population of the diamond drillhole samples and channel samples. The blast hole assays were not included in the final assay database due to this indication of a separate statistical population. The final assay database was made up of all the diamond drilling assays and the channel samples.

The data shows a strong positive skew with a mean value of 1.10g/t Au and a few very high grade samples with a maximum of 395g/t Au. The statistical analysis of the global data by sample type as described above is listed in Table 3.6. Each of the sample campaigns shows a similar distribution with a strong positive skew indicating that the database as a whole covers a single population.

Log probability plots of Au assays were constructed for each of the main lithological types, diorite and granite, within the overall sample set. Each of the individual lithological types shows a similar type of distribution with a strong positive skew. There is slight deviation between lithological types at higher grades. The statistical analysis of the global data by lithological type is listed in Table 3.7.

> ***WAI Comment:*** *The final sample database is verified and robust and suitable for further processing and grade estimation, with no significant bias present due to sample type or lithology.*

Table 3.6: Standard Statistical Analysis By Borehole Type

Borehole Type	Pre-2008 Drillholes	2008 Drillholes	UG	2009 Drillholes
Field	**Au**	**Au**	**Au**	**Au**
No. of Samples	96,370	3,563	33,518	18,228
Minimum	0	0.045	0	0.045
Maximum	395	57.33	104.8	86.58
Range	395	57.29	104.8	86.54
Mean	1.01	0.69	1.43	1.08
Variance	9.94	5.92	9.99	8.31
StandDev	3.15	2.43	3.16	2.88
Skewness	29.03	10.22	6.86	7.86
Kurtosis	2,687.02	157.46	92.95	106.23
Coefficient of Variation	3.13	3.54	2.20	2.67

Table 3.7: Standard Statistical Analysis By Lithology

Lithology	Diorite	Granite
Field	**Au**	**Au**
No. of Samples	43,558	107,002
Minimum	0	0
Maximum	118.53	395.00
Range	118.53	395.00
Mean	0.95	1.15
Variance	8.29	10.18
StandDev	2.88	3.19
Skewness	9.77	25.82
Kurtosis	181.64	2,341.68
Coefficient of Variation	3.03	2.76

KMC applied no top-cuts to the raw data and believe that their search ellipses, estimation parameters and domains adequately account for their influence during Kriging. The mean sample length is 1.3m and the most common sample length is 1m. KMC chose to use a composite length of 1m for the resource estimation.

> ***WAI Comment:*** *Typically top-cuts are applied to outlier samples which have grades outside of the main population in order to avoid any undue influence during grade estimation. The log-probability plot for Au assays selected within the mineralised zones shows that in the main there is a single major population within the mineralised domains suggesting good stationarity. There is, however, a very minor high grade population which, left uncut, could lead to localised over estimation within the resource model. Any over estimation though will be minimal on a deposit wide scale. Although the most common sample length is 1m, approximately 34% of samples within the mineralised zones have a larger length than this. A 1m composite length would lead to a large amount of decompositing*

where samples are split in to two or more samples of equal grade. This has the effect of artificially reducing the local variability of data, in particular suggesting that the nugget value of the data is lower than reality. This may lead to over smoothing of grade within the resource model.

3.4.2.4 Variography

KMC calculated a single set of directional experimental variograms for the Vasilkovskoye deposit in Micromine using the composited samples. Using a lag distance of 10m, horizontal and then vertical experimental variograms were created to define the main axis of anisotropy. This direction corresponded roughly to the trend of the main mineralisation controlling fault. Perpendicular directions to this main axis were assigned for across strike and down dip directions. Single structure spherical models were assigned to the selected experimental directions. Table 3.8 lists the model parameters.

Table 3.8: Summary of Variogram Models by Domain

Nugget	Along Strike Range	Across Strike Range	Down Dip Range	Sill
5.3	40.1	52.3	17.0	10.4

WAI Comment: *The directions chosen for experimental variogram creation are appropriate considering the interpreted trends of mineralisation. The variogram models assigned are appropriate to the experimental variograms.*

3.4.2.5 Block Modelling

Block models were created within the mineralised zone wireframes. KMC used a block model with parent cells of 20m x 20m x 15m in the X, Y and Z directions respectively. Ten subcells were allowed in each direction so that the smallest possible call size was 2m x 2m x 1.5m.

WAI Comment: *The block model parent cell sizes are appropriate to the sample spacing and the subcell splitting achieves a good fit against the mineralised zone wireframes.*

3.4.2.6 Density

Density calculations were based on 1199 wax-treated samples and 16 pillars testing results received in Soviet times, with 147 and 829 additional samples analysed respectively in 2007 and 2009.

Two sets of density data are available for the Vasilkovskoye deposit. Density results were organised by rock type and then amalgamated to form groups representing the two major lithological units; diorite and granite.

Based on these results KMC assigned an average bulk density of 2.83 to the diorite unit and an average density of 2.68 to the granodiorite into the block model. Blocks within the model were selected using the lithological wireframes and assigned the average grade for that unit.

3.4.2.7 Grade Estimation

Gold grades were estimated in to the block model using a zonal control based on domain. Gold grades were estimated using Ordinary Kriging (OK) as the main estimator and Inverse Power of Distance Squared for comparative purposes. Grades were estimated into parent cell volumes with any subcells all receiving the same grade as the parent. Gold grade in the subcells was the same as in the parent cells. Cell discretisation was set at 2 x 2 x 2.

A multiple pass approach was used with up to an initial possible three expansions of the search ellipse if minimum conditions were not met in the first or second ellipse. The first search ellipse is equal in size to 2/3 of the variogram ranges as outlined above. The second ellipse was equal in size to the range of the variograms and the third equal to twice the variogram range. With any blocks left unestimated after the third pass, further expansions of the search ellipse were carried out until all blocks within the mineralised zone were estimated.

The key estimation parameters used by KMC are listed in Table 3.9. The pass used in estimating blocks formed the basis used in resource classification.

3.4.2.8 Validation

A model validation process included the examination of block model versus composites, and the building up of a model grade profile, to compare average grades on vertical slices, as derived from the composites directly, as well as from interpolated model grades. An example Swath plot from this process is shown below in Figure 3.4.

Table 3.9: Estimation Parameters

Ellipse	**Parameter**	
1st	Search Radii 1 (m) – across strike	34
	Search Radii 2 (m) – along strike	26
	Search Radii 3 (m) – down dip	11
	Minimum Composites	12
	Maximum Composites	30
	Minimum Drill Holes/Trenches/Cross Cut	3
2nd	Search Radii 1 (m) – across strike	52
	Search Radii 2 (m) – along strike	40
	Search Radii 3 (m) – down dip	17
	Minimum Composites	6
	Maximum Composites	30
	Minimum Drill Holes/Trenches/Cross Cut	2
3rd	Search Radii 1 (m) – across strike	104
	Search Radii 2 (m) – along strike	80
	Search Radii 3 (m) – down dip	34
	Minimum Composites	3
	Maximum Composites	30
	Minimum Drill Holes/Trenches/Cross Cut	1

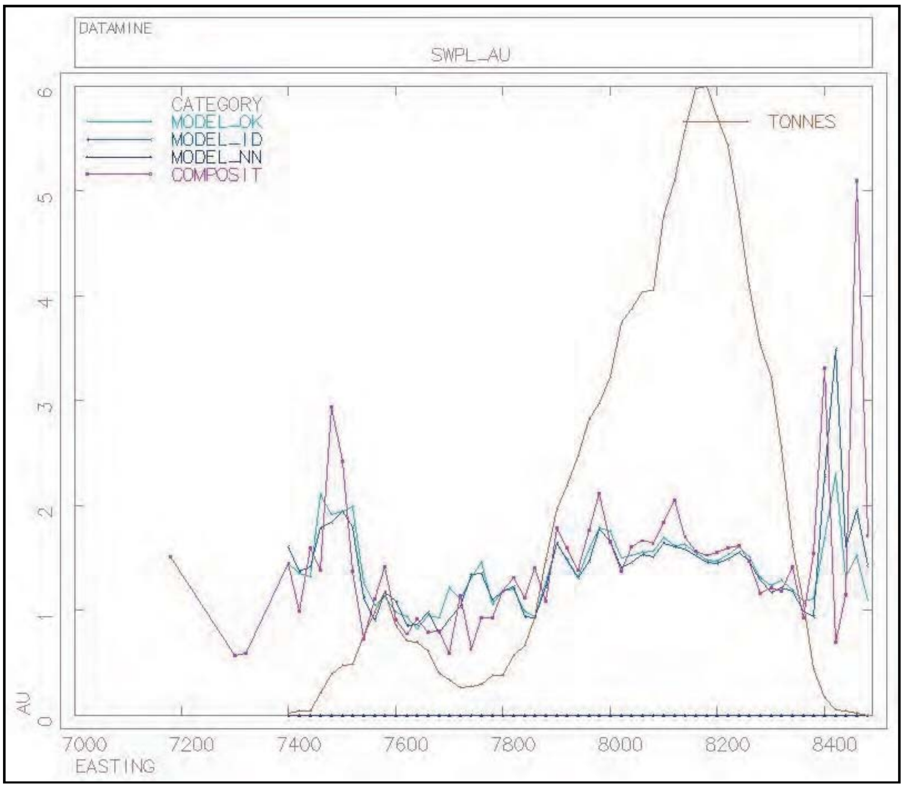


Figure 3.4: Grade Profile of KMC Model and Composites by Easting

3.4.2.9 Depletion

WAI depleted the KMC model up to the pit survey supplied by Kazzinc dated 01 January 2011 by removing blocks entirely above the pit surface DTM and splitting blocks intersected by the DTM to give an exact fit.

3.4.2.10 Resource Classification

The basis of the definition of the resource categories is the pass used in estimating blocks. Essentially this gives approximate drillhole spacings for the allocation of resources which can be summarised as 25m x 10m for *Measured* resources and 40m x 20m for *Indicated* resources. All other blocks within the mineralised domains were classified as *Inferred*.

3.4.2.11 Resource Evaluation

Grade-tonnage information for the Vasilkovskoye Au deposit (for all domains) is summarised in Table 3.10 for total in-situ resources estimated in accordance with the guidelines of the JORC Code (2004) at a range of cut-off grades. The grades and classifications are reported as estimated by the OK method in the KMC model, which has been depleted up to a pit survey dated 01 January 2011 by WAI.

Table 3.10: Vasilkovskoye Mineral Resource Estimate (WAI 01.01.2011) (In Accordance with the guidelines of the JORC Code (2004)

Cut Off Grade (g/t)			0.4	0.9	1.5	2.0
Measured	Tonnage (Mt)		45.23	30.77	19.52	13.71
	Au (g/t)		1.75	2.28	2.92	3.41
	Metal	kg	79,331	70,089	56,924	46,780
		oz	2,550,552	2,253,406	1,830,142	1,504,002
Indicated	Tonnage (Mt)		141.56	97.72	58.96	39.95
	Au (g/t)		1.72	2.21	2.89	3.44
	Metal	kg	243,862	215,792	170,309	137,371
		oz	7,840,344	6,937,853	5,475,553	4,416,563
Measured + Indicated	Tonnage (Mt)		186.80	128.49	78.48	53.66
	Au (g/t)		1.73	2.22	2.90	3.43
	Metal	kg	323,193	285,880	227,233	184,150
		oz	10,390,893	9,191,256	7,305,694	5,920,566
Inferred	Tonnage (Mt)		99.08	68.63	39.74	26.21
	Au (g/t)		1.77	2.27	3.07	3.77
	Metal	kg	175,747	156,032	122,157	98,883
		oz	5,650,405	5,016,526	3,927,426	3,179,143

Notes:
1) Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility Study or Pre-Feasibility Study. 2) Mineral Resources are reported inclusive of any reserves. 3) The contained Au represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery. 4) Mined areas removed from evaluation

WAI Comment: *WAI has also prepared a geostatistical resource model for the Vasilkovskoye deposit which presents a more global picture. Although the data are not reported here, overall, tonnages are higher and grades lower.*

However, since production began, it appears that the KMC model better represents the grades of mineralisation being recovered from the pit. As such, a decision was taken in 2010 to utilise the KMC model for short term planning, whilst the WAI model may be more suitable for long term planning purposes.

In any event, the large drilling campaign currently taking place at the mine will provide the opportunity for an updated resource model later in 2011.

3.5 Mining

3.5.1 Introduction

The Vasilkovskoye open pit mine was originally developed during the early 1980's to exploit an oxide gold resource. Mining of the oxide material continued from 1980 until 2005, when the resource was finally depleted. In total 14Mt of oxide ore was mined and processed by heap leaching. A significant primary sulphide resource is present below the oxide layer and the decision to re-develop the mine and build a sulphides processing facility was made during 2006.

The new plant was designed to process up to 8Mtpa of sulphide ore and a mining study was completed by AMC Consultants in order to design a mining operation to feed the plant at this rate. AMC re-estimated the resources in accordance with the JORC Code (2004) guidelines and undertook geotechnical, hydro-geological, pit optimisation and preliminary mine design studies. The initial AMC pit design was to a depth of 360m but following re-optimisation at higher gold prices, the final pit design by Tomsk Institute was for a 440m deep pit.

Waste stripping, ore stockpiling and construction of the in-pit crushing facilities commenced during 2007. Production itself officially began with the completion of the processing facilities in November 2009. Due to problems with the processing plant, however, the mine is currently running at less than half of the design capacity, producing at present in the region of 270kt of ore per month rather than 600kt per month.

3.5.2 Mining Operations

The Vasilkovskoye mine is a conventional open pit mine. The ore and waste rock is drilled and blasted prior to excavation by diesel-hydraulic excavators. The ore is loaded into diesel powered off-highway rigid dump trucks and hauled to either one of three in-pit stockpiles, depending on grade, or dumped directly into an in-pit crusher. The waste rock is hauled to one of two waste dumps depending on which side of the pit is being excavated. The mining fleet is owned and operated by VasGold. **Error! Reference source not found.** shows a general view of the open pit mining operations at Vasilkovskoye.

Photo 3.1: General View of Mining Operations at Vasilkovskoye

3.5.3 Drilling and Blasting

Blast hole drilling operations at Vasilkovskoye are conducted using 7 blast hole drilling rigs of which 4 units are generally operating at any one time. Three types of rig are in operation, 2 x Atlas Copco Roc L8 DTH drills, 3 x Atlas Copco Pit Viper PV 275 rotary drills and 2 x Atlas Copco DM45 drill rigs capable of both rotary and DTH drilling.

The Pit Viper rigs are fitted with 251mm drill bits and are used to drill both ore and waste but generally in softer areas of the pit. The DM45's are fitted with 171mm drill bits and are used to drill both ore and waste in areas of harder ground. The Roc L8's are fitted with 165mm drill bits and are used for drilling ore and trim blasting of the final faces. The drill patterns vary depending on whether it is ore or waste, the hardness of the rock and the type of drill rig used. The patterns range from 8.5m x 8.5m for a Pit Viper drilling waste rock down to a 5.0m x 5.0m pattern when using Roc L8's in ore. The drilling depth in both ore and waste is 8.5m for a 7.5m bench height.

All blast holes are loaded with Rioflex bulk emulsion explosives which are supplied by the local division of Maxam, an international explosives supplier and blasting contractor. Maxam has an explosive mixing and storage facility located adjacent to the Vasilkovskoye pit and supplies all explosives and blasting accessories for each blast. An average blast will contain between 120 and 150 holes and liberate between 30k and 50k bank cubic metres (BCMs) of material.

The Rioflex emulsion is loaded into the blast hole directly using a bulk explosives delivery truck with a capacity of 11,000kg of bulk emulsion explosives. Each hole contains between 25kg and 55kg of Rioflex depending on the diameter of the blast hole being loaded (170mm to 250mm). The Rioflex column charges are detonated using 450g Pentolite boosters which are placed in the bottom of each blast hole and initiated using non-electric (Nonel) detonators. All surface delays and connectors are also Nonel. The blast design work is undertaken by VasGold's Mine Planning department.

3.5.4 Loading and Hauling

The main loading and haulage fleet at Vasilkovskoye consists of 6 hydraulic excavators, 5 x Komatsu PC1800 backhoes and 1 x Terex RH120 face shovel, 2 x Komatsu WA800 wheel loaders and 20 x Caterpillar 777F rigid dump trucks. Additional support equipment includes 3 x Caterpillar D10 bulldozers, 3 x Caterpillar graders, 2 x water trucks for dust suppression and 1 x fuel tanker for re-fuelling the excavators and drill rigs.

Excavators are used for loading waste rock whereas ore is usually loaded using the wheel loaders.

The mining fleet is currently operating well below its design capacity due to the problems with the processing plant. During the WAI visit only 3 excavators, 1 wheel loader and 13 trucks were operating.

Currently, up to 4 blocks are in operation at any one time. Blocks may be waste only blocks or may be mixed ore and waste blocks. In the mixed ore and waste blocks loading of the material is selective with marker tapes and a banksman used to assist the loader operator. On average 8,000BCMs of ore and 23,000BCMs of waste are excavated each day. It is anticipated that the number of blocks in operation and the amount of equipment operating will increase when the plant throughput issues are resolved. The operations are continuous with 2 x 12 hour shifts operating per day. Effective operating hours are 20 hours per day due to meal breaks, shift changes and re-fuelling/servicing of equipment.

Due to the fact that the majority of the mining equipment is diesel-hydraulic, if the temperature drops below -38°C then operations cease to avoid damage to the hydraulic systems due to freezing of oil. Last year, 4 days were lost due to low temperatures and snow storms.

3.5.5 Ore Crushing and Stockpiling

The ore is hauled from the working faces to an in-pit crushing facility located on the south side of the pit. Haul trucks dump the ore into 1 of 2 x 150t rock hoppers which feed 2 x Sandvik CJ615 single toggle jaw crushers at a rate of up to 750tph each. The crushers reduce the ore to -350mm and discharge onto a 1,200m long inclined conveyor belt which transports the ore to an 18,000t live coarse ore stockpile that in-turn feeds the secondary crushing plant.

Located adjacent to the in-pit crushing facility are three run-of-mine (ROM) stockpiles for low grade ore (0.4g/t to 0.9g/t), medium grade ore (0.9g/t to 2.0g/t) and high grade ore (>2.0g/t). Ore is tipped on the stockpiles when the live stockpile is full, when the crushing plant is not operating due to maintenance or the ore is required to be blended.

The secondary crushing plant consists of 2 x cone crushers operating in closed circuit, which reduce the ore to -30mm in size.

3.5.5.1 Waste Rock

Waste rock from the mining operations is transported to one of two rock dumps located on the east and west sides of the pit. Waste is transported to the closest dump to the face being excavated. Sufficient waste dump capacity is available for the whole mine life but waste haulage distances increase as the mine deepens and the waste dumps extend further from the pit rim. The current average haul distance is 1.5km from the face to the waste dump. VasGold anticipates that the waste haulage fleet will need to increase in future to accommodate longer haulage distances. Five additional trucks will be made available in 2011 when the Shaimerden open pit ceases operations.

3.5.5.2 Dispatch and Control

VasGold is in the process of upgrading all the vehicles in the mining fleet with GPS transmitters with the aim of implementing a computerised dispatch and control system. Currently, the shift supervisor and dispatcher are located in an office overlooking the pit and control and record all truck movements manually by radio. This system works well but does not always provide optimal truck movements/waiting times, requires all data to be manually recorded and suffers in poor weather due to reduced visibility. The GPS dispatch system will automatically record all movements of materials and direct each truck to the nearest available excavator, ensuring reduced haul distances and lower waiting times. The GPS dispatch system is due to be operational during 2011.

3.5.5.3 Maintenance Facilities

Vasilkovskoye is equipped with very good maintenance facilities for both the mobile and static plant equipment. The main maintenance facility for the mining equipment consists of a "Pit Stop" workshop for minor maintenance, servicing, re-fuelling, tyre changing and lubrication of the truck and mobile equipment fleet. Each truck visits the Pit Stop once per shift for re-fuelling and lubrication. A mobile tanker truck which is based at this facility also visits the tracked vehicles (drill rigs, excavators and bulldozers) to re-fuel and lubricate them without the need for them to be tracked too far.

In addition to the Pit Stop, there is a large workshop where both planned and unplanned maintenance is carried out. This workshop is equipped with full servicing, fabrication and machining facilities and is capable of undertaking most servicing and repair tasks. The main items within the mining fleet are maintained under a service contract with their respective Original Equipment Manufacturers (OEMs). Each OEM is allocated a space within this workshop and conducts all necessary maintenance to its fleet of vehicles. Currently, Komatsu, Caterpillar and Atlas Copco are contracted to maintain the fleet of excavators, trucks and drill rigs.

3.5.5.4 Power and Pumping

The Vasilkovskoye pit is reported to be relatively dry and requires very little pumping. In winter the ground water is frozen and has no effect on the operations. A borehole fitted with a submersible pump is located in the middle of the pit and does operate during the summer months. WAI did not note any significant ground water during its site visit in October when air temperatures were still above freezing.

The is no major requirement for electrical power in the pit due to the fact that all the mining equipment is diesel powered; however, a system of low voltage overhead lines is present to supply power to the in-pit submersible water pump and flood lights for night time operations. Portable diesel lighting sets are also used to supplement the mains powered units.

3.5.6 Mine Planning

Long term mine planning at Vasilkovskoye is conducted by the Mine Planning Department and short term planning is conducted by the Mine Operations Department.

The Mine Planning Department is primarily responsible for the production of the annual plan, a 3 month plan and 1 month plan. The primary tool used by the Mine Planning Department is Surpac for the production of survey plans and the Gemcom Gems suite of software for blast design. The Mine Operations Department has an input to the monthly plan and then produces their own weekly and daily plans to ensure that the operations are scheduled and managed effectively. There is close communication between the Mine Operations and the Mine Planning Departments. Other key inputs to the management of the mining operations are provided by the Geology Department (Resources and Grade Control), the Survey Department and the Maintenance Department.

During the WAI site visit the mining operations appeared to be well managed and the operations were conducted to a very high standard. Inter-department communications and data sharing tools were well implemented with the effective sharing of basic geological data, survey data and production data to all interested parties.

3.5.7 Ore Reserves

3.5.7.1 Optimisation

A summary of the pit optimisation parameters used are shown in Table 3.11.

Table 3.11: Optimisation Parameters

Description	Unit	Value
Gold Price	US$/oz	1,000
	US$/g	32.15
Selling Cost	US$/g	0.30
Ore Production Rate	Mtpa	8.0
Discount Factor		10.0%
Mining Cost	US$/t	1.45
Dilution Factor		17.0%
Mining Recovery Factor		95.0%
Processing Cost	US$/t ore	10.74
Processing Recovery		82%
Overall Slope Angle	Degrees	41
Derived Cut-Off Grade	g/t	0.48

Optimisation runs were completed on both the KMC and WAI resource block models, and for different cut-off strategies. Free cut-off runs were made with the cut-off effectively calculated directly from the supplied parameters (which gives 0.48g/t). Fixed cut-off runs were also made at a fixed cut-off of 0.9g/t Au. All of the optimisation results, for maximum cashflow pits, are summarised in Table 3.12. The NPV's and other financial indices shown here are used to select an option pit shell and do not reflect the project valuation. For reference, the same results for final design pit are also shown in the same table. Graphs depicting the results for the KMC free optimisation runs are shown in Figure 3.5 and Figure 3.6, with the selected pit (shell 87), which includes the pit's western extension.

Table 3.12: Pit Optimisation Summary

	Run + Model	Cut-off g/t	Price US$/oz	Profit US$M	Revenue US$M	Processing Cost US$M	Mining Cost US$M	Total Rock Mt	In-Situ Mt	Plant Feed Mt	Total Waste Mt	Strip Ratio	Mes Mt	Ind Mt	Au g/t	Au Recovered t
Optimisations – Max Cashflow	KMC Free cut-off	0.48	900	3,898	6,430	1,612	920	635	135	151	500	3.70	41	94	1.92	202
	KMC Free cut-off	0.48	1,000	3,909	6,618	1,670	1,038	716	140	156	576	4.12	41	99	1.91	208
	KMC Free cut-off*	0.48	1,060	3,891	6,980	1,782	1,307	901	149	167	752	5.04	43	106	1.89	219
	KMC Fixed cut-off	0.9	900	3,733	5,872	1,219	920	634	102	114	532	5.21	30	72	2.32	184
	KMC Fixed cut-off	0.9	1,000	3,740	5,991	1,247	1,004	692	104	117	588	5.63	30	74	2.31	188
	WAI Free*	0.48	900	4,323	8,169	2,594	1,253	864	217	243	647	2.98	16	201	1.52	256
	WAI Free	0.48	1,000	4,352	8,845	2,885	1,608	1,109	242	270	868	3.59	18	224	1.48	278
	WAI Fixed	0.9	900	3,927	6,485	1,562	996	687	131	146	556	4.25	9	122	2.00	204
	WAI Fixed	0.9	1,000	3,963	7,060	1,710	1,387	956	143	160	813	5.68	10	133	1.99	222
	Design + KMC Model	0.9	1,000	3,897	6,575	1,373	1,306	901	115	128	773	6.05	36	92	1.97	206

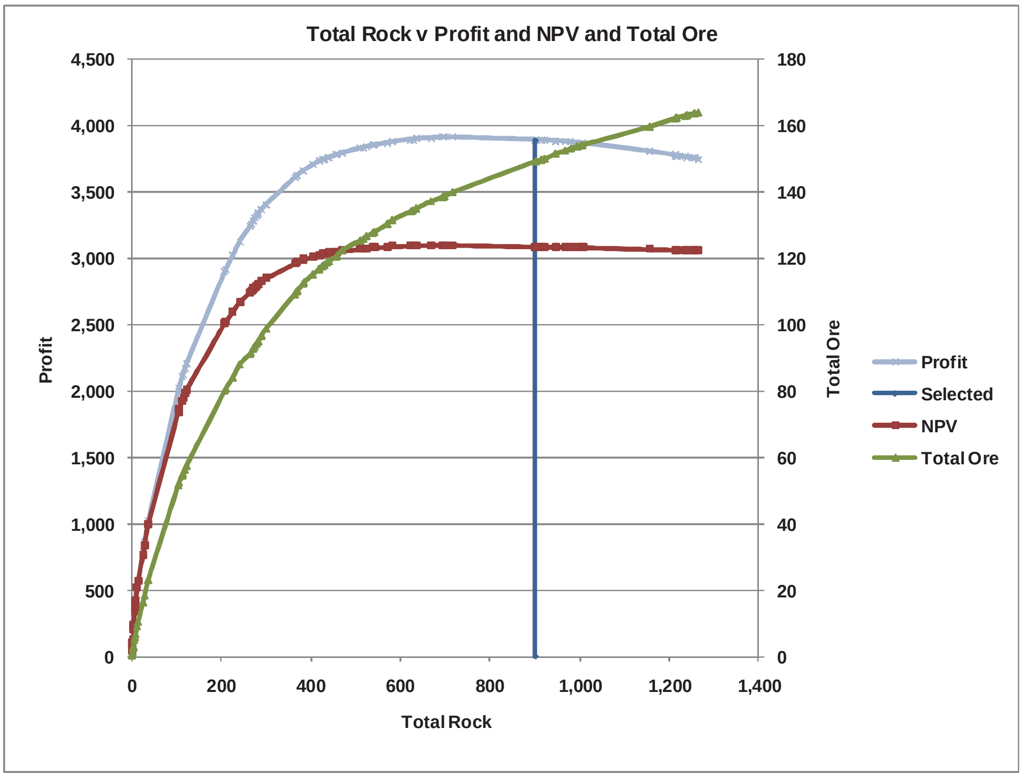


Figure 3.5: Optimisation Results – KMC Model - Rock v Profit/Ore

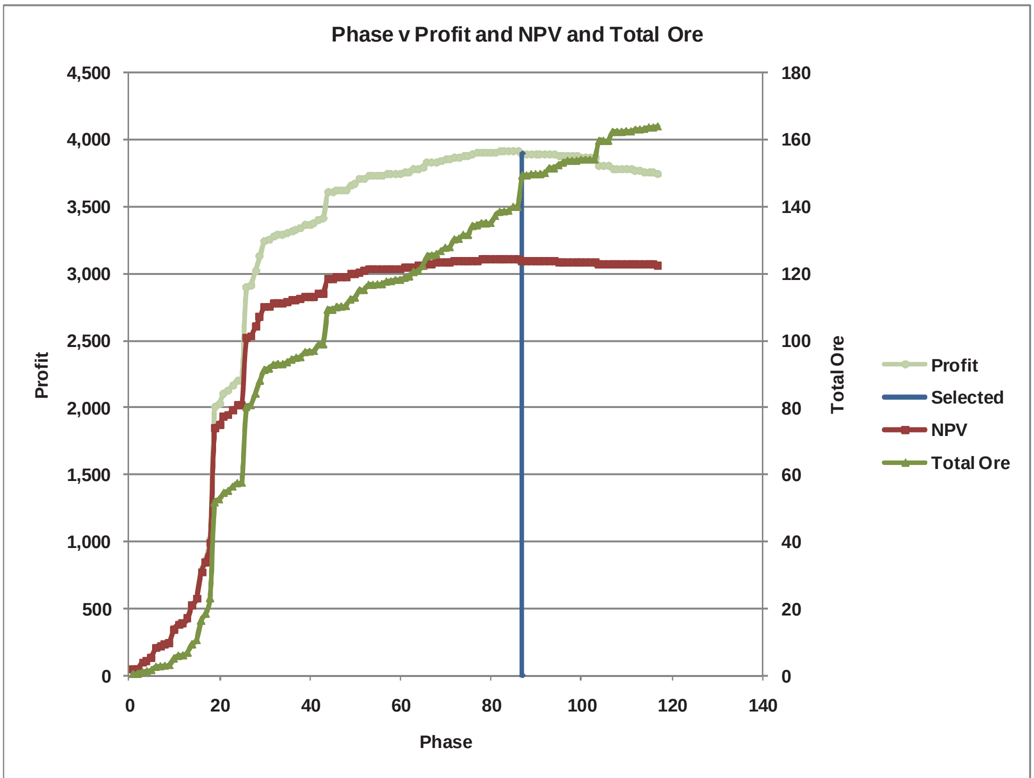


Figure 3.6: Optimisation Results – KMC Model - Phase v Profit/Ore

3.5.7.2 Pit Design

Based on the pit optimisation results, specifically those resulting from the optimisation of the KMC model (Phase 87, for a price of US$1060/oz), as well as the optimisation of the WAI model (US$900/oz), a final pit design was developed. This used the design parameters summarised in Table 3.13.

Table 3.13: Pit Design Parameters

Description	Unit	Value
Face Angles		
Above 145mRl	Degrees	60
Below 145mRl	Degrees	65
Berm Width	m	10
Bench Height between Berms	m	30
Ramp Width	m	32
Ramp Gradient		10%
Minimum Working Width between Cutback #4 and Final Design	m	50

The final pit design is shown in a plan in Figure 3.7, with reference sections in Figure 3.8 and Figure 3.9. The ramp was designed so as to exit in the south, and at the south end a horizontal pad was also incorporated, for the crusher and ore stockpile area, similar to that in cutback #4.

A summary of this overall pit evaluation and the estimated reserves at Vasilkovskoye calculated in accordance with the guidelines of the JORC Code (2004), against the KMC model, are shown in Table 3.14.

Table 3.14: Vasilkovskoye Pit Evaluation Summary
(WAI 01 01.2011)
(In Accordance with the guidelines of the JORC Code (2004)

Class	Reserves			Other Pit Contents		
	Tonnes Mt	Au g/t	Au Contained Moz	Rock Mt	Waste Mt	Strip Ratio
Proven	33.3	1.95	2.088	-	-	-
Probable	90.7	1.94	5.6576	-	-	-
Total	***123.97***	***1.94***	***7.732***	***870.65***	***746.68***	***6.02***

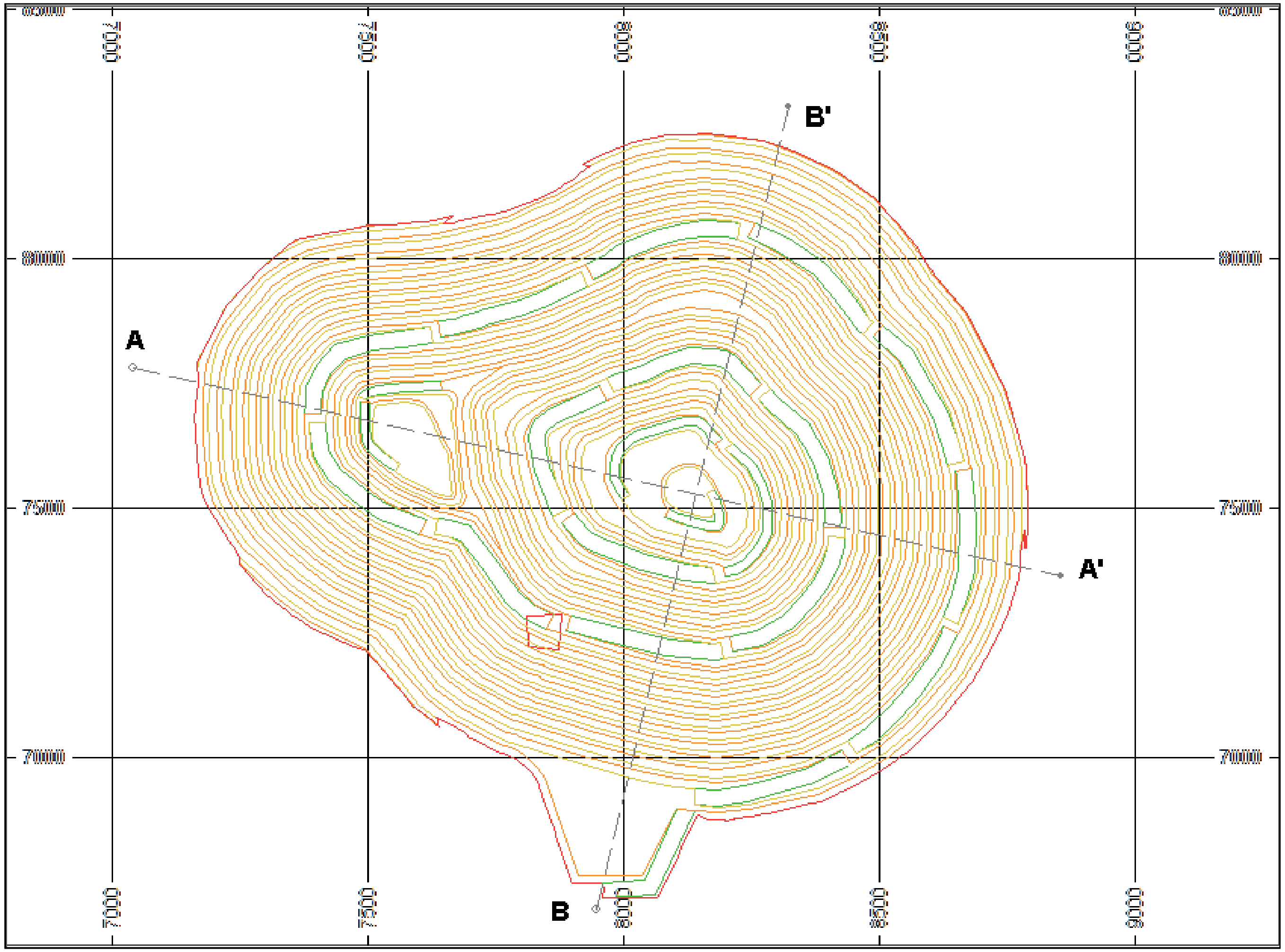


Figure 3.7: Plan of Final Pit Design

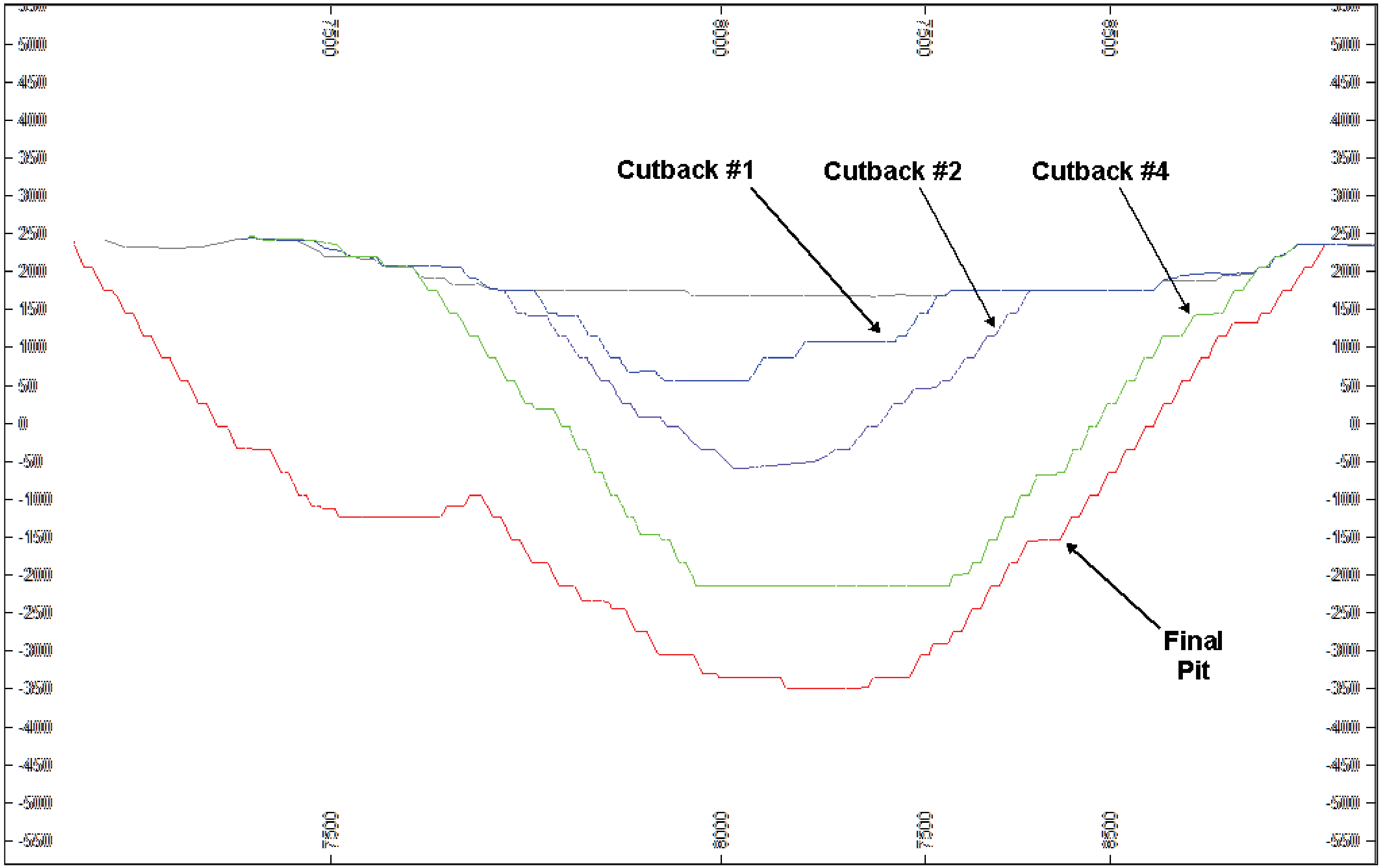


Figure 3.8: Section A-A' Of Final Pit Design

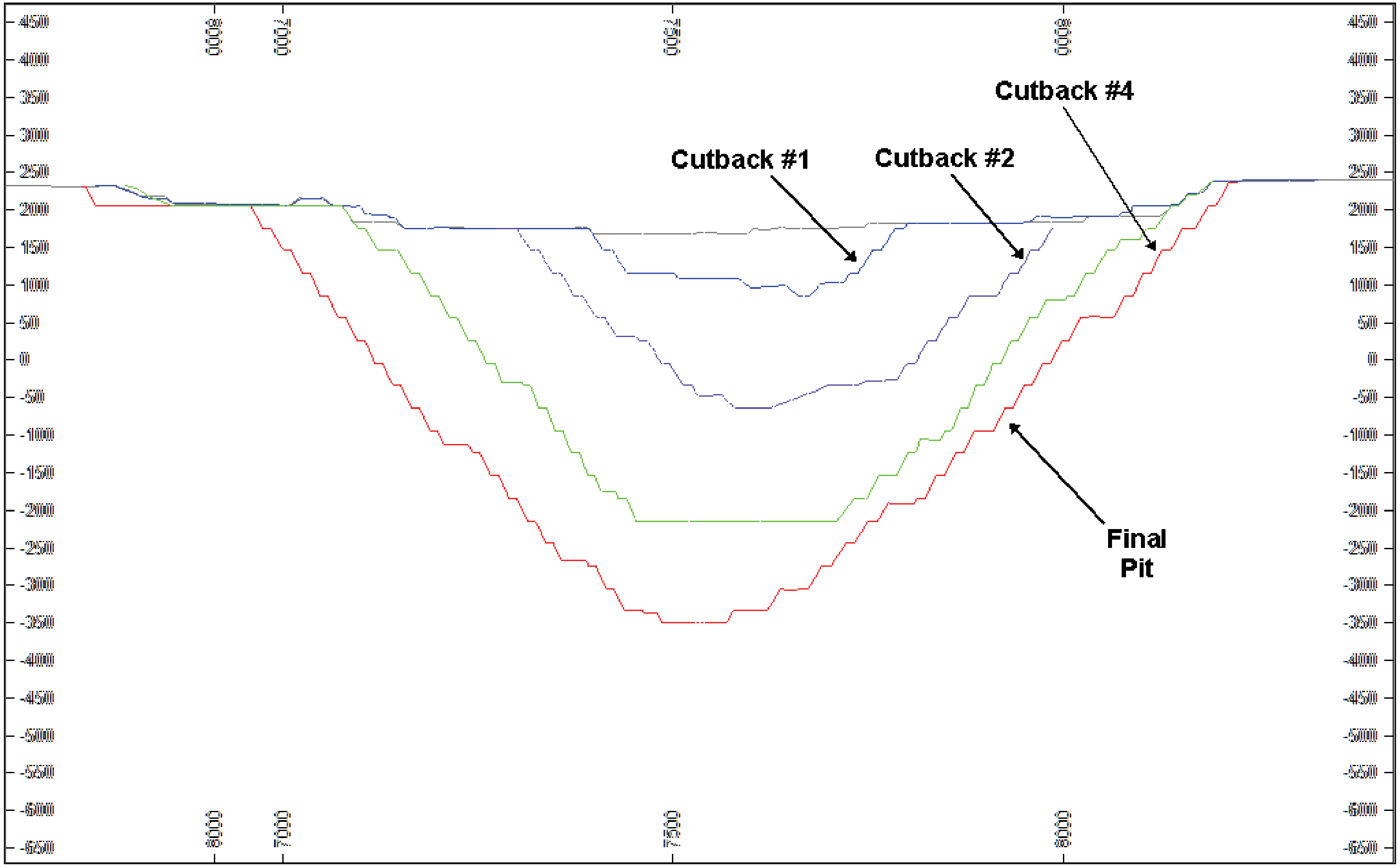


Figure 3.9: Section B-B' Of Final Pit Design

3.5.7.3 Scheduling

A mining schedule was developed for the final pit, incorporating the supplied earlier cutbacks (#1, #2 and #4) and based on an 8Mtpa mill production rate. Material from the final cutback is not mined until year 5, with the bulk of production from this final cutback coming after year 6.

A summary of this schedule is shown in Table 3.15, with a diagrammatic cross-section in Figure 3.10. This schedule has been developed with a relatively low stripping ratio for the first 5 years.

3.5.8 Grade Control

Within the open pit, grade control is done using blastholes, drilled on a 6x6m grid to a depth of 7.5m for the 7m bench. Several blasthole rigs are used including Atlas Copco ROC, drilling 151 and 171mm holes, and the Viper which drills 250mm holes.

Table 3.15: Schedule Summary

	Year	Unit	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total
			1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	
	Profit	US$M	236	297	285	292	307	230	185	238	220	260	231	246	176	178	181	236	**3,798**
	Revenue	US$M	372	435	424	428	440	411	368	423	404	461	428	431	373	369	348	360	**6,475**
	Processing Cost	US$M	86	86	86	86	86	86	86	86	86	86	86	86	86	86	86	82	**1,371**
	Mining Cost	US$M	51	52	53	50	47	95	97	9	99	115	111	100	110	105	91	42	**1,307**
	NPV	US$M	213	243	211	196	186	126	92	107	89	96	77	74	48	44	40	48	**1,891**
	Total Rock	Mt	35	36	36	35	32	66	67	68	68	79	77	69	79	72	56	29	**901**
	Total Waste	Mt	27	28	28	27	24	58	59	60	0	71	69	61	68	64	48	21	**773**
	Strip Ratio		3.4	3.5	3.5	3.4	3.0	7.2	7.4	7.5	7.5	8.9	8.6	7.6	8.5	8.1	6.0	2.8	**6.1**
	Ore	Mt	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0	7.7	**127.7**
	Au	g/t	1.78	2.08	2.03	2.05	2.11	1.97	1.76	2.03	1.94	2.21	2.05	2.06	1.78	1.76	1.67	1.79	**1.94**
	Au R Product	t	11.46	13.65	13.30	13.44	13.81	12.91	11.56	13.29	12.69	14.49	13.43	13.54	11.70	11.58	10.93	11.30	**203**
Cutback #1	Rock	Mt	16	9	5	2	-	-	-	-	-	-	-	-	-	-	-	-	**31.79**
	Ore	Mt	6.02	5.38	3.29	1.65	-	-	-	-	-	-	-	-	-	-	-	-	**16.34**
	Waste	Mt	10	4	2	0	-	-	-	-	-	-	-	-	-	-	-	-	**15.45**
Cutback #2	Rock	Mt	19	13	14	15	13	8	3	4	-	1	-	-	-	-	-	-	**90.21**
	Ore	Mt	1.98	2.62	4.47	6.15	7.75	5.19	1.90	2.89	-	0.87	-	-	-	-	-	-	**33.83**
	Waste	Mt	17	10	10	9	5	3	1	1	-	0	-	-	-	-	-	-	**56.39**
Cutback #4	Rock	Mt		14	17	18	17	7	52	25	26	17	17	14	13	6	-	-	**293.81**
	Ore	Mt	-	-	0.24	0.19	0.25	2.81	6.10	5.11	7.99	7.09	7.53	7.11	5.98	3.76	-	-	**54.15**
	Waste	Mt	-	14	17	17	16	55	46	20	18	10	10	7	7	2	-	-	**239.66**
To Final Wall	Rock	Mt	-	-	-	-	3	-	12	39	42	61	60	54	64	66	56	29	**485.25**
	Ore	Mt	-	-	-	-	-	-	-	-	0.01	0.04	0.47	0.89	2.02	4.24	8.00	7.68	**23.36**
	Waste	Mt	-	-	-	-	3	-	12	39	42	61	59	54	62	62	48	21	**461.90**

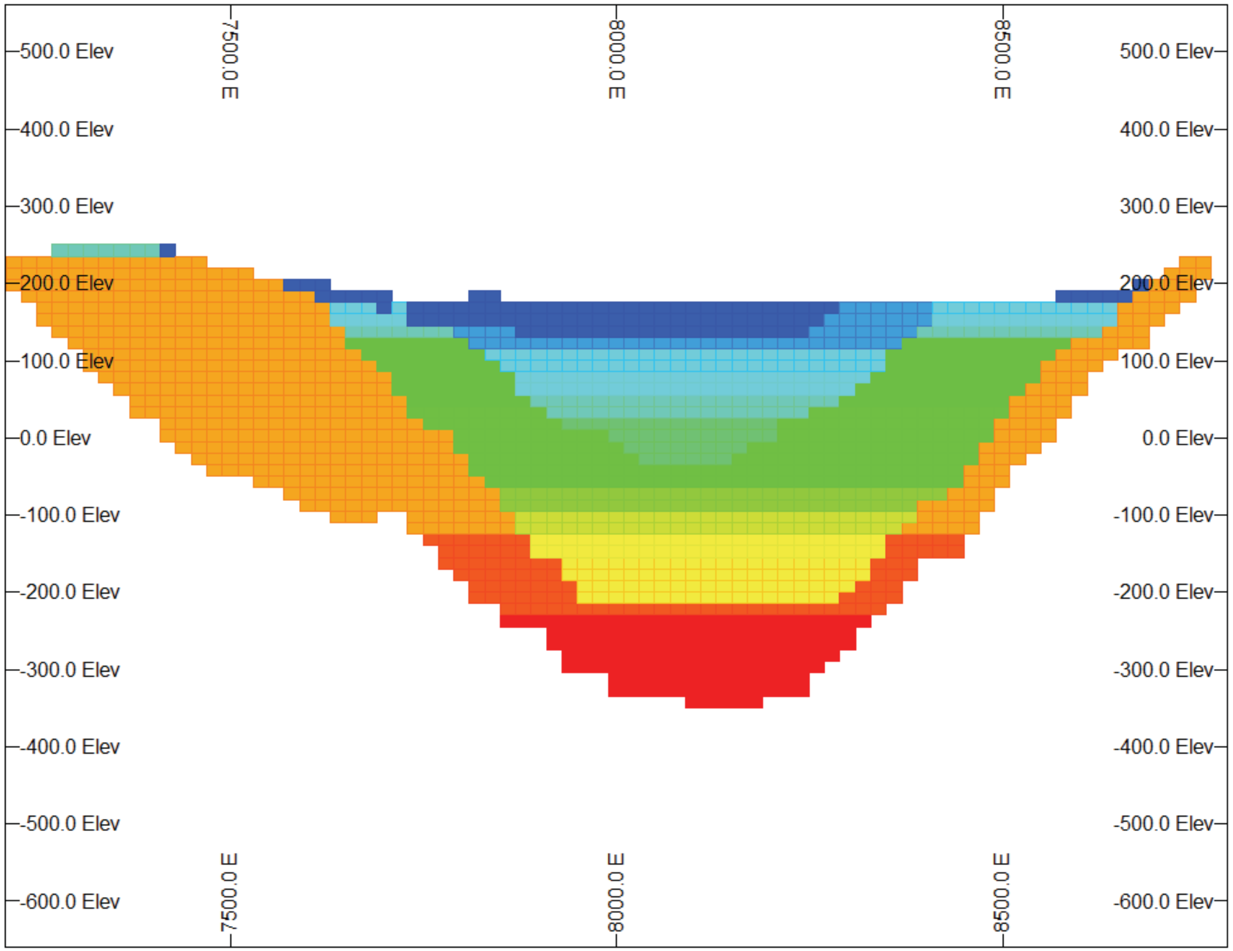


Figure 3.10: W-E Section, Depicting Mining Schedule

The Viper takes one sample per blasthole, the ROC's three samples (2.5x3m). Holes are laid out by GPS and tagged using nails hammered into the ground.

During the early development of the mine, extensive tests were undertaken to determine the optimum grade control methodology. This involved changing the drillhole spacing and importantly, using angled RC holes.

Bearing in mind that the mineralisation is broadly a sub-vertical stockwork, it is logical that angled holes will be better at delineating the steeply dipping mineralised features as opposed to vertical holes. This was in fact the case, with the angled holes providing a better reconciliation between predicted and actual grades.

However, the mine currently does not operate an RC rig, although angled exploration holes are planned for early 2011 to improve grade estimation.

> ***WAI Comment:*** *The introduction of angled RC holes for grade control should greatly improve the ability of the mine to predict bench grades thus allowing more efficient management of stockpile/direct feed/waste issues.*

3.5.9 Reconciliation

In an effort to establish how accurate the existing KMC resource model is in relation to mined production, the Company has undertaken some preliminary reconciliation studies. The results of this work for 2010 are shown in Table 3.16 below.

Table 3.16: Reconciliation Data of Block Model to Mining For 2010

Balanced Ores			
	Ore Tonnes	**Grade g/t**	**Au kg**
KMC Block Model	3,278,406	2.43	7,976.4
Production	3,271,189	2.29	7,496.2
Difference	-7,217	-0.14	-480.1
Off-balanced Ores			
KMC Block Model	1,177,973	0.62	735.1
Production	2,332,834	0.59	1,371.8
Difference	1,154,861	-0.04	636.8

Reconciling model grade to the production grade is always difficult due to the uncertainty in sampling the mined material. At Vasilkovskoye, the production grade was estimated from sampling the belt at the plant and assuming that this material has increased by a 12% dilution, thus allowing grade to be back-calculated.

Broadly, the results from the Balanced Ore (run-of-mine material) were good with only a small decrease in grade and produced 5% less gold in comparison to the model which appears to be well within the tolerance for normal losses within the pit. For the Off-balance Ore (low-grade material), there was a significant production tonnage increase, although at the approximate predicted grade.

The reasons for this are that the mine has consistently mined low-grade material that is not in the model, either on the periphery of the ore zone or as additional lenses. With high gold prices, off-balance material may well be economic to mine – a view shared by the Company.

3.5.10 Stockpile

At present, there are three stockpiles used by the mine:

- High clay content;
- High grade, and

- Run-of-mine.

The high clay content ore is not currently treated and therefore this stockpile does not play a part in everyday mining activities. The other two remaining stockpiles are formed by trucks dumping ore. Each truck is grab sampled (several small pieces) to give approximately 6kg of material. The stockpile is then levelled and a simple average grade applied to the horizon.

When the company plans to utilise a part of the stockpile, local averages are calculated both in plan and section, based on the original grab sample data to provide a grade for that particular slice of the stockpile.

During 2010, some (864kt @ 2.57g/t Au) 23% of total ore to the concentrator came from the stockpiles. This was in contrast (2,779kt @ 1.78g/t Au) to the balanced ore that went directly from the pit to the concentrator as well as (113kt @3.83g/t Au) of high grade ore.

> ***WAI Comment:*** *The use of 6kg grab samples to provide grade information for each truck is flawed as it is extremely unlikely that any degree of "representability" can be achieved. It may be possible with the introduction of the angled RC holes for grade control that the amount of ore passing through the stockpiles might be reduced, with an associated decrease in numbers of assays required.*

3.6 Process

3.6.1 Introduction

Processing of the Vasilkovskoye ores was initially undertaken in the 1990's using heap leach technology to treat the oxide ores. In 2006 the oxide ores were exhausted and a decision was made to begin the treatment of the sulphide ores by using flotation and cyanide leaching.

The design and plant construction was undertaken by Toms (Irkutsk) in conjunction with Kazzinc staff. The plant design was approved by the Kazak regulatory authorities and the construction of an 8Mtpa processing facility was begun in late 2007. Plant commissioning began in November 2009. In 2010, the equipment pre-commissioning was undertaken and in October 556kt of ore was processed which represents 83% of design plant capacity.

3.6.2 Process Testwork of Sulphide Ores

The results of rational analysis undertaken on two samples of Vasilkovskoye primary ores are given in Table 3.17.

Table 3.17: Rational Analysis Results

Phase	Sample 1	Sample 2
Free gold	11.65	7.16
Cyanide leachable gold	63.82	74.95
Total cyanide recoverable	**75.47**	**82.11**
Gold in Sulphides	20.28	15.81
Gold in Silicates	4.25	2.08
Total	100.0	100.0

The tests were undertaken at a grind size of 95% passing 71µm. The samples contained relatively low levels of free gold (11.6% for Sample 1 and 7.16% for Sample 2). The cyanide recoverable gold contents were 75.47% and 82.11%. A significant proportion of the gold was associated with sulphide minerals.

3.6.3 Testwork Undertaken at AMMTEC for Bateman Minerals

A sample assaying 3.12g/t Au, 0.3g/t Ag, 2.3% As and 3.2% Fe was subjected to a programme of metallurgical testwork at AMMTEC (Australia).

The ore minerals were found to be sulphides with significant quantities of arsenopyrite and lesser amounts of pyrite. Mineralogical analysis showed the presence of fine-grained gold particles (less than 10 microns) predominantly occurring in arsenopyrite.

Direct cyanidation of the ore showed that gold recovery increased with decrease in particle size, with a maximum recovery of 75.4% obtained at a grind size of 80% passing 45µm. Gravity concentration tests gave low upgrading with 40.2% of the gold being recovered at a 2.51% mass recovery and a concentrate grade of 57.2g/t.

Flotation tests on the gravity tailings gave high gold recoveries of 95-97%. The recovery of gold from the head sample by flotation was lower, at 84.6%. The overall recovery by gravity and flotation was 90.8%.

Direct cyanidation of the flotation concentrate after ultrafine grinding to 100% passing 25µm, gave a gold recovery of 77.3%. Preliminary alkalization of the concentrate with NaOH for 8 hours increased the gold recovery up to 83.8% from the cyanidation operation.

A summary of the test results undertaken by AMMTEC is summarised in Table 3.18.

Table 3.18: AMMTEC Test Results

Technology	Overall gold Recovery %	Comments
Direct ore leaching	75.4	Passing size 80% -0,045 mm
Gravity concentration – cyanidation of gravity concentrate and tailings	80.3	Passing size 95%-0,074 mm,
Gravity concentration with flotation and cyanidation of concentrates	79.2	Grind size 95% -0,074 mm, Regrind - 25µm (concentrates).
Gravity concentration + cyanidation of concentrates – cyanidation of flotation tailings	85.9	Passing size 95%-0,074 mm Less than 25 µm (concentrates)

Further testing at Kazzinc's ZMCC laboratory broadly confirmed these results.

The main conclusions of the testwork programmes were as follows:

1. Gravity concentration and flotation will give a recovery of gold into concentrates of 85-90.8%;
2. Recovery of gold from the concentrates is complicated due to their refractory nature. This was attributed to the fine disseminations of gold (less than 10 microns) and the presence of cyanicides which decrease the efficiency of the cyanidation process. The leach recovery of gold from the concentrates without regrinding was 66-69%;
3. The application of ultrafine grinding down to 25 microns resulted in the additional exposure of fine-grained gold with leach recoveries increasing to 87.0-88.4%) but also lead to increased consumptions of cyanide (of up to 39kg/t of concentrate); and
4. An alkalization pre-treatment with fine grinding increased gold recovery and resulted in lower cyanide consumptions.

3.6.4 Process Flowsheet

3.6.4.1 Crushing

Ore is subjected to primary crushing in the open pit and the -550mm fraction is conveyed to a coarse ore stockpile by overland conveyors. The primary crushing and ore transport are the responsibility of the mine department.

The coarse ore stockpile has a live capacity of 18,000t. Ore is recovered using 13 vibrating feeders and is conveyed via a surge hopper to an inclined double deck vibrating screen fitted with 50 and 30mm decks. The screen oversize passes to a Sandvik H8800C cone crusher (open size setting of 40mm) and the crushed product is further screened at 30mm with the oversize passing to a tertiary Sandvik H8800EF cone crusher. The tertiary crushed product and the screen undersize products are combined and are conveyed to one of two fine ore bins, each of 4,200m^3 capacity.

The products from the fine ore bins are conveyed via surge bins to two parallel lines utilising KHD high pressure grinding rolls (HPGR) which are designed to crush the material to 80% passing 5.2mm. The roller presses are fitted with two 1745kW motors each. The design feed rate is 1,280tph (1,380tph maximum). The edge products are recirculated to the surge bins.

3.6.4.2 Milling

The ore is ground in two parallel circuits, each using a single stage 6.7 x 11.3m Outukumpu ball mill, with each mill being powered using two 4.9MW motors. The ball mill discharge is cycloned using Krebs D75 cyclones and the underflow is returned to the mill. The cyclone overflow passes to "Intercycle flotation" which consists of three 130m^3 Outotec flotation tank cells to recover coarsely liberated sulphide minerals. The flotation tailings are cycloned and the overflows pass to rougher flotation. The secondary cyclone underflows gravitate via a 1.5mm screen to an XD70 Knelson concentrator. The Knelson concentrates are pumped to a regrind ball mill.

In October 2010, ore processing reached 556kt and in December all the required repairs and maintenance works were completed, including replacement and new design of gearboxes and reinforcement of foundations.

3.6.4.3 Flotation

Rougher flotation takes place in three 130m^3 Outotec flotation tank cells which give a rougher flotation time of 16 minutes. Rougher tailings pass to scavenger (Control) flotation where a further four 130m^3 cells give an additional 20 minutes flotation time. The scavenger tailings are pumped via a trash screen to three Knelson KC-CVD60 concentrators in parallel (continual discharge). The concentrates are cleaned using a single KC-CVD20. The concentrate from this machine joins the concentrate from the grinding circuit for regrinding.

The rougher concentrate is cleaned in two stages, with the first stage consisting of four 10m^3 cells and the second stage of three 5m^3 cells. The residence times are 12 and 10 minutes respectively. The final flotation concentrates are pumped to the regrind mill. The mass pull to the flotation concentrate is 4.8%. The plant has experienced problems in 2010 with insufficient pump capacities within the flotation circuit. This has now been overcome with the replacement of many 6" x 4" pumps with 8" x 6" models.

During the WAI site visit, high pulp levels and minimum froth depths were observed in the flotation plant. However, recent plant recovery statistics (Table 3.20) indicate that the plant is nearing design efficiency.

3.6.4.4 Concentrate Regrind

The gravity and flotation concentrates are combined and ground in a 3.6 x 5.5m ball mill fitted with a 1250kW motor to achieve a product size of 95% passing 45µm.

3.6.4.5 Ultrafine Grinding

The combined concentrates are then subjected to ultrafine grinding, using Deswick mills, to achieve a product grading 80-90% passing 4µm. There are three 2m^3 mills operating in parallel. The grinding medium is obtained from a French supplier (SiLi beads, 1-6 –1.8mm). The Deswick mills have failed to achieve the target is grind size and are currently only achieving 60-65% passing 4µm.

Since December, the mill's vendors have been controlling the works to assure the production target grind size achieves not less than 85% passing 4µm, which involves the use of a hydrocyclone prior to the Deswick mills, scheduled for implementation in March 2011.

3.6.4.6 Gold Recovery from the Gravity and Sulphide Concentrates

The gold in the gravity and flotation concentrates is partially refractory and the sulphide minerals need to be oxidised to ensure maximum gold recovery. This is achieved via the "Leachox Process", supplied by Maelgwyn Minerals Services (MMS).

After ultrafine grinding, the concentrates, typically assaying 40g/t Au and 25-30% As, are pumped at 30-40% solids to four oxidation tanks in series, each fitted with two "Aachen Reactors", with one operating and the other on standby. These are externally mounted and supply oxygen (900m^3/h), which is obtained from an Oxygen Plant, as ultrafine bubbles, thus giving the opportunity for oxidation of the sulphide minerals. Dissolved oxygen levels are maintained at 20ppm. However, the Company plans to replace the Aachen reactors with special "Telescopic Dispersion Units" within the period January to March 2011 in order to increase the level of dissolved oxygen to 30-35ppm.

Lime is added to control pH. After oxidation the pulp is pumped to a preliminary leach column where lime and cyanide is added to a pH of 10-11 and a cyanide concentration of 0.2g/l. There are a further two leach tanks (250m^3) and a further eight tanks for carbon in leach (CIL)

3.6.4.7 Detox

There are three tanks for detox. The first two are dosed with lime and sodium metabisulphite for cyanide destruction. Iron sulphate (1,140g/t) and lime are added to the third tank for arsenic precipitation. The Company has installed a Mintec analyser to control cyanide levels for direct measurement of Total, WAD and Free cyanide.

3.6.4.8 Gold Recovery from Carbon

Gold is recovered from carbon using the standard Zardra method at 140-150°C and 2.5 atmospheres. Final gold loadings are approximately 3.5-5.8kg/t. 6t of carbon is eluted giving a gold production per cycle of approximately 25-30kg. The elution cycle is 12 hours and gold stripping efficiency is reported to be 95%. Gold is recovered from the eluate by electrolysis in two cells with 40 cathodes. The gold bearing sludge is removed by high pressure water sprays and filtered and dried. The electrolysis product is smelted to produce Doré assaying 85-92% Au in 12kg bars. The carbon is regenerated at a rate of 500kg/h in a furnace at 600°C.

3.6.5 Consumables

The consumables for the process plant are given in Table 3.19.

Table 3.19: Vasilkovskoye Process Consumables	
Crushing and grinding	**kg/tonne**
Steel balls	1.4336
80mm	0.6846
70mm	0.2251
60mm	0.4259
40mm	0.1091
Soda ash	0.4000
Flotation and Gravity	
Metal balls 25 mm	0.0489
Potassium butyl xanthogenate (BKK)	0.1318
Sodium-butyl Aeroflot	0.0242
Pine oil	0.0331
Frother X-133	0.0003
Collector AERO 7279A	0.0003
Depressor AERO 7261A	0.0015
Flocculant Magnafloc 10	0.0040
Lime	0.0024
Coagulator Mafnafloc 1697	-
Ceramic balls	0.0116
Flotation agent (OXAL) T-92	0.0009
Flotation agent Flotanol C7	0.0009
Thickening, industrial water supply and tailings	
Flocculant Magnafloc 10	0.0380
Coagulant Magnafloc 1697	0.0139
Hydrometallurgy	
Sodium cyanide, 88% activity	0.3455
Lime 70% activity	1.3087
Diesel fuel	-
Caustic ash NaOH, 96% activity	0.0352
Hydrochloric acid (HCl), 35 % activity	0.0117
Sulphuric acid	0.0014
Sodium metabisulphite	1.2130
Ferrous sulfate grade II,	1.3931

3.6.6 Metallurgical Performance

The technological recoveries for the process plant for 2010 are given in Table 3.20 below.

Table 3.20: Vasilkovskoye Process Plant Recoveries					
Month	**Tonnes treated**	**Head Grade Au ppm**	**Recovery %**	**% Flotation Recovery**	**% Hydrometallurgical Recovery**
January	154,383	1.65	47.9	64.2	74.5
February	130,661	1.78	50.2	67.4	74.3
March	230,131	1.65	42.5	63.5	68.5
April	247,041	1.78	61.2	71.9	85.1
May	450,915	1.7	59.0	66.9	81.3
June	441,540	1.77	59.3	55.0	82.5
July	324,685	1.82	62.6	77.4	80.9
August	373,276	2.07	67.2	81.4	82.5
September	257,633	2.02	62.5	79.2	77.8
October	556,868	2.13	61.8	79.7	77.1
November	435,297	2.04	59.0	82.1	71.8
December	203,261	2.28	57.6	77.1	74.7

There was a gradual increase in recovery throughout the year. The maximum recovery was 67.2% and it appears that recoveries are ranging between 60-67%. The plant head grade has generally increased throughout the period, ranging from 1.65ppm Au (January) to 2.28ppm Au (December).

The tonnage throughput peaked in May and April, but decreased again in August and September before reaching 556kt in October. However, throughput decreased during November and December due to refurbishment of the Outotec mills.

3.6.7 Labour

A total of 597 persons is employed in the Plant. There are three senior managerial positions, and a total of 18 supervisors. There are four senior mechanical positions and an electrical foreman with two electrical engineers.

A further 48 are classified as "technical and engineering" staff and there are 516 workers.

3.6.8 Assay Laboratory

The Vasilkovskoye mine contains a well-equipped assay laboratory. The laboratory is not accredited but there are plans to apply for accreditation in the near future and also install a Quality Management system. The laboratory typically assays 8,000 mine and geological samples and 1,500 plant samples per month.

Sample preparation is achieved in three stages using a combination of jaw crushers, rolls crushers and ring mills to produce material that is 100% passing 200 mesh. The equipment is both Russian and Australian (Rocklabs). The sample preparation laboratory was well equipped and maintained.

Gold analysis is undertaken using fire assay (in duplicate) on 50g trials for geological or plant feed and tails samples and 25g for plant concentrates. The laboratory has four furnaces, each capable of holding 24 crucibles. There are also three cupellation furnaces.

The beads are parted using nitric acid and the gold weighed using a Sartorius micro balance to a limit of detection of 0.2ppm Au. The laboratory is also equipped with atomic adsorption machines (Perkin Elmer and Kvant) for solution analysis. The laboratory also has an "Express Laboratory" for Lasersizer particle size analysis and rapid analysis of process solutions (Analysis, pH and cyanide).

The laboratories QA/QC procedures include duplicate gold analysis, where the agreements between analyses must be within certain limits which are dictated by state protocol. There is a regular programme of external check analyses. The laboratory also uses international reference materials such as those supplied by "Geostats".

3.6.9 Conclusions

The plant has experienced a long ramp up period due to problems with equipment and lower than expected process recoveries. However, recent initiatives by the company have addressed many of these issues to allow plant production and recovery to approach design parameters, although optimal conditions have yet to be reached.

It is reported by Kazzinc that the key to the Vasilkovskoye process is the ultrafine grinding of the bulk concentrate in order to liberate the fine gold. This is achieved through the use of Deswik ultrafine grinding mills which take the particle size to 90% <4µm. The ultrafinely ground pulp is then subjected to an intensive aeration process in four columns. Oxygen is injected through telescopic gas dispergators (produced through Kazzinc's JV with Bakor Ceramics of Russia), where oxygen is forced into a ceramic membrane and finely diffused into the pulp, with approximately 20-25ppm dissolved oxygen content. The process results in an Iron hydroxide fim coating the outer shell of the mineral particles, thereby passivating the refractory mineralisation prior to the cyanide leach process. The pulp passes through cavitators, which are required in order to clean the surface area of the mineral particles through rapidly changing pressure. The pulp is then processed through a conventional CIL system.

The process is designed to keep the arsenopyrite molecular structure intact, oxidising only the outer surface in order to reduce subsequent cyanide consumption and increase gold dissolution. A small proportion of the arsenic will be dissolved, which is subsequently handled through the addition of iron sulphate into the pulp in order to neutralise the arsenic into scorodite prior to discharge into the sorbtion tailings dam.

Empirical tests to date, performed by Kazzinc, show that sorbtion tailings contain only unliberated gold which has been interpreted by Kazzinc as indicating the success of the aeration process but highlights the sub-optimal nature of the current grind size achieved by the Deswick mills.

Going forward, WAI believes that the problem of low process recoveries may be difficult to fully solve as although the Leachox process is not designed to achieve a high degree of oxidation of the sulphide minerals it is very dependent on grind size to liberate refractory gold particles. The low pulp temperatures being achieved in the Leachox Plant certainly indicate that very little oxidation of sulphide minerals is occurring, therefore, without the grind performance, it is difficult for WAI to see clearly how the refractory or locked gold will be liberated.

3.7 Environmental, Social and Health & Safety Issues

3.7.1 Introduction

3.7.1.1 Scope of Study

This review of the environmental and social performance of the Vasilkovskoye Mine and processing project is based on a brief site visit and reconnaissance, together with discussions with staff of the geology department and Department of Health Safety & Environment. In the short time available it is only possible to have an overview of the project and the way that the company manages its health, safety, environmental and social obligations.

Whilst WAI believes it has gained sufficient insight into the key issues and performance, there may be additional information that was not seen, or variations in interpretation of the available data that could not be explored further.

3.7.1.2 Method of Study and Information Sources

A site visit was undertaken over 2 days between 12 and 14 October 2010. Documents and plans were inspected but not translated from Russian, and key data were provided by the company staff. The main documents inspected are listed as appropriate in this Chapter.

In addition to site specific information, the overall Kazzinc Company Environmental Policy and Programme was discussed with the Chief Environmental Manager.

3.7.2 Environmental & Social Setting and Context

3.7.2.1 Landscape, Topography

The Vasilkovskoye mine is located about 10km from Kokshetau town, in a flat, open steppe landscape. The mine buildings, structures and dumps dominate the landscape.

3.7.2.2 Climate

The climate is characterised by a semi-arid continental climate, with hot dry summers and cold dry winters. Average annual rainfall is around 260mm.

3.7.2.3 Land Use and Land Cover

The land cover is dominated by short dry grassland (mainly Stipa species) with no trees and only very occasional shrubs. Lower lying areas consist of wetland and ponds, probably seasonal in nature.

3.7.2.4 Water Resources

Surface Waters

Whilst the mine area has few surface watercourses, the area drains generally to the south and southwest into the River Chaglinka, which flows northeast to Lake Chagly (Shaghalaltengiz).

To the south of the mine, in the vicinity of the old heap leach dumps and current TMF, the land is lower lying and there are a number of small seasonal ponds, probably arising from the high water table (Photo 3.2). This zone generally drains east into the river (visible in Photo 3.3), though there is no defined watercourse or drain.

Groundwater

The groundwater is sparse and there are no major aquifers. In the area of the TMF it is within 10m of the surface and is reported to be saline. In the vicinity of the open pit the GKZ groundwater reserve is stated to be 3,800m^3/day. Groundwater flows are very slow, due to the low permeability of the rocks.

Water Supply

The mine is licensed to obtain water from the River Chaglinka (potable), groundwater from the open pit, boreholes (near the river) and from the Murzakolsol Lake (industrial water). The water sources for Murzakolsol Lake are surface waters, drainage water from Kokshetau city after treatment and precipitation. Water from Murzakolsol Lake is neutralised and treated using ultraviolet lamps.

Nearby villages obtain their water supply from boreholes.

3.7.3 Communities and Livelihoods

There are 3 local villages:

a) Konysbay, 2km to the east of mine, on the River Chaglinka and close to the mine entrance (see Photo 3.2);
b) Altybay, adjacent to Konysbay and the other side of the river; and
c) Dongulagash, 5km to the west of the mine.

Kokshetau is the nearest major settlement, 20km to the south-east of the mine. Kokshetau is the capital of Akmola Oblast and has a population of around 150,000. Akmola Oblast has a population of around 810,000. The mine is located in the District of Zerendinsky, which has a population of 41,000. The district centre is Zerendi, about 60km south of the mine.

The area has a low population density, concentrated in settlements. The majority of the people in the local villages and a significant number in Kokshetau work for the mining company, directly or indirectly via contractors and suppliers.

Apart from the mine, the main livelihoods are agricultural, particularly cattle and sheep grazing, and some grain production. In the vicinity of the mine the only land use is for subsistence grazing, and the mine provides the only source of livelihood.

3.7.3.1 Infrastructure & Communications

The mine has road connections and a rail connection. Most of the plant and equipment for the mine was delivered by rail.

3.7.4 Project Status, Activities, Effects, Releases & Controls

3.7.4.1 Project Description & Activities

Past activities

Originally the open pit extracted oxide ores and produced gold by heap leaching. It is understood that some ore remains in the heaps (Photo 3.2).

Photo 3.2: Old Heap Leach Dumps and Associated Infrastructure
Note low lying areas of wetland

Current Operations

The arrangement of the current and past mine components in relation to the highway, River Chaglinka and Komysbay village is shown in Photo 3.3.

Photo 3.3: Aerial View Showing Location of Main Mine Components. The Outline of the new TMF is shown approximately

The open pit has a large surface area, but is still relatively shallow, the company having utilised the current excavation capacity to strip overburden whilst normal production through the plant has been limited due to construction and ramp up. Associated with the pit are two waste rock dumps – one to the north-west and one to the south-east (Photo 3.3).

Along the west perimeter of the pit is a water storage pond, into which the pit water was pumped. However, this is now decommissioned and water is pumped to the TMF.
The plant area has a number of facilities:

- Mobile plant maintenance area;
- Primary crusher and ROM stockpile;
- Milling (ball mills);

- Flotation concentrator and sorption (Leachox Process) plant;
- Rail head for equipment delivery, and warehousing;
- Heating plant – coal fired;
- Tailings treatment and detox plant; and
- Offices and administration.

In addition, to the south and south-west of the main plant area are located:

- Tailings pipelines and return water lines;
- The main flotation tailings disposal area (TMF);
- Sorption tailings disposal area (STMF);
- Water storage and conditioning lagoon (previously a tailings disposal area from oxide ore treatment); and
- Old heap leach dumps and associated derelict infrastructure.

The mining methods and processing flowsheet are described in a separate section of this report.

The sulphide ore has a high content of both arsenic and pyrite, which give rise to environmental complications as well as processing difficulties.

3.7.4.2 Energy Consumption & Source

Energy is used as follows:

- Electricity - Connection to Kazakh grid. Majority of power requirement; main use in process plant, conveyors, etc;
- Coal – Heating Plant; and
- Diesel fuel – Mobile plant in the mine.

Whilst the mine is connected to the Kazakhstan power grid, which has high carbon intensity (being coal, oil and gas dominated), Kazzinc operates a hydroelectric power station, which produces much of the required power of the company. Thus the total carbon emissions of the company from electricity are much reduced.

3.7.4.3 Mine Wastes – Rock

Overburden and waste rock is disposed of in two dumps, adjacent to the open pit (Photo 3.3). The waste rock production so far is high in relation to ore production. This means that the mine has used its mobile plant capacity to pre-strip overburden in preparation for ore production.

Geochemical information on the sulphide and sulphate content of the waste is very limited; however it is considered that the environmental stability of this waste material is good. The results of runoff monitoring indicate an alkaline pH, which is regularly controlled. Off balance ore is dumped separately and is intended for future processing. The cone of depression caused by the open pit results in all drainage waters collecting in the pit base. Water is pumped from the open pit to the flotation tailings dam as recycled water.

> ***WAI Comment:*** *Whilst the waste rock may be largely inert, there may be areas or zones from mineralised parts of the orebody, which have the potential to be acid generating or contain metals (particularly As). Waste rock should be tested for ARD and metals (total content and leachability) on a routine basis on the dumps. Zones of potential contamination can then be placed within the dump to isolate them in safer conditions. Currently, the geochemical composition of pit drainage waters, including waste dumps is regularly monitored.*

3.7.4.4 Mine Wastes – Tailings

Tailings Properties & Treatment

The process plant produces two tailings streams:

1. Flotation tailings, from the first stage of concentration; and
2. Sorption tailings, from treatment of the Au (and As) rich concentrate by oxidation to release the Au, and subsequent cyanidation.

Recent analysis of tailings solids provided by Vasgold is given in Table 3.21 below.

Table 3.21: Tailings Analysis

Element	Unit	Flotation tailings	Sorption tailings
Fe	%	0.74	15.92
Pb	%	0.002	0.009
Zn	%	0.002	0.008
Cu	%	0.003	0.15
As	%	0.17	19.80
S	%	0.14	11.17
CN total	mg/l		11 - 160
CN free	mg/l		7.4 - 3
Average of monthly samples, April – September 2010			

It can be seen that the Sorption tailings contains a substantial quantity of iron and sulphur (pyrite), which may have acid production potential, and contain arsenic. Even the flotation tailings contains significant quantities of Fe, As and S, and may be geochemically active. As a result, the tailings may represent an environmental hazard, and the sorption tailings may also be a potential hazard. The alkaline character of the tailings decant water will reduce the dissolution of sulphide minerals, and the thick layer of natural clay below the waste dump is considered to reduce the risk of environmental contamination.

Prior to disposal, the sorption tailings are treated in a detox unit in a two-stage process:

1. CN destruction, in two tanks – addition of lime and sodium metabisulphite. Residual CN levels are normally within the range 7mg/l to 10mg/l; and
2. Arsenic precipitation – addition of Iron sulphate (1,140g/t) and lime to precipitate arsenic as the more stable calcium iron arsenate (also referred to as 'scorodite', though this is slightly different from naturally occurring scorodite).

Levels of As, CN and pH are regularly monitored at the processing plant discharge to assess the effectiveness of the detox and further analyses for these compounds are performed in the TMF. Cyanide is destroyed by sunlight, and analyses indicate a consequent reduction in levels. In 2010 pH has not dropped below 9, with an average between 9-12.

Arsenic levels in the liquid phase in the tailings flow and decant water are monitored weekly and there is no indication of solubilisation of As in the short term. CN levels are monitored daily.

Tailings Pipelines

The flotation and sorption tailings are delivered to the TMF in separate pipelines, two lines for each (one operational, one backup). Pipelines are conventional high density plastic, and are laid directly on the ground surface, with no secondary pipeline containment; however there is an emergency spill discharge pond in the event of an incident, into which tailings will flow if there is a pipeline breach. Pipelines are inspected twice per shift by trained personnel and once per week by the Chief Engineer.

Tailings Disposal

The tailings management facility (TMF) was designed by Mechanobr Enginerring, St Petersburg, in 2009 and was subject to a full OVOS concluded in 2009 (along with the mine and plant facilities). A particular issue of concern was the safe disposal of the tailings and whether the TMF or STMF needed to be lined.

The selected site for tailings disposal is underlain by 6m to 10m depth of low permeability clay (<1x10-9m/sec), with a regulatory requirement of 1x10-7m/sec. This depth decreases towards the south-east of the TMF, the lower lying areas. The sorption tailings are contained within a separate paddock, in the north-west portion of the TMF area (see Photo 3.2), i.e. where the underlying clay is thickest.

The paddocks for both the sorption and flotation tailings have been developed and in situ tests were performed to assess permeability and the natural clay layer was not compacted. The tailings dam embankments are compacted rockfill and will be constructed in two stages – the first stage comprising 3 lifts, the first of which has been completed and the second has commenced.

The main TMF parameters are summarised in Table 3.22.

Table 3.22: Tailings Management Facility Parameters

Parameter	Units	1st Stage	Total on 2nd Stage (20 years)	
		Flotation tailings	Flotation tailings	Sorption tailings
Elevation, datum	metres	240	254	240
Area	Mm^2	5.96	6.20	2.16
Volume	Mm^3	54.54	144.02	6.5
	Mt (@1.7t/m^3)	93	245	11
Perimeter of dam	metres	8805	11,108	5801
Max height of dam to crest	metres	20	34	8

The intention is that the sorption tailings will retain a cover of water over them, in order to prevent pyrite oxidation. It is reported that since the TMF has recently been developed, to date, insufficient water has collected to cover the TMF surface. The company considers this water will be accumulated in 1-2 years time. It is also intended to rework the tailings beach in the future. The sorption tailings material has been assumed to be of the highest hazard class, which has informed the design of the TMF. To date, the company has designed all storage structures in line with national standards, which has been approved by the required regulatory authorities. The company considers that the pH of tailings decant waters which is maintained at pH 9 is sufficiently high to neutralise any potential acid generation.

> ***WAI Comment:*** *WAI has not independently examined the TMF design and OVOS, and has thus not verified the potential seepage rates and long term risks to water resources from the sorption tailings. WAI would recommend that the character of the sorption tailings material should be further clarified via specific ARD testwork, and that a review against compliance with international standards (IFC Performance Standards and EU Mine Waste Directive) should be undertaken as soon as possible.*
>
> *In Kazakhstan, tailings and other mine wastes are considered as a mineral resource or asset (an industrial raw material under the Law of Republic of Kazakhstan, on Mineral Resource & Subsoil use), on the basis that either technology development or economics (i.e. increased commodity prices) will enable them to be economically re-processed in the future. Whilst this may be true in some cases, the consequence of this policy is that the storage of potentially toxic materials can be considered as a temporary requirement. Thus long term or permanent risks to land and water resources are less critical, and storage requirements might be to a lower standard than would be for permanent final disposal.*

The TMF has a naturally very low permeability clay base layer, as indicated by the company, so the risk of seepage, particularly from the sorption tailings, is very low. WAI does not consider that there is a risk of acid being generated; as this is mitigated by the high pH of the tailings decant water in the long term.

3.7.4.5 Water Management & Effluents

The Vasilkovskoye Mine operates as a mainly closed system with maximum water recycling. This is necessitated by the scarcity of water supply, as well as by environmental considerations and minimisation of discharges.

- Groundwater from the open pit is pumped to the TMF for purification and recycling;
- Water decanted from the flotation tailings is stored in the water clarification dam, where natural biological activity provides some treatment;
- Water from the water clarification dam is recycled to the plant as industrial water;
- Water is not recycled from the sorption tailings, in order to maintain a water cover over the tailings;
- Industrial makeup water is abstracted from the Murzakolsol Lake and potable water is sourced from the Chaglinskoye water dam; and
- 'Domestic' waste water is treated in a biological treatment plant and the effluent recycled via the TMF.

Losses of water are likely to include:

- Process losses;
- Evaporation from the TMFs and water clarification dam; and
- Seepage to groundwater from the TMFs and water clarification dam.

In addition to the pumped pit water discharge, it is possible that some discharge occurs via shallow groundwater seepage reaching the natural drainage from the south-eastern corner of the TMF/leach pads area, although company monitoring data indicates that there has not yet been any contamination of water via this route. Potential drainage is intercepted by one pumping station (and another under construction) which collects and pumps any discharge to the old TMF, although none has been encountered to date.

Vasgold have commissioned hydrogeological modelling of the potential groundwater drawdown from pit dewatering. At its full extent this will extend to a radius of 7km from the pit, except towards the river which is 4.8km distant. It is possible therefore that pit dewatering will have a significant effect on some surface waters, and may affect the river, although the river bed is comprised of low permeability clays, and the cone of depression caused by the open pit is considered to intercept all drainage waters. Pit water is pumped at a rate of 750,000m^3 per year, whilst the average annual volume of Chaglinka River is 22,450,000m^3 per year.

3.7.5 Emissions to Air

Emissions to air are summarised in Table 3.23. Emissions are generally of low significance, although WAI considers that following emission is significant dust blow from the open ore stockpile, which is particularly prevalent during dry, windy conditions. Currently, this is stated to be controlled by water spray on the conveyors as an interim measure. Three options for treatment in 2011 are being considered: 1. enclosure by a concrete structure, 2. snow covering of the dump in winter and water spray in summer, 3. Dust removal by telescopic extractor duct.

Table 3.23: Potential Emissions to Air		
Fugitive dust from drilling, blasting	Open pit	Inert and mineralised rock dust. Controlled by dust filters on rigs.
Fugitive dust from loading and haulage of ore	Open pit and haul roads.	Mineralised rock dust. Controlled by watering of haul roads.
Deposition and storage of coarse ore prior to milling	Ore stockpiles	Mineralised rock dust. Conveyors are covered; dust from stockpile is uncontrolled (winter only).
Process emissions	Process plant stacks and ventilation	Dust and acid vapours. Controlled by filters and enclosure.
Combustion gasses from coal-fired heating plant	Chimney stack at heating plant.	Combustion gasses, smoke particulate. Particulate filters in place, no scrubbing of gasses (low emissions).
Fugitive dust from tailings surface	TMFs	Hazardous dust, containing As and metals, which could contaminate surrounding land. (not confirmed by company monitoring) Controlled by maintaining water cover and wet tailings beaches; effectiveness is dependent on water availability and it is estimated to improve within 1-2 years as more water accumulates.

3.7.5.1 Waste Management – General

General waste and recyclable materials are collected and stored separately as appropriate, for disposal by specialist contractors. Non-recyclable waste goes to the local municipal landfill. As part of the environmental license the company maintains records and makes returns on the quantities of waste produced, under different waste categories.

3.7.5.2 Hazardous Materials Storage & Handling

Oils and fuel (hydrocarbons) – are stored in proper bunded facilities in accordance with licence requirements and international standards.

Cyanide – separate and secure storage and handling facilities. The company has recently undertaken a review of requirements under the International Cyanide Code and has prepared a detailed and comprehensive specification of requirements and actions for compliance (copy received by WAI in draft) and the company is currently considering the implementation of such requirements and actions.

3.7.5.3 General Housekeeping

In general housekeeping at the mine is excellent and all areas are maintained well. No evidence was seen of uncontrolled tipping or abandonment of disused equipment, scrap, containers or wastes.

3.7.5.4 Fire Safety

Good quality systems and arrangements are in place.

3.7.5.5 Security

The site is well secured within a perimeter fence and public safety is maintained. The plant area is accessed via manned security gates and scanners.

3.7.6 Permitting

3.7.6.1 ESIA/OVOS

The OVOS (EIA in accordance with Kazakhstan Environmental Code) process commenced in 2008 and was completed in 2009. This covered all elements of the current project (open pit mining, processing, ancillary activities, waste rock and tailings disposal) with the exception of the chemical storage, which was added as an addendum. The work was carried out by Ecotera PLC of Almaty, which is a specialist environmental design institute licensed by the Ministry of Environment.

A copy of the conclusion of the 'Expertise' (expert review and issuing of environmental permit) was provided to WAI. No major issues of concern were identified by the Ministry of Environment.

3.7.6.2 Environmental Permits and Licences

Under the Environmental Code the following licences are required, and copies were provided to WAI:

- Emission Permit, setting out annual limits of releases to air, water and wastes;
  - Air emissions – dust, heating plant, and process plant stacks/vents;
  - Solid wastes – tailings, waste rock, heating plant slimes, containers, oil & filters, office/household waste; and
- Water use permit – open pit, boreholes, Chaglinka river/reservoir and municipal waste water use.

There are no water discharge permits as there is no planned discharge of water to surface or groundwater.

> ***WAI Comment:*** *The company has the necessary environmental permits and licences in place, in accordance with Kazakh Environmental Code.*

3.7.7 Environmental Management

3.7.7.1 Environmental Policy and Company Approach

Kazzinc has a strong central corporate environmental management function, based in Ust-Kamenogorsk. There is a Chief Environmental Manager, reporting to the Vice President of Operations, and two environmental specialists at the headquarters, supporting the site-based staff. The company therefore has a consistent approach to environmental and social management systems, procedures and standards.

The company is certified across all its sites for:

ISO9001 – Quality Assurance	Certified in 2004 and audited in 2010
ISO14001 – Environmental Management System and ***OHSAS18001*** - Occupational Health and Safety Management System	Certified in 2006, recertification audit in 2009 and supervisory audits of company facilities alternately each year, starting 2007.

Glencore is a majority shareholder in Kazzinc and thus also exercises an overarching commitment to Health, Safety, Environment and Community, through the Glencore Corporate Practice commitment applied to all subsidiary companies and operations. WAI understands that all Kazzinc assets were audited by a Glencore team in early 2010. The findings of this are not available to WAI, though it is understood that the main recommendation was in connection with implementing the International Cyanide Code and the company is currently considering the implementation of such requirements and actions.

Kazzinc also commissioned specialist environmental institute ECOTERA LLC of Almaty to undertake a full audit of all the company's assets. The report: Assessment of Compliance of Activities of Kazzinc LLC with the Nature Protection Laws of the Republic of Kazakhstan and with the Requirements of Controlling Agencies, Auditors Report to Management, was presented in September 2010.

> ***WAI Comment:*** *It is clear that, at a corporate level, Kazzinc is progressive and responsible in its approach to environmental, social, health & safety management across all their operations. They have progressively implemented measures to improve air quality and water management and tailings management and maintain consistent standards in accordance with Kazakh norms, policies and requirements.*

3.7.7.2 Environmental Management Staff & Resources

Health & Safety and Environmental are separate departments, under the Department of Production and Safety, reporting to the Director of Production.

The Head of the Environmental Protection department has 4 staff: two responsible for Control (processes, checks, operations, etc.) and two responsible for monitoring (including emissions control, environmental taxes, etc.). In addition, sampling and analytical requirements are outsourced to contractors.

3.7.7.3 Systems and Work Procedures

Vasgold has prepared a series of work procedures, dated 2009, copies were provided to WAI:

- PC-EP-016 Process card for environmental management; and
- PLC-EP-011 Environmental policy and procedures.

These set out the main processes and procedures to be followed. Parameters and norms that these apply to are set out in detail in the Environmental Permits. The company adheres to these requirements; there are no additional self-imposed requirements.

Vasgold are due to be audited on 2011 in accordance with ISO14001 and OHSAS18001 certification requirements.

As indicated above, Vasgold is considering the implementation of measures in accordance with the International Cyanide Code, covering transportation, storage, handling and disposal of CN used in connection with gold recovery.

3.7.7.4 Environmental Monitoring, Compliance & Reporting

Monitoring of a range of parameters as required by the Environmental Permit, and to an agreed protocol with the Government, is undertaken quarterly by an independent laboratory. In addition, weekly samples from boreholes are monitored for a limited range of basic parameters by the mine laboratory.

Groundwater boreholes are located downstream (south-east) of the TMF, but none upstream and none around the mine or process plant. CN and As levels are monitored in these boreholes and in surface waters. Data over the last 2 years seen by WAI did not show any significant levels of either contaminant, although SO_4-Cu+ and Fe+ levels could also be measured.

Soils are monitored once per year around the mine. It is reported that As levels are naturally high background; no significant elevated metal levels are evident so far.

WAI Comment: *As the mine has only been operational at a reduced production and for a short period, significant contamination would not be expected and it is not yet possible to comment on compliance. WAI considers that the mine has a good monitoring regime in place.*

3.7.7.5 Emergency Preparedness & Response

This is included within the Health & Safety policy and covers environmental aspects. There are plans covering the pit, plant, tailings, fuel storage and chemical storage, and other aspects such as tailings pipeline burst, as part of a full Emergency Preparedness and Response Plan.

3.7.7.6 Training

The Environmental Manager and staff carry out inductions and specific training on environmental awareness and procedures to supervisory and management staff.

3.7.8 Social and Community Management

3.7.8.1 Stakeholder Dialogue and Grievance Mechanisms

WAI understand that 80% of the local population in the vicinity of the mine are employed in the mine. The mine therefore has a very close relationship with its neighbours.

There is regular communication with communities through public meetings and the local press, and regular meetings with the heads of local villages. No issues or complaints have been raised in the last 4 years and the community see the mine as a positive benefit to the area, bringing jobs and prosperity.

3.7.8.2 Social Initiatives and Community Development

Vasgold has a range of community development and support activities:

- Use of equipment for small works;
- Tree planting and support for local forestation initiatives;
- Participation and financial support for local and community events and projects; and
- Provision of sports ground for the disabled.

Kokshetau is a significant town and has a good social infrastructure, including culture, health and recreational facilities, housing and communications.

3.7.9 Health & Safety

3.7.9.1 Health & Safety Management Arrangements

The Head of Labour Safety reports to the Health and Safety Director, similar to the Head of Environmental Protection. He has a staff of 7 occupational safety specialists and 9 first aid and medical specialists (total 17).

The company has in place an extensive management system and documentation, including the following (copies provided to WAI):

1. Safe Labour Code, setting out the mission, principles and rules, dated March 2010;
2. Process card for implementation of the health care and safety of the workforce – setting out the requirements for all aspects of the mine, inputs and outputs, legal responsibilities and documents;
3. Workflow tables – detailed responsibilities, resources, parameters, reporting procedures, training, maintenance of records, etc; and
4. Specific activity 'passports' (working procedures) – 54 covering various stages and activities.

There are regular health checks for employees involved in hazardous activities and who control machinery, including blood pressure, sight/hearing, alcohol and drug use.

Signage and PPE observed around the mine by WAI were good and employees clearly respected and followed safety requirements.

3.7.9.2 Performance and Accident Records

The mine considers that it has a good no-blame culture and incidents are reported reliably, for both employees and contractors. The reporting procedures for accidents and incidents cover 5 main categories and are reported monthly. Data seen by WAI showed that for 2010 to September, there had been 73 no-lost-time incidents, 11 lost-time incidents and 0 fatalities amongst employees, and only 1 no-lost-time incident for contractors.

Workplace monitoring for light, noise exposure, respirable air quality and exposure to hazardous chemicals (such as CN) is carried out on a regular basis by specialist contractors.

3.7.10 Mine Closure & Rehabilitation

3.7.10.1 Mine Closure Plans

Vasgold has prepared a closure and rehabilitation plan for the open pit, waste rock dumps and objects directly serving the mining process, in accordance with the requirements of the Kazakh Subsoil Use Code. This is the responsibility of the mine manager and does not involve the environmental department. There are no plans covering the old heap leach areas, the process plant (licensed under a separate Industrial Code) and the TMF (considered as industrial raw material rather than mine waste).

The mine closure plan was seen but not reviewed in detail by WAI. In general it included the following:

- Construction of a safety berm around the open pit;
- Dump slopes graded and planted with vegetation; and
- Buildings and mine related structures (offices, conveyor, vehicle maintenance, refuelling area) dismantled and removed.

There are no proposals for the pit itself, as it is considered unusable due to the steep slopes, arsenic and acid contents. It is likely to flood to natural groundwater levels.

WAI understand that the company is considering the rehabilitation of the heap leach areas, dumps and unused infrastructure, but no details or plans were reviewed. There is a plan to reprocess the heaps again, and there is a contract with a Russian company to assess different processing circuits for this material, and a specialist has been employed to investigate processing options.

3.7.10.2 Financial Provision for Closure

The Subsoil Use Code imposes contractual obligations on the mine licence holder, to fund the closure requirements. A sum of 0.1% of all mine operating costs (i.e. not including the plant and other activities) has to be placed in an escrow account, separate from the company assets. In addition, a liquidation programme has to be agreed with the Government and the fund made up to cover this. This fund cannot be drawn down until mining ceases and can only be used for closure requirements.

WAI did not receive information on the detail of the closure requirements, since an action plan is not required until 2-3 years prior to closure under Kazakh standards. The sum of accrued estimated costs for closure as at 31.12.10 was US$2,120,900 as per the contract requirements. With a 'good will' sum of US$37,420,000 set aside by the Company to cover all closure requests.

WAI Comment: *WAI considers that the present arrangements for mine closure and restoration of the Vasilkovskoye Mine are fully compliant with Kazzakh requirements,although they are insufficient when compared with international requirements.*

It is advisable that a full and comprehensive mine closure and rehabilitation plan, with estimated costs, is prepared, covering not only the mine and waste dumps, but also the process plant, TMFs, the old heap leach areas, administration/offices, power plant, warehousing and related infrastructure. The safe long term (maybe permanent) storage of the sorption tailings is a particular concern.

Once the closure and long term risks and liabilities are quantified it is advisable that a financial provision and guarantee is put in place to cover these. This could probably be arranged through Kazzinc and/or Glencore corporate, as parent company guarantors, subject to whether the assets are publicly or privately owned.

3.7.11 Conclusions

3.7.11.1 Environmental and Social Liabilities & Risks

For the most part, the Vasilkovskoye Mine has a very high standard of environmental, social, health and safety management. It is compliant with Kazakh licences, permits and norms. Both the environmental and labour safety functions of the company are of high quality and well organised, and supported by a strong corporate policy, commitment and team.

There are no known social, community or cultural issues or impacts that need to be addressed, and no displacement or compensation requirements. The mine appears to have a good relationship with the local communities, and does not put undue pressure on the social infrastructure of the District or Oblast.

WAI emphasise the following areas requiring further Company attention:

1. The characterisation and safe long term disposal of arsenic and acid-producing tailings, notably the sorption tailings. Monitoring and protection of groundwater and related surface water resources is important regionally, via the River Chaglinka;
2. Dust control from the exposed tailings surface, particularly a backup irrigation system during periods of water shortage;
3. Dust control from the dry ore stockpile, from the open pit and haul roads, to prevent contamination of surrounding land; and
4. Long term closure liabilities for all the project areas need to be addressed, with a full closure plan, rehabilitation and costs, and a long term environmental liability risk assessment.

The Company considers that the above areas already receive regular attention and are being fully managed with regard to national standards, but is prepared to assess any further requirements to achieve international practice compliance.

3.7.11.2 Compliance with Local and International Standards and Expectations

The project is generally compliant with international standards and expectations, with the exception of the potential liabilities and risks identified above. It is likely that the management of hazardous tailings and the mine closure provisions fall short of international practice, although WAI believes that the company's attention is focussed on further improvement in connection with these issues and there are no reasons why they cannot be readily resolved in the near future.

3.7.11.3 Recommendations for ESAP

Table 3.24 shows WAI recommendations for inclusions in an environmental and social action plan for the mine to achieve international compliance. All these issues are being addressed by the Company.

Table 3.24: Recommendations for Environmental & Social Action Plan

Action		Priority & timescale
1.	Geochemical and environmental characterisation of the waste rock and tailings (flotation and sorption) – acid-base accounting and TCLP/SPLP leaching tests.	Immediate, high priority.
2.	Further review of tailings disposal arrangements, particularly the sorption tailings, given information from (1) above and hydrogeological modelling of seepage movements.	Q2 2011, high priority.
3.	Depending on the outcome of (1) and (2) above, implement remedial measures and improved containment for sorption tailings.	Q4 2011, 2012, priority depends on previous.
4.	Design and implement dust control for ore stockpile; possibly by containment or wind barriers.	2012; medium priority.
5.	Prepare a full and comprehensive mine closure and rehabilitation plan for all current and past project areas, with costs and timescales. Include a post closure Environmental Liability Risk Assessment.	Q4 2011; medium priority.
6.	Based on (7) above, it is advisable to provide a mine closure guarantee and fund for implementation.	2012; medium priority.

4 MALEEVSKOYE DEPOSIT

4.1 Introduction

4.1.1 Location & Access

The Maleevskoye polymetallic mine is situated some 17km to the north of the town of Zyryanovsk (where the concentrator is located) which in turn is situated 186km east of Ust-Kamenogorsk, northeastern Kazakhstan.

The geographic coordinates for the mine are latitude 49°52'57"N, longitude 84°16'49"E (Figure 4.1).

Figure 4.1: Location of Maleevskoye, Northeast Kazakhstan

The mine is linked by a graded road to Zyryanovsk (a town established on the site of historic lead-zinc production), and a paved road to Ust-Kamenogorsk, with a driving time between the two of approximately 3 hours. The Russian border lies about 45km to the northeast and the Chinese border about 200km to the southeast.

4.1.2 Topography & Climate

The area surrounding the mine shows moderate mountain relief with absolute elevations from 450m to 920m. Much of the area is covered by superficial diluvial-proluvial material which ranges from 3m to 15m in thickness effectively masking bedrock.

Vegetation consists of high mixed grass and thick bushy undergrowth with small groves of birch, aspen, poplar and bird-cherry.

The Bukhtarma River flows south of the deposit and is the main artery of the region along with its tributaries the Khamir and Bobrovka, the latter flowing through the western part of the deposit.

The region has a typical extreme continental climate characterised by a long winter (November-February) and short summer (June-August), both with sharp variations of daily temperatures. The average annual temperature is 1-2°C, with annual absolute temperature variations from -52°C in winter to +40°C in summer. The average annual precipitation at Kutiha, west of the deposit, is 700mm, distributed evenly throughout the year. Snow cover normally prevails from November to May.

4.1.3 Infrastructure

The region is sparsely populated with the majority being concentrated in the town of Zyryanovsk, which has some 50,000 inhabitants. The town has grown up around historic polymetallic mining and processing, although the deposits close to the town are now exhausted. As a result, it is only mining and agriculture that are the main sources of income in the region.

Electrical power is supplied to the mine from the Bukharma and Ust-Kamenogorsk power station, whilst water is taken from the Khamir River.

4.1.4 Mineral Rights & Permitting

Kazzinc holds the right to mine polymetallic ores under the terms of the Contract for Subsurface Use dated 21 May 1997. The contract supersedes Licence Series MG No 59 D granted to OAO Kazzinc on 28 March 1997. As amended, the Contract is valid for 25 years from the date of the licence issue and can be extended by mutual agreement between Kazzinc and the issuing authority.

The current mining lease (7.703km^2) was issued by the Ministry of Energy and Mineral Resources of the Republic of Kazakhstan in August 2001, superseding an earlier released mining lease. The boundaries of the lease are defined by 14 corner points as detailed in Table 4.1. The legal depth limit for mining defined in the mining lease is to the elevation of 1,500m below Baltic Sea datum. The deepest mine level is currently at approximately -70m level, the deepest shaft reaches -303m level and the deepest mineralised zone extends to an elevation of -1,220m.

Table 4.1: Mining Licence Coordinates

Coordinate	Easting	Northing
1	84°14'40"	49°51'58"
2	84°14'10"	49°52'51"
3	84°15'54"	49°53'43"
4	84°16'36"	49°53'40"
5	84°17'05"	49°53'37"
6	84°17'29"	49°53'25"
7	84°18'45"	49°53'41"
8	84°18'47"	49°53'37"
9	84°17'54"	49°53'24"
10	84°17'50"	49°53'12"
11	84°17'35"	49°53'02"
12	84°16'51"	49°52'39"
13	84°15'49"	49°52'37"
14	84°15'49"	49°52'20"

WAI Comment: *The Maleevskoye mine benefits extensively from the proximity of Zyryanovsk which provides the majority of the workforce as well as being well connected by rail, road and power to the rest of Kazakhstan. In this respect, the mine is very well located.*

In addition, although the climate can be harsh, the underground nature of operations insulates against weather extremes. Also, the licence documentation has been inspected and is in order. Moreover, the conditions of the licence are sufficient for the life of mine.

4.2 Geology & Mineralisation

4.2.1 Regional Geology

The Maleevskoye deposit is situated on the western limb of the Maleeevsko-Putintsevskaya anticline between the Bukhtarmy River and the northern periclinal closure of the anticline. The Revniushinskaya Formation occurs in the core of the anticline, whilst terrigenous sediments of the Maslyanskaya, Khamirskaya and Turgusunskaya Series form the limbs.

In a broader regional context, the Maleevsko-Putintsevskaya anticline forms the northern closure of the Revniushinskaya anticlinorium, which covers an area of 250km2 and contains six other polymetallic deposits, including the now exhausted Zyryanovskiy and Grekhovskoe.

With one exception, all these deposits are hosted by Middle Devonian volcano-sedimentary rocks and closely associated with sills of quartz-plagioclase porphyry and felsite either of submarine volcanic or subvolcanic origin.

Polymetallic and copper mineralisation is found in several stratigraphic levels within the Revniushinskaya and Maslyanskaya Formations and can be considered a fairly typical VMS Exhalative type. On the western side, the Revniushinskaya anticlinorium abuts against the Schebniushinsky intrusive massif composed mostly of granite, tonalite and diorite.

Figure 4.2 shows the regional geology of the Maleevskoye area and the main stratigraphic units.

4.2.2 Local Geology

4.2.2.1 Structure

The Maleevskoye deposit comprises seven stratabound zones of lead-zinc-copper-gold-silver mineralisation: Rodnikovaya, Maleevskaya, Octyabrskaya, Holodnaya, Lugovaya, Bobrovskaya and Platovskaya.

They are found at three stratigraphic levels within a 600-700m interval of the Revniushinskaya and Maslovskaya Formations, and are confined to broad mushroom-shaped brecciated domes passing downwards into steeply dipping stockwork feeder channels, which are generally aligned along a NW-trending fractures.

The stratabound bodies generally strike 300-310°, parallel to axial traces of the domes, dip at low to moderate angles SW and plunge NW.

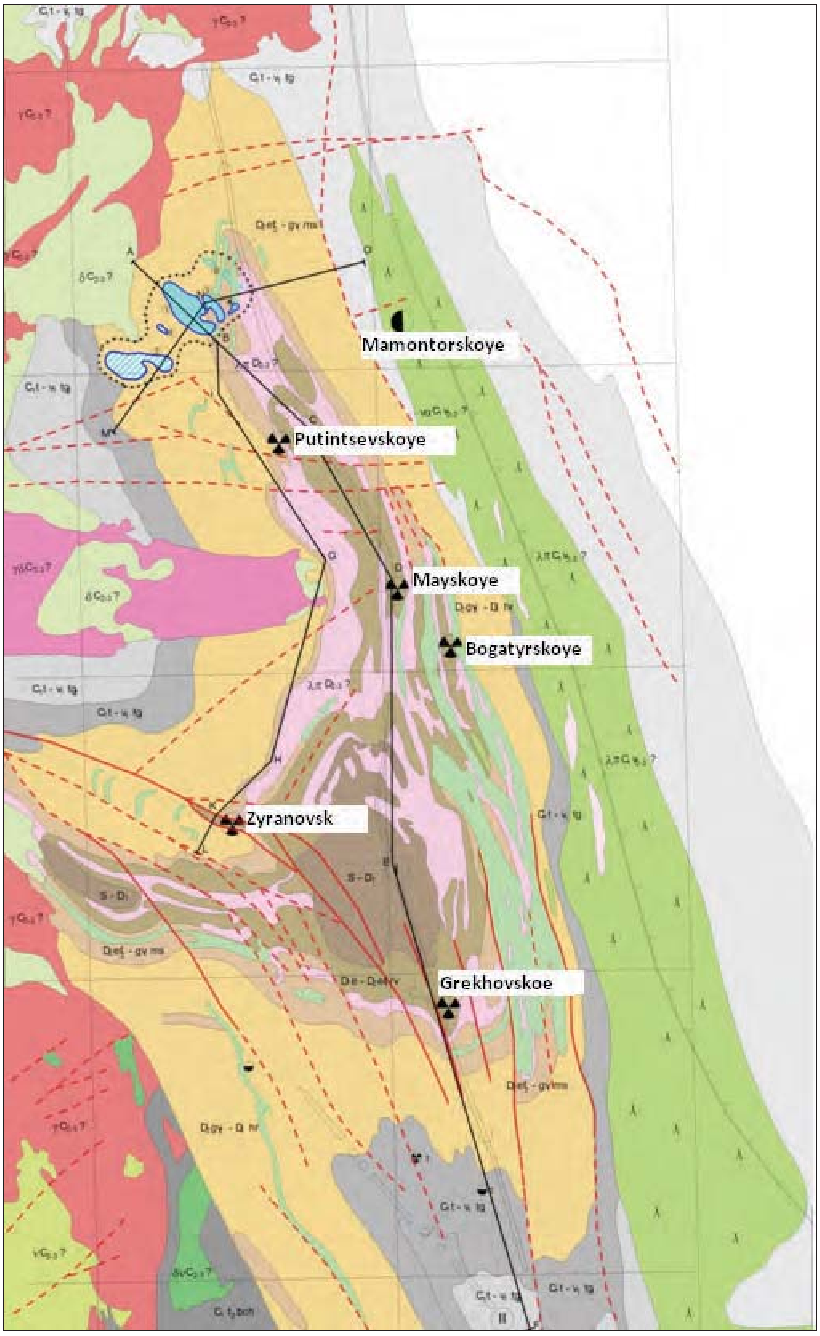


Figure 4.2: Regional Geology of the Maleevskoye Area

Legend for Figures

4.2.2.2 Mineralisation

Mineralisation is divided into polymetallic (lead-zinc with >0.6% Pb) and copper-zinc (<0.6% Pb and high Cu), the division defined by the lead content.

In general, polymetallic mineralisation, accompanied by barite, occurs on the flanks and on the hangingwall side of the lenses, whilst copper-zinc mineralisation tends to prevail in the central parts of the lenses and on the footwall side.

Soviet geologists initially thought that the mineralisation formed within thick zones of intrabed brecciation and cleavage ("traps") in pelitic-siliceous siltstones after the emplacement of the overlying rhyolite, which acted as a screen. The deposit is now regarded as syngenetic exhalative VMS mineralisation developed on the sea floor.

The largest and richest mineralised zones (Maleevskaya, Rodnikovaya, Holodnaya and Lugovaya) occur within a 150-200m thick Maleevskoye Member of the Maslovskaya Formation. They consist of massive sulphide stratabound bodies of various forms (saddles, lenses, tabular bodies) which pass downwards into veinlet-disseminated mineralisation.

Figure 4.3 shows a plan outline of the Maleevskaya Zone on 12 Level, whilst Figure 4.4 shows a section through this zone.

The upper boundary to mineralisation is generally sharp, although veinlet-disseminated mineralisation occurs locally above the massive sulphides.

The footwall boundary is generally inconspicuous as massive sulphide bodies pass into fracture filling veinlets and replacements of cement in hydrothermal breccias. This boundary has to be defined by sampling. The hangingwall is controlled by brecciated rhyolite (69%), porphyritic andesite sills and dykes (26%) and hydrothermal quartzites (5%).

Veinlet-disseminated mineralisation of the Bobrovskaya and Platovskaya zones occur at the level called Platovsky, 100-150m below the Maleevskoye level in the hinge zone of the Maleevsko-Putintsevska anticline. This type of mineralisation is characterised by poor continuity and erratic metal grades. Resource delineation requires closely spaced sampling, especially in areas where veinlet-type and disseminated mineralisation is dispersed throughout the Maslovskaya Formation between the upper and lower rhyolite bodies (e.g. on the northwestern flank of the Rodnikovaya zone and the Bobrovskaya zone).

The veinlet-disseminated mineralisation of the Octyabrskiy level occurs in mottled slates at and below the interface of the Revniushinskaya and Maslovskaya Formations. Another level of veinlet-disseminated mineralisation has been encountered in the middle of the Revniushinskaya Formation, 50-150m below the Octyabrskiy level. The mineralisation at this level occurs in quartz rhyolites and andesite-dacite porphyries and is also characterised by erratic grades and poor continuity.

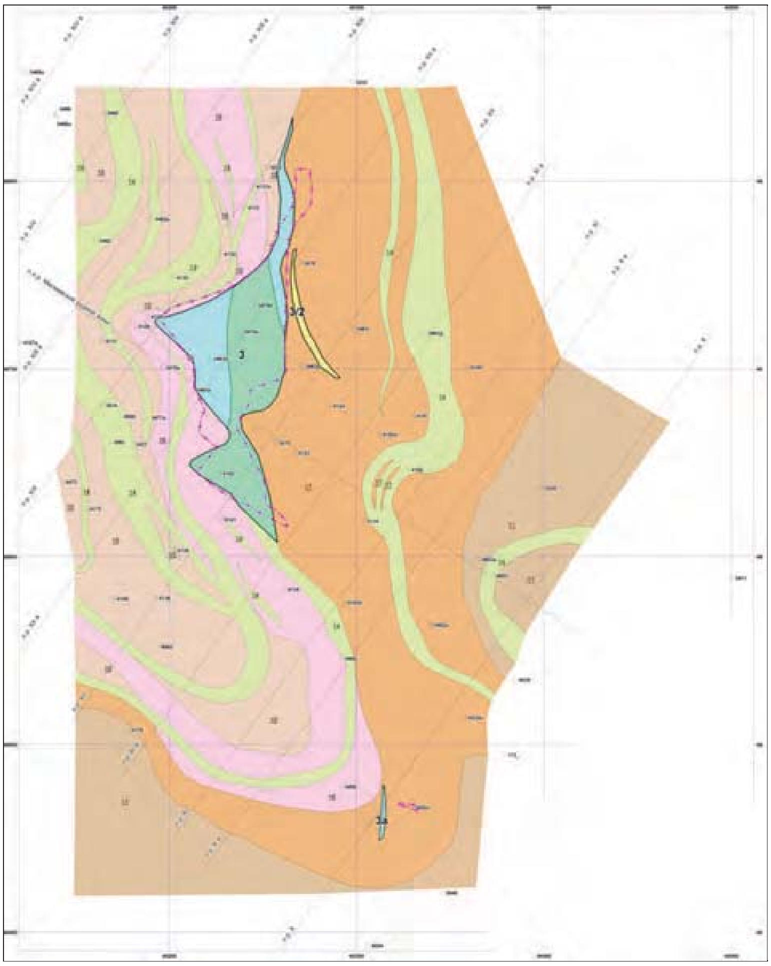


Figure 4.3: Outline of the Maleevskaya Zone (Orebody 3), 12 Level (Grid:100m)

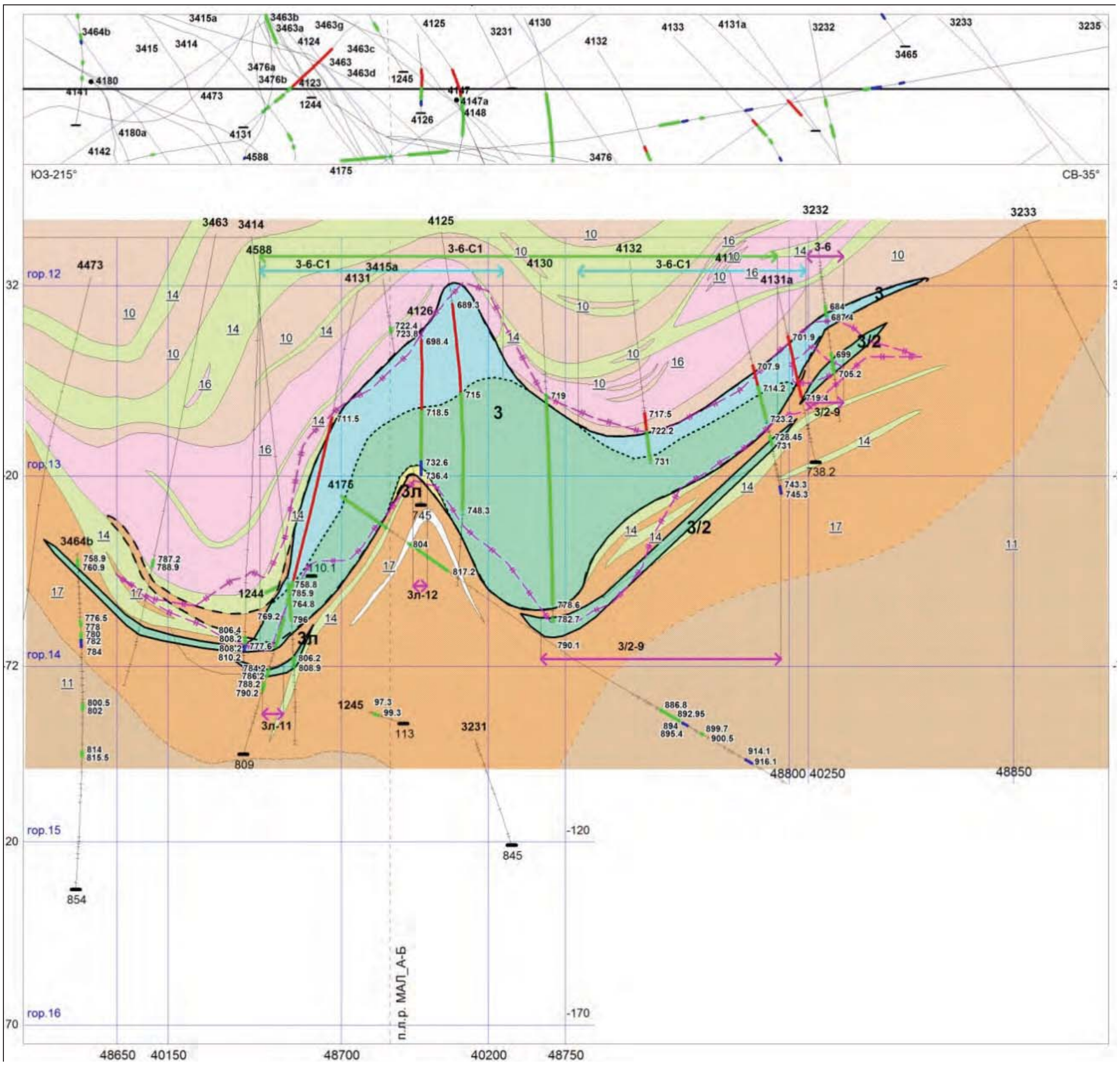


Figure 4.4: Section XIII through Maleevskaya Mineralised Zone (Orebody 3)

4.2.3 Orebodies

4.2.3.1 Maleevskaya Zone

The outcrop of this zone was mined in a small open pit and from shallow adits. The blind extension of this zone, called Novo-Maleevskaya, was discovered in 1979. A series of folded stratabound lenses of complicated geometry has subsequently been traced to a depth of 700-750m. The overall strike of the zone is 315˚ with a 32-35˚ northwestern plunge. The combined strike length is 2.3km.

The largest mineralised body in this zone, identified as No 3 Orebody, has a strike length of 1,175m and extends from Level 4 (430m) down to Level 16 (-170m). Its larger north¬western segment measures 575m in strike length with a down-dip extent of up to 250m. Dips are highly variable but generally less than 40˚SW flattening and turning NE at the north¬western end. The southeastern part is about 410m in strike length and extends down-dip for up to 195m. The average dip is 20-25˚SW.

In addition, this zone contains small satellite bodies. Mineralised body 3a is located at Levels 10 to 12 (130-32m) at the same stratigraphic level as No 3 Orebody. Mineralised lenses 3b and 3v are located at a slightly higher stratigraphic level, 90-125m from the south-eastern segment of No.3 Orebody. Lenses 3/2 (Figure 4.5 and Figure 4.6) and 3l are found in the footwall of No.3 Orebody at levels 11 to 13 and 13 to 15 respectively.

4.2.3.2 Rodnikovaya Zone

This is the main mineralized zone at the Maleevskoye deposit. It extends from Level 9 at 180m down to Level -550m along a dome structure plunging 25-30˚ northwest. The total strike length is 1,750m.

The zone contains 18 stratabound mineralised lenses with complicated forms due to folding and the presence of cross-cutting dykes. Orebodies 6 and 7, which hold the bulk of the Maleevskoye resource, represent a single predominantly massive sulphide body cut by a dyke of porphyritic dolerite and its apophyses.

Orebody 6 is situated above the steeply dipping porphyrite dyke. On average, it dips 35°WSW and plunges 27°NNW. The vertical span is 434m between absolute elevations of 318m and -116m.

Orebody 7 is situated below the dioritic porphyrite dyke. It dips 36° WSW and plunges 23° NNW. The vertical span is 383m from 213m to -170m. The combined strike length of both orebodies exceeds 1,500m, the combined true width is in the range of 120-380m and the horizontal width reaches 900m in the central part of the zone.

There is strong vertical mineral zoning. From top to bottom the main zones are:

- Thin discontinuous pyritic zone along the hangingwall;
- Barite-lead-zinc mineralisation;
- Zinc mineralisation;
- Pyrite-polymetallic mineralisation with barite;
- Pyrite-copper-zinc mineralisation;
- Copper-pyrite mineralisation, and
- Pyritic zone in the footwall (0.5-7m) passing down into disseminated pyrite.

Massive sulphides, represented by pyritic-polymetallic, copper-zinc and barite-bearing varieties are best developed in Orebody 6 (over 70% of Total volume). Disseminated ore types occur mostly in the footwall and on the flanks.

Overall, the dyke and its apophyses make up about 11% of the volume of the Rodnikovaya Zone. As dolerite apophyses are more abundant in disseminated mineralisation, they contribute about 8% of volume within copper-zinc mineralisation and only 3% of volume within predominantly massive sulphide polymetallic mineralisation. Other barren and sub-economic partings are represented mainly by weakly mineralised quartzites. On average, barren and sub-economic partings form 8.3% of the Rodnikovaya Zone.

The footwall contact is transitional. The pyritic zone passes into microquartzites with relics of bedding and disseminated syngenetic pyrite (0.001-0.05mm) forming bands and small lenses. These rocks are cut by steep feeder channels marked by brecciation with quartz-sericite-chlorite alteration and cubic pyrite (0.04-0.1mm).

In contrast, the hangingwall contact with rhyolites, siltstones and porphyritic andesites is sharp with no, or very weak alteration.

4.2.3.3 Bobrovskaya Zone

This zone is situated southwest of the Rodnikovaya Zone at a depth of 1,000-1,500m below the surface. It contains at least three lenticular bodies over a strike length of 1,750m.

4.2.3.4 Octyabrskaya Zone

This zone is situated a short distance to the northeast of the Maleevskaya Zone. In contrast to other zones, it is bowl shaped. The strike length is 600m. Mineralised bodies forming this zone dip west and northwest.

4.2.3.5 Holodnaya Zone

This is the deepest zone so far discovered at the Maleevskoye deposit. It is situated at a depth of 1,400-1,700m, 2km from the central part of the Rodnikovaya Zone. It has been followed by drilling over a strike length of 1,500m. From the north and northwest, the zone is bounded by intrusive rocks of the Schebniushinskiy massif. Its prognosticated southwest extension, called Lugovaya Zone, was confirmed in drillholes 4452a, 4503 and 4510. In 2001-2008 Kazzinc drilled 12 diamond drillholes totalling 21,579m, including 4,068m of deflections. Drillhole 7005 intercepted rich massive pyritic-polymetallic mineralisation. Four other holes intercepted lower grade veinlet-type mineralisation.

4.2.3.6 Platovskaya Zone

This zone occurs within a NNW trending subsidiary situated in the northeastern part of the deposit, 700m from the Maleevskaya Zone. It extends over a vertical distance of about 120m with widths in the range of 5.5m to 23m (6m on average). The lode plunges 20° NW.

4.2.4 Mineralogy

The main metalliferous minerals are pyrite, sphalerite, chalcopyrite and galena. Black ore (tetrahedrite-tennantite), pyrrhotite and magnetite occur in subordinate amounts. Accessories include native gold, silver, antimony, bismuth, electrum, bismuthite, molybdenite, cobaltine, pyrargyrite. The main gangue minerals are quartz, chlorite, calcite, barite, actinolite, tremolite and less common sericite, albite, epidote and biotite.

With respect to chemical composition, the Maleevskoye mineralisation is pyritic polymetallic with the average Pb:Zn:Cu ratio of 1:6:1.7.

As mentioned above, from a technological standpoint, the ore is divided into pyritic copper-zinc (<0.6% Pb) and polymetallic (≥ 0.6% Pb), with further subdivisions depending on the relative abundance of sphalerite, galena, chalcopyrite and pyrite. The lead content is the key parameter as ore with less than 0.6% does not produce a lead concentrate. The relative abundance of the two technological types and the mineralogical subtypes are given in Table 4.2.

Pyritic copper-zinc mineralisation generally prevails in the central portions of mineralised bodies.

Although the various mineralogical types alternate, there is a weak mineral zoning within the main mineralised zones expressed, from footwall to hangingwall, by the following sequence: pyritic - pyritic copper - copper-zinc – zinc - lead-zinc -polymetallic.

Table 4.2: Technological and Mineralogical Classification of Maleevskoye Mineralisation

Type	Subtype	Relative Abundance %
Polymetallic (>0.6% Pb)	Polymetallic	10
	Lead-zinc	7
	Zinc	34
Pyritic copper-zinc (<0.6% Pb)	Copper-zinc	37
	Pyritic copper	10
	Pyritic	2

Pyritic mineralisation in the footwall is highly variable in thickness (up to 7m). The pyrite content is in the range of 30-60% in disseminated varieties and up to 95% in massive mineralisation. Chalcopyrite is the main associated ore mineral (1-3%). The boundary between the pyritic subtype zone and the overlying mineralisation (generally pyritic copper) is arbitrarily set at 1% ZnEq[1].

Massive sulphides have a complex internal composition with massive, banded, lenticular and rare brecciated and mottled textures. Disseminated mineralisation, which makes up about 40% of the total volume of the mineralisation, occurs mainly at the base and on the flanks of massive sulphide bodies. It is represented by veinlet, veinlet-disseminated and disseminated textures. The matrix is formed by hybrid rocks (95.9%) represented by quartzites and silicified siltstones and porphyries (4.1%). Polymetallic and lead-zinc mineralisation often contains barite either as bands or lenses.

The main recoverable by-products are gold and silver. Gold occurs in its native form as very fine grains (5-8 microns) dispersed mainly in pyritic copper mineralisation and barite-bearing lead-zinc mineralisation. A small percentage of gold occurs as larger visible grains of up to 0.8mm across. The fineness of gold is 794.

Silver is also very fine and occurs as native silver and electrum in massive and banded barite-bearing polymetallic mineralisation and, in lesser quantities, in lead-zinc mineralisation. It is associated with pyrrhotite, barite and black ore.
Coarser electrum (20-70 microns) occurs as inclusions in pyrrhotite in pyritic copper-zinc mineralisation.

Barite-bearing polymetallic mineralisation also contains silver in freibergite and pyrargyrite.

*ZnEq[1] (zinc equivalent) is defined as 0.4*Pb + Zn + 1.4*Cu, with grades less than 0.4% Pb, less than 0.1% Zn and less than 0.1% Pb not being subject to conversion*

4.2.5 Exploration Potential

A number of other small occurrences/deposits have been identified which either have been depleted (Grekhovskoe) or are too small to be of interest.

However, the main potential appears to be down-dip from the known mineralisation towards the Holodnaya zone, although as yet, no other commercial scale mineralisation has been defined.

> ***WAI Comment:*** *The geology and mineralisation of the Maleevskoye deposit are well known through decades of exploration and nearly ten years of exploitation. It is characterised as a Volcanogenic Massive Sulphide (Exhalative Type) deposit. The orebody geometry and mineralogy are relatively straightforward and well known and efficient mining methods maximise ore extraction.*
>
> *Maleevskoye deposit is world class in terms of the base and precious metal grades it contains. Coupled with the generally large dimensions of the various ore zones which lend themselves to bulk mining techniques, Maleevskoye represents a tremendous asset to Kazzinc.*

4.3 Exploration Works & Procedures

4.3.1 Background

The Maleevskoye mine has had a long history of exploration before production finally commenced in 2000.

Surface discoveries were made in the 19th Century, but it was not until the 1950's that systematic exploration took place which has continued following a series of specified protocols through to the present day.

4.3.2 Drilling

Table 4.3 below presents data on exploration undertaken at Maleevskoye from 1950 – 2004.

Table 4.3: Historical Exploration Works			
Activity	**Dates**	**Drilling (km)**	**Drilling (holes)**
Preliminary Reconnaissance Works	1950-1955	14.0	56
Follow-up Exploration	1967-1974	6.4	10
Continued Exploration	1979-1983	93.6	159
Reconnaissance	1981-1986	159.6	281
Detailed Reconnaissance	1983-1986	111.3	237
Additional flanks exploration	1987-1988	31.2	47
Exploration on flanks and deep horizons	1986-1992	176.1	153
Exploration on the flanks	1988-1993	124.8	121
Holodnaya Exploration	2001-2004	10.3	6
Total:		**724.3**	**1070**

The main surface drilling campaign was carried out in 1979-1986 using conventional drill rigs, including hydro-percussive rigs. Depending on depth of drilling, the drilling diameter was 76mm or 59mm.

Unusually, some of the core remains from this period, representing mineralised intersections through ore that has not yet been mined - protocols allowed for core to be discarded once that particular part of the orebody had been exploited.

Wireline drilling with the NQ size (75mm) has been used in most recent drilling programmes, including the most recent deep drilling to delineate the Holodnaya zone.

Drilling profiles at Holodnaya are aligned on an azimuth of 055˚, which appears to be perpendicular to plunge, whereas early drillholes, prior to the discovery of the Rodnikovaya zone, were sited on profiles trending 074-075˚.

The majority of surface drillholes are sited along profile lines on an azimuth of 035˚, perpendicular to the prevailing plunge direction, and drilled at various angles with or without wedging to reach expected intercepts at predetermined points. As most mineralised bodies have lenticular forms elongated along the plunge direction and highly variable strikes and dips, grid orientations vary to suit local conditions.

Most drillholes were angled as required to secure intersections at angles approximating 90˚. Many holes had up to three or wedged deflections (total of 302 wedged deflections for 103,000m). In most instances, drillholes were naturally deflecting due to complex folds typically 60-300m in wavelength and 200-300m in strike length.

Recent exploration in the developed sections of the mine from Level 3 to Level 14 has been conducted entirely by underground exploration methods, including underground diamond core drilling. A grid of 50x50m is regarded as optimal for the delineation of a C_1 resource and a grid of 30m along strike or plunge by 25m along dip for an upgrade to a B category. Closer spaced drilling is applied is areas of complex geology.

Sludge drilling combined with electrical logging to confirm the hangingwall contact had been used in addition to channel sampling prior to 1999.

Exploration below the current development and elsewhere in undeveloped areas relies on surface diamond drilling which is subcontracted to Zyryanovsk Geological-Exploration Expedition (Zyryanovsk GRE). Drilling grids vary depending on the structural complexity and grade variability. A grid of 100m by 100m is currently considered optimal for the delineation of a C_2 category resource. Grids used in the past were generally 200m along strike or plunge by 25-50m down dip for the delineation of a C_2 category resource and 100m by 25m respectively for its upgrade to the C_1 category.

4.3.3 Surveying

All underground exploratory workings, collar positions of surface and underground exploration drillholes and geophysical survey points were surveyed using instrumental methods. This is considered sufficiently accurate for resource modelling and mine planning purposes.

Downhole surveys have been conducted in all drillholes at 20m intervals and at 5-10m intervals in wedged intervals. Various instruments were used at various times. In the 1987 report, it is stated that absolute errors of zenithal angles and azimuths were 21′ and azimuth 1˚53′ respectively. Higher errors are mentioned in the report on the Holodnaya drilling (series 7000 holes). At deviations to 10˚, errors in measurements of zenithal angle and azimuth did not exceed 0.5˚ and 5˚ respectively. At deviations exceeding 10˚, errors in measurements of zenithal angle and azimuth did not exceed 1˚ and 5° respectively.

Geophysical drillhole logging, including electrical logging and roentgen-radiometric grade logging, has been routinely conducted in most surface drillholes to monitor depths of mineralised intercepts recorded in drill logs and to monitor grades.

Oriented drill core was collected from 111 holes in 1980 and compared with telephoto logging records.

4.3.4 Core Recovery

4.3.4.1 Surface Drilling

Geoincentr (2005) reported that core recoveries in excess of 80% were achieved for 61.7% of the total length of mineralised intercepts included in the resource estimate approved by GKZ RK. Core recoveries improved in surface drillholes completed after 1986.

Geoincentr (2005) also reported results of a comparison of linear core recoveries with weight core recoveries for the post-1987 drilling. No systematic bias in recording linear core recovery was observed.

Differential loss is suspected to have occurred only in pre-1986 drilling. Correction coefficients have been proposed to account for it. The correction coefficients are: 1.2 for Pb, 1.2 for Zn, 1.1 for Cu, 1.3 for gold and 1.1 for Ag.

4.3.4.2 Underground Drilling

Geoincentr (2005) reported some quality control data for the underground diamond core drilling and sludge drilling.

4.3.4.3 Underground Sampling

Horizontal channel samples were taken with a chisel and hammer from one or two walls of each underground opening with visible sulphide mineralisation. Channels are 10cm wide and 2.5cm deep.

There has been a considerable amount of work done to check the quality of channel sampling. It included duplicate sampling, larger channels, control drilling and bulk sampling. Geoincentr (2005) reported rather large relative differences, but no systematic bias.

4.3.4.4 Core Sampling

All mineralised intervals have been sampled, by splitting drill core in a mechanical splitter up to 1968, and then by sawing the core in two halves. From 1974, all drill core recovered from 59mm diameter holes was taken for sample preparation. Core from subsequent drilling programmes was sawn in half. Lengths of core samples range from 0.1m to 2m.

Geoincentr (2005) mentioned that that 5,784 core samples were included in the 1986 resource and those samples comprised 39 samples from 93mm diameter holes, 610 samples from 76mm diameter holes and 5,135 samples from 59mm diameter holes. Core sampling variance depends on the core diameter, the smaller the diameter the larger the variance.

Pulverised sample rejects were composited over intervals with similar characteristics for analyses for potential by-product elements and deleterious elements. The analyses also included the main elements. The samples were typically in the range of 300-500g each. Geoincentr (2005) reported that a statistical analysis of composite sample results confirmed that no mineralisation of potentially economic grades was overlooked.

Geochemical samples were collected from each lithological unit outside mineralised zones.

4.3.5 Sample Collection

The sample preparation scheme is based on the Richard-Czeczott formula Q=kda, where Q is the minimum sample quantity at a given stage of volume reduction, d is the diameter of the largest fragments defined as the screen size that retains the largest 5% of the mass, k is a coefficient dependent on the distribution irregularity of the mineral of interest and a is a coefficient related to the roundness of mineral grains (generally approximately 2).

The coefficient k is the key parameter. In general terms, the lower coefficient k is, the better it accounts for the erratic distribution of minerals.

Different schemes were used at different times. The k coefficient for processing drill core from surface drilling was initially 0.2, then 0.6 from 1978 and 0.2 again from February 1984.

Experimental tests confirmed that the 0.2 coefficient was appropriate. The k coefficient for processing underground drill core was initially 0.2 and then it was changed to 0.1 in 1993.

A series of tests conducted on four bulk samples representing polymetallic and copper-zinc mineralisation confirmed that the scheme based on the coefficient 0.2 was appropriate.

4.3.6 Sample Analysis

Routine analyses were performed mainly by the Zyryanovsk GRE laboratory. All samples with spectral Pb+Zn+Cu results greater than 0.5% or Zn results greater than 0.3% were analysed by the AAS method, which was introduced towards the end of 1980. Reported lower and upper detection limits are: 0.005-20% for Cu and Zn and 0.02-20% for Pb. Samples containing more than 20% Zn or more than 20% Pb were analysed by the titrometric method. A small number of drill core samples from surface exploration was analysed by the polarographic method on electron polarograph CLA-2122.

External control analyses were performed by Vostkazgeologia in Ust-Kamenogorsk. Analyses for by-product elements and deleterious elements were conducted by Vostkazgeologia and external control analyses by Yuzhkazgeologia in Almaty.

Out of a Total of 14,524 analysis made in 1980-1986, 2,016 duplicate samples (13.9%) were subjected to internal control analyses and 1,765 duplicate samples (12.2%) to external control analyses. Average relative differences of internal control samples were within acceptable limits.

However, based on external control analyses, some systematic errors were detected in specific periods, although samples from these periods represented different parts of the deposit, most of which have since been delineated in detail during underground development. On the whole, therefore these errors are not considered to have biased the average grades.

4.3.7 Current Activities

The mine currently operates three Diamec 262 rigs completing around 50,000m of development exploration drilling per year.

All the core from this drilling is crushed and sampled, as the 42mm diameter core does not allow sub-samples to be statistically valid. The results from these samples are input to the resource model to improve future mine planning and resource estimation.

For grade control, a small 5-9kg grab sample is taken after each blast. In addition, all wagons pass over a weightometer where sample analysis is done using a portable XRF, which allows classification of the ore into either polymetallic or copper-zinc (or some mixture of the two).

Continued surface exploration drilling uses a half core for analysis, the remainder are currently kept at the mine in a new core storage unit, which also has a small laboratory attached.

> ***WAI Comment:*** *The Maleevskoye deposit has been thoroughly explored and developed over a period of approximately sixty years. As such, the huge volume of exploration data available on the mine, coupled with the knowledge that these data will have been collected under strict Soviet protocols, provides strong comfort to the quality of data. Moreover, nearly ten years of production has allowed comparisons of exploration data with production information, and in general, exploration (both past and present) has proved satisfactory in delineating the sometimes complex mineralised zones.*
>
> *In particular, the use of small, versatile underground core rigs for development exploration has proved vital in efficient orebody definition.*

4.4 Mineral Resources

4.4.1 Introduction

Maleevskoye is unusual in Kazakhstan in that the most recent GKZ approved resource was estimated using contemporary techniques and software. The initial estimate was created in the Datamine software by Computing Resource Services Ltd (CRS) in late 1999. CRS then went on to train Kazzinc personnel before handing over to them in 2002/03.

After the handover, Kazzinc retained Almaty-based TOO Geoincentr and ZF TOO Geos to prepare a resource report in the format required by GKZ RK. The report (Geoincentr, 2005) contains two resource estimates:

- Geostatistical estimate in Datamine (Kriging) with about 80% of the estimated resource checked using a locally-developed GST programme; and
- Conventional estimate using the method of parallel vertical cross sections in the developed part of the deposit and the method of geological blocks in the undeveloped part.

The estimates were accepted and approved by GKZ RK in February 2005 (Protocol No 379-05-U dated 11 February 2005).

4.4.2 Resource Conditions

The currently valid resource conditions were approved by GKZ RK on 22 July 2004 (Memorandum No 327-04-K).

The approved conditions require a resource to be estimated and reported for two types of mineralisation, namely polymetallic mineralisation (with the lead grade equal to or more than 0.6% Pb) and copper-zinc mineralisation (with the mean lead grade less than 0.6%).

For the developed part of the Maleevskoye deposit, the resource conditions are as follows:

- Sample cut-off grade to define mineralised intercept intervals - 1.0% ZnEq, where ZnEq = 0.4*Pb + Zn + 1.4*Cu, with grades less than 0.4 % Pb, less than 0.1% Zn and less than 0.1% Pb not being subject to conversion.
- Minimum grade in estimation block - 3.3% ZnEq.
- No top-cut applied.
- Minimum thickness – 2m.
- Maximum thickness of barren and below cut-off inclusions – 4m.
- Cut-off grade for delineation of off-balance resource – 0.8% ZnEq.

Grades of lead, zinc, copper, gold, silver, cadmium, bismuth, indium, selenium, tellurium, arsenic, antimony, total sulphur, pyritic sulphur and barite should be estimated within mineralisation shells. Blocks with mean grades of less than 3.3% ZnEq should be classified as an off-balance resource. Estimates of pyritic sulphur and total sulphur should be reported in the off-balance category.

Correction coefficients should be applied to mean block grades estimated from drilling results reported prior to 1987. The correction coefficients are: 1.2 for Pb, 1.2 for Zn, 1.1 for Cu, 1.3 for gold and 1.1 for Ag.

4.4.3 2005 GKZ Approved Estimate

Details of the 2005 Balanced Ore Conventional Reserve calculation are given in Table 4.4 below.

Table 4.4: 2005 Conventional Reserve Estimate

	Reserves						**Average content**				
	Ore '000t	Pb '000t	Zn '000t	Cu '000t	Au kg	Ag t	Pb %	Zn %	Cu %	Au g/t	Ag g/t
Total	39400.5	548.3	3415.3	1012.4	28627.0	3233.3	1.39	8.67	2.57	0.73	82.06
Made up of:											
Polymetallic	19294.6	491.7	2643.2	379.2	16851.6	2427.4	2.55	13.70	1.97	0.87	125.81
Copper-zinc	20105.8	56.6	772.1	633.2	11775.4	805.9	0.28	3.84	3.15	0.59	40.08

In comparison, detailed below is the 2005 Geostatistical Reserve Estimate which has been approved by GKZ (Table 4.5).

Table 4.5: Geostatistical GKZ-Approved Resources

	Reserves						Average Content				
	Ore '000t	Pb '000t	Zn '000t	Cu '000t	Au kg	Ag t	Pb %	Zn %	Cu %	Au g/t	Ag g/t
Total	42703.5	641.9	3499.6	1017.4	33139.9	3478.4	1.50	8.20	2.38	0.78	81.45
Made up of:											
Polymetallic	28084.6	592.00	2894.8	624.8	24088.9	2631.9	2.11	10.31	2.22	0.86	93.71
Copper-zinc	14618.9	49.9	604.9	392.5	9051.0	846.5	0.34	4.14	2.69	0.62	57.91

The approved resource estimate has also been classified according to the various parts of the deposit, the results of which are shown in Table 4.6.

Table 4.6: Classified Geostatistical Approved Resource				
	Ore Reserves	Metal content		
		Lead	Zinc	Copper
	t	%	%	%
Category C_1				
Reserves of Developed part of Mine				
Total	23,399,055	1.35	8.56	2.76
Reserves of Undeveloped part of Mine				
Reserves of Rodnikovaya ore zone				
Total	8,852,260	1.41	7.43	2.00
Reserves of Maleevskaya ore zone				
Total	6,276,000	1.36	8.02	2.39
Total Category C_1				
Total	38,527,215	1.37	8.21	2.53
Category C_2				
Reserves of Undeveloped part of Mine				
Reserves of Rodnikovaya ore zone				
Total	2,101,500	3.36	8.17	1.38
Reserves of Maleevskaya ore zone				
Total	113,800	3.00	10.21	0.79
Reserves of Oktyabrskaya ore zone				
Total	1,909,900	2.13	8.02	0.73
Total C_2 category				
Total	4,125,200	2.78	8.16	1.06
Total C_1+C_2 categories				
Total	42,652,415	1.50	8.20	2.39

WAI Comment: *It is very encouraging that GKZ has allowed the use of a geostatistical resource estimate to become part of the State balance, albeit still classified under the Russian system. Moreover, the closeness of the geostatistical and conventional estimates provides extra comfort as to the robustness of the resource. Overall, the Maleevskoye resource base is sound and can be relied upon for future mine scheduling and development.*

4.5 WAI 2010 Resource Estimate

4.5.1 Introduction – Previous Resource Estimates

The mineral resource model presented and evaluated here for the Maleevskoye polymetallic deposit has been supplied by Kazzinc and created by the methods laid out below in accordance with the guidelines of the JORC Code (2004). The effective date of the resource estimate is 01 January 2011.

4.5.2 Database Compilation

The sample database was supplied by Kazzinc in Datamine Format separated by mineralised zone and orebody. Checks were made for overlapping or duplicate samples and the database was found to be in good order. Orebody 3 in the Maleevskaya Zone and orebodies 6 and 7 in the Rodnikovaya Zone are the most extensively sampled. Table 4.7 below lists the number of samples by orebody. As different sampling intervals were used for the different elements, the lengths and number of samples reported in Table 4.7 are for Pb/Zn/Cu analysis.

4.5.3 Domaining

Mineralised zone wireframes have been created within Datamine to a sample cut-off grade of 1.0% Zinc Equivalent (ZnEq) where ZnEq= 0.4*Pb + Zn + 1.4*Cu where grades of less than 0.4% Pb, 0.1% Zn and 0.1% Cu were not converted. The minimum thickness of mineralised intercept is 2m and the maximum included thickness of barren or below cut-off grade samples is 4m. As examples, Figure 4.5 and Figure 4.6 below are isometric views of the Maleevskaya Zone orebodies and ore body 6 and orebody 7 from the Rodnikovaya Zone.

Table 4.7: Sample Database

Orebody	Number of Samples	Minimum Length	Maximum Length	Mean Length	Total Length
		Maleevskaya Zone			
3	4126	0.10	4.30	1.57	6497.77
3b	29	0.40	2.10	1.45	42.00
		Octyabrskaya Zone			
18	89	0.50	2.80	1.72	153.10
19	131	0.20	2.00	1.41	184.60
		Rodnikovaya Zone			
5	464	0.10	2.50	1.61	747.15
6	12728	0.10	16.00	1.64	20864.33
7	15365	0.10	26.00	1.61	24804.30
7_4	463	0.20	2.20	1.64	758.80
9	51	0.20	2.00	1.02	52.22
10	272	0.10	5.70	1.19	324.64
10a	37	0.20	2.10	1.22	45.20
10b	6	0.65	1.50	0.90	5.40
11	17	0.10	2.00	0.83	14.05
13	7	0.40	2.00	1.07	7.50
14	49	0.20	2.05	1.08	53.00
14a	6	0.35	2.05	0.68	4.10
72	15	0.20	1.50	0.85	12.70
7a	130	0.20	2.00	0.99	128.85

Figure 4.5: Isometric View of Maleevskaya Zone Orebodies 3 and 3b looking approximately SE

Figure 4.6: Isometric View Rodnikovaya Zone Orebodies 6 and 7 looking approximately SE

4.5.4 Global Geostatistical Analysis

The database is very robust and contains a significant number of samples for the larger orebodies. Statistical analysis indicates roughly log-normal populations of grades for each individual orebody with no significant bias present. As examples, Figure 4.7 shows the log-probability plots for orebody 3 Pb, Zn, Cu grades. Figure 4.8 shows the log-probability plot of Au within Orebody 7 and Figure 4.9 is the log-probability plot of Ag also within orebody 7.

Different sample intervals have been used for Pb/Zn/Cu, Au/Ag and Ba/S analysis. For this reason different composite lengths have been selected. A composite length of 3m has been selected for Pb/Zn/Cu assays, a composite length of 5m has been selected for Au/Ag analysis and a composite length of 4.5m has been selected for S/Ba assays.

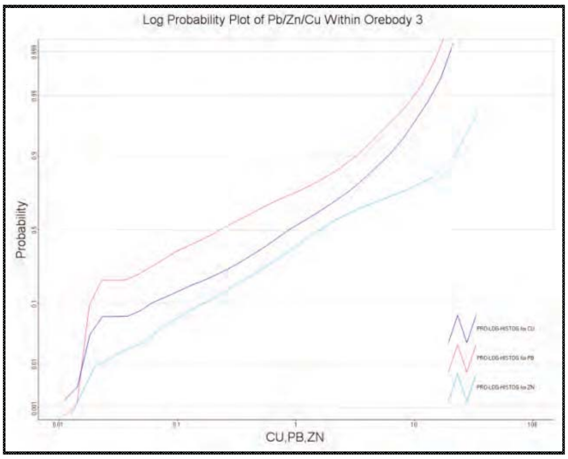


Figure 4.7: Log Probability Plot of Pb/Zn/Cu within Orebody 3 Maleevskaya Zone

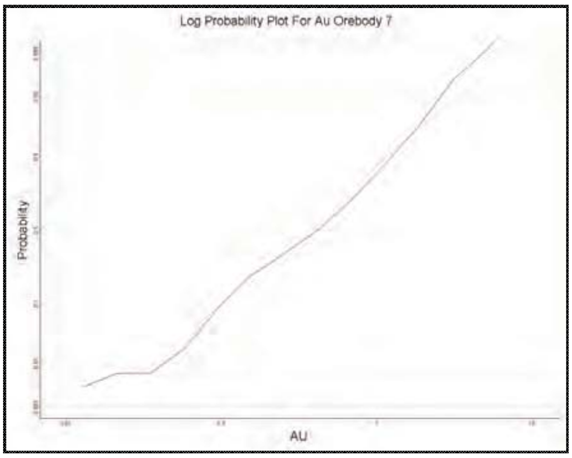


Figure 4.8: Log Probability Plot for Au in Orebody 7 Rodnikovaya Zone

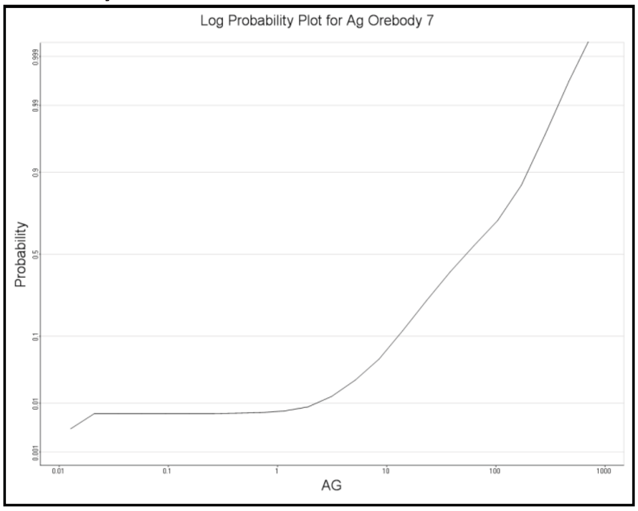


Figure 4.9: Log probability Plot of Ag within Orebody 7 Rodnikovaya Zone

WAI Comment: *WAI considers the composite lengths chosen to be appropriate with regard to the mean and the spread of the sample lengths.*

4.5.5 Variography

The initial estimate for the Maleevskoye deposit was created using Datamine software by Computing Resources Limited (CRS) in 1999. CRS continued to update the model and train Kazzinc personnel until the model was handed over to Kazzinc in 2002/2003. Part of this process was a variographic study which has been updated as required. Directional semi-variograms for the along strike, down dip and across strike directions were generated for Pb, Zn, Cu, Ag, Au, Ba and pyritic Sulphur. Examples of some of these experimental variograms and their associated models are shown below in
Figure 4.10 and Figure 4.11.

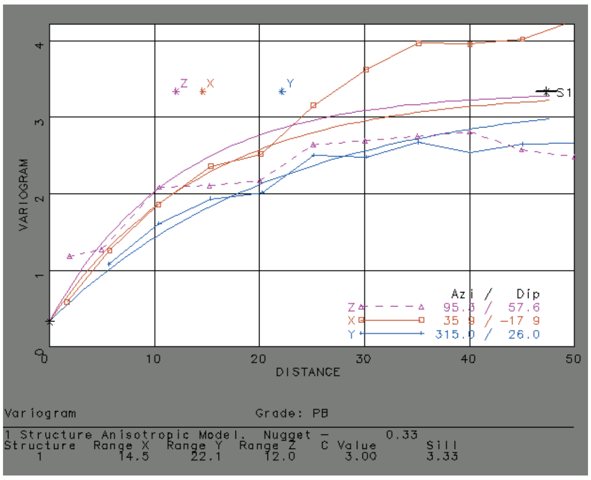


Figure 4.10: Variogram Model for Pb in Orebody 6

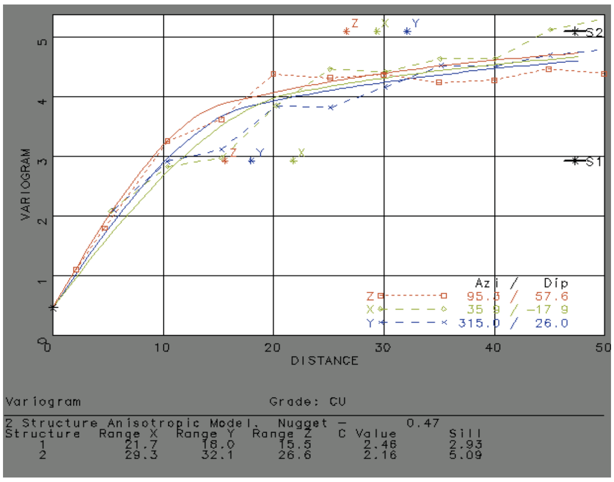


Figure 4.11: Variogram Model for Cu in Orebody 7

4.5.6 Block Modelling

Block models were created within each of the mineralised zone wireframes. A parent cell size of 10x10x10m was selected. Sub cell splitting to a minimum block size of 2.5x2.5m in the X strike and Y directions has been used with precise fitting to wireframe boundaries in the Z direction where additional cell resolution is required.

4.5.7 Density and Zinc Equivalent

Bulk density has been determined on approximately 15,000 samples (mostly drill core). This included 4,135 samples from the Maleevskaya Zone and 5,939 samples from the Rodnikovaya Zone. Regression formulae have been developed for each of the zones and these were used post grade estimation to calculate density in the block models. These regression formulae are listed below in Table 4.8. A zinc equivalent grade (ZnEq) is calculated in to the block models from the estimated grades using the formula ZnEq= (0.4 x Pb) + Zn + (1.4 x Cu).

Table 4.8: Density Regression Formulas

Zone	Density Regression Formulae
Maleevskaya	2.7351+0.101*(PB+0.8*ZN+CU)-0.0019*(PB+0.8*ZN+CU)
Octyabrskaya	*2.773 + (0.0403*Cu) + (0.0134*Pb) + (0.0365 Zn)*
Rodnikovaya	*For samples with analysis for Cu, Pb, Zn, pyritic S and Ba* =100/(36.9-(0.303*Pb+0.186*Zn+0.395*Cu+0.31*S+0.262*Ba) For samples with <8.39% ZnEq (see below) =2.8306+0.1789*(0.9Pb+1.0Zn+1.0*Cu) For samples with >=8.39% ZnEq =4.3397-0.0009*(0.9*Pb+1.0*Zn+1.0*Cu)

4.5.8 Grade Estimation

Grade estimation was carried out using Ordinary Kriging (OK) as the principal interpolation method with Inverse Power of Distance (IPD) used for comparative purposes. For orebodies 3b in the Maleevskaya Zone, 18 and 19 in the Octyabrskaya Zone and orebody 5 in the Rodnikovaya Zone, IPD was used as the principal interpolation method.

The OK method used estimation parameters defined by the variography. The estimation was performed only on mineralised material defined by each ore zone and only drillholes contained within each ore zone were used in the grade estimation (i.e. no drillholes from adjacent ore zones have been used).

Where used, the OK estimation was run in a three pass Kriging plan, the second and third passes using progressively larger search radii to enable the estimation of blocks unestimated on the previous pass. The search parameters were derived from the variographic analysis, with the first search distances corresponding to the variogram range where a spherical mode was used, the second search distance twice the variogram range and the third search distance three times the variogram range. Where exponential models were used the search ellipses were limited to one third of the variogram model range.

Sample weighting during grade estimation was determined by variogram model parameters for the OK method. Block discretisation was set to 3x3x3 to estimate block grades. Grades were estimated in to each individual subcell.

4.5.9 Validation

A model validation process included the examination of block model versus composites, and the building up of a model grade profile, to compare average grades on vertical slices, as derived from the composites directly, as well as from interpolated model grades. An example Swath plot from this process is shown below in Figure 4.12 for Pb grades within orebody 6.

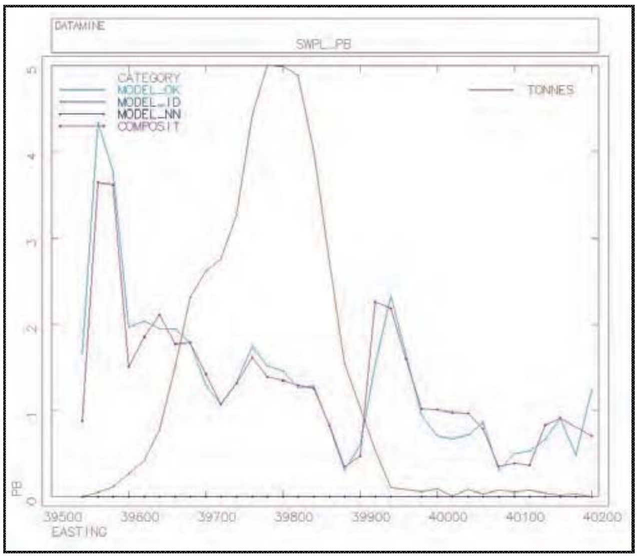


Figure 4.12: Swath Plot for Orebody 6 Pb Grades

4.5.10 Depletion

The block models were coded based on existing stopes and other underground development. The effective date of the resource assessment is 01 July 2010.

4.5.11 Resource Classification

WAI has classified the Maleevskoye deposit in accordance with the Australian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves JORC Code (2004).

Key drillhole spacings for the allocation of resources by area can be summarised as follows:

- ***Measured*** resources - 20m x 25m (down dip and along strike) with underground development within this area;
- ***Indicated*** resources – 40m x 50m (down dip and along strike); and
- ***Inferred*** resources – 80m x 100m (down dip and along strike);

An example vertical section is shown in Figure 4.13 for orebody 6, demonstrating the resultant resource class categories which have been set into the block model. An example isometric view of the resource classification for orebody 6 is shown in Figure 4.14.

4.5.12 Resource Evaluation

The resource classification for the Maleevskoye deposit is classified in accordance with the guidelines of the JORC Code (2004).

The final block models were used as the basis for resource evaluation. The resource is reported to different types of mineralisation; polymetallic mineralisation (PbZn) with a Pb grade more than or equal to 0.6% Pb and copper-zinc mineralisation (CuZn) with a mean Pb grade of less than 0.6% Pb.

Summary results of the evaluation of the unmined, in-situ resources for the whole of the Maleevskoye deposit are shown below in Table 4.9.

> ***WAI Comment:*** *The resource modelling process at Maleevskoye is, in WAI's opinion, robust and accurately reflects the remaining resources both in the developed part of the mine, and in those other undeveloped areas.*
>
> *As the parameters set for the Zinc Equivalent cut-off were set in 2004, it is likely that a late-2010 economic cut-off might be a little lower which would have an effect of increasing the resource tonnage, but probably decreasing the grade. However, WAI does not believe that this change would be significant and moreover would have minimal effect on the overall life-of-mine schedule.*

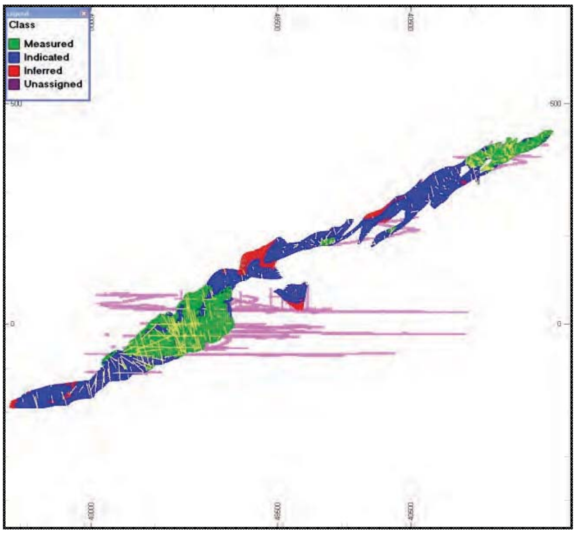


Figure 4.13: Orebody 3 NW-SE Vertical Section Showing JORC Classification

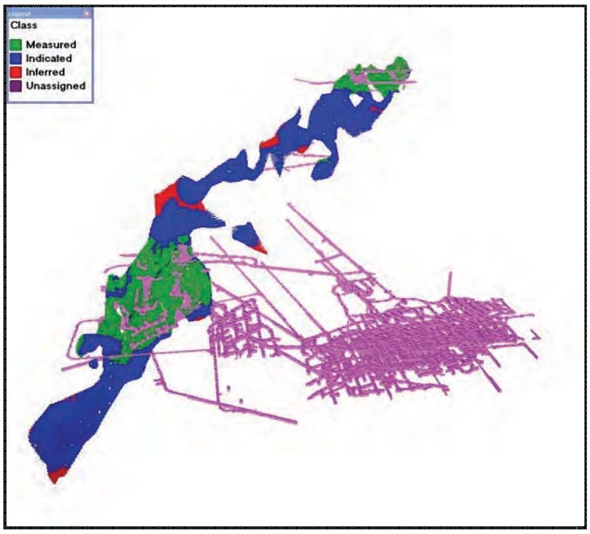


Figure 4.14: Orebody 3 Isometric View from North Showing JORC Classification

Table 4.9: Maleevskoye Resource Estimate - For All Orebodies
(WAI 01.01.2011)
(In Accordance with the guidelines of the JORC Code (2004))

Classification	Ore Type	Tonnage (Mt)	Density	Pb		Zn		Cu		Au		Ag		Ba		Sp		EQV
				%	t	%	t	%	t	g/t	oz	g/t	oz	%	t	%	t	%
Measured	CuZn	5.16	3.57	0.31	16,118	3.17	163,709	2.37	122,268	0.46	76,838	45.78	7,592,815	2.34	12,074	20.83	107,488	6.62
	PbZn	7.77	3.81	1.68	130,483	9.41	730,724	2.39	185,584	0.73	181,078	98.97	24,707,132	5.19	40,308	18.06	140,209	13.44
	Total	12.92	3.71	1.13	146,601	6.92	894,433	2.39	307,852	0.62	257,917	77.74	32,299,948	4.05	52,382	19.17	247,696	10.71
Indicated	CuZn	3.68	3.22	0.35	12,826	3.28	120,504	1.65	60,638	0.39	45,517	41.84	4,943,748	2.30	8,438	11.46	42,095	5.71
	PbZn	7.36	3.62	1.55	114,356	8.59	631,546	2.10	154,476	0.65	154,837	76.29	18,043,611	3.78	27,792	11.49	84,529	12.15
	Total	11.03	3.49	1.15	127,182	6.82	752,050	1.95	215,114	0.56	200,354	64.82	22,987,359	3.28	36,231	11.48	126,625	10.00
Measured + Indicated	CuZn	8.83	3.43	0.33	28,944	3.22	284,213	2.07	182,906	0.43	122,355	44.14	12,536,563	2.32	20,512	16.93	149,583	6.24
	PbZn	15.12	3.72	1.62	244,838	9.01	1,362,270	2.25	340,060	0.69	335,915	87.94	42,750,744	4.50	68,101	14.86	224,738	12.81
	Total	23.96	3.61	1.14	273,783	6.87	1,646,483	2.18	522,966	0.60	458,271	71.79	55,287,307	3.70	88,613	15.63	374,321	10.39
Inferred	CuZn	1.77	3.06	0.29	5,047	2.80	49,408	1.22	21,533	0.18	10,145	24.28	1,377,707	1.15	2,038	5.80	10,234	4.55
	PbZn	3.11	3.21	2.31	71,746	6.23	193,725	0.84	26,099	0.29	28,611	60.67	6,061,129	2.75	8,538	5.83	18,101	8.55
	Total	4.87	3.16	1.58	76,794	4.99	243,133	0.97	47,632	0.25	38,756	47.49	7,438,836	2.17	10,576	5.82	28,334	7.10

4.6 Mining

4.6.1 Introduction

Maleevskoye is the largest underground mine in the Kazzinc group in terms of ore production. Operations at Maleevskoye started in 2000 at a rate of 1.5Mtpa, with full scale production of 2.25Mtpa being reached in 2002. Two ore types are mined at Maleevskoye, copper-zinc ore and polymetallic ore. Both products are transported by road to the Zyryanovsky Mining and Concentrating Complex ("ZGOK") located some 25km to the south of the mine site. The mine utilises modern high capacity trackless mining methods combined with a traditional tracked haulage system. The main mining methods in operation are sub-level caving, which accounts for approximately 5% of production, and sub-level open stoping with backfill, which accounts for the remaining 95% of production.

4.6.2 Mining Methods

Two main mining methods are employed at Maleevskoye, being:

- Block Caving (5%); and
- Sub-level Open Stoping ("SLOS") with Backfill (95%).

Both mining methods utilise mechanised development with electric-hydraulic face-jumbos and diesel LHDs for drilling and ore extraction. Ore and waste is transported either directly to ore/waste passes using LHDs or loaded into trucks and transported to a central ore/waste pass. Both sub-level caving and SLOS mining methods use electric-hydraulic production jumbos for blast hole drilling

The sub-level caving method is essentially open stope mining but the hangingwall is allowed to cave into the stope void after the ore has been extracted. Blast holes drilled from hangingwall development drives are used to initiate and control the caving. Stopes are orientated longitudinally along the strike of the lode and are extracted in a top-down sequence. The caving method is only used between Level 2 and Level 7 (inclusive) of the Maleevskiy lode. The minimum mining width is approximately 5m; maximum width is approximately 20m and sub-level spacing is typically 25-50m.

SLOS mining with backfill is a variation of Open Stope Mining with the final void being backfilled with cemented classified tailings, typically with a final strength of 1.5-2.5MPa. Extraction takes place from multiple sub-levels located vertically between main mine levels.

The SLOS stopes are transversely orientated across the orebody strike. The method employs up-hole drilling and stope extraction usually takes place as a series of four stopes mined along strike (20m width each) with each stope containing several sub-level stopes with a vertical spacing of 12.5m between sub-levels. The first stope in each block is always mined top-down over several sub-levels and opened up as one large open stope and subsequently backfilled with cemented fill. The second and third stopes in the sequence are mined bottom-up and always adjacent to a stope side wall fill exposure. The last (4th) stope in the block is the closest to the access point and is essentially a pillar recovery stope. It is mined bottom-up as per stages 2 and 3.

The SLOS mine method is employed from Level 11 down to Level 16 (inclusive) in both the Maleevskaya and Rodnikovaya Zones and represents approximately 95% of current and future production.

For mining blocks that span more than four sub-levels, the lower (down-dip) series of stopes are mined under the backfill. When this occurs (which is not often), the floor of the overlying stope incorporates tank-buster style steel frames embedded in higher strength cemented backfill to ensure safe working conditions in the underlying stope.

In areas where the ore does not extend to an extraction level, it is mined with an intermediate sub-level to reduce waste rock dilution. The majority of stopes employ up-hole drilling but some down-hole drilling is employed for resources that don't extend the full extent between sub-levels. All stopes have a uniform 20m strike width.

The stope extraction sequence is 1 to 3 (right to left) followed by the 4th, on the right hand side of 1 (see Figure 4.15). The extraction sequence within the primary stope is top-down; for example 13L+37m, 13L+25m, 13L+12m, 13L and then all sub-levels are backfilled. The extraction sequence within the 2nd 3rd and 4th stopes is bottom-up; for example 13L+12m, 13L followed by backfilling of these two sub-levels, then 13L+37m, 13L+25m followed by backfilling of these two sub-levels. Adjacent stopes on the same sub-level have a strike step stagger, for example Stope 2 – 13L+37m sub-level and Stope 2 13L+25m sub-level are mined, backfilled and allowed to cure for 90 days before production starts in the adjacent Stope 3 – 13L+12m sub-level.

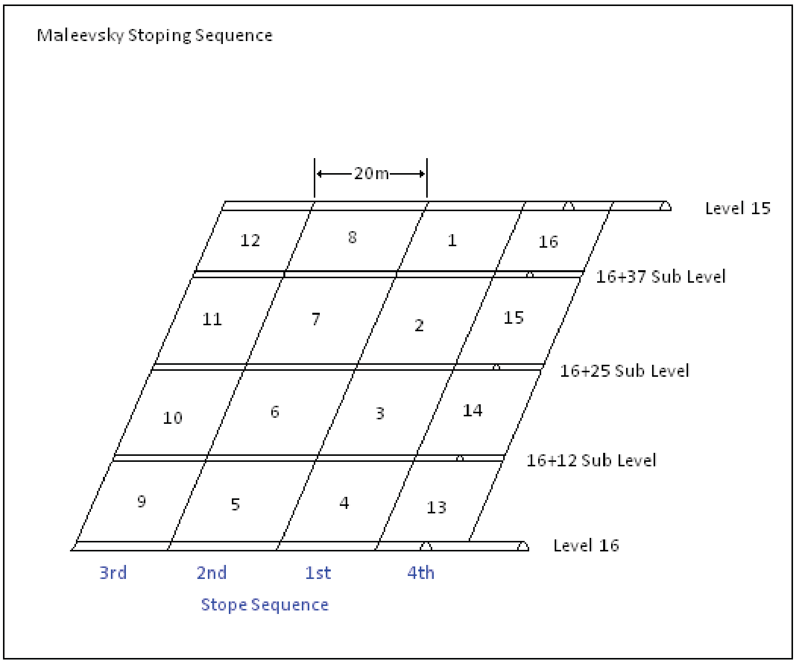


Figure 4.15: SLOS Stope Extraction Sequence at Maleevskoye Mine

Where the orebody thickness (from hangingwall to footwall) is greater than 50-60m, the stope may be split into two transverse stopes as well as 4 sub-levels. Again, a stepped extraction sequence is employed between transverse stopes.

Typically each stope can take 9-12 months to complete from development through to backfilling. Approximately 10 to 11 stopes are active at any time to achieve the 2.25Mtpa production rate.

Ore transportation from the stopes to the ore and waste passes is via loaders (LHDs) and trucks

Ground conditions are very good underground with little or no support required. Kazzinc reports very few in-situ or mining induced stress problems and none were viewed during WAI's site visit.

4.6.3 Dilution, Recoveries and Losses

Dilution factors are applied to the Mineral Resource depending on the mining method to be employed in extracting the resource. Total dilutions (primary and secondary) typically vary between 10 – 12% (mine dilution) with the overall average being 11%. Dilutions are typically higher for the 4th stage pillar recovery stopes.

The dilution factors applied assume zero grade for material classified as waste even if it may contain some mineralisation. Off balance material that is included within stope boundaries is assigned its respective grade for mining and planning purposes.

Exploitation losses (under-break, mucking losses, spillages, misallocation etc) are applied to the Mineral Resource depending on the mining method to be employed when extracting the resource. Total losses (primary and secondary) typically vary between 4-8% with the overall average for stope extraction method being 4%.

4.6.4 Mining Equipment

The following main mining equipment fleet is employed at Maleevskoye mine:

- 3 x Atlas Copco Boomer – Twin boom electric-hydraulic face drilling jumbos for mine development;
- 7 x Caterpillar R1700G LHDs for ore extraction and haulage;
- 4 x Sandvik Solo 7 electric-hydraulic production drilling jumbos;
- 1 x Kiruna K635E – 35t electric haul truck; and
- 2 x Caterpillar 740 – 40t diesel haul trucks.

The mine is equipped with an underground workshop for maintaining all underground mining equipment. All equipment is owner operated and maintained.

4.6.5 Backfill

Backfill for the SLOS mining operations at Maleevskoye is produced in an on-site backfill plant. The principal ingredients in the fill are:

- Tailings from ZGOK – 1,140kg/m^3 (60%);
- Granulated smelter slag from Karaganda – 240kg/m^3 (12.6%);
- Smelter slag from Ust-Kamenogorsk – 260kg/m^3 (13.7%);
- Cement – 60kg/m^3 (3.2%); and
- Water – 200kg/m^3 (10.5%).

The combined bulk density of the backfill is 1.9t/m^3 with 3.2% cement content.

The tailings are excavated from the ZGOK tailings dam located 14km south of the Maleevskoye mine and transported as a return load by the trucks used to transport ore from the mine to the metallurgical plant.

The smelter slags from Ust-Kamenogorsk and Karaganda are transported to Zyryanovsk by rail and then to the mine site by truck.

The backfill plant consists of two ball mills in series which mill the tailings and smelter slags down to the correct particle size before the cement is added. All ingredients are measured and added by their dry weight and then water is added to make up to the prescribed pulp density.

The fill is transported underground by gravity through a borehole within the backfill plant. Underground there is a distribution system comprising of steel pipes and valves to direct the backfill to the required stope for filling.

The backfill plant is fully automated and control by a SCADA system located in a central control room.

4.6.6 Ore and Waste Extraction

The majority of the ore production at Maleevskoye is produced between Levels 11 and 14 (1,200ktpa) and Levels 4 to 7 (550ktpa). The remaining 500ktpa is produced between Levels 14 and 16.

The main haulage level is located on Level 14. All ore produced above level 14 is dropped down a series of ore passes to Level 14 where it is collected and loaded into rail wagons. The ore produced on Level 14 and below is transported up a dedicated haulage ramp, using a Kiruna electric haul truck, to a central ore pass located just above Level 14 on the 14+25m sub-level. From here it drops down to Level 14 and loaded into wagons.

The ore and waste is transported by rail along Level 14 to an automated sampling point where the ore type is determined. The wagons are analysed and then proceed to a wagon tipping point which discharges into a series of storage bins depending on whether it is polymetallic ore or copper-zinc ore. The ore is then drawn from the various storage bins, crushed and hoisted to surface via Skipovaya Shaft, which is equipped with an automated twin skip hoisting system.

Waste rock is sent to Maleevskaya Shaft where it is hoisted to surface in a single skip hoist without being crushed.

All men and material enter the mine through Vozduzhovdyushtaya (Exhaust) Shaft, which is equipped with a man riding cage. Maleevskaya Shaft also serves as a second means of egress.

4.6.7 Dewatering System

The main pumping station at the mine is located in close proximity to Maleevskaya Shaft. Mine water is collected in a series of sumps close to the bottom of the shaft from where it is pumped 660m to surface using 5 pumps (one on stand-by) each with a capacity of $300m^3$/hr.

4.6.8 Ventilation

The mine utilises forced ventilation. Fresh air enters the mine via Ventilatsioniya Shaft and Maleevskaya Shaft using VOD 30 ($180m^3$/m) and VOD 40 ($300m^3$/m) main ventilation fans, respectively. The total air intake is $480m^3$/m and is heated when required.

The main exhaust is Vozduzhovdyushtaya (Exhaust) Shaft, which is equipped with a VCD 47.5 ventilation fan extracting $500m^3$/hr.

Two new ventilation shafts are currently being constructed by raise boring and are due for completion in early 2012. This will increase the fresh air intake capacity by $150m^3$/m. The airflow in the existing Exhaust Shaft can be increased to match.

4.6.9 Conclusions

The Maleevskoye Mine is a modern underground mine with high production capacity, which utilises modern mining methods and equipment. The mine employs many automated systems and has been developed to a very high standard.

The mine is also operated to a very high standard and the workforce appears to be qualified and skilled providing stable production rates.

Despite the fact that the mine is located 25km from the processing facility, the modern high productivity mining methods allow a good overall mining cost (approximately US$18/t of ore mined). The reserves appear sufficient to maintain operations at the present level until 2015, but after that production rate drops as a result of fewer faces being available.

4.7 Ore Reserves

4.7.1 Introduction

WAI has carried out a mine design, and produced Ore Reserves for the Maleevskoye deposit in accordance with the guidelines of the JORC Code (2004), based upon the most recent Mineral Resource Block Model (WAI 2010). WAI has used GijimaAST Mine2-4D® software to prepare the mine design, and EPS® software to produce Ore Reserves. The objective of the mine design is the best utilisation of the economic resources with a safe and productive mining method, making maximum use of the existing infrastructure.

4.7.2 Mine 2-4D and EPS Software

The mine design for the Maleevskoye deposit was carried out using Mine2-4D software, which is an automated mining software package developed in Australia and currently marketed by GijimaAST. It allows the user to accurately design mine excavations such as development and stoping, and then allows the operator to apply time-dependent mining activities such as backfilling and cable bolting in a fully three-dimensional graphical environment. Following the design of excavations and associated activities (i.e. bolting or backfilling), mining activities can be sequenced, with time delays built into the sequence where appropriate. Once the design is complete and the associated activities applied, the mine design is exported into the Enhanced Production Scheduler (EPS) which is a direct representation of the 3D mine design in a Gantt chart format. The sequence and delays built into the model in Mine2-4D are also exported to EPS.

EPS allows the user to input specific production rates for individual activities and manipulate, in detail, the various mining activities by applying mining resources such as drilling crews, mining equipment and personnel to tasks. A mining schedule and production report including mined tonnages, grade, and development metres over the life of the mine or for specific time periods can then be produced.

4.7.3 Mining Parameters

The stope blocks for Maleevskoye have been designed to a minimal average block grade of 4% Zn, or 4% Zinc Equivalent (ZnEQV).

4.7.4 Mine Layout

The Maleevskoye mine has been laid out following the proposed mining methods laid out in Section 4.6.

4.7.5 Mine Development

The principal mining levels at Maleevskoye currently incorporate ramps, main mining levels, crosscuts and repair/storage areas, at 50m vertical intervals, with 12-13m sub-levels, extending to the -175m level.

WAI has carried out a mine design by utilising existing development to access proposed new stoping areas on the +400m to -175m levels, and designed extensions to the existing development to provide access to new mining horizons to the -275m levels.

4.7.6 Stoping

All proposed new stopes for the Maleevskoye deposit have been designed as sub-level chamber stopes with backfill as outlined in the Mining chapter of this document, above.

> ***WAI Comment:*** *WAI considers that the stoping methods outlined are well suited to the deposit and in addition will not require significant investment in new equipment or training of personnel.*

Figure 4.16 shows the proposed stope layout for Maleevskoye.

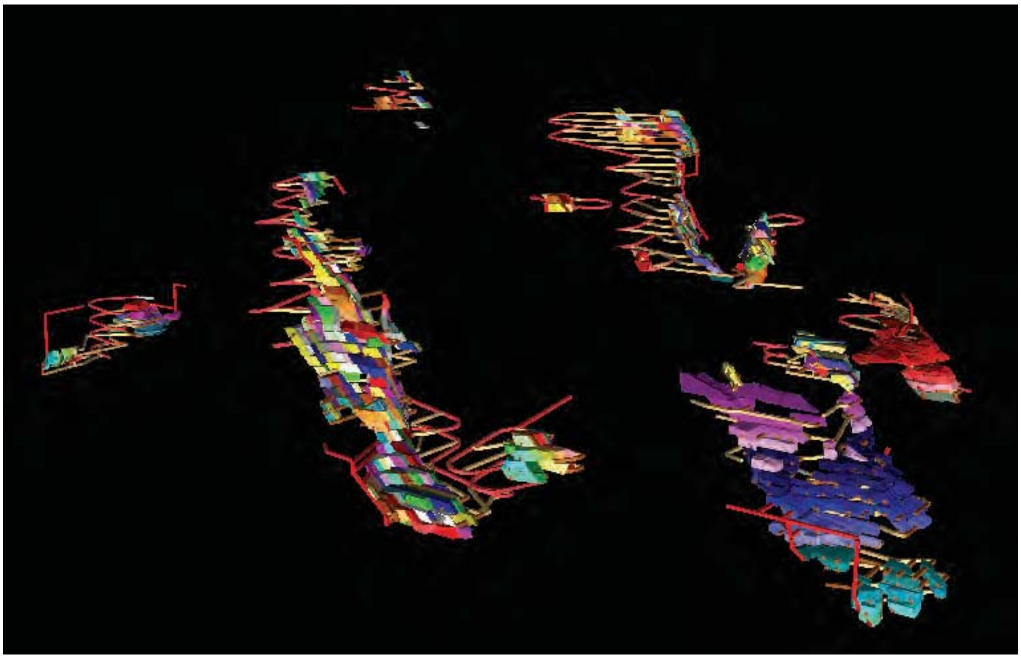


Figure 4.16: Proposed Stopes with Development

4.7.7 Losses and Dilution

During the mine design process, losses (4-8%) and dilution (10-12%) were applied to the mined tonnages at Maleevskoye.

4.7.8 Mining Schedule

The production schedule for Maleevskoye is shown in Table 4.10 below.

> ***WAI Comment****: It should be noted that the production schedule includes 171,010t of Inferred material (at 5.14% Zn, 1.31% Cu, 0.93% Pb, 0.30g/t Au and 41.8g/t Ag), which have not been reported as Ore Reserves. This material has been included in the production schedule, as it is not realistic to leave this material in-situ.*

4.7.9 Ore Reserves

Ore Reserves for the Maleevskoye deposit have been calculated in accordance with the guidelines of the JORC Code (2004). A summary of the Ore Reserves is presented in Table 4.11.

Table 4.10: Maleevskoye Production Schedule (WAI)

Year	Units	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	Total
Total Mined Tonnage	kt	2,313	2,137	2,196	1,710	822	899	420	393	386	328	352	200	118	**12,274**
Zinc Grade	% Zn	5.22	6.14	6.57	7.41	6.69	7.10	6.90	6.41	6.44	7.15	5.27	4.74	5.08	**6.34**
Copper Grade	% Cu	1.75	1.66	1.60	1.59	1.62	1.76	1.97	2.05	2.42	2.55	2.82	1.94	2.82	**1.78**
Lead Grade	% Pb	0.89	1.00	1.00	1.16	0.94	1.04	1.22	1.10	1.18	1.53	0.88	0.85	0.85	**1.02**
Gold Grade	g/t Au	0.42	0.48	0.42	0.64	0.50	0.56	0.67	0.55	0.71	0.77	0.82	0.48	0.63	**0.52**
Silver Grade	g/t Ag	68.07	58.03	49.82	58.55	55.97	56.58	77.36	78.25	79.81	69.70	68.14	59.65	59.42	**60.92**

Table 4.11: Maleevskoye Ore Reserves
(WAI 01.01.2011)
(In Accordance with the guidelines of the JORC Code (2004))

Ore Reserves	Tonnage (Mt)	Grade					Contained Metal				
		Zn (%)	Cu (%)	Pb (%)	Au (g/t)	Ag (g/t)	Zn (t)	Cu (t)	Pb (t)	Au (oz)	Ag (oz)
Proven	5.04	6.46	1.92	1.00	0.56	68.13	325,627	96,770	50,358	90,779	11,044,289
Probable	7.06	6.29	1.69	1.04	0.51	56.23	444,011	119,630	73,522	115,777	12,764,963
Total	***12.10***	***6.36***	***1.79***	***1.02***	***0.53***	***61.19***	***769,638***	***216,400***	***123,880***	***260,233***	***23,810,222***

4.8 Process

4.8.1 Introduction

The concentrator at Zyryanovski was constructed in 1953 and has undergone several stages of refurbishment. The plant utilises the standard processes of crushing, heavy media concentration (HMS) and froth flotation to produce copper, lead and zinc concentrates as well as a gold rich gravity concentrate. The plant went through a substantial upgrade in 2000 when all sections of the plant were refurbished and the grinding and flotation sections were renewed. The plant was originally designed to treat 1.5Mtpa but by 2001 the throughput had increased to 2.25Mtpa. The maximum plant throughput is reported to be 3.5Mtpa.

The plant treats ore from three sources:

- Maleevskoye mine copper-zinc and polymetallic ores;
- Grekhovskoe mine – polymetallic ore; and
- "Foreign" ores.

All ore types contain copper, lead, zinc, silver and gold. The gold is present predominantly in the native form and can therefore be recovered using gravity processing methods.

At Maleevskoye there are two ore types: a copper-zinc ore and a polymetallic copper-lead-zinc ore. The ore types are classified based on the lead content – those containing <0.6% Pb are deemed to be copper zinc ores and those with > 0.6% are classified as polymetallic ores. The copper-zinc ores also have high copper and zinc contents than the polymetallic ores.

The plant also processes a small amount of ore (70ktpa) from the Grekhovskoe mine, which is located some 12km from the plant. This ore source is only expected to last for another three years.

4.8.2 Ore Mineralogy

The ore minerals are chalcopyrite, tennantite, tetrahedrite, galena, sphalerite and pyrite.

4.8.3 Flowsheet Description

4.8.3.1 Crushing and HMS feed Preparation

The crushing plant is designed to operate 21 hours per day. Ore is trucked to site, after primary crushing at the mine site to -100mm, and dumped directly into the main plant feed hopper (170m^3). Ore is further crushed in a Telman (2,120 x 1,500mm) jaw crusher, which crushes any oversize material that the mine has produced.

The crushed produce passes to three stages of feed preparation screening with an intermediate cone crushing stage to produce a –70+5 mm feed product to the HMS. This product is conveyed to one of three bunkers with 8,000, 5,400 and 5,400m^3 capacities.

The crushed material is transferred via conveyors fitted with belt weightometers to two 5mm Feed Preparation screens in series. The screen undersize gravitates to spiral classifiers and the classifier sands are conveyed to flotation. The classifier overflows are pumped to hydrocyclones and the underflows are returned to the spiral classifiers. The cyclone overflows are thickened and pass to flotation.

4.8.4 Heavy Media Separation

Heavy media separation (HMS) takes place on the –70+5mm material in two 6m diameter cones each with a capacity of 170t/h. A combination of ferrosilicon and magnetite is used at separating densities of between 2.8-

3.0g/cc. Weight rejection to the "floats" product ranges between 13-30%. The "floats" and "sinks" are crushed to pass 10mm and the floats used as backfill. The "sinks" and fines products passes to flotation.

4.8.5 Grinding

Milling of the HMS and fines product is achieved using a total of nine 3.2 x 3.9m diameter ball mills, with five being used as primary mills and four as secondary mills. The primary mill discharge gravitates to a jig for coarse gold recovery and the jig tailings spiral classifier and the sands products are returned to the mill.

The spiral classifier overflows are cycloned and the underflows are also returned to the mill. The cyclone overflow is pumped to secondary cyclones and the underflows pass to jigs and intercycle bulk Cu-Pb flotation. Copper and lead minerals are floated using potassium amyl xanthate at pH 7.6. Zinc sulphate and sodium cyanide are used as pyrite and sphalerite depressants. The concentrate is pumped to the second stage Cu-Pb cleaning cells.

The intercycle flotation tailings pass to the secondary mills. The secondary cyclone overflow, at 85-90% passing 74µm passes to Cu-Pb bulk rougher flotation.

The jig concentrates are pumped to a magnetic drum separator to remove grinding steel and then are cleaned using shaking tables to produce a gold rich lead concentrate. The final gravity concentrate, which assays typically 100g/t Au, is free draining and is loaded into Big Bags for transport.

4.8.6 Flotation

Separate copper lead and zinc concentrates are produced by floating a bulk copper lead concentrate and then depressing the lead using sodium dichromate. Zinc is recovered from the copper-lead flotation tailings. There are two parallel flotation circuit using Russian RHYF flotation machines with automatic levels control and low pressure air supply.

Rougher copper lead flotation takes place in seven 25m^3 cells with scavenger flotation taking place in a further six cells. Zinc sulphate and cyanide are used as zinc and pyrite depressants. The scavenger concentrates are pumped back to rougher flotation. The rougher concentrate is cleaned in three stages with a ball mill regrind stage on the cleaner tailings product. The regrind ball mill is currently being replaced with Metso SMD mills which will result in a finer particle size and improved metallurgical performance.

The bulk concentrate is then conditioned with sodium dichromate to depress galena and the copper minerals are re-floated in a separation circuit. The copper and lead products are pumped to thickeners.

The copper lead scavenger tailings are conditioned with copper sulphate to activate sphalerite and the pH is increased to 11-12 using lime. Rougher flotation takes place in four 25m^3 cells and scavenger flotation takes place in a further 11 cells. The rougher concentrate is cleaned in three stages using seven, five and three cells of 8.5m^3 capacity.

4.8.7 Process Control

The plant is controlled with a SCADA system using Delta V software. Feed rate to the plant is controlled automatically and motor temperature and oil pressures are monitored. The system also monitors cyclone pressures, bunker levels, flotation cell pulp levels, air flows, pH and reagent controls. The efficiency of the plant is monitored with a Courier 11 stream on stream analyser.

4.8.8 Concentrate Dewatering

The concentrates are pumped to 15m conventional thickeners. The copper concentrate is filtered using a Svedala VPA Filter Press. The gold rich lead concentrates are filtered using an Outotec Ceramic filter and the zinc concentrates are filtered using a Ceramic filter (Kazakh), or a vacuum drum filter or a Svedala 1540 Filter Press.

4.8.9 Concentrates Transport and Sales

The zinc concentrates are transported by rail to either the zinc smelters at Ridder or Ust-Kamenogorsk. The lead and gravity gold concentrates are sent to smelters in Ust-Kamenogosk. The copper concentrates are shipped to customers in China. The company is in the process of constructing an IsaSmelt furnace in Ust-Kamensogorsk and this is scheduled for completion in 2011. This facility will be able to process the copper concentrates.

4.8.10 Concentrate Management and Labour

There are a total of 415 persons employed within the concentrator. The plant is managed by the "Head of Department" to whom the Chief Engineer reports.

A breakdown of the other personnel employed is given in Table 4.12.

Table 4.12: Process Plant Manning Levels

Chief Technologist	1
Health and Safety	4
Information centre	4
Testwork research	32
Crushing and Beneficiation	121
Grinding and flotation	90
Thickening and filtration	90
TMF	16
Reagents	48
Financial	1
Plant managers assistant	1
Project Manager	1
Copper sulphate production	13

The manning levels would be considered high by western standards but are typical for an operation in the CIS.

4.8.11 Metallurgical Performance

The metallurgical balance for the treatment of all ore types in 2009 is given in Table 4.13.

Table 4.13: Maleevskoye Plant Metallurgical Balance (2009)

Product	Tonnes (t)	Assay %, ppm					Distribution				
		Zn	Pb	Cu	Au	Ag	Zn	Pb	Cu	Au	Ag
Feed	2,405,000	6.28	0.91	1.98	0.53	59.28	100.00	100.00	100.00	100.00	100.00
Zn Concentrate	242,405	55.40	0.46	0.92	0.31	31.24	88.91	5.14	4.68	5.88	5.31
Pb Concentrate	27,603	8.50	46.00	2.30	1.28	757.04	1.55	58.25	1.33	2.76	14.66
Cu Concentrate	166,354	2.92	3.63	24.64	2.63	572.14	3.21	27.73	86.13	33.99	66.76
Gravity Concentrate	4,770	3.52	7.94	1.05	100.00	192.63	0.11	1.74	0.10	37.12	0.64
Tailings	1,642,086	0.51	0.07	0.19	0.09	8.61	5.58	5.32	6.66	11.98	9.92
HMS Tailings	307390	0.17	0.06	0.16	0.06	8.33	0.34	0.89	1.06	1.33	1.80

The balance shows a high degree of metallurgical efficiency with low losses of metals to the HMS tailings and satisfactory grades of base metal concentrates at good recovery levels. The recovery of gold to the gravity concentrates was 37.1% with a further 34% reporting to the copper concentrate.

Copper recovery to the copper concentrate was 86.1% and the concentrate assayed 24.6% Cu, 3.63% Pb, 2.92% Zn, 2.63ppm Au and 572ppm Ag.

The lead concentrate was rather low at 46% Pb, 2.3% Cu and 8.5% Zn at a lead recovery of 58.2%.

The zinc concentrate assayed 55.4% Zn, 0.92% Cu and 0.46% Pb at a zinc recovery of 88.9%.

The average grade of ore treated was 1.98% Cu, 0.91% Pb, 6.28% Zn, 0.53ppm Au and 59.3ppm Ag.

4.8.12 Process Consumables

The major processing consumables are given in Table 4.14 below.

Table 4.14: Maleevskoye Plant Consumables

Item	Consumption kg/t
Ferrosilicon	0.12
Balls	1.09
$ZnSO_4$	0.76
$CuSO_4$	0.36
Xanthate	0.22
NaCN	0.077
Na_2S	0.032
Lime	4.1
Dichromate	0.10
Frother	0.017
Thionocarbamate	0.043
$FeSO_4$	0.30
Electricity	40.4kWh/t
Industrial Water	2.86m^3/t

The rates of consumable usage are typical for the treatment of a moderately hard polymetallic base metal ore.

4.8.13 Process Capital Budget 2011

The total capital expenditure budget for 2011 is US$24.8M. The major items are

- Modernisation of the main flotation plant (US$10.9M);
- New cells for the Cu-Pb separation circuit (US$4.2M);
- A new treatment facility to process lead dust from the Isasmelt process (US$3.0M); and
- One new SMD mill (US$1.69M).

4.8.14 Conclusions

The Maleekskoye Plant operates with a high degree of efficiency on a range of plant feeds from different ore bodies and ore types. The concentrates so produced are typical of those obtained from polymetallic ores. The HMS section is rather old, perhaps overly complex, and in need of modernisation yet it produces a satisfactory upgrade of plant feed with minimal metal losses to the floats products.

The flotation plant operates with a high level of process control and the operators are clearly highly experienced in the treatment of such ores.

The intstallation of Metso SMD mills for copper-lead regrind should result in improved metallurgical performance.

4.9 Environmental, Social, Health & Safety

4.9.1 Introduction

This review of the environmental and social performance of the Zyryanovsk Mining & Concentrator Complex (ZGOK), including the Maleevskoye mine, is based on a brief site visit and reconnaissance, together with discussions with staff of the geology department and Department of Health Safety & Environment. In the short time available it was only possible to have an overview of the project and the way that the company manages its health, safety, environmental and social obligations.

Whilst WAI believes it has gained sufficient insight into the key issues and performance, there may be additional information that was not seen, or variations in interpretation of the available data that could not be explored further.

4.9.2 Environmental & Social Setting and Context

4.9.2.1 Landscape, Topography

The main ZGOK processing plant is located within the industrial zone at the north-east side of the town of Zyryanovsk. This zone is characterised by the largely disused remains of former mining related industry and works, and has an air of dereliction and abandonment. Immediately adjacent to the plant are a large water-filled open pit and a range of mine waste dumps, which are owned by the Government.

The Maleevskoye mine and the TMF are located in rural areas to the north of Zyryanovsk.

The Zyryan region is mountainous, located in the foothills of the southern Altai Mountains, with a landscape dominated by steep hills and open valleys, many of which are wide and fertile.

4.9.2.2 Climate

The climate is sharply continental with hot summers and cold dry winters.

4.9.2.3 Land Use and Land Cover

Zyrynaovsk Concentrator Plant

The surrounding land is mainly post-industrial urban fringe, with a high proportion of derelict or unused land. There is quite a lot of natural colonisation with scrub and trees, as well as municipal and company planting of trees. Old open pits are now open water, usually with steep hazardous slopes into the water.

Previous attempts at 'reclamation' by state authorities have been largely ineffective.

Within the urban fringe landscape there are many residences and informal smallholdings, mainly of lower standard.

Zyryanovsk Tailings Storage Facility

This is located in a fertile river valley, dominated by cultivation and cattle grazing. There are a number of rural communities such as the village of Maleevsk.

Maleevskoye Mine

The mine is located in a mountainous area, with a high proportion of the land forested. Land use consists of localised cultivation in sheltered valleys and pastoral grazing.

4.9.2.4 Water Resources

The area is in the catchment of the Bukhtarma/Hamir River, which flows west into the Irtysh River, one of the main river catchments of eastern Kazakhstan and rising in the southern Altai Mountains. Water resources are mainly surface waters – fast flowing streams and rivers, with shallow groundwater resources in the river valley alluvial deposits The Zyryanovsk tailings facility is within 2km of the river, in the river plain, and overlying the valley alluvial aquifer.

4.9.2.5 Communities and Livelihoods

The town of Zyryanovsk is a significant industrial town, though clearly prosperity has declined in recent years. The community has grown up and developed around the mining and concentrator plant, and a significant proportion of the community will depend on Kazzinc for employment as employees, contractors or providing services.

Outside of the town smaller communities have developed, mainly relying on agriculture, though tourism is also significant (as a base for the mountains). There are a number of village communities in the Bukhtarma River valley, close to the tailings facility.

Zyryanovsk is the administrative centre for Zyryan District, within which the mine and concentrator complex sits. Zyryan is within the East Kazakhstan Oblast, the provincial capital being Ust-Kamenogorsk.

4.9.2.6 Infrastructure & Communications

Zyryranovsk has the usual road, rail and communication infrastructure associated with an industrial town and complex. Power is available from the Kazakhstan grid.

4.9.3 Project Status, Activities, Effects, Releases & Controls

4.9.3.1 Project Description & Activities

Project Components

The Zyryanovsk Mining and Concentrator Complex (ZGOK) consist of 4 main components:

1. The Maleevskoye Mine, 25km to the north of Zyryanovsk. This is the main ore production facility;
2. The Grekhovskoe Mine, 12km to the south of Zyryanovsk. This is exhausted and will shortly be closed, though some areas will continue to be used for waste disposal. This site is not considered further in this report;
3. The Zyryanovskok Concentrator facility itself; and
4. The Tailings Management Facility (TMF), midway between Zyryanovsk and Maleevskoye.

Ore is hauled by truck from the mine to the concentrator, partly on a dedicated haul road and partly on the public highway. On the return journey, trucks are loaded with tailings excavated from the TMF and hauled to the mine for backfill underground.

Maleevskoye Mine

The mine is a self-contained complex with its own facilities and infrastructure, remote from Zyryanovsk. The layout is shown in Photo 4.1.

- Shafts and adit to access underground, with a main ore haulage shaft. Ventilation and emergency access shafts are separate from the main complex;
- ROM ore stockpile and loadout onto trucks;

- Mine offices, administration, maintenance, facilities and lamproom.
- Backfill plant utilising tailings;
- Heating plant and other infrastructure, much of which is disused;
- Electricity substation; and
- Pumped mine water treatment plant and lagoons.

Around and below the mine are derelict and disused areas. These have poor drainage and there is evidence of ochre and acid rock drainage.

The ore mined has very high sulphur (pyrite) content, up to 20% S. Under certain conditions, such as exposure to air, this can give rise to pyrite oxidation and resultant problems with acid production (referred to as Acid Rock Drainage or Acid Mine Drainage, depending on the context).

Ore is loaded at the ROM stockpile by front loader direct into trucks for transport to the concentrator. It was noted during the site visit that trucks are frequently overloaded and spill ore onto the road surface, which will therefore be contaminated with heavy metals. In addition the trucks are uncovered.

Photo 4.1: Aerial View of Maleevskoye Mine

Zyryanovsk Concentrator

The concentrator was originally commissioned in 1955. However the current plant dates from a modernisation completed in 2006, to a capacity to treat a variety of Pb, Zn and Cu ores, up to 3,500kt/yr. At present the concentrator treats ore from Maleevskoye and also 800kt/yr of polymetallic ore from Kazakhmys.

The process flowsheet involves the following stages: crushing and HMS (waste rock) - grinding – gravity – flotation (flotation tailings) – thickening – filtration of concentrates. CN and dichromate are hazardous materials used in the plant. There is a detox unit in the plant for converting the toxic chromium(IV) to the less toxic (and insoluble) chromium(III) form.

In 2008 water recirculation was introduced, to reduce the need to abstract industrial water from local supplies, and eliminate the discharge of waste process water.

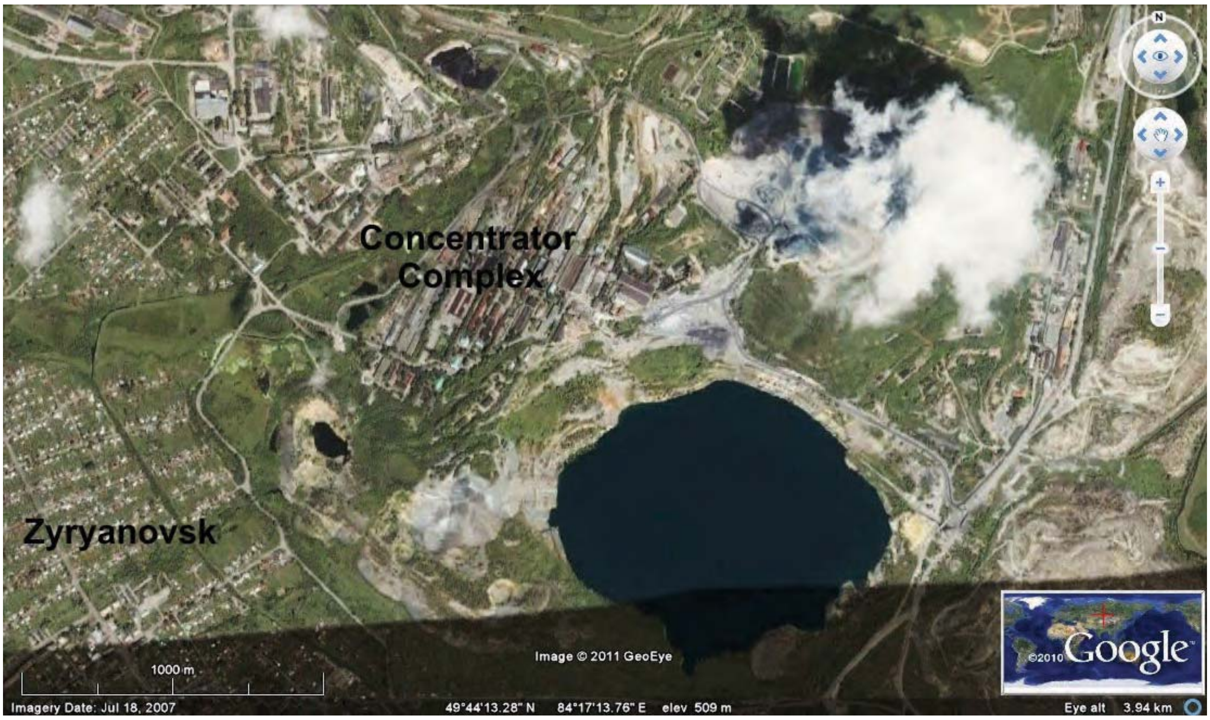


Photo 4.2: Concentrator Complex in Zyryanovsk
(Note the old open pit mine and waste dumps are owned by the Government.)

Zyryanovsk TMF

Flotation tailings produced by the concentrator are piped 4.3km to the TMF, via two steel 820mm diameter slurry lines, one operational and one backup. The pipelines were initially installed in 1986. They are visually inspected daily (walking) and x-rayed annually. A pumping station at the base of the TMF raises the tailings onto the lagoon. Slurry discharge rates are typically 2,000m^3/hr, but vary between 1,800m^3/hr and 2,500m^3/hr; the slurry pulp density is 900kg/m^3.

There are also 2 return water lines, 600mm and 530mm diam, to the plant. Return water rates are usually 1,100m^3/hr to 1,400m^3/hr, though at the time of the visit, were 600m^3/hr.

The area of the TMF is 368.5ha in total and the dam structure is 4.35km in length. The predicted flow to the spillway (residence time) is 15 – 25 days. The dam and tailings basin are unlined and the western half (downslope) is on former alluvial deposits, connected to the river. Infiltration/seepage through the base is estimated by the company at around 800m^3/hr.

The TMF was last raised in 2005 to give a total capacity of 85Mm^3; the current volume is 84Mm^3, equivalent to 120Mt @1.8t/m^3 density. Thus the dam is close to capacity. A new raise is planned which will bring the capacity to 95Mm^3 up to 2016.

Photo 4.3: Zyryanovskoye TMF, Showing Local Communities and Connection to Bukhtarma River

The technical study "Operation of concentrator tailing storage" for 2008 – 2010 has been approved by the State Committee of Emergency Control and Industrial Safety (Report 47 dated 11.01.2008).

An Emergency response plan for the TMF was developed and approved by the Company Operations Manager, and approved by the State Emergency Control Agency, dated 15.12.2009.

4.9.3.2 Mine Wastes – Rock

The existing external waste dumps at Maleevskoye and Grekhovskoe mines pre-date 1993 and are owned by the State; Kazzinc has no liability for them. All mine waste produced at Maleevskoye is used for backfilling underground and for raising the TMF dam, so there are no current waste rock dumps associated with the mine.

4.9.3.3 Mine Wastes – Tailings

Tailings waste from the concentrator has a small particle size – 97% <0.15mm. Recent chemical analysis of the tailings solids is as follows:

Table 4.15: Chemical Analysis

Element	% of solids
Total S	32.82
Fe	5.2
Pb	0.083
Zn	0.2
Cu	0.033
Co	0.005
Ni	0.006
Cd	0.002
Mn	0.08

The tailings have a very high pyrite S content and significant metal content, so are considered hazardous waste. The tailings will be acid generating and there is visible evidence of this on the tailings beaches, however no acid-base accounting or leaching testwork has been undertaken.

The tailings liquid phase (and return water) has a very high pH (9 to 12), together with a high Ca, bicarbonate and sulphate content (as expected), and generally a low heavy metal content. This strong alkalinity will neutralise any acid produced by pyrite oxidation, as long as there is process water on the TMF. However, dispersed tailings, dry beaches and zones where there is no high pH water (such as after the TMF is closed) will be net acid generating and no provision has been made for this.

4.9.3.4 Other Solid Mineral Wastes

Sludge residue, containing precipitated heavy metals, is produced by the mine water treatment plant (see below). Recent analysis of this is as follows:

Element	% of solids
Pb	0.8
Zn	3.5
Cu	1.91

This sludge is transported to an old open-pit at Grekhovskoe; the long term safety and stability of this facility is not known.

The Company is proposing to use the TMF for the disposal of imported 'Scorodite' waste from Vasilkovskoye Mine and the smelters at Ust-Kamenorgorsk. This material is a synthetic Scorodite, being the residue from treatment of arsenic-containing wastes, by addition of lime and iron sulphate, to precipitate insoluble calcium iron arsenate.

The design of this facility is still in preparation. WAI understands that it is proposed to construct a geomembrane lined cell within the tailings and to deposit the Scorodite within this containment. The nature of this containment would seem to be adequate, however the long term risk of depositing arsenic waste in this location, close to groundwater and an important river, will need to be carefully examined.

4.9.3.5 Water Management & Effluents

The recent policy of the company is to conserve water, and water recycling has been introduced at Zyryanovskoye. Water stored on the TMF is returned to the Concentrator as technical water. Potable water required for the plant (drinking and reagent mixing) is supplied from the town supply, and technical water for makeup etc. comes from boreholes.

The expected water balance provisions for the TMF are given in Table 4.16 below.

Table 4.16: Water Balance for the TMF	
Balance items (planned on 2010)	**Total 2010**
Tailings Storage Basin	
A. Water supply thousand cubic metres	
Drainage basin dregs	3248,0
Concentrator production waste water	16095,24
Total of A	**19343,24**
B. Waterloss, thousand cubic metres	
Evaporation	2805,43
- pool surface	1133,59
- land surface (beach)	1671,84
Filtration through dams	635,04
Filtration through bead	113,88
Bead steeping	85,20
Filtration through base	486,96
Total of B	**4126,51**
C. Total volume of water (A-B), thousand cubic metres	15216,73
D. LOOSE WATER km^3	0,0
E. Tailings storage water(C-Г km^3	15216,73
- porewater	690,0
- store water (to the pool)	-373,26
- spill water (discharge)	14900,0
INWASH SPECIFICATION	
Tailings inflow (kT)	2700,0
The same as previous, but packed, thousand cubic metres	1500,0
Solid particles in pool bulk, %	65,0
Tailings storage space filling, %	-
Displaced water volume, $000m^3$	970,83
Raising the water level because of displacement, m	0,61
Water level rise by reason of accumulation, m	-0,24
General water level rise in the pool, m	0,37
Inwash height, m	0,63
Summarized tailings volume at the end of the year, thnd. cub. m	84576,0
Beach length, m	200,0
Inwash line length, m	4000,0
Pool water volume at the end of the year, thnd. cub. m	1955,74
Pool area at the end of the year km^3	1622,49
Pool water average depth, m	1,18
Water mark in pool year at the end of the year, м	469,67
Minimal crest level of warp tailings at the end of the year, m	472,0
Feather excess above the water line at the end of the year, m	2,33
Water Treatment Oxidation Pond	
A. Water in flow km^3	
Drainage basin dregs	522,0
Tailings storage discharge	14900,0
Filtration from the tailings storage	253,80
Total of A	15675,80
B. Waterloss, thousand cubic metres	
Vaporation	546,0
- pool surface	420,0
- land surface (beach)	126,0
Filtration underflow	9920,64
Total of B	10466,64
C. LOOSE WATER km^3	5225,0

Prior to the installation of water recycling in 2008, the decant overflow from the TMF was discharged to the river via a biological oxidation treatment lagoon; see Photo 4.3 and Photo 4.4. At times of high rainfall and snowmelt, excess water is still discharged via the lagoon system – the current licence permits a total of 800,000m^3/year. Monitoring data indicates that this discharge is within acceptable limits.

Seepage from beneath the TMF is significant and will contain contaminated process water leached through the tailings. Groundwater flows from east to west, towards the river, and there is the potential for significant polluted water to reach the river. There is a network of 27 boreholes along the western perimeter and northwest corner of the TMF, used for monitoring and for pumping intercepted groundwater, to prevent migration of contaminated groundwater. This interception is apparently effective and pumped water is returned to the TMF; however it is a long term liability and pumping may be required for many years post-closure of the TMF.

Photo 4.4: Biological (Oxidation) Water Clarification Lagoon at the TMF

Since the water recirculation scheme was introduced, this facility is only used when high rainfall or snowmelt require water to be discharged from the dam.

The Maleevskoye Mine is too far away from the Concentrator for use of the mine water in the Concentrator to be feasible. Minewater is pumped from the mine and is treated in a treatment plant before discharge to the Buktarma river. Treatment involves two stages:

i. Lime dosing with hydrated lime to raise the pH and precipitate metals; and
ii. Settlement in lagoons to remove the sediment. The 3 lagoons are used in rotation and excavated periodically to remove the sludge for disposal.

The resulting effluent is monitored and falls within discharge limits, with the exception of ammonia (NH_3-), which originates from underground blasting residues. The company has planned to reduce ammonia discharge levels by 2012, by utilising the treated mine water in the backfill plant (thus reducing the total quantity discharged).

In addition to the mine water, there are other fugitive uncontrolled discharges from the mine site:

- Drainage from the road during heavy rainfall will transport contaminated sediment (ore spilt from overloaded trucks) on to surrounding land and into streams; and

- Storm rainfall runoff from the mine site area contains acid and metals leached from ore residues deposited or spilled on the ground over a period of years. This discharges via local streams to the river.

The Company has identified the need to reconstruct the stormwater drainage system for the mine area and has an action plan to improve this.

4.9.3.6 Emissions to Air

The significant emissions to air are summarised in Table 4.17.

Table 4.17: Emissions to Air

Mine ventilation	Maleevskoye ventilation shafts	Inert and mineralised rock dust; combustion gases from underground diesel plant.
Deposition and storage of coarse ore at RoM stockpile	ROM stockpiles at Maleevskoye	Mineralised rock dust. Conveyors are covered.
Fugitive dust from loading and haulage of ore	ROM stockpile and haul roads.	Mineralised rock dust. Controlled by watering of haul roads. Spillage of ore from overloaded trucks onto haul roads will increase this source considerably.
Process emissions	Concentrator plant stacks and ventilation	Dust and acid vapours. Controlled by filters and enclosure.
Fugitive dust from tailings surface	Zyryanovskoye TMF	Hazardous dust, containing metals, which could contaminate surrounding land. Controlled by maintaining water cover and wet tailings beaches; effectiveness is dependent on water availability.

One of the most significant sources is fugitive ore dust from the ROM stockpile, due to conveyor deposition and truck loading activities. Dust will contain heavy metals and will disperse on to the surrounding land during dry windy periods.

Fugitive ore dust is also emitted from the haul road between the mine and concentrator. The passage of trucks at speed emits significant dust from the haul road surface and by windblow from the load itself.

4.9.3.7 Waste Management – General

General waste and recyclable materials are collected and stored separately as appropriate, for disposal by specialist contractors. Non-recyclable waste goes to the local municipal landfill.

As part of the environmental licence the company maintains records and makes returns on the quantities of waste produced, under different waste categories.

4.9.3.8 Hazardous Materials Storage & Handling

Oils and fuel (hydrocarbons) – are stored in proper bunded facilities in accordance with licence requirements and international standards. The Company maintains full monthly records and provides annual returns to the State for all consumption and outflows of hazardous materials and wastes.

Particular hazardous materials in use at the concentrator are cyanide and Dichromate. Facilities for storage and handling are in accordance with requirements. There is a detox plant in the Concentrator for treating the streams containing toxic Cr(VI) and converting it to the non-toxic Cr(III) form.

4.9.3.9 General Housekeeping

In general housekeeping at the mine is excellent and all areas are maintained well. No evidence was seen of uncontrolled tipping or abandonment of disused equipment, scrap, containers or wastes.

4.9.3.10 Fire Safety

Good quality systems and arrangements are in place.

4.9.3.11 Security

The site is well secured within a perimeter fence and public safety is maintained. The plant area is accessed via manned security gates and scanners.

4.9.4 Permitting

4.9.4.1 ESIA/OVOS

The Zyryanovskoye complex and Maleevskoye Mine have been operational for many years and have therefore developed progressively. Most of the activities pre-date the requirement for an OVOS so have not been through this process.

WAI understands that an OVOS is in progress as part of the proposed project to stockpile scorodite waste in the TMF dam. This will be undertaken in accordance with Kazakh norms and regulatory requirements.

4.9.4.2 Environmental Permits and Licenses

The Kazzinc audit of its facilities confirms that all necessary permits and licences are in place for the mining and processing operations. The latest TMF dam raise, in 2005, was linked to the increase in mine and plant production. Required permits from the fishing authorities and water basin authorities (both part of the Ministry of Agriculture) are in place. The project was subject to State Expertise in 2006 and received full permits, including the requirements of the Emergency Department.

The Sanitary Zone for the Concentrator plant and TMF has been set at 100m from the perimeter of each facility.

4.9.5 Environmental Management

4.9.5.1 Environmental Policy and Company Approach

Kazzinc has a strong central corporate environmental management function, based in Ust-Kamenogorsk. There is a Chief Environmental Manager, reporting to the First Vice President, and two environmental specialists at headquarters, supporting the site-based staff. The company therefore has a consistent approach to environmental and social management systems, procedures and standards.

The company is certified across all its sites for:

ISO9001 – Quality Assurance	Certified in 2004 and audited in 2010
ISO14001 – Environmental Management System and ***OHSAS18001*** - Occupational Health and Safety Management System	Certified in 2006, recertification audit in 2009 and supervisory audits of company facilities alternately each year, starting 2010.

Glencore is a majority shareholder in Kazzinc and thus also exercises an overarching commitment to Health, Safety, Environment and Community, through the Glencore Corporate Practice commitment applied to all subsidiary companies and operations. WAI understands that all Kazzinc assets were audited by a Glencore team in early 2010. The findings of this are not available to WAI, though it is understood that the main recommendation was in connection with implementing the International Cyanide Code.

Kazzinc also commissioned specialist environmental institute ECOTERA LLC of Almaty to undertake a full audit of all the company's assets. The report: Assessment of Compliance of Activities of Kazzinc LLC with the Nature Protection Laws of the Republic of Kazakhstan and with the Requirements of Controlling Agencies, Auditors Report to Management, was presented in September 2010.

> ***WAI Comment:*** *It is clear that, at a corporate level, Kazzinc is progressive and responsible in its approach to environmental, social, health & safety management across all their operations. They have progressively implemented measures to improve air quality and water management, and maintain consistent standards in accordance with Kazakh norms, policies and requirements.*

4.9.5.2 Environmental Management Staff & Resources

There are 2 environmental staff covering all of the facilities at the operation – a Head Environmental Specialist and an Environmental Engineer. These two both report to the Kazzinc central Environmental Service Department and locally to the Operations Support Manager (and thus to the Chief Engineer).

The Head Environmental Specialist attends weekly management conferences with all function heads, and any environmental issues are dealt with here. There is also regular dialogue with the District Environmental Inspector (Ministry of Environment and Nature Protection - MENP).

4.9.5.3 Systems and Work Procedures

The company has an Environmental Activity Standard and all operations have their individual work procedures and requirements documented. There are regular quarterly and annual reports to MENP detailing all emissions, discharges and wastes, hazardous raw materials and activities, against annual permit levels and norms.

The company prepares a 5 year plan in consultation with MENP, setting out the significant environmental impacts, targets, aims and specific actions and budget to implement the plan. The current action plan has 5 specific actions identified:

1. Reduction of dust emission from Tailings surface, target reduction of 1.5t/yr by 2015;
2. Reduction of discharge of NH_3 in mine water by 0.8t/yr by 2012;
3. Safe disposal of Scorodite (As containing waste) in TMF by 2011;
4. Reconstruction of surface stormwater drainage for Maleevskoye Mine by 2011; and
5. Improvements within the Sanitary Protection Zone of the Concentrator, 49.7ha, by 2012.

4.9.5.4 Environmental Monitoring, Compliance & Reporting

There is an extensive groundwater and surface water monitoring regime around the project areas, and particularly the TMF, which is contracted out to a specialist supplier. Monitoring is undertaken 4 times per year and a detailed annual report is prepared. This monitoring is supplemented by the company with 10-day monitoring of critical parameters (pH, conductivity, metals, etc) at key locations such as discharges.

No details of air quality or soil monitoring were reviewed.

In addition to physio-chemical monitoring, regular monthly inspections are carried out by environmental staff. Whilst there are no pro-forma reports or checklists, any problems or issues are noted and reported.

Quarterly and annual reports are prepared for company management, and the Environmental Manager participates in the weekly management meetings.

The independent Kazzinc audit confirms that the compliance record with standards and norms is good, with only a few problem areas as identified in this report

> ***WAI Comment:*** *The monitoring of water quality, which is the main risk area, is thorough and sufficiently comprehensive, and compliance with the required standards is good. However, as is usual it is based on measuring physio-chemical parameters of effluents and pathways, and does not give a good picture of the impacts or health of the receiving environment. For example, periodic sampling of soils, vegetation and stream/river sediments, gardens, drinking water, and biological monitoring of benthic invertebrates, would give an indication of the long term impacts of the mining operation on the surrounding environment and communities.*
>
> *Monitoring air quality, particularly dust deposition, should also be considered.*

4.9.6 Social and Community Management

4.9.6.1 Stakeholder Dialogue and Grievance Mechanisms

Zyryanovsk is a mining community and has a very close relationship with the company; it is reported that there is regular dialogue with the local administration and the Mayor of Zyryanovsk. However, whilst the OVOS law prescribes structured public hearings, none have apparently been carried out yet under these regulations. Nevertheless the Company does hold public meetings and involves representatives of the community in the planning stages.

Company news and initiatives are regularly reported and discussed in local and Oblast newspapers and the local radio broadcast channel. The Company employs a journalist specifically to report on company activities. There is ample opportunity for the public to voice opinions, concerns or support for the company activities through these media.

The local administration authority holds open public meetings twice per year, at which any member of the public can raise issues or request information from any industrial enterprise in the District. GOK Directors are usually present at these meetings and present reports on the company activities.

Specific complaints or grievances are received by the GOK Director's office and recorded in a register. This register also gives a response to the comment and any actions taken. The results of this are published in the local newspapers.

It was reported to WAI that there are no NGOs active in the region.

4.9.6.2 Social Initiatives and Community Development

The Company has an active social sponsorship and community development programme, which is set out in a Memorandum between Kazzinc and the Mayor of Zyryanovsk, the current one being dated May 2008. This sets out a commitment to 8 specific initiatives for community support, mainly covering donations and provision of facilities for orphans, disabled and elderly within the District.

These initiatives are mainly of a charitable nature and are clearly an important contribution to the District. No information was provided to WAI on other types of community support such as economic diversification, local enterprise and training that the Company could consider as part of a wider and longer term support.

4.9.7 Health & Safety

4.9.7.1 Health & Safety Management Arrangements

The mine and the concentrator plant both have labour safety departments, responsible to the mine and concentrator managers respectively, but overseen by the Kazzinc team (responsibility for Labour is 1st VP of Kazzinc). Staffing is organised as follows:

- Safety Manager for ZGOK
- 3 Safety Inspectors & 2 Clerks reporting to the Safety Manager
- 2 Safety Specialists at the Mine
- 1 Safety Specialist at the Concentrator
- 2 Safety Specialists at auxiliary departments

There are overall standardised policies and procedures for Kazzinc together with local procedures in each facility appropriate to the activities carried out there. These follow the statutory prescribed procedures in the Law on Industrial Safety, which sets out the functions, responsibilities and procedures to be followed. These are implemented with the prescribed 3 layers of safety control and responsibility: Foreman; Senior Specialist at each facility and Senior Specialist of Company.

The medical service at the mine and plant is outsourced to a specialist company, who provide a medical centre and trained staff.

All staff receive 5 days of safety and other induction training at the dedicated Kazzinc training centre at commencement of employment.

4.9.7.2 Occupational Issues at ZGOK

The Company is aware of potential problems at the mine due to the high level of silica in the rock. Mine ventilation is being improved with the proposed installation of a larger fan, to reduce the risk further and ensure that air quality is within required norms.

4.9.7.3 Performance and Accident Records

The company performs regular occupational health and exposure surveys, with annual monitoring and reports prepared by an independent specialist company. Air quality (dust and gases from blasting) is monitored daily by the mine rescue department, in accordance with sanitary norms.

Occupational health and safety data was seen by WAI and no particular issues were noted. There has been one case of silicosis in 5 years, and the incidence of bronchitis is slightly above normal expectations.

4.9.8 Mine Closure & Rehabilitation

4.9.8.1 Mine Closure Plans

According to the Subsoil Use Code, all stockpiles and tailings formed before 1992 revert to State supervision. Thus all old waste dumps around Zyryanovskoye are not connected with the Company and are not a liability for the present operation. The TMF was originally constructed in 1968 so the deeper layers technically fall under State control and are not the responsibility of the Company. However, in practice it is not possible to separate the pre and post-1992 parts of the TMF and all is treated as one entity.

Under the Subsoil Use Code licence requirements, the mining operation has prepared a closure plan, dealing with the physical closure only; there is no provision for social closure, other than the statutory redundancy payments. The costs of the closure plan have been estimated at US$2.5million.

The Concentrator and TMF are licensed as an Industrial complex and thus have no requirement for a formal closure plan.

The TMF is considered as a man-made mineral formation, with a metal content that may, one day, be of economic or beneficial value, and is therefore considered as an asset. It is thus treated as a potential resource that will either be re-worked by the company or returned to the State. Kazzinc have stated that, in the long term, they will continue to be responsible for the TMF and will prepare a design for decomissioning and recultivation, but that this is too far in the future for consideration now. Thus, no provision has been made for its long term and post closure condition, or funding.

> ***WAI Comment:*** *Whilst the Maleevskoye Mine has made provision for closure, there is no provision for the concentrator or TMF, and only short-term plans are made. There is no consideration of long term and post-closure physical, geochemical or land use stability, and long term risks do not appear to be well considered. Thus the TMF in particular must be considered a potential long term liability, particularly as the tailings material itself is potentially hazardous and deposition of imported arsenic-containing scorodite waste increases the potential risk.*

4.9.8.2 Financial Provision for Closure

Under the Subsoil Use Code licence the closure fund for the Maleevskoye Mine (US$2.5M) has been created and is held in a special Company account, as part of the Mine Closure Programme that has been developed.

There is no financial provision for closure of the Concentrator complex and TMF, and in the absence of a closure plan there is no basis for estimating the magnitude of the closure and post-closure liability.

4.9.9 Conclusions

4.9.9.1 Environmental and Social Liabilities & Risks

For the most part, Maleevskoye Mine has a very high standard of environmental, social, health and safety management. It is compliant with Kazakh licences, permits and norms. Both the environmental and labour safety functions of the company are of high quality and well organised, and supported by a strong corporate policy, commitment and team.

There are no known social, community or cultural issues or impacts that need to be addressed, and no displacement or compensation requirements. The mine appears to have a good relationship with the local communities, and does not put undue pressure on the social infrastructure of the District or Oblast.

The town of Zyryanovsk is essentially a mining town, and grew up around the developing mining operations over 200 years. It is heavily dependent on the continuation of mining for its economy.

Whilst there are a number of historic mining liabilities around Zyryanovsk, these are not part of the company's current liability and responsibility for them lies with the State.

WAI has identified the following areas of potential liability and risk, which do not meet international expectations and standards:

1. The characterisation and risk assessment for long term disposal (storage) of acid-producing tailings. Monitoring and protection of groundwater and related surface water resources are important regionally;

2. Dust control from the exposed tailings surface, particularly a backup irrigation system during periods of water shortage;
3. Dust control from the ROM ore stockpile, from the haul roads between the mine and concentrator, to prevent contamination of surrounding land and sediment in runoff into watercourses. Overloading of haul trucks, and the absence of load sheeting, should be addressed by the company urgently; and
4. Long term closure liabilities for the concentrator and the TMF Facilities within the company's responsibility need to be addressed, with a full closure plan, rehabilitation and costs, and a long term environmental liability risk assessment.

4.9.9.2 Compliance with Local and International Standards and Expectations

The project is generally compliant with international standards and expectations, with the exception of the potential liabilities and risks identified above. It is likely that the management of hazardous tailings and the mine closure provisions fall short of international practice, although WAI believes that the company's attention is focussed on further improvement in connection with these issues and there are no reasons why they cannot be readily resolved in the near future.

4.9.9.3 Recommendations for ESAP

The following Table 4.18 summarises the action plan identified for investment by the Company (numbers 1 to 5), together with some additional WAI recommendations for an environmental and social action plan for the mining and concentrator complex.

Table 4.18: Recommendations for Environmental & Social Action Plan

	Action	Priority & Timescale
1.	Reduction in the emission of dust from the TMF, by a combination of maintaining water cover and irrigation sprays.	2015
2.	Reduction in the release of ammonia in treated mine water effluent	2012
3.	Disposal of imported Scorodite in safe containment cell on TMF (benefits to other Company operations)	2011
4.	Reconstruction of stormwater drainage and treatment for Maleevskoye Mine	2011
5.	Improvements to the housekeeping and landscape within the sanitary protection zone of the Zyryanovskoye Plant (49.7ha)	2012
6.	Improvements to ore loading on trucks at Maleevskoye Mine – avoidance of overloading and sheeting of loads, to prevent ore spillage on haul road and dust emission	2011
7.	Characterisation and testing of tailings solids for ARD and metal leaching; risk assessment for long term storage of tailings, including Scorodite.	2012
8.	Prepare integrated closure plans for mine, concentrator and TMF, for physical, biological and social closure, including cost estimates and financial provision.	2013
9.	Characterisation and testing of mine water treatment sludges at Grekhovskoe quarry; risk assessment and groundwater monitoring.	2012

The environmental and social performance of the Zyryanovskiy Mining & Concentrator Complex (ZGOK), including the Maleevskoye mine, is based on a brief site visit and reconnaissance, together with discussions with staff of the geology department and Department of Health Safety & Environment. In the short time available it was only possible to have an overview of the project and the way that the company manages its health, safety, environmental and social obligations.

Whilst WAI believes it has gained sufficient insight into the key issues and performance, there may be additional information that was not seen, or variations in interpretation of the available data that could not be explored further.

5 RIDDER-SOKOLNIY DEPOSIT

5.1 Introduction

Kazzinc own and operate three polymetallic deposits within the Ridder Area: Ridder-Sokolniy, Tishinskiy, Shubinskiy and are planning to develop a further three at Chekmar, Dolinnoe and Obruchevskoe.

5.1.1 Location & Access

All six deposits are located within approximately 35km of the town of Ridder, which itself is situated some 120km north-east of the city of Ust-Kamenogorsk (Ust). The town is located in the north-eastern part of the Ridder basin, which has an undulating relief and absolute elevations between 650m-1,000m above Baltic Mean Sea Level. It is flanked on the southern side by the Prohodny and Ivanovsky mountains which rise to 2,300m, and by several lower mountain ranges on the northern side.

The town of Ridder is linked by metalled roads and by rail, with total driving time to Ust of approximately two hours. Ust is served by regular Air Astana flights to the main Kazakh cities of Astana and Almaty.

The six deposits are located as follows:

- The Ridder-Sokolny mine complex is located on the outskirts of the town of Ridder, with Kazzinc offices located in the town centre;
- The Tishinsky mine is located on the main road between Ridder and Ust, 17km south-west of Ridder and 20 minutes from Ridder-Sokolny Mine;
- The Shubinskiy deposit is located some 14km to the north-east of Ridder via a well-maintained, graded haul road;
- The Chekmar deposit is the most outlying of the Ridder Area deposits and is situated some 46km north of Ridder via a graded road; and
- The Dolinnoe and Obruchevskoe deposits are located 7.5km and 11km respectively to the north of the town of Ridder on a graded gravel road from Ridder to Biysk (located within the Russian Federation).

Figure 5.1 below shows the Ust Region and the Ridder Area deposits.

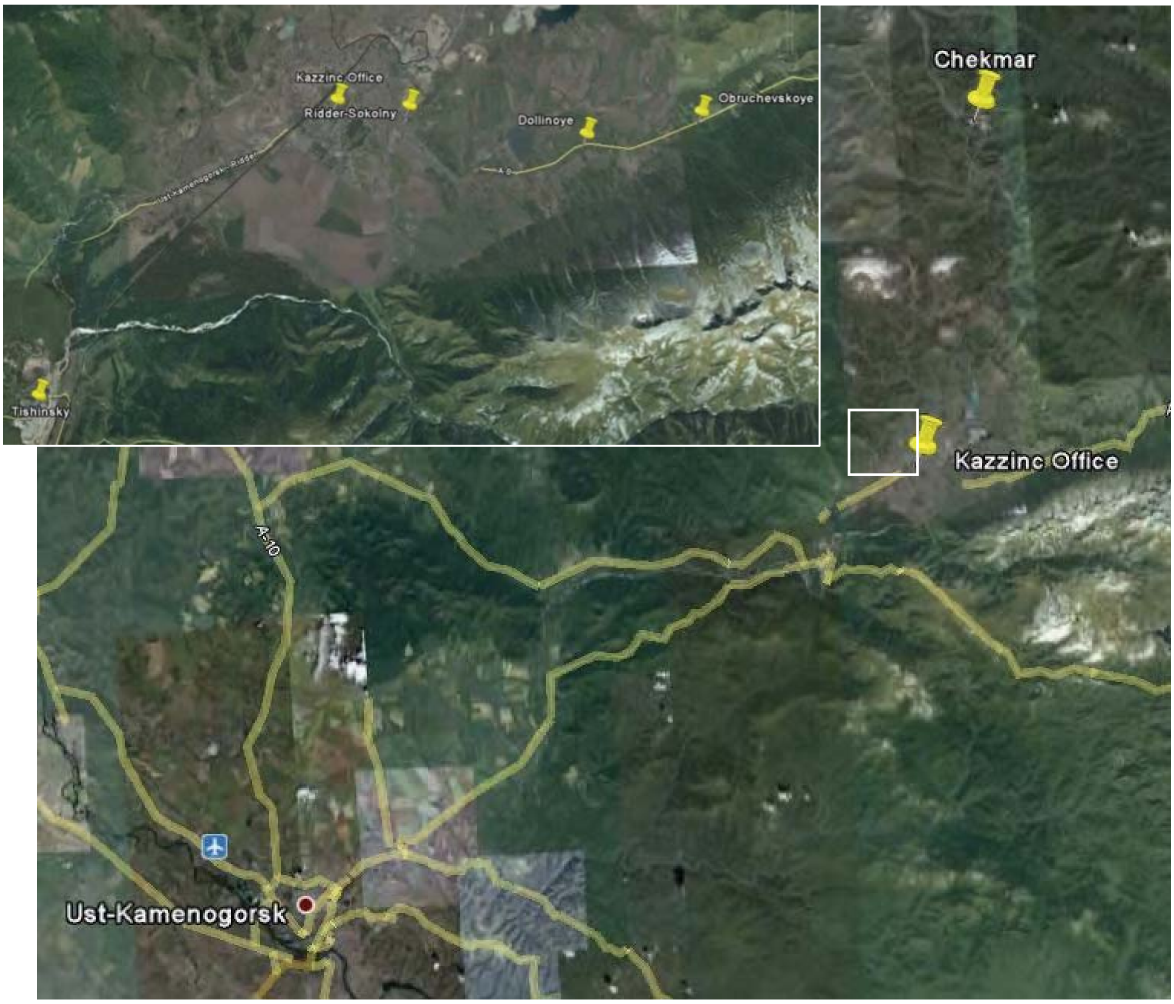


Figure 5.1: Ust Region and (inset) Ridder Area

5.1.2 Topography and Climate

The climate in the region is extreme continental with an average annual temperature of around 2°C, varying between +35°C in July (average of 18°C) and -45°C in December (average of -16°C). Mean annual precipitation is approximately 700mm, of which 75% falls between October and April as snow. Snow cover generally lasts from October to mid-April.

The topography of the region comprises principally undulating relief at absolute elevations between 600-1,200m above Baltic Mean Sea Level, and mountain ranges with peaks of between 1,500-3,000m.

The region has well developed infrastructure.

> ***WAI Comment:*** *In general, access and infrastructure in the Ridder Area are good, and despite harsh winter conditions, present no major obstacles to the continued development of the mines in the area.*

5.1.3 Infrastructure

5.1.3.1 Mineral Rights and Permitting

Kazzinc holds the right to mine gold-polymetallic ore under the terms of the 'Contract for Subsurface Use (MG No.65D)' dated 28 March 1997. The Contract is valid for 25 years from the date of the licence issue and can be extended by mutual agreement between Kazzinc and the issuing authority.

The current mining licence (Ridder-Sokolniy) covers an area of 11.5km^2 and was issued by the Ministry of Energy, Mineral Resources and the Environment of the Republic of Kazakhstan in May 2003, superseding the previous mining lease.

5.1.3.2 Mining Licence for Subsoil Use for Exploitation of Gold-polymetallic Ores (1)

The licence covers an area of 8.588km2 and permits mining to a depth of horizon 18.

The boundaries of the licence (local grid co-ordinates) are defined in Table 5.1 below.

Table 5.1: Mining Licence (1) Boundary Points

Corner Points	Y	X
1	80 427	10 465
2	80 572	10 780
3	80 573	11 245
4	80 195	11 535
5	79 750	11 700
6	79 675	12 244
7	80 006	13 800
8	79 880	13 650
9	79 662	13 800
10	79 056	13 696
11	79 530	12 850
12	78 285	12 800
13	78 315	13 532
14	77 952	13 480
15	77 267	12 447
16	76 539	12 437
17	75 680	12 480
18	77 480	11 807
19	77 417	11 294
20	77 044	11 047
21	11 120	10 627
22	77 577	10 450
23	77 407	10 067
24	77 953	9 820
25	78 135	10 300
26	78 500	9 856
27	78 690	10 266
28	78 917	10 575
29	78 548	10 918
30	78 942	10 920
31	79 143	10 646
32	79 440	10 490
33	79 630	10 710
34	80 010	10 833
35	80 172	10 476

5.1.3.3 Mining Licence for subsoil Use for Exploitation of Gold-polymetallic Ores (2)

The licence covers an area of 11.5km^2 and permits mining to a depth of horizon 24.

The boundaries of the licence are defined in Table 5.2 below.

Table 5.2: Mining Licence (2) Boundary Points		
Corner Points	Corner Points Coordinates	
	Latitude (N)	Latitude (E)
1	50°21'38"	83°31'33"
2	50°21'42"	83°31'50"
3	50°21'43"	83°32'12"
4	50°21'44"	83°32'34"
5	50°21'40"	83°34'04"
6	50°21'25"	83°34'28"
7	50°20'45"	83°34'20"
8	50°20'37"	83°33'38"
9	50°20'30"	83°33'37"
10	50°20'31"	83°34'12"
11	50°20'19"	83°34'10"
12	50°19'39"	83°33'13"
13	50°19'38"	83°32'25"
14	50°19'57"	83°32'37"
15	50°20'02"	83°32'16"
16	50°19'49"	83°32'04"
17	50°19'42"	83°31'09"
18	50°20'00"	83°30'45"
19	50°20'18"	83°31'02"
20	50°20'24"	83°31'26"
21	50°20'36"	83°31'04"
22	50°20'42"	83°31'24"
23	50°20'33"	83°31'46"
24	50°20'37"	83°31'57"
25	50°20'50"	83°31'56"
26	50°20'56"	83°31'43"
27	50°21'06"	83°31'35"
28	50°21'14"	83°31'27"
29	50°21'30"	83°31'34"

5.1.3.4 Geological Allotment for Exploration of Gold-Polymetallic Ores on the Flanks of Ridder-Sokolniy

The exploration licence covers an area of 12.1km^2. The boundaries of the licence are defined in Table 5.3 below.

Table 5.3: Exploration Licence Boundary Points		
Corner Points	Corner Points Coordinates	
	Latitude (N)	Latitude (E)
Site #1		
1	50°21'42"	83°31'50"
2	50°21'34"	83°31'00"
3	50°20'53"	83°29'48"
4	50°19'20"	83°30'28"
5	50°19'26"	83°24'50"
6	50°20'20"	83°24'50"
7	50°20'46"	83°33'52"
8	50°20'37"	83°33'38"
9	50°20'30"	83°33'37"
10	50°20'31"	83°34'12"
11	50°20'19"	83°34'10"
12	50°19'39"	83°33'13"
13	50°19'38"	83°32'25"
14	50°19'57"	83°32'37"
15	50°20'02"	83°32'16"
16	50°19'49"	83°32'04"
17	50°19'42"	83°31'09"
18	50°20'00"	83°30'45"
19	50°20'18"	83°31'02"
20	50°20'24"	83°31'26"
21	50°20'36"	83°31'04"
22	50°20'42"	83°31'24"
23	50°20'33"	83°31'46"
24	50°20'37"	83°31'57"
25	50°20'50"	83°31'56"
26	50°20'56"	83°31'43"
27	50°21'06"	83°31'35"
28	50°21'14"	83°31'27"
29	50°21'30"	83°31'34"
30	50°21'38"	83°31'33"
Area – 10.2km^2		
Site #2		
1	50°21'25"	83°34'28"
2	50°20'22"	83°36'02"
3	50°20'22"	83°34'56"
4	50°20'49"	83°34'00"
5	50°20'45"	83°34'20"
Area 1.9km^2		

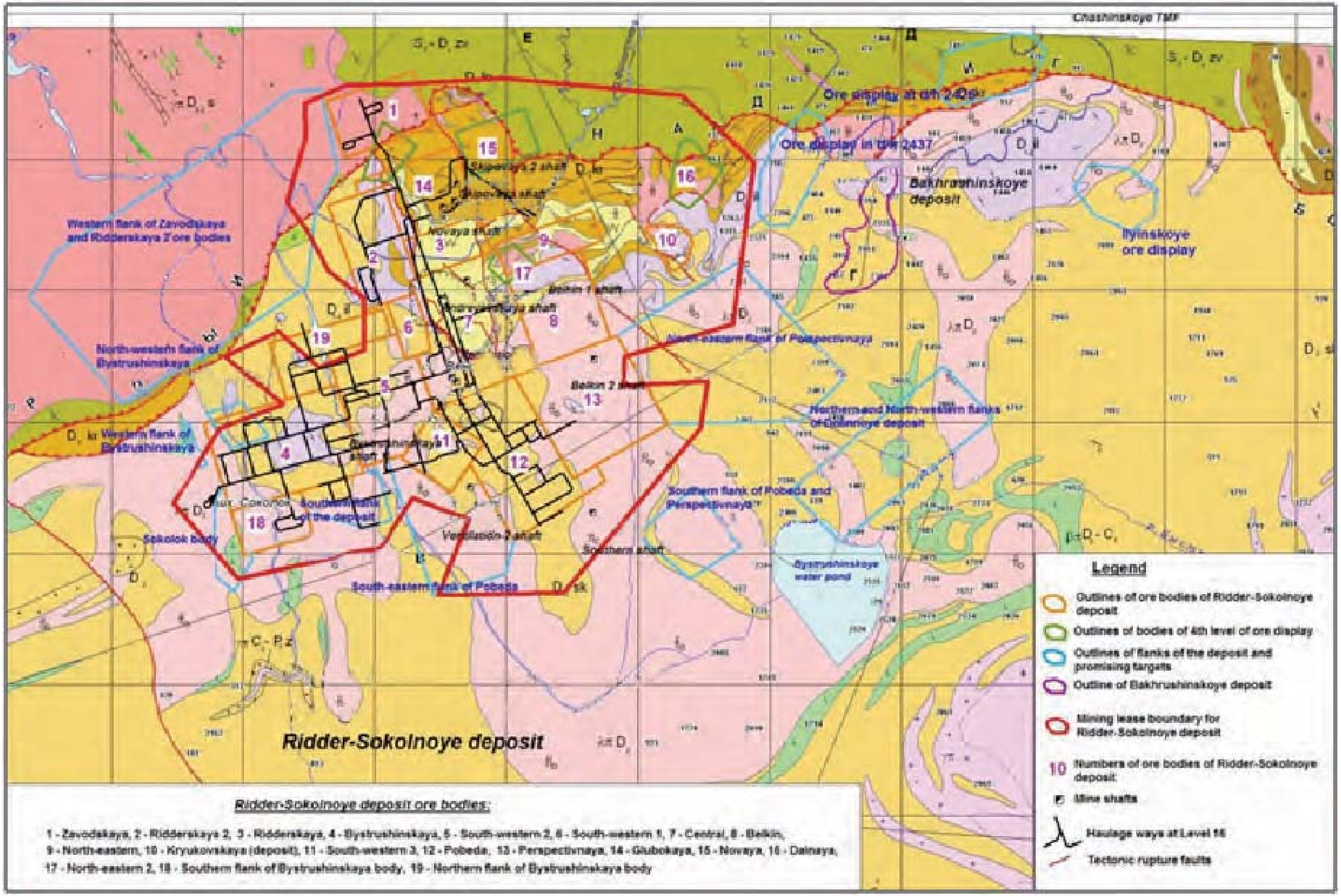


Figure 5.2: Location Plan showing Position of Ridder Licences

5.1.4 Project History

The Ridder-Sokolniy deposit was discovered in 1786 and has been worked since 1789, initially exploiting silver and gold-bearing ore, before producing gold-polymetallic ore from surface and underground working since 1920. The total mine production over the period 1789 to 2008 inclusive is understood to be of the order of 180Mt at 3g/t Au, 29.5g/t Ag, 0.3% (Cu), 0.9% (Pb) and 1.7% Zn. These figures are based on a summary of annual accounting.

The current underground mine layout was developed on the basis of a project called 'Reconstruction of the Mines in the Ridder-Sokolniy Deposit' which was prepared by the Kazgiprotzvetmet Institute in 1984.

Prior to 1994, the deposit was exploited via three separate underground mines (known as Leninogorsk, Ridder and 40th Anniversary). Between 1994 and May 2001 only Ridder and 40th Anniversary were operational, utilising a common haulage and ventilation system, and in May 2001 the three mines were merged into a single operation, subsequently renamed as Ridder-Sokolniy.

5.2 Geology and Mineralisation

5.2.1 Regional Geology

The Ridder-Sokolniy deposit is situated in the northern part of the Ridder mining district in the Rudnyi Altay. Geologically, this district coincides with an unusual graben structure oriented perpendicular to the regional north-west structural trend and preserving Silurian to Middle Devonian volcano-sedimentary sequences almost in the same position as they were laid down. The graben measures 20km in length by up to 8km in width at its centre. It is bounded on all sides by reverse faults. Terrains located immediately to the west and east of these faults display intense folding with steep pervasive north-west striking schistosity.

The graben is filled with four volcano-sedimentary formations comprising, in ascending order, Zavodskaya (S2-D1zv), Leninogorskaya (D1ln), Kriukovskaya (D1kr), Ilinskaya (D1-2il) and Sokolnaya (D2sk) formations (refer to Table 5.4 below).

The Kriukovskaya Formation hosts most of the polymetallic mineralisation known within the confines of the graben structure. It consists of three members:

- Upper member of predominantly fine-grained sedimentary rocks (mainly siltstones of highly variable composition);
- Middle member of acid volcanogenic rocks (agglomerates, tuffs, minor lavas and lava breccias and their reworked derivatives), which attain 350m in thickness in the vicinity of the palaeovolcanic centres (in the central part of the Ridder-Sokolniy deposit and at the Kriukovskaya Lode) and peter out rapidly in the south-western, southern and south-eastern flanks of the Ridder-Sokolniy deposit; and
- Lower member consisting of carbonaceous siltstones and tuffaceous clastic sediments of varying grain size.

Calcareous siltstones at the top of the Kriukovskaya Formation, with their distinctive green-grey or ash-grey colour, serve as the marker horizon throughout the Ridder graben. Isolated reef limestones are also locally known at the same level.

Table 5.4: Stratigraphy of the Ridder Graben

Formation	Symbol	Typical Lithology of Sedimentary and Volcanogenic Origin	Intrusive Rocks
	Q	Alluvial sediments predominated by gravel and pebble size clasts, loam, thickness from several metres to over 100m	
Sokolnaya	D_2sk	Dark-grey to black carbonaceous-pelitic siltstones with intercalations of sandstones, gravelites, calcareous siltstones at the base	Sills of dolerite, porphyritic dolerite and subvolcanic porphyries Subconformable subvolcanic rhyolites ranging in thickness from 130m to 400m with widespread hydrothermal alteration Subconformable tabular extrusive to subvolcanic rhyolites and dacites of variable thickness
Ilinskaya	D1-2il	Variable banded sedimentary and volcano-sedimentary rocks, including tuffs of variable composition, tuffites, tuffaceous gravelites, tuffaceous sandstones, siliceous-mica rocks ("peperite"), sandstones, gravelites, siltstone and rare limestones Basal horizon of coarse tuffogenic-sedimentary rocks with angular clasts of siliceous siltstones, sandstones and quartzites, generally 10-15m in thickness, resting on erosional surface of calcareous-siliceous siltstones of Kriukovska Series	Subvolcanic porphyritic andesites forming subconformable tabular bodies
Kriukovkaya	Dkr	"Hanging wall schists" (carbonaceous siltstones, calcareous-pelitic siltstones, siliceous siltstones, sandstones, gravelites and quartzites) Siltstone member formed of fragmented terrigenous rocks: siltstones, aleuropelite, siliceous siltstones, microquartzite. Volcanic material is transformed into chlorite-sericite-quartz rocks. Volcanomictous gravelite with interlayers of siltstones and silty sandstones; rock fragments consists of liperaite-dacite porphyries; albitophyre, rarely tuffs of acid composition	Subvolcanic porphyritic andesites forming subconformable tabular bodies Subconformable subvolcanic rhyolites ranging in thickness from 130m to 400m with widespread hydrothermal alteration
Leninogorskaya	Dln	Metamorphosed tuffs of acid and intermadiate composition, tuffogenic and volcanomictic sandstones and gravelites Intercalations of siliceous and siliceous-pelitic siltstones	Subconformable subvolcanic rhyolites ranging in thickness from 130m to 400m with widespread hydrothermal alteration
Zavodskaya	S_2-D.,zv	Massive and schistose greenschist facies rocks formed from sandstones, siltstones and pelites (chlorite-epidote-carbonate-albite-quartz schists)	

5.2.2 Local Geology

The Ridder-Sokolniy deposit is a cluster of approximately 20 ore zones of predominantly veinlet-type and disseminated sulphide mineralisation found at the same stratigraphic position within the Middle Devonian volcano-sedimentary Kriukovskaya Formation. Four other ore zones are known from deeper stratigraphic levels. The mineralisation covers an area of approximately 20km^2 and extends down to a depth of at least 700m.

Two NW-trending faults divide the deposit into three structural blocks:

- The Central block is bounded by the Drill holes 50-53 Fault on the south-western side and by the Nikolayevska Shaft Fault on the north-eastern side. It contains the Central ore zone flanked by the Ridder, 2nd Ridder and Zavodskaya ore zones on the north-western side and by Pobeda (Victory) ore zone on the south-eastern side;
- The Western block (south-west of the Drill holes 50-53 Fault) contains three South-Western ore zones (1st, 2nd and 3rd) and Bystrushinskaya and the Southern flank of Bystrushinskaya ore zone; and
- The Eastern block (north-east of the Nikolayevska Shaft Fault) contains the North-Eastern, Philippovskoye, Belkina, Perspectivnaya and Kriukovskaya ore zones.

At depth further mineralisation has been identified and includes the Novaya (New), Glubokaya, Dalnyaya (Far) and the 2nd North-Eastern ore zones.

These ore zones are shown in Figure 5.3 to Figure 5.6 below.

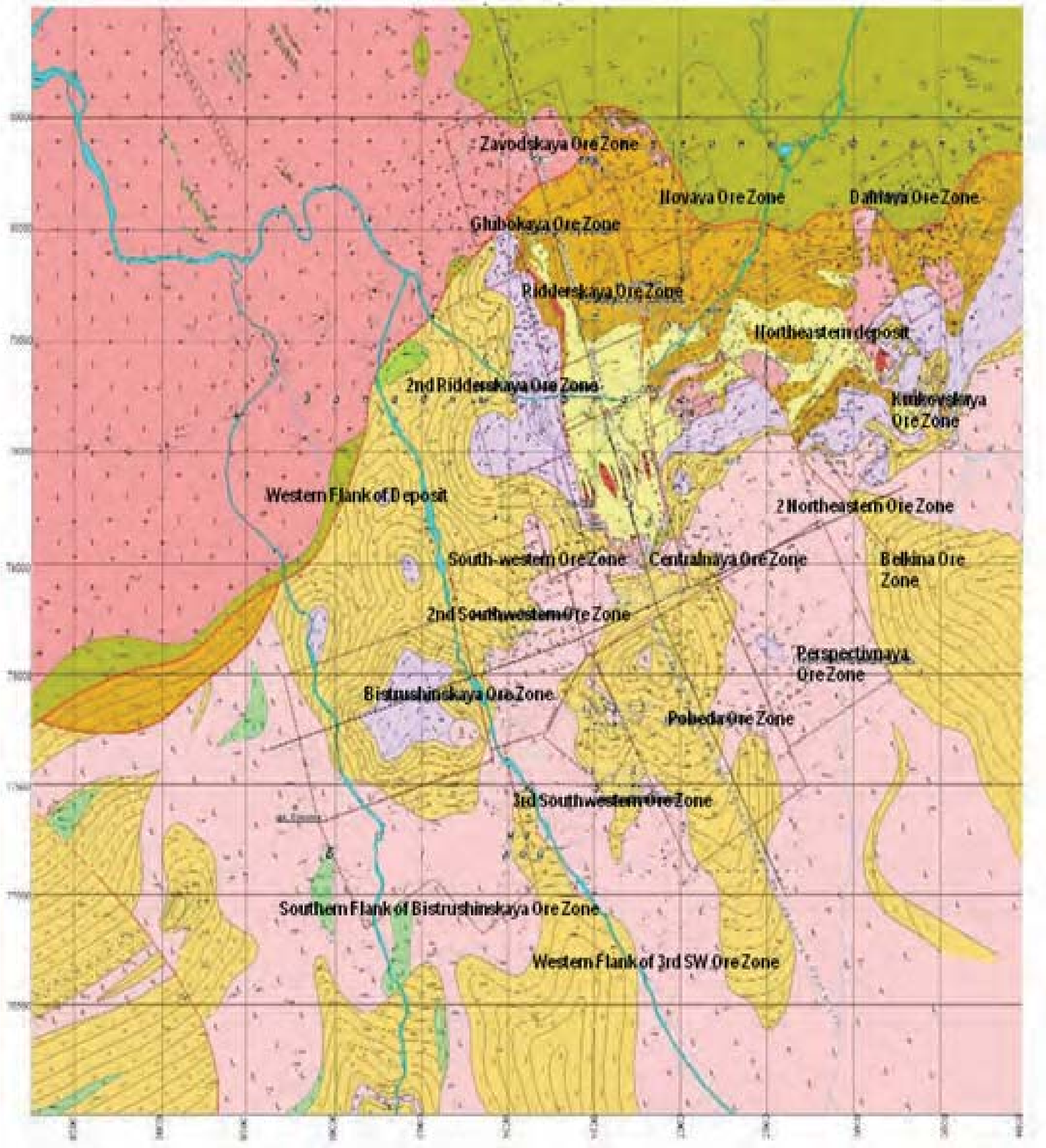


Figure 5.3: Geology Plan showing the Location of the Main Ore Zones

West **East**

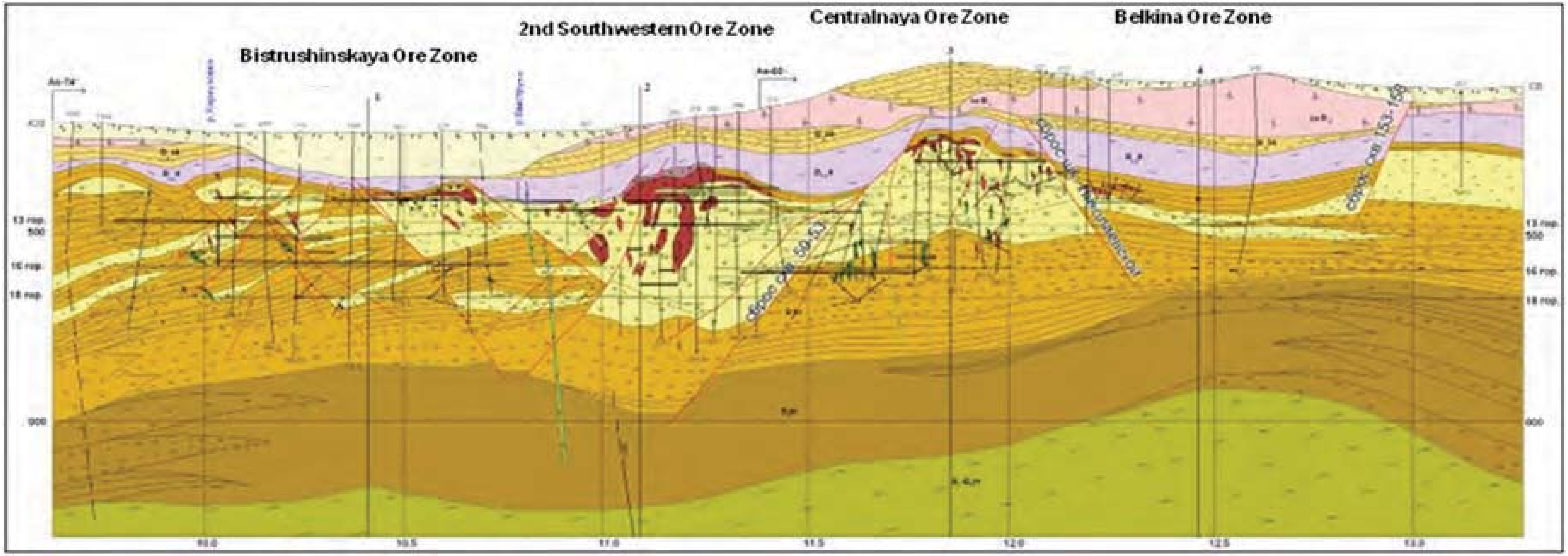


Figure 5.4: West-East Cross Section through the Central Block (main ore zones in red)

North **South**

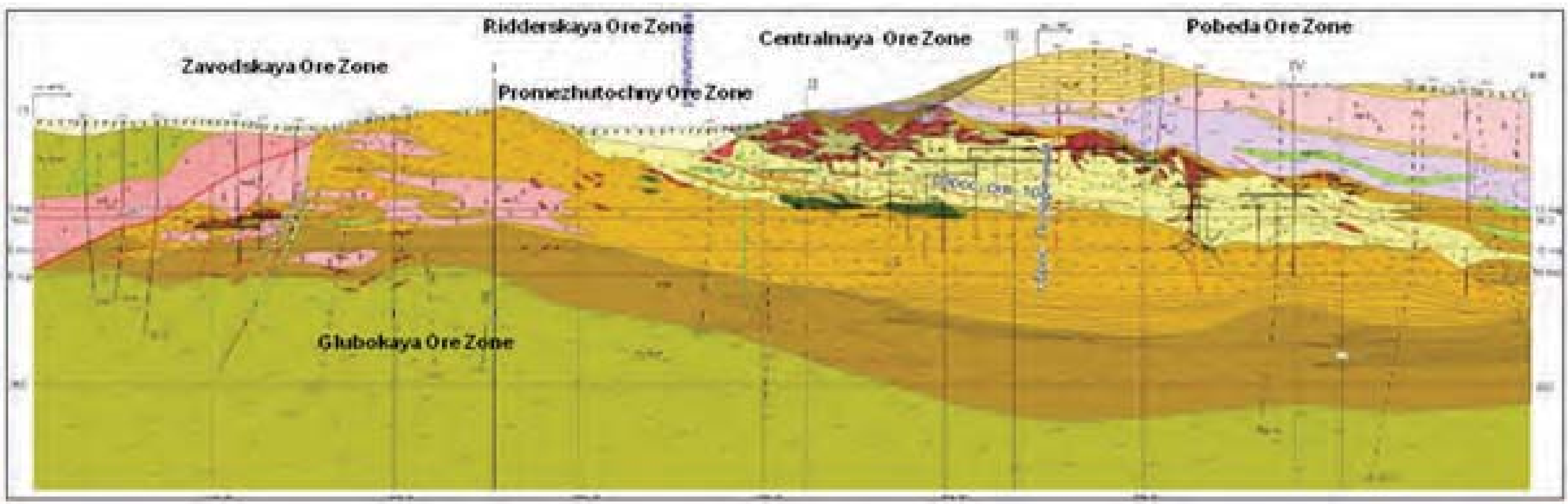


Figure 5.5: North- South Cross Section through the Central Block (main ore zones in red)

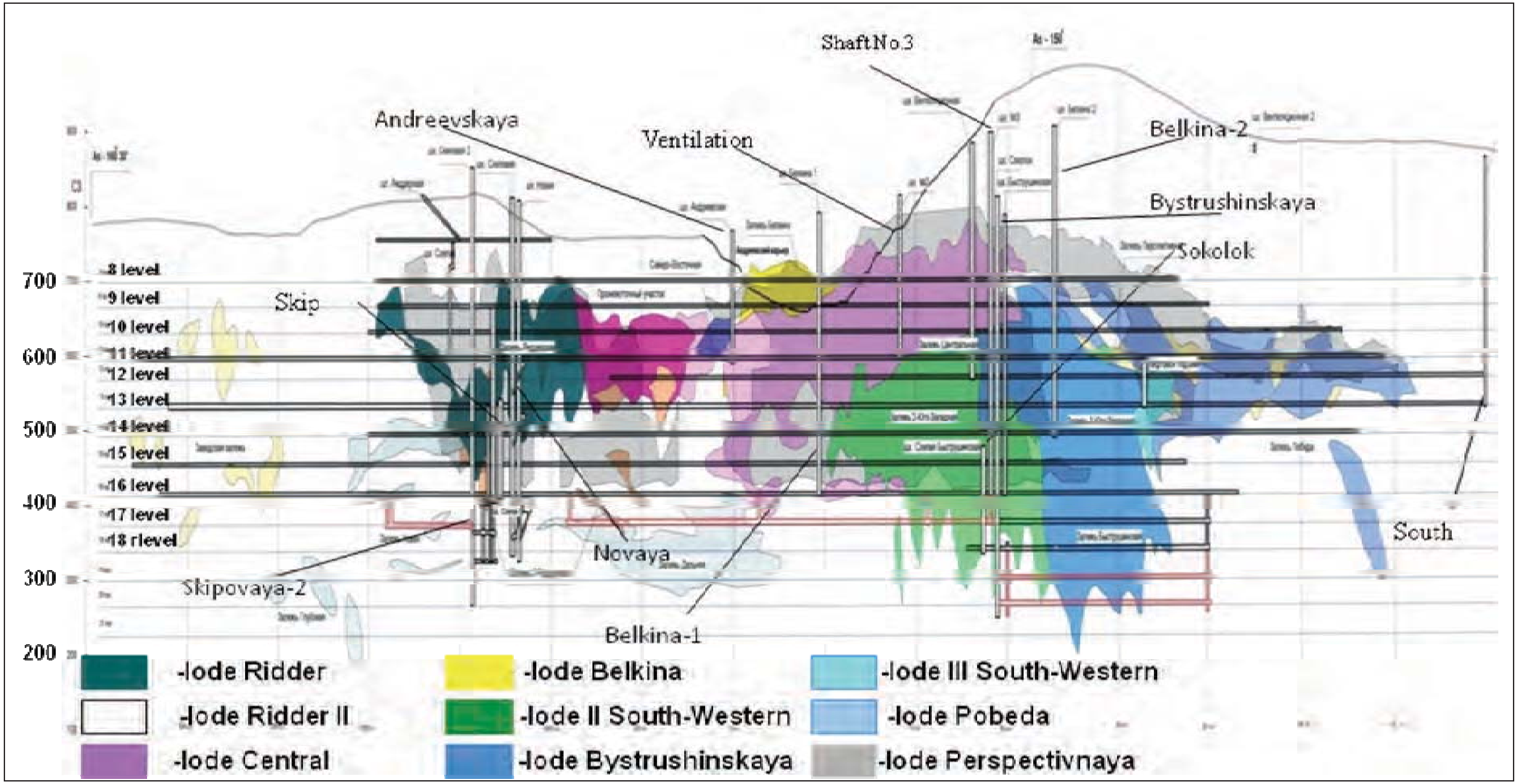


Figure 5.6: Long Section showing the Location of the Main Ore Zones

Horizon I, which is now completely exhausted within the developed mine area, consisted of stratabound mineralisation comprising massive sulphide lenses among veinlet-disseminated mineralisation underlain by veinlet-type and disseminated mineralisation resembling stockwork, which extended to depths of tens of meters. Some veinlet-type and disseminated mineralisation was also found above the massive sulphide lenses. The largest lens (Central) was 1km long (NW), 300-500m wide and up to 100m thick.

The highest grades at this horizon were reported from gold-barite-polymetallic mineralisation, which comprised approximately 15% of the mineralised volume at this horizon but contained approximately 25% of the total contained zinc and lead. Gold grades in this type of mineralisation were in the range of 2g/t Au. Gold-barite-polymetallic mineralisation formed clusters of cupola shaped bodies characteristic for the southern and south-eastern parts of the Ridder-Sokolniy deposit (Central, 2nd South-Western, Perspectivnaya ore zones).

The underlying Horizon II, which is currently in exploitation, contains steeply to moderately dipping veins of zinc-copper mineralisation with variable composition ranging from polymetallic through copper-zinc to copper. The most characteristic feature of this horizon is the predominance of zinc and copper over lead, with zinc being more abundant than copper at Ridder and 2nd South-Western ore zones and copper being more abundant than zinc in Central ore zones. The proportion of copper mineralisation increases with depth, see Figure 5.8.

The other characteristic feature of Horizon II is a higher gold content than at the overlying Horizon I. Gold occurs in sulphide mineralisation and, more importantly, in distinctive narrow veins.

Two types of gold veins within the ore zones are known:

- In Type 1 the gold occurs in association with tennantite-tetrahedrite, galena, sphalerite, ankerite and quartz. These veins, referred to as gold-sulphide veins, are particularly abundant among copper-zinc mineralisation in the 2nd South-Western ore zones. The veins pass upwards into stockwork zones which extend into the gold-barite-polymetallic cupolas; and
- In Type 2, gold occurs in quartz. The vein fill consists predominantly of quartz and dolomite, with minor quantities of unevenly disseminated sulphides. These are particularly abundant in the 2nd South-Western Lode and the Bystrushinskaya ore zones. The veins contain 30-45g/t Au or more, particularly at levels 11-15, and despite small tonnages (typically in the 5,000-10,000t range) may carry as much as 15-20% of the total gold contained in the deposit. In recent years, gold-bearing quartz veins have been worked selectively and stockpiled for processing as high value flux ore.

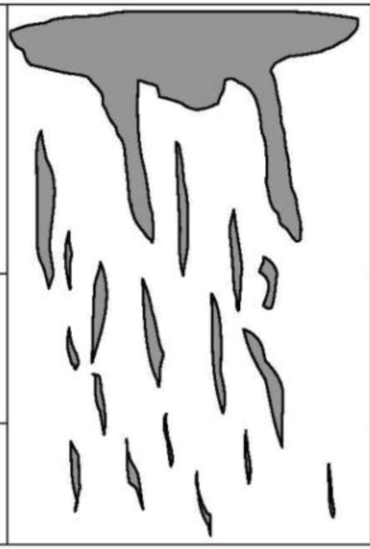
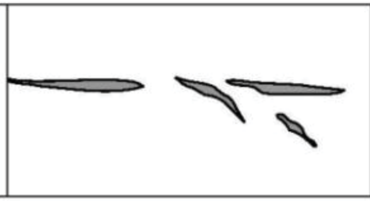
Stratigraphic Column	Mineralisation Horizon	Lodes at Ridder-Sokolny Deposit	Average Grades	Percentage Of Current Resource	MORPHOLOGY OF MINERALISED BODIES	Overall Form. Mining Status
Ilinskaya Fm (20-240m)						
Kriukovskaya Fm (250-650m)	Horizon I (lead-zinc)	Central, Ridder, 2nd Ridder, Zavodskaya, Pobeda, Promezhutochnaya, Belkina, Perspectivnaya, Kriukovskaya, 1st South-Western, 2nd South-Western, 3rd South-Western, Bystrushinskaya, North-Eastern, Filipovskoye prospect	6.2% ZnEq 3.0 g/t Au			Stockwork mineralisation, thick flat tabular and lenticular bodies passing downwards into steeply dipping vein zones. Now practically worked out.
	Horizon II (zinc-copper)	North-Eastern, deep levels of all main lode and flanks of the deposit	4.0% ZnEq 1.8 g/t Au	68		Numerous steeply dipping veins. Developed, currently being mined.
			4.4% ZnEq 1.1 g/t Au	20		Numerous small steeply dipping veins. Undeveloped.
Leninogorskaya Fm (20-350 m)	Horizon III (lead-zinc)	Dalnaya, Glubokaya, Novaya, 2nd North-Eastern	3.7% ZnEq 0.2 g/t Au	12		Small flat tabular bodies and steeply dipping veins. Undeveloped.
Zavodskaya Fm (200-400m)	Horizon IV (polymetallic)					

Figure 5.7: Stratigraphic Position

5.2.3 Description of the Ore Zones

Within the deposit, vein-impregnated, vein, and stockwork-vein ore zones can be distinguished. On the upper levels, flat-dipping hydrothermal-sedimentary, hydrothermal-metasomatic ores are developed, whilst with depth the hydrothermal stockwork-vein formations transform into more typical vein systems.

Each ore zone is characterised by the development of all structural-genetic types of ore at various quantitative ratios. Flat-dipping ores found within the upper levels had a wide aerial distribution over the deposit, but are now mined only on marginal parts of certain ore zones. Today flat-lying ore bodies remain within the Bystrushinskaya, 2nd South-Western and Pobeda ore zones, on the southern flank of Bystrushinskaya ore zone, as well as residual sections in the Perspectivnaya and Belnina lodes.

These ore zones are also characterised by small metasomatised vein ore bodies that often occur on the footwall side of the main flat-dipping ore body and subparallel to it. With distance from the main flat-dipping ore body veins, the flat-dipping ore bodies beneath the footwall become steeply dipping veins.

Currently within the deposit, the steeply dipping vein formations with the ore zones contain the great majority of reserves. These veins are aligned sub-parallel to main shear structures of the deposit and associated fractures.

Rich ores are represented by massive sulphide lenses and gold-bearing quartz veins. Gold-quartz veins with high gold grade (more than 16g/t Au) have been selectively mined and developed particularly in the South-Western and Bystrushinskaya ore zones, although the majority of these have now been mined. In individual cases, such veins occur in the Central and Pobeda ore zones. Gold-bearing quartz veins are typically 0.2-0.8m thick and as a rule occur concordantly with the host lead-zinc and copper ores, their down dip dimensions are up to 40m, and along the strike – 30-50m.

A brief description by ore zone is given below:

Ridderskaya ore zone is mainly represented by vein-like bodies, rarely by columnar and disk shaped ore shoots. These veins are predominantly made up of vein-impregnated sulphide lead-zinc ore, which is altered by complex and oxide variations in the southern part of the lode on the upper levels. In addition, in south-eastern part of the lode, copper ore vein bodies also occur.

2nd Ridderskaya ore zone is represented by sheet-like bodies and beds of hydrothermal sedimentary ores. Ore bodies are predominantly oriented along a strike to the north-west and have a variable south-westerly dip (35-75°). 2nd Ridderskaya ore zone borders on Ridderskaya lode and Intermediate area near "Boreholes 50-53" fault.

Intermediate ore zone area is made up of steeply-dipping vein ore bodies of north-western strike. Lead-zinc ores distributed in the western part of the ore zone dip to the south-west, and copper ores of eastern part of the ore zone dip near-vertically and steeply to the north-east, rarely to the south-west. According to its position, the area is intermediate between the Ridderskaya and Central ore zones. Here, sulphide lead-zinc ores are predominant, with their complex and oxide variations distributed on upper levels, and copper-sulphide ores at the deeper levels.

Centralny ore zone has ore bodies which have a lenticular, sheet-like and vein morphology. On the upper levels, ore bodies are represented by complex dendritic veins and veinlets of various orientation, intersections of multiple-aged veins are observed. At the lower horizons there is a transition from mesh-vein stockwork to oriented vein systems, ore bodies are represented by steeply-dipping veins with banded structure, the banding is conditioned by alternation of variously coloured quartz bands, lenses and spots of sulphides. On the lower levels where copper ores are developed the ore body shape is vein-like or wedge-like. The banded structure veins pinch out rapidly down dip, but along the strike they can be traced for long distances. Veins of the Central ore zone are oriented to the north-west and dip to the south-west along the "boreholes 50-53" fault, but around the fault of Nikolayevskaya shaft - to the north-east, and in the central part of the veins are vertical.

The *Pobeda* ore zone contains both flat-dipping and steeply-dipping ore bodies which can be lenticular, sheet-like, vein-like and disc shaped. The ore zone is made up of sulphide lead-zinc and copper ores. Sheet-like ore bodies consist of vein-impregnated ores. Veins are orientated to the north-west, but in central part near E-W trending veins are also developed.

Perspectivnaya ore zone is characterised by the development of flat-dipping sulphide lead-zinc ore bodies, typically disk-shaped ore bodies predominate, this shape is conditioned by development of short down dip and along the strike fractures filled with quartz and ore minerals. Veins are oriented from north-west to north-south, whilst near Nikolayevskaya shaft fault, ore bodies dip to the north-east, whereas on the north-eastern limb of the ore zone, ores occur horizontally.

Belkina ore zone is mainly represented by flat-dipping ore bodies of sheet-like, band-like and lenticular shape, rarely of disk shape. Only sulphide lead-zinc ores are developed in the ore zone. Ore bodies are made up of thin lenses and streaks and of massive sulfides. On the lower levels rare steeply-dipping thin veins and veinlets with short strike length are developed which are represented by quartz-ore material. Ore bodies are oriented to the north-west and dip to the north-east near Nikolayevskaya shaft fault and to the south-west around the "boreholes 158-153" fault.

The *1st South-Western* ore zone is represented by small vein-like ore bodies. The lode veins are oriented to the north-west and dip to the south-west.

The *2nd South-Western* ore zone is mainly represented by sulphide lead-zinc and copper vein ore bodies, which are typically thin; and have a vein-like shape, rarely columnar. Numerous veins are very thin, however, sometimes these can be traced for considerable distances both down-dip and along the strike. Ore bodies combine one or several veins with numerous sulphide veinlets. Ore bodies typically dip sub-vertically.

The *3rd South-Western* lode mainly consists of sulphide lead-zinc ores transforming to copper ores with depth. Vein-type ore bodies of sub-vertical dip and approximately E-W strike are similar to ore bodies of the 2nd South-Western lode in structural location, mineral content and higher gold grade.

Bystrushinskaya ore zone is mainly represented by steeply-dipping veins and crush zones. Veins and zones are oriented approximately E-W, with crush zones very often overlapping veins and vice versa. Textures are divided into brecciated, brecciform ore bodies filled with quartz, carbonate and sulphide minerals, and brecciated aleuropelites. On the upper levels, minor flat-dipping lenticular ore bodies are developed and represented by vein-impregnated mineralisation in quartz-barite and quartzite. More than half of ore reserves in the lode are represented by copper ores, the rest – by sulphide lead-zinc ores.

Within the *Southern flank of Bystrushinskaya* ore zone a large main flat-dipping ore body has been explored which contains small narrow steeply–dipping ore bodies located on the footwall side of the main body. Steeply–dipping veins are oriented approximately E-W and to the north-east and dip to the south-east.

Lodes of the 4th level of mineralisation (Novaya, the 2nd North-Eastern, Glubokaya, Dalnaya ore zones) are mainly represented by flat-dipping ore bodies occurring sub-concordantly with the contact of the Zavodskaya suite host rocks with Leninogorskaya suite. These lodes are represented by sulphide lead-zinc ores.

Novaya ore zone is represented by a series of small bodies (total 55) of which the main one has an isometric shape and cross-sectional size of 300m with an average thickness of 8.41m. The strike of the ore body is approximately E-W, whose dip is nearly horizontal.

The *2nd North-Eastern* ore zone is represented by a lenticular body 600m long, approximately 300-500m wide and 1 to 19m thick and by 10 small 50-60m lenses occurring nearly horizontally. Ore bodies are oriented to the north-west.

Glubokaya ore zone is represented by one large, some middle-size and some small ore body (a total of 26). The main ore body has lense-sheet-like shape and is isometric about 300m long and average thickness of 16.0m. It is orientated approximately E-W, flat-dipping (15-20°) to the south-west and the west.

Dalnaya ore zone is represented by four quite large flat-dipping ore bodies as well as by 49 small lenses. The main ore body represents two lenses of irregular shape which have a lenticular section. The thickness of the main ore bodies is between 1.0 and 35.0m, average is 13.63m, with dimensions of 600x400m. Ore bodies are oriented approximately E-W, sub-E-W, and nearly horizontal. Dalnaya lode mainly consists of sulphide lead-zinc ores, whilst copper ores are rarely developed. Dalnaya lode is more saturated with mineralisation than other lodes of the 4th level, having a greater content of massive sulphide (totally 30 ore bodies) are observed here, one of which is characterised by higher gold grade.

North-Eastern ore zone is represented by 19 small steeply-dipping ore bodies of vein-impregnated sulphide lead-zinc and copper ores. Ore bodies are elongated to the north-north-nest and dip to the north-east. The lode predominantly consists of sulphide lead-zinc ores, copper ores are of minor significance. Only 3 lenses of massive sulphides with enriched gold are observed in the lode.

Philippovskoye ore occurrence is represented by 11 steeply-dipping small vein oxide and complex copper ore bodies and by 5 small oxide lead-zinc ore bodies with extension to the north-north-west. No rich ore shoots have been discovered.

Krukovskaya ore zone consists of a combination of flat-dipping ore bodies and steeply-dipping vein-stockwork mineralisation of the first level. The ores are represented by oxide and complex lead-zinc variations.

5.2.4 Mineralogy of the Veins

Hydrothermal-sedimentary Ores are represented by brecciated and scaly lead-zinc polymetallic ores known only in the 2nd Ridderskaya ore zone. The breccia-like ores prevail near the set of "faults 50-53", where thick layers (up to 4m) are split up by intercalations of aleuropelites. With distance from the faults, the layer thickness and size of clasts decrease, and at a distance of 30-50m from the fault, the scaly variations prevail. The ore body is represented here by rhythmically alternating intercalations of finely disseminated and microfragmental ores from several centimeters to 15cm thick with thicker layers (up to 0.5m) of aleurolites. On the ore body flanks the aleuropelites contain only spots and blotches of fine-grained pyrite and rarely – inclusions of other sulphides. The scaly lead-zinc ores are fine-grained, formed of a galena-pyrite-sphalerite-dolomitic assemblage.

Hydrothermal-metasomatic Ores and Sedimentation in Cleavage cavities

Massive and vein-impregnated polymetallic ores of the level I are composed of chalcopyrite- galenite-pyrite-sphalerrite mineral assemblage. The main ore mineral is sphalerite; non-metallic minerals are quartz and dolomite. The rare elements in these ores are fahlore, tennantite, gold, silver, arsenopyrite, calaverite, cellular pyrite, stephanite, enargite, hematite. They differ from scaly ores only by their higher copper content.

Hydrothermal, mainly Vein Ores these are zinc-copper ores of the level II, which consist of copper, copper-zinc and polymetallic variations separated by gradational contacts. Unlike the level I ores, these ores are characterised by preponderance of zinc and copper over lead and by their coarse-grained structure resulting from filling of crushed zones by the metal minerals. The veins have a coarse-ribboned, symmetrical, rarely asymmetrical texture. The ores in the crushed zones are spotty, brecciated, rarely impregnated, lense-like-impregnated and massive.

Metamorphogenic-hydrothermal SulphIdic-sericitic Ores of lead-zinc composition are impregnated or massive, of medium-grain size. They consist of pyrite-sphalerite-clinochlore-phengite mineral assemblage. The porphyroblastic textures of ores are typical resulting from cementing of relatively large rounded (15mm) porphyroblasts of dark sphalerite with a phengite and clinochlore assemblage and disseminated small grains of pyrite, chalcopyrite and galena. The ores tend to occur in the zones of later displacement that surround the quartz-barite domes and intersect the bodies of massive and vein-impregnated polymetallic ores.

Oxidized and Mixed Ores are developed in areas lying beneath quaternary deposits and have restrictedly spread. The oxidation zone varies from 30-100m thick. The subzone of the mixed/transitional ores occurs in the lower part of the oxidation zone and its thickness is up to several meters.

5.2.5 Mineralisation

The most distinguishing feature of the Ridder-Sokolniy mineralisation is the dominance of zinc over copper and lead. The average ratio of Cu:Pb:Zn is 0.2:1:2.4, except in copper and zinc-copper veins where copper predominates. The other characteristic feature is the presence of substantial quantities of gold and, to a lesser degree, silver. A list of primary minerals identified at the deposit is given in Table 5.5 below.

Table 5.5: Primary Minerals

Abundance	Metalliferous Minerals	Gangue Minerals
Main	Sphalerite, pyrite, galena	Barite, graphite, dolomite, quartz, sericite, phengite
Abundant	Tennantite-tetrahedrite, gold, silver, electrum, fine-grained pyrite	Albite, ankerite, hydrophengite, calcite, prochlorite, ripidolite, chlorite
Rare	Altayite, hematite, hessite, marcasite, molibdenite, pearcite, rutile	Oligoclase, gypsum, cleavelandite, chlinochlore, corundophyllite, magnesite, muscovite, carbonaceous matter, fluorite
Accessory	Acanthite, arsenopyrite, bismuth, bismuthite, calaverite (?), petzite, stephanite, tellurobismuthite, enargite, bornite	Bleinerite, penninite, siderite, talc

Mineral associations found at Horizons III and IV differs from those at Horizons I and II. Horizon III contains galena-pyrite-sphalerite mineralisation, in which sphalerite and pyrite each form 5-8% by volume, galena forms 1% and chalcopyrite 0.5-1.5%. The gold content is typically in the range of 0.2-0.3g/t Au. Gangue minerals include sericite, quartz, calcite, dolomite, chlorite, potassic feldspar, plagioclase, siderite, barite and fluorite. Horizon IV contains chalcopyrite-galena-sphalerite mineralisation in calcite-quartz veinlets.

5.3 Exploration Works

5.3.1 Sample Collection

Currently mined veins generally do not exceed 50m in strike length. A grid of 25m along strike by 10m to 25m up and down dip is normally required to delineate such veins in order to classify the estimated reserves as C_1 category (under the statutory requirement of mines to report reserves under GKZ (RK) protocols). Detailed pre-production drilling and channel sampling to upgrade the reserves to the B category is generally carried out on a 12.5m by 12.5m or a closer spacing if necessary.

The following sequence has been developed through many years of experience:

- Preliminary exploration by deep diamond core drilling from surface on a 50m by 50m grid (using directional wedging), which is considered optimal to delineate a C_2 category resource; now carried out only to explore the flanks of the deposit;
- Detailed underground exploration with geological mapping and sampling of underground openings and drilling on grids varying from 50m by 25m to 25m by 25m; generally sufficient to delineate C_1 category resource blocks; and
- Additional pre-stoping exploration with channel sampling and drilling to achieve a 12.5m by 12.5m or closer sample spacing required to upgrade the C_1 reserve to the B category.

Two different schemes of underground development and detailed exploration are in use depending on the geometry of mineralised zones. They are:

- Crosscut development scheme with crosscuts across the strike of mineralised structures at 50m spacing and fans of exploration drill holes at 25m intervals along the crosscuts to achieve a 25m by 25m sampling grid; and
- Drive development scheme with drives along the strike of mineralisation and fans of drill holes at 25m intervals. The spacing between the drives varies from 100m to 150m.

All underground openings and drill site locations are surveyed with instrumental methods. Drill hole trajectories are monitored at regular intervals. Placement of drill core markers is checked against grades recorded on roentgen-radioactive logs.

Channel samples are cut along one side of each crosscut exposing sulphide mineralisation. Channel samples are 2m in length or less if required. Drives along the strike are sampled by horizontal channel taken from advancing faces at intervals of 6m or 12.5m. Short crosscuts are developed at 12.5m intervals to intersect the whole width of mineralisation. Raises are sampled by horizontal channels at 4-6m intervals from the same wall or from alternate opposing walls. All channel samples are 10cm wide and 1.5cm deep.

Drill core from underground holes is divided into samples of variable length to account for geological features. The whole core is sent for sample preparation. External drill bit diameters are 46mm or 59mm, producing 42mm or 30mm diameter core respectively.

5.3.2 Sample Preparation

Sample preparation is conducted at the laboratory of Ridder Mining and Concentrating Complex. The scheme is based on the Richard-Czeczott formula $Q=kd^a$, where Q is the minimum sample quantity at a given stage of volume reduction, d is the diameter of the largest fragments defined as the screen size that retains the largest 5% of the mass, k is a coefficient dependent on the distribution irregularity of the mineral of interest and a is a coefficient related to the roundness of mineral grains (generally approximately 2).

The coefficient k is the key parameter. In general terms, the lower coefficient k is, the better it accounts for the erratic distribution of minerals. In this instance, the k parameter of 0.1 has been selected after a series of experiments using schemes with k equal to 0.4, 0.3, 0.2, 0.15 and 0.1.

In accordance with the adopted scheme, samples are crushed to less than 1mm and then divided to obtain an approximately 1kg sub-sample which is pulverised to minus 0.074mm. The scheme is considered to be appropriate for sub-sampling of samples with variable contents of fine-grained gold.

5.3.3 Sample Analysis

Analyses are performed at the laboratory of Ridder Mining and Concentrating Complex and include semi-quantitative multi-element spectral analysis (to select samples for accurate analysis), chemical analyses, phase analyses and fire assaying. External control analyses are performed by CL Evrika (former Central Laboratory of PGO Vostkazgeologia), AO Topaz and VNIItsvetmet, all at Ust-Kamenogorsk. Each laboratory is accredited in Kazakhstan.

5.3.4 Bulk Densities

Resource tonnages are based on tonnage factors calculated from regression formulas which link dry bulk densities to combined copper, lead and zinc grades. Two general regression formulas are in use; one for polymetallic mineralisation and one for copper mineralisation (see Table 5.6 below). Regression coefficients in the general formula for the polymetallic mineralisation are based on 554 bulk density determinations on samples taken from lodes in the Central and Western blocks. Regression coefficients for the general formula for copper mineralisation are based on 140 determinations, also taken from the Central and Western blocks. A separate regression formula has been developed for polymetallic mineralisation of the Zavodskaya Lode.

Volumes are converted to tonnages by applying densities based on the general regression formulas for polymetallic mineralisation and copper mineralisation as given in Table 5.6 below.

Table 5.6: Bulk Density versus Grade (from Geoincentr, 2001)

Deposit, Block, Lode	Number of Samples	Correlation Coefficient	Y axis intercept	Regression coefficients		
				Cu	Pb	Zn
Copper Mineralisation						
Ridder-Sokolniy Deposit	140	0.948	2.692008	0.044040	0.010715	0.012510
Western Block	62	0.874	2.697247	0.035039	0.052520	0.002671
Central Block	78	0.962	2.700849	0.044836	0.058719	0.007287
Lead-Zinc Mineralisation						
Ridder-Sokolniy Deposit	554	0.937	2.669419	0.026710	0.034540	0.018910
Western Block	203	0.927	2.673783	0.035749	0.024483	0.015851
2nd South-Western Lode	135	0.952	2.676467	0.039887	0.022098	0.017107
3rd South-Western Lode	26	0.876	2.670899	0.033712	0.037627	0.009317
Bystrushinskaya Lode	42	0.809	2.670790	0.019446	0.026259	0.015513
Central Block	249	0.951	2.668990	0.028714	0.041528	0.018835
Central Lode	128	0.953	2.670613	0.036217	0.030463	0.017473
Belkina Lode	54	0.978	2.673930	0.053992	0.037482	0.022481
Pobeda Lode	67	0.867	2.670876	0.030090	0.040783	0.019444
Zavodskaya Lode	102	0.934	2.679540	0.019379	0.024205	0.015695
Dalnaya Lode	110		2.732580	0.04389	0.01185	0.011020

5.4 QA/QC Analysis for Ridder-Sokolniy and Satellite Areas

WAI has carried out QAQC analysis on a selected portion of the available data from the Kazzinc assets. The data can be treated as being representative of the sample handling and assaying procedures of the company's Ridder assets and the analysis of these is presented here.

5.4.1 Internal Checks

Internal duplicate checks were carried out on 411 Au-Ag samples from the Solovievskiy licence area during 2010. Statistical analysis has been carried out on the data.

Overall the plots demonstrate that the internal duplicate checks have been carried out to a satisfactory standard. The results for the Ag internal checks give similar results.

For the Cu, Zn and Pb assays 270 samples were selected for internal duplicate tests from a range of assay values from the Solovievskiy licence area during the 2010 period.

5.4.2 External Checks

217 of the Au samples and 209 of the Ag samples submitted for internal analysis were also submitted to Ridder-Sokolniy laboratory for external tests. Figure 5.8 shows scatter plots for these external assays and show excellent correlation.

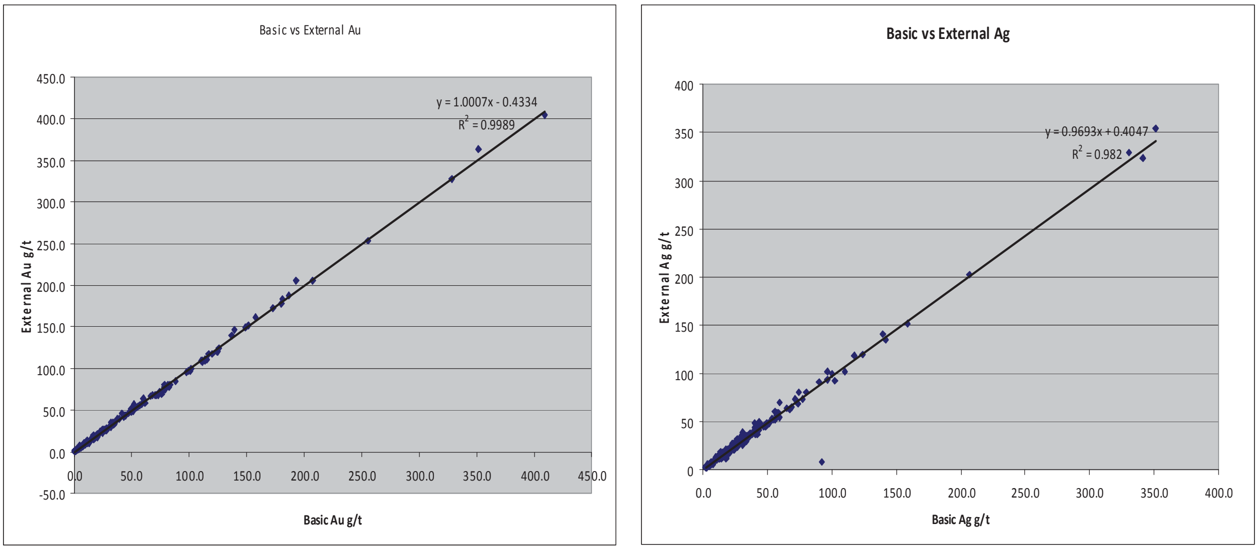


Figure 5.8: Scatter Plots of External Au and Ag Check Assays

Similarly the Q-Q plots for both elements show good linearity.

Overall the results give WAI confidence that the sample preparation and analysis across the Kazzinc assets has been carried out to a high standard.

5.5 Current Mineral Resource Estimates

Mineral Resources for individual Ridder-Sokolniy ore zones have been calculated in accordance with the guidelines of the JORC Code (2004) and are shown in the tables together with a summary below.

5.5.1 Centralny

The Centralny resource model was produced by WAI. A summary of the resource estimate is shown in Table 5.7 below.

**Table 5.7: Centralny Resource Estimate (WAI 01.01.11)
Total In-Situ Resources At COG of 1.7% ZnEQV for PbZn Ore and 0.6% CuEQV for Cu Ore
(In Accordance with the guidelines of the JORC Code (2004))**

Classification	Tonnage (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (Pb)		Zinc (Zn)	
		Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Measured	20.09	1.00	648,768	8.43	5,446,956	0.9	18,020	0.31	61480	0.8	160,800
Indicated	36.21	1.23	1,437,071	8.46	9,847,050	0.44	15,950	0.36	130750	0.85	308,310
Measured + Indicated	56.30	1.15	2,085,839	8.45	15,294,006	0.60	33,970	0.34	192,230	0.83	469,110
Inferred	1.53	0.83	40,763	3.74	183,365	0.45	690	0.15	2320	0.71	10,880

Notes:
1. Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility study or pre-feasibility study.
2. Mineral Resources are reported inclusive of any reserves.
3. Grade represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery.

5.5.2 Bystrushinskoe

The Bystrushinskoe resource model was produced by WAI. A summary of the resource estimate is shown in Table 5.8 below.

**Table 5.8: Bystrushinskoe Resource Estimate (WAI 01.01.11)
Total In-Situ Resources At COG of 1.7% ZnEQV for PbZn Ore and 0.6% CuEQV for Cu Ore
(In Accordance with the Guidelines of the JORC Code (2004))**

Classification	Tonnage (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (Pb)		Zinc (Zn)	
		Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Measured	-	-	-	-	-	-	-	-	-	-	-
Indicated	16.98	2.72	1,486,264	12.29	6,711,147	0.28	48,064	0.42	71,510	0.90	152,812
Measured + Indicated	16.98	2.72	1,486,264	12.29	6,711,147	0.28	48,064	0.42	71,510	0.90	152,812
Inferred	0.04	1.53	1,768	3.44	3,922	0.18	63	0.15	53	0.33	118

Notes:
1. Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility study or pre-feasibility study.
2. Mineral Resources are reported inclusive of any reserves.
3. Grade represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery.

5.5.3 North Bystrushinskoe

The North Bystrushinskoe resource model was produced by WAI. A summary of the resource estimate is shown in Table 5.9 below.

Table 5.9: North Bystrushinskoe Resource Estimate (WAI 01.01.11) Total In-Situ Resources At COG of 1.7% ZnEQV for PbZn Ore and 0.6% CuEQV for Cu Ore (In Accordance with the Guidelines of the JORC Code (2004))											
Classification	Tonnage (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (Pb)		Zinc (Zn)	
		Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Measured	-	-	-	-	-	-	-	-	-	-	-
Indicated	1.75	1.26	70,796	5.63	317,328	1.02	17,890	0.29	5,140	1.08	18,868
Measured + Indicated	1.75	1.26	70,796	5.63	317,328	1.02	17,890	0.29	5,140	1.08	18,868
Inferred	0.09	2.46	7,106	6.90	19,997	0.86	776	0.29	264	1.03	925

Notes:
1. Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility study or pre-feasibility study.
2. Mineral Resources are reported inclusive of any reserves.
3. Grade represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery.

5.5.4 Belkina

The Belkina resource model was produced by KMC and audited by WAI. A summary of the resource estimate is shown in Table 5.10 below.

Table 5.10: Belkina Resource Estimate (WAI 01.01.11) Total In-Situ Resources At COG of 1.7% ZnEQV for PbZn Ore (In Accordance with the Guidelines of the JORC Code (2004))											
Classification	Tonnage (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (Pb)		Zinc (Zn)	
		Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Measured	3.76	1.26	152,331	18.98	2,294,630	0.09	3,384	0.47	17,670	0.98	36,850
Indicated	4.77	1.11	170,126	16.85	2,582,538	0.08	3,814	0.41	19,550	0.85	40,520
Measured + Indicated	8.53	1.18	322,456	17.79	4,877,168	0.08	7,200	0.44	37,220	0.91	77,370
Inferred	0.52	0.88	14,669	23.42	390,393	0.28	1,450	0.32	1,660	0.90	4,670

Notes:
1. Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility study or pre-feasibility study.
2. Mineral Resources are reported inclusive of any reserves.
3. Grade represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery.

5.5.5 Perspectivnaya

The Perspectivnaya resource model was produced by WAI. A summary of the resource estimate is shown in Table 5.11 below.

Table 5.11: Perspectivnaya Resource Estimate (WAI 01.01.11)
Total In-Situ Resources At COG of 1.7% ZnEQV for PbZn Ore
(In Accordance with the Guidelines of the JORC Code (2004))

Classification	Tonnage (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (Pb)		Zinc (Zn)	
		Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Measured	4.59	1.55	228,476	16.01	2,359,940	0.13	5,960	0.57	26,130	1.07	49,060
Indicated	3.94	1.36	172,076	16.79	2,124,381	0.13	5,120	0.53	20,860	1.03	40,530
Measured + Indicated	8.52	1.46	400,552	16.37	4,484,321	0.13	11,080	0.55	46,990	1.05	89,590
Inferred	2.03	1.19	77,607	12.08	787,806	0.14	2,840	0.49	9,940	0.95	19,270

Notes:
1. Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility study or pre-feasibility study.
2. Mineral Resources are reported inclusive of any reserves.
3. Grade represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery.

5.5.6 Sokolok

The Sokolok resource model was produced by KMC and audited by WAI. A summary of the resource estimate is shown in Table 5.12 below.

Table 5.12: Sokolok Resource Estimate (WAI 01.01.11)
Total In-Situ Resources At COG of 1.7% ZnEQV for PbZn Ore
(In Accordance with the Guidelines of the JORC Code (2004))

Classification	Tonnage (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (Pb)		Zinc (Zn)	
		Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Measured	-	-	-	-	-	-	-	-	-	-	-
Indicated	0.29	1.36	12,839	120.84	1,140,808	0.13	380	1.00	2,940	1.89	5,550
Measured + Indicated	0.29	1.36	12,839	120.84	1,140,808	0.13	380	1.00	2,940	1.89	5,550
Inferred	0.37	1.40	16,715	15.27	182,315	0.14	520	1.48	5,550	1.98	7,350

Notes:
1. Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility study or pre-feasibility study.
2. Mineral Resources are reported inclusive of any reserves.
3. Grade represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery.

5.5.7 New Glubokaya

The New Glubokaya resource model was produced by KMC and audited by WAI. A summary of the resource estimate is shown in Table 5.13 below.

Table 5.13: New Glubokaya Resource Estimate (WAI 01.01.11)
Total In-Situ Resources At COG of 1.7% ZnEQV for PbZn Ore
(In Accordance with the Guidelines of the JORC Code (2004))

Classification	Tonnage (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (Pb)		Zinc (Zn)	
		Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Measured	-	-	-	-	-	-	-	-	-	-	-
Indicated	0.32	0.18	1,867	2.48	25,723	0.06	190	0.67	2,160	1.80	5,810
Measured + Indicated	0.32	0.18	1,867	2.48	25,723	0.06	190	0.67	2,160	1.80	5,810
Inferred	0.07	0.14	314	2.68	6,004	0.31	220	0.74	520	2.10	1,460

Notes:
1. Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility study or pre-feasibility study.
2. Mineral Resources are reported inclusive of any reserves.
3. Grade represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery.

5.5.8 Glubokaya

The Glubokaya resource model was produced by KMC and audited by WAI. A summary of the resource estimate is shown in Table 5.14 below.

Table 5.14: Glubokaya Resource Estimate (WAI 01.01.11)
Total In-Situ Resources At COG of 1.7% ZnEQV for PbZn Ore
(In Accordance with the Guidelines of the JORC Code (2004))

Classification	Tonnage (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (Pb)		Zinc (Zn)	
		Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Measured	-	-	-	-	-	-	-	-	-	-	-
Indicated	-	-	-	-	-	-	-	-	-	-	-
Inferred	0.51	0.10	1,640	1.48	24,277	0.08	410	0.83	4,230	1.91	9,740

Notes:
1. Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility study or pre-feasibility study.
2. Mineral Resources are reported inclusive of any reserves.
3. Grade represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery.

5.5.9 Dalnaya

The Dalnaya resource model was produced by KMC and audited by WAI. A summary of the resource estimate is shown in Table 5.15 below.

Table 5.15: Dalnaya Resource Estimate (WAI 01.01.11)
Total In-Situ Resources At COG of 1.7% ZnEQV for PbZn Ore
(In Accordance with the Guidelines of the JORC Code (2004))

Classification	Tonnage (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (Pb)		Zinc (Zn)	
		Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Measured	-	-	-	-	-	-	-	-	-	-	-
Indicated	3.14	0.31	31,104	3.49	352,551	0.68	21,281	0.22	6,975	2.31	72,368
Measured + Indicated	3.14	0.31	31,104	3.49	352,551	0.68	21,281	0.22	6,975	2.31	72,368
Inferred	1.16	0.18	6,855	3.18	118,984	0.51	5,958	0.40	4,620	2.07	24,083

Notes:
1. Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility study or pre-feasibility study.
2. Mineral Resources are reported inclusive of any reserves.
3. Grade represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery.

5.5.10 Zavodskaya

The Zavodskaya resource model was produced by KMC and audited by WAI. A summary of the resource estimate is shown in Table 5.16 below.

Table 5.16: Zavodskaya Resource Estimate (WAI 01.01.11)
Total In-Situ Resources At COG of 1.7% ZnEQV for PbZn Ore
(In Accordance with the Guidelines of the JORC Code (2004))

Classification	Tonnage (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (Pb)		Zinc (Zn)	
		Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Measured	1.78	0.82	46,922	22.60	1,293,223	0.12	2,111	0.79	14,105	1.53	27,187
Indicated	0.51	0.97	15,816	21.62	352,524	0.10	509	0.67	3,397	1.29	6,523
Measured + Indicated	2.29	0.85	62,739	22.38	1,645,747	0.12	2,620	0.76	17,502	1.48	33,710
Inferred	0.33	1.00	10,567	21.10	222,961	0.14	459	0.60	1,958	1.21	3,991

Notes:
1. Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility study or pre-feasibility study.
2. Mineral Resources are reported inclusive of any reserves.
3. Grade represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery.

Table 5.17: Kazzinc Mineral Resources Ridder-Sokolniy Mine (WAI 01.01.2011)
(In Accordance with the Guidelines of the JORC Code (2004)

Deposit	Resources	Cut Off Grade	Date	Tonnes (Mt)	Gold (Au) Grade (g/t)	Gold (Au) Metal Content (oz)	Silver (Ag) Grade (g/t)	Silver (Ag) Metal Content (oz)	Copper (Cu) Grade (%)	Copper (Cu) Metal Content (t)	Lead (Pb) Grade (%)	Lead (Pb) Metal Content (t)	Zinc (Zn) Grade (%)	Zinc (Zn) Metal Content (t)
Centralniy	Measured	1.7% ZnEq for PbZn ore and 0.6% CuEq for Cu ore	01.01.2011	20.09	1.00	648,768	8.43	5,446,956	0.9	18,020	0.31	6,1480	0.8	160,800
	Indicated			36.21	1.23	1,437,071	8.46	9,847,050	0.44	15,950	0.36	130,750	0.85	308,310
	Measured + Indicated			56.30	1.15	2,085,839	8.45	15,294,006	0.60	33,970	0.34	192,230	0.83	469,110
	Inferred			1.53	0.83	40,763	3.74	183,365	0.45	690	0.15	2,320	0.71	10,880
	Total			57.83	1.14	2,126,602	8.33	15,477,371	0.60	34,660	0.34	194,550	0.83	479,990
Bystrushinskoe	Measured	1.7% ZnEq for PbZn ore and 0.6% CuEq for Cu ore	01.01.2011	-	-	-	-	-	-	-	-	-	-	-
	Indicated			16.98	2.72	1,486,264	12.29	6,711,147	0.28	48,064	0.42	71,510	0.90	152,812
	Measured + Indicated			16.98	2.72	1,486,264	12.29	6,711,147	0.28	48,064	0.42	71,510	0.90	152,812
	Inferred			0.04	1.53	1,768	3.44	3,922	0.18	63	0.15	53	0.33	118
	Total			17.02	2.72	1,488,032	12.28	6,715,069	0.28	48,127	0.42	71,563	0.90	152,930
Bystrushinskoe North Flank	Measured	1.7% ZnEq for PbZn ore and 0.6% CuEq for Cu ore	01.01.2011	-	-	-	-	-	-	-	-	-	-	-
	Indicated			1.75	1.26	70,796	5.63	317,328	1.02	17,890	0.29	5,140	1.08	18,868
	Measured + Indicated			1.75	1.26	70,796	5.63	317,328	1.02	17,890	0.29	5,140	1.08	18,868
	Inferred			0.09	2.46	7,106	6.90	19,997	0.86	776	0.29	264	1.03	925
	Total			1.84	1.31	77,902	5.69	337,325	1.01	18,666	0.29	5,404	1.07	19,793
Belkina_RSM_WA	Measured	1.7% ZnEq	01.01.2011	3.76	1.26	152,331	18.98	2,294,630	0.09	3,384	0.47	17,670	0.98	36,850
	Indicated			4.77	1.11	170,126	16.85	2,582,538	0.08	3,814	0.41	19,550	0.85	40,520
	Measured + Indicated			8.53	1.18	322,456	17.79	4,877,168	0.08	7,200	0.44	37,220	0.91	77,370
	Inferred			0.52	0.88	14,669	23.42	390,393	0.28	1,450	0.32	1,660	0.90	4,670
	Total			9.05	1.16	337,125	18.11	5,267,561	0.10	8,650	0.43	38,880	0.91	82,040
Perspectivnaya	Measured	1.7% ZnEq	01.01.2011	4.59	1.55	228,476	16.01	2,359,940	0.13	5,960	0.57	26,130	1.07	49,060
	Indicated			3.94	1.36	172,076	16.79	2,124,381	0.13	5,120	0.53	20,860	1.03	40,530
	Measured + Indicated			8.52	1.46	400,552	16.37	4,484,321	0.13	11,080	0.55	46,990	1.05	89,590
	Inferred			2.03	1.19	77,607	12.08	787,806	0.14	2,840	0.49	9,940	0.95	19,270
	Total			10.55	1.41	478,159	15.55	5,272,127	0.13	13,920	0.54	56,930	1.03	108,860

Sokolok	**Measured**	1.7% ZnEq	01.01.2011	-	-	-	-	-	-	-	-	-	-	-
	Indicated			0.29	1.36	12,839	120.84	1,140,808	0.13	380	1.00	2,940	1.89	5,550
	Measured + Indicated			0.29	1.36	12,839	120.84	1,140,808	0.13	380	1.00	2,940	1.89	5,550
	Inferred			0.37	1.40	16,715	15.27	182,315	0.14	520	1.48	5,500	1.98	7,350
	Total			0.67	1.38	29,554	61.94	1,323,123	0.14	900	1.27	8,440	1.94	12,900
New Glubokaya	**Measured**	1.7% ZnEq	01.01.2011	-	-	-	-	-	-	-	-	-	-	-
	Indicated			0.32	0.18	1,867	2.48	25,723	0.06	190	0.67	2,160	1.80	5,810
	Measured + Indicated			0.32	0.18	1,867	2.48	25,723	0.06	190	0.67	2,160	1.80	5,810
	Inferred			0.07	0.14	314	2.68	6,004	0.31	220	0.74	520	2.10	1,460
	Total			0.39	0.17	2,181	2.51	31,727	0.10	410	0.68	2,680	1.85	7,270
Glubokaya	**Measured**	1.7% ZnEq	01.01.2011	-	-	-	-	-	-	-	-	-	-	-
	Indicated			-	-	-	-	-	-	-	-	-	-	-
	Measured + Indicated			-	-	-	-	-	-	-	-	-	-	-
	Inferred			0.51	0.10	1,640	1.48	24,277	0.08	410	0.83	4,230	1.91	9,740
	Total			0.51	0.10	1,640	1.48	24,277	0.08	410	0.83	4,230	1.91	9,740
Dalnaya	**Measured**	1.7% ZnEq	01.01.2011	-	-	-	-	-	-	-	-	-	-	-
	Indicated			3.14	0.31	31,104	3.49	352,551	0.68	21,281	0.22	6,975	2.31	72,368
	Measured + Indicated			3.14	0.31	31,104	3.49	352,551	0.68	21,281	0.22	6,975	2.31	72,368
	Inferred			1.16	0.18	6,855	3.18	118,984	0.51	5,958	0.40	4,620	2.07	24,083
	Total			4.30	0.27	37,959	3.41	471,535	0.63	27,239	0.27	11,595	2.24	96,451
Zavodskaya	**Measured**	1.7% ZnEq	01.01.2011	1.78	0.82	46,922	22.60	1,293,223	0.12	2,111	0.79	14,105	1.53	27,187
	Indicated			0.51	0.97	15,816	21.62	352,524	0.10	509	0.67	3,397	1.29	6,523
	Measured + Indicated			2.29	0.85	62,739	22.38	1,645,747	0.12	2,620	0.76	17,502	1.48	33,710
	Inferred			0.33	1.00	10,567	21.10	222,961	0.14	459	0.60	1,958	1.21	3,991
	Total			2.62	0.87	73,305	22.22	1,868,709	0.12	3,079	0.74	19,460	1.44	37,701
Ridder-Sokolniy Mine	**Measured**		01.01.2011	30.21	1.11	1,076,497	11.73	11,394,749	0.64	29,475	0.40	119,385	0.91	273,897
	Indicated			67.91	1.55	3,397,959	10.74	23,454,050	0.38	113,198	0.40	269,542	0.95	645,031
	Measured + Indicated			98.12	1.42	4,474,456	11.05	34,848,799	0.46	142,675	0.40	388,927	0.94	918,928
	Inferred			6.64	0.83	178,004	9.09	1,940,024	0.29	13,386	0.59	39,365	1.12	74,187
	Total			104.76	1.38	4,652,459	10.92	36,788,824	0.45	156,061	0.41	428,292	0.95	993,115

5.6 Mining

5.6.1 Introduction

Ridder-Sokolniy has a long history. The deposit was discovered in 1786, the underground operations first started in 1791. Originally there were three separate mines: '40 Years of VLKSM', 'Ridder' and 'Leninogorskiy'. The three mines were eventually joined together into one operation, as they needed a combined access to ore.

5.6.2 Historical Mining

Approximately 181.6Mt of ore has been mined since the beginning of operations. Some historical highlights are:

- 1811 – Krukovsky deposit was discovered;
- 1817 – Filippovsky deposit was discovered;
- 1820 – Sokolniy deposit was discovered;
- 1900 – The Austrian concession "Tury-Taksisa" gained the deposit development rights;
- 1914 – The English firm of L. Urkwart gained the deposit development rights;
- 1918 - The concession was terminated, mines were flooded;
- 1925 - Reconstruction and exploration of Ridder deposits was started; and
- 1930 – Intensive development of Sokolniy deposit.

Mining operations have been conducted in the 17 major ore zones till present day. The future plans are to develop the eastern flank of the Perspectivnaya Lode at Bakhrushinskoy deposit.

5.6.3 GKZ Resources and Reserves

The total resources of approximately 23Mt are currently accounted for by State balance (as of 01 January 2010). A detailed resource statement, approved by GKZ (RK) is given in Table 5.18 below.

Table 5.18: Ridder-Sokolniy GKZ-Approved Resources & Reserves as of 01.01.2010			
	Category	**On-Balance**	**Off-Balance**
Gold-Polymetalic Resources	B	3,643.3	603.0
		6,338.9	353.3
	C1	19,339.6	15,513.7
		24,704.4	11,081.1
1.35	B+C1	22,982.9	16,116.7
		31,043.3	11,434.4
0.62	C2	20,729.1	11,645.4
		12,837.4	12,533.4
Inclusive of Undeveloped Resources	B	-	-
	C1	4,007.6	938.2
0.25		997.0	222.3
	B+C1	4,007.6	938.2
0.28		997.0	222.3
	C2	15,650.3	8,661.3
		4,334.9	10,290.4
Inclusive of Developed Resources	B	3,643.3	603.0
		6,338.9	353.3
	C1	15,332.0	14,575.5
1.58		23,707.4	10,858.8
	B+C1	18,975.3	15,178.5
1.67		30,046.3	11,212.1
	C2	5,078.8	2,984.1
		8,502.5	2,243.0
Included into Developed Resources: Cu ore	B	328.4	34.4
		1,172.9	27.0
	C1	3,143.8	1,486.0
1.14		2,786.1	618.8
	B+C1	3,472.2	1,520.4
0.94		3,959.0	645.8
	C2	478.2	255.7
		447.3	106.1
Included into Developed Resources: Pb-Zn ore	B	3,314.9	568.6
		5,166.0	326.3
	C1	12,188.2	13,089.5
1.68		20,921.3	10,240.0
	B+C1	15,503.1	13,658.1
1.75		26,087.3	10,566.3
	C2	4,600.6	2,728.4
		8,055.2	2,136.9

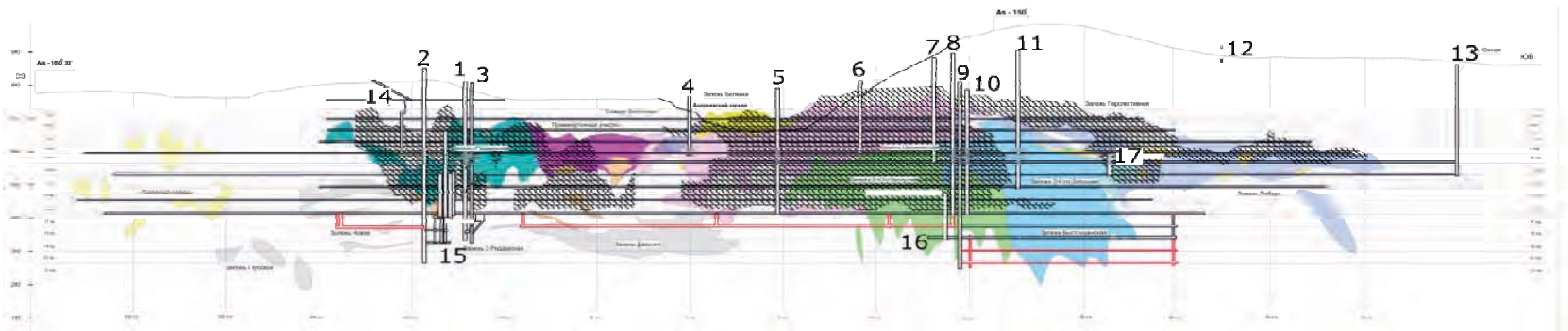
Historically, the mine has increased its resources by the same amount as mined by exploring adjacent areas. This programme remains in place, but the resource grade is progressively lower because the resource increase is less than material mined.

5.6.4 Mine Design and Current Mining Activities

Originally, the operations were worked as three separate units. The mine has an extensively developed underground infrastructure. Mining activities take place on 11 haulage levels and in 11 different ore zones, which are accessed by 12 shafts (10 in operation), to a maximum depth of 460m, hoisting ore and waste, men and materials.

The main hoisting shafts are Skipovaya (for Pb-Zn ore) and Novaya (for Cu ore and development waste). The Skipovaya shaft is equipped with two 7.5m^3 skips, which can be loaded from 11, 13 and 16 levels with a maximum weight capacity of 13,300kg. The Novaya shaft has two 4.5m^3 skips, which has loading facilities on the same levels.

Bystrushinskaya, Novaya and Andreevskaya are shafts used for men hoisting. A long section showing the mined out areas (hatched), shafts and ore zones (differentiated by colour) is given in Figure 5.9 below.



Ridderskaya	Perspectivnaya
2nd Ridderskaya	2nd South-West
Promezhutochnaya	Bystrushinskaya
Tsentralnaya	Zavodskaya
Belkina	3rd South-West
Pobeda	Unexploited Deposits (Novaya, Dalnaya, Glubokaya, North-East)

Mined Out Areas are Shown Hatched.

Shafts: 1 – Skipovaya-1; 2 – Skipovaya-2; 3 –Novaya; 4 – Andreevskaya; 5 – Belkina-1; 6 – Shaft No2; 7 – Ventilation; 8 – Shaft No3; 9 – Sokol; 10 – Bystrushinskaya; 11 – Belkina-2; 12 – Ventilation No2; 13 – Yuzhnaya; 14 – Slepaya; 15 – Slepaya-1; 16 – Slepaya Bystrushinskaya; 17 - Cage

Figure 5.9: Long Section of Ridder-Sokolniy

Figure 5.9 also show the future development in red. This development work targets to access levels 18-20. A detailed design for mining of the bottom levels is now being undertaken. Some preliminary assessment has shown that a conveyor decline, delivering ore to main haulage level 16 provides better economics in comparison to trackless haulage. The conveyor option is considered as preferred.

Currently, main mining activities are concentrated on levels 11 to 16, with 16 level being the major production haulage level. Approximately 70% of the ore is hoisted from 16 level; 20% from 11 level; the remaining 10% from 13 level. The main mining area is currently focused on 14 and 15 levels.

5.6.5 Mining Schedule

The mine schedule is based on short term (monthly, annually), medium term (3 years) and long term mine planning (up until year 2035). WAI has been provided and reviewed both short and long term schedules, highlighting areas where future production is going to take place.

The annual production schedule is designed at the end of each year and highlights exactly which blocks are to be mined and the amount of ore expected from these blocks together with metal grades. The mining schedule also contains information on development and stope preparation requirements for the year. WAI has reviewed the mining schedule for 2011 which is summarised in Table 5.19 below.

Table 5.19: Summary Mine Schedule for 2011

Deposit	Ore	Mining Method* (% of total ore)			Stope Access Works		Stope Preparation Works		Exploration		Blasthole Drilling	Subcontractors			
												Stope Access Works		Stope Preparation Works	
	(kt)	S1	B	S2	m	m^3	m	m^3	m	m^3	m	m	m^3	m	m^3
Tsentralnaya	160	53	47	-	810	4,900	1,200	7,200	-	-	75,080	125	500	675	3,700
Ridder	96	-	100	-	125	500	630	4,380	-	-	21,100	-	-	-	-
Pobeda	378	100	-		1,240	8,260	2,000	13,780	600	2,400	62,500	1,455	7,310	1,720	9,100
Belkina	76	58	-	42	125	500	580	4,100	-	-	11,000	-	-	-	-
Perspectivnaya	102	100	-	-	325	1,600	930	5,900	150	600	18,500	50	300	315	1,200
2ndSouth-West	254	58	32	9	2,975	16,900	5,350	34,600	385	1,540	87,000	1,150	4,700	1,500	6,790
3rdSouth-West	127	100	-	-	770	4,750	1,710	14,600	705	2,820	41,800	-	-	-	-
Bystrushinskaya	821	-	100	-	4,780	44,410	6,650	59,320	3,660	14,640	80,090	-	-	-	-
TOTAL	2,125	44	53	3	11,150	81,820	19,050	143,880	5,500	22,000	397,070	2,780	12,810	4,210	20,790

The schedule indicates that 53% of the ore will be mined using sublevel open stoping with backfill). A description of the employed mining methods is given below.

The long-term mining plan has been designed to 2035 due to the active exploration programmes in place, this will be subject to further changes and therefore not considered within this report.

5.6.6 Mining Methods

Most of the production is performed using hand-held production equipment and scrapers. The main haulage equipment is tracked transport. Trackless methods have been recently introduced, and are focused in the Pobeda ore zone which contains high-grade thin veined gold zones in the southern part of the mine. It is the company plan to implement 30% trackless mining machinery (especially in development and haulage) in 2011 and to increase trackless machinery utilisation to 50% of overall production by 2013.

5.6.6.1 Sublevel Open Stoping

The majority of the ore is extracted using the Sub-Level Open Stoping (SLOS) method or Open Stoping method, which are relatively similar. Figure 5.10 below illustrates SLOS system. SLOS is used in steeply dipping orebodies of more than 50° and where the thickness varies from 3-15m. Ore in the blocks have a medium to high grade. The average block parameters are as follows:

- Length – 50m;
- Width – defined by orebody thickness; 6.1 on average; and
- Height – 40m.

Open stoping is used for thicker orebodies, where average thickness reaches 12.4m.

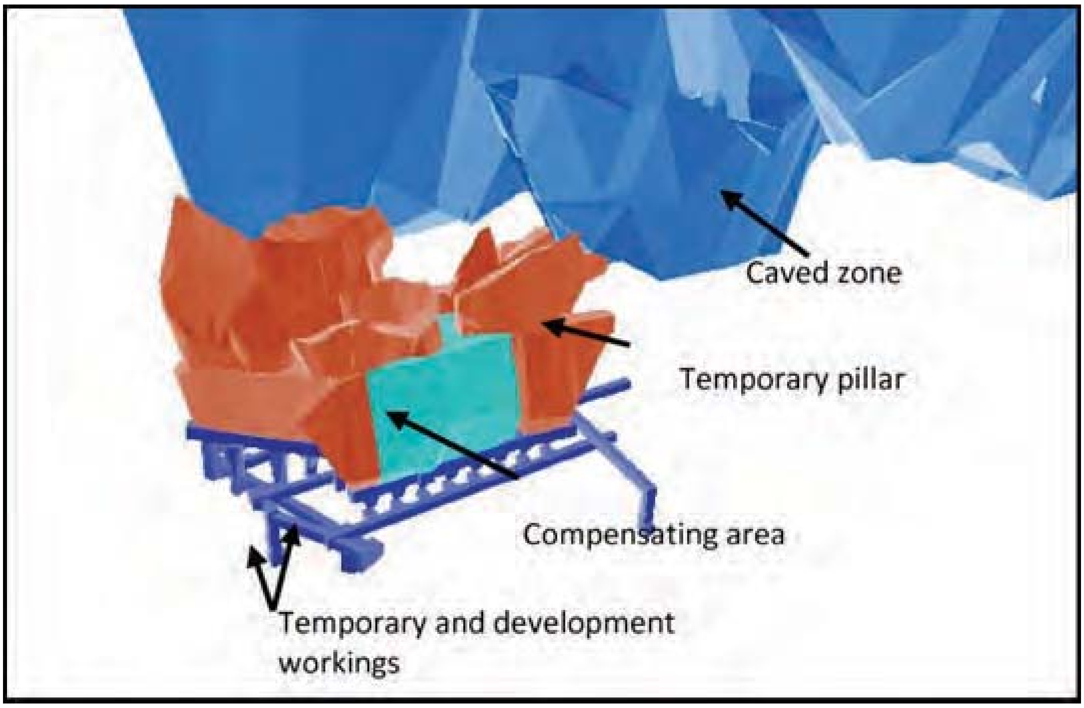


Figure 5.10: Sub-Level Open Stoping: 3D Image

The stopes are split into two sublevels, each of them having a haulage drive and access crosscut. There is also a scraping drift located adjacent to the footwall, ventilation and ladderway raises, and orepasses arranged at each sub-level. Blasthole fans are drilled from a dedicated drift. After blasting, ore is gravity fed into chutes which have been installed along the length of the orebody. A longitudinal retreat method of extraction is used.

The top sublevels are extracted 10-15m in advance of the bottom sublevels. Blasthole fans are charged and fired after all of the ore from previous cycle has been mucked. Kazzincmash drill rigs LPS-3U are used for the blastholes and they are charged using a ZP-12 pneumatic charger. Ore is mucked by 55kW scrapers 55LS-2SM.

After a stope has been mined, temporary pillars are removed and the stope is left unfilled. This leads to caving of rock above the stope into it, caving in many cases accretes to surface. Prior to mining, any area, potentially affected by caving, is thoroughly assessed and checked for the presence of buildings or constructions and appropriate safety pillars are designed.

5.6.6.2 Sublevel Open Stoping with Backfill

The method is similar to SLOS as shown Figure 5.11 below, but uses backfill. The ore is mined in same manner as in the SLOS method, except that an additional drive is developed for backfilling purposes, or the exhausted stope is backfilled via a borehole. Temporarily pillars are left between sections of stope, and removed after the backfill has set.

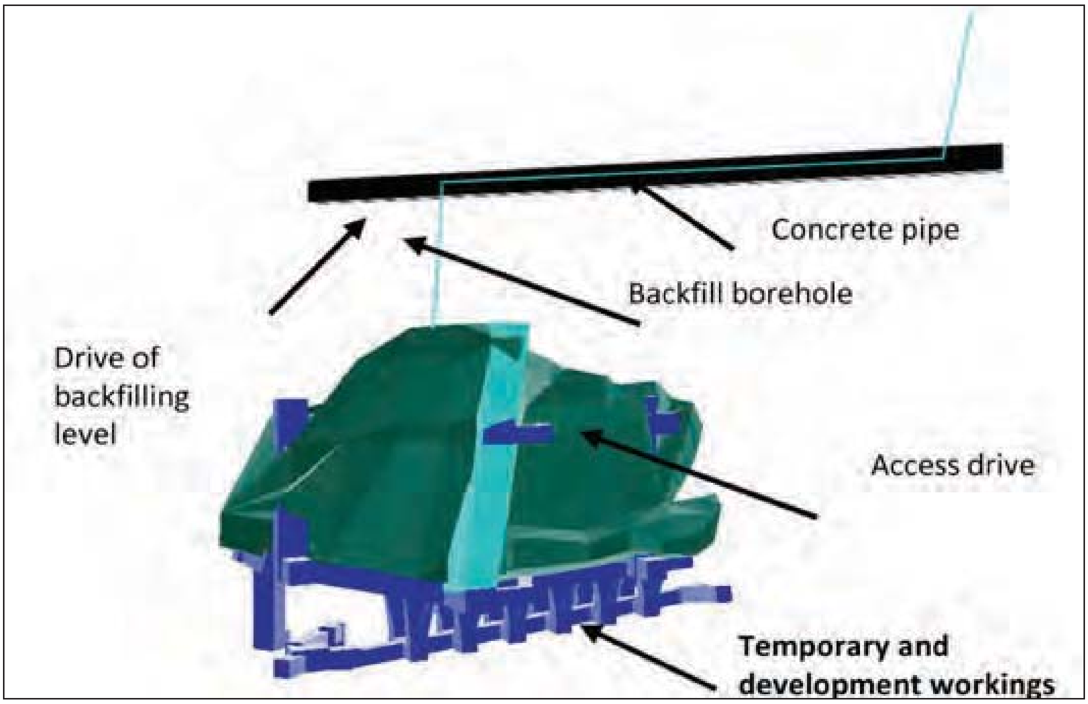


Figure 5.11: Sublevel Open Stoping with Backfill

The hardness and stability of the backfill is monitored and controlled via boreholes.

The backfill is used in areas of the mine where the caving of empty stopes is dangerous or could potentially damage buildings on surface. Backfill is also used where there is potential for a slide or collapse contour reaching the shaft protection pillars.

5.6.6.3 Shrinkage Stoping

Shrinkage stoping is applied in thin steeply dipping ore bodies with a thickness varying from 0.2-1.5m, in medium to stable rock. This method uses the broken ore as a platform for drilling the next lift and installing ground support.

After blasting, ore is taken from the stopes until there is sufficient space to drill the next lift. The ore is fed into rail wagons from chutes and draw points. The miners access the faces via timber ladder-ways which are surrounded by crushed rock but kept open whilst the stope is in production. As well as drilling and blasting, the miners conduct ground support by installing rock bolts.

Shrinkage stoping is used for extracting approximately 3-5% of overall tonnage. Typical shrinkage stope parameters are as follows:

- Length – 50m;
- Width – defined by orebody thickness;
- Height – 40m.

5.6.6.4 Unmechanised Sublevel Stoping

This method is similar to shrinkage stoping and is applied in thin (0.2-1.5m) steeply dipping ore bodies in medium to stable rock. The difference with shrinkage stoping is that this method allows for an increased production rate by developing several faces simultaneously and the lag time between ore being blast and that ore being hauled to the shaft is minimal. The other difference is this method requires more development as shown in Figure 5.12 below.

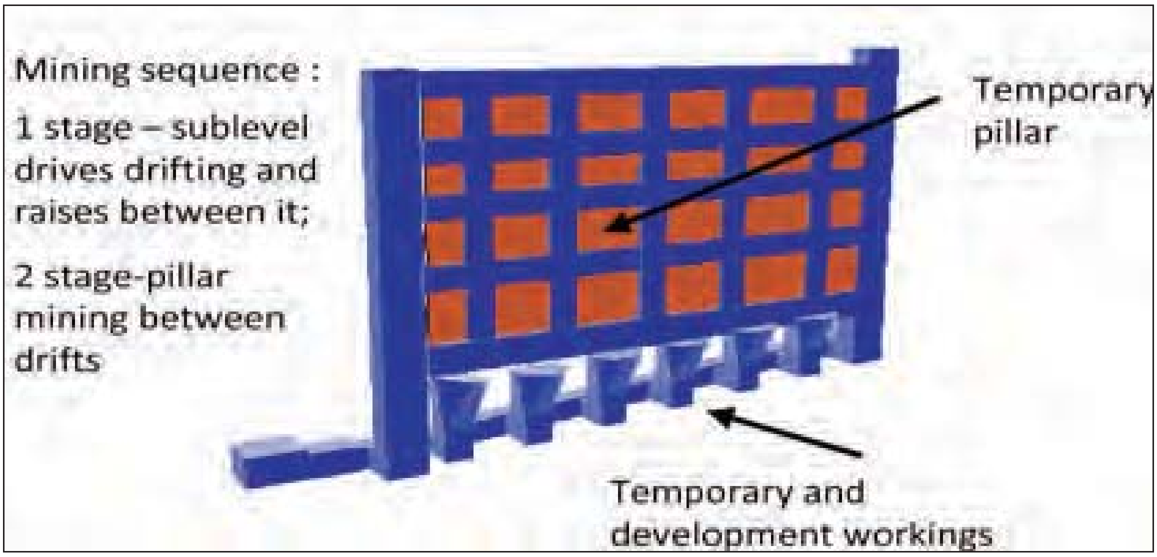


Figure 5.12: Unmechanised Sublevel Stoping

This method is rarely used, as the majority of orebodies could be mined employing more productive and less labour-intensive methods. The typical stope parameters are as follows:

- Length – 50m;
- Width – defined by orebody thickness;
- Height – 40m.

WAI Comment: *The increase of trackless equipment on the mine will improve the development advance rate and open up access to multiple orebodies quicker. As the number of large orebodies suitable to bulk mining is decreasing; the trackless mining methods will ensure that the target production rate is still met.*

5.6.7 Block Grade Evaluation

The mining stopes are designed once the mineralised cut-off grade of the orebody has been outlined. Usually more than one option is considered in terms of ore block access and extraction. All options considered are compared by the amount of preparation required, estimated losses and dilution, final metal content, and proposed value of extracted metals. As a result every mining block is assigned its Net Smelter Return (NSR) value and all the values are compared. At the time of the WAI visit, the cut-off NSR was US$36/t.

The NSR value is dependent upon market prices for metals and other external factors. The actual block NSR value is monitored during mining, and if it is below the set limit for current month, some measures are put in place.

> ***WAI Comment:*** *It is an advantage of the mine that ore tonnages and grades can be tracked for every minimal mining unit using weighing and sampling system of every loaded wagon. Evaluation of block NSR is a good practice, which improves efficiency of mining, and which is not common in former Soviet Union countries.*

5.6.8 Rock Properties and Geotechnical Conditions

The rock properties are generally medium stable and medium hard. The hardness factor varies from 6 to 14 for ores and 9 to 13 for barren rock. The drillability factor is in a region of 15. Loosening coefficient is normally from 1.24 to 1.88 with average of 1.56 (used in calculations). Average density 2.8t/m3 for ore; 2.7t/m^3 for waste. Ore is hazardous in terms of silicosis possibility.

5.6.9 Drilling and Blasting

Most of the production blastholes are drilled using LPS-3U pneumatic drillrigs, as shown in Photo 5.1 below, produced locally by Kazzincmash in Ridder town. The blasthole sizes are either 110mm or 130mm in diameter depending on the rock properties. There is a tendency to use 110mm diameter, as it helps to reduce dilution, although requires higher density of the blasthole grid.

The mining of the Pobeda deposit will be with trackless equipment in both development and production. Atlas Copco Rocket Boomer 104 and Boomer 282 jumbos will be used for the mine development.

Photo 5.1: LPS-3U Pneumatic Drillrig in Operation

Both electric and non-electric initiation systems are used in development blasting. Detonating cords are used to initiate production blasts in the stope. Electric blasting is used in vertical raises and a combination of electric and non-electric initiation is used in mass blasts.

The high explosives are mainly granulated explosives, Granulit-A6, Granulit-AS8 and Igdanit, to maintain ore fragmentation. Packaged Ammonit-6ZhV in 90mm diameter cartridges are used for wet blast holes and Ammonal-200 in 32mm diameter cartridges are used as a booster.

5.6.10 Losses and Dilution

Mining activities take place on a large number of ore bodies which exhibit considerable variation in both morphology and grade, therefore the dilution and loss parameters are variable. The difference can also explained by the large number of ore bodies which are mined at a time. The monthly production reports containing the detailed data on actual dilution and losses were provided to WAI at the site. The monthly results show that expected losses are 3-6% for sub-level stoping; 3-8% for backfilled methods, 25-35% for sub-level open stoping and 20-40% for backfilled stopes.

5.6.11 Ore and Waste Transportation

Ore and waste is drawn from chutes and other drawpoints into rail wagons and transported by K-10, K-14 and EL 5/04 electric locomotives to the shaft. Each locomotive is capable of towing up to 11 wagons. The capacity of the wagons is 0.8, 2.2, 2.5 and 4.5m^3 depending on the level where it is operated. The wagons are discharged by rotary wagon tippers OK-2.8-2.96, OKE-4-410 or by wagon pushers installed at the shaft stations.

The average tramming distance on the 11, 13 and 16 haulage levels is normally around 10km, and an example for 16 level is shown in Figure 5.13 below, and the standard locomotive travel speed is 7-12km/h.

Ore and waste from 18 level is hoisted in 2.2m^3 wagons to 15 level at Slepaya-Bistrushinskaya Shaft. From 15 level, it is moved to the main haulage level on 16 level and then delivered to skips at shafts Skipovaya (Pb-Zn ore) and Novaya (Cu ore and waste).

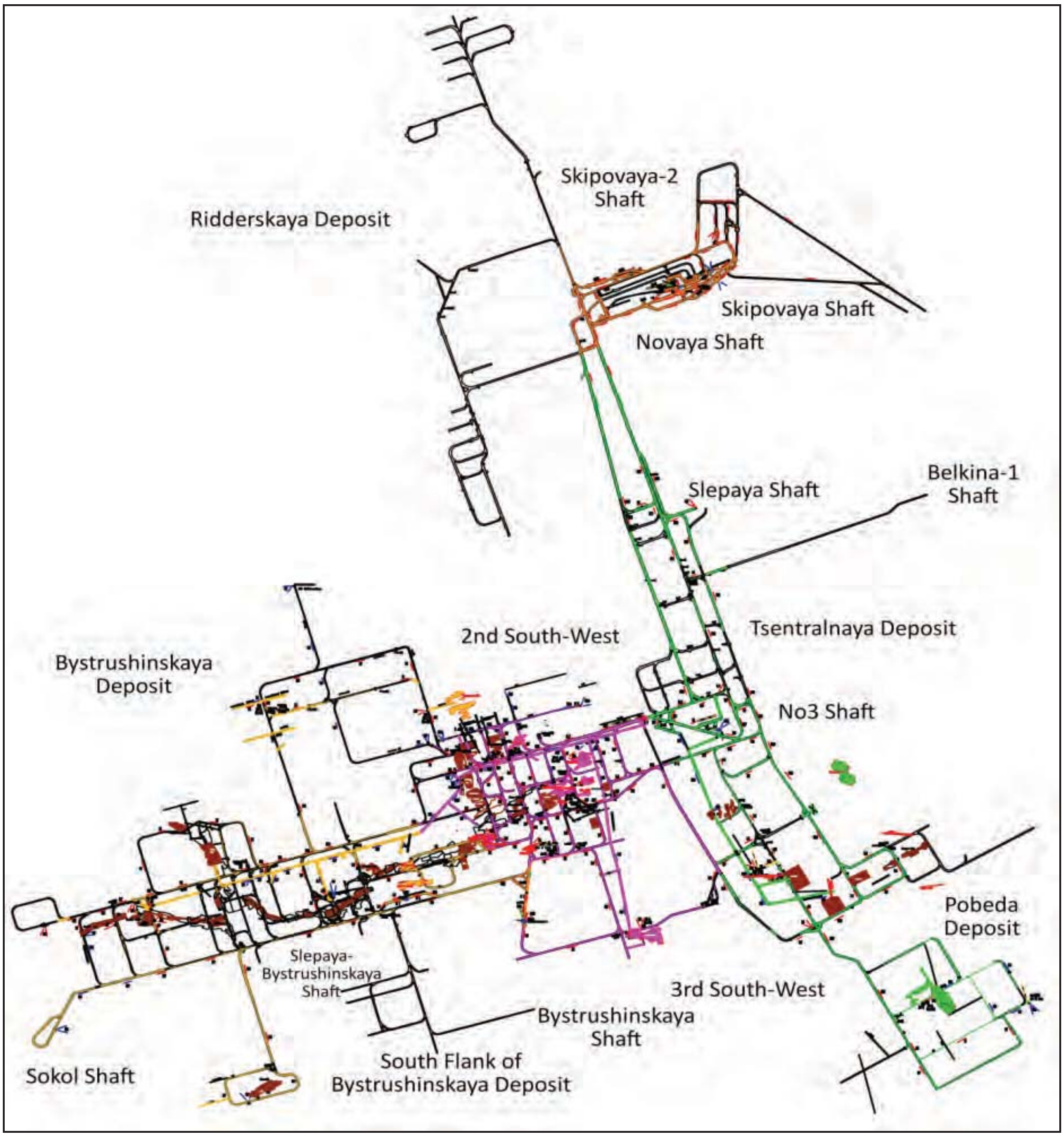


Figure 5.13: Plan of Horizon 16

5.6.12 Hoisting Facilities

Skipovaya shaft is equipped with a 2C-5x2.3 winder (drum diameter 5m, width 2.3m) which is used for (on levels 13 and 16) Pb-Zn ore hoisting (7.5m^3 skips). Novaya shaft has two winders, skip type and cage type. The skip hoisting is operating with 4.8m^3 skips hoisting Cu ore from level 16. Cage hoisting is performed by a CR5-3.0/0.6 winder working with double deck cage and counter weight.

Andreyevskaya Shaft is used for man riding to 11 level and is equipped with a CR-2.2AR cage type winder. Bystrushinskaya shaft is equipped with a ShPM2x4x1.7 winder operating with a double decked cage and counterweight.

Belkina-2 Shaft is used as an emergency egress for the miners, employing a 2BM-3000/1520 winder and cage. Slepaya-Bystrushinskaya shaft is equipped with a 2x3x1.5 U4P single cage winder. This shaft is used for hoisting men, materials and equipment and ore from 17 and 18 levels to 15 level.

5.7 Dewatering System

There are 4 major pumping stations at Ridder-Sokolniy mine, located on 11, 13, 16 and 18 levels as shown in Figure 5.14 below. Each station works has two pipelines, one operational and another is a reserve. All of the pipelines are installed within Novaya shaft.

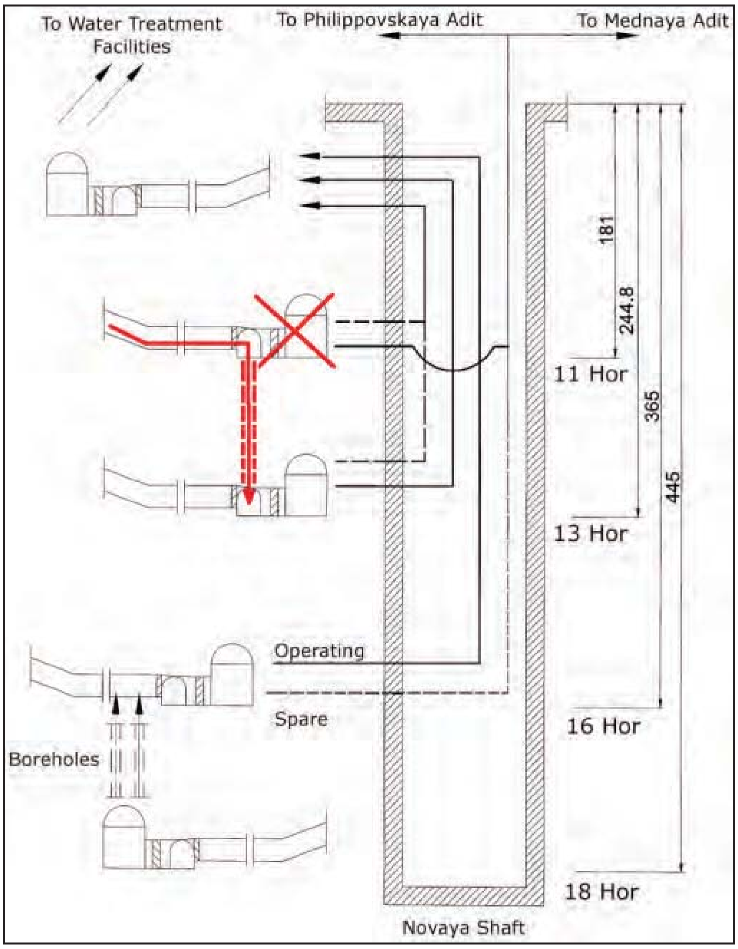


Figure 5.14: Dewatering Scheme (planned layout changes are shown in red)

Water from the lower levels is collected in the sumps on 18 level and then pumped, via 100mm diameter pipes installed in boreholes, to the next pumping station located at the 16 level sumps. Detailed data on pumping facilities is given in Table 5.20 below. From level 16, water is pumped to the adit level via a 400mm diameter pipe which is then used at the ore treatment facilities. After the water is cleaned, it is discharged into Philippovka River. The pumping station on the 13 level works in line with the same treatment facilities.

Water from the 11 level sumps is discharged to Phillipovka River via the Mednaya adit without treatment.

Table 5.20: Major Dewatering Facilities

Unit	Adit Station	11 Horizon Station	13 Horizon Station	16 Horizon Station	18 Horizon Station
m^3/h	1280	734	660	620	102
pcs	1	3	3	2	2
m^3	1600	6 200	6 200	3 700	1830
	1D1250/125	TsN 1000/180	14M12-4	14M8-4	TsNS180/170
m^3/h	1250	1000	900	600	180
m	125	180	310	380	170
pcs	3	5	5	5	3
pcs	1	2	2	2	1
pcs	1	2	2	2	1
pcs	1	1	1	1	1

The mine is intending to upgrade the dewatering scheme by installing new pumps on 13 level and removing the existing 11 level pumping station. Boreholes will be used to move water from the 11 level pumping station to 13 level, where higher capacity pumps will be installed in order to deal with the increase water quantities.

5.7.1 Ventilation

Fresh air is supplied to the workings from Novaya, Skipovaya-2, Andreyevskaya, Belkina-1, Bystrushinskaya, Slepaya-Bystrushinskaya, Sokolok and Yuzhnaya shafts.

Foul air is discharged via Ventilation, Shaft No.3, Belkina-2 and Severniy shafts by means of exhaust ventilation fans. In order to minimise ventilation requirements, mined out areas, and collapsed areas connected to surface are barricaded off by concrete and timber constructions.

There are a number of ventilation fans installed both on surface and underground. The surface ventilation fans are installed as follows:

GVhV- 40 – 2200 at Ventilation Shaft, reversible by system of by-passes;
VUPD-2.8 – Shaft No.3, reversible by changing rotation direction of the engine;
VUPD-2.8 – Shaft Belkina-2, reversible by changing rotation direction of the engine;
VOKD-1.8 – installed in ventilation raise, not used in reverse mode;
VOD-30 – Shaft Andreevskaya, not used in reverse mode;

The main underground fans are installed as follows:

VOD-21 – on level 14 of 2-South-West ore zone, reversible by changing rotation direction of the engine which should be performed together with reverse of GVhV - 40 - 2200;
VOD-21 – on level 16 of 2-South-West ore zone, not used in reverse mode;
VOD-21 – on level 11 of Bystrushinskaya ore zone; reversible by changing rotation direction of the engine which should be performed together with the reverse of GVhV - 40 - 2200;
VM-12 – Yuzhnaya shaft, level 14 of Pobeda ore zone, not used in reverse mode;

An additional fan is expected to be installed at surface on Belkina-2 shaft by the end of 2010.

Local mobile ventilation fans are also located in the workings to supply fresh air to underground sites. Types and quantities of the fans are specified below.

VME-5 – 17 units;
VME-6 – 58 units;
Korfman ESN9-450 – 5 units.

> ***WAI Comment:*** *It was noticed by WAI during the underground visit that the ventilation was operating efficiently, providing a good quantity of air to the remote locations of the mine as required.*

5.7.2 Mine Personnel

The total number of people employed by Kazzinc at Ridder-Sokolniy is approximately 1,600, with a further 700 contractors. The mine has a developed structure of departments, each of the departments has specific designated areas and scope of works. A list of departments, together with the number of staff employed is given in Table 5.21 below.

Table 5.21: Kazzinc Personnel

Administration	9
Health and Safety Service	9
Dispatcher department	8
Production management	2
Surveyor Department	23
Geology Department	24
Mine Design and Planning Department	8
Underground Mining Brigade No1	97
Underground Mining Brigade No2	98
Underground Mining Brigade No3	91
Underground Mining Brigade No4	69
Underground Mining Brigade No5	50
Underground Development Works Brigade No14	52
Underground Development Works Brigade No15	64
Underground Development Works Brigade No17	89
Underground Development Works Brigade No18	113
Underground Drilling Works Brigade No6	80
Underground Exploration Works Brigade No11	58
Underground Blasting Works Brigade No7	73
Underground Transportation Brigade No8	235
Underground Materials Supply Brigade No12	64
Underground Installations Maintenance Brigade No9	175
Underground Ventilation Brigade	37
Underground Backfill Brigade No10	52
Total for the mine	**1,580**

It was noticed by WAI on the site visit that the mine has high standards of health and safety in place, particularly the use of PPE and minimising risks in underground environs, as well as paying a lot of attention to social aspects. Sports and recreational facilities, medical services are available to employees and their families.

> ***WAI Comment:*** *WAI considers that there are no major employment issues for the mine. The mine is located in close proximity to a town with a population of approximately 60,000 people. Historically mining has been one of the main business activities in the area, and WAI understands that there is a large number qualified personnel available in Ust-Kamenogorsk (located approximately 80km north-west from Ridder.*

5.7.3 Future Mine Development

Most of the mine development work will be centered at the Bystrushinskaya and Pobeda areas next year. It is proposed to develop levels here below 16 level using trackless equipment. There are plans to develop a 2,225m decline from 13 to 20 level in the north-west part of the mine, accessing the south flank of the Bystrushinskaya deposit. This decline will be connected with a 980m conveyor, with a 10◦ inclination, running from 16 to 20 level. The conveyor will move ore from the bottom levels to the main haulage on 16 level.

Exploration is currently taking place on the flanks of the ore zones and it is anticipated that these new resources will be incorporated into future production plans.

5.7.4 Conclusions

Ridder-Sokolniy mine is an operation with a long history and an expected long mine life. The developed reserves and exploration will ensure the availability of a reserve up 2030 and beyond. The mine is operated to a high standard both in management and actual mining activities. The employment of qualified and skilled personnel provides a stable workforce and assists in meeting the desired production rate. The existing underground infrastructure has some spare capacity to take up the planned increase in production rate. Despite most of mining requiring backfill and employing manual mining methods, reasonable mining costs have been achieved. This has also been helped by the availability of company owned machinery manufacturing facilities for locomotives, wagons and drill rigs and the availability of power.

5.8 Process

5.8.1 Introduction

The Ridder Mining and Metallurgical Complex (RMCC) which is owned and operated by Kazzinc is situated approximately 120km due east of Ust-Kamenogorsk in the north eastern region of Kazakhstan. Various sulphide and precious metal bearing ores are mined in the Ridder area and processed in the nearby metallurgical facilities. Zinc ore from Kazzinc's Shaimerden mining operation 200km south west of the city of Kostanay is also transported to Ridder for processing.

The ores that are processed at Ridder are produced from the following mine resources:

- Ridder-Sokolniy mine;
- Tishinskiy mine;
- Shubinskiy mine;
- Staroye tailings dam sands;
- Aged slimes from crushing;
- Fresh slimes from crushing; and
- Shaimerden zinc oxide and other oxide ores.

All but the zinc oxide ores are initially sent for crushing at one of three crushing facilities. The Shaimerden ore is transported by rail directly to the zinc smelter. Of the ores sent for crushing one ore type, a high gold grading silica rich ore from the Ridder-Sokolniy mine is dispatched to Ust-Kamenogorsk directly after crushing. The remaining ores are further treated by crushing, milling, gravity and froth flotation in one of two concentrator buildings.

The target mine ore production/ore treatment tonnages for 2010, excluding oxide ores, are given in Table 5.22 below.

Table 5.22: Ridder Concentrators Target Ore Production and Treatment for 2010

Ridder	Ore Type	Tonnes (kt)	Zn (%)	Pb (%)	Cu (%)	Au (g/t)	Ag (g/t)
Ridder-Sokolniy	Pb/Zn	1,952	0.54	0.31	0.15	1.75	13.37
Ridder-Sokolniy	Cu	270	0.22	0.1	1.25	0.4	5.3
Ridder-Sokolniy	Au Flux	30	0.50	0.28	0.28	1.83	12.26
Tishinskiy	Polymet	1,187	5.23	0.66	0.4	0.83	9.84
Subinskoye	Cu/Zn	190	1.52	0.16	1.17	0.26	11.02
Staroye Tailings	Au/Zn	1,100	0.63	0.28	0.04	1.04	12.38
DMS Slimes	Polymet	142	2.68	0.38	0.33	0.36	6.69
Old DMS Slimes	Polymet	197	2.2	0.54	0.22	0.43	8.1

From the inputted ore given above, the metal production forecast is shown in Table 5.23 below.

Table 5.23: Ridder Concentrators Target Production for 2010

Metal	Form	Tonnes (t)	Comment
Cu	In concentrates	10,591	Sold to Chinese Smelters
Pb	In concentrates	8,256	Transported to Kazzinc Smelter in Ust-Kam
Zn	In concentrates	73,642	Treated at Ridder Zinc smelter
Au	In ore/concentrates	3,392	To further processing in Ust-Kam
Ag	In ore/concentrates	17,501	To further processing in Ust-Kam

The copper concentrate is sold to a Chinese smelter and the lead concentrate is dispatched to the Kazzinc lead smelter in Ust-Kamenogorsk. The gold concentrate is also dispatched to Ust-Kamenogorsk where it is fed into the lead smelter.

The zinc concentrate is transported by truck a few kilometres to the Kazzinc zinc smelter that is also located on the edge of the town of Ridder. Several other ores and concentrates, including the Shaimerden and other oxide ores are treated at the zinc smelter as shown in Table 5.24 below.

Table 5.24: Feed to Ridder Zinc Smelter (2010)

Source	Tonnes Ore/Concentrate		Tonnes Zn	
	Planned 2010	Actual 2010	Planned 2010	Actual 2010
Combined Zn Concentrate, Ridder Concentrator	137,066	132,348	73,643	69,133
Zyryanovskiy Concentrate	0	8,480	0	4,703
Akzhalskiy Concentrate	0	0	0	0
Artemievskiy Concentrate	8,641	15,761	4,407	8,093
Zheskentskiy Concentrate	10,121	2,278	4,549	1,051
Ust-Talovskiy Concentrate	1,421	8,554	537	3,608
Berezovskiy Concentrate	5,364	2,733	2,361	1,211
Karagailinskiy Concentrate	8,548	4,409	2,821	1,782
Belousovskiy Concentrate	9,564	4,382	3,826	1,620
Balquash Concentrate (Cu-Cd)	4,200	3,638	1,962	1,674
Shaimerden Ore	225,719	235,746	47,401	48,726
Zn cake ex Ust-Kam Metal Complex	0	4,202	0	841
Iron Concentrate	16,370	7,188		
Zinc cake ex Ridder zinc plant	54,230	80,138	11,774	17,480
Zn white bleach	0	0	0	0
Slimes from Purification Facilities	0	0	0	0
Slimes from Ust-Kam	0	0	0	0

There are two types of smelting operation in the zinc smelter. There are Waelz kilns for treating the oxide ores that produce a precipitated zinc oxide fume product, and there are fluidised bed roasters that treat the zinc sulphides and produce a zinc calcine. Both products are then acid leached using acid made from the roaster off-gas in the on-site acid plant to produce a zinc-rich solution. This solution is purified and electro-won to produce the final zinc metal product. Cadmium and excess acid are also produced in this facility along with several other minor by-products. Table 5.25 below shows the planned smelter production for 2010.

Table 5.25: Ridder Zinc Smelter Target Production for 2010

Metal	Form	Tonnes (t)	Comment
Cu	In Cu cake	878	To Zyrianovskiy plant for further processing
Pb	In by product	1,747	Transported to Kazzinc Smelter in Ust-Kam
Zn	Metal	110,829	Sold to final customer
Au	In by product	0.0285	To further processing in Ust-Kam
Ag	In by product	1.80	To further processing in Ust-Kam
Cd	Metal	378	Sold to final customer
H_2SO_4	93 - 95% concentrate	146,464	Sold to final customer

5.8.2 Services

Power to the Ridder mines and ore processing facilities is supplied by overhead power cables from the Bukhtarminskoya Hydro-power station some 140km away to the west. The whole site consumes 519,026MW per annum.

5.8.2.1 Industrial Water Supply

Two systems are applied for industrial water supply to RMCC facilities:

- The fresh industrial water pipeline with water intake from surface sources; and
- The process water circulation system of the Concentrator.

The sources of the industrial water circulation system are as follows:

- Verkhne-Khariuzovskiy water dam. Water from the Gromotukha River flows by gravity through a reinforced concrete flume to the "zero chamber" and from there goes through two water pipes to a 1,000m^3 distribution tank and further on flows by gravity through two 1,000mm water pipes to the RMCC industrial water supply system; and
- Bystrushinskiy water dam. Water from this dam goes through a 900mm pipeline to the general production water supply system. (This water dam is a backup dam that is to be used in case of a shortage of water from the Verkhne-Khariuzovskiy dam. The annual water consumption from these facilities is 153Mm^3.

Concentrator Process Water Circulation System

This system is intended for water supply for crushing and processing and it operates as follows. Slurry with a solid content of 6 to 11%, and pH = 8.8 is pumped sequentially by pumping stations Nos.1, 2 and 5 from the concentrator to the Talovskoye tailings dam where the first settling stage is performed. The settled water from Talovskoye is then pumped through pumping station No.4 into Chashinskoye tailings dam where water is further settled and becomes suitable for application in the production process. Clarified water with a suspended solids content of 4.3mg/l and pH =7.6 from Chashinskoye tailings dam is pumped through the recycling water pumping station No.6 into the Concentrator process water tank. The volume of water that is recycled in this way is 28.8Mm^3 per year.

5.8.3 Ore Crushing Facilities

There are three crushing installations at Ridder, two of these are located adjacent to the Ridder–Sokolniy mine and Concentrator buildings Nos.2 and 3, while the third installation is located at the Tishinskiy mine site where it crushes ore from the Tishinskiy mine to be used as the feed to a dense media separation facility.

5.8.3.1 Crushing Section No.2

Located in an elevated position behind Concentrator building No.2 is the crushing Section No.2 facility which consists of two almost identical crushing circuits. The first of these circuits, Processing Chain No.1, is used mainly for crushing the Tishinskiy heavy ore product from the DMS beneficiation plant. This ore is transported from the mine by rail and stockpiled close to the crusher and from there it is moved by trucks to a 1,000t primary crusher feed bin.

The primary crusher is an old McCool CCD 500 gyratory cone crusher with an installed power of 75kW. Ore from the feed bin is conveyed to a 150mm vibrating screen from which the coarse fraction feeds the primary crusher. The crushed product then joins the screen fine fraction and is conveyed to a 12mm vibrating screen from which the coarse product feeds the Russian Uralmesh CSD 1750B secondary cone crusher. The fine product from this screen however is fed to a spiral classifier. Note that copious amounts of spray water are used throughout the crushing operation here and in all of the crushing facilities, in order to facilitate the transport of ore through transfer points, to reduce sticking of fine fractions to operating parts of crushers and to keep dust levels low which would otherwise pose a health risk. Classifier overflow is pumped to Concentrator building No.2 for processing.

The secondary crushed product is conveyed to a third and final 16mm vibrating screen from which the coarse product feeds the Russian Uralmesh CMD 2200 tertiary crusher. The final tertiary crushed -16mm product joins the tertiary vibrating screen underflow and together with the second stage classifier sands, is conveyed to the Concentrator building No.2 mill feed bins for further processing.

Processing Chain No.1 of Crushing Section No.2 is also used to crush the high grade gold "Flux" ore from the Ridder-Solkolniy mine for intermittent short periods. And there is facility to remove this from the crushing circuit after secondary crushing and to load it out in trucks to Ust-Kamenogorsk.

Processing Chain No.2 of Crushing Section No.2 is used to treat the Ridder-Sokolniy Copper Ore and the Shubinskiy mine ore. The circuit is essentially a copy of Processing Chain No.1 with the exeption that the primary jaw cursher CMD-110 has an installed power of 110kW. There is also some flexibility built in to this crushing chain enabling the circuit feed or final product to be transferred over to Processing Chain No.1. Both the Ridder-Sokolniy copper and the Shubinskiy mine ore also have their own ore bin and feeding systems to introduce each ores into the crushing circuit. Ores crushed in this circuit are conveyed to the Concentrator building No.3 mill feed bins for further processing.

5.8.3.2 Crushing Section No.3

Located close to Crushing Section No.2 and Concentrator Building No.3, Crushing Section No.3 is comprised of a single line, three stage crushing facility that is normally dedicated to treating Pb/Zn ore from the Ridder-Sokolniy mine which lies directly beneath it.

The ore is hoisted up a vertical shaft to the surface in skips to a 500t bin. The ore is then fed on a steel plate apron feeder to the 150mm grizzly screen from which the coarse oversize ore goes for primary crushing in a Kennedy CCD 900 cone crusher (manufactured in 1929) with 184kW power. The screen unders and the primary crushed ore are conveyed to one of two 60mm grizzly screens. The oversize product from the screen is fed to the secondary Uralmash CSDT 2,200 crusher while the screen undersize is fed to a 12mm grizzly screen from which the oversize joins the secondary crusher product and the undersize is fed to a spiral classifier. Note that as for the other crusher circuits, copious amounts of water are added to the circuit. The coarse fraction from the classifier joins the final tertiary crushed product while the overflow is pumped to Concentrator building No.3 for further processing.

The secondary crusher product in Crushing Section No.3 is fed by conveyor to a series of 13 16mm vibrating screens from which a complex system of conveyors carries the coarse product to four installed tertiary crushers. Two of the four tertiary crushers are Russian Uralmesh CMDT 2,200 cone crushers while the other two are newly installed Metso/Nordberg HP 400 and HP 200 cone crushers. The undersize from the vibrating screens form the final -16mm crushed ore is conveyed to the feed bins of the Concentrator building No.3.

> ***WAI Comment:*** *While most of the facilities in Crushing Section Nos.2 and 3 are old they appear to be well maintained and fit for purpose. Kazzinc management have replaced two of the worst crushers in Crusher Section No.3 with modern Nordberg units from Metso which it is claimed has increased the crushing capacity of the circuit. Further renewal and replacement in the Crusher Sections now forms part of a future plan to increase the overall milling capacity of Concentrator building No.3.*
>
> *The strategy of upgrading the crushing sections appears to revolve around the replacement of individual units of equipment with more modern and efficient units. There are several areas in the crushing circuits as a whole however that do not conform to modern practice and where improvements could be made. For example, the number of standby units is inefficient as is the number of vibrating screens in each circuit. It is also inefficient to pass the classifier coarse product directly to the final tertiary crushed product as appears on both flow sheets in Section No.2. A modern circuit*

might be comprised of a jaw crusher, a standard cone crusher and a short head cone crusher, arranged in circuit with a double deck screen.

The screens (13 units) in Section No.3 installed upstream the fine crushers are in continuous operation. This scheme is arranged in such a way to allow ore stockpiling in the Crushing section for the period of ore supply interruption from the mine. Design and survey works are being carried out by TOMS Institute to select crushing and equipment flowsheet for Crushing Section No.2, particularly, for fine crushing and ore fines removal.

It is suggested that Kazzinc put a temporary halt to the acquisition of new crushing equipment and take a step back in order to take a higher level look at their current and future crushing needs and what the most efficient means of achieving this might be.

5.8.3.3 Tishinskiy Crusher

Ore from the Tishinskiy mine is hoisted to the surface and tipped into one of two Run-of-Mine ore bins. There is also a third ore bin into which ore from outside sources can be introduced into the crushing circuit. From these bins the ore is fed by conveyor on to a 100mm grizzley screen from which the coarse +100mm fraction is fed to a UZTM (A Russian manufacturer based in the Urals) model CRD 700/75 primary cone crusher with an installed power of 250kW and a discharge setting of 150mm. This primary discharge then joins the -100mm screen fine fraction and is conveyed to a 50mm vibrating screen. Coarse product from this screen, feeds a secondary UZTM CSD 2200T cone crusher with an installed power of 250kW producing a -80mm product. The crushed product then joins the -50mm screen underflow and is conveyed to a 2,200t crushed ore bin from which it is fed into the dense media separation (DMS) plant.

There is a third, tertiary crusher in the Tashinskiy DMS beneficiation plant building that operates on the DMS light (waste) ore fraction. After screening and washing to remove and reclaim the dense media, the light ore fraction is fed by conveyor to a UZTM CMD 2,200T cone crusher with an installed power of 250kW from which the discharge is conveyed to a 25mm vibrating screen. The +25mm fraction from the screen is conveyed back to the tertiary crusher feed. The -25mm fine screen product is fed by conveyor to a stockpile. Further on, the crushed light fraction is used for preparation of a concrete fill mixture for mine back fill. The concrete back fill preparation plant and Tishinskiy ore DMS process are discussed elsewhere in this report.

5.8.4 Concentration Facilities

There are three main concentrators at and around the Ridder mining complex. These are the DMS plant situated at the Tishinskiy mine site, and Concentrator buildings No.2 and No.3, which are located adjacent to the town of Ridder itself.

5.8.4.1 DMS Plant

The crushing section of the Tishinskiy DMS plant as described earlier produces a minus 50mm feed to the dense media separation facility. Prior to separation in the DMS drum however, the ore is split on a double deck vibrating screen into +5mm, +2mm and -2mm fractions. The latter fines fraction of the ore is passed through a bank of two spiral classifiers to recover coarse and heavy material which joins the 5mm product. The fine and lighter material from the classifiers is thickened and filtered in a plate and frame filter press. It is then fed by conveyor to a temporary stockpile before being transported by rail to the concentrator. It is then re-pulped and pumped to the Main Building No.2 concentrator for processing.

The coarse -50mm +5mm fraction from the double deck screen enters the Russian made DMS SB-200 drum separator which contains a dense media made up of water and a ferrosilicon: magnetite (70:30) powder. The operating volume of the drum is 1,400m^3 with a design throughput of 200tph. The density of the media is controlled at 2.75g/cm^3 such that the lighter gangue material will float and can be easily removed from the drum, while the heavy, base metal sulphide fraction of the ore will sink and can be collected separately from the bottom of the drum. To prevent the build-up of fine ore particles in the heavy media suspension, the overflow DMS plus that washed from the light and heavy fractions during screening is cleaned using wet magnetic roll separators. The dense medium solids cleaned off ore slimes and excess water is used again for suspension preparation.

Photo 5.2: DMS Drum and Magnetic Roll Separators

As described earlier, the light floating fraction from the DMS is washed on a screen and further crushed to -25mm for use as backfill in the Tishinskiy mine. The heavy sinking fraction is similarly washed on a vibrating screen after which it joins the - 5mm ore fraction and is conveyed to the heavy fraction storage bin. From here it is loaded into dump cars and transported by rail for further crushing at Crusher Section No.2 and further processing.

Including engineering and management, the Tishinskiy DMS plant employs 66 full time staff. It operates continuously. Periodic shutdowns of the DMS processing chain is allowed when rich ore with zinc content over 8% is delivered from the mine but it happens quite rarely. Ore crushing only is performed at the plant in such cases. The crushing and processing plant is designed for removal of waste rock and backfill concrete at the initial processing stage in order to increase the qualitative indicators of ore processing. On average the DMS plant rejects 15.6% of the ore that is mined.

> ***WAI Comment:*** *An alternative to DMS would be to develop a mine planning strategy to yield a less variable Run of Mine grade and/or a simple blending facility might be a more efficient approach and a separate study into this possibility is recommended.*

5.8.4.2 Concentrator No.2 and No.3

Concentrator buildings Nos.2 and 3 process all the sulphide ores that are mined in the Ridder area. These are currently the Tishinskiy polymetallic DMS heavy ore fraction, and the slimes from both the Tishinskiy DMS plant and from the Crushing Sections Nos.2 and 3, which are treated in the No.2 Concentrator, and the Ridder-Sokolniy Cu ore, the Ridder-Sokolniy Pb/Zn ore, the Shubinskiy Cu/Zn ore and the Staroye tailings dam sands, which are treated in the No.3 Concentrator. Each of the ore types requires a different treatment to efficiently recover the contained metals and therefore as the figures below show, the overall flow sheet for each concentrator is quite complicated. For this reason, the flow sheets as applied to the individual ore types will be discussed individually in later sections of this report.

In general however, each of the concentrators is comprised of milling, froth flotation and gravity separation. The primary mills are generally grate discharge overflow ball mills with manganese steel liners, while the secondary mills are open discharge overflow ball mills with rubber liners. All the mills have an installed power of 400kW and were originally 2.7m in diameter by 3.6m in length. More recently however, certain of the secondary mills in Concentrator No.3 have been lengthened to 4.5m. There is also a single mill in Concentrator No.2 that is 4.5m long but this is currently mothballed. All of the mills have been manufactured and modified on site in Kazzinc's own Engineering workshop. All of the mills are in closed circuit with either a spiral classifier (primary mills) or a hydrocyclone classifier (secondary mills).

Photo 5.3: Concentrator Building No.3 and Spiral Classifier

Gravity separation is achieved with jigs, shaking tables and centrifugal concentrators. The jigs are Russian MOD-2M diaphragm jigs which are positioned on the primary and secondary mill discharge streams. These machines are to be gradually replaced with Knelson centrifugal concentrators. The gravity concentrates produced by the jigs and Knelson concentrators are further upgraded in two stages using Russian SKO 15m^2 and 7.5m^2 shaking tables.

Photo 5.4: Jig on Mill Discharge (centre left) and New Knelson Concentrator

Froth flotation is conducted in Russian forced air RIF 16m^3 rougher cells and RIF 8.5m^3 or FM-6.3m^3 cleaner cells. There is a plan underway in both concentrators however to replace these cells with 14.15m^3 and 4.25m^3 Wemco induced air flotation cells.

Photo 5.5: RIF Flotation Cells and Shaking Table

> ***WAI Comment:*** *The upgrading of the existing flotation machines and the introduction of Knelson concentrators in place of jigs is warranted and in line with modern mill practice. There is however, very little free gold in any of the ores and even after two stages of concentration with shaking tables this results in a low grade gravity concentrate of around 120g/t Au. It is questionable therefore whether shaking tables are the correct choice of equipment in these circumstances or even whether gravity separation is warranted at all, given that the gold reporting to the gravity concentrate may be picked up during flotation. A review of the gravity circuit is therefore warranted.*

All concentrates are dewatered with conventional rake thickeners and ceramic disc filters prior to being shipped for further processing.

Photo 5.6: Thickening and Filtration

5.8.4.3 Planned Changes to Concentrator Capacities

Current and planned annual tonnage throughputs for the Concentrators Nos.2 and 3 are shown in Table 5.26 and Table 5.27.

Table 5.26: Concentrator Building No.2 Annual Tonnage		
	Current (t)	**Planned (t)**
Slimes Polymet	500,000	500,000
Tishinskiy Polymet (heavy)	979,090	979,090
Shubinskiy Cu/Zn	0	190,000
Total	1,479,090	1,669,090
Planned Increase	190,000	
% Increase	13	

Table 5.27: Concentrator Building No.3 Annual Tonnage		
	Current (t)	**Planned (t)**
Ridder-Sokolniy Cu	180,000	290,000
Ridder-Sokolniy Pb/Zn	1,900,000	2,300,000
Shubinskiy Cu/Zn	190,000	0
Staroye tailings dam Au/Zn	1,100,000	1,100,000
Total	3,370,000	3,690,000
Planned Increase	320,000	
% Increase	9	

In the case of the Concentrator building No.2, plans are in place to increase the flotation capacity by the introduction of five Outotec 50m^3 tank cells in order to accommodate the extra tonnage. The ongoing introduction of new and more efficient crushing equipment to Crushing Section No.2 will to some degree offset the increased throughput; there is however, no plan to increase the milling capacity as it is claimed there is sufficient excess capacity in the current circuit.

In the Concentrator building No.3 the strategy for handling the planned extra throughput is to increase the milling capacity. This will be achieved by replacing the two primary 2.7x3.6m primary, plus the 2.7x4.5m secondary ball mills with single 4.5m x 5.0m primary and a single 4.5x5.0m secondary ball mills (section 5). This will be aided by a finer crush size from the planned new crushers, and by adopting a smaller steel ball size in the secondary mill, it is believed that this will not only accommodate the increased tonnage but it will also produce a finer grind. There is however, no plan to modify the existing froth flotation and gravity sections of the concentrator as it is claimed that sufficient capacity already exists.

WAI Comment: *There is no cause to doubt the calculations and conclusions of the Kazzinc management regarding the planned upgrades. Given the complexity of operations in both of Concentrators Nos.2 and 3 and the potential cost of any mistake however, a full review of the planned upgrades is suggested with the joint objectives of identifying any possible bottle necks and confirming the planned throughput and grind. It is recommended that a "fresh pair of eyes" undertake this review.*

General Comment on Facilities: *All of the plants visited – the DMS facility, the Crusher Section Nos.1 & 2 and the Concentrator buildings Nos.2 & 3 were well maintained and well managed. Some of the equipment was very old and in need of replacement with either new equipment or alternative equipment but the management were aware of this and plans were in place to rectify these matters. All of the management and operational staff that were interviewed or engaged in less formal conversation were knowledgeable and helpful.*

If there is one negative it is the condition of certain stairways, walkways and access ways within the facilities which were not entirely up to modern European standards.

5.8.5 Ore Types and Treatment

The various ore types that are mined in the Ridder area and processed at the Ridder concentrators and their nominal grades are summarised in Table 5.28. The oxide ore from Shaimerden and its subsequent smelting and refining will be discussed later in the report.

Table 5.28: Summary of Nominal Grades					
Ore	**Au (g/t)**	**Ag (g/t)**	**Cu %**	**Pb %**	**Zn %**
Tishinskiy Polymet Ore (heavy fraction)	0.83	9.84	0.40	0.66	5.23
Ridder-Sokolniy Lead Zinc Ore	1.80	13.23	0.15	0.31	0.54
Ridder-Sokolniy Copper Ore	0.40	5.30	1.25	0.10	0.22
Shubinskiy Copper Zinc Ore	0.26	11.02	1.17	0.16	1.52
Staroye Tailings Dam Gold Zinc Sands	1.04	12.38	0.04	0.28	0.63
Polymet Slimes from DMS – Old and New	0.40	7.51	0.27	0.47	2.40

Each of the above ores is different to the other and as such each ore must be treated differently in order to efficiently recover the contained metals.

5.8.5.1 Tishinskiy Polymetallic Ore

The preliminary upgrading of the Tishinskiy ore using dense media separation and its subsequent crushing to -16mm has been described earlier. This pre-treated ore is then delivered to Concentrator building No.2 where it is subjected to two stages of milling. Jigs are installed at the primary and secondary mills' discharge and the jig concentrate is reground in a 2.7m x 3.6m rubber lined overflow ball mill and then is concentrated further on shaking tables. The final gravity concentrate is pumped to the dewatering container SK-2.5m^3 which has a porous base, overlain with filter cloth. When full the dewatering container is removed from the circuit and allowed to drain naturally. After dewatering the concentrate is transferred to a standard container of the same size but without a porous base. The SK-2.5 container dimensions are: height 1,760mm, base diameter 1,057mm, top diameter 1,495mm.

The gravity tailings from the cleaning circuit are recycled back to the primary milling circuit.

After two stages of milling, the final milled product (less the gravity concentrate), has been reduced in size to a P80 of 74 microns and is now ready for the first stage of what is quite a complicated process of differential froth flotation.

In essence however, a first stage of flotation involving roughing scavenging and three stages of concentrate cleaning are employed, using a mixture of n-butyl xanthate and proprietary C7 dithiophosphate collectors to produce a mixed Cu/Pb concentrate. Zinc and pyrite are depressed during this float by the addition of zinc sulphate, sodium sulphide and very small amounts of sodium cyanide. The lead is then floated from the Pb/Cu concentrate using further xanthate and C7 additions while depressing the copper with the addition of lime and more sodium cyanide. This final concentrate is pumped to the lead thickener for dewatering. Tailings from this Pb float then pass to copper flotation where the copper sulphide minerals are activated by the addition of sulphuric acid and floated into a final concentrate by the addition of more of the xanthate/C7 collector combination. Sodium sulphite is also added to the copper float to depress any traces of Pb, Zn or pyrite that are still present. The final copper concentrate is pumped to the copper thickener for de-watering. The tails from copper flotation are reground in a 2.7x3.6m open discharge rubber lined overflow ball mill before being floated in a middling flotation circuit producing Cu rich and Zn rich products that are recycled back into those respective circuits.

Tailings from the primary Cu/Pb float are then subjected to zinc flotation after activation with copper sulphate and the addition of xanthate and C7 collectors. Aerofloat promoter is also used in the scavenger part of this float and lime is used to suppress pyrite. The resulting zinc flotation concentrate is then pumped to the zinc concentrate thickener for de-watering.

5.8.5.2 Shubinskiy Cu/Zn Ore

After crushing to -16mm in Crusher Section No.2 – Chain No.2, the Shubinskiy ore is conveyed to the Concentrator building No.3 where it is milled in two stages to produce a P80 -85micron flotation feed. There are jigs on the discharge of each of the two primary mills, as well as on the secondary mill discharge. The Shubinskiy ore has a tendency to slime during milling however, which produces a high viscosity pulp that makes the jigs operate inefficiently. Due to this and the low gold content of the Shubinskiy ore therefore, these jigs do not normally operate while this ore is being processed. Note however, that this same processing circuit. – Section No.2 – is also used to treat the copper ore from the Ridder-Sokolniy mine, the two ore types being treated in separate batches. The jigs would be in operation while treating the Ridder-Sokolniy copper ore.

After milling the Shubinkiy ore is subjected to two stages of differential froth flotation to produce separate copper and zinc concentrates. The first stage of the differential float involves roughing and scavenging with three stages of concentrate cleaning including the usual middling recycle streams to produce a final copper concentrate. A 60:40 blend of butyl xanthate and sodium Aerofloat are used to float the copper with the addition of T-66 frother. Zinc sulphide and other unwanted sulphide minerals are depressed during this stage of flotation by the addition of zinc sulphate, sodium sulphite and small quantities of sodium cyanide. The resulting copper concentrate is pumped to the copper thickener for dewatering.

In the second stage of the Shubinskiy differential float, the zinc sulphide is activated by the addition of copper sulphate to the pulp and then floated with further additions of the xanthate/aerofloat collector blend and T-66 frother. In the process of zinc flotation, lime is added to raise the pulp pH and depress unwanted sulphides such as pyrite. The zinc flotation stage comprised of roughing, scavenging and three stages of concentrate cleaning. The final concentrate is pumped to the zinc concentrate thickener for dewatering.

5.8.5.3 Ridder-Sokolniy Cu Ore

The copper ore from the Ridder-Sokolniy mine is crushed to -16mm and subjected to milling and froth flotation in the same circuit as the Shubinskiy ore described above. In this instance however, the jigs in the milling circuit are in operation and the concentrate that they produce is cleaned on two stages of shaking tables. There is also a 2.1x3.0m open discharge rubber lined overflow ball mill in the gravity cleaning circuit.

Copper flotation is carried out using roughing, scavenging and three stages of cleaner flotation. The flotation machines used in the zinc circuit for treating Shubinskiy ore are used here for scavenging copper from the flotation tailings during Ridder-Sokolniy copper ore processing. During copper flotation zinc sulfides that are present in the ore in small quantities are depressed by the addition of zinc sulfate. 60:40 butyl xanthate and Aerofloat mixture is used as copper collector with addition of the frother T-66.

5.8.5.4 Ridder-Sokolniy Pb/Zn Ore

This Pb/Zn ore is crushed to -16mm in Crusher Section No.2 and conveyed to Concentrator building No.3. Further processing follows essentially the same route as described above for the other ores with two stages of milling, gravity concentration and froth flotation. Gravity concentrates from the jigs report directly to a regrind circuit incorporating a 2.7x3.6m open discharge rubber lined overflow ball mill before being upgraded in the two stages of shaking tables. This is a recent change to the gravity circuit which has reportedly led to a doubling of the gold recovery from the jig concentrate as well as producing a significant increase in the grade of the final gravity concentrate from 100 to 120g/t Au. The final gravity concentrate is dewatered as described earlier and stored in bins for transportation to Ust-Kamenogorsk for further treatment. Gravity tailings from the cleaning circuit are recycled back to the secondary milling circuit.

The final milled product, less the gravity concentrate, at a grind size P70 of 74 micron, is fed to froth flotation. The flotation circuit includes both bulk flotation and selective flotation procedures. A bulk sulphide concentrate and tailings are produced in the bulk flotation circuit which includes roughing, scavenging and two stages of cleaning flotation. Butyl xanthate and sodium aerofloat are added in the ratio 60:40 along with T-66 frother as required.

The tailings from the bulk stage of flotation are pumped to the tailings dam. The bulk concentrate is further condition with sodium sulphide in order to desorb the flotation reagents and then thickened and pumped to a 2.1x3.0m open discharge rubber lined overflow ball mill. The regrinding discharge containing 94% passing 74 microns goes to selective circuit. The selective flotation circuit includes copper-lead flotation stage, zinc flotation stage, a stage of gold re-flotation from the zinc stage tailings and a copper-lead concentrate separation stage. The copper-lead flotation circuit consists of roughing scavenging and four cleaners. Flotation is carried out in a weakly alkaline media with depression of zinc minerals by the addition of zinc sulphate and some small quantity of sodium cyanide. Butyl xanthate and sodium aerofloat are added in the ratio 60:40 along with T-66 frother as collectors. A bulk copper-lead concentrate with a high gold grade and copper-lead flotation tailings are produced in the copper-lead circuit.

Copper-lead concentrate splitting into copper and lead concentrates was introduced in 2010. Copper is floated in acidic conditions using sodium thiosulphate and ferrous sulphate to depress lead and zinc minerals. The copper circuit includes rougher, scavenger and three cleaner stages. Copper concentrate is produced in copper circuit in form of the cell concentrate and lead concentrate in form of the cell tailings product. The copper concentrate reports to a copper concentrate thickener for dewatering and the lead concentrate reports to the gold-bearing concentrate thickener for dewatering.

The tails from Cu-Pb flotation then reports to zinc flotation. The zinc flotation circuit includes rougher, scavenger and three cleaner stages. Zinc minerals are firstly promoted by copper sulphate, then subject to flotation using 60:40 blend of butyl xanthate aerofloat with addition of T-66 frother. The zinc concentrate is pumped to the zinc thickener for dewatering.

The tailings from zinc flotation are then subject to a further stage of froth flotation with the addition of 60:40 blend of butyl xanthate: aerofloat and T-66 frother. A low grade gold/pyrite concentrate is produced in flotation circuit. This concentrate is mixed with the copper concentrate. Note that the copper concentrate sales contract with China allows for a minimum Cu content of 18% and the addition of the pyrite does not dilute the Cu level below this. The advantage to Kazzinc of adding the pyrite is the extra gold credit.

5.8.5.5 Staroye Tailings

The Staroye tailings dam operated from the start-up of the first concentrator in 1926 through to 1953 at which time tailings disposal was moved to the Chashinskoye site. This material is now being reclaimed and processed for its gold and zinc values. The sands are moved by means of trucks and front end loaders to a temporary stockpile before being fed through grizzly bars into a feed hopper which in turn feeds onto a conveyor belt and into a rotating scrubber. Water is added to the scrubber which together with the sands forms a pulp which discharges into a trommel screen on the end of the scrubber. The pulp passes through the trommel and is pumped to the Concentrator building No.3 for processing. The coarse material in the tailings which is essentially barren waste, discharges at the end of the trommel and is discarded.

The pulped tailings reports to a standalone milling circuit made up of one primary grate discharge and two secondary centre discharge rubber lined overflow ball mill, each mill being 2.7x3.6m with a 400kW motor. The mills operate in closed circuit with a hydrocyclone. There is a jig on each of the mill discharges and the collective rougher gravity concentrate from these jigs is pumped to a 2.1x3.0m open discharge rubber lined overflow ball mill for regrinding before it is further concentrated on two stages of shaking tables to produce a final gravity concentrate. This concentrate is then dewatered as described earlier and stored in bins for transportation to Ust-Kamenogorsk for further treatment. Gravity tailings from the cleaning circuit are thickened and recycled back to the secondary milling circuit.

The final milled product less the gravity concentrate has now been reduced in size to 95% passing 74 microns and is conditioned with a 60:40 blend of butyl xanthate and aerofloat collectors plus T-66 frother before being pumped to a bank of rougher and scavenger flotation machines to produce a bulk Au/Zn concentrate. The tailings from the bulk flotation are pumped away to the operating Talovskoye tailings dam.

Sodium sulphide is then added to the bulk Au/Zn concentrate to partially desorb the flotation reagents from the particles and it is then thickened and sent for differential flotation using roughers, scavengers and three stages of concentrate cleaning. A gold concentrate is produced here by the addition of more of the xanthate/aerofloat collector and T-66 frother. Zinc sulphate, sodium cyanide and activated carbon are also added in order to depress zinc sulphides and pyrite. The resulting gold concentrate is sent for thickening with the gold concentrate that is produced from the Ridder-Sokolniy Pb/Zn ore.

Tails from the gold float are then subject to further roughing, scavenging and three stages of cleaning to produce a zinc concentrate. This is achieved with the addition of copper sulphate to activate the zinc sulphide and further additions of the collectors and the frother. Lime is also added to depress pyrite.

Tails from the zinc float then report for pyrite flotation. This again consists of roughing, scavenging and three cleaners and is affected by the addition of more of the collector and frother. The pyrite concentrate contains gold and is added to the copper concentrate that is sold to China. The tailings from this final stage of flotation are considered waste and pumped out to the Talovskoye tailings dam.

5.8.5.6 Slimes

Slimes originate from Tishinskiy crushing circuit (current slimes) as well as being reclaimed from the slimes collectors (aged slimes) at the Tashinskoye crushing and concentrating (DMS) plant. Slimes are delivered to temporary stockpiles at the Concentrator and then repulped in a separate scrubber and fed to Concentrator of building No.2 in form of pulp.

Slimes are milled to 90% passing 74 micron in a 2.7x3.6m open discharge rubber lined overflow ball mill. There are no jigs in this circuit. Copper and lead are floated into a combined concentrate using roughing, scavenging and three cleaning stages using C7 collector and T-66 frother. Zinc and pyrite are depressed by the addition of zinc sulphate and cyanide.

The Cu/Pb concentrate then passes to differential flotation, again with roughing scavenging and three cleaners where only activated carbon, zinc sulphate and T-66 frother are added to generate a final Pb concentrate which is pumped to the Pb thickener for dewatering. Tailings from the Pb float then report for Cu flotation in the standard rougher, scavenger, three cleaner circuit where the copper sulphides are activated by the addition of sulphuric acid to give a pulp pH of 5.0. C7 collector and T-66 frother are added along with zinc sulphate to depress the zinc. The final Cu concentrate that is produced is pumped to the copper thickener for dewatering.

The tailings from Cu flotation, along with the first cleaner tails from the initial Cu/Pb combined float, are then reground in a 2.1x3.0m open discharge rubber lined overflow ball mill to a size of 98% passing 74 microns. Roughing and scavenging flotation are then employed to recover any remaining Cu and Pb, with the use of the C7 collector and T-66 frother. Zinc sulphate and sodium cyanide are also added to depress zinc and pyrite. The resulting low grade Cu/Pb concentrate is recycled back to the head of the initial combined Cu/Pb float.

The tails from this scavenging operation still contain some zinc and they go to join the main tailings stream from the Cu/Pb float where rougher and scavenger flotation is used to produce a low grade zinc concentrate using C7 collector and T-66 frother. The tailings from this stage are now essentially barren and are pumped out to the Talovskoye tailings dam. The low grade zinc concentrate is forwarded to a final rougher scavenger and 3 cleaner circuit where further C7 and T-66 additions are used to produce a final zinc concentrate. Pyrite is depressed during this float by the addition of lime and the tails from this stage are pumped back to the head of the zinc low grade rougher scavenger float. The final zinc concentrate is pumped to the zinc thickener for dewatering.

WAI Comment: *While the basic processes and reagents that are in use in the concentrators are standard, the complexity of the flow sheet and the seemingly smooth running of the operation is a testament to the time and effort that has gone into the developing the process over many years.*

5.8.6 Production

The following two tables summarise the tonnes treated and the concentrate production from the various ores for the period 2007 to 2010. Both planned and actual data is given for 2010.

5.8.6.1 Tishinskiy

Table 5.29: Tishinskiy Polymetallic Ore

	2007	2008	2009	2010 Planned	2010 Actual
Tonnes Treated	1,388,373	1,061,843	1,234,778	1,187,500	1,250,683
Au g/t	0.82	0.8	0.88	0.83	0.85
Ag g/t	11.1	10.02	10.92	9.84	10
Cu %	0.39	0.4	0.43	0.04	0.42
Pb %	0.71	0.72	0.8	0.66	0.66
Zn %	5.06	5	5.28	5.23	4.93
Cu % Recovery	78.04	84.76	81.69	82.00	79.27
% Cu concentrate Grade	29.17	29.43	29.06	28.50	28.75
Pb % Recovery	71.44	71.44	68.81	68.00	65.63
% Pb concentrate Grade	73	72.55	71.07	72.00	67.45
Zn % Recovery	91.2	91.91	92.93	93.00	91.28
% Zn concentrate Grad	56.49	56.37	55.82	56.00	54.74
Gravity Au % Recovery	3.69	2.46	5.88	13.76	2.22
Gravity Au g/t Grade	63.01	58.57	51.16	75.00	56.26
Total Au % Recovery	65.82	65.32	66.39	72.76	61.67

WAI Comment: *The actual tonnage for 2010 has met and even slightly exceeded the plan, although zinc and lead grades were slightly down. Generally however, the planned and actual production is in reasonable agreement. The one oddity in this is the gold grade and recovery which is in line with previous years, but which for some reason were predicted to rise.*

Production figures were expected to increase as a result of an upgrading of the ore gravity concentration circuit but due to delays in equipment delivery it was not completed in time.

5.8.6.2 Ridder-Sokolniy Pb/Zn Ore

Table 5.30: Ridder-Sokolniy Pb/Zn Ore

	2007	2008	2009	2010 Planned	2010 Actual
Tonnes Treated	1,847,190	1,949,921	1,762,822	1,952,200	1,810,443
Au g/t	1.72	1.68	1.61	1.75	1.77
Ag g/t	10.55	10.68	7.96	13.37	13.46
Cu %	0.16	0.17	0.23	0.15	0.22
Pb %	0.25	0.26	0.27	0.31	0.28
Zn %	0.52	0.53	0.50	0.54	0.53
Gravity Au %Recovery	27.78	25.66	35.25	34.00	26.60
Gravity Au g/t Grade	106.59	117.35	162.36	140.00	138.56
Float Au % Recovery	55.8	53.55	36.97		39.45
Float Au g/t Grade	72.88	73.23	54.32		54.51
Cu %Recovery	-	-	1.82	73.00	27.85
%Cu concentrate Grade	-	-	15.60	17.19	6.41
Pb %Recovery	-	-	-	70.00	0.00
%Pb concentrate Grade	-	-	-	31.00	0.00
Zn %Recovery	63.77	57.15	52.45	55.00	50.00
%Zn concentrate Grade	57.10	56.15	54.31	54.00	54.41
Pyrite Au % Recovery	-	2.97	7.28	4.00	0.77
Pyrite Au g/t Grade	-	9.02	11.21	10.00	12.28
Total Au % Recovery	85.17	84.42	78.82	85.90	83.33

WAI Comment: *Based on the above figures, the 2010 tonnage of Ridder-Sokolniy Pb/Zn Ore were approximately on target both for tonnage and grade.*

5.8.6.3 Ridder-Sokolniy Cu Ore

Table 5.31: Ridder-Sokolniy Cu Ore

	2007	2008	2009	2010 Planned	2010 Actual
Tonnes Treated	169,671	132,386	262,886	270,000	160.091
Au g/t	0.40	0.43	0.65	0.40	0.67
Ag g/t	5.88	5.61	5.22	5.30	6.68
Cu %	1.31	1.06	1.04	1.25	1.05
Pb %	0.06	0.07	0.09	0.10	0.15
Zn %	0.18	0.19	0.23	0.22	0.33
Gravity Au % Recovery	4.25	0.87	13.09	12.00	6.21
Gravity Au g/t Grade	89.27	11.55	156.14	100.00	63.49
Cu % Recovery	95.88	96.17	95.17	62.00	95.84
%Cu concentrate Grade	24.23	24.64	23.88	25.00	22.56
Total Au % Recovery	66.37	63.56	77.15	74.00	67.49

WAI Comment: *The tonnage treated in 2010 shows a substation shortfall in production. Gold recovery and grade are also approximately half of plan. Both of these issues warrant further investigation.*

5.8.6.4 Ridder-Sokolniy Ore Flux

Table 5.32: Ridder-Sokolniy Ore Flux

	2007	2008	2009	2010 Actual
Tonnes Treated	38,218	44,470	60,316	59,820
Au g/t	15.63	19.8	26.8	19.71
Ag g/t	12.85	9.7	13.8	19.6
Cu %	0.35	0.3	0.5	0.62
Pb %	0.66	0.3	0.2	0.37
Zn %	1.29	0.8	0.6	0.67
Total Au % Recovery	100	100	100	100

5.8.6.5 Shubinskiy

Table 5.33: Shubinskiy Cu/Zn

	2007	2008	2009	2010 Planned	2010 Actual
Tonnes Treated	186,789	179,457	211,650	190,000	194,414
Au g/t	0.46	0.54	0.72	0.26	0.55
Ag g/t	13.95	12.49	13.94	11.02	11.51
Cu %	0.94	1.15	1.37	1.17	0.91
Pb %	0.24	0.19	0.23	0.16	0.22
Zn %	1.64	1.66	1.74	1.52	1.65
Cu % Recovery	83.14	88.21	87.41	87.00	83.56
%Cu concentrate Grade	22.52	22.53	22.38	22.80	22.37
Zn % Recovery	72.89	78.09	78.02	78.00	75.92
%Zn concentrate Grade	46.12	47.16	45.39	45.00	42.59
Total Au % Recovery	42.35	35.11	35.06	32.00	28.33

WAI Comment: *Production for 2010 was on target although the gold grades in the ore are substantially higher than planned while gold recovery is lower than plan and lower still than the previous year. Together these two factors constitute a significant loss that warrants further investigation.*

5.8.6.6 Staroye Tailings

Table 5.34: Staroye Tailings

	2007	2008	2009	2010 Planned	2010 Actual
Tonnes Treated	346,232	421,885	936,966	1,100,000	414,636
Au g/t	1.73	1.64	1.76	1.04	1.12
Ag g/t	16.79	16.56	14.99	12.38	11.16
Cu %	0.07	0.07	0.15	0.04	0.06
Pb %	0.44	0.37	0.35	0.28	0.26
Zn %	1.18	0.92	0.97	0.63	0.72
Float Au % Recovery	52.83	56.63	45.31	41.00	37.78
Float Au g/t Grade	44.06	38.37	38.85	37.00	29.18
Gravity Au % Recovery	10.98	6.69	8.60	8.00	7.19
Gravity Au g/t Grade	76.05	52.82	91.24	75.00	49.96
Zn % Recovery	27.10	19.94	23.95	25.00	11.84
%Zn concentrate Grade	39.15	35.20	31.84	40.00	21.65
Total Au % Recovery	72.40	69.26	64.06	56.70	56.68

WAI Comment: *The actual tonnage is very low and under one half of the planned tonnage for 2010. Planned recoveries and/or grades for gold and zinc are low compared to previous years, presumably because of the lower grades in the ore.*

The reason for the sands tonnage decrease in 2010 is that sands had not been processed from February to May inclusive. This was due to an emergency situation at the existing tailings dam and the Staroye tailings dam quarry from where sands were transported to the Concentrator, was flooded.

5.8.6.7 Tishinskiy Slimes

Table 5.35: Current Tishinskiy Slimes

	2007	2008	2009	2010 Planned	2010 Actual
Tonnes Treated	0	141,649	27,732	142,500	225,803
Au g/t	-	0.59	0.52	0.36	0.61
Ag g/t	-	7.97	6.85	6.69	7.96
Cu g/t	-	0.32	0.34	40.33	0.34
Pb g/t	-	0.45	0.49	0.38	0.48
Zn g/t	-	2.78	2.86	2.68	2.8
Cu % Recovery	-	27.26	22.41	32.20	20.12
%Cu concentrate Grade	-	18.69	21.20	20.97	18.81
Pb % Recovery	-	23.48	24.35	30.00	27.54
%Pb concentrate Grade	-	36.49	33.47	41.00	40.35
Zn %Recovery	-	73.45	76.29	74.16	73.21
%Zn concentrate Grade	-	46.20	42.05	44.00	42.6
Total Au % Recovery	-	55.63	73.36	58.08	71.55

WAI Comment: *Actual production of Tishinskiy slimes in 2010 is much greater in terms of tonnage and gold grade than planned. This may be a result of a backlog from 2009 when only approximately 28kt was treated.*

5.8.6.8 Old Tishinskiy Slimes

Table 5.36: Old Tishinskiy Slimes

	2007	2008	2009	2010 Planned	2010 Actual
Tonnes Treated	207,162	149,609	0	197,500	144,168
Au g/t	0.54	0.52	-	0.43	0.55
Ag g/t	8.44	8.10	-	8.10	7.58
Cu g/t	0.25	0.29	-	0.22	0.31
Pb g/t	0.57	0.49	-	0.54	0.45
Zn g/t	2.66	2.49	-	2.20	2.21
Cu % Recovery	9.36	32.23	-	32.20	12.22
%Cu concentrate Grade	20.03	20.97	-	20.97	16.01
Pb % Recovery	25.83	24.02	-	30.00	16.07
%Pb concentrate Grade	33.44	41.12	-	41.00	25.06
Zn % Recovery	70.06	74.16	-	74.16	56.03
%Zn concentrate Grade	45.01	45.55	-	44.00	31.05
Total Au % Recovery	49.66	52.70		58.08	62.25

WAI Comment: *Tonnages are significantly down on plan for 2010, which is presumably due to the excess of the current Tishinskiy slimes that have been treated, as both these materials are treated through the same circuit. Aside from this all the metals with the exception of gold are yielding poor recoveries or concentrate grades or both as compared to the planned production*

Cu losses in zinc and lead concentrates resulting from the presence of secondary (up to relative 35%) and oxidized (up to relative 30%) copper forms in the old slimes, were poorly depressed in the copper-lead and lead flotation circuits.

Pb losses in zinc concentrate and discard tailings resulted from the presence of oxidized forms of lead minerals in the old slimes (up to relative 70%).

Zn losses in discard tailings resulted from presence of non-recoverable oxidized zinc forms in the old slimes (relative 40%).

5.8.6.9 General

Table 5.37 shows the overall performance for 2010.

Table 5.37: Overall Performance			
	2010 Planned	12 Month 2010 Actual	Shortfall
Tonnes	5,039,700	4,200,238	839,462

WAI Comment: *The above table shows shortfall in tonnage mined and treated of 839kt. WAI personnel were unaware of this situation at the time of the site visit and as such there has been no opportunity for discussion.*

An examination of the individual production profiles for each of the ore types reveals some large deviations between the planned 2010 production and actual. Leaving the issue of tonnes aside, there are still significant variations in the planned grades and recoveries of each of the metals, especially for gold. This may be more a planning problem than a processing problem, or it might be both, but the poor reconciliation between the expected and the actual does need to be investigated.

5.8.7 Zinc Smelter

WAI Comment: *The recovery of gold from the various concentrates that are treated at the zinc smelter appears to be very poor. In 2009 for example some 524kg of gold was sent to the smelter from Ridder-Sokolniy and a further 297kg was brought in from other sources, such that the total gold in the smelter feed is 819.831kg. According to the figures supplied by the smelter, only 28kg of this gold is recovered. Most of this gold arrives in the zinc sulphides and may be recoverable. The current process as described above involves the roasting and acid leaching of the concentrates to produce a zinc rich solution for further treatment. The leach residue which will still contain the gold, is then fed into the Waelz kilns to recover the unleached zinc. The Waelz kiln residues are stockpiled in waste dumps behind the plant in Ridder City.*

It is recommended that the recovery of gold from the zinc concentrates be investigated. This might be achieved for example by the inclusion of a small CIL plant after the acid leaching of the zinc calcine and before adding the leach residue to the Waelz kilns.

If this suggestion were to be found viable, then there may also be the opportunity to treat the gold containing pyrite concentrate in the roasters rather than adding it to the copper concentrate and sending it to China. This will produce extra acid that can either be sold or used for Kazzinc's own future projects as briefly suggested elsewhere in this report. The gold remaining in the calcined pyrite concentrate could then be cyanide leached along with the zinc calcine.

5.8.8 Manpower

Manpower for the Ore beneficiation facilities is given in Table 5.38 and the zinc smelting facilities in Table 5.39 below.

Table 5.38: All Crushing, Concentration and Related Activities

	Plan	Current
Tishinskiy Crushing & DMS Plant	78	73
Reaearch Laboratory	29	28
Crushing Section Nos.2 & 3	98	95
Concentrator Building No.2	92	87
Concentrator Building No.3	151	149
Tails and Slimes processing	47	42
Product Thickening, Filtration and Transport	38	39
Reagent Area	21	21
Auxiliary (Storeman)	1	1
TMF	43	43
Management	7	7
Operation Support Service	4	4
Safety	2	1
Security	5	5
Total:	616	595

Table 5.39: Zinc Smelting and all Related Activities

Shop, division	Number of personnel					
	Total	including				
		Workers	Employees			
			Total	including		
				Managers	Specialists	Clerks
Shop 1	160	144	16	15		1
Shop 2	137	127	10	8	1	1
Electrolysis Shop	224	214	10	8	1	1
Hydrometallurgical Shop	90	82	8	6	1	1
Waelz Shop	296	278	18	16	1	1
Lead Shop	7	6	1	1	-	-
Maintenance Shop	99	90	9	8	-	1
Technical Support Service	10	-	10	1	9	-
HSE Service	6	-	6	1	5	-
QA/QC Service	78	64	14	4	10	-
Including: Service	8		8	-	8	-
Qa/Qc	55	52	3	3	-	-
Research	11	9	2	1	1	-
Dust-Gas Sampling	4	3	1	-	1	-
Personnel Services	10	-	10	2	7	1
Including: Service	6	-	6	1	5	-
Leading Legal Advisor	1	-	1	-	1	-
G&A Service	3	-	3	1	1	1
Management	1	-	1	1	-	-
Budgeting Dept	9	-	9	1	8	-
HR Service	1	-	1	-	1	-

5.8.9 Tailings Dams

From the commencement of operations at the first concentrator in 1926, the concentrator tailings were pumped to the Staroye tailings dam. This dam remained in continuous use until 1953 by which time some 13Mt of tails had been deposited there. Subsequent to 1953 the tailings deposition was switched to the Chashinskoye tailings dam and a further 95Mt of tailings were pumped here up until 1978. From this date until the present day all the concentrator tailings have been and continue to be pumped to the Talovskoye tailings dam and to date some 100Mt have been deposited here.

As described earlier, the tailings contained in the Staroye dam are being retreated at a rate of 1.1Mt. The Chasinskoye tailings are also considered to be a resource and it is proposed to begin treating this material to recover its gold and silver content in 2013. Drilling has shown the dam to contain a potential resource of approximately 88Mt of tailings with 1.7Moz of gold and 14.0Moz of silver.

Although there are no firm plans in place to retreat the Talovskoye tailings dam, it is recognised that there is the potential to do this at a future date although this dam will likely remain in use for a further 20 years.

Photo 5.7: Talovskoye and Chashinskoye Tailings Dams

5.8.10 Laboratory

The assay laboratory function at Ridder is essentially split into two entities which both operate under the umbrella of the same top management. These two divisions can be classed as being "crushing and concentration" and the "zinc smelter". Each division operates a main assay facility close to the operations that it services plus smaller satellite laboratories, the main purpose of which is to provide express analysis for plant control.

Aside from the process control and metallurgical accounting functions of the laboratory, it is also responsible for the environmental monitoring of all gas, liquid and solid emissions from the Ridder Complex. The laboratory facilities employ a total of 170 staff and operate around the clock.

The Crushing and Concentration laboratory mainly uses Atomic Adsorption Spectroscopy, X-Ray Florescence Spectroscopy and Fire Assay with a gravity finish, as well as several of the classical wet chemical methods. There is also an on-line XRF analyser that analyses the more important pulp streams from both concentrator buildings every hour and so provides an important control function.

The Zinc Refinery laboratory uses the following spectrometric methods of analysis:

- Atomic Adsorption;
- Atomic Emission;
- Inductively Coupled Plasma;
- Spark Emission;
- Infra Red; and
- X-Ray Florescence.

WAI Comment: *The laboratory equipment is modern and the facilities are well maintained and well managed.*

5.8.11 Engineering Workshop

Kazzincmash is a separate organisation owned by Kazzinc and operating within the Ridder metallurgical complex. Its main activities are the manufacture and repair of mining, concentrating and metallurgical equipment and the manufacture of spare parts. As such most of the equipment that is required on the Ridder complex is manufactured here and some 50% of Kazzincmash's output is for external clients

The workshops employ 1,435 people and the capability of the operation is wide ranging; from mill shells and gears, crushers and pumps to drill rigs, mine cages and rail cars, locos and loader buckets and parts. Kazzincmash are also in partnership with international mining equipment supplier such as Atlas Copco, Caterpillar, the SMS group and Weir for maintenance and manufacturing.

5.9 WAI Ore Reserve Estimate

5.9.1 Introduction

WAI has carried out stope design, and produced JORC Code (2004) compliant Ore Reserves for the various ore bodies at Ridder-Sokolny, based upon the most recent Mineral Resource Block Models. WAI has used GijimaAST Mine2-4D® software to prepare the designs, and Microsoft Excel to prepare production schedules.

5.9.2 Mine 2-4D Software

Mine2-4D is an automated mining software package developed in Australia and currently marketed by GijimaAST. It allows the user to accurately design mine excavations such as development and stoping, and then allows the operator to apply time-dependent mining activities such as backfilling and cable bolting in a fully three-dimensional graphical environment. Following the design of excavations and associated activities (i.e. bolting or backfilling), mining activities can be sequenced, with time delays built into the sequence where appropriate.

Typically, following the completion of the design is complete and the associated activities applied, the mine design is exported into the Enhanced Production Scheduler (EPS) which is a direct representation of the 3D mine design in a Gantt chart format with the sequence and delays built into the model in Mine2-4D are also exported to EPS. However, due to time constraints, it has not been possible to utilise EPS for production of the Ridder-Sokoliny deposit, and as such the production schedules have been produced using Microsoft Excel.

5.9.3 Mining Parameters

The stope blocks for the Ridder-Sokolny ore bodies have been designed to a minimal average block grade of 2% Zinc Equivalent (Zn_{EQV}).

5.9.4 Mine Layouts

Mining areas at the Ridder-Sokolny mine have been laid out following the proposed mining methods laid out in Section 5.6 'Mining'.

5.9.4.1 Centralny Orebody

The Centralny orebody is one of the principal orebodies within the Ridder-Sokoliny deposit, and mining is currently on-going within the ore body. Principal mining levels are currently present at 20-40m intervals, with sub-levels to allow access to additional mining levels.

Figure 5.15 shows the Centralny orebody, highlighting mined areas of the orebody (orange/red) and non-mined areas (purple).

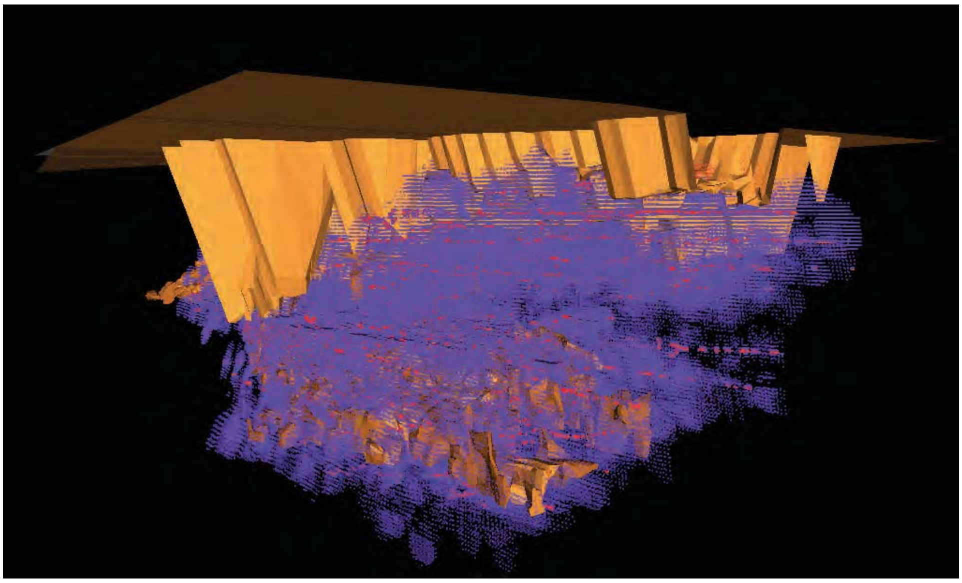


Figure 5.15: Centralny Orebody

WAI has designed stope blocks at 20-40m vertical intervals from the 375m to 775m Levels, utilising existing development to access stopes where feasible, with additional development required where existing infrastructure is not present.

Figure 5.16 below shows the proposed and existing stopes for Centralny.

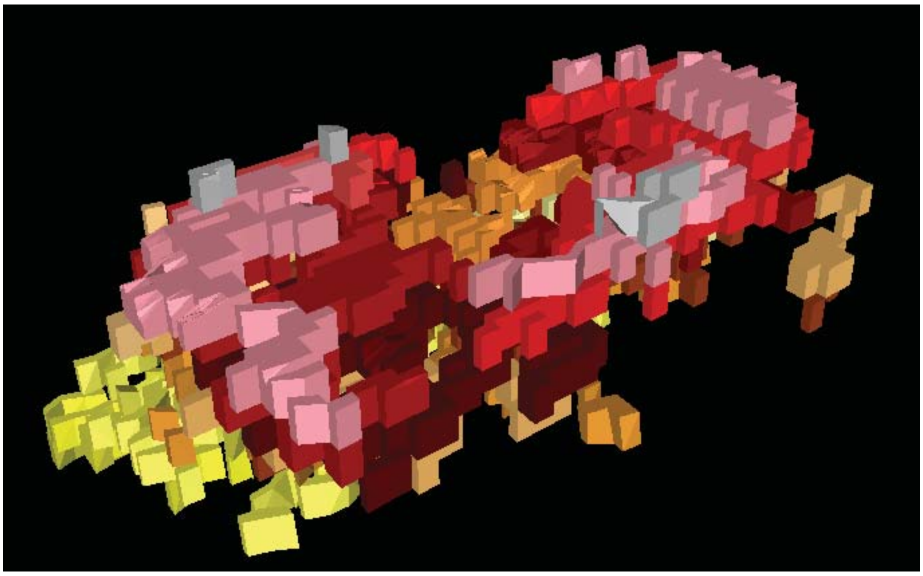


Figure 5.16: Centralny Stope Blocks

5.9.4.2 Belkina Orebody

The Belkina orebody is one of the larger orebodies within the Ridder-Sokolniy deposit, and mining is currently on-going. Principal mining levels are currently present on the 530m, 565m, 590m, 625m, 665m elevations, with sub-levels to allow access to additional mining levels.

Figure 5.17 shows the Belkina orebody, highlighting mined and non-mined areas.

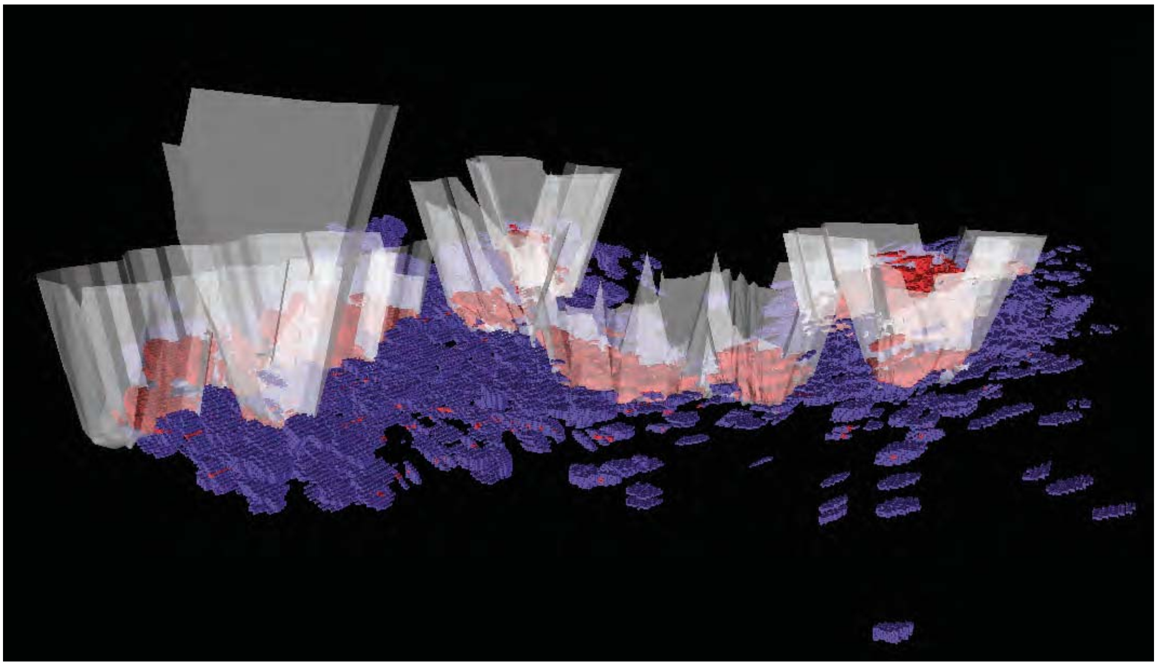


Figure 5.17: Belkina Orebody
Showing mined (red) and unmined (purple) areas, with mined-out envelopes (white)

WAI has designed stopes at 20m vertical intervals from the 535m to 755m Levels, utilising existing development to access stopes where feasible, with additional development required where existing infrastructure is not present.

Figure 5.18 below shows the proposed and existing stopes for Belkina.

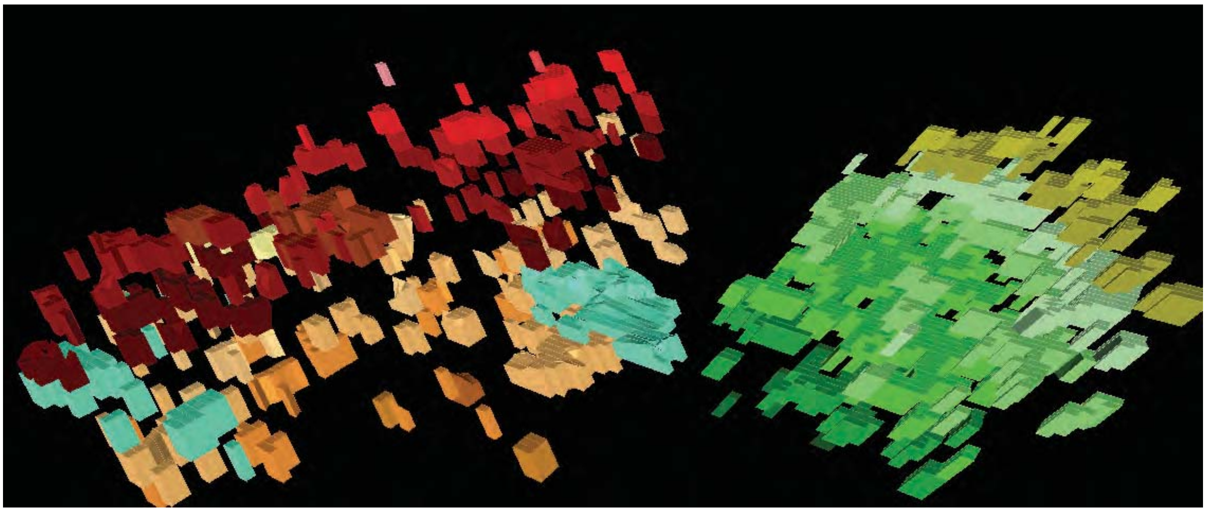


Figure 5.18: Belkina Stope Blocks

5.9.4.3 Perspectivnaya Orebody

The Perspectivnaya orebody is similar in size to the Belkina orebody. The orebody forms part of the Ridder-Sokoliny deposit with mining currently on-going. Principal mining levels are currently present on the 490m, 530m, 560m, 600m and 630m elevations, with sub-levels to allow access to additional mining levels.

Figure 5.19 shows the Perspectivnaya orebody, highlighting mined and non-mined areas.

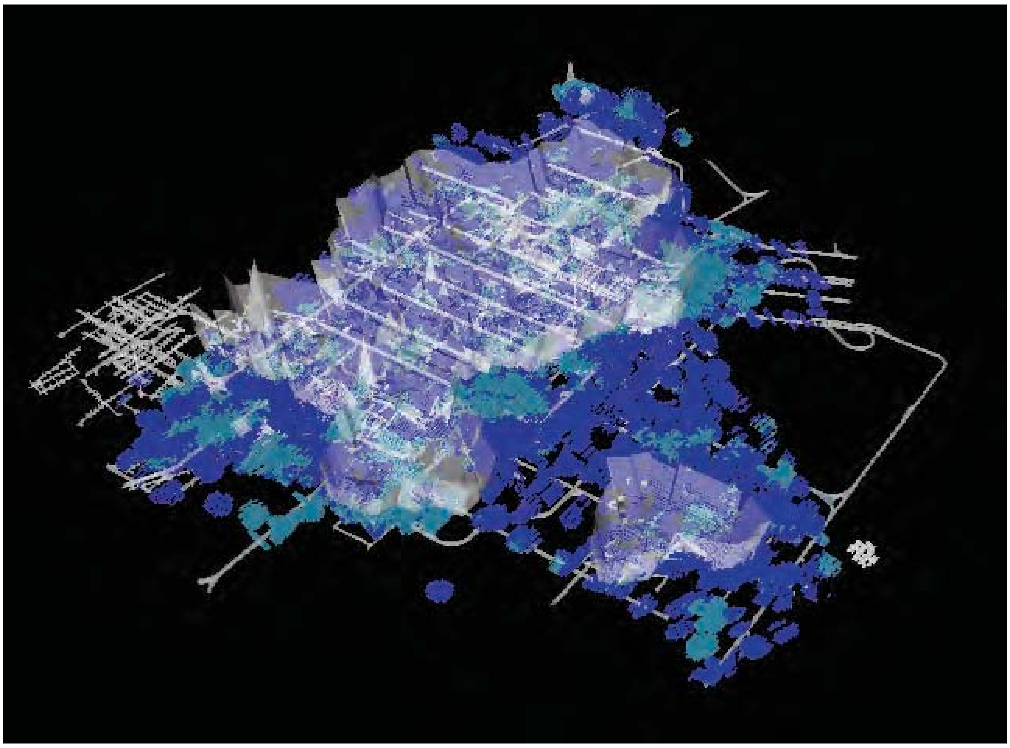


Figure 5.19: Perspectivnaya Orebody
Showing un-mined (blue) areas, with mined-out envelopes (white)

WAI has designed stope blocks at 30m vertical intervals from the 450m to 660m Levels, utilising existing development to access stopes where feasible, with additional development required where existing infrastructure is not present.

Figure 5.20 below shows the proposed stopes for Centralny.

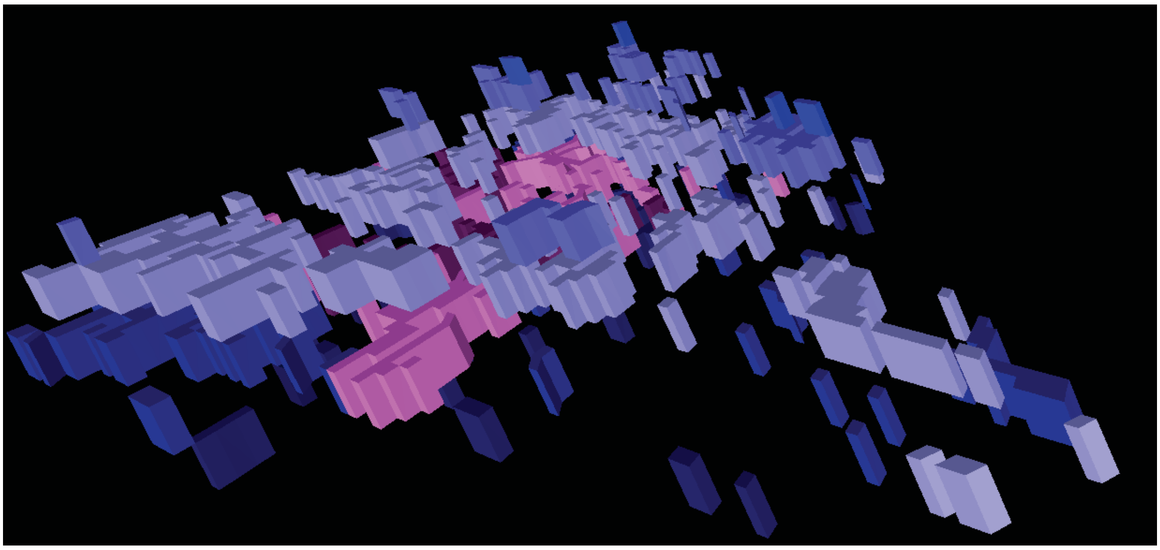


Figure 5.20: Perspectivnaya Stope Blocks

5.9.4.4 Zavodskaya Orebody

To date, the Zavodskaya orebody has been largely mined out, however a number of areas remain within the orebody suitable for mining. Principal mining levels are currently present on the 405m, 445m, 525m and 585m elevations, with sub-levels to allow access to additional mining levels.

Figure 5.21 shows the extent of existing extraction within Zavodskaya, relative to the geological block model.

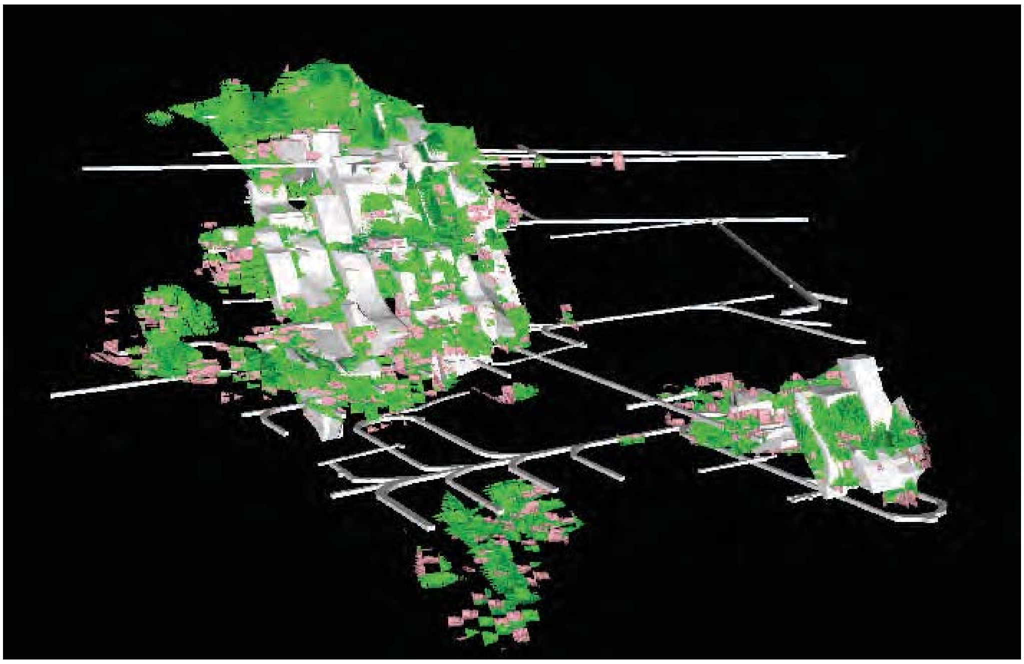


Figure 5.21: Existing Development at Zavodskaya

WAI has designed stopes at 20m vertical intervals from the 565m to 645m Levels, utilising existing development to access stopes where feasible, with additional development designed as required. It should be noted that much of the resource below the 565m Level has been sterilised by existing stope blocks.

Figure 5.22 below shows the proposed and existing development for Zavodskaya.

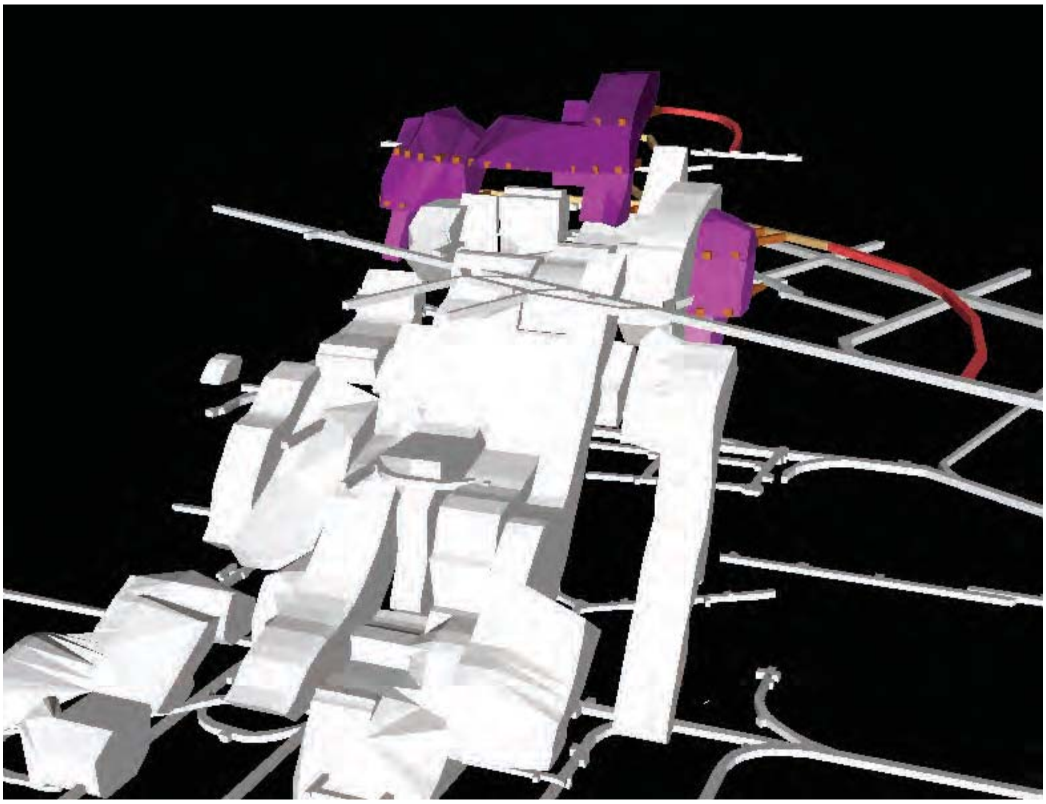


Figure 5.22: Zavodskaya Current (white) and planned (coloured) Stope Blocks

5.9.4.5 North Bestrushinskoye

The North Bestrushinskoye ore body has been accessed on the 400m Level, and whilst mining has been carried out within the ore body, areas for further extraction remain.

WAI has designed stopes in un-mined areas at 10-20m vertical intervals from the 380m to 570m Levels, utilising existing development to access stopes where feasible, with additional development required where existing infrastructure is not present.

Figure 5.23 below shows the proposed stoping blocks for North Bestrusinskoye.

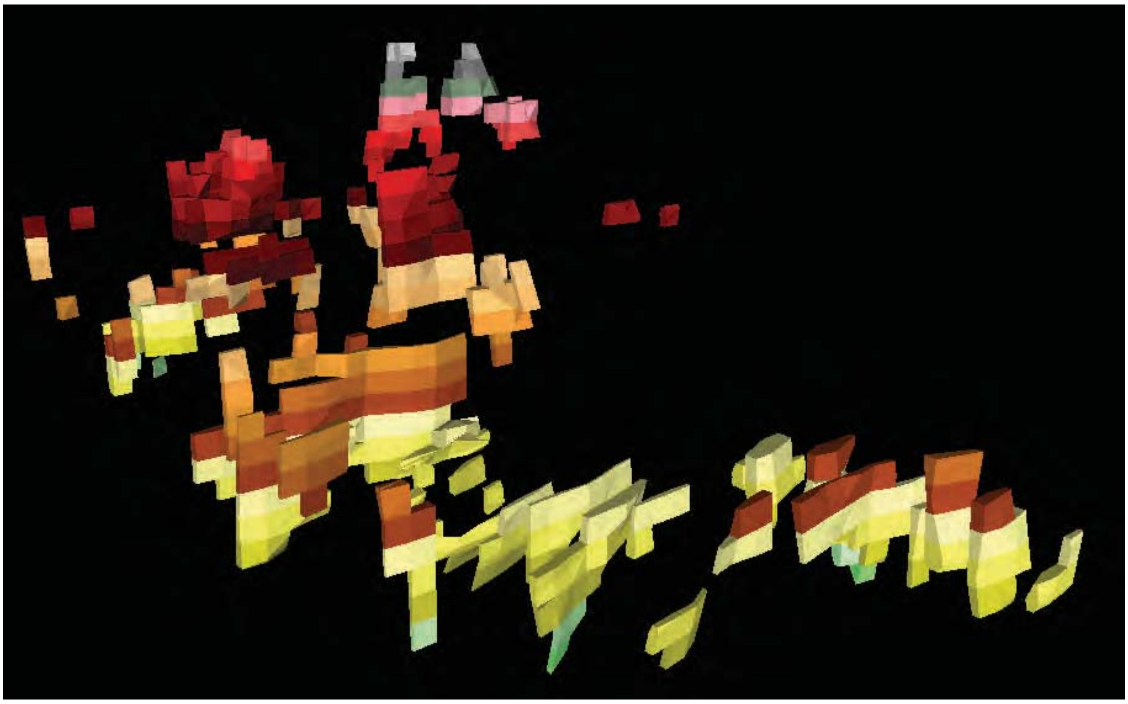


Figure 5.23: North Bestrushinskoye Stopes

5.9.5 Ore Reserves

Ore Reserves for the Ridder-Sokolny ore bodies have been calculated in accordance with the guidelines of the JORC Code (2004). A summary of these JORC compliant Ore Reserves is presented in Table 5.40.

Table 5.40 Ridder-Sokolniy Ore Reserve Estimate
(WAI 01.01.2011)
(In Accordance with the Guidelines of the JORC Code (2004))

Deposit	Reserves	Ore (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (Pb)		Zinc (Zn)	
			Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Centralny	**Proven**	5.02	0.71	114,830	5.19	837,614	0.69	34,566	0.18	9,076	0.52	26,208
	Probable	9.17	1.03	303,446	5.95	1,756,434	0.26	23,699	0.34	31,365	0.64	58,683
	Total	**14.19**	**0.92**	**418,276**	**5.69**	**2,594,048**	**0.41**	**58,264**	**0.28**	**40,440**	**0.60**	**84,891**
Belkina	**Proven**	2.24	0.98	70,492	25.38	1,826,106	0.07	1,541	0.45	9,960	0.93	20,814
	Probable	1.22	0.82	31,972	13.16	514,297	0.06	672	0.29	3,499	0.61	7,369
	Total	**3.46**	**0.92**	**102,463**	**21.08**	**2,340,403**	**0.06**	**2,213**	**0.39**	**13,459**	**0.82**	**28,183**
Perspectivnaya	**Proven**	1.45	1.54	71,946	18.55	864,235	0.11	1,632	0.52	7,501	0.97	14,126
	Probable	0.83	1.33	35,682	13.82	369,402	0.09	785	0.37	3,086	0.69	5,711
	Total	**2.28**	**1.47**	**107,628**	**16.82**	**1,233,637**	**0.11**	**2,416**	**0.46**	**10,587**	**0.87**	**19,837**
Zavodskaya	**Proven**	0.24	0.72	5,511	21.73	165,757	0.13	299	0.86	2,050	1.71	4,047
	Probable	0.03	1.56	1,278	19.65	16,120	0.10	26	0.70	179	1.28	326
	Total	**0.27**	**0.80**	**6,789**	**21.53**	**181,876**	**0.12**	**324**	**0.85**	**2,228**	**1.66**	**4,373**
North Bestrushinskoye	**Proven**	-	-	-	-	-	-	-	-	-	-	-
	Probable	0.80	1.05	26,971	23.76	612,977	0.12	971	0.85	6,791	1.54	12,387
	Total	**0.80**	**1.05**	**26,971**	**23.76**	**612,977**	**0.12**	**971**	**0.85**	**6,791**	**1.54**	**12,387**
Total	***Proven***	*8.95*	*0.91*	*262,779*	*12.85*	*3,693,712*	*0.43*	*38,038*	*0.32*	*28,587*	*0.73*	*65,195*
	Probable	*12.05*	*1.03*	*399,349*	*8.44*	*3,269,230*	*0.22*	*26,153*	*0.37*	*44,920*	*0.70*	*84,476*
	Total	***21.00***	***0.98***	***662,127***	***10.32***	***6,962,941***	***0.31***	***64,188***	***0.35***	***73,505***	***0.71***	***149,671***

5.10 Environmental Issues

5.10.1 Introduction

WAI was commissioned by Kazzinc to carry out a review of environmental and social issues associated with the Ridder-Sokolniy Mining Complex in line with national and international requirements.

5.10.2 Environmental & Social Setting and Context

5.10.2.1 Landscape, Topography

The Ridder basin has a predominantly gently undulating topography with hills varying from 650m to 1,000m in height. The basin is surrounded by the Prohodny ridges to the south, up to 1,800m in height. To the north, the Ivanovsky ridges rise to 2,300m, with other lower mountain ranges also present. The region is seismically active with earthquakes up to 4 on the Richter Scale being reported in the Ridder area in the last 10 years.

5.10.2.2 Climate

The climate is sharply continental with hot summers reaching temperatures in excess of +40°C and cold winters dropping to -47°C. Snow cover is present from November to April. Average rainfall is 710mmpa. The prevailing wind is from the north-west. Average wind speed is 5.7m/s in the winter, and 3.5m/s in the summer.

5.10.2.3 Land Use and Land Cover

Soil horizons are expected to be thin and lacking in fertile topsoil – no information on soil characteristics has been provided. Flora is defined by several landscape zones, affected by site geography, altitude and terrain. There are numerous tree and grass species, in a mosaic habitat, with coniferous species predominantly found at higher altitudes and pine and mixed forest, including birch found in the lower foothills. There are flat areas of scrubby grassland, with apparent species abundance being somewhat limited by climatic conditions. There are 94 bird species in the area, the majority being non-migratory, and 90 animal species, including bear, mink, deer, wild cats and numerous rodent species. Two of the bird species are reported to be rare raptors.

5.10.2.4 Water Resources

Four rivers are present within the mining licence, namely Filipovka, Bystruka, Harivzovka and Bolshoy Talovka.

It is reported that two main aquifers are present beneath the site. The upper aquifer is contained within superficial Quaternary alluvial deposits which occur approximately 20m below surface, and locally extend to 120m in thickness. The lower aquifer is a fracture and fault controlled groundwater body within the Paleozoic sedimentary and sedimentary volcanogenic rocks. A highly fractured zone is reported to occur at approximately 800m.

5.10.2.5 Communities and Livelihoods

The mine is located in Ridder city, and a number of small villages are also present in the environs, such as Talovka village.

5.10.2.6 Infrastructure & Communications

The Ridder-Sokolniy Mining Complex is situated in a topographic basin 120km north-east of Ust-Kamenogorsk, connected by a metalled road, and freight and passenger railway lines. Other than the mine and associated infrastructure, there are no other significant industrial emissions sources in the Ridder area, and air quality is therefore considered to be good.

5.10.3 Project Status, Activities, Effects, Releases & Controls

5.10.3.1 Project Description & Activities

The Ridder-Sokolniy deposit was discovered in 1786.

Mined ore is treated at the Ridder concentrator, which has separate circuits for polymetallic ore and copper/gold ore from Ridder and other nearby Kazzinc operations (Tishinskiy and Shubinskiy ore and Tishinskiy and Staroye tailings). Zinc concentrate produced from polymetallic ore is treated at the Ridder zinc refinery, whilst lead and gold concentrates are sent to the Ust-Kamenogorsk lead smelter for pyrometallurgical treatment. Copper concentrates are sold to third parties, however a Kazzinc copper refinery is planned, and refurbishment of the lead smelter is planned (the old smelter is currently mothballed). The operational site also contains redundant surface workings, old waste dumps and Tailings Management Facilities (TMF). Tailings from the Staroye TMF are currently reprocessed in the Ridder concentrator, with plans to reprocess Chashinskoye TMF in the near future. Current process tails are sent to the Talovskoye TMF, located approximately 5km from the concentrator.

The underground minewater is neutralised and pumped 3.5km overland to a waste water treatment facility. An acid neutralisation facility (gypsum plant) and two paste backfill plants are also located within the project area. In residential areas, it is understood that historic underground workings have been backfilled with waste rock material, and that current operations in these areas are backfilled with paste tails. WAI understands that in areas where no surface infrastructure is present, mining subsidence is permitted to occur.

5.10.3.2 Land Ownership and Tenure

Kazzinc has the right to mine gold-polymetallic ores under the terms of the Contract for Subsurface Use (1997), which is valid for 25 years. The mining licence can be extended in duration by mutual agreement between Kazzinc and the regulatory authority. The current mining lease (2003) covers an area of approximately 12km^2. The mining licence also includes areas of residential development, and outlying areas that have not been disturbed by surface mining activity. The land allotment area encompasses current mining and processing infrastructure. Ancillary facilities, historic surface workings and storage facilities, and peripheral undisturbed areas.

> ***WAI Comment:*** *The WAI team has viewed a number of mine licences and permits and considers that the mine licences have been obtained in line with State requirements. It is understood that the future expansion of mining activity would not necessitate relocation of communities within the current licence boundary.*

5.10.3.3 Energy Consumption & Source

Power is supplied from two main lines from Ust-Kamenogorsk at 132kV and 113kV respectively. The Company owns a Hydroelectric Power Plant at Bukhtarma which feeds the Ust-Kamenogorsk electricity grid. No Polychlorinated Biphenyls (PCBs) are believed to be present. Energy consumption for 2009 was reported to be 528,990,778kWh at the Ridder-Sokolniy complex.

> ***WAI Comment:*** *At the time of the visit, the transformer station was well managed and maintained, and energy usage is reviewed as part of the Company-wide resource minimisation scheme. The 5% target is thought to be met in the energy department, apart from with regard to the heating system.*

Rational use of energy is assessed on a continuous basis to reduce costs, and plans to save energy are developed and implemented.

5.10.3.4 Mine Wastes – Rock

Waste rock is used for void backfilling underground. There is a government owned waste dump behind the concentrator, and Kazzinc has no responsibility for it.

Settled solids from the sulphuric acid neutralisation facility ('gypsum' plant) are piped to the aforementioned unlined Kryukovskoye mined-out open pit for evaporation of liquid fraction. The solids are allowed to accumulate in situ and the facility will eventually be capped and revegetated.

Waste rock is deposited in the mining subsidence area. Surface movement related to subsidence is monitored once a year. Precipitation entering this subsidence zone percolates through the rock mass and into the mine drainage system. Kazzinc considers that distribution of contaminants from this drainage water is localised within the subsidence zone.

The geochemical composition of solids from the sulphuric acid neturalisation facility was studied, and testwork on its further treatment using Russian Technology was performed. During the period of disposal of solids in the open pit, run-off was pumped to the mine water treatment facilities. In recent years the acid has not been neutralised, but sold.

5.10.3.5 Mine Wastes - Tailings

The Ridder Concentrator processes Pb-Zn, Cu and Au ore from Staroye tailings, Shubinskiy, Ridder-Sokolniy and Tishinskiy mines. After leaving the concentrator complex, the tails are piped in 2 separate lines. Within a short distance the tailings pipelines enter a transfer station where the 15% of the Ridder-Sokolniy and Staroye tails are diverted to one of the Paste Backfill Plants.

There are two Paste Backfill Plants at Ridder-Sokolniy complex, which process diverted Ridder-Sokolniy and Staroye tails for void filling underground. Excess diluted tailings are sent to the Talovskoye TMF via the main pipeline. The Talovskoye TMF is a valley impoundment located in the Bolshoy Talovka river valley. Tailings are discharged via a distribution pipeline. The TMF has a capacity of 120Mt, with a current volume of 70Mt.

The tailings are piped approximately 5km from the concentrator to Talovskoye TMF, via 3 pumping stations, two of which have emergency discharge ponds. At the first pump station all tailings are mixed and from this point onwards pumped in single pipeline with a standby line running parallel. There is no secondary containment below the pipeline, however 2 emergency discharge stations are present along the length of the route, which crosses the Filipovka River in two locations. Flow rate and pressure is measured at each pumping station, with an average flow of 4,000m^3/hour, translating to an annual average of approximately 4Mm^3/yr. The pipeline is inspected daily for corrosion, and some sections are currently being replaced.

Supernatant water from Talovskoye TMF is piped back to the concentrator, for use as technical water via the old Chashinskoye (State owned) TMF. None of the facilities are lined. The base of the tailings dam is formed by clay deposits of known quality and thickness which serve as an impermeable membrane and prevent water percolation to underground aquifer. Drainage facilities are constructed downstream of Talovskoye tailings dam by means of which drainage is intercepted and sent to the tailings pond.

Sulphuric acid from the zinc refinery can be neutralised if necessary, with crushed limestone and the slurry is pumped to two storage ponds ('Kryukovskie mined out open pits') for settlement. When full, decant water from these ponds is pumped to the Mine Water Treatment Plant. This area is not currently in operation since all the sulphuric acid produced is sent to the consumer.

Additionally, the Staroye old TMF (State owned) is being reprocessed by the Company. The dry tailings material is excavated and transported via dump trucks to a mixing station at the site, where water is added, and the resultant slurry is pumped to the concentrator for reprocessing. The Staroye TMF is expected to be exhausted by 2014. The same process is planned for the old Chashinskoye TMF, however this has not yet commenced.

WAI Comment: *No engineering designs or geotechnical monitoring information has been reviewed for this structure. It is assumed that it has been designed in line with State requirements, and to withstand seismic tremors and seasonal meltwater intake, however WAI cannot comment on these aspects.*

Kazzinc reports that the stability of the TMFs is guaranteed by the project design which was approved by the State authorities. The Mechanobr Engineering Institute (Russia) who designed the Talovskoye tailings dam carries out continuous monitoring of TMF's operation. A grid of monitoring holes and movement pins are used to assess the dam stability. The company also monitors the dam levels, condition and compliance with design parameters. When the mine closure plan is developed, the environmental section will include an assessment of environmental pollution and the required amount of reclamation.

It is understood that the Concentrator's recycling water supply through Chashinskoye TMF circuit will be made redundant in the future. This would make the system less complicated, increase efficiency and reduce the risk to the environment.

Secondary containment should be developed for the length of the tailings pipelines, and at river crossings. A pumping station is present on the pipeline to receive tailings pipeline run-off when pumping is stopped.

5.10.3.6 Water Management & Effluents

WAI considers the following activities could result in surface and groundwater pollution:

- Transportation, surface stockpiling and loading/unloading of Tishinskiy and Shubinskiy fine fraction ore materials;
- Excavation, loading, haulage and deposition of Staroye tailings material;
- Dust blow from TMF surfaces;
- Dust blow from road transportation;
- Spills and leaks of hazardous materials and chemicals (e.g. reagents and tailings);
- Surface runoff transporting potential contaminants including heavy metals, hydrocarbons and reagents (e.g. waste rock and ore stockpiles);
- Breaches of TMF and settlement facilities containing contaminative materials;
- Seismic activity compromising containment facilities;
- Exhaust gases from underground mobile fleet and combustion processes;
- Gases from explosives usage;
- Localised methane emissions from microbial sewage treatment and landfill facility;
- Localised chemical and solvent volatilisation;
- Tailings delivery across rivers with no secondary containment;
- Unplanned discharge of untreated minewaters;
- Unsegregated deposition to the subsidence area, all waters will report to the mine water treatment facilities;
- TMF and storage/settling pond percolation;
- Leaching from backfilled rock/paste backfill in underground working, to be treated by the mine water treatment facility until clean;
- Absorption/dissolution of explosives residues and gases;
- Hydrocarbons from the mobile fleet;
- Leaching from contaminated soils; and
- Rebound of contaminated minewater at cessation of/or interruption to pumping. However, water treatment is envisaged until the water is clean.

WAI Comment: *Surface storm run-off collection and discharge is managed at the mine site and surface diversion trenches are also present at the site. A new area for dry tails storage has been developed. When dry tails are transported, wagons are covered with canvas to avoid dust generation.*

A hydrogeological assessment was prepared during the mine development phase, and research into migration of material migration with groundwater and hydraulic connection with surface waters has also been studied. Areas of potential underground and surface water use by the population monitored.

It should be ensured that where sub-contractors are used, they adhere to company policies to minimise the potential for environmental pollution.

There are several discharge points to surface water receptors within the mining licence. The outlets discharge to the Filipovka and Bystruka rivers. Discharges to surface are permitted in accordance with national legislative requirements.

Discharge streams include industrial effluent from the compressor house, domestic effluent treated via microbial action and chlorination, and underground mine water neutralised by mixing with lime milk and settling in the Waste Water Treatment Plant and supplementary containment pond. Approximately 2000m^3 an hour of underground water is pumped to surface, treated and discharged in this manner.

Technical water for the Concentrator and ancillary operations (compressor stations laboratory) at Ridder Complex is sourced from the Bystrushinsky water reservoir, under the provisions of an abstraction licence.

Other than the diversion of the Bolshoy Talovka River, no surface runoff water management systems are present. Potable water is sourced from the Ridder city (Gramotuka watershed) mains water supply. The Company also has an abstraction permit for use of water for technical and potable supply. In 2009, 257,000m^3 were used by the complex, at a rate of 350,400m^3/day for potable supply and domestic needs. No technical water was obtained from this source.

There is an internal initiative for 2011 to reduce water and energy consumption by 5% with results reportedly favourable for water consumption and discharge rates.

> ***WAI Comment:*** *Although there is clearly adequate water supply to meet current operational needs, the Company assessed the possibility of recycling minewater for use at the Zinc Smelter and the Concentrator. Mine water treatment facilities are being expanded for this purpose with completion anticipated in 2012. This would potentially negate the need for river water abstraction and would reduce the potential for contamination of surface water features. WAI is encouraged by the Company's resource efficiency initiatives.*

A mine domestic sewage treatment plant is located within the mine site. Domestic sewage is delivered to the facility into two agitator tanks, where microbial degradation occurs. Treated water is chlorinated and discharged to the Bystruka River. Sewage solids collect in a cess pit and are periodically collected and disposed of off site by a specialist contractor.

Minewater is mixed underground with chemical grade lime milk to neutralise acidity, and is then pumped 3.5km at surface to the waste water treatment facility at a rate of 2,000m^3/hr. The water enters four settlement cells to remove suspended solids prior to discharge into a clay-lined secondary pond. Prior to discharge, the pH of treated waters is monitored at the waste water facility every two hours. During the site visit, pH was noted to range from 8.5-10.5. During the site visit, an odour was noted which may have resulted from the use of explosives underground. Water is finally discharged from this facility to the Zurhardt stream, and ultimately to the Filipovka River

Mine water is delivered to the surface from underground water sumps. Availability of water sumps at Levels 11, 13, 16 and 18 make it possible to collect water underground and periodically feed it to surface water treatment facilities. The design of the mine water drainage system eliminates any potential overtopping of the settlement pond at surface. A containment pond is provided to avoid discharge of untreated mine waters to the river.

WAI Comment: *Refurbishment of water treatment facilities is currently being carried out with the installation of a lime liquor preparation and supply system instead of mixing underground in the mine workings. This should regulate pH during treatment. The mine closure plan includes long-term operation of water treatment facilities once mine workings are flooded, to ensure the quality of discharge water.*

5.10.3.7 Emissions to Air

Particulate emissions could result from the following:

- Transportation, surface stockpiling and loading/unloading of Tishinskiy and Shubinskiy fine fraction ore materials;
- Excavation, loading, haulage and deposition of Staroye tailings material;
- Dust blow from TMF surfaces; and
- Dust blow from road transportation.

In addition to the particulate emission sources outlined above, air pollution at Ridder-Sokolniy could result from the following processes:

- Exhaust gases from mobile fleet, railway, and combustion processes;
- Gases from explosives usage;
- Localised methane emissions from microbial sewage treatment and landfill facility; and
- Localised chemical and solvent volatilisation.

Sources of air emissions have been included in a draft emissions inventory. In line with national requirements, Kazzinc has plans to minimise volumes of emissions and discharges as per best practice.

5.10.3.8 Discharges to Soil

Potential soil contamination could arise at the operations via runoff from temporary stockpile areas, deposition of contaminated dusts, reagent/process spills, and emergency situations, such as a chemical spill or containment breach. At Ridder-Sokolniy complex, there are several issues which may lead to the above, including:

- Transportation, surface stockpiling and loading/unloading of Tishinskiy and Shubinskiy fine fraction ore materials;
- Excavation, loading, haulage and deposition of Staroye tailings material;
- Dust blow from TMF surfaces;
- Dust blow from road transportation;
- Spills and leaks of hazardous materials and chemicals (e.g. reagents and tailings);
- Surface runoff transporting potential contaminants including heavy metals, hydrocarbons and reagents (e.g. waste rock and ore stockpiles);
- Breaches of TMF and settlement facilities containing contaminative materials; and
- Seismic activity compromising containment facilities.

5.10.3.9 Waste Management – General

Limited wastes are stored at the site. Scrap metal and any timber is stored in metal containers at each area of the facility, and periodically removed by contractors. Domestic wastes, poor quality industrial wastes, including reagent containers, and other miscellaneous items are disposed of in an unlined subsidence zone resulting from mining, with this material being used as backfill. Reagent drums are neutralised and pressed before disposal to avoid contamination and recycling.

The transport fleet, fuel delivery and maintenance facilities are subcontracted out, and hence the Company does not handle any materials associated with these processes. Old oil from the substation transformers is removed by contractors and reused for combustion purposes.

Waste material is used for reclamation of the mining subsidence zone. It is reported that all percolation waters are intercepted by the mine water collection system, and treated prior to discharge. Although this system has been approved locally, it is not considered to meet best practice and should be further assessed in line with international standards.

5.10.3.10 Hazardous Materials Storage & Handling

Fuel delivery and storage is subcontracted to the city facilities, which have a storage area in the vicinity of the mine. Therefore, no fuels are stored at the sites.

Explosives are delivered by rail to an explosives magazine at a remote site to the north of the Zn refinery. From here, the explosives required for underground use are transported by secure rail wagon to Ridder mine, lowered in containers in the shafts and stored in intermediate underground areas prior to use. The average volume of explosives stored in the main facility equates to 120t. This includes ANFO, for which there is a manufacturing area (not visited by WAI) where the product is transported in 40kg bags. In underground areas the maximum volume of explosives stored is 2t in any one location.

The main railway line from Ust-Kamenogorsk crosses two rivers, the Ulba and Gramotuka on the way to Ridder. Freight on this line includes metal concentrates, chemicals including cyanide and sulphuric acid, together with clinker and explosives. The Tishinskiy concentrate is transported in uncovered wagons over a 24 hour period. Approximately, 140kt/month of ore is transported to Ust-Kamenogorsk.

Chemical reagents are delivered to the Company rail depot, and diverted onwards by rail to the Zn concentrator. There is an intermediate storage area to the north of the Zn refinery, in a remote site. These reagents include chemical grade lime, sulphuric acid, sodium cyanide, and various other process reagents. For hazardous chemicals, such as sodium cyanide, the trains have a police escort, and are equipped with neutralisation reagents in the event of a spill. Cyanide is delivered as granules, in metal drums, which are offloaded manually, and transported to a ventilated, alarmed storage area. In this area, the drums are loaded into a sealed dosing facility, which opens the drums, mixes the cyanide with water, and rinses the containers, which are then crushed. The cyanide liquid is then piped directly into the plant. Personnel working with hazardous substances had gloves, goggles and respirators, however full chemical suits are not worn. Emergency wash facilities exist.

Other chemicals are stored in separate areas in the reagent unit, however, these are not bunded, but it was reported that a drainage system for all effluent conveys any spills back into the process.

Emergency response plans for dealing with spills exist, and spills are either neutralised or diluted and washed with water. However, no spill containment kits are used.

> ***WAI Comment:*** *WAI considers that in general, storage areas are appropriate and well maintained; all storage facilities correspond with national safety requirements although WAI recommends acquiring spill containment kits for emergencies.*
>
> *WAI considers that the Company would benefit from demonstrating a commitment to compliance with the International Cyanide Management Code (ICMC). Transportation, handling and storage practices appear adequate.*

Where contractors are used, they are conversant with Company handling, storage and disposal protocols. Clear lines of responsibility, in the event of an incident, such as a cyanide or fuel spill, are established. Spill kits should be provided for containment of spills. The spill management plans should be extended to include disposal of containment spill mats, and these plans should be regularly tested via drills.

5.10.3.11 General Housekeeping

General housekeeping at the site appeared generally good, with most areas being maintained in a tidy manner.

> ***WAI Comment:*** *WAI considers that housekeeping at the site is good.*

5.10.3.12 Fire Safety

Fire extinguishers and fire safety stations are located at various points across the mine and plant site. All staff and contractors are given training in fire safety plans, emergency evacuation routes and fire fighting protocols, although these are not tested via actual drills. There is also a training log, outlining training received. The State mine rescue team, located in Ridder city, is responsible for underground fire management. A designated person in each area is responsible for inspection and maintenance of fire extinguishers.

> ***WAI Comment:*** *The fire management systems appear appropriate to the size of the operations, and WAI considers that these issues are being well managed by the health and safety team. WAI understands that Kazzinc intends to introduce more drill training systems, and recommends that this should be implemented as a priority.*

5.10.3.13 Security

Security control points are present at the entrance to the site, and control points are also included for all operational areas. These control points are permanently manned (two 12-hour shifts), and access is controlled via a 'pass' system.

> ***WAI Comment:*** *Whilst access to the main areas of infrastructure is appropriately controlled, the scale of the site means that it is not possible to prevent access to all areas. Additional hazard signage could be employed at dangerous areas, such as TMFs, storage ponds and old surface workings/ground collapse areas.*

5.10.4 Permitting

5.10.4.1 ESIA/OVOS

An OVOS (Russian equivalent to Environmental Impact Assessment (EIA)) produced in 2007 by Vostokvodoochistka is in place for the Ridder Mining Complex (including Tishinskiy mine and processing facilities), which covers extraction and processing. The Ecological Expertise for the 2007 OVOS concluded that the project would not have any negative environmental impacts, subject to the described mitigation measures being implemented.

WAI has reviewed the environmental monitoring and mitigation programmes which were approved for 2009-2010. These reports have to be prepared by an external registered contractor. Regular audits other than for ISO 14001 compliance purposes are not undertaken by State authorities.

> ***WAI Comment:*** *WAI considers that the Company is well aware of its obligations with regard to meeting national requirements, and seems to be performing the appropriate environmental studies in this regard.*
>
> *However, analysis of OVOS compliance with international standards should be performed to highlight any shortfalls. As required under the national Subsoil Use Contract, a mine closure plan has been developed with an associated closure fund held in a special Kazzinc account. A detailed closure plan will be developed 3 years before mine closure, as per national standards. This differs from international best practice requirements. An independent audit of all facilities at Ridder-Sokolniy mine was commissioned by Kazzinc in 2010 and performed by Ecoterra.*

5.10.4.2 Environmental Permits and Licenses

WAI considers that Kazzinc is in possession of all the relevant environmental permits as dictated by Kazakh legislation.

5.10.5 Environmental Management

5.10.5.1 Environmental Policy and Company Approach

According to the environmental activities plan, construction of a new site for handling Tishinskiy tails, located further from the river was completed, and the former site was closed. All company training materials are prepared by company Environmental specialists. The environmental budget is prepared on an annual basis by the environmental manager, based on the cost of permitting requirements and expenditure. For 2010, the environmental plan included measures for the following:

- Air – dust suppression on roads;
- Water – prevention of water pollution;
- Flora and Fauna – protection of species and tree planting;
- Production waste management;
- Radiation research and protection; and
- Environmental publicity programmes.

The sum allocated to the above for 2010 was 13.7 Million Tenge (approximately US$1M). This sum does not include any contingency for unexpected costs, such as pollution associated with e.g. a breach of Talovskoye TMF or unplanned closure of a facility.

> ***WAI Comment:*** *Expenditure for accident elimination or mine closure related contingencies are included as part of the mine closure fund and environmental insurance contract. Risk assessments are performed to identify priority environmental issues. Monies are then allocated to address these.*
>
> *WAI also considers that Kazzinc is proactive with regard to dissemination of information at key stages of project development. The Company is meeting national obligations, however WAI suggests that current practice should be specifically compared with international standards for consultation and disclosure. The Company relationship with the local community is very good.*

5.10.5.2 Environmental Management Staff & Resources

There are two Environmental Managers at Ridder Mining and Concentrating Complex, responsible for the Ridder operations, and other outlying sites in the area. The corporate Environmental Manager is based at the Company head office in Ust-Kamenogorsk. Environmental monitoring and sampling is carried out by the Company environmental laboratory, supported where necessary by external contractors. Corporate Environmental training is also provided to managers. Environmental training aspects are included within a training program provided by a special personnel training department. The Company has special procedures for managing sub contractors both in terms of environmental and health and safety performance. Health and Safety Training is expanded further in the Health and Safety section. Top tier managers receive external training, and in 2005 completed training in ISO 14001 EMS.

5.10.5.3 Systems and Work Procedures

The Company is accredited under the following international management systems:

- ISO 9001 – Quality Management (achieved 2004);
- ISO 14001 – Environmental Management (achieved 2006); and
- OHSAS 18001 – Occupational Health and Safety (achieved 2006).

The independent accrediting Company for the above standards performs annual audits. A general assessment of environmental conditions is made during the annual monitoring visits. Six ISO 14001 audits were performed internally in 2009, and seven non compliances were identified and measures were implemented in January 2010 to rectify these.

The Company has developed a number of long term corporate global programmes. These include: the reduction of sulphur dioxide emissions, the reduction of Pb particulates, the recycling of water at reprocessing of industrial wastes and technogenic mineral formations.

Kazzinc operates a transparent policy with regard to dissemination of information on their operations. Formal public hearings are held when a new development occurs at the mine, and regular annual meetings are also held.

> ***WAI Comment:*** *WAI considers that the environmental management at the mine, with regard to meeting national requirements is good. The Environmental Managers appear well aware of their duties, efficient and proactive, and aware of national legislative requirements. WAI is encouraged that the Company has obtained accreditation under international management systems, and is aware of the requirements to maintain these. Development of these systems is annually checked by the international certification authority, and their improvement is being noted.*

5.10.5.4 Environmental Monitoring, Compliance & Reporting

Environmental Monitoring plans, prepared by a registered licensed contractor (as stipulated by State requirements) are approved annually. Discharge and emission limits were set for 2010. The monitoring plan includes information on location of sampling, frequency and determinands for groundwater, surface water, discharge points, snow, air, dust and soils. Monitoring reports, based on the findings of the monitoring plan, are sent to the Environmental Ministry.

Groundwater is sampled via 8 boreholes in 4 locations across the project area. Surface water is sampled in 7 locations from the Filipovka, Bystruka, and the Bolshaya Talovka Rivers. When the concentrations are exceeded, mitigation measures to rectify the situation are implemented, to ensure that all site runoff is treated.

According to the monitoring programme, there are 13 monitored discharge points in 7 main areas which are sampled monthly for pH, copper, iron, lead, zinc, cadmium, manganese, ammonium salts, nitrate, and nitrite, and quarterly for the additional determinands of sulphates, suspended solids, dry residue, and oils. At the waste water treatment facility, the pH of the neutralised minewater is monitored by resident staff every two hours on a daily basis.

According to the monitoring plan, air is monitored in 9 locations at the operational mine site for dust and gas emissions. In addition one air monitoring point is located in a residential area on the periphery of the Sanitary Protection (buffer) Zone. Total dust is monitored in this location. The Sanitary Protection Zone (SPZ) for Ridder-Sokolniy Concentrators buildings is 1000m, and for Talovskoye TMF is also 1000m.

According to national legislation, maximum permissible discharges from mine site are established which are specified in the permit for substance emissions.

Continuous gas monitoring occurs in hazardous chemical storage areas, and in the plant, and alarms sound if limits are exceeded. Greenhouse Gas (GHG) monitoring does not currently occur, since GHG emission legislation is not currently well defined under Kazakh law. GHG sources at the site would potentially include emissions from fixed and mobile plant, the acid neutralisation areas, and lime preparation facilities and from the sewage treatment works. In 2010 an inventory of greenhouse gas emissions sources was produced and approved by the State environmental authority.

Noise is monitored at point sources, on an annual basis. Noise levels at potentially sensitive community receptors are not controlled. A working level of 80dBA is permitted, and where this is exceeded, Personal Protective Equipment (PPE) is provided, or mechanical improvements are made.

Soils are monitored in 6 locations on an annual basis.

Process tailings composition from all concentrator circuits is continuously assessed as part of the process flow in the plant. Tailings recycled water composition is analysed at Talovskoye and Chashinskoye TMFs.

Radioactive point sources are monitored at over 1000 locations, on a quarterly basis, using either mobile or automatic detection equipment. Radon exposure is also monitored twice per year in working areas, including the underground mine, and at planned construction sites together with scrap metal if required. The threshold level of 310Bcq/m^3 has not been exceeded at any locations where radon is measured.

Monitoring for air and water quality is performed by the Company environmental laboratory, with samples analysed at the Analytical Laboratory, which is nationally accredited. Groundwater and soils are monitored by specialist contractors. It is reported that full tailings analysis and recycling water analysis is performed by the Company Analytical Laboratory, however WAI has not reviewed the results.

Environmental test results are reviewed and reported monthly by the Company Environmental Managers. These reports include a comparison against both State and site-specific thresholds.

These reports are prepared and submitted to the Ministry of Environmental Protection to report on compliance. Furthermore, annual State environmental inspections are carried out to assess compliance and environmental management practices. Non compliances can either result from exceedance of thresholds or quantities, or inadequate management/mitigation measures, resulting in discretionary fines.

In 2009, the total fines payable by Kazzinc amounted to 93,000 Tenge (approximately US$600). This largely related to slightly elevated metal concentrations in discharge waters.

> ***WAI Comment:*** *The scope of the environmental monitoring programme has been developed in line with national legislative requirements, as testified by the limited penalties due to non compliances. The Kazzinc Environmental Managers, Laboratories and third party specialists are aware of compliance requirements and the analytical and sampling methodologies required to assess these. However, the monitoring programme should be compared with International standards and recognised best practices.*

A hydrogeological assessment of the mine operations was performed when the deposit reserves were calculated. Ongoing hydrogeological studies are being carried out as part of the operational phase by the RMCC hydrogeology service. Monitoring holes are located at specific points ensuring control of hydrochemical processes. This is especially important, given the sensitivity of groundwater supplies in the area. An OVOS was developed for the deposit development and approved by the State environmental expertise, which included baseline data characterisation.

Groundwater testing should also include chemical reagents used in the concentrator (e.g. cyanide and microbial parameters. When limits are exceeded, mitigation measures are implemented, to ensure adequate treatment.

With regard to surface water, WAI considers that the distribution and number of river sample points is good. Surface water sampling locations are considered adequate to assess the quality of river water and the potential influence of industrial discharges across the site. Ochre coloured discharge was noted at the Chashinskoye water discharge point, owned by the State which enters the Filipovka River catchment. This indicates high sulphate-ions levels in monitoring results, although when assessed in the context of many years of monitoring results, Kazzinc states that no high acidity has been recorded in run-off, and the level of contaminants is in line with State approved levels.

The quantity and location of point source air quality monitoring sites is considered adequate. Additional noise monitoring should be undertaken at the location of sensitive residential receptors, either within or outside the licence area.

WAI appreciates that the history of mining in the area has already resulted in previously disturbed and depleted soil formations. The State approved Environmental monitoring program includes monitoring of soil contamination within the zone of influence of surface facilities. A survey, financed by the government was performed to assess contamination in the area of the mine site on a 100x100m grid.

Ore rock waste is not stockpiled at the site. Mine ore is directly delivered to the Concentrator without stockpiling. Mine wastes are used for reclamation of the subsidence zone that has resulted from mining of the Ridder lode. Drainage water from this zone enters the mine drainage system. Periodic control shows the mine run-off pH is 7 or higher and the pH of flotation tailings is higher than 9.

The composition of the tailings liquid and solid phase is monitored each shift on a daily basis to prevent metal losses, or high level reagent discharge and to assess run-off and tailings acidity. The assessment should include a full analysis for tailings solids.

WAI considers that the detection limits for some determinant testing, such as sulphate, arsenic and mercury, is not sufficiently low to assess potential contamination. However these methods and detection limits are established in the Kazakh State register and therefore Kazzinc follows them.

WAI considers that the radioactivity monitoring performed is appropriate to the size of the operations.

Overall compliance with national standards appears to be good.

5.10.5.5 Emergency Preparedness & Response

There are Emergency Preparedness and Response Plans for various scenarios, such as a TMF breach, outlining responsibilities, actions and reporting requirements. However, these plans are not tested via actual drills, except in areas considered as more hazardous, such as the Talovskoye TMF and reagents storage area.

There are chemicals for spill neutralisation for cyanide and sulphuric acid, and other spills are flushed with water. There are no spill kits for containing spills. All spills are in the Concentrator and reagent storage area is collected by the surface drainage system, which reports to Talovskoye TMF.

5.10.6 Social and Community Management

5.10.6.1 Stakeholder Dialogue and Grievance Mechanisms

Internally, the main method for internal communication of environmental issues is via training, whilst health and safety issues are also communicated via signs and notice boards. An internal Kazzinc newspaper is also produced and distributed to employees. Externally, public hearings, as required by law, are advertised in the local paper twenty days in advance, when there is a new development, or an expansion to existing facilities. Additionally, quarterly meetings are held with community members. Furthermore, an annual programme of environmental presentations is developed and delivered to invited representatives. This is also reported in the local newspaper and on television. Tours of the mine facility for pupils, students and public organisations also promote transparency, and local awareness of the operations.

Internal occupational grievances can be raised during quarterly meetings, attended by workers and sector managers. Occupational related issues can also be communicated in writing to sector managers, via the health and safety manager for that area. There are also comment boxes for anonymous complaints, and a comment book for suggestions to improve working conditions. Additionally, managers allocate times during which personal complaints can be discussed.

External grievances can be made either verbally or formally in writing. Grievances are either addressed to the Company director, or the relevant sector head. Grievances are recorded and investigated by a team including a Company lawyer, and reported back to the complainant. The Company director is informed of the outcome together with an estimation of any compensation considered necessary. Compensation measures are discretionary and the final decision is formally reported by the director or relevant sector head. Environmental complaints resulting in Company action have been infrequent. In 2007 in response to a complaint about haulage dusts, an alternative haulage route was devised.

> ***WAI Comment:*** *WAI considers that the internal stakeholder dialogue and grievance mechanism is appropriate to the size and nature of the operations.*

5.10.6.2 Social Initiatives and Community Development

Ridder city has a population of approximately 58,000 people, with an additional 3,000 living on the outskirts or in villages. Part of Ridder city lies with the western boundary of the mining licence. Additionally, the villages of Kanalovka and Talovka lie within the mining licence, the latter being situated to the south of the Talovskoye TMF. In 2009, the total number of employees at Kazzinc was 3,518 with the vast majority living locally.

In line with Company policy, the following financial sums have been allocated in 2010:

- 1.5M Tenge for wedding or funeral costs;
- 1.5M Tenge for maternity pay;
- 10M for unused leave on resignation;
- 2000 Tenge per pensioner (the 3010 received a total figure of 7.7 M Tenge);
- Optional salary contribution to local Kazzinc orphanage – donations totalled 797,115 Tenge;
- 500,000 Tenge for city improvements/repairs; and
- 2M Tenge for additional community assistance.

In addition to the above, Company employees also receive other employment benefits, such as medical treatment, bereavement support, presents and parties for employees' children, a profit share bonus scheme, long service recognition, optional and membership of trade unions. Additionally, the Company has a scheme for teaching English to managers, with the opportunity on successful completion of the course to work overseas for up to two years, at the Company's expense. The Company also funds a technical university in Ridder, open to current employees, to enable them to further their training, and specialism. External experts are invited to provide guest lectures.

In addition to the above, the Company has undertaken a number of social initiatives to benefit the local community. These include:

- Maintenance of public roads;
- Provision of equipment for waste collection;
- Repairs to the hospital;
- Rebuilding a local church;
- Financial assistance and equipment to schools and kindergarten;
- Development of a local orphanage for 0-3 years;
- Scheme to find adoptive parents for local orphans in Ridder and Ust-Kamenogorsk; and
- Educational excursions to mine and processing facilities.

With regard to land take, in line with national policy, if acquisition or resettlement is required, the Company lawyer assesses the condition of the land/property that would be affected, and the Company compensates the individuals accordingly.

> ***WAI Comment:*** *WAI considers that the Company is working well with the local community, and is encouraged that a social development plan and supporting funds have been developed.*

5.10.7 Health & Safety

5.10.7.1 Health & Safety Management Arrangements

The Company has a central health and safety (H&S) management team in Ust-Kamenogorsk, with engineers designated for different sections of the operations. At Ridder, there are two corporate Health and Safety managers, who are responsible for a team of engineers, responsible for different areas. Additional inspectors are also present to undertake regular assessment of the facilities. The Company is also accredited for H&S management under the OHSAS 18001 scheme.

There is a comprehensive training programme, which varies in the level of detail, depending on the target audience. The environmental training covers issues such as dealing with spills, waste management, water and power consumption and how to manage and minimise environmental risks. Managers also receive training every 3 years, from State authorities. WAI viewed a number of personnel training logs.

There is a medical point in the concentrator, and all employees are first aid trained. In chemical storage areas there is also an emergency wash facility. The Company also has a special clinic in Ridder, where all employees receive annual medical checks. The Company has a contract with the State ambulance provider and the nearest hospital with an Accident and Emergency (A&E) department is in Ridder city, a few kilometres away. Spot tests for drugs and alcohol are also performed.

Noise, dust and gases are monitored in working areas, and alarms sound if safe conditions are exceeded. Additionally gas monitors are present in reagent storage areas, and respirators are also worn in these areas. PPE is provided to all employees, and additional PPE is provided when hazardous substances are handled.

A CCTV system is located in the main office, with screens monitoring various areas across the site.

> ***WAI Comment:*** *WAI considers that health and safety is very well managed at the site, with appropriate training being provided, and good response systems in place for personnel. PPE was worn in all areas, and H&S managers were proactive in their management of H&S issues, both with regard to national and international requirements. WAI would recommend implementing drills to test Emergency Response Plans, to assess their adequacy. Hazard suits should be provided to workers handling and unloading hazardous substances. Another minor recommendation is that alternative dust masks should be sourced, since the current design is cumbersome, and could result in cases of masks not being used.*

5.10.7.2 Performance and Accident Records

The Company generally has a good health and safety record, with 102 days lost to injury for the concentrator (total 607 staff) in 2009. Two fatalities occurred in 2008, and there were 11 injuries overall in 2009. A full investigation into fatalities was performed with an assessment of further actions required to avoid repeat incidents. Another fatality occurred on 11 November, 2010, due to an explosion in a lime preparation area. Up to this point, accidents had been infrequent, with the majority being assigned to negligence. The Company had an aim to reduce the number of accidents by half in 2010. Accident logs are maintained, and in the event of an accident, a full inspection and investigation, with remedial action, takes place. Daily informal inspections are performed, and there are also annual inspections from various State departments including: Sanitary Epidemiological, Police, Safety and Emergency Response units. Formal internal inspections are performed three times per year.

There are clear lines of responsibility in case of an accident, and disciplinary and re-training procedures exist if unsafe working practices are noted by H&S managers. The managers can also stop production and issue warnings if breaches are noted. These are then recorded, and remedial measures, with a given timescale for implementation are devised. The progress on implementation is then inspected by the H&S manager. Health and safety signs are displayed across the site, and appropriate signs were in place at all hazardous areas.

WAI Comment: *WAI considers that the health and safety management is very good at the site, and that the appropriate record keeping and improvement procedures are in place to deal with incidents. Overall the safety records are good, and all personnel seem committed to improving safety management.*

5.10.8 Mine Closure & Rehabilitation

5.10.8.1 Mine Closure Plans

It was reported to WAI that for the Ridder-Sokolniy mine and processing facilities, an initial estimate of potential closures costs was made, and a sum of money was deposited in a protected Company fund, for this purpose. This figure amounted to US$3.7M. In 2008, this figure was revised to US$4.1M, based on outline closure concepts. This sum does not include the Chashinskoye and Staroye TMF, which are the subject of a separate closure fund of US$4.8M established in 2000 and due for revision in 2011. Typical closure measures include demolition of surface structures, stripping of utilities, stabilisation of mining related features, earthworks and revegetation. It is reported that standard post-closure monitoring includes: rivers and groundwater, minewater, dust, soils, flora and fauna. It is also reported that post-closure aftercare is likely to include the continuation of minewater treatment and pumping. At Tishinskiy, this is envisaged for 12 years, before the workings are allowed to flood and groundwater rebound occurs. This period has not been estimated for Ridder-Sokolniy.

5.10.8.2 Financial Provision for Closure

It is reported that the closure fund will periodically be updated during the mine life, with a final detailed closure plan to be prepared 2 years before actual closure, in line with State requirements. The Company provides training in both mining and non-mining related sectors, and aims to provide employment in alternative jobs, once closure has occurred. Progressive reclamation is carried out, e.g., demolition of old buildings, and rehabilitation of the land.

Kazzinc closure plans are understood to be in line with the national requirements but are not compliant with international standards, since it is considered best international practice to develop a final closure plan prior to operations commencing, and consequently the Kazzinc closure plan and funds should be regularly reviewed, and amended to reflect current and future obligations. Systems should also be put in place in the event of unplanned company closure, as required by international best practice.

5.10.9 Conclusions

5.10.9.1 Environmental and Social Liabilities & Risks

There has been mining activity in the Ridder area since 1786, via surface and underground workings, with concentration facilities since the 1920s. Prior to 1991, mining and processing at Ridder-Sokolniy was State owned and operated. Kazzinc started operating at Ridder in 1997. The mineral rights for Ridder-Sokolniy mine remain State owned, and operations take place under the Subsoil Use Contract with the government. Additionally, Kazzinc leases Staroye and Chashinskoye old TMFs for reprocessing purposes. The Company also uses the Kryukovskoye old open pits for temporary disposal of gypsum slurry produced from RMV sulphuric acid neutralisation. The Company is responsible only for liabilities generated via their current operations.

The Company has environmental insurance, to cover environmental damage up to a maximum value of 22 Million Tenge (US$146,880).

As previously stated, under the mining agreement, if no surface infrastructure is present, it is permitted to let subsidence occur. As a result, there are areas within the mining licence which have subsided, including the site currently used as the Company waste disposal facility. It is the intention of the Company to prevent subsidence in residential areas, or areas with surface infrastructure, by using rock waste and paste backfill to stabilise underground workings. Paste backfill is pumped into underground voids via a series of fixed manifold outlets in a single pour. The progress of the pour is monitored from surface using a dip meter equivalent, to ensure that the material reaches the void roof. For every 1,000m^3 of paste backfill produced, three sub samples are prepared and tested over a three month period, to assess density and uni-axial strength throughout the solidification process. It is also reported that core samples of in situ paste backfill undergo the same testing processes after setting has occurred.

The Company does not have any liabilities associated with contaminations prior to 1997 when it was established. The Company prepared an OVOS for the waste dumps and determined boundaries for State responsibility. Similarly as for Staroye and Chashinskoye tailings dams, liability for water run-off and soil is delimited between the parties in the RMCC OVOS. Liability in the event of a claim, particularly with regard to subsidence, which may be due to historic workings, is determined by the national legislation.

Underground voids are assessed by underground surveys, and measures have been taken to prevent collapse due to incomplete backfilling.

The process of voids backfilling, material composition and backfill properties are controlled by RMCC backfilling laboratory.

5.10.9.2 Compliance with Local and International Standards and Expectations

The following is a list of WAI's main conclusions and recommendations with regard to the Ridder-Sokolniy mine and processing operations.

- Current environmental management is performed in line with national requirements, and WAI is encouraged by the Company's accreditation under environmental, quality and health and safety management systems. The implementation of these systems is translated to practical environmental improvement and sustainability across all management tiers and operational sectors;
- Environmental risks, associated targets and an action program were assessed during due diligence carried out in 2010. The use of Key Performance Indicators (KPIs) and risk assessments should be considered to achieve this;
- The approved OVOS has been prepared in line with national legislation, but it is recommended to renew the OVOS for compliance with the international best practice;
- The environmental monitoring programme meets national standards, but comparison with international standard requirements should be performed, and amendments made as required;
- The responsibility for environmental monitoring is centralised, such that monitoring performed by different departments and contractors is fully incorporated in the environmental monitoring programme, and as such all contaminative sources can be addressed. The results are recorded in a central database, in order to identify trends and point sources/plumes, for each determinant across all media;
- Enhanced environmental protection along the tailings pipeline should be considered, especially at river crossings. Consideration should also be given to using all emergency discharge points;
- The current landfill facility should be assessed in line with international standards;
- Consideration should be given to adherence with the ICMC;
- Health and safety is generally well managed, but could be improved by the introduction of practice drills. Apart from the recent fatality, health and safety performance to date has been good;
- Site security is good, however extra signage could be introduced to prevent access to dangerous areas;
- Progressive rehabilitation of sterile areas of the mine site should be implemented for stabilisation and environmental protection purposes;

- The current closure estimate for Ridder-Sokolniy, is in compliance with national legislation but should be reviewed against international best practice, and include provisions for unplanned company closure;
- Internal and community dialogue processes are developed in line with national requirements; and
- The Company demonstrates a good working relationship with the local community and has a well developed social plan and fund.

5.10.9.3 Recommendations for ESAP

WAI considers that given the scale of operations at Ridder Mining Complex, a gap analysis should be prepared by Kazzinc, to inform the production of an action plan, which should also consider the above recommendations.

6 TISHINSKIY DEPOSIT

6.1 Introduction

The Tishinskiy deposit is situated on the south-eastern spurs of the Ulbinsky Ridge, 200-400m east of the Ulba River and 18km south-west of Ridder. The collar of the main shaft (Tishinskiy Shaft) is at an elevation of 644.3m and the neighbouring mountains rise to 1,000-1,200m above sea level.

The Tishinskiy mine is linked by rail and asphalt road, which lies adjacent to the mine with Ridder and Ust-Kamenogorsk.

6.1.1.1 Mineral Rights and Permitting

Kazzinc holds the right to mine pyritic polymetallic ores under the terms of the 'Contract for Subsurface Use' dated 21 May 1997. The Contract is valid for 25 years from the date of the licence issue (i.e. 21 May 2022) and can be extended by mutual agreement between Kazzinc and the issuing authority.

The current mining lease covers an area of 3.8km^2 and was issued by the Ministry of Energy, Mineral Resources and the Environment of the Republic of Kazakhstan in November 2002, superseding the previous mining lease.

The lease permits mining to a depth of -590m relative to Baltic Mean Sea Level. The deepest mining level is currently at an elevation of approximately -230m, the deepest shaft reaches -345m and mineralisation locally extends down to an elevation of -570m (mineralisation has not been studied below the depth level of -570m).

The boundaries of the lease are defined as detailed in Table 6.1 below.

Table 6.1: Lease Boundary Points

Boundary Points	Geographical Coordinates	
	Latitude N	Longitude E
1	50°15'46.6"	83°21'58.2"
2	50°16'31.3"	83°20'44.1"
3	50°17'00.9"	83°20'43.5"
4	50°17'16.3"	83°21'14.1"
5	50°16'51.2"	83°22'32.5"
6	50°16'24.5"	83°22'32.8"

6.1.2 Project History

The Tishinskiy deposit was discovered during prospecting of the Butachihinsko-Kedrovska shear zone in 1958. Preliminary and detailed exploration of the new discovery was completed in mid-1963. Up to August 1961 the deposit had been explored, principally by surface drilling, to a depth of 450m from surface. By the end of June 1963 the central part of the Main Lode had been delineated to a depth of 750m and the flanks of the deposit to a depth of 450m. Mine development and detailed underground exploration began in July 1963. Whilst underground work was in progress, drilling from surface continued until the end of 1983 focusing primarily on deep levels of the deposit. The central part of the Main Lode and its eastern flank were delineated to depth of 1,200m and the western flank to a depth of 900m (Tishinskiy Shaft collar being at 644m).

Exploration was initially (to 1957) conducted by Altay Base Metals Exploration (ACMR), then jointly by Leninogorsk Geological Exploration Expedition (Leninogorsk GRE) and Leninogorsk Polymetallic Complex (LPC) and, from 1997, by Kazzinc (successor to LPC).

A summary of the exploration conducted up to June 1999 is given in Table 6.2 below.

Table 6.2: Exploration Summary (1954 – 1999)				
Activity	Unit	Exploration phase		
		1954 - June 1963	July 1963 - 1983	1984 - June 1999
Geological mapping 1:10,000 scale	km^2	59		
Prospecting traverses				
1:25,000 scale	km	756		
1:10,000 scale	km	1,*243*		
Geological mapping 1:2000 scale	km^2	8		
Cartographic drilling	m	51,300		
Pitting	m	18,350		
Trenching	m	2,810		
Prospecting and structural drilling	m	20,000	20,693	
Exploration drilling				
from surface	m	60,900	78,505	
underground	m	1,000	51,062	34,018
Exploratory underground workings	m	1,332	9277,0	10,794

Mining commenced in 1964 from an open pit sited in the centre of the deposit. Open pit production ceased in 1978, overlapping with underground mining, which began in 1969, initially Level 6 reserves were mined employing sub-level stoping with backfill using hand-held equipment, and from 1976, mechanised sublevel stoping with backfill. At that time (1976) the mining of open pit's west wall reserves was started above Level 5 employing sub-level caving method. The current underground mine layout was developed on the basis of a project prepared by the Kazgiprotzvetmet Institute in 1991.

6.2 Geology and Mineralisation

6.2.1 Regional Geology

The Tishinskiy deposit is situated in the central portion of the Butachihinsko-Kedrova shear zone, which adjoins the south-western flank of the Ridder graben. In contrast to the Ridder graben, in which Silurian to Middle Devonian volcano-sedimentary sequences are found almost in the same position as they were laid down, Palaeozoic formations in the Butachihinsko-Kedrova shear zone have undergone strong polyphase folding and intense shearing. The deformed formations comprise high grade metamorphic Ordovician basement rocks and weakly metamorphosed volcanogenic-sedimentary Devonian-Upper Carboniferous rocks.

The structure of the Butachihinsko-Kedrova shear zone is characterised by major WNW to NW trending folds with steeply dipping limbs and pronounced axial plane schistosity. As a result of Hercynian tectogenesis, Middle-and-Upper Devonian formations of Kedrovsko-Butachilkhinsky zone were formed as NW-trending folds, the major of which are the Siniushinsky anticlinorium and the Bystrushinsky and Beloubinshy synclinoriums. The Thishinsky deposit area covers the structures of south-west limb of Siniushinsky anticlinorium and north-east limb of Bystrushinsky synclnorium and is situated in the central part of Kedrovsko-Butachikhinsky shear zone which adjoins the south-east flank of the Ridder graben.

The structure of the Butachihinsko-Kedrova shear zone is characterised by major WNW to NW trending folds with steeply dipping limbs and pronounced axial plane schistosity.

6.2.2 Local Geology

Tishinskiy is a stratabound deposit developed along the E-W trending subvertical contact between the Ilinskaya and Sokolnaya Formations, both of Middle Devonian (Eifelian) age. The upper sections of the stratigraphically older Ilinskaya Formation (D2e1il) underlie the northern part of the deposit area. They consist of dark green chloritised tuffs and lavas of andesitic to basaltic composition, with intercalations of reworked tuffs, siltstones and fine grained sandstones. The basal part of the younger Sokolnaya Formation (D2e2sk), underlies the southern part of the deposit area. It consists predominantly of dark grey to black carbonate-pelitic siltstones. Both formations are cut by rhyolite porphyries and felsites which have been variously interpreted as sub-volcanic bodies associated with Devonian volcanic activity, or late Palaeozoic intrusives.

At the deposit, the contact zone between the Ilinskaya and the Sokolnaya Formations has been subjected to intense shearing and hydrothermal alteration over a width of around 400m. The alteration displays zoning with quartz-sericite and sericite-quartz in the centre through quartz-carbonate-chlorite-sericite in the intermediate zone to quartz-carbonate-chlorite in the outer zone.

A major proportion of the resource is contained in three mineralised bodies within the Main Lode, which is elongated in an east-west direction, with a near vertical northerly dip.

Main Orebody, also known as Orebody No.1 extends over a strike length of 1,250m from surface to a depth of 1,270m corresponding to level 22 at the absolute elevation of -590m. The central part of this body, about 500m in strike length and up to 60m in width, contains three subvertical lenses of massive sulphides (Western, Central and Eastern) with a combined strike length of about 200m, enveloped in disseminated mineralisation. The Western and Central lenses peter out downwards on levels 14 to 18 at the absolute elevations of -110m and -350m respectively and the Eastern lens pinches out at about the zero datum (10m below level 12). Average widths range from 6.5m to 17m. Lower grade disseminated mineralisation with much reduced widths (generally less than 10m) occurs in the Western Shaft section of the mine on the western flank of the deposit above level 8 and on the eastern flank, where it peters out rapidly towards a major transverse fault.

Orebody No.67 has a strike length of 1,000m, dip extent of 700m and an average width of 3.7m. Orebody No.1011 has a strike length of 550m, dip extent of 400m and an average width of 1.7m. On its flanks, the Main orebody divides into a number of parallel tapering branches to the east and west and gradually fades out.

Lenses and small vein-like bodies on the flanks of the deposit range from 25m to 50m in strike length and from 40m to 150m in down-dip extent.

Based on surface drill holes, the deepest parts of the deposit have been interpreted as lenses of disseminated mineralisation, which are open at depth. Underground holes intercepted lenses of massive sulphides among disseminated mineralisation on the western flank of the deposit indicating that massive sulphide mineralisation is also present.

Host rocks are strongly foliated carbonate-sericite-quartz schists and massive metasediments of the Sokolnaya Formation and, locally, carbonate-chlorite-sericite-quartz schists derived from volcanogenic rocks of the Ilinskaya Formation.

The southern contact (hanging wall) of Orebody No.1 coincides with a series of closely spaced faults. Lateral movements along these faults have produced two major gouge zones, which extend along the Western and Eastern massive sulphide lenses over a strike length of up to 170m and down to the bottom of the deposit. When disturbed, the gouge behaves like quicksand. Ground conditions are also very difficult along the northern contact of the orebody, which is strongly foliated along with the host sericite-carbonate-chlorite-quartz schists. The ore itself is foliated and cut by flat joints. This combination renders underground workings susceptible to roof failures and seriously impedes stope cleaning.

The available geological information suggests that Tishinskiy was originally a stratabound volcanic hosted deposit that has subsequently been subjected to intensive dynamic metamorphism and shearing producing plastic flow folds, boudinage structures, and lit-par-lit crystallisation schistosity. The deformation has redistributed primary sulphides and consequently modified the morphology of the deposit.

6.2.3 Mineralisation

Four primary and two secondary mineral associations have been recognised at the Tishinskiy deposit. The prevalent associations are: (1) A polymetallic (chalcopyrite-galena-pyrite-sphalerite) association, and (2) A copper-zinc (chalcopyrite-sphalerite-pyrite) association. Minerals representing all associations are listed in Table 6.3 below.

Table 6.3: Mineral Associations

	Metalliferous Minerals			Gangue Minerals		
Mineral Association	**Main**	**Abundant**	**Rare**	**Abundant**	**Main**	**Rare**
Oxidised Zone	Smithsonite, Cerussite, Goethite, Hydrogoethite, Beaverite	Malachite, Jarosite, Anglesite, Azurite	Native copper, Cuprite, Manganese hydroxides, Calamine, Aluminosilicate, Chrysocolla		Quartz	Halloysite
Secondary Sulphide Enrichment Zone	Chalcocite	Covellite	Bornite			
Pyritic	Pyrite		Rutile, Melnikovite, Pyrrhotite, Cobaltite	Quartz	Dolomite, Prochlorite	corundophyllite
Copper-pyrite	Chalcopyrite, Pyrite		Bismithite	Quartz, Dolomite	Prochlorite	Breinerite, Mesitite (Ferroan magnesite)
Copper-zinc	Chalcopyrite, Sphalerite	Pyrite	Galena, Altayite	Quartz	Dolomite, Calcite	Magnetite, Maghemite, Graphite
Polymetallic	Sphalerite, Galena, Chalcopyrite	pyrite	Tetrahedrite, Tennantite, Native gold, Native mercury, Hessite, Tellurobismuthite, Cavalerite (?), Claustthallite (?), Ilmenite, Arsenopyrite	Quartz, dolomite	Prochlorite, Phengite	Calcite, Albite, Gypsum

Disseminated veinlet-type polymetallic mineralisation predominates, but massive sulphide lenses of various sizes occur in the central parts of mineralised bodies.

The average ratio of pyrite and chalcopyrite to sphalerite and galena in disseminated mineralisation (which comprises about 90% of all mineralisation) is 1.5:1. The same ratio in massive sulphides is 0.6:1. The average Cu:Pb:Zn ratio to a depth of 1,000m is 0.46:1:5.4. The lead content decreases with depth and eventually, at a depth exceeding 1,000m, is lower than the copper content. The gangue composition also changes with depth, with magnetite, maghemite and graphite appearing in copper-zinc mineralisation at depths exceeding 1,000m. There is also a weak lateral metal zoning marked by a gradual eastward increase in the copper content and a pronounced drop in the gold content on the western flank. The pyrite content is less than 5.0%.

6.3 Exploration Works

6.3.1 Sample Collection

The current resource estimates are based on results of diamond core drilling from surface, underground mapping and sampling and underground diamond core drilling.

According to the Soviet resource classification system, which is still utilised by GKZ (Republic of Kazakhstan), the Tishinsky deposit was classified as being of Group II category, in the four-tier classification of mineral deposits with respect to geological complexity. Group II comprise of mineral deposits of considerable overall dimensions and moderate complexity.

According to specific instructions supplementing the Soviet resource classification, (under which the mines in Kazakhstan have a statutory requirement to report their reserves under to GKZ (RK,). a drilling grid of 100m by 100m was required for the delineation of a C_1 category resources for mineral deposits of that complexity group. The required sampling density has been achieved in the Main orebody on the currently developed deeper levels 11 to 16 and partially on the undeveloped levels 17 and 18. The same instructions defined a drilling density of 200m by 200m for the delineation of a C_2 category resource.

Detailed pre-production drilling and channel sampling was carried out by Kazzinc on the mining areas on grids ranging from 12.5x10-20m to 25x25-30m. Kazzinc considers this grid density sufficient for a resource upgrade from the C_1 category to the B category.

6.3.1.1 Surface Diamond Core Drilling

The main drilling campaigns were carried out by Leninogorsk GRE during 1958-1963. Surface drilling continued to 1983. Drill holes were sited on the northern side (in the footwall) of the Main orebody on profile lines bearing 180° except for some early holes, which were collared on profile lines bearing 12°.

Early holes were angled 80-88° to the south and drilled at 150-130mm external diameter, which were reduced to 110mm diameter (or occasionally to 91mm) at depth. Directional drilling with wedges was introduced in 1964. Holes were drilled vertical to depths of 600-800m and then wedged to deflect upwards. External bit diameters were 112mm to a depth of 25-30m, 93mm to 70-80m depth, 76mm to 600-800m depth and then 59mm at greater depths. Most holes naturally deviated to azimuths of 160-175°.

Drill collar locations were surveyed with instrumental methods. Down hole surveys were carried out at approximately 20m intervals using a variety of downhole survey instruments. Inclinations of the deepest portions of drill holes (final 150-200m) were generally determined using only acid-etch tubes with bearing directions extrapolated from previous measurements.

Kazzinc reported that core recoveries from mineralised intervals were generally better than 70%.

6.3.1.2 Underground Exploration and Resource Delineation Methods

Underground exploratory workings in the central part of the Main orebody consist of drives, which are generally oriented on a bearing of 90°, and crosscuts on a bearing of 180°. Crosscuts on the western flank of the Main orebody, where the overall strike changes to WNW, are oriented on a bearing of 228°. The average distance between crosscuts is 100m. With levels being developed 60m apart, this layout of exploratory workings forms a regular three dimensional grid of 100m along strike by 60m down dip. This layout is appropriate to the overall structural orientation. Historically, crosscuts on levels 3, 5, 6 and 7 were driven across the whole width of the Main orebody at 50m intervals.

Superimposed on the exploratory workings are extraction drives, crosscuts, sublevels, service raises and other underground openings developed in the process of stope preparation. The density of such workings varies from 10m to 20m along the strike and from 12m to 20m along the dip.

Geological documentation for each opening consists of 1:100 scale mapping of both walls and, in areas with more complex geology, also mapping of the backs, with annotations and descriptions.

Direct underground exploration is augmented with underground diamond core drilling. Underground holes are collared along drives at 12.5-25m intervals and drilled as fans oriented either north or south. On levels 11 and 13 in the central part of the Main orebody (crosscut lines 25-29), where the lode displays a flexural bend, changing its orientation from 90° to 45-30°, some exploration drill holes were oriented 265-275°. Underground drill holes on the western flank of the deposit (profiles 6 west to 5 west) were oriented on a bearing of 228° consistent with the change of strike in that area.

Most holes were drilled at 59mm diameter, but some horizontal holes were started and drilled up to 120m at 76mm diameter. A few deeper holes were completed in 46mm.

As with surface drilling, good core recoveries were difficult to achieve due to the presence of pervasive schistosity and strong localised fracturing and faulting. The overall core recovery in underground drill holes completed during the period 1984 to 1999 (in horizontal holes) was reported as 69.4%, whilst the overall core recovery from mineralised intersections was reported as 71.9%. The current situation has not changed.

Drill hole collar positions were surveyed with instrumental methods. Hole deviation surveys were carried out in approximately 55-60% of underground drill holes completed during the period 1963-1999. Changes in drill hole directions between the neighbouring survey points (at 20m spacing) were random and did not exceed 2°, which is less than the precision of survey instruments. As shown by control surveys of the actual piercing points in underground workings, the accuracy of the determination of X, Y and Z coordinates of the piercing points ranged from 0.7-1.1m.

Recorded drill hole depths and locations of mineralised intercepts were verified using grades recorded on roentgen-radioactive logs. Currently in-fill drilling is conducted with a Diamec 252 rig.

6.3.1.3 Sampling Techniques and Quality

Drill core recovered from mineralised intercepts is divided into 1m long samples or slightly shorter/longer lengths which are determined by geological factors: lithologic contacts or qualitative changes in mineralisation. Low grade sulphide mineralisation elsewhere is sampled over core lengths of 1-2m. Only core recovered from 76mm diameter holes is sawn along the core axis. Core from 59mm and 46mm diameter holes has been sampled in its entirety.

A comparison of analytical results on drill core samples with results of roentgen-radiometric logging (RRK) did not reveal any systematic errors.

Underground workings were sampled by cutting channels along horizontal lines over mineralised intervals exposed in crosscuts and from wall rocks stepping out 3-5m from visible limits of sulphide mineralisation. Channels are typically 10cm wide, 3cm deep and generally 1m in length. Only one side wall was sampled. Drives through mineralised bodies were sampled by taking horizontal channels from faces exposed at intervals ranging from 3m to 25m as the drives were developed.

Starting from 1982, channel samples were collected using pneumatic hammers and diamond rock cutting saw. Earlier samples were taken using chisel and hammer. The channel sampling quality was monitored by taking control channel samples immediately above and adjoining the existing channels. As reported by Kazzinc, differences between results on routine and control samples did not indicate any systematic bias.

6.3.2 Sample Preparation

The sample preparation scheme used at all exploration stages was based on the Richard-Czeczott formula Q=kda, where Q is the minimum sample quantity at a given stage of volume reduction, d is the diameter of the largest fragments defined as the screen size that retains the largest 5% of the mass, k is a coefficient dependent on the distribution irregularity of the mineral of interest and a is a coefficient related to the roundness of mineral grains (generally approximately 2).

The coefficient k is the key parameter. In general terms, the lower the coefficient k is, the better it accounts for the erratic distribution of minerals. In this instance, the k parameter of 0.16 has been selected after a series of experiments using schemes with varying k coefficients.

The same sample preparation scheme is used at the Ridder sample preparation facility today. In accordance with the adopted scheme, samples are crushed in three stages to less than 2mm and then divided to obtain approximately 3kg sub-sample. A duplicate is retained for mineral processing and other purposes, whilst the remainder is ground in roll grinder, sieved through a 1mm screen and split. A 1.5kg sub-sample is pulverised and sieved to pass 0.074mm screen. After mixing, sub-samples are collected for Cu, Pb and Zn analyses (50g), gold and silver analyses (300g), internal and external control analyses (500g). A 650g duplicate is retained for reference purposes.

The scheme is considered to be appropriate for the determination of base metal grades, but Kazzinc are aware that a scheme based where k=1, in which the first split is done at 1mm grain size, would be more appropriate for precious metals. Control analyses on duplicates representing different types of mineralisation and different grade classes do not reveal any significant discrepancies (see QA/QC section).

6.3.3 Sample Analysis

Analyses are currently performed at the Ridder MCC laboratory, but were in the past also performed at the Leninogorsk GRE and PGO Vostkazgeologia laboratories. Past and current procedures and methods are essentially the same. Internal and external control analyses on duplicates of routine samples have not revealed any significant random or systematic errors.

6.4 Proposed Exploration Drilling for Deep Horizons and Flanks

Kazzinc has proposed an extensive exploration programme of deep drilling at Tishinskiy in 2011. These holes envisage intersecting the main ore zone at depth for extension of the mine and on the flanks to

The programme consists of:

- Drilling of x17-18 drill holes in the center and on the western flanks (and to some extent on the eastern margin) of the Main ore zone between the -410 and -470m elevations at 18 to 21 levels; and
- Drilling x4 or 5 very deep directional drill holes to intersect the Main ore zone at the -600m elevation which lies just below -22 level. These holes will be from 1,500-1,600m long.

Exploration drilling is to be continued through 2011. The exploration budget and programme is given in Table 6.4 below.

> ***WAI Comment:*** *WAI has reviewed the current drilling practices on site and has found them to be well implemented. The recording of drill hole data (logging and surveying), sampling procedures and drilling practices were of very good standard.*
>
> *WAI has reviewed the proposed exploration programme and budget for 2011 and has no reason to believe it is not fit for purpose.*

Table 6.4: Planned Exploration Works For 2011 Proposed by Kazzinc

Object	Units	Total 2011	Same by Quarters			
			1	2	3	4
1. NW Flank of Bystrushinskaya Lode	m	5,600	1,400	1,400	1,400	1,400
	US$	685,714	171,429	171,429	171,429	171,429
	k tenge	100,800	25,200	25,200	25,200	25,200
2.Western Flank of Zavodskaya Lode	m	4,000	1,000	1,000	1,000	1,000
	US$	489,796	122,449	122,449	122,449	122,449
	k tenge	72,000	18,000	18,000	18,000	18,000
3.Western Flank of 2nd Ridderskaya Lode	m	8,000	2,000	2,000	2,000	2,000
	US$	979,592	244,898	244,898	244,898	244,898
	k tenge	144,000	36,000	36,000	36,000	36,000
4. Deep Horizons of Belkina Lode	m	20,000	5,000	5,000	5,000	5,000
	US$	2,448,980	612,245	612,245	612,245	612,245
	k tenge	360,000	90,000	90,000	90,000	90,000
5. South-East Flank of Pobeda Lode	m	11,000	3,000	3,000	2,500	2,500
	US$	1,346,939	367,347	367,347	306,122	306,122
	k tenge	198,000	54,000	54,000	45,000	45,000
6. Ore Occurence of Borehole No. 2426	m	10,400	2,600	2,600	2,600	2,600
	US$	1,273,469	318,367	318,367	318,367	318,367
	k tenge	187,200	46,800	46,800	46,800	46,800
7. Ore Occurence of Borehole No. 2437	m	10,400	2,600	2,600	2,600	2,600
	US$	1,273,469	318,367	318,367	318,367	318,367
	k tenge	187,200	46,800	46,800	46,800	46,800
8. Ilinskoye Ore Occurence	m	4,800	1,200	1,200	1,200	1,200
	US$	587,755	146,939	146,939	146,939	146,939
	k tenge	86,400	21,600	21,600	21,600	21,600
9. Bakhrushinskoye Deposit	m	16,000	4,000	4,000	4,000	4,000
	US$	1,959,184	489,796	489,796	489,796	489,796
	k tenge	288,000	72,000	72,000	72,000	72,000
10. Deep horizons of Tishinskiy Mine	US$	897,959	224,490	224,490	224,490	224,490
	k tenge	132,000	33,000	33,000	33,000	33,000
	m	96,200	24,300	24,300	23,800	23,800
Total Exploarion Works of Ridder Mining and Processing Complex	US$	11,942,857	3,016,327	3,016,327	2,955,102	2,955,102
	k tenge	1,755,600	443,400	443,400	434,400	434,400
	US$	897,959	224,490	224,490	224,490	224,490

6.5 Current Mineral Resources Estimate

6.5.1 Topography and Underground Survey

Underground survey data has been provided by the client as wireframes in Micromine format, an isometric view of these, with just the lower levels of stopes displayed for clarity, is shown below in Figure 6.1. The survey upon which the wireframes are based is understood to be up to date as of January 2011.

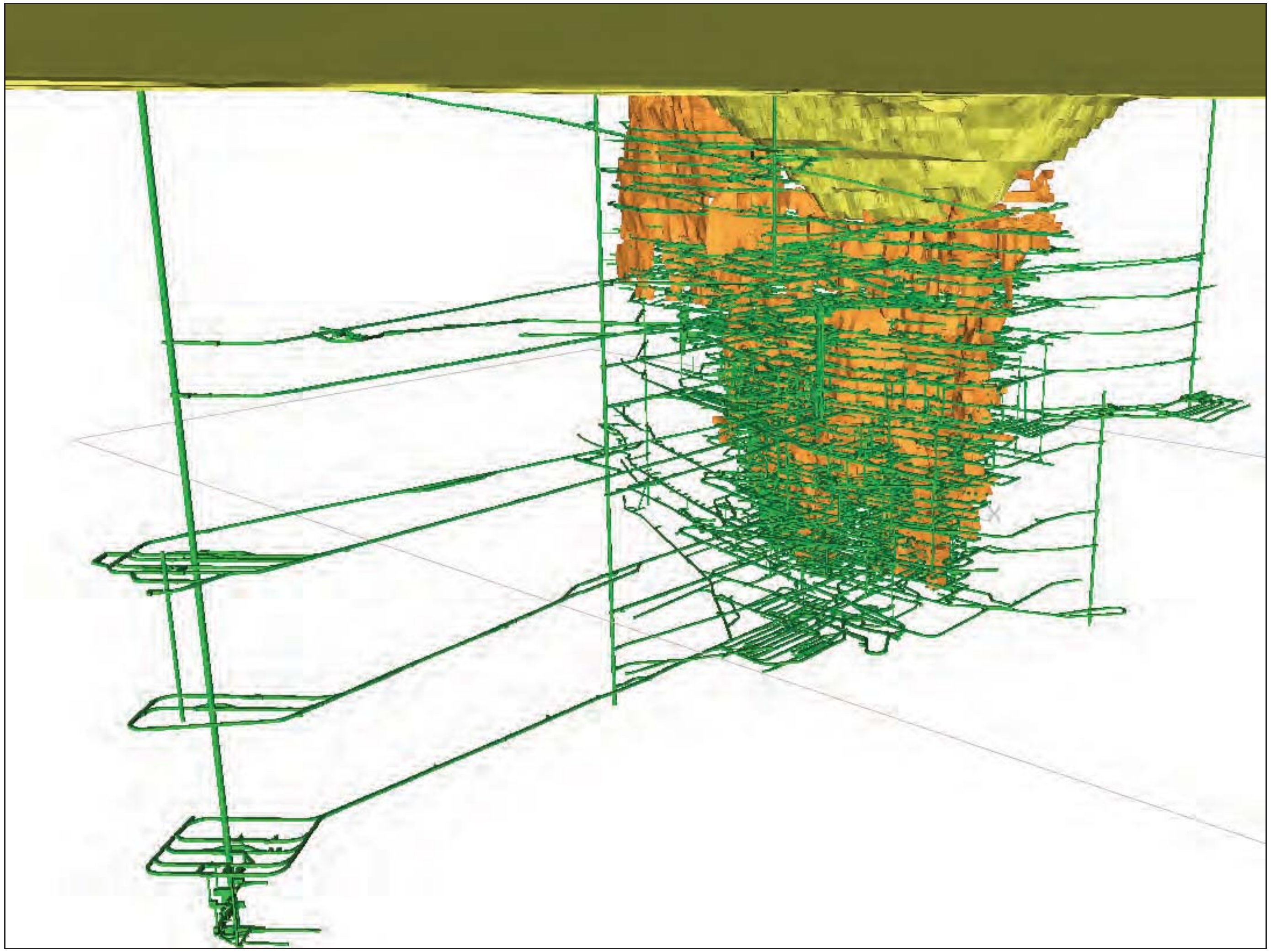


Figure 6.1: Isometric View of Underground Survey Wireframes

6.5.2 Database Compilation

6.5.2.1 Database

The sample database was supplied as a single desurveyed file. Verification was carried out to ensure there were no duplicate or overlapping samples. The database consists of a mixture of channel samples and underground drilling but is not coded as such. A summary of the database is shown in Table 6.5.

Table 6.5: Sample Database Summary		
Total Holes/Channels	**Total Length (m)**	**Number of Assays**
10,486	359,848	287,740

6.5.2.2 Drillhole Sections

Drilling at Tishinskiy is comprehensive and has been undertaken from both surface and underground. Drilling is generally orientated in a north south direction, at varying dip angles to cut across the strike of the deposit. The profile sections are spaced approximately 12.5m apart and are shown below in Figure 6.2 in plan view.

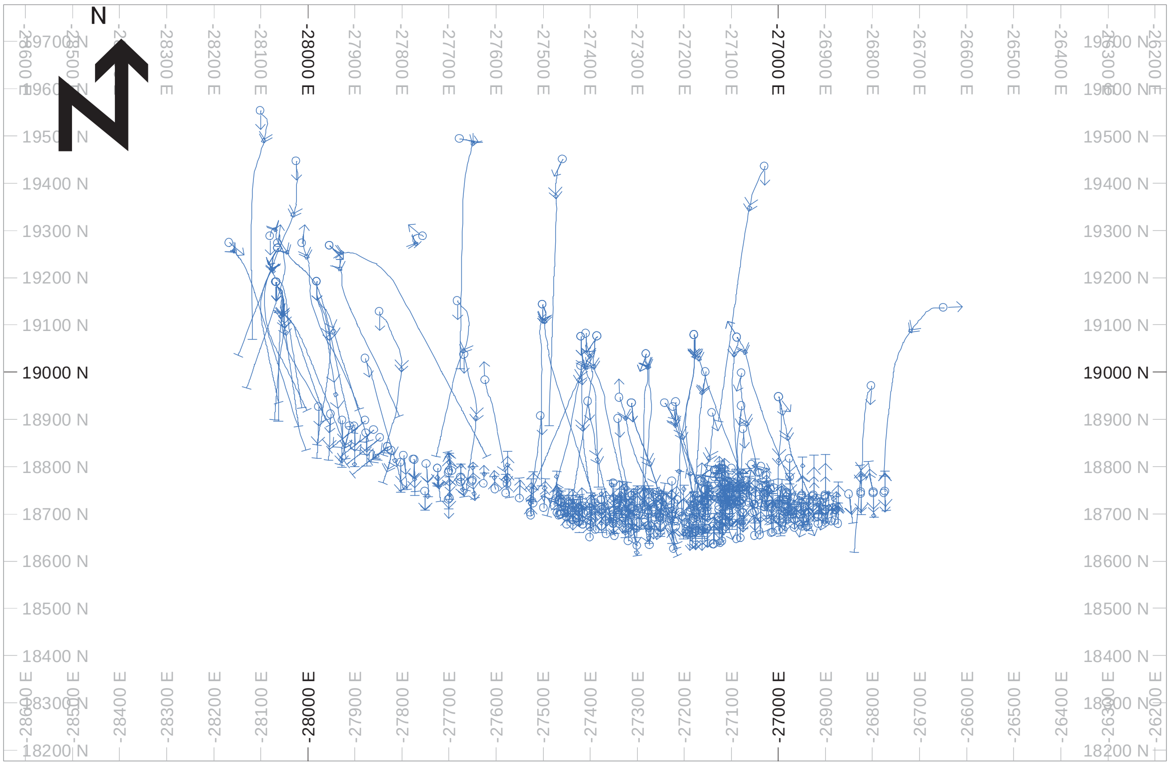


Figure 6.2: 100m Level Plan of Drillholes

6.5.3 Domaining

6.5.3.1 Equivalent Grades

Tishinskiy is a polymetallic deposit and equivalent grades are calculated for Zinc. For the Tishinskiy deposit the equivalent grade conversion factors are listed in Table 6.6. The minimum grades required for conversion are listed in Table 6.7.

Table 6.6: Conversion Factors for Equivalent Grades	
Zn	1
Pb	0.84
Cu	2.64
Au	0.96
Ag	0.01

Table 6.7: Minimum Grades for Conversion to Equivalent Grades	
Zn	0.4
Pb	0.1
Cu	0.06

6.5.3.2 Statistical Analysis

Domaining was carried out based on equivalent grades. A statistical analysis of grades has been carried out to assess grade levels used to determine areas of mineralisation.

A Histogram and Log Probability Plot for Zn indicate a break in population at approximately 25% Zn. Zn samples were coded as belonging to the low grade (<25% Zn) or high grade (>25% Zn) population and these groups were assessed separately for estimation purposes.

6.5.3.3 Zone Modelling

The subsequent interpretation and modelling work was based on cut off grades of 2.2 % Zn equivalent. A separate assessment was made based on a low and higher grade Zn domain with a cut off of 25% Zn. The steps used in the mineralised zone interpretation and modelling are summarised below:

1) An additional 'mineralisation limit' wireframe model was also defined. This defined an approximate limit to mineralisation;

2) Existing cross-sections for the deposit, alongside existing stope outlines, were used, to define directional strings down the centre of the principal mineralised structures. Two sets of strings were defined; along strike directional strings and across strike dip strings;

3) The sample data was converted into 5m composites;

4) The composites were then flagged if they were either above the 2.2% Zn equivalent cut-off level. A separate tag was made indicating if a sample was above or below the 25% Zn cut off. A minimum of 1m above cut off were required for a composite to be included for modelling. A maximum of 3m internal waste was allowed for inclusion within multiple composites; and

5) Based on the flagged composites, and the directional strings for dip and strike, an indicator estimation was carried out using a 50m x 50m x 10m search ellipse (along strike x down dip x across strike) to estimate those areas inside the approximate mineralisation limit that are above cut off grade for Zn equivalent. A separate estimation was carried out to estimate if blocks were above or below the 25% Zn cut off. A typical cross-section of the resultant interpretation is shown in Figure 6.3. The estimation, using nearest neighbour method, was carried out in to a block model with block sizes of 10m x 1m x 10m (across strike x along strike x down dip).

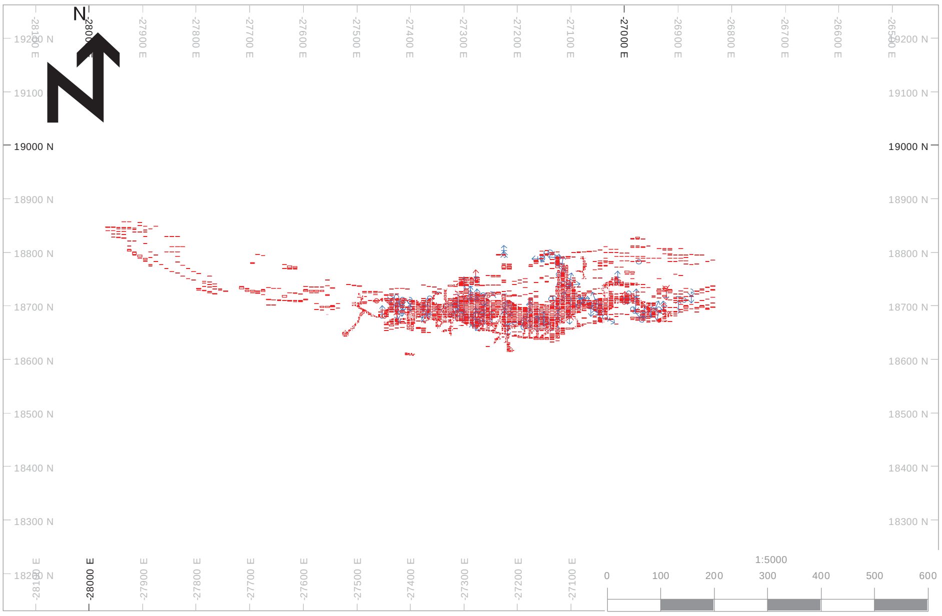


Figure 6.3: Example Plan section 220m of Mineralised Zone Interpretation with Composites above Cut-Off Grade

6.5.4 Sample Data Processing

Samples were coded based on their locations relative to the mineralised domains defined as described above. All samples falling within the defined mineralised zones based on the Zn equivalent cut off grade were selected for further processing.

6.5.4.1 Statistical Analysis

Statistical analysis for Pb and Cu has been carried out on the samples to identify any potential bias that may be present within the data. This indicates an approximately log normal population of samples for these elements.

Both Zn domains show a roughly log-normal distribution of grades.

The basic statistics for each element are listed in Table 6.8.

Table 6.8: Basic Statistics by Element

FIELD	Minimum	Maximum	Mean	Variance	Standard Deviation	Log Estimate of Mean	Coefficient of Variation
Zn Low	0	53.11	5.15	31.42	5.60	6.80	1.09
Zn High	0	59.79	31.10	94.13	9.70	35.75	0.31
Pb	0	28.3	1.44	8.36	2.89	1.62	2.01
Cu	0	55	0.63	0.90	0.95	0.78	1.51
Au	0	795.2	0.70	17.01	4.12	0.72	5.88
Ag	0	3973	13.20	1308.94	36.18	16.20	2.74

6.5.4.2 Removal of Outlier Grades

To identify the need for top cuts, the log probability plots and quantile distribution for each element were studied to identify the presence of any outlier values. Following statistical analysis and the splitting of the two Zn populations it was decided that top cutting was not necessary.

6.5.4.3 Compositing

The overwhelming majority of samples are 1m in length and so a composite length of 5m was chosen to correspond with block model sizing. This allowed further processing of samples giving a consistent level of support for geostatistical analysis.

6.5.4.4 Data Processing Summary

The statistical analysis of the Tishinskiy sample database is summarised below:

- No significant bias is shown in the Cu, Pb, Au and Ag assays;
- A slight difference in Zn population distribution is shown above a cut off grade of 25% Zn. Zn will be modelled separately as a lower grade and higher grade domain based on this cut off value; and
- A 5m composite interval has been applied to standardise sample length for geostatistical interpretation.

6.5.5 Variography

6.5.5.1 Introduction

Variographic analysis was performed using Datamine Studio v3 software. Absolute, as well as relative variograms were generated, with the spherical scheme model being used for modelling purposes. Variography was carried out on the 5m composited data.

6.5.5.2 Variogram Parameters

Directional semi-variograms for Pb, Cu, Au and Ag were generated for the along strike, across strike and down-dip directions using the composited and top-cut data. Similar variograms were generated for Zn, but separated in to the high grade and low grade domains described above.

The experimental variograms and the fitted variogram models for Zn shown below in Figure 6.4.

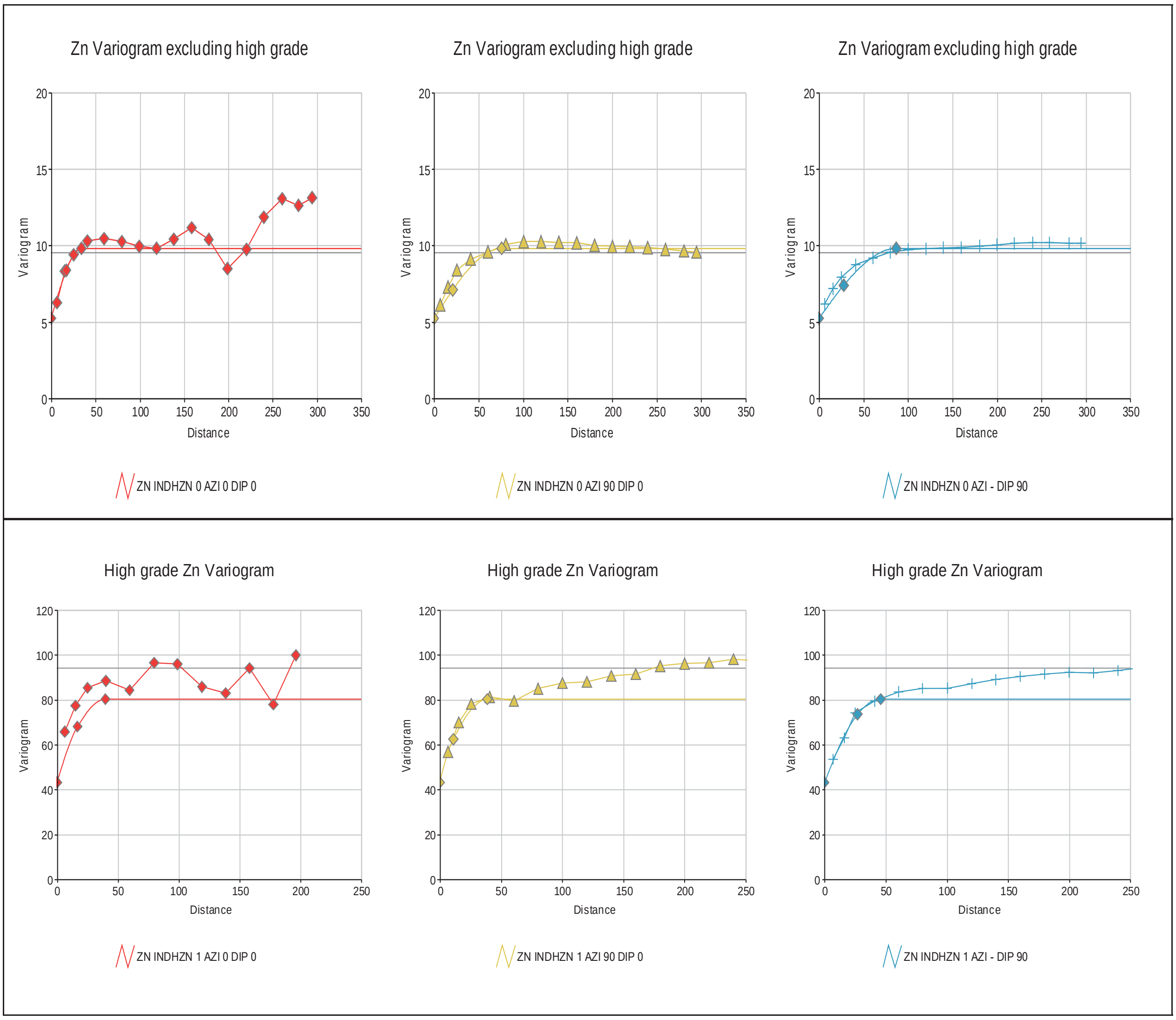


Figure 6.4: Variograms for High grade and Low grade Zn Populations

6.5.5.3 Variogram Interpretation

The principal direction of continuity for each group was selected from the generated experimental semi-variograms and modelled with three-structure spherical models. The three orthogonal orientations represented the predominant along-strike, down-dip and cross-strike directions. Overall the semi-variograms generated are considered to be well structured and interpretable.

6.5.6 Block Modelling

A summary of the block model prototype used is shown in Table 6.9. A cell size of 10m x 5m x 12.5m (across strike x along strike x down dip) was used for the final block model cell size.

Table 6.9: Summary of Block Model Parameters		
Property	**Direction**	**Metres (m)**
Model Origin	X	-28100
	Y	18600
	Z	-670
Parent Cell Size	X	10
	Y	5
	Z	10
No. of Cells	X	135
	Y	90
	Z	141

6.5.7 Density

Density values were assigned by ore type based on metal content using the equation listed in Table 6.10 below.

Table 6.10: Density Calculation
2.82 + (0.0254 x (Cu + Pb + Zn))

6.5.8 Grade Estimation

6.5.8.1 Introduction

Grade estimation was carried out using Ordinary Kriging (OK) as the principal interpolation method. Inverse Power of Distance Squared (IDW^2) and Nearest Neighbour (NN) were also used for comparative purposes for each element. The OK method used estimation parameters defined by the variography. The estimation was performed on mineralised material domains defined during the domaining process described above and only drillhole composites contained within a domain were used in the grade estimation of that domain.

6.5.8.2 Kriging Plan

For the mineralised zones the OK estimation was run in a three pass kriging plan, the second and third passes using progressively larger search radii to enable the estimation of blocks unestimated on the previous pass. The search parameters were derived from the variographic analysis, with the first search distances corresponding to the distance at 2/3^{rds} of the variogram sill value and the second search distance approximating the variogram range.

Sample weighting during grade estimation was determined by variogram model parameters for the OK method. Block discretisation was set to 3x3x3 to estimate block grades. Sub cells were estimated individually.

The directional control settings defining the local variation in the strike and dip of the mineralised zones that were defined during the domaining process were used during estimation. The dip and dip directions were used as vectors to interpolate dip directions and dip values into the block model. These orientations were subsequently used during grade estimation to orient the search ellipses independently for each block. This dynamic anisotropy procedure gives a more realistic reflection of the local variations in the strike and dip of the deposit. A summary of the kriging plan is shown in Table 6.11.

Table 6.11: Summary of Kriging Plan							
Search Ellipse	**Parameter**	**Pb**	**Cu**	**Au**	**Ag**	**Zn Low Grade Domain**	**Zn High Grade Domain**
1st	Search Radii 1 (m) – across strike	67	67	53	60	50	26
	Search Radii 2 (m) – along strike	37	53	40	67	22	26
	Search Radii 3 (m) – down dip	67	97	63	60	58	30
	Minimum Composites	6	6	6	6	6	6
	Maximum Composites	15	15	15	15	15	15
	Minimum Octants to be Filled	3	3	3	3	3	3
	Minimum Composites Per Octant	1	1	1	1	1	1
	Maximum Composites Per Octant	3	3	3	3	3	3
2nd	Search Radii 1 (m) – across strike	100	100	80	90	75	39
	Search Radii 2 (m) – along strike	58	80	60	100	33	39
	Search Radii 3 (m) – down dip	100	145	32	90	87	45
	Minimum Composites	4	4	4	4	4	4
	Maximum Composites	15	15	15	15	15	15
3rd	Search Radii 1 (m) – across strike	201	201	159	180	150	78
	Search Radii 2 (m) – along strike	111	159	120	201	66	78
	Search Radii 3 (m) – down dip	201	291	189	180	174	90
	Minimum Composites	1	1	1	1	1	1
	Maximum Composites	15	15	15	15	15	15

6.5.9 Validation

Following grade estimation a statistical and visual assessment of the block model was undertaken to:

1) To assess successful application of the estimation passes;
2) To ensure that as far as the data allowed, all blocks within mineralisation domains were estimated; and
3) To ensure the model estimates performed as expected.

The model validation methods carried out included a visual assessment of grade, global statistical grade validation and SWATH plot (model grade profile) analysis.

6.5.9.1 Visual Assessment of Grade Validation

A visual comparison of composite sample grade and block grade was conducted in plan view and cross section. Visually the model was generally considered to spatially reflect the composite grades.

6.5.9.2 Global Statistical Grade Validation

Statistical analysis of the block model was carried out for comparison against the samples and composited drillhole data. This analysis provides a check on the reproduction of the mean grade of the composite data against the model over the global domain. Typically the mean grade of the block model should not be significantly greater than that of the samples from which it has been derived. The mean block model grade and its corresponding mean sample and composite grades are shown in Table 6.12.

Table 6.12: Global Statistical Grade Validation				
	Mean Composite Grade	Model Block Grades		
		OK	ID	NN
ZN Low	5.5	5.1	5.2	5.0
ZN High	22.4	23.0	23.4	23.8
PB	1.7	1.7	1.7	1.6
CU	0.7	0.6	0.6	0.6
AU	0.8	0.6	0.7	0.6
AG	15.5	13.8	13.8	13.4
NB –				
1) No cut off grade applied				
2) OK (ordinary kriging), NN (nearest neighbour), ID (inverse distance weighting squared)				

6.5.9.3 Swath Analysis

Swath plots have been generated from the model by averaging both the composites and blocks along northings, eastings and vertically. The dimensions of each panel are controlled by the dimensions of the block size. Swath plots were generated for all block model estimation methods. Each estimated grade should exhibit a close relationship to the composite data upon which the estimation is based.

6.5.9.4 Validation Summary

Globally no indications of significant over or under estimation are apparent in the model nor were any obvious interpolation issues identified. From the perspective of conformance of the average model grade to the input data, WAI considers the model to be a satisfactory representation of the drillhole data used and an indication that the grade interpolation has performed as expected. In terms of conformance to the drillhole composite data WAI consider the OK interpolation method to most closely represent the drillhole data in both the cross validation and swath analysis plots. The resource estimate is therefore based upon the OK grade estimation.

As a general comment, the validations only determine whether the grade interpolation has performed as expected. Acceptable validation results do not necessarily mean the model is correct or derived from the right estimation approach. It only means the model is a reasonable representation of the data used and the estimation method applied.

6.5.10 Resource Classification

The resource classification for the Tishinskiy deposit is classified in accordance with the Australian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves JORC Code (2004). Criteria for defining resource categories were also derived from the geostatistical studies.

Key drillhole spacing for the allocation of resources can be summarised as:

- ***Measured*** resources - at least 50m x 58m (along-strike x down-dip);
- ***Indicated*** resources - at least 100m x 116m (along strike and down dip); and
- ***Inferred*** resources - all other blocks within defined mineralised zones.

6.5.11 Depletion

The block model was depleted against stope and other developments. This information is believed to be accurate to 01 January 2011.

6.5.12 Resource Evaluation

The resource classification for the Tishinskiy deposit is classified in accordance with the Australian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves JORC Code (2004). The grades in the final resource model were derived from the Ordinary Kriging estimation method for all elements. A complete block model was built containing both the remaining in-situ material as well as previously mined material. An evaluation of the remaining unmined in-situ material is shown below in Table 6.13 reported, for consistency with the domaining method, to cut off grades of 2.2% Zn equivalent.

Table 6.13: Tishinskiy Resource Estimate - At COG of 2.2% ZnEQV
(WAI, 01.01.2011)
(In Accordance with the Guidelines of the JORC Code (2004))

Classification	Tonnage (kt)	Density	Zn		Pb		Cu		Au		Ag		ZNEQV
			%	Kt	%	kt	%	kt	g/t	oz	g/t	oz	%
Measured	21,225	3	4.7	1,000	1.0	212	0.6	125	0.60	412,000	9.02	6,154,000	7.4
Indicated	7,010	3	4.3	305	0.9	66	0.4	31	0.46	104,000	9.75	2,072,000	6.3
Inferred	5,185	3	4.5	231	1.4	70	0.6	29	0.33	55,000	11.94	2,380,000	9.4

Notes:

1. Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility study or pre-feasibility study.
2. Mineral Resources are reported inclusive of any reserves.
3. Grade represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery.

WAI has also prepared grade-tonnage curves for combined measured and indicated resources (Figure 6.5) which demonstrate the relative values of the model and resource estimate. The grade-tonnage curve is generated by averaging nodes into block grades and accumulating the respective tonnages above a series of cut-off grades. The average grades are then plotted against the tonnages at each cut-off.

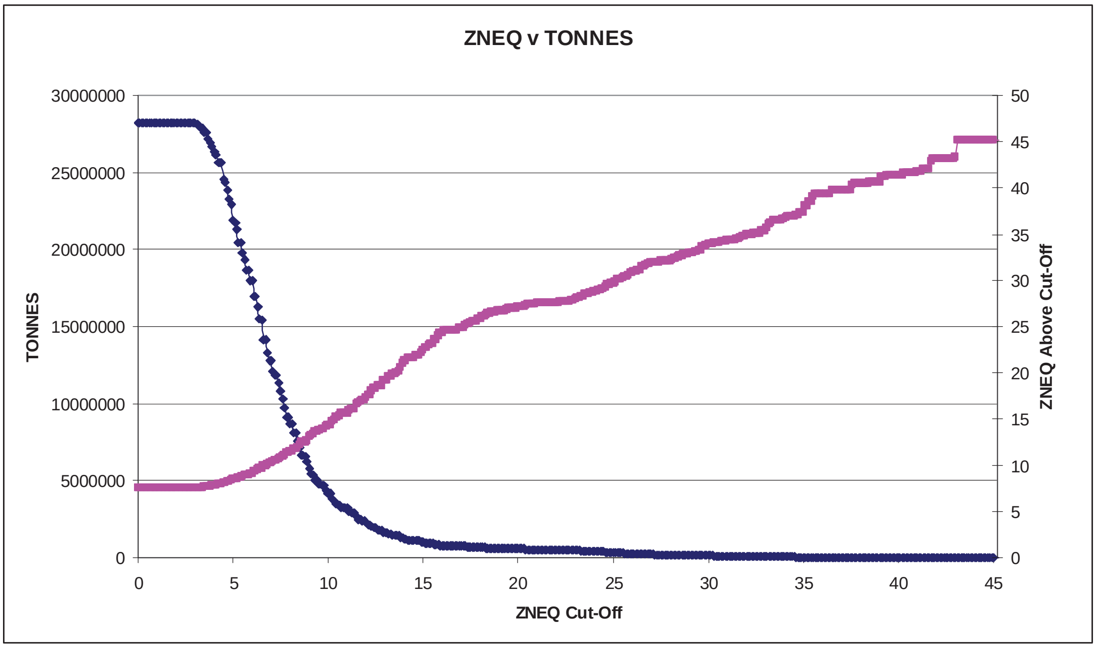


Figure 6.5: Grade Tonnage Curve for Measured and Indicated Resources

6.6 Mining

6.6.1 Introduction

Operations at the Tishinskiy mine started in 1975 using both surface and underground mining methods. To date, approximately 49Mt of ore has been extracted (including open pit ore). The open pit ceased operations in the mid-1990s due to the exhaustion of the reserves and has remained inactive since that time. A graph showing the annual underground production rate between 1975 and 2006 is presented in Figure 6.6 below.

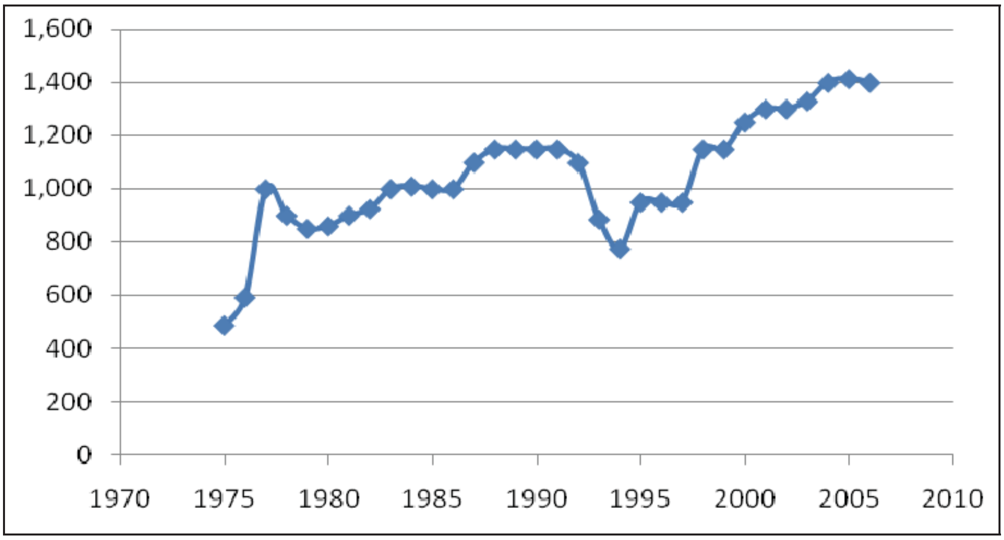


Figure 6.6: Annual Underground Production (ktpa)

Historically, the main mining method employed in the underground mine has been underhand open stoping with hydraulic cemented backfill. Trackless mining equipment is employed for the development and stoping activities but a track haulage system is used to transport ore and waste from drawpoints and ore passes to the main hoisting shaft.

The current ore production rate is between 1,300-1,400ktpa.

6.6.2 Mine Design and Current Mining Activities

Considering the time in operation, Tishinskiy mine has a very developed infrastructure. Currently the Main orebody is accessed via 5 shafts: Ulbinskaya Shaft, Slepaya-Ulbinskaya Shaft, RESh Shaft, Ventilation Shaft and Tishinskaya Shaft. Additional access is provided via decline. A 3D layout of the mine is shown on Figure 6.7 below.

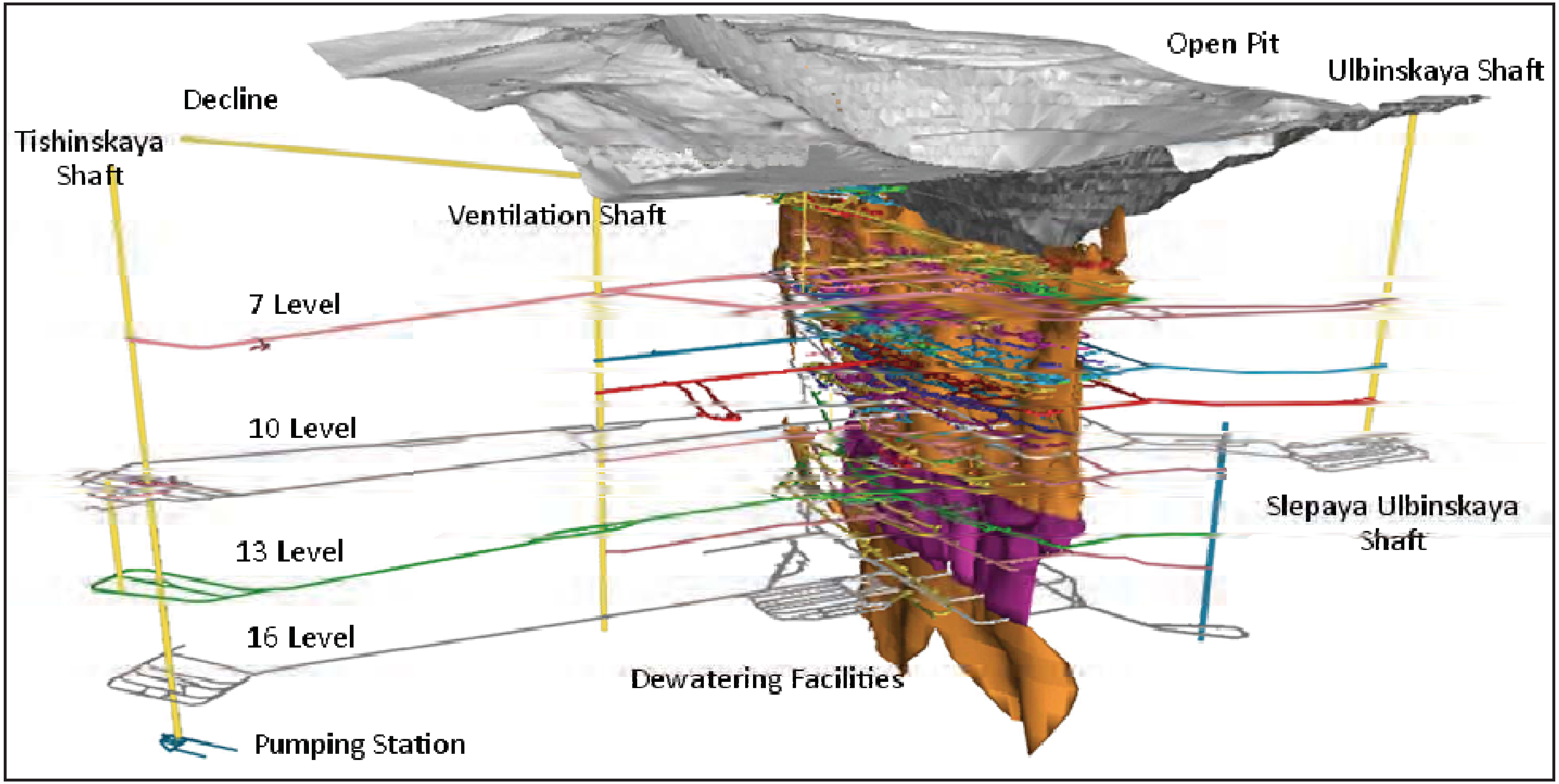


Figure 6.7: 3D Layout of Tishinskiy Mine

The major ore haulage areas are 7, 10, 13 and 16 levels. Current production is focused between 12-16 levels, with the majority of ore coming from 15 level. The distribution of the planned production between the levels in 2011 is given in Table 6.14 below.

Table 6.14: Distribution of Production between Levels

Level	Ore to be Mined (kt)	% of Total
12	61.6	5
13	202.9	15
14	357.7	27
15	553.1	42
16	154.7	12

The deposit was developed from top to the bottom and from the centre to flanks. The ore is drilled, blasted and mucked by trackless equipment, and hauled by electric locomotives at one of the major hauling levels. The Main orebody is steeply dipping, with an average thickness ranging from 6.5-17m and is relatively consistent, which altogether provides highly favourable conditions for bulk mining. Unusually, all mining takes place beneath backfill but very few stability problems have been reported.

Compressed air is supplied from a centralised compressor station consisting of 6 turbo compressors K-250-61-2 with a capacity of 250m^3/min each. The air is pumped via the Ventilation shaft by means of a 426mm diameter pipeline.

6.6.3 Mining Schedule

The mine production rate target for 2011 is 1,330kt as shown in Table 6.15, which is equally distributed between the 12 months. The mine operates 6 days week, with 3 shifts per day (6 hours per shift for the underground works. The mine planning is based on mining blocks of 100m in length and 60m in height, which cover the majority of ore bearing areas. The blocks are split into 20m sublevels, forming a basement area for stope preparation development and ore extraction works. The minimal unit, considered in mining scheduling, is the stope. The stopes are mined from top to the bottom, with two or three levels active at a time. This provides additional flexibility by performing backfill, extraction and stope preparation works at various areas simultaneously.

Table 6.15: Summary of Mining Schedule for 2011

	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
Total Ore	kt	**109.3**	**105.5**	**116.8**	**113.,0**	**109.3**	**105.5**	**109.3**	**109.3**	**113.03**	**116.8**	**113.0**	**109.3**	**1,330.0**
Zn	%	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81	4.81
	t	5,256	5,075	5,617	5,437	5,256	5,075	5,256	5,256	5,437	5,618	5,437	5,253	63,973
Pb	%	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.55	0.54	0.55	0.54	0.54	0.55
	t	596	575	637	617	596	576	596	596	616	637	616	595	7,253
Cu	%	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
	t	410	396	438	424	410	396	410	410	424	438	424	410	4,990
Au	g/ t	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
	kg	85.2	82.3	91.1	88.2	85.2	82.3	85.2	85.2	88.2	91.1	88.2	85.2	1,037.4
Ag	g/ t	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	8.99	9.00
	kg	983	949	1,051	1,017	983	949	983	983	1,017	1,051	1,017	982	11,965
Development	m	890	865	970	940	895	875	895	900	935	965	935	895	10,960
	m^3	**9,535**	**9,230**	**10,180**	**9,885**	**9,545**	**9,255**	**9,555**	**9,565**	**9,880**	**10,215**	**9,865**	**9,555**	**116,265**
Drilling Works	**m**	**15,430**	**16,100**	**15,440**	**17,450**	**16,100**	**17,440**	**17,385**	**16,815**	**17,445**	**17,435**	**16,780**	**16,770**	**200,590**
Backfilling	m^3	**31,570**	**32,840**	**31,620**	**35,650**	**32,900**	**35,645**	**34,290**	**35,660**	**35,660**	**35,635**	**34,265**	**34,265**	**410,000**

The expected dilution and mining losses for 2011 are 14-15% and 5-6% respectively. The majority of the ore in 2011 will be mined via underhand blasthole open stoping with hydraulic cemented backfill. A description of the mining method is given below.

6.6.4 Mining Method

6.6.4.1 Introduction

Underhand sub-level blasthole open stoping with cemented backfill is the main mechanised mining method. This method utilises jumbo development, electrico-hydraulic production drilling and diesel load haul dump (LHD) loaders. The production mining fleet typically consists of:

- Development drills - Sandvik Minimatic 265 and Atlas Copco Boomer 282 multi boom jumbos, heading sizes of approximately $12m^2$;
- Production drills - Sandvik Solo 5/7F and Sandvik Solomatic 720 drilling holes up to 102mm diameter; and
- CAT R1300G LHD and Sandvik Toro 6M, both with a bucket size of approximately $3m^3$ and remote control capability.

6.6.4.2 Underhand Blasthole Sub-level Open Stoping with Backfill

The primary transverse stope dimensions are 40m in length (N-S orientation) by 10m width (E-W orientation) and 20m in height, extracted as a continuous panel sequence along strike. The secondary stopes are 25m in length (E-W), 10m in width (N-S), and 20m in height, extracted from hangingwall to footwall in a continuous panel sequence across strike.

Normally, 4 stopes are in production, 2 are being backfilled and 5 being drilled at any one time. As well as these, approximately 6 will be in development or preparation stage. The stopes cycles are usually 4 months, including development, but can vary from 1.5 months to 8 months depending on the actual size of the block.

6.6.4.3 Backfill

The mine uses cemented hydraulic backfill, which consists of pre-processed tailings and smelter slag. The composition of the backfill is detailed below:

- Light Tailings Fraction – $647kg/m^3$;
- Smelter Slag – $300kg/m^3$;
- Glanulated Slag – $270kg/m^3$;
- Mill Tailings – $116kg/m^3$; and
- Cement – $64kg/m^3$.

The inclusion of smelter slag and granulated slag into backfill resulted in significant reduction in the cement consumption (from 220kg/m to $64kg/m^3$). There are three types of backfill produced M25, M35 and M40. Each type has a specific purpose:

- M25 is used for stope backfill (general use);
- M35 for 0.7-0.8m roof pillar forming underneath transport and drilling drives; and
- M40 – for 4.0-4.5m floor pillar forming if combined cemented and waste backfill is used.

The strength characteristics of the three types of backfill are described in Table 6.16 below.

Table 6.16: Compressive Strength Properties of Various Types of Backfill (MPa)						
Type of backfill/Age (Days)	**14**	**28**	**60**	**90**	**180**	**360**
M25	0.9/0.9	1.7/1.4	2.0/2.1	2.5/2.6	2.7/2.8	3.5/3.5
M35	1.4/1.4	2.5/2.2	3.0/2.9	3.5/3.6	4.0/4.2	4.7/5.0
M40	1.8/1.9	2.6/3.0	3.4/3.5	4.2/4.0	4.5/4.5	5.6/5.5

The mine has its own backfill preparation plant, where backfill is mixed and pumped to a pipeline connected to the underground infrastructure. From this pipeline the backfill is distributed to stopes via backfill boreholes (normally one for the backfill, and an additional borehole for control) and pipeline extensions.

6.6.5 Rock Properties and Geotechnical Conditions

The rock properties of the deposit are generally medium to low stability. The areas between the ore and the host rock within 5-7m from the contact area have reduced stability. It is has also been influenced by tectonic faults.

There are four main regions which have delineated by their rock properties:

- Main orebody within lines (13-32) across strike;
- Northern orebodies within lines (10-33) across strike and thin orebodies of Main orebody to the east of line 33 across strike;
- Main orebody to the west of line 13 across strike; and
- Southern contact of Main orebody represented by unstable mineralised and barren rocks.

The average mine rock stability is as follows:

- 15% is stable;
- 50% is medium stable;
- 30% is unstable, and
- 5% is strongly unstable.

The average rock hardness coefficient is 8-10 (Russian Protodyakonov's scale), with values varying from 4 to 16. The bulking factor is 1.4-1.5. The ore is classified as hazardous in terms of risk of silicosis.

6.6.6 Ore and Waste Transportation

There are three main haulage horizons at 10, 13 and 16 level. At the intermediate levels of 11, 12, 14 and 15 level, the ore is transported by trackless equipment to the nearest orepass, where it drops to one of the haulage levels as shown in Figure 6.8 below.

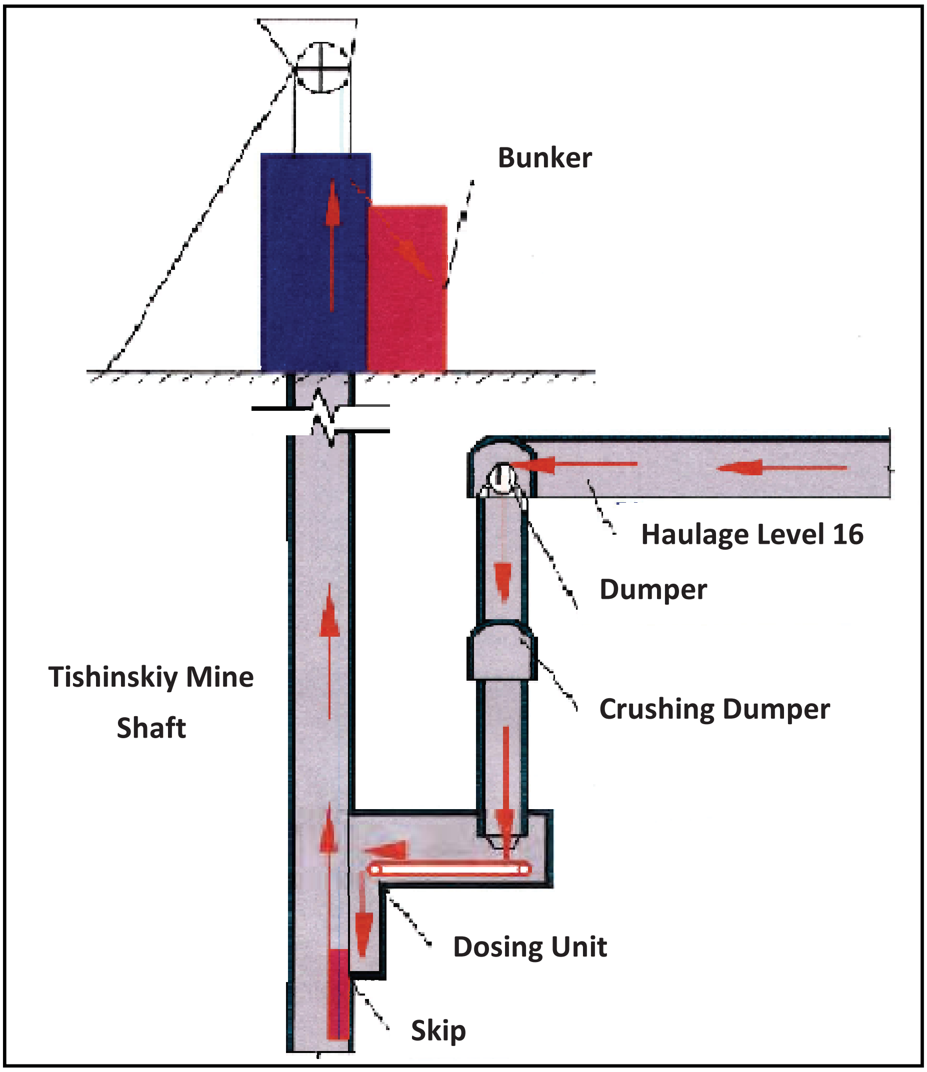


Figure 6.8: Ore Haulage Schematic

Ore is mucked by a TORO-301D LHDs (3 units), CAT R1300 (4 units), TORO-151 (1 unit) and TORO-006 (1 unit). A number of remote controlled LHD are used to extract ore from the stopes located under active levels, which minimises risk of accidents.

During stope preparation, rock is transported by TORO-301D (5 units), TORO-301HL – (1 unit), TORO-300 (1 unit) and LK-1 (1 unit).

K14M type locomotives are used for hauling the 4.5m^3 wagons of ore, with normally 10 wagons per train, to the shaft. There are 4-5 locomotives operating at each level with the exception of 10 level, where the number of locomotives is reduced to one. The total number of locomotives is 16.

The wagons of ore are emptied into a bunker via rotary wagon tippers, and then crushed by a jaw crusher. The crushed ore is loaded into skips by means of belt conveyor. The skip loading point has both weighing and volume control facilities. The amount of ore in the skip is limited by tonnage (13t) ore, total volume (9.5m^3).

6.6.6.1 Hoisting Facilities

The main hoisting shaft is Tishinskaya Shaft. The shaft is equipped with 3 winders:

- A single cage winder;

- A single-skip hoisting winder, and
- A double-skip winder.

The cage hosting is performed by a BTsK8/4.5x2.25 machine, working with a double decked cage measuring 4.5x1.5m and a 14.8t counter weight. This cage is used for hoisting men, materials and equipment. The double-skip hoisting system, TsR6-6.4/1.8, provides skip speeds up to 8.5m/s, which ensures an hourly performance of 18 skips per hour required for ore production.

The single-skip hoisting system, BTsK8/4.5x2.25, operates with a 5.5m^3 skip and 12.8t counterweight. It is used for hoisting waste at a maximum speed of 8m/s. It is capable of 8 skips per hour production rate.

In addition to the Tishinskaya Shaft, the other operating shafts at Tishinskiy mine are:

- The Ventilation Shaft which is equipped with a TsSh2.25x4 winder, a 4.5x1.5m cage and a 9.4t counter weight. This shaft is used for ventilation and man riding;
- The Ulbinskaya Shaft is a single-cage shaft currently not in operation;
- The West-Ventilation shaft has no winder installed and is used for ventilation only, and
- The Slepaya-Ulbinskaya Shaft is used for emergency egress.

In addition to the above hoisting facilities, the mine has a decline sunk down to the 16 level, which is used for access.

6.6.7 Dewatering System

The mine has a two-stage dewatering system. At the first stage, heavy fractions are removed and pumped to the surface for further processing. At the second stage, most of the water is pumped to the surface.

The first stage of dewatering is performed by Feluwa pumps made in Germany, whose specifications are given in Table 6.17 below. These pumps are installed at 16 level, close to Tishinskaya Shaft. The main purpose of the first stage pumps is to increase the life of the Sulzer pumps by removing the heavy fractions and to reduce environmental impact.

The second stage dewatering takes the rest of the underground water to surface. It is performed by x4 centrifugal Sulzer pumps, whose specifications are given in Table 6.18 below.

Table 6.17: First Stage Pumps

Type	Feluwa ZGL 100/200 – K 130 – 2 SM 350 HD
Head	1100m
Capacity	8-10m^3/hour
No of Units installed	4

Table 6.18: Second Stage Pumps

Type	Sulzer HPH 58-25-27- 8
Head, meters of water column	960m
Capacity	650m^3/hour
No of Units Installed	4

6.6.8 Ventilation

The mine has a complex ventilation system, where the majority of the fresh air is supplied from the extremeties of the mine, and exhaust air is discharged at the centre. The main ventilation facilities are described in Table 6.19 below.

Table 6.19: Main Ventilation Facilities of the Mine	
Main Ventilation Fan at Ventilation Shaft	
Main Fan	VOD-40 reversible
Engine Capacity	1,600kW
Voltage	6kV
Nominal Capacity	275m^3/s
Depression	143mm
Ventilation Fan at the Decline	
Main Fan	VM12(2 units)
Engine Capacity	110kW
Voltage	0,4kV
Nominal Capacity	46 m^3/s
Depression	43mm
Ventilation Fan at Ulbinskaya Shaft	
Main Fan	VOD 30
Engine Capacity	800kW
Voltage	6kV
Nominal Capacity	131m^3/s
Depression	54mm
Ventilation Fan at Zapadnaya Shaft	
Main Fan	VTsD-31.5M reversible
Engine Capacity	1600kW
Voltage	6kV
Nominal Capacity	228m^3/s
Depression	121mm

Remote sites, such as development faces, extraction stopes etc., are supplied with fresh air by means of portable local ventilation fans, typically these fans are Russian-made VME-5, VME-6 and VME-8.

6.6.9 Mine Personnel

Approximately 765 personnel are employed at Tishinskiy mine. The mine has a well developed departmental structure of management. Each department has a specific designated area of responsibility and scope of work. A list of departments together with the number of staff employed in each is shown in Table 6.20 below.

Table 6.20: Mine Personnel by Department	
Administration	19
Ventilation Service	2
Design and Engineering Department	4
Surveyor Department	12
Geology Service	14
UG Mining and Loading Brigade No1	92
UG Development Brigade No2	86
UG Reinforcement Brigade No3	91
UG Drilling and Blasting Works Brigade No4	106
UG Backfilling Brigade	53
UG Transportation Brigade	91
UG Stationery Equipment Maintenance Brigade	155
incl. Hoisting	118
incl. Dewatering (General)	23
incl. Dewatering (Main)	14
Auxiliary and Open Pit Mining Works Brigade	40
Total Administrative	*138*
Total Non-administrative	*627*
Total Mine	**765**

As at Ridder-Sokolniy mine, WAI notes that the mine has high standards of health and safety in place, particularly the use of PPE and minimising risks in underground works, as well as paying a lot of attention to social aspects. Sports and recreational facilities, medical services are available to employees and their families.

WAI Comment: *WAI considers that the mine has no significant employment issues.*

6.6.10 Future Mine Development

With depletion of the ore reserves from the central part of the deposit, the mine will be developed towards its flanks, and towards to the bottom. Current exploration programmes are targeting to bring into production the horizons between 18 and 22 levels. An additional resource estimation study is currently being conducted for the eastern flank of the deposit, with production from this area due to commence in 2012.

For the medium term plan, the mine is going to operate at its current rate of 1,300-1,400ktpa.

6.6.11 WAI Ore Reserve Estimation

WAI has performed an evaluation of the Tishinskiy mine Ore Reserves in accordance with the requirements of the JORC Code (2004). The evaluation has been performed using a geological block model produced by WAI dated 01.01.2011 and considers modifying factors, such as dilution and losses, with respect to the current mining operations and methods.

The stope boundaries were generated to correspond with the standardised dimensions of the existing stopes and development in the mine and also to be above the minimum cut-off grade for exploitation. A summary of typical stope parameters is given in Table 6.21 below.

Table 6.21: Typical Stope Parameters

Length (m)	20
Width (m)	10
Height (m)	20
Minimal Zn_{Eq} Average Grade (%) For a MU	3.0
Dip Angle (Deg)	90

Datamine® Mineable Stope Optimiser® (MSO) software was used to assess whether mineable stopes can be generated for certain parts of the deposit. MSO computes the optimal size, shape and location of stopes for an underground mine using an input block model containing grades or values. $Zn_{Equivalent}$ grades were used for Tishinskiy evaluation.

MSO searches for the optimal mineable shapes taking into account the orebody geometry. The stope shape is parameterised, the programme generates outlines on adjacent sections, and links these to create a wireframe shape for evaluation against the block model. The sectional outlines are defined by four points on the roof and floor. Constraints are applied on the dip and strike of the final stope shape.

The stopes produced by MSO are then evaluated against the geological block model in order to quantify average grades of the economic minerals and the metal content, together with ore and waste tonnages.

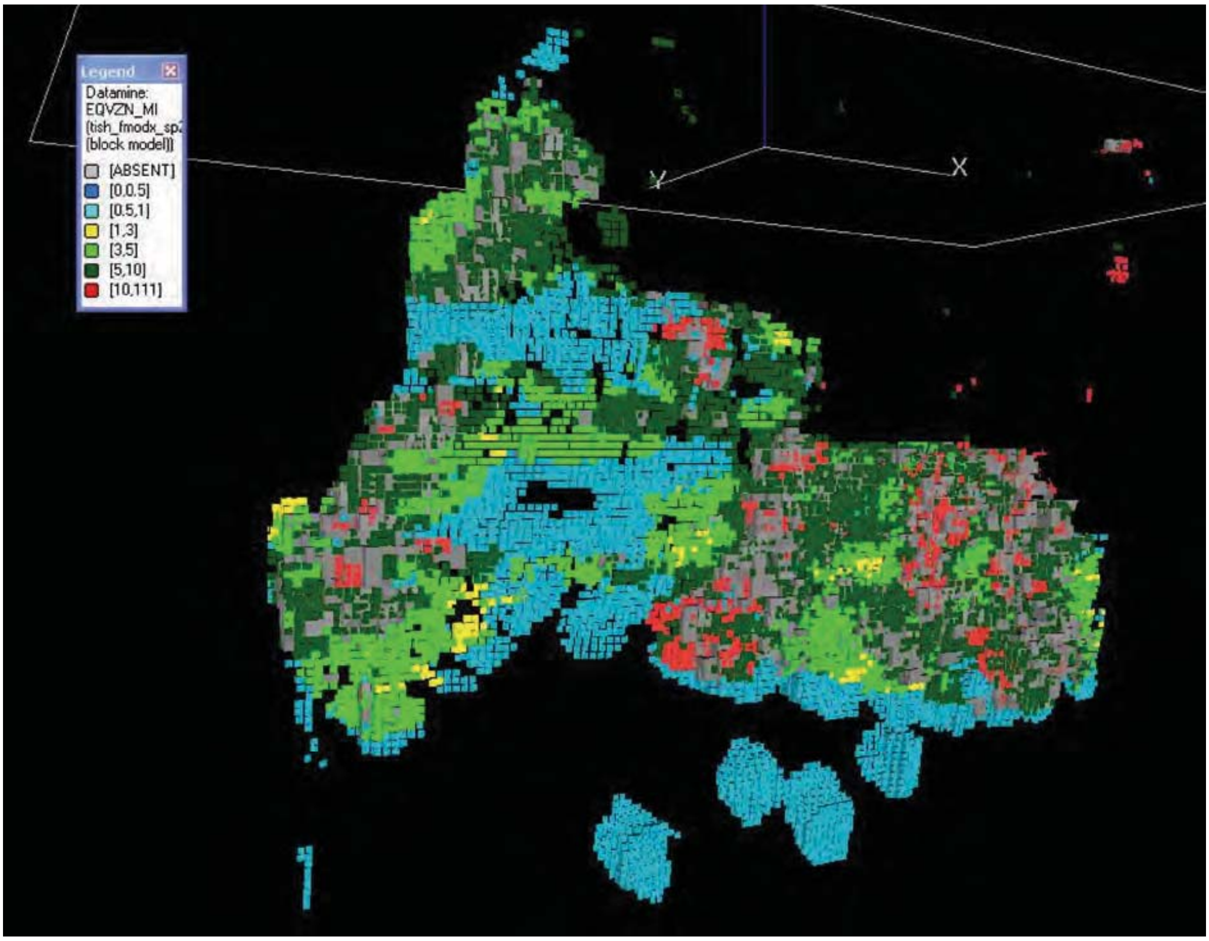


Figure 6.9: Stope Layout for Tishinskiy
(Blue – low grade or Inferred material; grey – MSO stopes; light blue, yellow, green, dark green and red – model blocks with 0.5-1, 1–3, 3–5, 5-10 and >10 % of ZnEq in Measured and Indicated categories)

A total of 2,725 stopes were produced for the ore reserves. The greatest part of the reserve is contained in the central part of the deposit, but there is a significant portion of reserves located in the western part of the deposit. A summary of ore reserves as calculated in accordance with teh JORC Code (2004) is given in Table 6.22 below.

Table 6.22: Tishinskiy Ore Reserves Estimate
(WAI 01.01.2011)
(In Accordance with the Guidelines of the JORC Code (2004))

	Ore	Zinc		Copper		Lead		Gold		Silver	
	kt	%	kt	%	kt	%	kt	g/t	kg	g/t	kg
Proven	18,886	4.22	797	0.52	98	0.91	172	0.54	10,198	8.12	153,353
Probable	4,928	4.13	204	0.4	20	0.88	43	0.47	2,316	9.36	46,124
Total Proven and Probable	***23,814***	***4.20***	***1,001***	***0.50***	***118***	***0.90***	***215***	***0.53***	***12,514***	***8.38***	***199,477***
Inferred material within stopes	*156*	*11.17*	*17*	*0.45*	*1*	*1.2*	*2*	*0.45*	*70*	*11.05*	*1,728*

The layout of the generated stopes is relatively dense, therefore, a simplified approach has been used in order to access development requirements. It was assumed that the ore will be hoisted via Tishinskaya shaft, in-line with the present operations, and further blocks below level 16 will require haulage up to level 16 providing access to the most remote stopes created by MSO. The length of such haulage levels was then added to the overall capital development requirements. An additional allowance was made for ramp construction below Tishinskaya shaft bottom, which will be used for both access and haulage purposes.

Stope preparation requirements were estimated on the basis of historical production figures. A summary of development requirements is given in Table 6.23 below.

Table 6.23: Summary of Development Requirement

Item	Total Length (m)	Total Volume (m^3)
Haulage Drives at Main Levels	2,813	45,000
Haulage Drives at Sublevels	8,438	84,375
Ramps	600	9,600
Stope Preparation	NA	2,500,000

It should be stressed that the estimated development requirements used in the ore reserve estimation are to ensure the economic viability of the reserve only and do not represent the actual development schedule proposed by Kazzinc.

6.6.12 Conclusions

Tishinskiy mine is a mature operation. Despite relatively unfavourable rock conditions, resulting in the requirement for additional ground support, mining is performed to a high standard. The utilisation of modern western underground mining equipment and qualified personnel provides confidence to WAI that production targets are being met. The remaining Ore Reserve together with available Mineral Resources estimated by both internal and independent sources, show long-term potential for this operation.

6.7 Environmental

6.7.1 Introduction

The Tishinskiy Mine forms part of the Ridder Mining Complex (RMC). The mine is approximately 18km west of the Ridder complex and is 120km north-east of Ust-Kamenogorsk, connected by a metalled road, and freight and passenger railway lines.

The site boundary was delineated by the Tishinskiy mining licence, see section 6.7.4 for details.

The first horizon is at 670m and the lowest level at -230m, the upper horizons have all been mined out (by open pit, the western flank – by underground method) when the mine was operated by the State. No processing of ore takes place at Tishinskiy Mine, with ore sent to RMC concentrator by rail.

There has been mining activity in the Ridder area since 1786, via both surface and underground workings and with concentrator facilities since the 1920s. Mining at Tishinskiy commenced in the 1960's when the mine was owned and operated by the State. Kazzinc`s involvement commenced in 1997 when the Company was established.

6.7.2 Environmental & Social Setting and Context

6.7.2.1 Landscape, Topography

The Tishinskiy Mine area is predominantly gently undulating topography with hills varying from 650m to 1,000m in height.

6.7.2.2 Climate

The climate is sharply continental with hot summers reaching temperatures in excess of 40°C and cold winters dropping to -47°C. Snow cover is present from November to April. Average rainfall is 710mm/yr. The prevailing wind is from the north-west. Average wind speed is 5.7m/s in the winter, and 3.5m/s in the summer.

6.7.2.3 Land Use and Land Cover

Soil horizons are expected to be thin and lacking in fertile topsoil – no information on soil characteristics has been provided. Flora is defined by several landscape zones, affected by site geography, altitude and terrain. There are numerous trees and grass species, in a mosaic habitat, with coniferous species predominantly found at higher altitudes and pine and mixed forest, including birch found in the lower foothills. There are flat areas of scrubby grassland, with apparent species abundance being somewhat limited by climatic conditions. 94 bird species are reported in the area, the majority being non-migratory, and 90 animal species, including bear, mink, deer, wild cats and numerous rodent species. Two of the bird species are reported to be rare raptors.

6.7.2.4 Water Resources

Two Rivers are present within the Tishinskiy mining license area, the River Ulba to the east, the River Poznopalovka a tributary of the Ulba which enters the license area in the north of the site. The Poznopalovka River was diverted from its natural course to the River Ulba and is now re-directed via a water diversion channel, 500m upstream from its natural outfall.

Aquifers in the area are of lower quaternary alluvial sediments (35m thick and 300-500m wide) represented by river gravel/boulder, sandy gravel in a wide band of 800-1200m.

An underground abstraction point is located at the northern end of the site this water is used for the boiler house, mine offices and as potable water for the nearby communities. The intake is managed, and water is transported by L-TVK Ltd. (a contractor). All other on site processes e.g. Batching plant use treated mine water.

6.7.2.5 Communities and Livelihoods

A village is located c4km from the site: this consists of mainly holiday homes and a few permanent dwellings. The village developed after the mine in c1960s and was purposely built in the area on land where exploration had proved there were no underlying ore reserves thus reducing the risk of subsidence.

6.7.2.6 Infrastructure & Communications

Occupational health monitoring is carried out at the plant, a set of monitoring results were presented to WAI and found to be compliant with national standards. No vibration of noise monitoring is undertaken in the plant. No water is discharged from this plant. Operatives working on the day of the visit wore limited PPE, however it was not considered fully compliant with best practice. All fire extinguishers checked were in date and pressures were compliant at 2psi.

> ***WAI Comment:*** *The batching plant is well managed and standards of housekeeping are very good, however, there was a lack of H&S signage and PPE (high-vis vest should be worn).*

6.7.3 Project Status, Activities, Effects, Releases & Controls

6.7.3.1 Project Description & Activities

Neutralisation plant

A neutralisation process plant to treat mine water was constructed in 1968 and has been operating for 42 years. The mine water treatment is undertaken in two stages, below and above ground. The above ground tanks are constructed of concrete. An overhead crane with grabber removes the sludge after each water treatment cycle. The sludge are removed and deposited in the subsidence area, (general site waste landfill). The tank cleaning process takes approximately 3 days.

The mine water is collected underground at the 16th horizon into 4 settling/sludge tanks to begin initial mine water treatment. The residence time in these settling tanks is several days after which the mine water is pumped to the surface. Underground slimes are pumped to the surface and, together with ore, are treated in the crushing and DMS sections. The water enters the above ground tanks at pH 8.0-5.5 with a flow inlet rate of 730m^3/hr, where 'lime milk' is added to increase the pH to 9.5-10.5. There are 8 above ground settling tanks each 5m deep, the water in each tank is monitored daily.

Following treatment of the mine water, approximately 25% to 30% is piped to the Dense Media Separation Plant (DMS) and batching plant, whilst the remaining water is discharged to the River Ulba at a flow rate of 16-17,000m^3 per day. Water Monitoring is undertaken at the discharge point and also 500m upstream and downstream of this point. NO_3 (Point 10) is elevated due to blasting in the underground mine.

> ***WAI Comment:*** *The discharge monitoring results did show exceedances for NO_3 at the discharge point, however the exceedances are still within the state limits for this type of discharge and NO_3 content in the river water decreases downstream.*

The neutralisation plant is very well organised and appears to be operating efficiently. Results from monitoring the inlet following stage 1 to discharge to River Ulba were presented for 2009-2010 and were acceptable. Given the age of the neutralisation plant, the condition of concrete tanks is inspected on a systematic basis by a special Buildings and Structures Monitoring Service; and repair plans are prepared and implemented yearly.

Batching Plant

Tishinskiy Mine has its own batching plant which produces an average of 380,000m^3 of cementitious material on average per year. This material is used as underground backfill for void filling. The building was in a reasonable state of repair and appears to be well maintained with a good standard of housekeeping. The plant only uses re-processed water for the production. The ball mills are fed with waste rock by conveyors. Except for cement, only waste materials are used in the production of back fill.

Quality Control testing of the mixture is undertaken every 1000m^3 of backfill.

Rail link

The Railway and rail yard is operated by 'Kazzinc Logistics'.

Dust/air quality monitoring is undertaken in the area three times over during the summer months (given the moisture content of the material) and monitoring also occurs 500m from the SPZ boundary on a monthly basis, as approved by State authorities.

It was noted that not all the railway operatives wore high-vis PPE. The rail depot is approximately 500m from the river Ulba, and it is understood that the River water is monitored upstream and downstream of this facility. Copies of the 2009 and 2010 monitoring results were presented to WAI.

> ***WAI Comment:*** *In general, the area is reasonably well maintained and appears to be operated in a satisfactory manner. Although this area is outside of the area of the mine control, the following comments are relevant. Best practice requires that all operatives working on and in the vicinity of a railway should wear high-vis work wear at all times for safety reasons. It was noted that several workers did not have appropriate PPE and the explanation given for this was unacceptable. It should be mandatory that PPE is worn in this area.*

Stockpiling of ore at the rail depot is adjacent to the rail line. The material is stored in a designated concrete lined area to prevent ore from getting onto the rail line.

All the material (ore and slime) loading areas are either concrete or clay lined to prevent soil and groundwater contamination. The OVOS draft has been approved with the State Expertise Assessment Department. As part of Kazzinc's corporate social responsibility programme, they neutralise contaminated water discharge from the State-owned dump to the Ulba river.

Dense Media Separation Plant (DMS)

In the DMS plant ore is crushed and pre-concentrated and then sent to the Ridder Concentrator. Tishinskiy ore pre-concentration tailings (slimes) are sent to the Concentrator also after de-watering in the filter-press which is installed in the DMS plant. The flowsheet was implemented in 2002 to exclude slimes collection. The slimes collected over the 1997-2001 period are currently removed from the slime pond and sent to the Concentrator for additional metal recovery. The slimes pond will be rehabilitated in 2012 when the slimes have been removed. Filter-press filtrate (Crushing and Concentration plant overflow) of pH 9-11 is sent to neutralise acid flow (pH 4-5) from the state-owned dump number 2. After mixing and settling, the flow of pH 7 (free from metal hydroxides) goes to the Ulba river.

Water sampling is undertaken before and after treatment and also at the discharge point on the River. The rate of discharge agreed with the state is 100m3/hr, however it is understood that the discharge is spasmodic, and only takes place during the filter-press operation period, and does not exceed this discharge rate.

> ***WAI Comment:*** *In general the dewatering of the slimes via the DMS plant is acceptable, and the plant appears to be efficiently managed.*

Vehicle Work Shops and Plant Maintenance

There are two areas where vehicle and plant maintenance is undertaken, both of which are housed in buildings dating back to the 1960's. Both buildings are maintained and kept in a reasonable state of repair; however they would benefit from some further improvements, nonetheless the standard of housekeeping within the building is good. Facilities to deal with grease and oil spills were in place, and also personal washing facilities were checked and found to be acceptable. All fire extinguishers were up to date with checks and pressures were at 2psi.

A waste management regime was in place in both workshops. There were no vehicle washing facilities evident at either location, therefore limited run off is expected. Only limited H&S signs were present in all areas.

> ***WAI Comment:*** *In general the workshop and maintenance plant were both well managed and housekeeping was of a good standard. It is noted that procedures are in place to deal with waste and spillages. The H&S department presented the 'Safe work procedures' for these installations on request, and these are considered adequate.*

Open Pit Area

The former open pit area is located in the centre of the mine site, to the east of the River Ulba. The pit is understood to be 300m deep and below this at 400m depth is the underground mine. The open pit remains the possession of the state, therefore Kazzinc have no liabilities associated with it. Due to the excavation and de watering of this pit a cone of depression of 5km^2 has occurred. De-watering is undertaken via two lines of boreholes, and this water is pumped to the neutralisation zone for treatment. Groundwater regime is monitored monthly by the Hydrogeological Dept via 14 drillholes; inflows to the mine are also monitored. Interim and final hydrogeological reports including the depression-cone induced. Process development forecasts are issues at the end of the quarter and year respectively.

> ***WAI Comment:*** *Hydrogeological observations ensure good control. Kazzinc's obligations under the Subsoil Use Contract are met in full.*

Ventilation Shafts

There are 3 ventilation shafts within the sit area comprising of 1 inlet and 2 outlets. These shafts have their own individual testing regime.

> ***WAI Comment:*** *All the results presented were acceptable with regard to frequency of testing.*

Miscellaneous Buildings

Several other buildings are occupied on site, which although owned by Kazzinc are rented and operated by a third party company, e.g.:

- Boiler House rented and operated by L-TVK LLP;
- Coal Store Rented and operated by L-TVK LLP; and
- Fuel store Kazzinc building operated by Kazzinc procurement and logistics.

These buildings do not form part of the remit of this report. However water supplied to the boiler house comes from the neutralisation plant. The overhead pipeline showed no evidence of erosion or leaks.

6.7.3.2 Land Ownership and Tenure

Kazzinc holds the right to mine polymetallic ores under the terms of the Contract for Subsurface Use (1997), which is valid for 25 years. The mining license can be extended in duration by mutual agreement between Kazzinc and the regulatory authority. The current mining lease (2003) covers an area of approximately 12km^2.

> ***WAI Comment:*** *WAI has viewed the mine licence and permit and considers that these have been obtained in line with State requirements. It is understood that the future expansion of mining activity would not necessitate relocation of communities within the current licence boundary. It is understood from discussions that the local village developed after the mine was opened in an area with no underlying ore reserves to minimise the risk of subsidence.*

6.7.3.3 Energy Consumption & Source

Power is supplied from two main lines from Ust-Kamenogorsk at 132kV and 113kV respectively. The Company owns a Hydroelectric Power Plant at Bukhtarma which supplies the national electricity grid. Power for the mine is supplied by the national grid.

6.7.3.4 Mine Wastes – Rock

A total of 6 waste rock/overburden dumps are located at Tishinskiy mine area, these are of various sizes, namely waste dumps 1,2,3,4 7 and 8. Waste dumps No 5 and 6 are no longer in existence. The waste dumps date back to c1964 and resulted from the former open pit (excavated to level 5) when operational.

The open pit was closed in the 1970's. The waste dumps belong to the state although they are within the Tishinskiy mine area. WAI understands that Kazzinc does not have any liability for these dumps. Therefore, no waste dump characterisation information has been undertaken.

Waste Dump No 2 (deposition 1965-1977) is at the southern end of the mine site and is by far the largest of all the dumps. Prior to Kazzinc leasing the mine area Slime Pond 1 (SP1) was developed within the dump. This remains state owned, however Kazzinc have permission to excavate these slimes and send them for re-processing, which should commence in 2011. It is understood from discussions that this slime pond was constructed as an engineered clay lined containment, pre 1992. For SP1 slimes processing in 2011 under the Subsoil Use Contract the slime pond has been dewatered.

Waste Dump 2 is infiltrated by rain, and this water discharges as springs appearing along the contact of dump footage and the underlying loose sediments. Flow is 153-462m^3/hr at annual average value over 236m^3/hr. To neutralise the runoff from the state-owned dump Kazzinc treats it free of charge using DMS plant overflow as a neutraliser.

Slimes Pond 2 is also located within Waste dump No 2 and Kazzinc is currently excavating these slimes, which are taken to the railway stockpile to be loaded into railway wagons and transported to Ridder concentrator for re-processing. It is understood that SP2 is lined with compacted clay. Kazzinc has been processing SP2 slimes since 2003.

The water runoff and seepage from Slime Pond 2 and Waste Dump 2 migrates in a southerly direction and is captured in 2 trenches developed by Kazzinc before reaching the River Ulba. The seepage water when mixed with waste dump 2 water has a pH level of 5 (acidic), although after mixing with alkali flow from the DMS plant in the trench, pH 7 is recorded. Following treatment, although water is discharged to the River Ulba. The residual sludge is excavated and taken to the Concentrator for re-processing. It is unclear how the trenches were designed and engineered.

> ***WAI Comment:*** *The trenches are used to catch underground acidic flow from the SP2 and mix it with alkali flow from Crushing and Concentration plant before discharging to the Ulba river which lowers the impact of the state-owned dump 2 on the Ulba river.*

Kazzinc controls the efficiency of dump runoff interception in drainage trenches via 4 boreholes monitored once a month. Kazzinc produced an OVOS for waste dump 2, an OVOS for water interception trenches and mixing of runoffs from the dump and Crushing and Concentration plant, and an OVOS for SP1 and SP2. Gidrotsvetmet Institute (Russia) and Kazmekhanobr Institute (Kazakhstan) conducted scientific researches for a long period of time and provided a detailed assessment of contaminants leaching from the dump; based on this research, the current runoff neutralisation system was implemented. It is understood from the monitoring report that soils/slimes from waste dump 2 and slime pond 2 are monitored once a year, for total, mobile and solubility for Cu, Pb, Zn, Cd, Co, Cr, Ni, Hg, As, Mn, F, Be and V and of these it appears that Cu, Zn, Co, Cr Ni, and F are soluble.

St Petersburg Mining Institute (Russia) carried out a 3-year integrated study of the environmental condition of Tishinsky mine including dump 2 (covering runoff, land cover, soils atmospheric air, etc).

Tishinsky mine waste rock is not used for the road construction as it is mainly shale which turns into clay when affected by atmospheric precipitation. The scope of liability for Kazzinc and the state was clearly defined by law in 2002. All the mine dumps belong to the state. As requested by the state authorities, Kazzinc prepared an OVOS for each dump separately and recorded the level of environmental impact. The nature and level of the dumps environmental impact was recognised by the state authorities in the environmental impact statements. The impact of Kazzinc's operations has been identified and controlled. Meanwhile Kazzinc is implementing mitigation measures for the state-owned facilities located within the mine territory, and the treatment of water is a good will gesture on the part of Kazzinc, to avoid contamination of the river.

6.7.3.5 Mine Wastes – Tailings

Ore is pre-concentrated in DMS plant. The former tailings (slimes) are discussed in section 6.7.3.4.

6.7.3.6 Water Management & Effluents

There are two discharge points to the river Ulba from within the mining licence area. Discharges to surface waters are permitted in accordance with national legislative requirements. Water balance calculations were presented for 2009 and 2010 and these are updated annually.

Water is abstracted, under permit No 03YK-183 issued by the Water Resource committee.

> ***WAI Comment:*** *There is clearly an adequate underground water supply to meet current operational requirements. Water consumption and drainage was audited as part of the draft discharge limits in 2009. The recommended measures regarding water recirculation in the mine boiler house and increased mine water consumption in DMS plant are being implemented.*

Potential soil contamination could arise via runoff from temporary stockpile and dumps, deposition of contaminated dusts, oil/grease spills, and emergency situations, such as a chemical spill or containment breach.

- Excavation, loading, haulage of tailings material from slime ponds;
- Dust blown from waste rock dumps ore stockpiles, and filter cake;
- Dust blown from road and rail transportation;
- Spills and leaks of hazardous materials and chemicals (e.g. fuels, oils, waste oils);
- Surface runoff from roads constructed from waste rock material; and
- The subsidence zone is used a landfill – Kazzinc states that this is to reclaim disturbed areas, and that soil contamination in this area does not occur.

Pollution of surface waters could result from:

- Sludge catchment trenches overtopping; and
- Unplanned discharge of untreated minewaters.

Additional processes which may result in groundwater contamination include:

- Unsegregated deposition of waste to landfill; waste is deposited in the mine subsidence zone and runoff goes to the mine water draingage system for further treatment;
- Leaching from backfill in underground working; it is stated that leaching from backfill, runoff is collected and treated by the mine drainage system
- Absorption/dissolution of explosives residues and gases;
- Hydrocarbons from the mobile fleet;
- Leaching from contaminated soils; and
- Treatment of waters - to continue until waters are clean, which is anticipated to take 12 years.

In addition to the emission sources outlined above, air pollution at Tishinskiy could also result from the following processes:

- Exhaust gases from mobile fleet, railway, and combustion processes; and
- Gases from explosives usage.

> ***WAI Comment:*** *Surface water runoff is reasonably well managed although the site could be improved by the renovation and introduction of lined ditches/interceptor trenches.*

Although there is no Kazzinc liability for the other stockpiles/waste dumps on site, leached water from these may enter the water courses and cause contamination which may affect the general site environment. As requested by the state authorities and as part of the OVOS, in 2001, Kazzinc assessed the environmental impact of state-owned dumps and identified all sources and nature of potential contamination. As part of their CSR initiatives, Kazzinc treats dump runoff via the mine drainage system, to neutralise runoff from the State owned dump 2. Kazzinc has also rehabilitated waste dumps 1 and 8.

Kazgiprozem Institute conducted an assessment and provided recommendations for reclamation of the State-owned dumps, which has been followed. Currently dust is monitored 2-3 times a year, during dry periods. The depth of soil freezing in the region is 3m and dust generation does not occur during the winter.

6.7.3.7 Emissions to Air

The air quality in the Tishinskiy area is considered to be good and there are no other significant industrial outlets in the locality. Air quality monitoring is undertaken on the border of the sanitary protection zone annually for dust, sulphur dioxide and nitrogen dioxide. Results were presented to WAI for review and found to be acceptable. These locations are not plotted on a plan; however one point is measured in close proximity to the rail line and stockpiles.

An emission stack associated with the batching plant is included in the monitoring regime; this is monitored for dust 3 times a year. All results presented in the 2009 report were acceptable. Air quality is also monitored at the ventilation shafts - see section 6.7.2.6 for details.

> ***WAI Comment:*** *Monitoring frequency and methods comply with the national environmental requirements and are approved yearly by the state authorities in the environmental monitoring programme. It is recommended that national requirements should be compared with the international standards to assess control coverage, and be amended as appropriate.*

6.7.3.8 Waste Management – General

Sewage and domestic waste water is removed from site via the main sewer system, operated by a specialist contractor. All the wastes are classified, as agreed with the state authorities, as backfilling material for reclamation of subsidence zone developed on the western side slope of the former open pit towards Tishinskiy Hill.

All the runoff from the area enters the mine drainage system and is treated at the neutralisation station.

On completion of infilling of the subsidence zone (estimated to be around 2030) the area will be remediated, by installing a clay cap and then revegetated. Ultimately this will need to be approved by the state.

Domestic (kitchen) and clinical (centre) waste is removed from site by the local authority and disposed of at the municipal landfill in Ridder.

Waste oil and greases are taken to the Ridder testing laboratory for analysis. Each batch is tested twice and the oils are either sent for recycling or disposal at a state landfill. Oily and greasy rags are collected in appropriate containers and burned on site near the subsidence zone, with the ashes disposed of in this zone. Contaminated overalls are either burned or sent to a commercial laundry for washing. Waste tyres are sold to a third party for recycling. Scrap metal from the vehicle workshops and mine is collected and stored close to the vehicle maintenance area; and is then taken off site by a third party contractor.

> ***WAI Comment:*** *In general there is a reasonably efficient waste management system in place whereby waste is sorted for either recycling, or disposal, and where putresible waste is sent off site to the state operated landfill.*

Potential rock displacement is surveyed and controlled using movement pins on an annual basis, although no movement has been noted for a long period. Water resources are monitored by the Hydrogeological Department.

PH control is performed on a regular basis; over the decades of deposit mining pH level has never been lower than 7, which is typical for ore hosting metamorphous shale. The deposit's rock and ore composition is reported not to result in ARD generation.

6.7.3.9 Hazardous Materials Storage & Handling

Fuel delivery is subcontracted. Explosives are delivered by rail to an explosives magazine at a remote part of the site. From here, the explosives required for underground use are transported in sealed containers and, lowered in by shaft to the underground storage area prior to use.

> ***WAI Comment:*** *WAI considers that in general, storage areas are appropriate and well maintained, although some of the buildings require upgrading maintenance. Where contractors are used, it should be ensured that they are fully conversant with Company handling, storage and disposal protocols.*

It was noted that spillage/cleanup protocols and spill kits were available in the vehicle maintenance plant areas for oil spills. It was demonstrated and checked that the spill kits were adequately stocked and that staff were fully conversant with the procedures for spills.

6.7.3.10 General Housekeeping

General housekeeping at Tishinskiy Mine is good, with most open areas and operational buildings being maintained in a tidy and orderly manner.

> ***WAI Comment:*** *WAI considers that housekeeping at site is good and it was noted by WAI that the inside of the operational buildings were well maintained and appeared to be working efficiently.*

6.7.3.11 Fire Safety

A fire protection plan has been developed for Tishinskiy Mine. This would appear to be very comprehensive for both above and below ground facilities.

All staff and contractors are given training in fire safety procedures, advised of emergency evacuation routes and fire fighting protocols, as part of the induction records kept. A site induction programme is given to each employee which includes fire protection details.

Fire drills are undertaken twice a year. A copy of the latest fire drill report (9 July 2010) was presented to WAI. The State mine rescue team, located in Ridder city, is responsible for underground fire management.

A designated person in each area is responsible for inspection and maintenance of fire extinguishers. During the site visit WAI staff randomly checked the extinguishers, for pressure and calibration date, and all extinguishers checked were acceptable.

> ***WAI Comment:*** *The fire management systems appear appropriate to the size of the operations, and WAI considers that these issues are being well managed by the health and safety team. WAI understands that Kazzinc intends to introduce more drill training systems, and recommends that this should be implemented as a priority.*

6.7.3.12 Security

Security for Tishkinskiy mine is provided by Group 4 Security (G4S), a world renowned company. Security is in place on all of the tracks passed through during the visit and a vehicle check of passengers was undertaken on entering and leaving the mine site. The security service is provided on a continuous basis.

The only incident to occur over the last two years was of trespassing and petty theft from employee's personal effects. No mine equipment or assets were reported to have been taken.

> ***WAI Comment:*** *It was noted that security was in attendance at site. It would also be a suggestion that the mine gate should be a lifting barrier instead of a rope/chain barrier.*

6.7.4 Permitting

6.7.4.1 ESIA/OVOS

An OVOS has been produced which includes the Tishinskiy Mine. There were no fundamentally different conclusions/impacts contained within the OVOS appertaining to Tishinskiy Mine.

6.7.4.2 Environmental Permits and Licenses

Kazzinc holds the right to mine polymetallic ores under the terms of the Contract for Subsurface Use (1994), which is valid for 25 years.

The tenure lease for Tishinskiy mine lies with the state of Kazakhstan. The mining permit is defined by the "subsoil use" contract based on an agreed tonnage with the state authorities. A water abstraction licence for potable water and discharge is in place.

The environmental emissions permit prepared by Kazzinc and agreed with the Ministry of Environmental Protection (RK), permit No.0056107 (2010), has been granted to Ridder Mining and Concentrating Complex (RMCC). This permit regulates water, waste and air, emissions at Tishinskiy.

> ***WAI Comment:*** *The WAI team has viewed a number of mine licences and permits and considers the mine licences to have been obtained in line with State requirements. It is understood that the future expansion of mining activity would not necessitate relocation of communities within the current licence boundary. The Company has environmental insurance to cover damage to third parties. When issuing air emission permits, state environmental authorities approve medium-term and annual plans for emissions and discharged minimisation which is a mandatory requirement of the national legislation.*

6.7.5 Environmental Management

6.7.5.1 Environmental Policy and Company Approach

There are no specific additional initiatives implemented by Tishinskiy Mine separate to Kazzinc's company plan.

6.7.6 Environmental Management Staff & Resources

6.7.6.1 Systems and Work Procedures

The Environmental Monitoring Programme has been agreed and endorsed by the Ministry of Environmental Protection Republic of Kazakhstan (MoE RK) and is renewable each year.

The monitoring plan includes information on location of sampling, frequency and determinands for groundwater, surface water, discharge points, snow, air, dust and soils.

6.7.6.2 Environmental Monitoring, Compliance & Reporting

Groundwater is sampled via 4 boreholes in the south of the project area. Samples are collected quarterly and analysed for pH, hardness, mineralisation, dry residue, nitrates, nitrites, sulphates, total iron, arsenic, cadmium, selenium, manganese, ammonium, copper, lead and zinc. Surface water is sampled in 2 locations from the Ulba River. Samples are collected monthly and analysed for pH, copper, lead, zinc, cadmium, iron, manganese, ammonium salts, nitrate, and nitrite, and quarterly for the additional determinands of sulphates, suspended solids, dry residue, oils and overall toxicity. The results are compared with Maximum Allowable Concentrations (MACs), and are compared with potable water levels.

2 monitored discharge points are monitored which are sampled monthly for pH, copper, iron, lead, zinc, cadmium, manganese, ammonium salts, nitrate, and nitrite, and quarterly for the additional determinands of sulphates, suspended solids, dry residue, and oils. At the neutralisation treatment facility, the pH of the neutralised minewater is monitored by resident staff every two hours on a daily basis, as a quarterly control check.

Air is monitored at 6 locations at the operational mine site batching plant, slime ponds and rail loading yard for dust and gas emissions. Several point sources may be present at each location, and are sampled 2-3 times per year. The determinants include: nitrogen dioxide and carbon monoxide, and total dust is also measured. In addition one air monitoring point is located in a residential area on the periphery of the Sanitary Protection (buffer) Zone on the far side of the Ulba River. Total dust is monitored in this location.

Greenhouse Gas (GHG) monitoring does not currently occur. GHG sources at the site would potentially include emissions from fixed and mobile plant, the acid neutralisation areas, and the lime preparation facilities.

Noise is monitored at point sources, on an annual basis. Noise levels at potentially sensitive receptors are not controlled. A working level of 80 dB is permitted, and where this is exceeded, Personal Protective Equipment (PPE) is provided, or mechanical improvements are made.

Soils are monitored at 2 locations on an annual basis and are analysed for the following lead, cadmium, copper, zinc, iron, bismuth, antimony, arsenic, mercury, fluorine, nickel and cobalt. Mobile forms of cobalt, copper, nickel, fluorine and chromium are also analysed together with soluble forms of copper, lead, zinc, cadmium, arsenic, fluorides, sulphates, manganese, nickel, cobalt and chromium.

Radioactive point sources are monitored, on a quarterly basis, using either mobile or automatic detection equipment. Radon exposure is also monitored twice per year in working areas, including the underground mine, and at planned construction sites together with scrap metal if required.

Collecting of air quality, tailings/slimes analysis and supernatant surface and discharge waters is undertaken by Kazzinc environmental laboratory, and samples are analysed at Kazzinc analytical laboratory, which is nationally accredited and located at the RMC. Groundwater and soils are monitored by specialist contractors.

Results are reviewed and reported monthly by the Company Environmental Managers.

> ***WAI Comment:*** *The scope of the environmental monitoring programme has been developed in line with national legislative requirements. The Kazzinc Environmental Managers, Laboratories and third party specialists are aware of compliance requirements and analytical and sampling methodologies required to assess these. WAI therefore considers that the monitoring programmes are fully compliant with national standards, however it is recommended to make a comparison against international best practice, and amend as necessary.*

It is considered that the quantity of river sample points (3) is sufficient (upstream from the mine, after the mine water discharge point and downstream of the mine). Ochre coloured discharge was noted at the downstream water discharge point on the Ulba River. This is suggestive of the influence of the rock dumps and embankment formed by the open pit overburden, all of which are property of the state and outside Kazzinc's responsibility.

The quantity and location of point source air quality monitoring sites is considered adequate.

Dust pollution monitoring is undertaken in and around slime ponds and the rail loading yard 2-3 times a year. 2009 results were presented to WAI, and found to be compliant with national standards.

The stacks on the DMS plant (total of 9 stacks Nos 125-133) are monitored 2-3 times a year. 2009/2010 testing results were presented to WAI, and found to be compliant with national standards.

6.7.6.3 Emergency Preparedness & Response

A total of 34 Emergency Preparedness and Response Plans covering various possible scenarios has been developed. These outline responsibilities, actions and reporting requirements should an incident occur.

> ***WAI Comment:*** *The plans were comprehensive, however these plans have not been tested via any actual drills. Out of the 34 plans, WAI randomly selected Response Plan No 1, to review as an example, and this was presented to WAI together with a discussion on how the plan works. The plan appeared adequate, but plan testing via drills should be implemented.*

6.7.6.4 Training

There are no specific additional initiatives implemented by Tishinskiy Mine separate to Kazzinc's company plan.

6.7.7 Social and Community Management

There are no specific additional initiatives implemented by Tishinskiy Mine separate to Kazzinc's company plan.

6.7.7.1 Stakeholder dialogue and grievance mechanisms

There are no specific additional initiatives implemented by Tishinskiy Mine separate to Kazzinc's company plan.

6.7.7.2 Social Initiatives and Community Development

There are no specific additional initiatives implemented by Tishinskiy Mine separate to Kazzinc's company plan.

6.7.8 Health & Safety

6.7.8.1 Health & Safety Management Arrangements

Tishinskiy mine has a H&S Manager, who is responsible for the H&S of both above and below ground operations. A total of 51 ''Safe Work Procedures' are in existence covering each aspect of work undertaken at the mine. The H&S Manager has a team of 5 inspectors per shift which cover both above and underground works. During each shift these persons randomly check the working areas. The Company is also accredited for H&S management under the OHSAS 18001 scheme.

The environmental training covers issues such as dealing with spills, waste management, water and power consumption and how to manage and minimise environmental risks. Managers also receive training every 3 years, from State authorities. WAI viewed a number of personnel training logs.

The Company also has a special clinic in Ridder, where all employees receive annual medical checks. The Company has a contract with the State ambulance provider and the nearest hospital with an Accident and Emergency (A&E) department is in Ridder city, a few kilometres away. Spot tests for drugs and alcohol are also performed.

Noise, dust and gases are monitored in working areas, on a continuous programme. PPE is provided to all employees, and additional PPE is provided where necessary eg ear defenders.

> ***WAI Comment:*** *WAI considers that health and safety is very well managed at the site, with appropriate training being provided, and good response systems in place for personnel. PPE was worn in all areas to some degree, however it was noted that on the day of the site visit, some staff did not*

have hi-vis PPE on or hard hats, this was especially noted in the area of the rail sidings and landfill/subsidence area. It should be noted that heavy plant was in use in these areas. In general H&S managers and their teams are proactive in their management of H&S issues, both with regard to national and international requirements. WAI would recommend implementing drills to test Emergency Response Plans, to assess their adequacy.

It was noted that there were areas which would benefit from additional warning/instruction signs, to comply with international standards. WAI would suggest that although there is obviously a road infrastructure on site, there was a lack of signage indicating ''give way' and 'stop' and 'one way' etc. It was also noted that a speed limit was displayed on some roads; however it is the opinion of WAI that this was not being adhered to on site.

6.7.8.2 Performance and Accident Records

Tishinskiy mine generally has a good health and safety record. The last time an accident happened was in 2009, where an employee was off for 3 months.

There are clear lines of responsibility in case of an accident, and disciplinary and re-training procedures exist if unsafe working practices are noted by H&S managers. The managers can also stop production and issue warnings if breaches are noted. These are then recorded, and remedial measures, with a given timescale for implementation are devised. The progress on implementation is then inspected by the H&S manager.

WAI Comment: *WAI considers that the health and safety management is very good at the site, and that the appropriate record keeping and improvement procedures are in place to deal with incidents. Overall the safety records are considered good, and all personnel seem committed to improving safety management.*

6.7.9 Mine Closure & Rehabilitation

6.7.9.1 Mine Closure Plans

In accordance with state legislation the mine closure plans are not required to be prepared until 2 years prior to closure.

WAI Comment: *WAI recognises national closure requirements are being met, and there is a closure program developed at the mine with specified types and volumes of works to be performed and closure fund established and kept on the Kazzinc's account. Detailed project specifying closure costs will be developed 2 years prior to the mine closure, however this should be compared and updated in line with international standards and should cover unplanned company closure.*

6.7.9.2 Financial Provision for Closure

Tishinskiy Mine initial potential closure cost is estimated at US$1,000,000, and this sum was deposited in a protected Company fund. This has been increased to US$4,000,000. Typical closure measures include demolition of surface structures, stripping of utilities, and stabilisation of mining related features, earthworks and re-vegetation. It is reported that standard post-closure monitoring includes: rivers and groundwater, mine water, dust, soils, flora and fauna. It is also reported that post-closure aftercare will include the continuation of mine water treatment after flooding of the mine workings. At Tishinskiy, this is envisaged for 12 years, before the workings are allowed to flood and groundwater rebound occurs.

It is reported that the closure fund will periodically be updated during the mine life, with a final detailed closure plan to be prepared 2 years before actual closure, in line with State requirements.

WAI Comment: *The current closure fund estimate is revised on an annual basis and will be itemised during closure project development. It is recommended that funds include sums for unplanned* *company closure.* The environmental budget is prepared on an annual basis by the environmental managers and this is based on the continuous environmental improvement strategy of the mine.

6.7.10 Conclusions

Kazzinc has acquired a number of historic mining features at Tishinskiy Mine. SP1 and waste dumps remain the property of the State therefore liability remains with the State.

WAI considers that Company environmental management and monitoring is performed in line with national requirements, and Kazzinc has achieved accreditation under international environmental, quality and health and safety management systems (ISO 14001 and OHSAS 18001). The Environmental management system has been implemented, with findings of annual inspections speaking for its continuous improvement.

A key area for attention is water recycling and management, together with mine closure provisions.

The Company is not held liable to the government for any historical contamination, and considers that liabilities for current operations are clearly defined.

In 2010 an independent environmental audit was conducted at Kazzinc which included Tishinsky Mine. During the audit, the adequacy of all environmental aspects, risks, targets and environmental management programmes used at the operations were assessed.

7 SHUBINSKIY DEPOSIT

7.1 Introduction

The deposit was discovered in 1846 and initially named Priisk-1. Three years later two silver-bearing mineralised bodies were exposed in shallow underground exploratory workings. However, it appears that no further prospecting or mining was undertaken and the occurrence was overlooked until its rediscovery during regional prospecting and prospecting-assessment programmes in 1954-1955.

Trial underground production began in 1990/1991 and continued intermittently and at low output rates for over six years. In 1999 the production exceeded 100kt and has since risen to reach its full capacity of 200ktpy in 2009. During the period 1992-2009 inclusive, the mine produced 1.6Mt of ore grading 0.66g/t Au, 17.9g/t Ag, 1.74% Cu, 0.28% Pb and 2.25% Zn. The mine is operated by TOO Shubinskiy, who had worked as Kazzinc's mining contractors prior to April 2009.

The mine development consists of five underground levels connected by two vertical shafts located on the north-western and south-eastern flanks of the deposit. Level 1 is at an absolute elevation of 980m (at 75-100m depth). Level 2 is developed 50m below level 1 and 60m above level 3. Levels 3, 4 and 5 are 60m apart. The shaft on the north-western flank is 319m deep and is used for personnel, equipment and ore and waste hoisting.

7.1.1 Location and Access

The Shubinskiy mine is situated in the Glubokovskoe region of East Kazakhstan province 14km north-east of Ridder from which it is readily accessible by an all weather graded road (Figure 7.1).

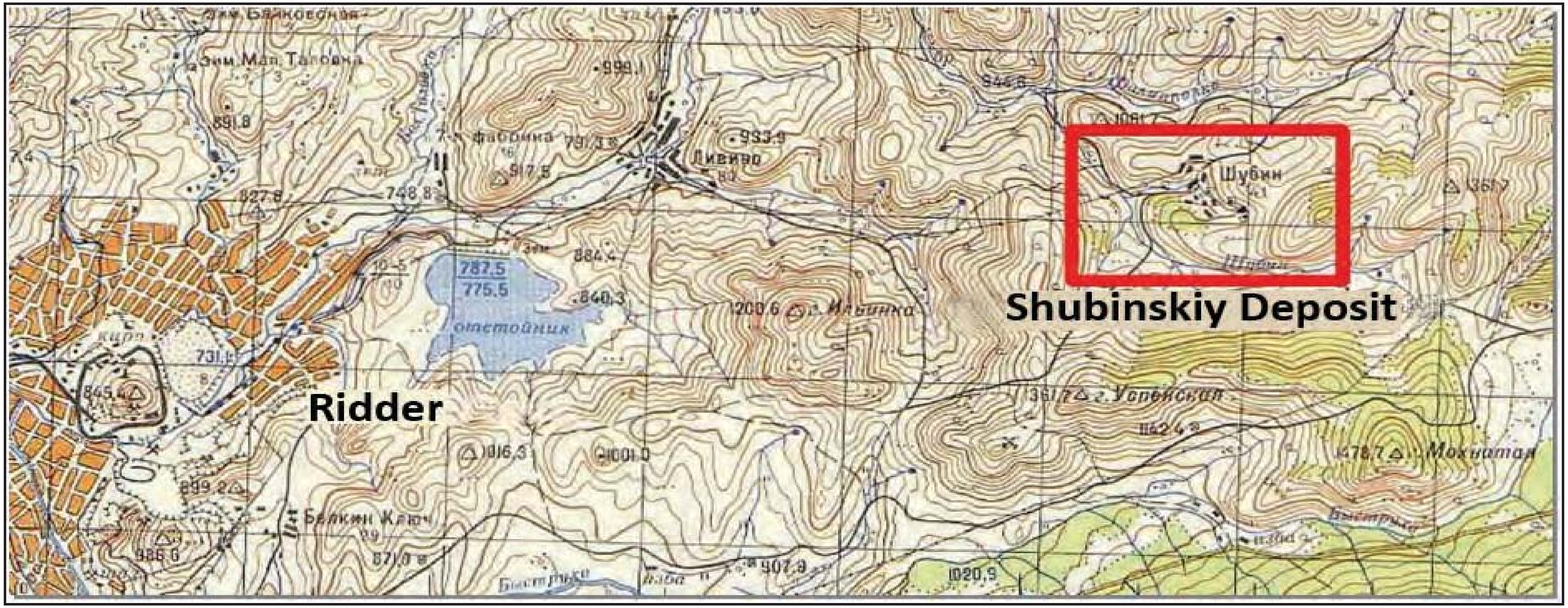


Figure 7.1: Location of Shubinskiy Mine in Relation to Ridder
(Scale – Each Division± 2km)

WAI Comment: *The Shubinskiy site is favourably located in relation to a major centre of industry and population at Ridder, providing a significant advantage to the project.*

7.1.2 Topography and Climate

Topographically the area comprises upland with strong relief, the deposit itself being located on an undulating plateau, with ground elevations ranging from 1,000-1,100m above sea level; the plateau is bounded to the north and south by the deeply dissected valleys of the Martyn and Shubin tributaries of the Ulba river the waters of which are potable and suitable for technical purposes.

Climate is extreme continental with the average annual temperature of 1.6°C and seasonal variations from +34°C in July to -45°C in December. Mean annual precipitation is 667mm, of which the maximum falls as rain in summer months. Snow cover lasts for 160 days from November to April. The ground freezes to depths of up to 1.5-2.0m.

The entire region (with exception of the higher mountain region) is forest-covered, predominately with coniferous species.

7.1.3 Infrastructure

The basis of the local economy is the production of non-ferrous metals at the Kazzinc Ridder Concentrator and Metallurgical Complex from production of Ridder-Sokolniy, Tishinskiy (underground and slimes), Shubinskiy mines and sands from the Staroye tailings dam. Electric power is provided by the Bukhtarminskoy power station, supplemented by the Ridder heat and power plant. An adequate labour supply is available in Ridder.

Building materials, apart from timber from the abundant forests, include the various local volcano-sedimentary lithologies, gravel- pebble deposits, clays and cement.

Other local industries comprise forest management, a meat-packing plant and a clothing factory amongst others but agriculture is poorly developed, as a consequence of the dissected relief.

7.1.4 Mineral Rights and Permitting

Kazzinc holds its tenure rights to mine polymetallic ores from the Shubinskiy deposit through its wholly owned subsidiary TOO Shubinskoe. Contract No.1296 for Subsurface Use was initially granted to AO Leninogorsk Polymetallic Complex (LPC) on 30 December 2003 and then transferred to TOO Shubinskoe on 8 April 2009. The contract is valid until 7 April 2015 and can be extended by mutual agreement in writing between the tenure holder and the issuing authority; it supersedes Licence Series MG No 68 granted to AO Leninogorsk Polymetallic Complex on 7 April 1995.

The Shubinskiy mining lease covers an area of 97ha (0.97km^2) defined by four boundary points (Table 7.1).

The legal depth limit of mining defined in the mining licence is level 9 at an elevation of 510m above Baltic Sea datum. The mine is developed to level 5 at the elevation of 750m. The deposit as currently delineated, peters out between the elevations 570m to 510m.

Table 7.1: Mining Licence Boundaries

Boundary Points	Local Interim Co-ordinates*[1]	
	X	Y
1	30,590	-4,760
2	31,340	-4,140
3	30,710	-3,365
4	29,960	-3,995

WAI Comment: *an inspection of the licence documentation has shown that all are in good order and suitable for the future needs of the Company.*

7.2 Geology and Mineralisation

7.2.1 Regional Geology

The Shubinskiy deposit is situated at the boundary of the Uspensko-Karelinsky and Shubinskiy structural blocks within the Ulbinskaya branch of the Uspensko-Karekinska shear zone.

The Uspensko-Karelinsky block underlies the southern part of the deposit area. It is composed of Lower-Middle Devonian volcano-sedimentary rocks of the Leninogorskaya, Kriukovskaya, Ulbinskaya and Uspenskaya formations. The Shubinskiy block containing terrigenous sediments of the Middle-Upper Devonian Beloubinskaya Formation underlies the northern part of the deposit area.

The contact between the two blocks strikes 315-330° and dips 65-85° NE. Rocks on either side have been subjected to intense polyphase deformation, which has resulted in complex folded structures and pervasive schistosity. The contact itself is a shear zone.

7.2.2 Deposit Geology

7.2.2.1 Stratigraphy and Lithology

The deposit covers an area of 600x110m extending from north-west to south-east along the contact of the Uspenskaya Formation (D_2ef-qv us) and the Beloubinskaya Formation (D_2qv_2-D_3fr ы). It has been delineated by diamond core drilling from surface to a depth of 730m. The dip is concordant with schistosity, generally within a range of 65-85°NE.

The deposit is hosted by volcanogenic-sedimentary rocks of the Uspenskaya Formation in the contact zone with the sediments of the Beloubinskaya Formation as shown in Figure 7.2. The host rocks comprise chlorite-sericite-quartz schists and sericite quartzites derived primarily from acid tuffs and their reworked derivatives.

Rocks of the Beloubinskaya Formation, which form the hanging wall of the deposit, comprise carbonaceous-pelitic and pelitic siltstones, silty sandstones with intercalations of sandstones and occasional small lenses of acid tuffs in the immediate vicinity of the contact with the Uspenskaya Formation.

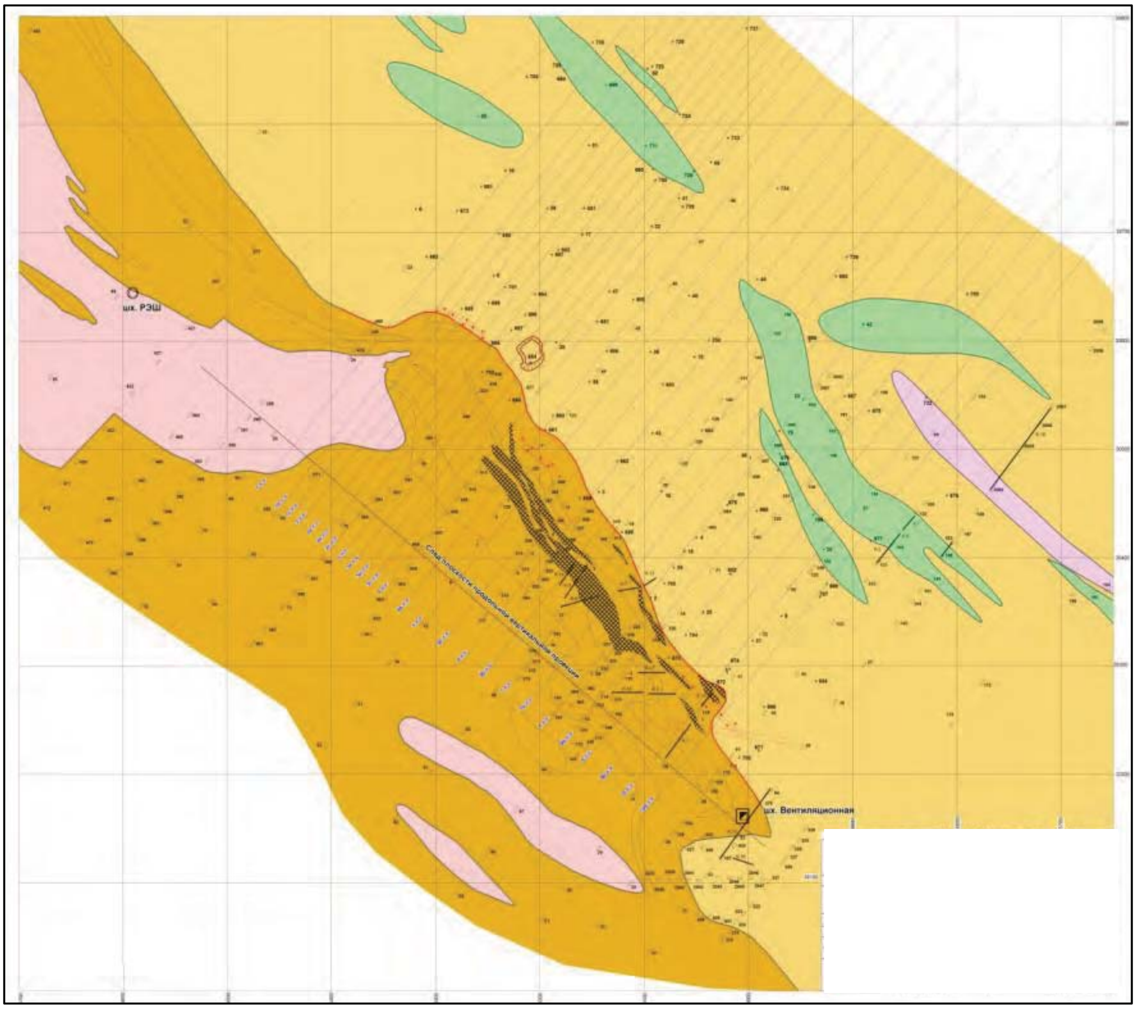


Figure 7.2: Geology Showing the Mineralised Bodies and Lenses (Hatched) on the Contact between Uspenskaya Formation (Yellow) and the Beloubinskaya Formation (Pale Yellow) with Magmatic Rocks (Green and Mauve)
(Scale: Grid 100m)

7.2.3 Ore Body Morphology

The deposit consists of two clusters of sub-parallel, tabular and lenticular mineralised bodies, one on the north-western flank of the deposit and another on the south-eastern flank, referred to as the North-Western Lode and the South-Eastern Lode respectively as shown in Figure 7.3 below. In the 1989 report, the ore bodies were numbered in sequence from hanging wall to footwall as shown in Table 7.2 below.

Orebodies No.1 and 2 host the bulk of the mineralisation. Orebody No.1 extends throughout the deposit as a string of narrow boudinaged lenses and widens into two sub-vertical shoots at both ends. In the South-Eastern Lode area, the shoot extends for 580m down dip (from level 1 to level 9) and attains 210m in strike length on level 5. The smaller shoot in the North-Western Lode area breaks up into separate lenses which in aggregate extend for 550m down dip. The combined strike length in this area is 100m.

Orebody No 2 also extends throughout the deposit as a narrow pinch-and-swell structure and opens up into a large shoot in the North-Western Lode area. This shoot extends down dip for 725m (from level 1 to level 9), attains 220m in strike length and 28m in width. A smaller shoot on the South-Eastern Lode area extends down for 420m and has a strike length of 170m.

The ore bodies and lenses themselves, dip 65-80° NE and strike 320-340°. They vary from 100-130m to 200-220m in length, extend down dip from 190m to 500-725m with widths between 0.26-0.40m to 21-28m and average values from 1.6-9.0m. The morphological variations include columnar, linear and lenticular, and the contacts are irregular as a consequence of tectonic disturbances; apophyses also occur. The main parameters are summarised in Table 7.2.

Five ore bodies and 24 lenses of pyritic polymetallic mineralisation have been identified at Shubinskiy. The majority of the reserves (78.7%) are concentrated in the No.1 and No.2 ore bodies, and 63.9% in these bodies in the NW Lode where the grades are higher. Only 0.9% of the reserves are contained in the 24 small lenses.

The ore zone hangingwall contact coincides with the interface of the Beloubinskaya and Uspenskaya formations whilst on the south west the boundary is diffuse and is defined by the progressive disappearance of polymetallic and pyritic bodies. The zone has a strike length of 550m and extends down dip from 450-580m; below 500m the ore bodies decrease in size and the mineralisation becomes discontinuous.

The North-Western Lode has almost been exhausted from level 1 to level 4 and is now mined on level 5. The South-Eastern Lode is mined on level 2, whilst stopes are being prepared on level 3. Mixed sulphide-oxide mineralisation in the upper part of both lodes remains largely intact on and above level 1.

Table 7.2: Characteristics, Morphology and Parameters of Ore Bodies

No of Ore Body	Ore Body Location			Drilling Grid From-To/Average		Ore Body Dimensions(m)			Grade (Range) average, %			BeddingDip/ Azimuth	Morphology of the Ore Bodies
	Lode	Horizon	X-Sections	C_1	C_2	Strike Extent/ Continuous	Dip Extent/ Continuous	Thickness Range/ Average	Copper	Lead	Zinc		
1	NW	1-9	2B-4B	15-25*50 25	40-60 50	100 100	550 150	0.68-7.20 1.89	0.02-5.21 1.72	0.08-3.19 1.20	0.09-10.48 5.55	35-60° 50-85°	Linear
	SE	1-9	5B-11B	10-25*60 31	25-40*80 60	210 210	580 580	0.4-11.0 3.11	0.02-11.55 0.47	0.04-3.85 0.55	0.09-21.3 3.08	10-90° 50-85°	Linear
2	NW	1-9	0-5B	15-25*75 42	25-75 40	220 220	725 725	0.83-28.2 9.0	0.02-6.18 2.78	0.08-4.85 0.62	0.09-14.22 4.68	15-75° 53-85°	Columnar Linear
	SE	1-9	6-10B	15-25*60 25	20-75 53	170 140	420 420	0.58-7.40 2.39	0.02-16.35 1.20	0.02-2.56 0.34	0.09-10.5 2.57	48-70° 46-75°	Linear
3	NW	1-8	1B-5B	10-25*70 35	25-100 70	140 85	500 340	0.26-14.8 3.7	0.02-7.4 1.59	0.08-2.08 0.38	0.2-9.91 2.35	35-57° 52-83°	Columnar Linear
	SE	1-7	7B-10B	10-25*60 33	10-60 25	130 130	340 340	0.37-10.5 3.43	0.08-15.22 1.57	0.02-7.47 0.41	0.05-23.35 2.10	54-120° 40-90°	Linear
4	NW	1-6	2-5	10-60 30	25-70 65	130 80	540 300	0.52-21.3 4.5	0.10-4.12 1.73	0.02-0.25 0.22	0.06-4.41 1.99	30-60° 60-77°	Linear
	SE	2-3	7B-9B	10-50*50 36	40-60 40	130 75	190 120	0.75-6.2 3.21	0.02-12.10 1.58	0.02-1.9 0.07	0.06-1.85 0.69	30-155° 65-90°	Linear
5	NW	3-7	3B-5B	-	25-60 60	50 50	185 185	0.78-3.17 1.6	0.08-2.08 1.0	0.02-0.75 0.16	0.02-6.2 2.05	35-42° 68-70°	Lenticular
	SE	3	9B	-	15-50	25	11	1.72	5.53	0.73	2.84	36-142° 70-80°	

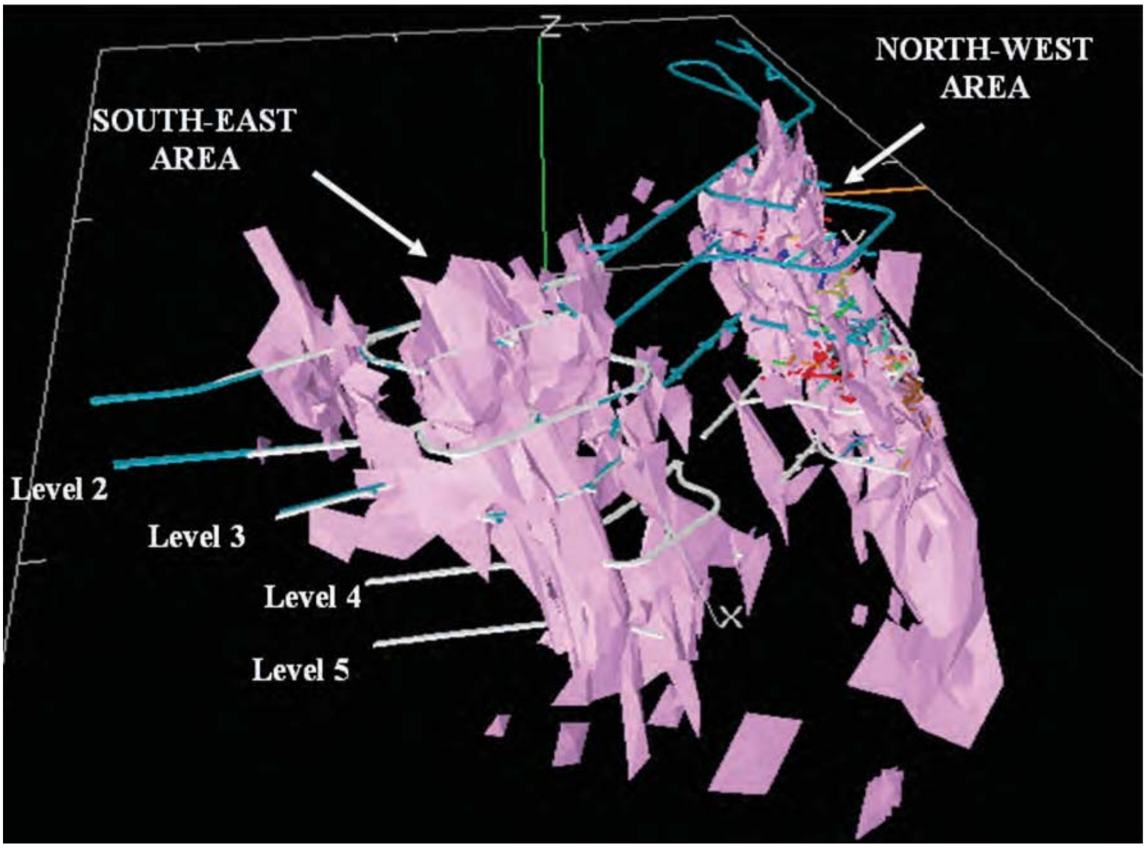


Figure 7.3: Modelled North Western and South Eastern Lodes

7.2.3.1 Structure

The tectonic structure of the Shubinskiy deposit is complex; the deposit is located on the south western flank of the NW striking Listvyazhnaaya syncline, where the Shubinskoya syncline and its small transverse plications, thought to be related to the mineralisation phase, complicate the structure.

Ore bodies and lenses are metamorphosed and sheared, the local shear zones range from 10-20m in width and 50-550m in length (Figure 7.4). Fracture dislocations and faulting, believed to be subsequent to the mineralisation processes are characterised by crushing and shearing; these disruptive features, one of which occurs along the contact of the Beloubinskaya and Uspenskaya formations, extending over the length of the deposit, strikes NW-SE and dips at 60-80°NE (Figure 7.5). The smaller crush zones have been observed in the metasomatically altered and sheared acid tuffs and tuffites.

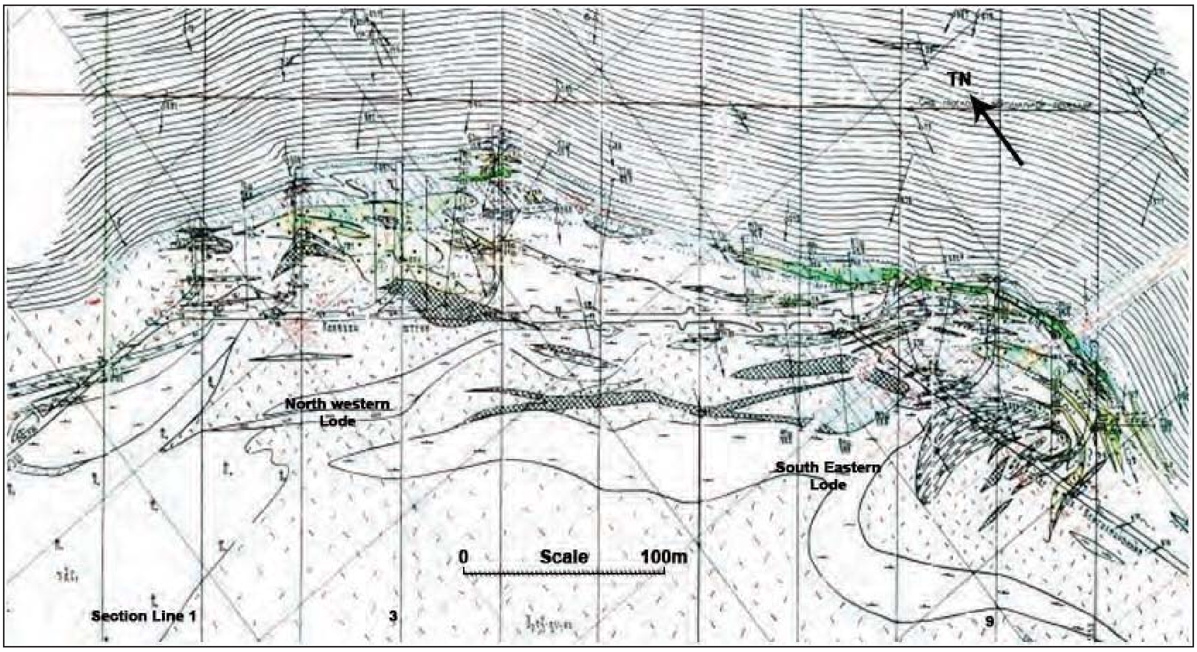


Figure 7.4: Plan of Level No.3 (870m) showing the NW and SE Lodes and the Dislocated and Sheared Ore Bodies

(Section Lines Indicated by 1, 3 and 9)

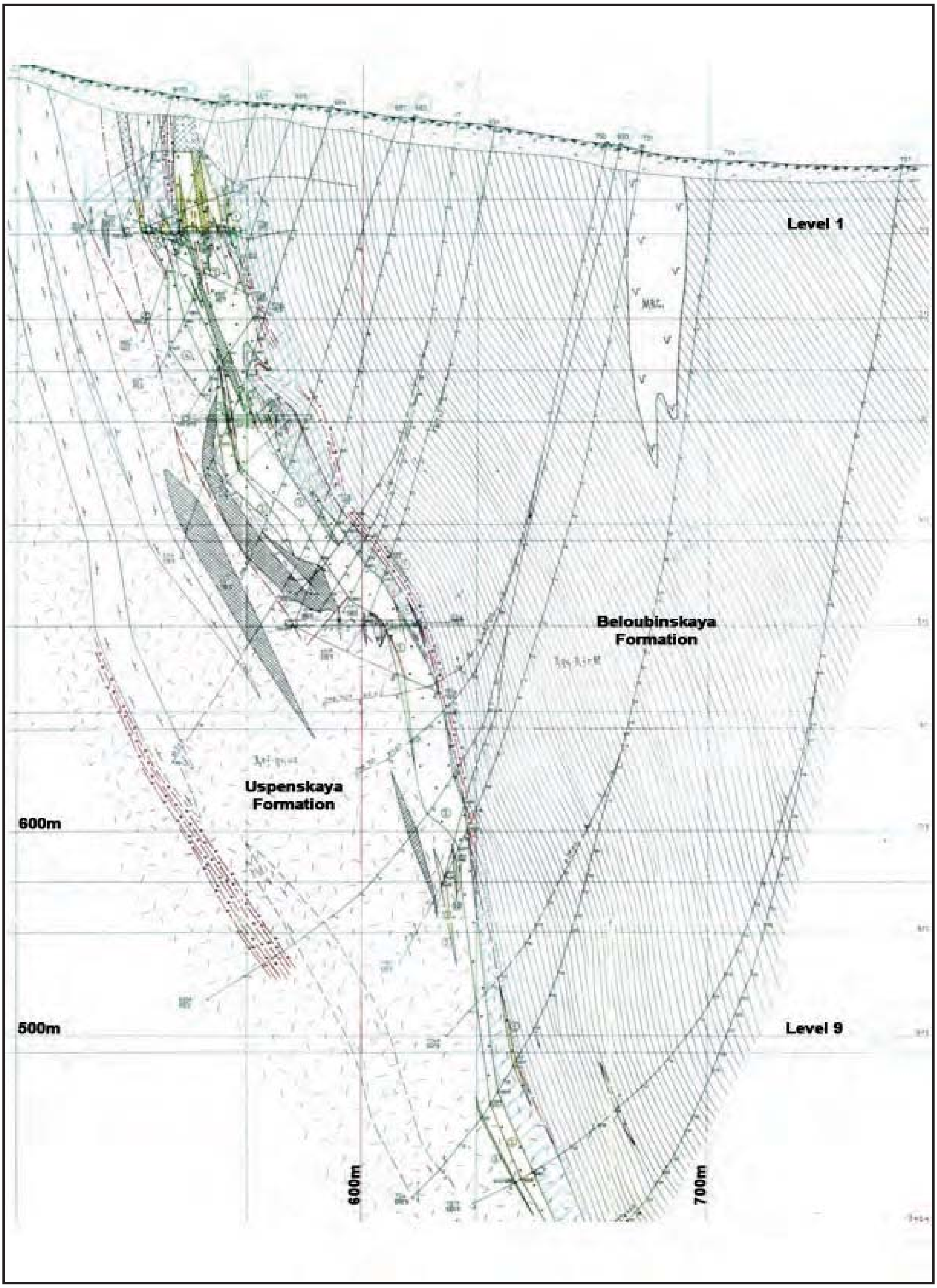


Figure 7.5: Cross Section No 3 through the North Western Lode
(Refer to Horizontal Section of Level 3 in Figure 7.4 for Position of Section Line)

7.2.4 Mineralogy

The primary sulphide and mixed zones are defined by the degree of oxidation, the former comprising <12% copper, <20% lead and <10% zinc, oxidised minerals. The corresponding figures for the mixed zone are Cu 12-50%, lead 20-50% and Zn 10-30%.

Primary sulphide mineralisation comprises four major mineral associations:

- Pyritic;
- Chalcopyrite (chalcopyrite- pyritic). Cu≥(Pb + Zn);
- Pyritic-copper- zinc (chalcopyrite-sphalerite- pyrite) Cu≥ Pb; and
- Polymetallic, substantially lead-zinc (pyrites-galena-sphalerite). Cu ≤ (Pb + Zn).

Veinlet-type and disseminated mineralisation predominate. Massive sulphides occur as isolated lenses and altogether make up approximately 11% of the original 1989 resource. Table 7.3 lists primary minerals identified at the deposit.

Table 7.3: Primary Minerals

Abundance	Metalliferous Minerals	Gangue Minerals
Main	Pyrite, sphalerite, chalcopyrite, galena	Quartz, sericite, chlorite
Abundant	Arsenopyrite, tennantite-tetrahedrite, marcasite, melnikovite (layered) pyrite	Rutile, calcite, siderite, leucoxene
Accessory	Pyrrhotite, hessite, tellurobismuthite, native gold, native silver	

The depth of oxidation varies from 25-35m and is defined as the boundary above which oxidised minerals of copper, lead and zinc exceed 50%, 50% and 30% respectively.

Pyritic and copper-pyrite sulphide mineralisation, being more susceptible to surface weathering, has been converted to a porous mixture of limonite, goethite, lepidocrocite and halloysite. Secondary copper minerals include malachite, azurite, tenorite, cuprite, native copper and chrysocolla. Base metal grades are low and for this reason oxidised mineralisation is not included in the reserves. Gold and silver grades have not been determined in the oxidised zone.

Mineralisation containing oxidised forms of copper, lead and zinc in the range of 12-50%, 20-50% and 10-30% respectively, is classified as mixed and extends from the base of oxidation approximately down to level 1 at an elevation of 980m. This is a supergene sulphide enrichment zone containing inter alia chalcocite, covellite, bornite, goslarite (hydrous zinc sulphate) and chalcanthite (hydrous copper sulphate). Copper enrichment is approximately 1.5-1.9 times in the North-Western Lode and 4-4.2 times in the South-Eastern Lode. Zinc enrichment is 1.2-1.5 times. The enrichment is defined as a ratio of the average grade of mixed mineralisation to the average grade of primary sulphide mineralisation.

Horizontal zoning is reflected in the predominance of lead and zinc near the hanging wall and a gradual decrease towards the footwall, where the copper content increases. In continuous and disseminated sulphide bodies the lower horizons are pyritic. The NW section has a higher copper content than the south east section; vertical zoning is manifest by the more rapid decrease in copper than lead and zinc.

Increased concentrations of tellurium and selenium are characteristic of the chalcopyrite and lead-zinc ores and increased grades of cadmium (up to 0.11%) and silver (up to 270g/t) occur in continuous pyritic-polymetallic ores. Gold grade is usually low (average 0.2-0.6g/t), although higher values have been recorded occasionally, in the upper part of the deposit.

Harmful impurities include silicon dioxide, iron and arsenic. Iron as pyrites is up to 37% in chalcopyrite ores which are characterised by increased arsenic (up to 0.3%), also in the upper parts of the deposit. The maximum content of silicon dioxide in copper-zinc ore is 81.8%.

The chemical composition of the Shubinskiy ores is given in Table 7.4.

Table 7.4: Chemical Composition of Ores

	Contents %
Na_2O	0.01-0.20
MgO	0.07-1.50
Al_2O_3	0.39-16.84
SiO_2	2.11-93.6
P_2O_5	0.008-0.168
K_2O	0.04-5.69
CaO	0.07-0.36
TiO_2	0.008-0.23
MnO	0.02-3.71
$Fe_2O_{3\ total.}$	0.04-64.06
S_{total}	1.05-49.01
BaO	0.03-0.50
PbO	0.05-4.48
CuO	0.05-9.59
ZnO	0.05-21.6

7.3 Exploration

7.3.1 Historical Work

The deposit was discovered in 1846 and initially named Priisk-1 and was first properly investigated during regional prospecting and prospecting-assessment programmes in 1954-1955.

Subsequent exploration was carried out in three stages:

- Preliminary exploration conducted by Leninogorsk GRE in 1954-1960;
- Preliminary exploration conducted by Leninogorsk GRE in 1973-1975, targeting deeper levels of the deposit and its flanks; and
- Detailed exploration and simultaneous mine development by LPC in 1976-1989.

A summary of work accomplished during the period 1954 to 1989 inclusive is given in Table 7.5.

Table 7.5: Exploration Summary					
Exploration Works Conducted	Unit	Prospecting Assessment Date	Preliminary Exploration		Detailed Exploration and Mine Development
		1954-1955	1954-1960	1973-1796	1986-1989
Geological Mapping 1:10,000	km^2	50			
Prospecting Traverses	km^2	92			
Geological Mapping 1:2,000	km^2	2			
Cartographic Drilling	m	13,968			
Trenching	m^3	1,800			
Pitting	m	3,391			
Diamond Core Drilling					
Surface Drilling	m		17,616	33,256	
	number		60	86	
Underground Drilling	m				9,575
	number				181
Drill Core Samples	number		2,590	3,120	9,421
Underground Openings					
Vertical Workings	m				651
Horizontal Workings	m				5,440
U/g Channel Samples	number				3,782

7.3.2 Drilling

7.3.2.1 Surface Diamond Core Drilling

Surface drilling was carried out by the Leninogorsk GRE. Drill holes were sited on profile lines, bearing 219° and inclined south-west. Initial inclinations ranged from 73-86° and subsequently holes were deflected to lower angles either with or without the use of directional wedges. The initial drilling diameter, either 112mm or 132mm, was reduced to 76mm and 59mm below the oxidised zone.

Drill collar locations were surveyed by instrumental methods. Downhole surveys were carried out at 20m intervals, or more frequently around deflection points. Control depth measurements were taken at intervals of 100-150m.

The average core recovery over mineralised intercepts for surface drillholes was 75.6%.

> ***WAI Comment:*** *the core recovery for the mineralised intercepts would be considered unsatisfactory by current drilling standards, but is probably explained by the complex disruptive fracturing which characterises the ore bodies; no core was available for inspection.*

7.3.2.2 Underground Exploration

Kazzinc obtained the subsurface use right in 2004. Previously this right was owned by HSC Leninogorsk Polymetallic Complex. For the period 1997-2003 inclusive, only 4,231m of underground workings were drifted through infill drilling and 1,403m of channel samples were taken from mine workings.

After Kazzinc obtained the subsoil use right it intensified underground infill drilling using a modern Diamec 232 drill rig. For the period from 2004 till 2010, 36,397m of prospecting holes were drilled and 982m of channel samples were taken from mine workings (see Table 7.6 below).

Table 7.6: Exploration Works 2004-2010					
Year	Samples Taken	Core		Sludge	Trench
		BSK	Diamec		
1997	1,232	0	0	1,229	0
1998	1,078	46	0	396	563
1999	1,500	142	0	1,077	276
2000	555	0	0	457	86
2001	585	0	0	278	307
2002	297	0	0	174	115
2003	488	0	0	432	56
2004	606	0	0	248	355
2005	2,015	1,278	0	405	323
2006	3,287	2,044	0	786	304
2007	7,477	773	5,250	1,379	0
2008	7,240	93	6,917	230	0
2009	8,700	0	8,306	348	0
2010	8,096	0	7,660	432	0
Total 2004-2010	38,027	4,188	28,133	40,76	982

Based on such works, the density of the exploration grid within levels 1-5 has improved to 10-15mx12.5m (explored along strike by either drill holes or mine workings on 12.5m centres, and down dip from 10-15m). Level 6 reserves were investigated on a spacing of 25m. This exploration grid has greatly improved the confidence in estimates and reserve category accordingly.

Underground exploratory workings prior to the commencement of mining were developed on levels 1, 3 and 5 at vertical intervals of 110-120m. Horizontal workings comprised crosscuts on a bearing of 39° at 50m intervals across the entire width of the deposit plus several drives in the North-Western and South-Eastern lodes to confirm the lateral continuity of the mineralisation, and drill cuddies.

Superimposed on the exploratory workings, haulage and extraction drives, crosscuts, sublevels, service raises and other underground openings were subsequently developed in the process of stope preparation. The frequency of such workings varies from 10-20m along strike and 12-20m down dip.

Geological documentation for each development consists of 1:100 scale sections of both side walls and, in areas with more complex geology, the backs, with annotations and descriptions.

As a general observation, drawings and descriptions adequately address forms and types of mineralisation but are short on structural details. Some workings have photographic documentation.

Direct underground exploration was augmented with underground diamond core drilling. Underground holes are collared on profiles at 25m intervals and fan drilled on an orientation from north-east (39°) and south-west (219°). Some drillholes sited on the south-eastern flank of the deposit were drilled on different bearings to define a subsidiary fold structure developed in this area.

Upside-facing and horizontal holes were initiated with 59mm external diameter drill bits and downward-facing holes with 76mm external diameter bits. The hole sizes were subsequently reduced to 46mm and 59mm respectively. Out of the total 9,575m of drilling, 812m were drilled using double core barrels.

Drillhole collar positions were surveyed by instrumental methods. Downhole surveys, which were routinely conducted in virtually every borehole, did not reveal any significant deviations.

The overall core recovery in underground drillholes completed to 1989 was reported as 70.5%, whilst the overall core recovery from mineralised intersections was reported as 73.2%. Some holes with low core recovery were redrilled (a total of 337m). Roentgen-radiometric logging (RRK) was conducted in most boreholes and the results were substituted for chemical analyses in 9 holes with low core recoveries.

A statistical analysis based on hydrostatic weighing of 1,000 drill core samples from the detailed exploration stage revealed that core recoveries by weight were on average approximately 8% lower than linear recoveries recorded in drill logs.

> ***WAI Comment:*** *The core recovery for the mineralised intercepts would be considered unsatisfactory by current drilling standards, and confidence is further reduced by the discrepancy between linear measurements (on which the recoveries are assumed to be based) and hydrostatic weighing.*

7.3.3 Sampling

7.3.3.1 Sampling Techniques

Drill core samples were collected from all intervals with visible polymetallic sulphide mineralisation and from lithologies on either side of each mineralised interval. Most intervals with hydrothermal alteration and disseminated pyrite were also sampled.

Drill core samples from the 1955-1961 and 1974-1975 drilling programmes were split in a mechanical core splitter. Sample intervals ranged from 0.2m to 2m in length, but did not exceed 1m over mineralised intervals.

Relatively small diameter underground drill core was not split, except for intervals subjected to control duplicate sampling. Sludge samples were collected in addition to drill core over intervals with low core recoveries.

Geochemical chip samples were collected from barren intervals.

The variability of drill core sampling was assessed by comparing analytical results from two corresponding halves of drill core. Relative differences did not exceed 12% and had no negative or positive bias.

RRK readings reportedly showed no correlation with drill core recovery at recoveries in excess of 70%. However, a comparison of results from 9 pairs of drill intercepts located in close proximity to each other showed that, on average, copper and zinc grades were higher at lower core recoveries, whilst lead grades were lower. No explanation was given.

Underground workings were sampled by cutting horizontal channels along both walls of crosscuts through mineralised intervals, alteration zones with disseminated pyrite and wall rocks adjoining sulphide mineralisation. Channel dimensions were generally 0.10x0.03x1.0m.

Drives through mineralised bodies were sampled by taking horizontal channels from faces exposed progressively at intervals ranging from 4-5m, as drives were being developed.

Drives through barren rocks were sampled at intervals of 17-23m

Channel samples were collected using either pneumatic hammers or rock cutting saw.

The channel sampling quality was monitored by taking control channel samples immediately above and adjoining the existing channels. In total 16.8% of channel samples were "duplicated" with such control samples. Average of relative paired differences between twinned channel samples did not exceed 7% for copper and zinc. Higher average relative paired differences were reported for lead: 5% for concentrations <0.5% Pb; 17.6% for 0.5-1% Pb and 13.2% for concentrations >1% Pb. These variations indicate an erratic distribution of galena, although the overall impact on the reserves is not significant since these last two grade classes combined do not exceed 9% of the total number of channel samples.

7.3.3.2 Sample Preparation

Two different sample preparation schemes were used during the exploration period. Both schemes were based on the Richard-Czeczott formula Q=kda, where Q is the minimum sample weight at a given stage of volume reduction, d is the diameter of the largest fragments defined as the screen size that retains the largest 5% of the mass, k is a coefficient dependent on the distribution irregularity of the mineral of interest and is a coefficient related to the roundness of mineral grains (generally approximately 2).

The coefficient k is the key parameter. In general terms, the lower the coefficient k is, the better it accounts for the erratic distribution of minerals.

All samples from the Shubinskiy exploration programmes were prepared at k=0.16. Samples were jaw crushed twice to pass a 2mm sieve size, reduced, ground in a roll grinder, sieved through a 1mm screen, reduced again and pulverised to 0.074mm nominal particle size. Pulverised analytical samples weighed approximately 300-350g.

During the first phase of the preliminary exploration (1955-1961), samples were prepared at the sample preparation facility of the Karelinska geological exploration party. During the second drilling campaign (1974-1975), samples were prepared at the Leninogorsk GRE laboratory. During the detailed exploration phase, samples were prepared at the laboratory of the Leninogorsk Processing Plant Complex (Kazzinc's predecessor).

7.3.3.3 Analyses and QA/QC

Prior to 1976 analytical work was performed by the chemical laboratory of Leninogorsk GRE and the Central Laboratory of PGO Vostkazgeologia. Leninogorsk GRE was the principal laboratory and conducted semi-quantitative analyses for 16 elements on drill core and geochemical samples and chemical analyses for copper, lead and zinc. Fire assaying for gold and silver were carried out by Leninogorsk GRE (up to 1964) and then by Vozkazgeologia. Phase analyses were conducted by Voskazgeologia and Leninogorsk Polymetallic Complex.

VNIItsvetmet performed external control analyses on routine samples analysed by Leninogorsk GRE and Youzhkazgeologia completed control analyses on samples analysed by Vostkazgeologia.

The chemical laboratory of Leninogorsk Polymetallic Complex served as the principal laboratory during the detailed exploration stage. Samples were initially submitted for semi- quantitative multi-element spectral analysts to screen out the samples for accurate analyses. Samples with spectral copper, lead and zinc exceeding 0.2% were then sent for chemical analysis for copper, lead and zinc and fire assaying. External control analyses were done by Vostkazgeologia.

Durnev et al (1989) also reported that earlier quality control results (for the periods 1954-1960 and 1973-1975) were audited by GKZ USSR and since the audit did not reveal any problems the analytical work completed during those periods was considered acceptable.

> ***WAI Comment:*** *Drilling methods, sampling and, sample preparation appear to be satisfactory although the core recoveries and linear/weight discrepancies give cause for concern; based on historical reports the QA/QC (internal and external control analyses) did not appear to reveal any significant random or systematic error.*

7.4 Mining

7.4.1 Introduction

Underground production began at Shubinskiy with trial mining in 1990/1991 and continued intermittently at low output rates for over six years. In 1999 the production exceeded 100,000t and has since risen to reach its full capacity of 200,000tpa in 2009. During the period 1992-2009, the mine produced 1.6 Mt of ore grading 0.66g/t Au, 17.9g/t Ag, 1.74% Cu, 0.28% Pb and 2.25% Zn. The mine is operated by TOO Shubinskiy, who had worked as Kazzinc's mining contractors prior to April 2009, and operates for 305 days on a 3 six hour shift basis.

Ore is extracted from the stopes on the 1-5 levels, it is loaded in rail wagons and hauled by electric locomotives to the hoisting shaft. The rail wagons are hoisted to surface in the cage and taken to a discharge point adjacent to the shaft. The ore is hauled by road trucks to the Ridder processing plant, where it is stockpiled for separate treatment.

The Shubinskiy ore is processed approximately once a month or when the other concentrator circuits are shut down for a day or longer to allow for the separate treatment of copper-zinc ores. Zinc, copper and gravity concentrates are produced.

7.4.2 Mine Design

The current mine layout consists of five underground levels connected by two vertical shafts located on the north-western and south-eastern flanks of the deposit. 1 level is at an elevation of 980m (at 75-100m depth). Level 2 is developed 50m below 1 level and 60m above 3 Level. Levels 3, 4 and 5 are 60m apart.

The key infrastructure consists of two surface shafts and five production haulage levels, as shown in Figure 7.6. The ventilation shaft is located to the south east and the main Shubinskiy ore-waste hoist shaft to the north-west. The Shubinskiy shaft is 319m deep and is used for personnel, equipment and ore and waste hoisting. The Shubinskiy Shaft adit is located at approximately +1035m elevation with the resources extending to 12 level, approximately 700 metres below the Shubinskiy Shaft adit. The extraction sequence for each level commences in the centre of each lode and extends top-down and towards the flanks.

The mine has been designed to extract ore to 5 level using the existing infrastructure and mining method. The ore below 5 level is to be accessed via a decline. Ore will hauled from the lower levels using 20t capacity trucks and delivered to the ore pass system on 4 and 5 level.

Kazzinc has stated that the current ventilation infrastructure and pumping capacity from 5 level to surface will be adequate for production below 5 level using a diesel truck fleet as no significant development infrastructure upgrade required.

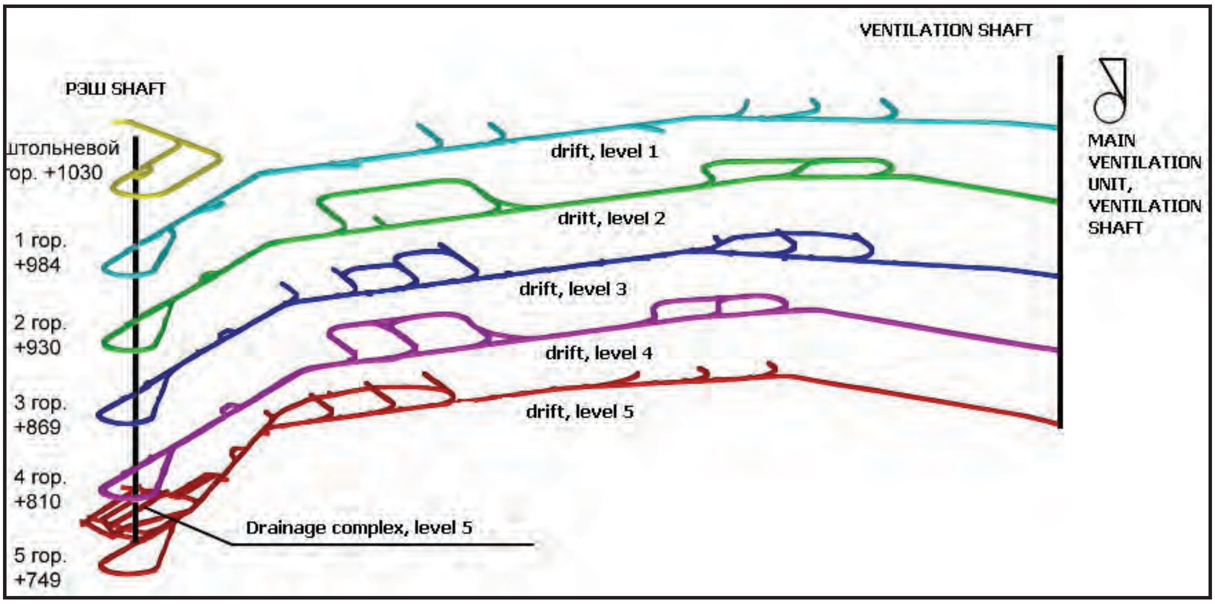


Figure 7.6: Schematic Underground Mine Layout

7.4.3 Mine Optimisation

The Shubinskiy mine uses a zinc equivalent (ZnEq) cut-off for the polymetallic orebodies. The ZnEq grade is calculated as Zn% + 0.4Pb% + 1.7Cu%.

Waste is termed as material with a grade less than 1.0% ZnEq, and although contains mineralisation grades less than 0.4% ZnEq cannot be treated by the current Kazzinc concentrator.

The cut-off grades are based on historic metal prices used for the 1989 TEO for the Shubinskiy project and are therefore unlikely to be optimal for 2010 costs, metal prices and process terms.

The mineralisation identified in the lower levels (south-eastern deposit) are insignificant and deemed to be uneconomical. Additional ore that is expected to extend the life of the mine will be sourced from the north-eastern lower levels of the Shubinskiy deposit.

7.4.4 Mining Reserve

The mining reserves currently used at the Shubinskiy mine site have been estimated using conventional Soviet methods. At present no Mineral Resources or Ore Reserves have been prepared for Shubinskiy in accordance with the guidelines of the JORC Code (2004).

7.4.5 Recovery and Losses

Kazzinc currently uses Chamber Stoping with Backfill as the mining method and proposes to use this same method for extracting the remaining mineable ore. The total primary and secondary losses are typically between 1% and 6%, with the overall average being 2.5%.

7.4.6 Production Schedule

During the period 1992-2009, the mine produced 1.6Mt of ore grading 0.66g/t Au, 17.9g/t Ag, 1.74% Cu, 0.28% Pb and 2.25% Zn as shown in Table 7.7. The Shubinskiy mine is expected to continue at a production rate of 190ktpa for another 12 years, finishing in 2022. The production for 2010 was planned to be 190kt at 0.28g/t Au, 11.02g/t Ag, 1.17% Cu, 0.16% Pb and 1.52% Zn.

In 2009, 7,810m^3 of development was achieved and 9,520m^3 is planned for 2010; in the stopes 20,704m of drilling was achieved in 2009 and 19,600m is expected in 2010.

Table 7.7: Mine Production

Year	Tonnes (kt)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
1992	8	0.88	25.00	2.50	0.13	3.75
1993						
1994	31	0.52	22.88	1.63	0.20	2.61
1995	68	0.83	15.18	0.93	0.23	0.92
1996	22	1.14	22.73	1.82	0.45	2.27
1997	2	0.77	30.68	3.50	0.38	3.16
1998	97	0.91	19.97	2.20	0.27	2.51
1999	89	0.81	28.42	2.62	0.44	3.83
2000	100	0.89	22.24	2.80	0.28	3.03
2001	103	0.75	21.47	2.75	0.28	3.47
2002	115	0.77	28.70	2.69	0.50	2.87
2003	94	0.64	18.94	2.13	0.30	3.20
2004	95	0.54	14.91	1.60	0.23	1.61
2005	94	0.53	16.64	1.48	0.29	2.00
2006	125	0.4	13.95	1.17	0.26	1.81
2007	184	0.46	13.97	0.93	0.24	1.63
2008	190	0.55	12.41	1.13	0.19	1.64
2009	200	0.73	14.17	1.41	0.24	1.77
Total	1,619	0.66	17.91	1.74	0.28	2.25

7.4.7 Geotechnical

The maximum mine output is expected to be 190ktpa, further exploration will permit a technical and economic evaluation for development and mining of the deposit below the 5 Level. The lower level material is not expected to increase the production rate but to extend the life of the mine.

The ores hardness coefficient ranges 10-13, host rock hardness coefficient ranges 8-12, internal wastes hardness coefficient ranges from 6-10. Therefore the stability rating of the ore and host rock is from 'average' to 'stable', as shown in Table 7.8. Localised areas of shale may be unstable, with a thickness from 3-5m, and are confined to the hanging wall.

The rock densities range from 2.5-2.8t/m^3, ore density depends on the degree of mineralisation and varies from 2.9-4.4t/m^3. The swell ratio is 1.48 for waste and 1.50 for ore.

The hydrogeological conditions of the deposit are characterized as ordinary. The predicted inflow of fracture water to 8 Level ranges from up 69-104m^3/h.

Table 7.8: Rock Stability Classification						
The stability category	The stability degree	The names of ores and rocks	The solidity factor by M.M. Protodiyakonov	The duration of the ores stable condition in mine workings	The rocks corruption intensity	The mine workings maintenance conditions
II	Stable	Massive pyritic copper-zink ore Copper-pyritic ore Quartz albitophyres Quartzits	11-15 10-15 8-10 10	Up to 6 month	Sloughing occurs only at the particular areas The structural weakening factor 0.4-0.6	With the long duration condition demands reinforcing in particular places. Acceptable baring.
III	Moderately stable	Siliceous siltstones	5-8		Local and separate corruptions with depth up to 1 meter. The structural weakening factor 0/3-0/4	Demands reinforcing. Fastenings heaving off the boreholes is acceptable up to 100 m^2
IV	Unstable	Sericite-quartz, chlorite-sericite-quartz slates	3-5	Up to one day and night	The corruption spreads to the major portion of the workings contour and develops more than to 1 meter. The structuring weakening factor 1.2-0.3	The reinforcing is demanded along with the roadheading. Barings are acceptable not more than to $10m^2$
V	Very unstable	Chlorite-sericite-quartz rocks and slates in the zones of fractures. Intensively dragfolded.	1-2	Corrupts following the roadheading	Significant rock masses begins to move. The structuring weakening factor 0.2	Advanced strengthening or strengthening close to the bottom hole is demanded. The roadheading without strengthening is excluded.

7.4.8 Mining Method

The mining method is chamber mining with backfill and is used down to 5 Level. It employs conventional handheld pneumatic machine drift development and stope production drilling, electric scraper mucking and electric locomotive haulage. Drifting is carried out with handheld portable rock drills using compressed air. In the stoping operations, the ore from the drifts and stopes is mucked using scraper winches.

The chamber mining (with backfill) method is also known as sublevel open stoping with classified cemented tailings backfill. The extraction sequence is top-down (under hand), working from the centre of each lode to the strike flanks. The sequencing of the stopes is dependent on extracting the primary stopes first and backfilling them prior to extracting the secondary stopes. All stopes are backfilled to avoid damage to stoping areas on adjacent working levels.

The stope dimensions are typically 60x15x20m with the average stope producing 25kt and extracted as a continuous panel sequence along strike. Given the equipment currently utilised the minimum mining width within scraper stopes is typically 1.2-1.8m. The level spacing is 60m with 20m sublevels.

The mining method below 5 Level is proposed to be mechanised with ramp development access to the levels and sublevels. It will employ mechanised development, semi-mechanised production drilling, diesel loaders and diesel trucks.

The rock handling management appears to be appropriate without material losses (spillage) or dilution. The waste produced from the development below 5 level will need to be management carefully to prevent cross-tramming issues.

> ***WAI Comment:*** *WAI believes that the mining method is technically sound and cost effective for the geometry of the orebody.*

7.4.8.1 Drilling and Blasting

Handheld pneumatic drills are used for drilling the mine development with blastholes usually 38mm in diameter. The main explosives are Granulite A6 primed with a small diameter (32mm) cartridge (Ammonal, ammonite, powergel) in dry holes. In wet holes, packaged explosives are used. Blasting operations are performed using nonelectric blasting agents.

Pneumatic handheld production drills capable of drilling 110mm and 130mm diameter holes up to 20m in length are used in the stopes. The explosives used in stoping are similar to development, except that larger diameter cartridges are loaded into the holes.

> ***WAI Comment:*** *Shubinskiy is susceptible to sulphide dust explosions due to the nature of the ore. Precautions taken during blasting, involve washing of walls and use of inert material in the charging column to retard the blast flame, all which is acceptable and standard practice for most mines with this type of ore.*

7.4.8.2 Loading and Hauling

Ore is mucked in the stopes along the production drive using wire rope scrapers. The ore is scraped to and drops into timber boxholes (ore chute) which load directly into rail wagons. The scraper winches are rated at 17kW, 30kW and 55kW and are capable of moving ore up a scraping distance to 60m.

Rail wagons are used to deliver ore from the stopes to the Shubinskiy hoist shaft. The wagons have a capacity of 4-7t, 7 wagons make up a train which is hauled to the shaft by the electric locomotives.

The loaded rail wagons are hoisted to the surface via the shaft cage (with typically 210 wagon loads per day each way). The cars are individually hauled to the Shubinskiy adit where they are tipped and the ore is discharged onto a run of mine stockpile.

From there, the empty rail car is returned underground. The ore on the surface stockpile is loaded and hauled to the Ridder process plant by road trucks.

7.4.8.3 Mining Fleet

Table 7.9 below summarises the current mining fleet at Shubinskiy.

Table 7.9: Mining Equipment Fleet	
Model	**Quantity, pcs.**
LPS-3U Drill Rig	6
PT-48A Handheld Drill Rig	8
PP-54B2 Handheld Drill Rig	11
ЗП-2 Charging Machine	2
БП Concrete Mixing Machine	1
СП-8 Manual Pneumatic Drill Rig	4
Ulba-150I Mixing and Pumping Machine	1
ShVA-710 Secondary Scraper Winch	4
ShVA-18000 Secondary Scraper Winch	5
PPN-1 Pneumatic Loader	1
PKU Universal Bucket Loader	1
Injectors	7
TORO -151 LHD	1
30LS 2CM Scraper Winch	4
55LS 2CM Scraper Winch	7
17LS 2CM Scraper Winch	4
K-10M Electric Locomotives	6
VG-2,2 Railway Car	55
UVB-1,7 Railway Car	15
Diamec 232 Exploration Drill Rig	4

7.4.8.4 Backfilling

All of the stopes at Shubinskiy mine are backfilled. Tailings from the Talovskoye tailings dam are used as a stope backfill material. The surface trucks delivering ore to the Ridder processing plant bring the tailings back to Shubinskiy mine site on the return journey. In 2009, the backfill plant sent 41,450m^3 underground and it has been scheduled to place 76,000m^3 of backfill in 2010.

The backfilling strategy is to fill the primary stopes with cemented backfill. The cement content ranges from 6.1-8.7% depending on the location of the fill. The higher percentage cemented fill is placed in the bottom of the stope, creating a 5m thick sill pillar, as a higher weight bearing capacity is required. As the primary stope is filled, the percentage of cement is reduced.

The cemented backfill is left for 9 months before the stopes on other levels or the secondary stopes located nearby can be extracted. The secondary stopes are also backfilled but the only cemented fill used is to create the 5m sill pillar at the base; the remainder of the stope is filled with hydraulic or uncemented backfill.

The normal blasting practice when removing ore adjacent to backfill is to drill the blast holes 1m short of the backfill contact. This will prevent blast damage to the backfill surface and keep grade dilution to a minimum.

7.4.9 Dewatering

During 1985-1989, the total water inflow rate was 50m^3/h and the maximum water inflow rate reached 77.5m^3/h. Approximately 7-24% of this water was used for processing. In 1999-2000 the total water inflow reached 31-46m^3/h and 60% of this water, approximately 18m^3/h, was used for process water.

The present pumping station is situated on 5 level adjacent to the mine shaft and is equipped with three pumps with the capacity to move water back to the surface. Mine water is collected in the water channel located in the main drive on all working levels. It flows towards the shaft and down to 5 level via drainage holes where it is collected in an underground sump with a capacity of 3,042m^3 and is then pumped to the surface treatment facilities.

The anticipated water inflow when the mine reaches 9 Level will be 69-142m^3/h and will need to be studied carefully to ensure that dewatering can occur efficiently. A dewatering complex is planned on 7 or 8 Level for pumping of mine water to the surface and capable of dealing with a maximum water inflow of 150m^3/h.

7.4.10 Future Development

It is intended that mining below 5 level will be via a decline which will be developed using electric over hydraulic jumbo drill rigs and the broken material will be mucked by diesel load haul dump (LHD) loaders. The material will be loaded into 20t capacity trucks and hauled back to 5 level and stockpiled on the level. This material is then loaded into the rail wagons, transported to the Shubinskiy shaft and hoisted to surface.

Kazzinc has stated that the current ventilation infrastructure from 5 level to surface and the pumping capacity will be adequate for production below 5 level using a rubber tyred mining fleet.

The rubber tyred mining production fleet indicated by Kazzinc will typically consist of:

- Twin boom electric-hydraulic jumbos development drills, excavating heading sizes typically 12m^2;
- Electric hydraulic production drills capable of drilling 102mm diameter holes to a length of at least 30m;
- Diesel LHDs with a bucket capacity of 3m^3 with remote control capability; and
- Diesel underground trucks with a capacity of 20t.

7.5 Infrastructure

7.5.1 Introduction

The Shubinskiy mine infrastructure consists of the mine offices, workshop, backfill plant, compressor house, warehouse and stores which are located adjacent to one another. Other facilities on the mine site include the surface ventilation, boiler house, and the ore handler system.

7.5.2 Offices

The mine offices are located adjacent to the Shubinskiy shaft. These buildings provide office space for the senior management, financial, human resources, mining, geology, surveying, I.T. and engineering.

7.5.3 Maintenance Workshop

The workshop is divided into several sections depending on the size of the vehicle/equipment to be serviced or repaired, from light vehicles and buses to heavy plant equipment.

7.5.4 Warehouse and Stores

The warehouse and stores area is occupied by the purchasing and stores departments where the management, issuing and distribution of materials and parts around the mine site take place.

7.5.5 Ore Loading Facility

Ore hoisted to the surface is dumped on a stockpile adjacent to the surface adit before being loaded onto road trucks and hauled to the Ridder processing plant.

7.5.6 Ventilation

The Shubinskiy ventilation is an exhaust system with the primary (VPC-16) fan mounted at the top of the ventilation shaft. The mine workings and primary ventilation complex were inspected in April 2000 by

Kazennoe enterprise "*Paramilitary mine-rescuing crew of the Leninogorsk*". The results were documented in the "Mine workings ventilation and primary ventilation complex functioning of the Shubinskiy deposit observation report", April 2000.

The results showed that:

- The fan productivity was 25.4m^3/s;
- The total fan pressure was 90.4kg/m^2; and
- The total resistance was 0.14.

The characteristics of the ventilation and mine network displayed in the report showed that the fan was operating inefficiently. This was because of the oxidation in the mine workings where more ventilation is required to flush the low oxygen zones. The actual efficiency of the fan suggests that the air flow is 24.9m^3/s with the pressure of 88.0kg/m^2.

During the cold season air is preheated by an air heater (surface area 68.01m^2) mounted jointly with a VC-11 fan which provides the preheated air to the adit through metal ducting.

When mine development is taking place, or the stoping blocks are being prepared, ventilation is reversed. The reversing of the air flow is performed by adjusting the blades in the fan which are controlled remotely.

The estimated air required for ventilation is 49.96m^3/s, which is currently above capacity and the necessary air will need to be replaced with either:

- the VPC-16 fan working simultaneously with the VM-12 fan; or
- two VM-12 fans working together.

The second option of two VM-12 fans working together is the preferred option as the expected airflow is 45.6m^3/s with the pressure of 291.1kg/m^2.

The development of the mine below 5 Level will require the installation of an underground VME-12 type air fan on 5 Level for the ventilation of the decline whilst being driven. An existing main fan unit (VOD – 21) with the capacity of 120m^3/s will provide the required fresh air volume, and its distribution in the ventilation system of the mine, when extraction of ore from the lower levels commences.

7.5.7 Backfill Plant

The backfill plant which is located on the mine surface includes:

- Cement silos;
- Tailing stockpile bunker;
- Tailings preparation; and
- Mixing facility.

The inert aggregate or tailings are delivered to the plant by road trucks from the tailing dam. The tailings are tipped into a receiving bunker and fed into the tailings preparation process by a winch and wire rope scraper.

From the receiving bunker, the tailings are dropped onto a conveyor through a grizzley to remove any mine rubbish. It then passes over a vibrating screen to remove the oversize material greater than 30mm. The oversize material is sent to a dump and the undersized aggregate is delivered by another conveyor into the mixer.

Cement is delivered to the backfill plant by bulk-cement transport units and unloaded into the two cement silos (60t each). After that the cement is delivered to an active cement storage silo with a capacity of 7t and into the cement batch type mixer with the tailings. Water is added and then the components agitated.

The finished backfill mixture is delivered to the well which is connected to 1 Level with a 108mm diameter pipe and then transported to the stopes by 159mm diameter pipelines. The pipeline is washed out with water from 5m^3 special tanks to ensure the pipeline is clear of blockages as soon as the batch of backfill has been placed.

> ***WAI Comment:*** *The condition of the walkways, ladder and access ways within the backfill plant facilities were not up to modern European standards.*

7.5.8 Power Supply

The current power supply to the Shubinskiy mine is from two 6kW power lines connected to the Talovka power substation (distance 8.5km). In order to maintain power supply to the Shubinskiy mine, at increased ore output, it will be necessary to overhaul the power lines by replacing the wood poles with ferroconcrete ones. In the longer term it may be necessary to install two more 6kW power lines to ensure supply to deeper levels in the mine.

Also it will be necessary to increase the cross section of the wires to 240mm^2 by using two AC-120 power lines which will prevent the danger of voltage drop on the lines.

The electricity receivers have a rated power capacity of 4,750kW (including 1,930kW by 0.4kW). The electricity consumption is 5,000 – 5,400MW/h/year. The increase in productivity will increase to 110kW at the mine, boiler to 120kW, the crushing to 450kW and 200kW for the other consumers (total 880kw), and the approximate rated power capacity will be 5,630kW (including 2,520KW by 0.4kW). The approximate annual power supply will be 6,800MWh/h. The average load current is expected to be 120-140A whilst the maximum load current is expected to 280A.

7.5.9 Water Supply

The water supply to the underground mining workings is delivered by a 100mm diameter pipeline, which runs down the Shubinskiy shaft and into hydro-reducers on each level.

> ***WAI Comment:*** *WAI assumes that the water is supplied from a fresh water dam located near to the site or a central dam for the Ridder mines.*

7.5.10 Air Supply

The compressor station consists of 3 compressors; 6VV-30/8, 305VP-30/8 and 2VM-10-63/9, with an efficiency per unit of 58m^3/min. A 250mm diameter compressed air pipeline runs down the Shubinskiy shaft, and divides into each level.

One of the compressors (2VM-10-63/9) needs a major overhaul to achieve its maximum efficiency and the out-of-date compressors (6VV-30/8 and 305VP-30/8) are to be replaced with two new (ZT 250-10-50) compressors that each have a capacity of 36m^3/min each.

The total efficiency of the compressor station unit must not be less than 135m^3/min.

7.5.11 Heat Supply

The JSC Energotsvetmet production boilers have the maximum efficiency of 1.3Gcal/h. In order to provide the underground workings with heated air at a flow rate of 22.8m^3/s, a heating load of 1.65 Gcal/hour is needed. This means that with the boiler temperature chart showing 95/70°C, the net water consumption is about 66t/h.

As the mine gets deeper it will be necessary to reduce the net water consumption and still provide the mine with heat energy. The temperature chart of 150/70°C will be required which will reduce the net water consumption to 21.5t/h.

The most appropriate boiler will be a KV-TC-4-150 with a maximum efficiency of 4Gcal/h, coal consumption of 2000t/year. As a result of installing a new heat system some of the heating network may need to be changed to ensure the efficient distribution of heat.

7.6 Environmental

7.6.1 Environmental & Social Setting and Context

7.6.1.1 Landscape, Topography

The Shubinskiy Mine area is a predominantly gentle undulating topography with hills varying from 650m to 1,000m in height, situated in the Lenningorskoye valley on the northern side of the Shubin and Martyn Klutch brook which converge to from the Fillipovka River in the Ulba valley. Both brooks pass in close proximity to the mine, flowing south. The Martyn Klutch brook is used by the mine for water discharge purposes.

The region is seismically active with earthquakes up to 4 on the Richter scale being reported in the Ridder area in the last 10 years.

The air quality in the Shubinskiy Mine area is considered to be good and there are no other industrial outlets in the locality. Soil horizons are expected to be thin and lacking in fertile topsoil – no information of soil characteristics has been provided. Flora is defined by several landscape zones, affected by site geography, altitude and terrain. There are numerous trees and grass species, in a mosaic habitat, with coniferous species predominantly found at higher altitudes and pine and mixed forest, including birch found in the lower foothills. There are flat areas of scrubby grassland, with species abundance being somewhat limited by climatic conditions. 94 bird species are reported in the area, the majority being non-migratory, and 90 animal species, including bear, mink, deer, wild cats and numerous rodent species. Two of the bird species are reported to be rare raptors (birds of prey).

7.6.1.2 Land Use and Land Cover

The deposit was first discovered in 1846, mined for some years and later abandoned. In 1954-1960 preliminary shallow exploration re-commenced with deeper exploration undertaken in 1973-1975 and mine development 1976-1989. At this time it was State owned and operated.

It is a polymetallic deposit primarily zinc with a secondary copper and some lesser minerals. Approximately 190ktpa of ore is produced. No processing of ore takes place at Shubinskiy Mine, it is all sent to Ridder, road transport provided by Kazzinc logistics.

The site has several occupied buildings mostly constructed in 1970s, these are discussed in section 7.7.1.5 below. A series of hardcore roads are linking the infrastructure at site.

7.6.1.3 Water Resources

Underground water from fractures, rock and ore contacts, veins and fracture veins enter the mine workings at horizons of 62m and 150-200m. Clay (25m thick) beneath the Martyn Klutch brook prevents in-flow of water. Water losses from the Martyn Kluch are not recorded to confirm this assumption. The cone of water depression is 1.1km^2.

A water abstraction point is located on the Martyn Klutch brook, upstream of the mine. These water supplies the domestic water for the site. All water used by the batching plant is sourced from the compressor house. Water balance calculations were presented for 2009 and 2010, these are updated annually.

Hydrogeological assessment of the mining operation was conducted as a special assessment during the reserve estimation and mine design phase. The hydrogeological processes are continually assessed by the Ridder mining complex geological department.

7.6.1.4 Communities and Livelihoods

The nearest habitation is 21km from site, with the main workforce living in Ridder.

7.6.1.5 Infrastructure & Communications

Neutralisation Plant

A neutralization process plant to treat mine water was constructed in c1970s and upgraded in 2006-2007 (expansion of settlers and reagent section, repair of the settlers and buildings).

The mine water treatment is undertaken in one stage only, however water is collected below ground in a single tank and pumped to surface at a rate of 900m^3/day. A single concrete tank with 3 wooden segregation filtration boards installed is on a slight gradient so the water flows very gently through; this is a continuous process, with the retention time being approximately 5 days. The filtration boards are cleaned once a year, the waste sludge from the process is taken to the dumps, or used to fill the subsidence area, or to backfill the mine.

Following treatment the water flows by gravity to the Martyn Klutch brook for discharge. Monitoring is carried out on the brook both upstream and downstream of the discharge points and quality control results were presented to WAI (September and October 2010) respectively and all results were found to be acceptable.

Concrete corrosion assessment is performed annually, and repairs are planned and carried out based on the corrosion monitoring results.

Batching Plant

Quality Control testing of the mixture is undertaken every 1000m3 of backfill. Testing of the backfill cement after deposition is undertaken at 7 and 28 days using core sampling and sent to the Geotechnical laboratory at Ridder. Following the initial testing, inclined drilling of the chamber is undertaken after 3 months using a radial configuration; these cores are recovered and tested every metre. If settlement has occurred a further injection of backfill cement is carried out to ensure the chamber is completely full.

Ventilation Shafts

Emissions control is performed by the State Mine Technical Department once per quarter.

Pump House

A pump house located at the north of the site, is used for water extraction from the Martyn Klutch brook, and is in the process of being replaced with another building and pump installation.

Surface Water Channel

A surface run-off channel system has been constructed across the site. Debris is cleaned from the channel and concrete damage is repaired as routine maintenance, and it was evident that this is done. The water channel goes to the neutralization plant for treatment before being discharged into the Martyn Klutch brook. Monitoring of the brook in channels is undertaken at 2 intermediate points and at this outlet point.

7.6.2 Project Status, Activities, Effects, Releases & Controls

7.6.2.1 Project Description & Activities

Potential soil contamination could arise via runoff from temporary stockpile and dumps, deposition of contaminated dusts, oil/grease spills, and emergency situations such as chemical spill or containment breach.

Although there is no liability by Kazzinc with regard to the waste dumps on site, leached water from these may enter the water course and cause contamination which may impact on the general environment of the site. In 1995 Russian Institute GidroTsvetMet studied leaching of contaminants with drainage waters coming from the mine stockpiles. Kazzinc's response was to cover the stockpile owned by the State with a water resistant film to protect it from atmospheric precipitation.

In 2004, when the mine was transferred to Kazzinc (as Shubinskiy Ltd), in order to assess the mine's environmental condition an audit was carried out in co-operation with the State environmental authorities and in accordance with national legislation. The degree of site contamination, and division of responsibility between Kazzinc and the State, was documented by the relevant Certificate.

7.6.2.2 Land Ownership and Tenure

Kazzinc holds the tenure rights to mine polymetallic ores from Shubinskiy deposit, held in the name of TOO Shubinskiy.

The Company is required to have environmental insurance, to cover environmental damage up to a maximum value of 22,032,000 Tenge (US$146,880).

> ***WAI Comment:*** *WAI has viewed the mine licence and permit and considers that these have been obtained in line with State requirements. It is understood that the future expansion of mining activity would not necessitate relocation of communities within the current licence boundary. The nearest residential dwelling to the mine is 21km. The environmental insurance coverage is assessed on a site specific basis to ensure that liabilities have been identified and characterised and that adequate insurance cover is in place.*

7.6.2.3 Mine Wastes – Rock

A historic waste rock dump is located on the site, this is believed to date back to the 1970's and as such is not the responsibility of Kazzinc. Adjacent to this is a concrete-base temporary storage house for ore rock, awaiting transportation to Ridder.

A surface water run-off channel surrounds both the waste dump and the ore stockpile; this channel is constructed of concrete and installed to a depth of 0.3m ground surface. This channel forms part of a larger surface water collection system on site.

> ***WAI Comment:*** *Based on the audit report performed at acquisition, and subsequent studies, the Company decided to cover the dump with an HDPE liner. The dump appears to be well contained although the liner had slipped downwards. The Company considers that environmental liabilities have been adequately identified, and the chemical composition, Acid Rock Drainage (ARD) and leaching potential of this material was characterised.*

Run-off from the ore stockpile is collected within a concrete vessel and flows via the surface water channel to the neutralisation plant. Water from the channel is tested at 2 intermediate points and following treatment discharged into the Martyn Klutch brook.

7.6.2.4 Mine Wastes

Mine wastes are classified and stockpiled on assigned areas for disposal, or used for backfilling as required.

7.6.2.5 Water Management & Effluents

There are two discharge points to the Martyn Klutch brook from within the mining licence area. Discharges to surface waters are permitted in accordance with national legislative requirements.

Water is pumped from a point source close to the Martyn Klutch brook, permit No 03-YK-136/08 issued 19 December 2009 valid until 31 December 2012, and issued by the Water Resource committee.

7.6.2.6 Emissions to Air

Air quality is monitored at ventiliation shafts and the batching plant which are the main sources of emissions.

7.6.2.7 Waste Management – General

A subsidence zone has developed in the northern part of the site, and has been utilised as a landfill for general site waste.

Sewage and domestic waste water is collected on site and stored in two septic tanks, the tanks are serviced/emptied by an outside contractor twice yearly.

Waste oil and greases are taken to Ridder testing laboratory for analysis. Each batch is tested twice and on these results the oils are either sent for recycling or disposal at a State landfill. Oily and greasy rags are collected on designated reciprocals and burnt on site in the landfill area and contaminated overalls are also either burnt or sent to a commercial laundry for washing. Waste tyres are sold to a third party for recycling and scrap metal from the vehicle workshops and mine is collected and stored close to the vehicle maintenance area and taken off site by a third party contractor.

> ***WAI Comment:*** *There is a reasonably efficient waste management system in place, whereby waste is sorted for either recycling or disposal in the subsidence zone.*

7.6.2.8 Hazardous Materials Storage & Handling

Explosives are delivered by road to an explosives magazine at a remote part of the site. From here the explosives required for underground use are transported in sealed containers and lowered in by shaft to the underground storage area prior to use.

Main contracts specify the lines of responsibility, and an additional contract 'Safety Ageement' is awarded to specify environmental liabilities during the contractual work.

It was noted that spillage/cleanup protocols and spill kits were available in the vehicle maintenance plant areas for oil spills. In addition, it was demonstrated and checked that the spill kits were adequately stocked and that staff were fully conversant with the procedures for spills.

> ***WAI Comment:*** *WAI considers that in general, storage areas are appropriate and well maintained, although some of the buildings do require some upgrading maintenance.*

7.6.2.9 General Housekeeping

Generally the housekeeping of Shubinskiy Mine is very good, with most open areas and operational buildings being maintained in a tidy and orderly manner.

7.6.2.10 Fire Safety

A fire protection plan has been developed for Shubinskiy Mine; this would appear to be very comprehensive for both above and below ground facilities.

All staff and contractors are given training in fire safety procedures, advised of emergency evacuation routes and fire fighting protocols, as part of the mine site induction programme. A designated person in each area is responsible for inspection and maintenance of fire extinguishers. Fire drills are scheduled to be undertaken twice a year. The State mine rescue team, located in Ridder is responsible for underground fire management.

> ***WAI Comment:*** *The fire management systems appear appropriate to the size of the operations, and WAI considers that these issues are being well managed by the health and safety team. WAI understands that Kazzinc intends to introduce more drill training systems, and recommends that this should be implemented as a priority.*

7.6.2.11 Security

Security of the Shubinskiy mine is provided by Group 4 Security (G4S), a leading international firm, with much experience with mine sites.

7.6.3 Permitting

7.6.3.1 OVOS

An OVOS has been produced for Shubinskiy Mine, endorsed by an "expert" opinion of the State approved with the State Environmental Inspection. In 2007 Shubinskiy Ltd. OVOS (ESIA) was adjusted and approved with the State Environmental Inspection.

7.6.3.2 Environmental Permits

The environmental emissions permit, prepared by Kazzinc and agreed with the Ministry of Environmental Conservation (RK), has been granted to the Shubinskiy Mine. This permit regulates water and air emissions at Shubinskiy and regulates the volume, location and toxic elements of such emissions. The permit is renewable every year (permit No 0054698) and the requirements for the whole complex in 2010 are as follows:

- Emmissions to air 6,381317t
- Discharge to water 177,869t

7.6.4 Environmental Management

Details of Kazzinc's environmental policy and company approach and environmental management staff & resources are specified elsewhere. There are no specific additional initiatives implemented for Shubinskiy Mine separate to the company plan.

7.6.4.1 Systems and Work Procedures

The Environmental Monitoring Programme has been agreed and endorsed by the Ministry of Environmental Protection Republic of Kazakhstan (MoE RK) and is renewable each year.

The monitoring plan includes information on location of sampling, frequency and determinants' for groundwater, surface water, discharge points, snow, air, dust and soils.

7.6.4.2 Environmental Monitoring, Compliance & Reporting

Surface water is sampled at two locations upstream/downstream from the Martyn Klutch brook and 5km downstream the mine. Samples are collected monthly. Maximum Allowable Discharge from the mine site is set out in accordance with the State Law and specified in the environmental permit.

Two monitored discharge points are sampled monthly for pH, copper, iron, lead, zinc, cadmium, manganese, ammonium salts, nitrate, and nitrite. At the neutralisation treatment facility, the pH of the neutralised minewater and metals is monitored on a daily basis.

Air is monitored at 3 locations at the batching plant, for flow, temperature on exit, speed, volume, and particles using the fabric from the filter (this is reportedly 97% efficient). Air is also monitored in the shafts.

A working level of 80dB is permitted, and where this is exceeded, Personal Protective Equipment (PPE) is provided, or mechanical improvements are made.

No soils testing are currently undertaken at site, since according to the monitoring program approved with the State environmental authorities such tests are not required.

Radioactivity is not monitored at site since no excess background radiation levels or potential radiation sources (equipment, materials, etc.) were found at the time of OVOS development.

Water monitoring reports are prepared each month and submitted on a quarterly basis to the Ministry of Environmental Protection with a full report annually. Furthermore, annual State environmental inspections are conducted to assess compliance and environmental management practices. Compliance at Shubinskiy is reported to be acceptable.

> ***WAI Comment:*** *The scope of the environmental monitoring programme has been developed in line with national legislative requirements. The Kazzinc Environmental Managers, Laboratories and third party specialists are aware of compliance requirements and analytical and sampling methodologies required to assess these. WAI therefore considers that the monitoring programmes are fully compliant with national standards. However WAI considers there is an insufficient number of groundwater sampling points.*
>
> *WAI appreciates that the history of mining in the area has already resulted in previously disturbed and depleted soil formations, but consideration should be given to developing a monitoring plan. The mine closure plan will contain an assessment of soil contamination levels, which will inform technical decisions for closure.*

7.6.4.3 Emergency Preparedness & Response

A total of 15 Emergency Preparedness and Response Plans covering various possible scenarios has been developed. These outline responsibilities, actions and reporting requirements should an incident occur. However, these plans have not been tested via any actual drills.

> ***WAI Comment:*** *The plans are comprehensive, and appear adequate, but testing via drills should be implemented.*

7.6.4.4 Training

There are no specific additional initiatives implemented by Shubinskiy Mine separate to Kazzinc company plan.

7.6.5 Social and Community Management

There are no specific additional initiatives implemented by Shubinskiy Mine separate to Kazzinc's company plan.

7.6.6 Health & Safety

7.6.6.1 Health & Safety Management Arrangements

Shubinskiy Mine has a H&S Manager who is responsible for the H&S of both above and below ground operations. A total of 34 ''Safe Work Procedures' are in existence covering each aspect of work undertaken at the mine. All safe work procedures are on a 3 year rolling programme for review and updating by the H&S Manager or designated H&S team member. The H&S Manager has a team of 3 inspectors per shift which cover both above and underground works. The Company is also accredited for H&S management under the OHSAS 18001 scheme.

Visitors to the site are given an H&S induction, and provided with appropriate Personal Protective Equipment (PPE). Prior to anyone commencing work at the mine (employee or subcontractor) H&S training and an H&S induction pack is given. After induction, further training relating to specific working areas is also given, and refresher training in undertaken on a regular basis.

The environmental training covers issues such as dealing with spills, waste management, water and power consumption and how to manage and minimise environmental risks. Managers also receive training every 3 years from State authorities.

The Company also has a special clinic in Ridder where all employees receive annual medical checks. The Company has a contract with the State ambulance provider and the nearest hospital with an Accident and Emergency (A&E) department is in Ridder. Spot tests for drugs and alcohol are also performed.

> ***WAI Comment:*** *WAI considers that health and safety is very well managed at the site, with appropriate training being provided, and good response systems in place for personnel. PPE was worn in all areas to some degree, however it was noted that some staff did not have hi-vis PPE on or hard hats.*
>
> *In general the H&S managers and their teams are proactive in their management of H&S issues, both with regard to national and international requirements. WAI would recommend implementing drills to test Emergency Response Plans, to assess their adequacy.*

7.6.6.2 Performance and Accident Records

Shubinskiy Mine generally has a good safety health and safety record with no significant incidents occurring in the last few years. Accident logs are maintained, and in the event of an accident a full inspection and investigation, with remedial action, takes place. Daily informal inspections are performed, and there are also annual inspections from various State departments including: Sanitary Epidemiological, Police, Safety and Emergency Response units. Formal internal inspections are performed three times per year.

> ***WAI Comment:*** *WAI considers that appropriate record keeping and improvement procedures are in place to deal with incidents. Overall the safety records are considered good, and all personnel seem committed to improving safety management.*

7.6.7 Mine Closure & Rehabilitation

Shubinskiy Mine initial estimate of potential closures costs was made as 131,000,000 Tenge, and this sum of money was deposited in a protected Company fund. Typical closure measures include demolition of surface structures, stripping of utilities, and stabilisation of mining related features, earthworks and re-vegetation.

It is reported that standard post-closure monitoring includes: rivers and groundwater, minewater, dust, soils, flora and fauna. It is also reported that post-closure aftercare is likely to include the continuation of minewater treatment and pumping. At Shubinskiy Mine this is envisaged for 10 years before the workings are allowed to flood and groundwater rebound occurs. It is reported that the closure fund will periodically be updated during the mine life, with a final detailed closure plan to be prepared 2 years before actual closure, in line with State requirements.

> ***WAI Comment:*** *Pursuant to subsoil use & mining Contract a closure plan will be undertaken in 2012. It is important to ensure that the Mine Closure and Rehabilitation Plan (MCRP) includes all environmental and social aspects, including post closure monitoring, and that the supporting closure fund is adequate to provision for this, including in the event of unplanned closure.*
>
> *The closure fund should be based on site specific closure requirements and should include provision for post closure monitoring and treatment. The proposed figure should be reassessed once all site liabilities and ongoing treatment requirements have been fully investigated.*

7.6.8 Conclusions

7.6.8.1 Environmental and Social Liabilities & Risks

Potential soil contamination could arise via runoff from temporary stockpiles and dumps, deposition of contaminated dusts, oil/grease spills, and emergency situations, such as a chemical spill or containment breach.

Kazzinc has acquired a number of historic mining features at Shubinskiy mine for which the liability remains with the State. When acquiring the deposit, the representatives of the State authorities and Kazzinc drew up the Mine Environmental Condition Certificate. It is recommended that Kazzinc undertake a detailed baseline assessment of current environmental liabilities and prepare measurable benchmarks during the mine closure plan development.

Historical voids have been recorded by underground surveys and measures have been taken to prevent collapse due to lack of backfilling. In the event of claims with regard to subsidence, attributable to historic workings, the liabilities are stipulated by national legislation.

7.6.8.2 Compliance with Local and International Standards and Expectations

WAI considers that Company environmental management and monitoring is performed in line with national requirements, and Kazzinc has achieved accreditation under international environmental, quality and health and safety management systems. Development of the systems is annually audited by international certification authorities and a sustainable improvement is observed.
The environmental expenditure budget is linked to corporate priorities and should include appropriate levels of contingency.

Health and safety is generally well managed, and site security is good, but does require a more proactive approach for visitors to site.

The existing closure plan and budget estimate is not considered sufficient to cover current international requirements or post closure monitoring and treatment obligations. The need for and duration of post closure minewater treatment and rehabilitation of State owned facilities should be clarified.

7.6.8.3 Recommendations for ESAP

In general all the areas visited at Shubinskiy Mine were well managed and appeared to operate efficiently. Environmental management is good with monitoring being undertaken regularly which appears to be appropriate to control migration of contaminates. However, specific recommendations include:

- Batching Plant: Develop a programme of dust monitoring;
- Waste Disposal and Management: Investigate run-off from mine roads constructed with waste rock; and
- Subsidence Zone: Develop a structured approach to landfilling.

8 DOLINNOE AND OBRUCHEVSKOE DEPOSITS

8.1 Introduction

Development of the Dolinnoe and Obruchevskoe deposits, situated immediately east of Ridder, is planned. With depleting reserves at Ridder-Sokolniy (15 years production remaining), Tishinskiy (9 years) and the re-processing of low grade tailing dumps; it is evident that increasing the reserve base with primary ore is essential. The former deposit consists of two lodes referred to as 'North-Eastern' and 'South-Western' and the latter comprises 'Northern' and 'Southern' lodes and a 'Central Prospect' interpreted from relatively widely spaced drilling.

8.1.1 Location & Access

The Dolinnoe and Obruchevskoe deposits, included administratively within the city of Ridder, are located 7.5 and 11km respectively from Ridder (nearest railhead), 2.5km from the outer limit of the town, and are readily accessible from a graded gravel road that links Ridder with Biysk in the Russian Federation. The Dolinnoe deposit occurs 4550m below the Bystrushinskoe reservoir, see Photo 8.1.

Photo 8.1: Dolinnoe and Obruchevskoe – Location Adjacent to Ridder

8.1.2 Topography and Climate

The Dolinnoe deposit is situated at depths between 450-650m below the Bystrukha River valley, which flows into the Bystrushinskoe reservoir, and a significant part of the area is marshy. Elevations vary between 840-860m, increasing to 910m in the northwest.

The Obruchevskoe deposit is situated at a depth of 800-1,000m on a gentle northern slope at the foot of the Ivanovskiy Ridge, on the southern side of the Bystrukha river.

Ground elevations above the Baltic Sea datum range from about 930m on the northern side to 1,100-1,150m on the southern side. The terrain is dissected by shallow boggy valleys of streams flowing into the Bystruha river. Surface formations comprise moraine, alluvial and deluvial deposits ranging in thickness from 120m to 475m. The area is overgrown with deciduous forest predominated by birch trees

Seismicity of the region reaches 7 on the Richter scale

8.1.3 Infrastructure

The deposits are located in the immediate hinterland of Ridder and have access to all the necessary services and utilities.

8.1.4 Mineral Rights and Permitting

Kazzinc acquired the right to explore and mine the Dolinnoe and Obruchevskoe deposits by tender in April 2004. A geological exploration licence comprising two separate areas covering the Dolinnoe and Obruchevskoe deposits was issued to Kazzinc by the Ministry of Energy and Mineral Reserves in July 2004.

The contract was issued on 20 August 2007 (Contract No 2450), and registered on 24 August 2007, and allows Kazzinc to explore for, and mine, zinc, lead, copper, gold and silver from the Dolinnoe and Obruchevskoe deposits. It is valid for 19 years, including six years of exploration. The exploration period may be extended for a further two years if required.

An integral part of the Contract is the Work Programme, which was submitted by Kazzinc and accepted by the Ministry of Energy and Mineral Reserves after an expert review. The Work Programme includes a detailed exploration budget of US$12,392M which forms the contractual commitment for exploration of the Dolinnoe and Obruchevskoe deposits.

A geological exploration licence over the Dolinnoe deposit covers an area of 3.3km^2 with the boundary defined by eight corner points as detailed in Table 8.1.

Table 8.1: Dolinnoe Geological Licence Boundaries

Boundary Points	Geographical Coordinates		Local Coordinates *[1] VKTGU 3 degree zone	
	Latitude N	Longitude E	X	Y
1	50°40'49"	83°34'00"	67,516	77,928
2	50°20'22"	83°34'56"	66,856	78,930
3	50°20'22"	83°36'02"	66,856	80,192
4	50°19'34"	83°36'09"	65,412	80,328
5	50°19'05"	83°35'57"	64,529	80,092
6	50°19'26"	83°34'50"	65,114	78,790
7	50°20'20"	83°34'50"	66,824	78,786
8	50°20'46"	83°33'52"	67,486	77,832

A geological lease over the Obruchevskoe deposit covers an area of 1.61km^2 with the boundary defined by four corner points as detailed in Table 8.2.

Table 8.2: Obruchevskoe - Geological Lease Boundaries

Boundary Points	Co-ordinates	
	Latitude N	Longitude E
1	50°18'36"	83°36'33"
2	50°19'20"	83°36'33"
3	50°19'20"	83°37'33"
4	50°18'36"	83°37'33"

8.2 Geology and Mineralisation

8.2.1 Regional Geology

The Dolinnoe and Obruchevskoe deposits are situated in the centre and deepest south-eastern portions respectively of the Ridder mining district, in the Rudnyi Altay geotectonic block (Figure 8.1), and the unusual grabber structure (see section 5.2.1).

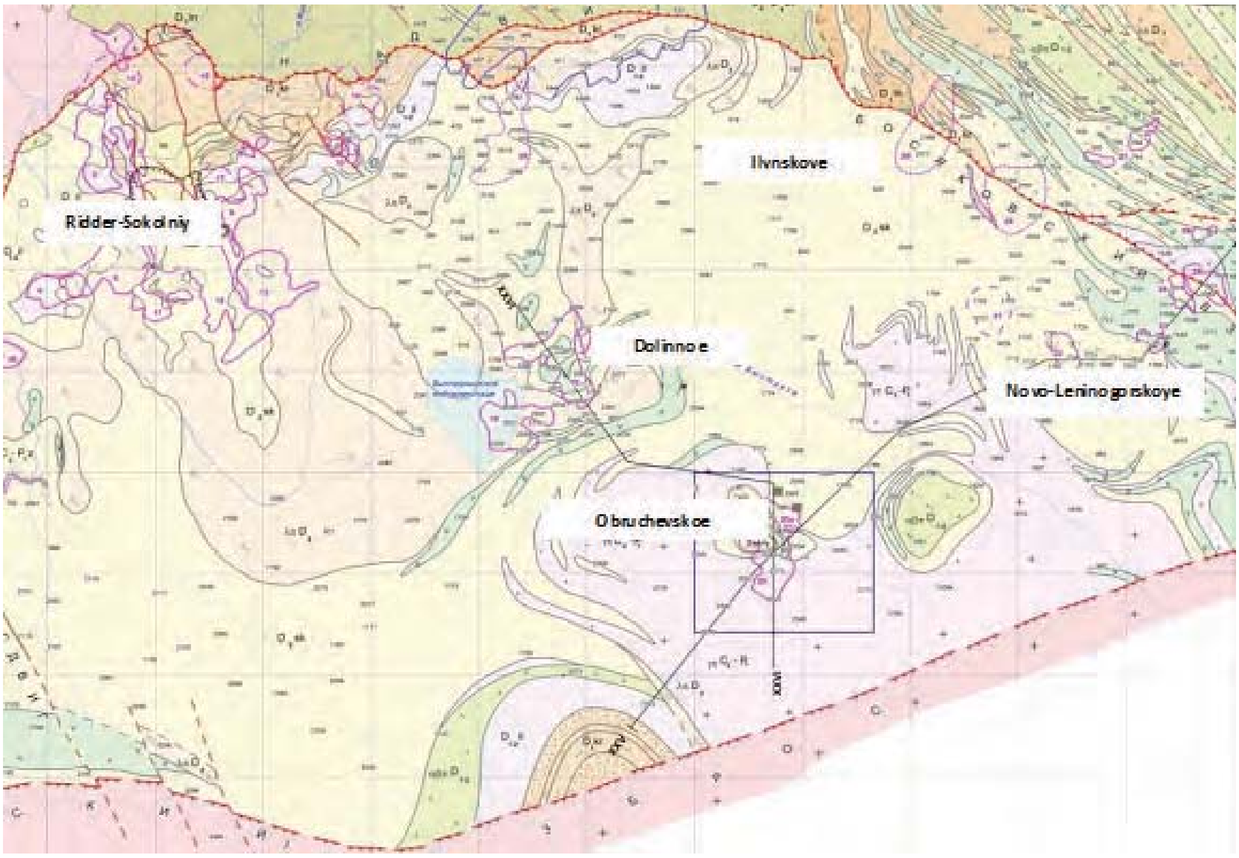


Figure 8.1: Dolinnoe and Obruchevskoe-Geological Setting and Section Lines XXVI and XXV
(Legend Refer to Figure 8.7)
(Scale Each Grid Division = 1000m; True North - Vertical Grid Lines)

The graben is filled with four volcano-sedimentary formations comprising, in ascending order, Zavodskaya (S2-D1zv), Leninogorskaya (D1ln), Kryukovskaya (D1kr), llibnskaya (D1-2il) and Sokolnaya (D2sk) formations (refer to 5.2.1).

The Kryukovskaya Formation hosts most of the polymetallic mineralisation known within the confines of the graben structure. It consists of two horizons of predominantly fine¬grained sedimentary rocks (siltstones of highly variable composition) separated by felsic volcanogenic rocks (agglomerates, tuffs and their reworked derivatives), which attain 350m in thickness at the Ridder-Sokolniy deposit and thin out rapidly in the south¬western, southern and south-eastern flanks of the Ridder-Sokolniy deposit. Calcareous siltstones at the top of the Kryukovskaya Formation, with their distinctive green-grey or ash-grey colour, serve as the marker horizon throughout the Ridder graben. Isolated reef limestones are also locally known at the same level.

The gold-silver-copper-led-zinc mineralisation occurs at four stratigraphic horizons, the most important horizons are:

- Stratiform, predominantly polymetallic mineralisation with a high content of gold and silver, hosted by a microquartzite-sericite quartzite horizon (called the Critical Horizon) in the upper part of the Kryukovskaya Formation (Middle Devonian), and underlain by subvertical stockwork-vein feeder channels; and
- Stratigraphically deeper, predominantly copper and copper-zinc mineralisation, at the interface of the Kryukovskaya Formation and the Leninogorskaya Formation, also underlain by subvertical stockworks and veins.

8.2.2 Deposit Geology

8.2.2.1 Stratigraphy and Lithology

The stratigraphy of the Leninogorskoye ore field includes metamorphic slates of early Palaeozoic, igneous-sedimentary formations of Lower and Middle Devonian and Quaternary deposits.

*Zavodskaya Suite (**S_2D1zv**)*: comprises strongly metamorphosed rocks of greenstone stage (greenschist facies), derived from siltstones, silty sandstones and sandstones, not intersected at Obruchevskoe, as a consequence of the considerable depth of the ore deposit structures. The suite is unconformably overlain by the following.

*Leninogorskaya Suite (**D_1ln**)*: the Lower Devonian igneous-sedimentary formations of the suite consists of molasse with irregularly alternating igneous-sedimentary formations of typically tuff, tuffites, tuffaceous volcanomictous sandstones, siltstones, silty sandstones, coarse sandstones and gravelstones; the basal horizon has rare lenses of basal conglomerates and gravelstones including fragments of metamorphic slates and angular rose quartz. Contact with the overlying Kryukovskaya suite is diffuse, the number of fragments gradually decreases and greenish grey tuffaceous siliceous cement is gradational into dark grey aleuropelites or grey/light grey sericitised micro-quartzites.

*Kryukovskaya suite (**D_1kr**)*: represents a sub-marine succession, characterised by a wide variety of facies with complex transition zones and considerable variation in thickness, intersected over their entire thickness at both Dolinnoe and Obruchevskoe. At the former the suite is 500-540m thick of which effusive pyroclastic formations (breccias of andesitic porphyrites and porphyry lavas) account for 170-230m and at the latter the thickness is 300-400m, represented by sedimentary formations.

Lithologies include calciferous, siliceous, carbonaceous/siliceous, carbonaceous/argillaceous siltstones with intercalations of sandstones and gravelites, with horizons of sub-rounded porphyrite breccias (Dolinnoe).

The mineralised zone is 70-100m thick and is characterised by a significant development of metasomatically altered lithologies *viz*. as micro-quartzites, siliceous and carbonate/sericitic rocks, sericitic and quartziferous rocks, sericitolites and chloritolites.

An upper light grey siltstone (0-103m thick) in the upper part of the suite has been identified in the hanging wall of the ore horizons (hanging wall schists) and acts as a consistent marker horizon. The Kryukovskaya suite is locally unconformably overlain by the *Ilyinskaya suite* (D1-2il); represented by mottled greenish, reddish, greyish green, sub-aerial and shallow marine sedimentry-volcanogenic rocks, the basal horizon consisting of tuffaceous sedimentary fragmental rocks viz. tuffaceous gritstones, grit stones with interlayers of tuffaceous sandstones and silty sandstones.

The suite is formed by irregularly interstratified tuffs of felsic to intermediate and mafic composition, tuffites, tuff gritstones and tuff sandstones, siliceous hydro-micaceous rocks, sandstones, grit stones, and calciferous silty sandstones with rare fossil horizons. Andesitic porphyrite bodies of sub-volcanic facies occur in abundance; the thickness of the suite is not regular and varies from 80-170to 330-530m. At Obruchevskoe the suite is fragmentary occurring as outliers in a thick and complex deposit of andesitic porphyrites and quartz porphyry, 450-500m thick including the magmatic rocks.

The *Sokolnaya suite* ***(D$_2$sk)*** completes the Devonian succession and is composed of dark grey, almost black siltstones and aleuropelites, argillites with minor interlayers and quartzo-feldspathic sandstones; intermittently, in the lower part of the suite there is an increase in the calcareous component of the sedimentary formations; thicknesses at Dolinnoe are 250-300m and at Obruchevskoe 200-250m.

Quarternary sediments almost everywhere overlie the Paleozoic rocks the thickness changing at Dolinnoe from a few metres near the north-east wall of the Bystrukhinskoye storage lake to 70-135m in the Bystrukha River valley. Quaternary sediments at the Obruchevskoe deposit vary from 90-150m in the north to 350-450m in the south.

8.2.2.2 Igneous Rocks

Igneous rocks are ubiquitous at both deposits and account for 25-30% of the explored deposit sections; at the Obruchevskoe deposit they amount to >50% where Lower Devonian extrusive, subvolcanic rhyolitic and dacite rhyolitic porphyries occur, mainly in the Kryukovskaya suite, forming a sub-concordant sheetlike body with thickness of up to 150-250m and almost over the whole of the Dolinnoe deposit, excluding its southern edge.

Lower Devonian extrusive subvolcanic andesite, andesitic and basalt porphyrites and their breccias are predominantly confined to sediments of the Ilyinskaya suite and are much rarer in sediments of the Kryukovskaya suite. Porphyrites form sheet bodies with dimensions from tens to hundreds of metres and with both sub-concordant and discordant contacts. The feeder zones (roots) of the intrusive bodies are of a discordant character.

Middle Devonian extrusive subvolcanic rhyolitic and dacite rhyolitic (quartziferous albito-phyres) porphyries are restricted to the base of terrigenous sediments of the Sokolskaya suite. They form sub-concordant sheet bodies, which are continuous on strike, and have thicknesses from 200-280m to >400m. The epicentre of extrusive rocks of the complex is on the Obruchevskoe deposit, where the feeder zone occurs in the upper horizons of the Kryukovskaya suite and causes shearing in the ore zone.

The late Devonian – Lower Carboniferous complex of gabbroic intrusions is represented by diabase dykes striking north-east (35-70°) with steep to vertical dips, from 0.5 to 50m thick. Dykes, the longest of which can be traced for more than 2km, intrude almost all Devonian rocks and ores zones and are frequently displaced en echelon.

Upper Carboniferous – Lower Permian plagiogranite porphyries, granite-porphyries and granites are confined to the formations of the Sokolnaya suite and form sheets of varying thickness up to 250-400m.

8.2.2.3 Structure

The Dolinnoe and Obruchevskoe deposits are located in the Leninogorskaya graben/syncline, which is constrained to the north by an overthrust, to the south by the Obruchevskoe upthrust fault and to the east and west by the marginal Uspensko-Karelinskaya and Kedrovsko-Butachikhinskaya shear zones.

In the graben/syncline mineralised deposits with a shallow dip, plunge at 7-10° to the south, south-east and south-west from the Ridder-Sokolniy ore deposit in conjunction with the trace of the upper contacts of the Kryukovskaya and Zavodskaya suites. Gently dipping fold structures (striking north-east) can be identified viz. an anticline to the north with the associated deposits of Ridder-Sokolniy and Bakhrushinsk, and a southern plunge associated with the Novo-Leninogorskoye and Obruchevskoe deposits separated by the Central syncline.

Complex fold structures are evident to the south on Dolinnoe superimposed on the shallow dipping limb of the Ridder-Sokolnaya dome. The fold axes which also plunge southwards, strike to the north-northwest.

In the central area of Dolinnoe synclinal folds with an amplitude of 400-600m are evident and to the north-east, and south-west anticlinal structures are developed complicated by discontinuous curved and longitudinal faults with downthrows to the south west of 95-160m and up to 130m respectively. The longitudinal faults also exhibit lateral movement of up to 95m.

The Obruchevskoe deposit is located on the plunging southern limb of the southern anticline where low angle thrusts with a north western strike occur. Faulting is not evident in the ore zones of the Obruchevskoe deposit.

Frequent interformational erosional and crush zones and flexure-like structures are evident in the higher grade gold-polymetallic and polymetallic ore zones which are sub-concordant with the enclosing rocks.

8.2.3 Morphology and Mode of Occurrence of Lodes

8.2.3.1 Dolinnoe

The two lodes comprising the Dolinnoe deposit are centred on anticlinal structures with gentle to moderate dips in all directions (domes) separated by a shallow trough. The distance between the lodes is approximately 900m (Figure 8.2).

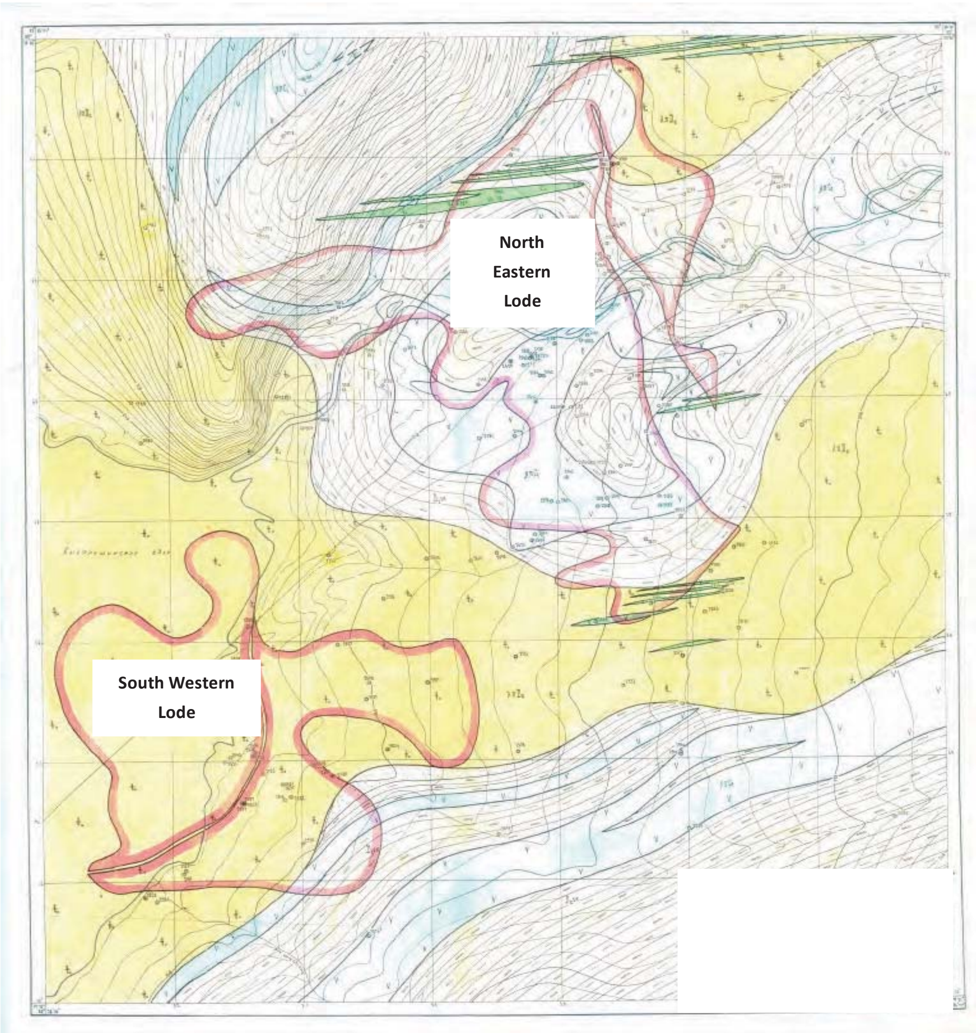


Figure 8.2: Dolinnoe – Outline of the North Eastern and South Western Lodes
(Scale Each Grid Division = 200m; True North-Vertical Grid Lines)

Each lode contains discrete mineralised bodies of two contrasting forms:

- Conformable, stratabound, mineralised mound-like bodies in altered calcareous siltstones; and
- Moderately to steeply dipping cross-cutting lenticular vein-like bodies in the gravelites which underlie the calcareous siltstone horizon.

The stratabound mineralisation is confined to zones of pervasive silica alteration which are locally referred to as microquartzite and which have developed within the calcareous siltstone horizon of the Kryukovskaya Formation. This is the key stratigraphic marker horizon identical to that observed at the Ridder-Sokolniy mine. It is widely believed that the calcareous siltstone acted as a screen preventing the ascent of mineralising solutions after it had been silicified and forcing precipitation of contained metals. However, venting of hydrothermal fluids and the direct precipitation of sulphides to form sub-marine sulphide rich mounds appears to be a more plausible possibility.

The steeply dipping lenticular bodies occur in intensely silicified tuffaceous gravelites and also in rhyolites and rhyolite breccias wherever these are present. These vein-like bodies are considered to be feeder channels to the stratabound sulphide accumulations.

Hydrothermal alteration assemblages associated with the mineralisation are predominantly quartz-sericite, chlorite-sericite-quartz and quartz. With increasing depth alteration changes from pervasive replacement of calcareous siltstone by silica (microquartzite) to quartz-sericite and quartz alteration of the underlying tuffogenic gravelites, porphyritic rhyolites and rhyolite breccias. Laterally, microquartzites pass into quartz-sericite, and locally, into quartz-barite-carbonate-sericite alteration assemblages found on the fringes of the hydrothermal system. Elevated silver content has been noted in the syncline separating the two domes. Sericite alteration occurs in the footwall of massive gold-polymetaliic mineralisation.

North-Eastern Lode

The stratabound North-Eastern Lode is represented by a single mineralised body, (Orebody 3) and a few small and isolated lenses. The underlying mineralisation is represented by a swarm of twelve moderately to steely dipping north-northwest trending veins.

Orebody 3 is centred on a north-northwest elongated half dome abutting against the Prodolnyi I Fault (see typical cross-section in Figure 8.3). Its thickness exceeds 25m in the saddle-shaped hinge zone. The south-western limb has a variable geometry due to variations in dip and the presence of subsidiary folds. Dips are generally shallow to moderate south-west but due to folding locally change through subhorizontal to shallow to the north-east. Widths are also variable, typically in the range of 5m or less. The hinge zone is cut by the Prodolnyi II Fault, a reverse fault parallel to Prodolnyi I Fault with throws of up to 35m. In plan view, Orebody 3 covers an elongated north-northwest trending area: 800m in length, with four west-pointing embayments and one 500m long offshoot. The lateral extent in plan varies from 200-400m.

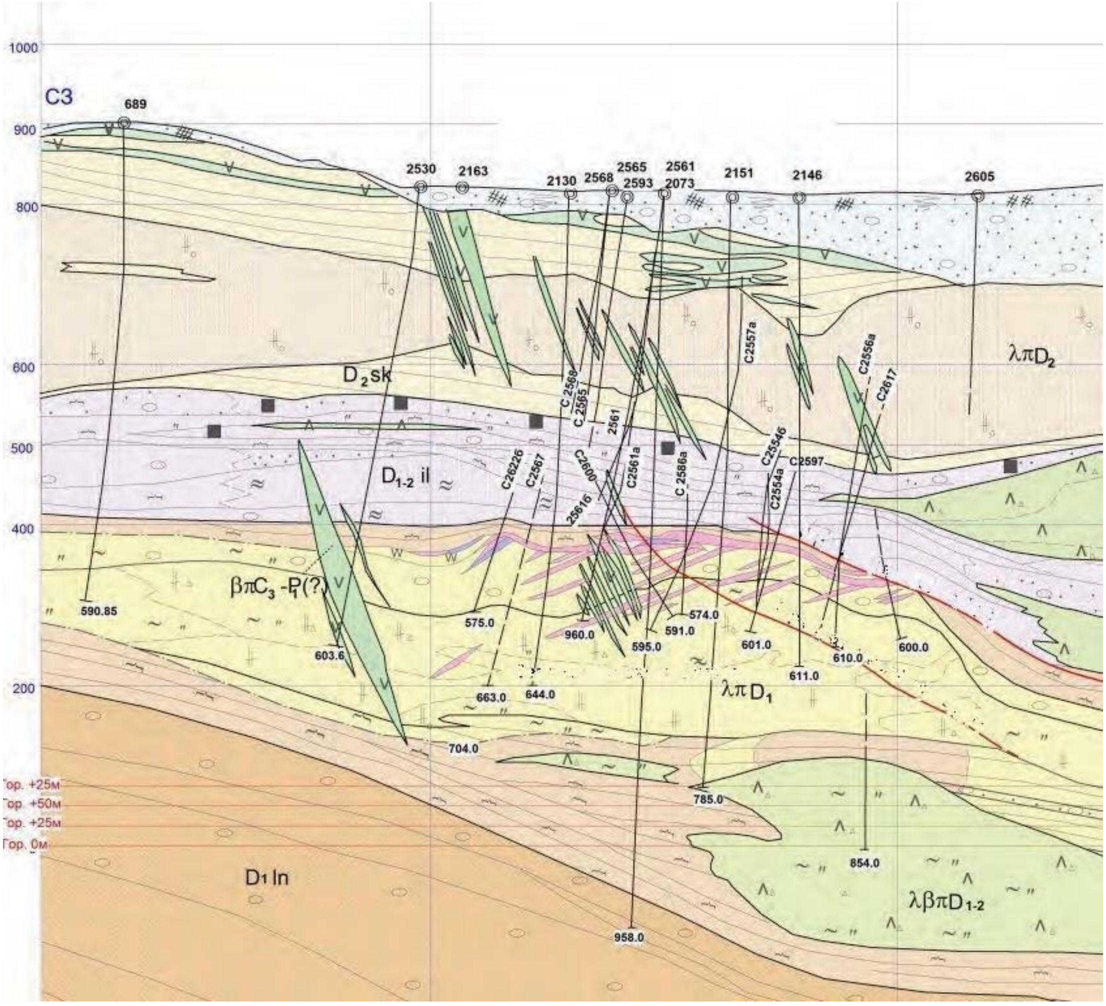


Figure 8.3: Dolinnoe-North Eastern Ore Body
(Scale Each Grid Division = 100m)

Orebody 3 displays pronounced vertical zoning with low sulphide barite mineralisation at the top passing down into massive barite-polymetallic and pyritic-polymetallic mineralisation, which in turn passes into massive polymetallic mineralisation. Barite is not pervasive and when it is absent, massive polymetallic mineralisation extends through the whole thickness of the mineralised zone. The hanging wall contact with the overlying siltstones is generally very sharp. Host siltstones are brecciated and contain hydrothermal barite, chlorite and sericite. The footwall rocks display very strong sericitic alteration with coarse crystalline barite and nests of sulphides.

Rich gold-silver-polymetallic massive sulphide mineralisation (>20% ZnEq) forms four lenses along the hinge zone of the dome. The largest lens extends for 300m with widths of 100-175m and up to 10.5m thick.

Steeply dipping mineralised zones strike 355° and dip 65°SW. The overall strike length of the whole swarm is 600m, vertical extent is at least 200m and the overall width is 130m. True widths of intercepts of individual zones range from 0.35m to over 7m (Table 8.3). Geolen interpreted these zones as being sub-parallel to each other and continuous within tuffogenic gravelites by analogy with similar zones at the neighbouring Bystrushinskaya Lode of the Ridder-Sokolniy deposit (which is in production) and at the Novo-Leninogorskiy deposit, which is located 5km to the east.

WAI Comment: *This interpretation is acceptable with regard to the overall structural pattern but the drilling data so far accumulated are insufficient to allow the grade continuity to be confidently interpreted between all drillhole intercepts on the steeply dipping vein mineralisation.*

Table 8.3: Dolinnoe-Parameters of Steeply Dipping Mineralised Bodies from the North-Eastern Lode

Mineralised Body	Dimensions (m)				№ of Drillhole Intercepts	Average Grades				
	Strike Length	Downdip Extent	True Width			Cu	Pb	Zn	Au	Ag
			From	To		%	%	%	g/t	g/t
6	100	35	1.0	1.1	2	0.05	1.05	2.02	3.16	9.95
7	75	25	1.0	1.3	2	0.53	1.64	2.36	3.72	15.21
8	450	120	0.4	5.3	13	0.18	1.04	2.10	3.49	11.86
9	260	50	0.7	7.1	10	0.26	1.11	2.05	3.25	19.66
10	130	80	0.4	4.2	13	0.18	1.22	2.45	3.10	7.78
11	200	70	0.6	2.9	5	0.20	2.14	4.36	3.13	13.05
12	354	130	0.5	3.6	15	0.26	1.00	1.86	6.29	14.27
13	260	80	0.7	2.4	10	0.15	0.67	1.11	6.50	7.38
14	400	115	0.4	3.4	16	0.22	1.08	2.46	6.17	12.84
15	340	85	0.4	3.0	13	0.23	1.36	2.35	4.68	47.76
16	150	80	0.4	2.4	6	0.25	1.03	2.58	5.13	9.14

8.2.3.2 South-Western Lode

This lode occurs at a depth of 495m to 580m below surface. Steeply dipping feeder veins extend to deeper levels. Grades tend to be lower than those recorded in the North-Eastern Lode.

The stratabound mineralisation forms a gently rising dome and is cut on the south¬eastern side by the Dugovoy Fault. The lode extends over a strike length of 145m to 420m and over a distance of 120m to 460m down dip.

Stratabound mineralised lenses, which are hosted by calcareous siltstones altered to microquartzites, cover an area of 600x600m-800m. The thickness of the altered microquartzites varies from a few metres to 55m. It appears that the favourable calcareous siltstone horizon had been locally eroded prior to deposition of the overlying llinskaya Formation.

Mineralised bodies are numbered in ascending order from the footwall to hanging wall of the calcareous siltstone horizon. Based on the approved reserve conditions, there are five subconformable lenticular mineralised bodies: 3, 3.1, 3.2, 3.3 and 3.4. In addition, there are 27 drillhole intercepts outside these lenses within the same lithological horizon.

There is no information to assess if these intercepts indicate flat lying stratabound lenses of mineable dimensions or just local mineralised partings within barren siltstones.

Drilling completed during the preliminary exploration stage also encountered steeply dipping mineralised structures within tuffaceous gravelites and volcanic rocks below the calcareous siltstone horizon. Geolen allocated these intersections to seven steep veins not exceeding 30-50m in strike and downdip directions with widths from tens of centimetres to a few metres.

The Dugovoy Fault has an eastern downthrow of less than 300m. Extensions of all mineralised lenses have been confirmed by drilling in the downthrown block but not followed along strike and dip.

Other Mineralisation

More recent drilling has identified mineralisation between Ridder-Sokolniy Mine and the South Western lode at Dolinnoe (Figure 8.4). Information on reserves and grade has not been obtained.

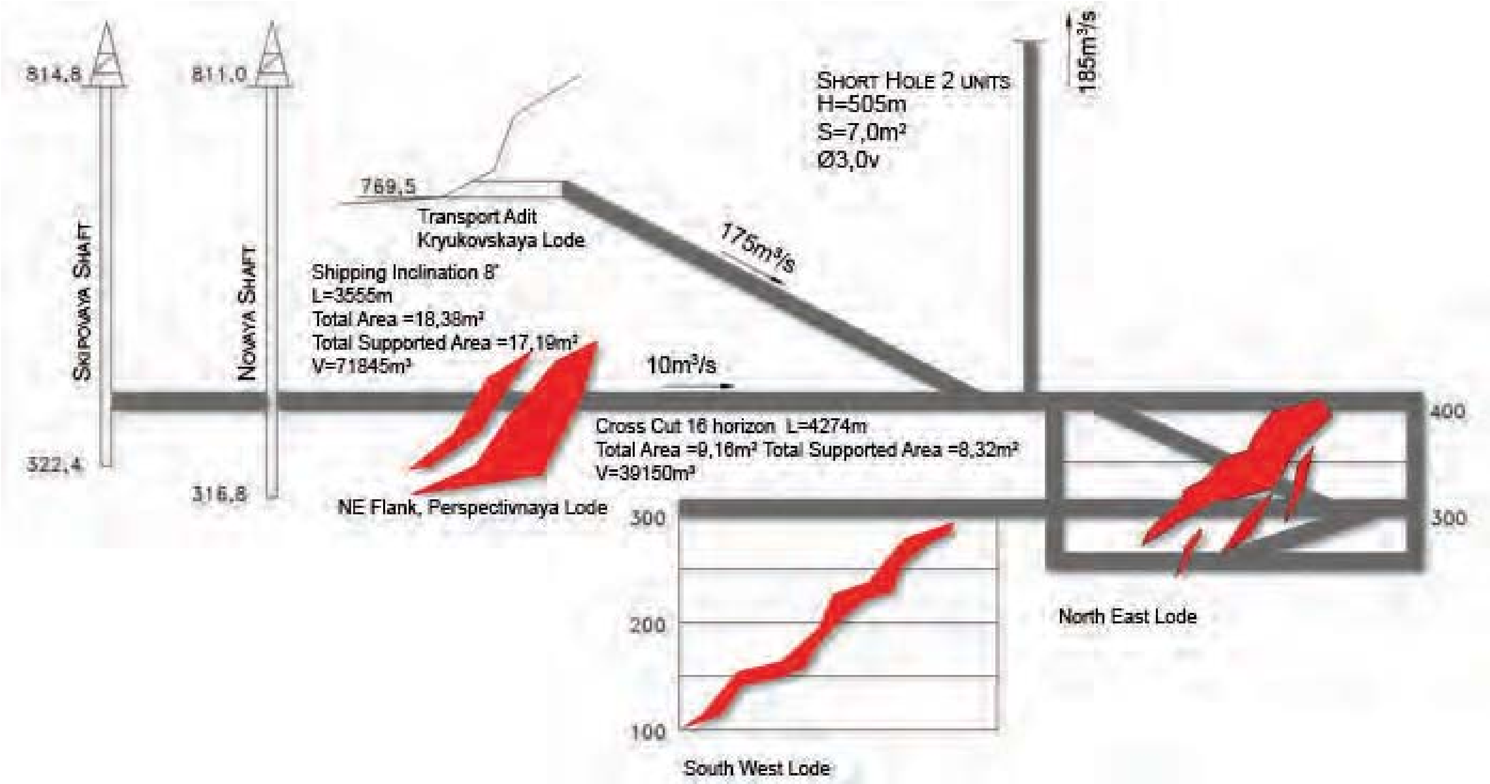


Figure 8.4: Dolinnoe-Diagrammatic Representation of Proposed Development with Perspectivnaya Extension

8.2.4 Obruchevskoe

Stratabound polymetallic sulphide mineralisation has been outlined by drilling in two cupola-shaped lodes, Southern and Northern, and traced over the intervening ground, called Central Prospect, within the same lithological unit of the Kryukovskaya Formation. At the Southern and Northern lodes (Figure 8.5 and Figure 8.6) the mineralisation occurs as tabular and lenticular veinlet-disseminated and massive sulphide bodies on three horizons that are identified, from top to bottom, as Nos.1, 2 and 3. Relatively thin and generally low grade polymetallic mineralisation encountered at the Central Prospect is correlated with the No.1 horizon.

The three horizons are embedded in altered rocks with disseminated pyrite and low grade polymetallic mineralisation. In a broad sense, the stratabound mineralisation so far delineated at the Southern and Northern lodes spans a vertical interval of 110-160m and 60-80m respectively.

The Northern Lode is situated at a depth of 850-920m below surface and the Southern Lode is at a depth of 930-1,155m. This is due to a combined effect of the south sloping topography and the generally south-west shallow dipping bedding within the Kryukovskaya Formation.

The continuity between drillhole intercepts is supported by the following observations:

- Mineralisation occurs below a distinctive horizon of calcareous siltstones within the upper part of the Kryukovskaya Formation;
- Drill intercepts display similar mineralogical composition, degree of concentration of copper, lead, zinc, gold and silver and similar vertical zoning patterns;
- Similar textures observed in neighbouring drillhole intercepts;
- Confirmation of earlier interpreted continuity by infill drilling to 25-50m spacing between drillholes; and
- Similar geophysical signatures on downhole geophysical logs.

Composition of the mineralisation is polymetallic but changes from predominantly lead-zinc in the Northern-Lode to copper-zinc in the Southern Lode, the latter with predominant copper or zinc varieties. Vertical zoning is represented by an increase of copper to lead ratio with depth. The lateral zoning seems to be related to hydrothermal alteration. Lead-zinc mineralisation with low copper occurs in association with sericite-quartz alteration in the Northern Lode, whilst mineralisation with copper and zinc predominating over lead occurs in association with chlorite alteration in the Southern Lode, particularly in its south-eastern part. On a local scale, however, pockets of polymetallic mineralisation also occur in the Southern Lode, particularly to the north west.

Gold and silver grades tend to be higher at the apical and 'apron' parts of mineralised lenses and decrease with depth. However, it is possible that gold and silver may occur in small shoots similar to those at the Ridder-Sokolniy deposit, at intersections of north-west and north-east trending faults. Oleynik (2003) mentioned three shoots in the Southern Lode, one in the Northern Lode and one in the Central Prospect. Gold also occurs in low sulphide quartz veins.

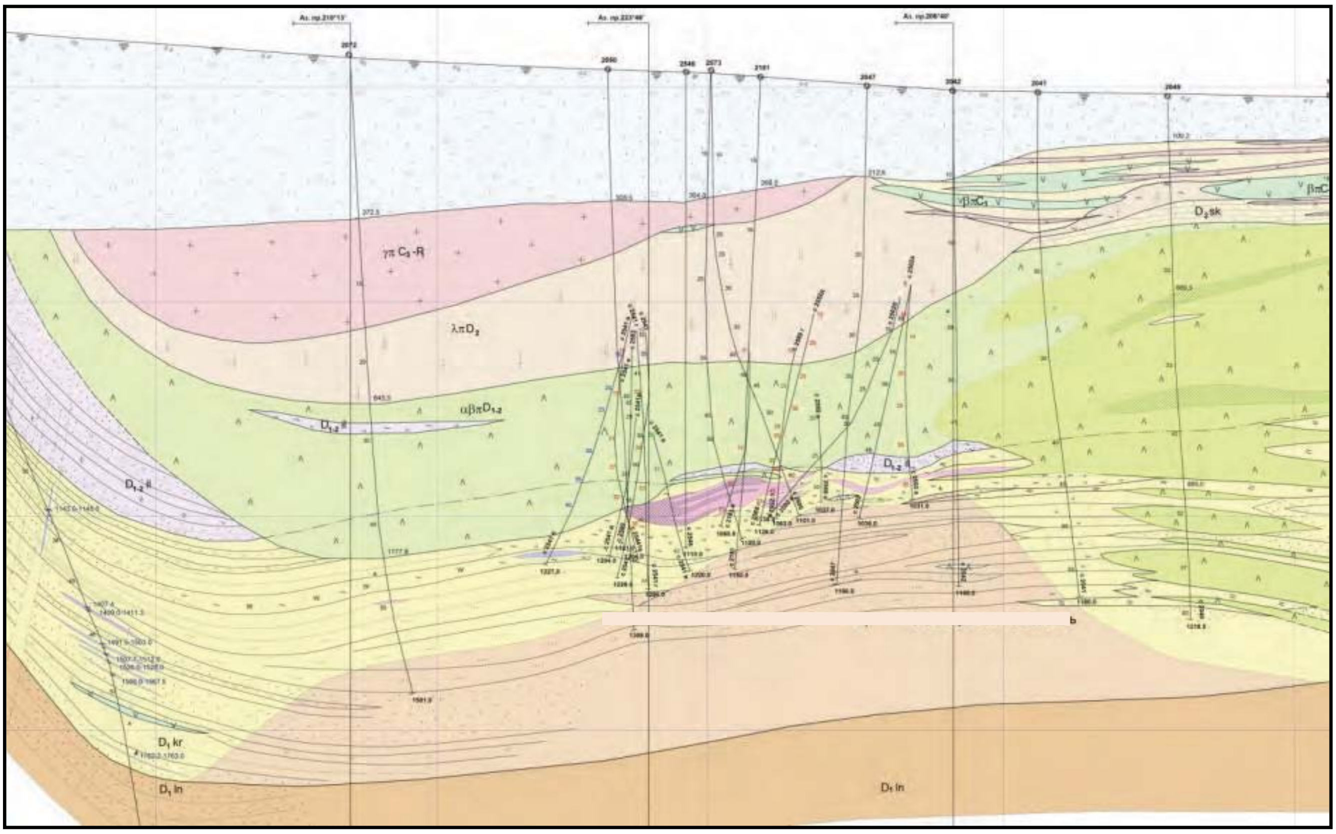


Figure 8.5: Obruchevskoe-Southern (Left) and Northern (Right) Lodes from Section XXV
(Scale: Grid Division= ±100m)

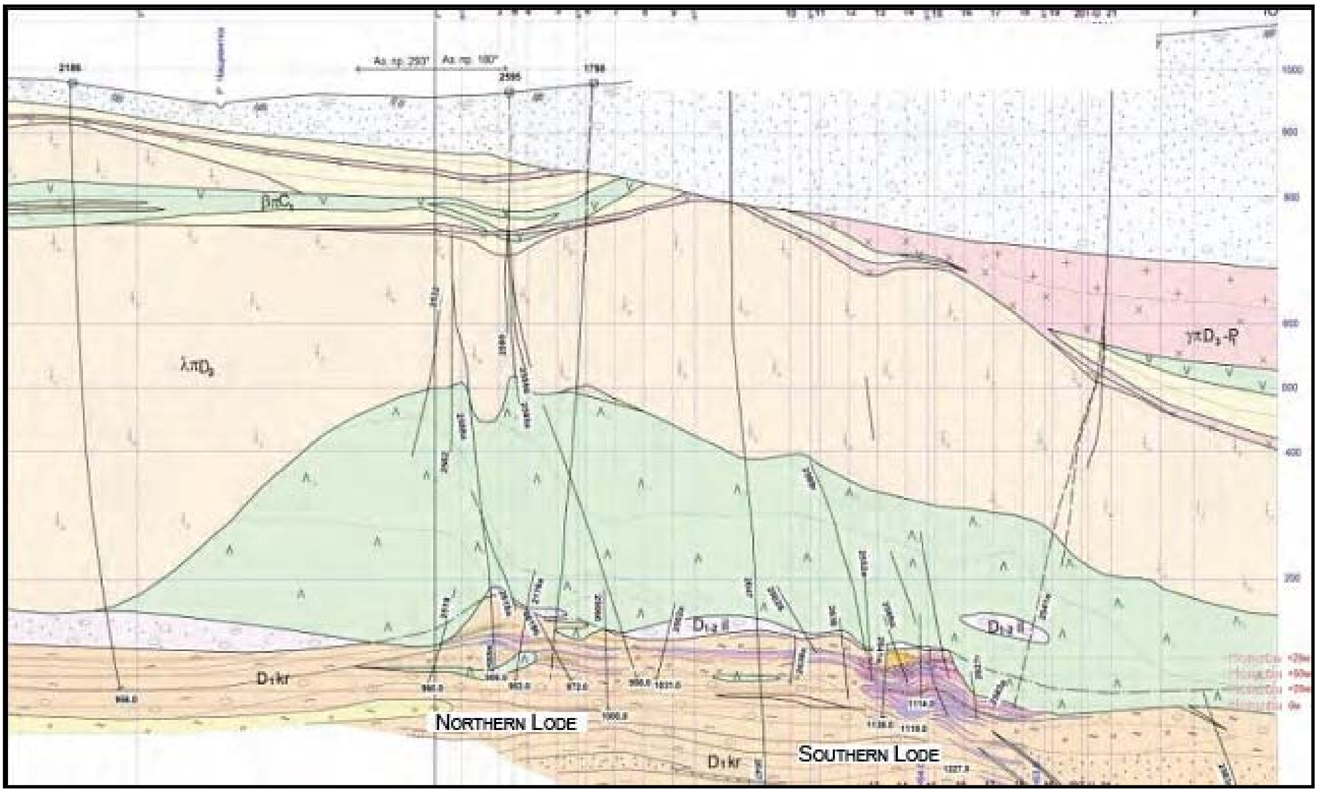


Figure 8.6: Obruchevskoe Northern (Left) and Southern Lodes (Right) from Section XXVI
(Scale: Grid Division= ±100m)

8.2.4.1 Southern Lode

This is by far the larger of the two lodes. It consists of three stratabound mineralised bodies denoted as 1, 2 and 3 from top to bottom and enclosed in an envelope of low grade disseminated pyrite-copper-zinc mineralisation. Mineralised Body No 1 has been traced over a distance of 970m throughout the deposit from the Southern Lode through the Central Prospect to the Northern Lode. The lode peters out rapidly on the western flank and is truncated by a porphyritic andesite intrusion of complex geometry on the eastern and southern flanks.

The proportions of base metal minerals varies considerably, with polymetallic and copper-zinc (>0.5% Cu) mineralisation types being the most common. Veinlet-type and disseminated mineralisation predominate over massive sulphide mineralisation.

The average Cu:Pb:Zn ratio is 0.3:1:2.4. There is a good correlation of lead with zinc (0.839) and gold with silver (0.759), some correlation of silver with lead (0.660), zinc with silver (0.568) and gold with lead (0.541). Copper alone has no correlation with the other elements.

The host rocks are gravelites, sandstones and siltstones of the Kryukovskaya Formation, all subjected to predominantly chloritic alteration. Chlorite is variously associated with quartz, pyrite and carbonate. Sericite alteration is local and insignificant in volume.

8.2.4.2 Northern Lode

The Northern Lode consists of three stratabound mineralised bodies denoted as 1, 2 and 3 from top to bottom and enclosed in an envelope of low grade disseminated pyrite-polymetallic mineralisation. The three mineralised bodies correlate with those in the Southern Lode. On the north-eastern side, the Northern Lode is truncated by small intrusive bodies of porphyritic andesite and quartz-albite rhyolite.

The average Cu:Pb:Zn ratio is 0.2:1:1.9. There is a very good correlation of zinc and lead (0.943) and good correlation of copper with zinc (0.802) and lead (773). Gold and silver have no correlation with the three base metals and only very weak correlation with each other (0.406), except in high-grade lead-zinc mineralisation where the correlation coefficient exceeds 0.9.

The host rocks are mottled gravelites and siltstones of the Kryukovskaya Formation, both subjected to intense carbonate-quartz-sericite alteration. The area displays two intersecting cleavages and brecciation of the more competent rock types.

8.2.4.3 Central Prospect

As interpreted from relatively widely spaced drilling, this prospect contains a single horizon of stratabound mineralisation correlated with the No 1 horizon of the neighbouring lodes. Base metals grades are relatively low but some high-grade gold and silver-bearing polymetallic mineralisation was reported.

8.2.5 Mineralogy

The mineral composition of the Dolinnoe and Obruchevskoe, Ridder-Sokolniy and other deposits in the Leninogorskiy ore field, is relatively uniform and are all characterised by the same complex of ore and non-metallic minerals.

The former comprise sphalerite, galena, chalcopyrite and pyrite which, depending on their content in different ores, can constitute major, abundant or accessory minerals, although in solid sulphide polymetallic ores they may all be major components. Accessory minerals include tetrahedrite and tennantite with a high zinc content (fahlores which can be present in varying amounts); rare minerals consist of free gold, gold-silver alloy (electrum), pyrrhotite and specifically, at Obruchevskoe, bornite and some chalcopyrite and arsenical pyrite.

Non-metallic minerals in the ore zones are quartz, calcite, sericite and chlorite and accessory minerals are dolomite, hematite and feldspar. Apart from the above mentioned minerals ore may contain apatite, marcasite, molybdenite, rutile, barite and sphene.

8.2.5.1 Dolinnoe

Veinlet-disseminated sulphide mineralisation predominates (95% of the total volume), with massive sulphides (sulphides >50% vol) making up the balance. The average ratio of Cu:Pb:Zn is 0.3:1:2 in the North-Eastern Lode and 0.3:1:1.8 in the South-Western Lode. The average Cu:Pb:Zn ratio in barite-polymetallic and massive pyritic barite-polymetallic (>15% pyrite plus >6% barite) mineralisation in the North-Eastern Lode is 0.4:1:1.3.

Table 8.4 lists minerals described and mentioned in the Dolinnoe exploration reports of 1994 and 1997.

Table 8.4: Dolinnoe Mineralogy

Abundance	Metalliferous Minerals	Gangue Minerals
Main	Sphalerite, galena, chalcopyrite, pyrite	Quartz, calcite, sericite, barite
Abundant	Silver-zinc tetrahedrite, silver-bearing zinc tetrahedrite, silver-bearing zinc tennantite-terahedrite	Dolomite, chlorite, hematite
Accessory	Native gold, electrum, pyrrhotite, kerargyrite	Rutile, apatite, monazite

Gold is the main mineral of economic interest. Results of phase analyses conducted by VNIItsvetmet and Kazmekhanobr (see Table 8.5) demonstrate that about 30% of gold occurs as free milling (native) gold particles with clean surfaces, about 5% as native gold covered with oxidised films and about 40% as native gold in intergrowths with other minerals. About 25% of gold occurs in crystal lattices of sulphides, mainly in sphalerite and, to a lesser degree, in galena, chalcopyrite and fahlores (tetrahedrite-tennantite group). Pyrite also carries gold though the available reports do not elaborate on the type of association. In addition, small amounts of gold occur in quartz.

The highest gold concentrations are found in massive polymetallic and pyritic-polymetallic mineralisation and, also, in massive barite-pyritic-polymetallic mineralisation. Steeply dipping veins in gravelites are generally lower in gold content.

The highest silver grades occur in massive pyritic-barite-polymetallic mineralisation. Phase analyses of silver showed that 10-15% of silver is free, 45-50% is intergrown with other minerals and 25-30% occurs in association with sulphides. Up to 8.5% of silver is held in grey ores (fahlore-tetrahedrite-tennantite group).

The reviewed reports mention molybdenum grades in the range of 0.004-0.015% at which levels it is a potentially economic by-product.

The main deleterious element is antimony, which ranges from 0.01-0.035%. Another possibly deleterious element is cadmium, which occasionally exceeds 0.025%. Geolen estimated the average content of cadmium as 0.01%.

Table 8.5: Dolinnoe- Forms of Gold and Silver Occurrence Based on Phase Analyses		
Forms of Gold and Silver Occurrence	**Percentage**	
	Gold	**Silver**
Laboratory Sample No 1 (VNIItsvetmet, 1991)		
3.0g/t Au, 30g/t Ag		
Free		
with clean surface	26.7	3.9
covered with oxidised films	4.5	11.4
Intergrown		
with clean surface	12.7	31.0
covered with oxidised film	30.6	17.8
Associated with sulphides	24.0	30.2
namely:		
with anglesite and cerussite	3.0	4.1
with galena	4.3	6.4
with sphalerite	6.8	7.1
with pyrite	8.4	8.7
with chalcopyrite	1.5	3.9
Associated with gangue	1.5	5.7
Large Laboratory Sample No 1 (Kazmekhanobr, 1992)		
3.43g/t Au, 91.4g/t Ag		
Free	34.4	10.9
Intergrown	34.4	33.8
Covered with films	6.6	10.4
Associated with sulphides	24.6	24.2
Associated with gangue		10.3
In kerargyrite		10.4

8.2.5.2 Obruchevskoe

Veinlet-disseminated polymetallic mineralisation predominates, and consists of sphalerite (1-6%, average 4%), galena (0.5-3%, average 2%) and chalcopyrite (average <1%). Sphalerite occurs as porphyroblasts (up to 4mm across) among aggregates of sphalerite, galena and chalcopyrite with black ore inclusions. The predominant grain size of these minerals is 0.5-1mm. Massive sulphides (total sulphides >50% by volume) form about 12% of the mineralisation volume and hold approximately 40% of the contained metal.

Copper-zinc mineralisation (>0.5% Pb) is also abundant particularly in the Southern Lode of combined sulphides).

Table 8.6: Obruchevskoe Mineralogy		
Abundance	**Minerals**	
	Metalliferous	**Gangue**
Main	Pyrite, sphalerite, galena,chalcopyriteBlack ores (silver-bearing zinc tetrahedrite, zinc tennantite, tetrahedrite)	Quartz, sericite, chlorite, calcite
Abundant	Proustite-pyrargyrite, lead sulphosalts, electrum, arsenopyrite, pyrrhotite,	Dolomite, feldspar, talcum
Accessory	bornite, wurcite, magnetite, marcasite	Apatite, rutile, sphene, barite,monazite

8.3 Exploration

8.3.1 Historical Work

8.3.1.1 Dolinnoe

The Dolinnoe deposit was discovered by DDH 1799 which drilled in 1987 to follow up results of integrated deep drilling, geophysical prospecting and geochemical investigations. DDH 1799 intercepted low grade polymetallic mineralisation at depths between 600-800m.

The result was considered to be encouraging enough to warrant further drilling. A prospecting-assessment programme, focused on the area where the discovery hole was sited, was conducted in 1989 to 1990. Several drillholes intercepted polymetallic mineralisation with significant gold grades, paving the way for further investigations.

The ensuing exploration was conducted in two stages:

- Qtr 1 1991 - Qtr 2 1993: Preliminary Exploration focused on the North-Eastern Lode and including the South-Western Lode, with both targets drilled on a grid of 50x50 -50x25-50m to a depth of 800m; and
- Qtr 3 1994 - Qtr 2 1996: Additional Exploration of the North-Eastern Lode, essentially an infill drilling programme to reduce the spacing between drillhole intercepts to about 25m and to upgrade the delineated reserve from the C_2 to the C_1 category.

Both exploration stages were conducted by Ridder-based TOO Geolen (Geolen).

8.3.1.2 Obruchevskoe

Mineralisation was discovered by DDH 1798 which drilled in March 1987 to follow up a geochemical anomaly. DDH 1798 intersected pyritic-polymetallic mineralisation between depths of 869.20-917.20m, including 4.35m of high-grade massive sulphide mineralisation that promoted follow-up exploration

A prospecting-assessment programme focused on the area where the discovery hole was sited was conducted from March 1989 to January 1991. A total of 35,563m was drilled in 40 drillholes, including 19 wedged deflections. DDH 2181, sited 600m south of the DDH 1798, intersected 66.5m of pyritic-polymetallic mineralisation which was confirmed in the wedged deflection No 2181a. Subsequent drilling delineated a body of mineralisation which was identified as the Northern Lode. The programme was carried out by the state-owned Leninogorsk Geological-Exploration Expedition; a scoping study conducted at the end of this programme recommended further drilling.

From July 1991 to November 1995 a total of 55,519m was drilled in nine parent holes and 80 wedged deflections, including 15 metallurgical holes. The drilling focussed on the Northern Lode and a newly discovered mineralised area, the Southern Lode. The drilling programme was 85% complete when it was terminated due to the withdrawal of State funding. The programme was carried out by TOO Geolen (Geolen), the privatised former state-owned Leninogorsk Geological-Exploration Expedition.

8.3.2 Drilling

8.3.2.1 Dolinnoe

A total of 70 diamond coring exploration holes with 94 wedge deflections was drilled in the two exploration stages. In addition, 30 technical holes were completed to obtain samples for process testwork. Table 8.7 provides essential summary figures.

Table 8.7: Dolinnoe Drilling Summary

Description	Number of Drillholes	Metres Drilled and Core Recovery						
		Total Drilled	Including intervals in Kryukovskaya Formation			Including Intervals with Gold Polymetallic Mineralisation		
			Interval	Core Recovery		Interval	Core Recovery	
		m	m	m	%	m	m	%
Preliminary Exploration (1991-1993)								
Exploration Holes	146	70,309	15,419	12,758	827	1,315	1,102	84.0
including								
Parent Holes	66	41,426	7,645	6,383	83.5	472	399	84.7
Wedged Deflections	80	28,883	7,774	6,376	82.0	840	703	83.6
Technological Holes	21	1,471	980	785	80.1	320	258	80.5
Additional Exploration (1994-1996)								
Exploration Holes	18	6,737	746	617	82.7	-	-	-
including								
Parent Holes	4	2,149	161.4	138.67	85.9	-	-	-
Wedged Deflections	14	4,588	584	478	81.8	-	-	-
Total								
Technological Holes	9	466	173	138	79.5	-	-	-

Drillhole trajectories were surveyed with MIR-36 and MI-40 inclinometers at 20m intervals over 40-100m depth increments. Control measurements were taken every 200-300m, at the beginning of each mineralised intercept and at the end of each hole.

Core recoveries were recorded by geologists after each run. In addition, weight and actual core diameters were recorded for all core recovered from mineralised, allowing. monitoring of the core recovery by weight.

The recovery was in the range of 80-86% which is not considered to be good by current industry standards.

A statistical analysis of grades against core recovery was conducted by Almaty-based consulting firm Geoincentr, who concluded that there was no differential loss.

8.3.2.2 Obruchevskoe

Borehole intersections form an irregular grid pattern:

- Northern Lode – 40x40m in the centre to 70x130m on the flanks;
- Southern Lode - an irregular grid with drillhole intersections at intervals of 25-60m; 60-100m on the north-eastern and south-eastern flanks; and
- Central Prospect - intersections 90-250m apart.

Start-up holes were drilled with roller bits at near vertical angles (average inclination 84-90° from horizontal) and a series of wedged deflection was made from those parent holes and from deflected holes to reach target depths at specific points.

Hole trajectories were surveyed with MIR-36 inclinometers at 20m intervals over 40-100m depth increments. Drilled depths were checked each time drilling advanced by 200-300m, at the top or end of each mineralised intersection and at the end of hole.

Core recovery was checked by geologists after each run and, from mineralised intercepts, additionally by hydrostatic weighting and measuring the diameter of the recovered core.

Core recovery from the mineralised section of the Kryukovskaya Suite averaged 79% at the prospecting-assessment stage and 81% at the preliminary exploration stage. Low core recovery (less than 70%) was reported in DDH 1783, 2501 and 2569. Grades over these intervals were compared against RRK logging data with satisfactory results.

8.3.3 Sampling

8.3.3.1 Introduction

Core was sampled over all intercepts of mineralised zones and hydrothermally altered hangingwall siltstones of the Kryukovskaya Suite.

At the preliminary exploration stage, the whole core was taken for sample preparation and analysis except for intervals selected for technological tests, which comprised half core. Bulk density determinations by hydrostatic weighing were performed on all samples.

At the additional exploration stage, core was sawn in half, one half sent for sample preparation and analysis and the other half used for mineralogical and petrographic studies and for compositing into technological samples. Prior to splitting, all core was weighted in water and air and those results were combined with measurements of the core diameter to estimate core recoveries by weight and bulk density.

Minor accompanying elements and potentially deleterious elements were determined on composite (grouped) samples comprising pulverised duplicates of routine samples by combining small portions of three to four successive samples, with the weight of each portion being proportional to the length it represented. The composite sample intervals were selected to ensure that each sample represented the same type of mineralisation and/or more or less uniform grade range.

Sample Preparation

Sample preparation was carried out at the Geolen sample preparation facility. The method was based on the Richard-Czeczott formula Q=kda, where Q is the minimum sample quantity at a given stage of volume reduction, d is the diameter of the largest fragments defined as the screen size that retains the largest 5% of the mass, к is a coefficient dependent on the distribution irregularity of the mineral of interest and a is a coefficient related to the roundness of mineral grains (generally approximately 2).

The coefficient к is the key parameter. Initially the sample preparation scheme was based on the к coefficient of 0.16. From March 1995, on GKZ's recommendation and after tests on 0.5kg subsamples of core crushed to -1 mm, the coefficient к was changed to 0.6. The scheme used for Obruchevskoe samples was ased on K-0.16. In general terms, the lower coefficient к is, the better it accounts for the erratic distribution of minerals. The tests conducted in 1995 showed that relative differences in copper, lead and zinc grades remained relatively constant at different values of k. Relative differences in gold and silver grades showed some variations but those variations reportedly remained within a narrow range.

8.3.3.2 Dolinnoe & Obruchevskoe

A total of 9,789 samples were collected during the preliminary exploration stage. The samples ranged from 0.3-2m in length, the average length being 1.3m. The average length of the core samples from the additional exploration stage was 1.15m, with a range from 0.20m to 1.80m.

Other samples collected during the preliminary exploration stage included:

- 1958 geochemical samples representing core intervals of up to 10m in length (6m on average) made up of small chips broken off along groves parallel to core axis;
- Samples from the lithological horizon hosting the stratabound mineralisation (also referred to as "upper mineralised zone") for silicate analysis to determine the silica content and 21 samples for self ignition tests;

- 39 waxed samples from different types of mineralisation and host rocks for the determination of bulk density, moisture content and porosity;
- 234 specimens for thin sections and 36 specimens for polished sections; and
- Samples for process testwork comprising: one 2,247.15kg sample; two laboratory scale samples, 558.8kg and 315kg in weight respectively; and five samples totalling 306.3kg in weight to be used for metallurgical mapping.

Analyses

Selection of core samples for accurate analysis was done on the basis of results of spectral analyses and spectral gold analyses. Samples that gave spectral grades greater than 0.3% Cu, Pb or Zn were submitted for chemical analysis of the three metals. Samples showing > 0.3g/t Au and Ag were submitted for fire assay. Samples submitted for gold and silver assays averaged 200-300g in weight, but the available reports do not mention the sample charge. Gold and silver beads were measured using the gravimetric method.

Composite samples collected at the preliminary exploration stage were analysed for Cu, Pb, Zn, Ba: Cd, Bi, Se, Te, total sulphur, sulphide sulphur, Sb, As, Ge, Ga, In, Tl, Ag, Fe, Mo, and Co.

Due to financial difficulties during the additional exploration stage, analytical work was limited to routine analyses for copper, lead, zinc, gold, silver and barium.

All involved laboratories (see Table 8.8) were certified in Kazakhstan in the 1990s and have maintained their certification status.

Table 8.8: Laboratories Used for Dolinnoe Exploration Analyses

Elements	Principal Laboratory	Control Laboratory	Method
Preliminary Exploration			
Multi-element Scan	AO Leninogorskiy Geolog	CChl VK PGO	Spectral
Gold	CL PGO Vostkazgeolgia Leninogorsk GRE CChl LPC	CL PGO Samrkandgeologia	Fire Assay
Silver	CL PGO Vostkazgeolgia Leninogorsk GRE CChl LPC	CL PGO Samrkandgeologia	Fire Assay
Copper, lead, zinc	AO Leninogorskiy Geolog	CL PGO Yuzhkazgeologia	Chemical
Barium	CL PGO Vostkazgeolgia Leninogorsk GRE CChl LPC	CL PGO Yuzhkazgeologia	Chemical
Other elements	VNIItsvetmet CChL YuK PGO	CL PGO Yuzhkazgeologia	Various
Process testwork	VNIItsvetmet		
Additional Exploration			
Multi-element scan	AO Leninogorskiy Geolog		Spectral
Gold	AO LPK		Fire Assay
Silver	AO LPK		Fire Assay
Copper, lead, zinc	AO LPK		Chemical
Barium	AO LPK		Chemical
Process testwork	VNIItsvetmet		

Abbreviations:
CChL LPC Central Chemical Laboratory Leninogorsk Polymetallic Combination
CChL YuK PGO Central Chemical Laboratory South Kazakhstan Geological Administration
CChL VK PGO Central Chemical Laboratory East Kazakhstan Geological Administration

Quality assurance and control (QA/QC) relied on internal and external control analyses of analytical duplicates. Internal control analyses did not indicate any problems, except for large relative differences for zinc analyses in Class 5% to 10% in the first six months of 1991. As most samples contain less than 5% Zn, this is not considered to have a material impact on zinc grade estimates.

With regards to external analytical control, 14.5% of samples were submitted for external chemical analyses and 6% for external fire assays for gold and silver during the preliminary exploration stage. Due to the lack of adequate funding, no samples were submitted to external laboratories during the additional exploration stage.

Relative differences between results of external and routine analyses for samples submitted at the preliminary exploration stage at times exceeded the 95% confidence limit (see Table 8.9). To assess the impact on grade estimates, Geolen carried out two sets of estimates of zinc equivalent based on all samples from the North-Eastern Lode that were analysed in the first six months of 1993. The first set of estimates was based on the results as reported by Geolen and the second set on values for the grades of the same samples calculated from regression formulas, derived from the comparison of routine and control results. The overall impact turned out to be insignificant: 0.02% reduction in tonnage and 0.46% reduction in contained copper and zinc.

Table 8.9: Grade Classes with Relative Differences in Excess of 95% Confidence Limit

Element	Grade Class	Period	Lode
Cu	0.01 – 0.2%	Otr 1-2 1991	South-Western
	0.2 – 0.5%	Otr 1-2 1993	North-Eastern
	0.5 – 1%	1991	South-Western
Zn	0.2 – 0.5%	Ote 1-2 1993	North-Eastern
Au	1 – 4g/t	1991	South-Western
	0.2 – 1g/t	1992	South-Western

8.3.3.3 Dolinnoe & Obruchevskoe

According to tables in the Geolen report, 10,356 core samples were taken Including 2,520 samples taken at the prospecting-assessment stage, 6,403 samples taken at the preliminary exploration stage and 1,433 samples taken from earlier prospecting boreholes, including the discovery hole. The average sample length was 1.6m. Other samples included:

- 7,781 geochemical samples representing core intervals of up to 10m in length (9.2m on average) made up of small chips broken off along groves parallel to the core axis;
- Samples from the lithological horizon hosting the stratabound mineralisation for silica analysis;
- 35 waxed samples from mineralised intercepts for the determination of bulk density, moisture content and porosity; and
- 126 specimens for thin sections and 63 specimens for polished sections.
- Samples for process testwork and metallurgical mapping.

Analyses

As for Dolinnoe, spectral analyses were conducted at the laboratory of the Leninogorsk GRE (Geolen), as well as chemical analyses for copper, lead and zinc. Fire assaying for gold and silver was conducted at the central laboratory of Vostkazgeologia in Ust-Kamenogorsk, the laboratory of Leninogorsk GRE and the central laboratory of the Ridder-Sokolny mine.

Vostkazgeologia and VNIItsvetmet analysed composite samples for potential by-products and deleterious elements.

External control analyses were performed at the laboratories of Altay Geophysical Expedition (spectral analyses), Yuzhkazgeologia (chemical analyses) and Samarkandgeologia (fire assays). All participating laboratories were locally accredited.

Internal and external control analyses did not reveal any significant random or systematic errors.

8.3.4 Bulk Density

8.3.4.1 Dolinnoe

Bulk density was determined by hydrostatic weighing of about 7,000 core specimens. However, the development of unambiguous regression formulas for different types of mineralisation proved to be very difficult. Various formulas were tested but they either overestimated tonnage at the expense of contained base metals or vice versa.

It appears that the main reason for wide density fluctuations and low correlation between density and combined base metals is the presence of barite. However, the distribution of barite is erratic as it tends to be localised at discrete horizons, particularly in the upper portions of the stratabound mineralisation. High silver grades, often recorded in barite-rich mineralisation, further complicate the issue. Incorporation of barite in the regression formulae reportedly did not help in improving them and the issue requires further investigation.

Table 8.10 lists regression formulae used in the current reserve estimates. Relative differences between densities derived from the formulae and mean densities calculated from actual measurements for various grade classes average approximately from 1% to 7% depending on the combined content of base metals.

Table 8.10: Regression Formulae Used in Current Reserve Estimates

Lode	Mineralisation Style	Regression Formula
North-Eastern	Stratabound balance and off balance	D =2.6874 + 0.0469Cu + 0.054575PB +0.019296Zn
	Rich Stratabound	D = 2.8807975 + 0.075101Cu + 0.048542Pb + 0.013674Zn
	Steep dipping veins	D = 2.663691 + 0.015273Cu + 0.017277Pb + 0.021154Zn
South-Western	All Stratbound	D = 2.395283 + 0.90559Cu + 0.01636Pb 0.001154Zn
	Steeply dipping veins	D = 2.663591 + 0.015273Cu + 0.017277Pb + 0.021154Zn

8.3.4.2 Obruchevskoe

The same density determintation applies of Obruchevskoe and the following regression formula was developed based on 1,094 measurements:

D = 2.743429+0.022552 Cu + 0.069044 Pb + 0.017698 Zn

> ***WAI Comment:*** *Drilling methods, sampling and, sample preparation appear to be satisfactory based on historical reports and at both projects QA/QC (internal and external control analyses) did not reveal any significant random or systematic errors.*

8.3.5 Future Exploration

The Work Programme, submitted by Kazzinc and accepted by the Ministry of Energy and Mineral Reserves, includes detailed exploration (which is also Kazzinc's contractual commitment) phased over a six-year period and comprises:

- Pilot drilling at the sites selected for three shafts - the main shaft to access the Dolinnoe and Obruchevskoe deposits (Ventilation Shaft), an exploration shaft at Dolinnoe and an exploration shaft at Obruchevskoe;
- Capital development, comprising sinking of Ventilation Shaft with the development of a haulage crosscut on 18 level and sinking of the exploration shafts with the development of drives on 16 and 17 levels;
- Underground exploration, including 20,200m of diamond core drilling to infill the current drilling grid to 12x12-30m;
- Technical-Economic Assessment (TEO) to define reserve conditions; and

- Reserve estimation and submission of results for approval to the Government Commission for Natural Reserves (GKZ).

Table 8.11: Schedule and Budget for Detailed Exploration of the Dolinnoe and Obruchevskoe Deposits

Scope of Work	Year/Exploration Expenditure (US$)						Total US$
	1	2	3	4	5	6	
Pilot Drilling	160	-	-	-	-	-	**160**
Ventilation Shaft sinking	-	3,462	1,224	-	-	-	**4,686**
Obruchevskoe Exploration Shaft	-	209	1,220	400	-	-	**2,229**
Horizontal development on Obruchevskiy Level 22	-	-	-	-	435	880	**1,315**
Dolinnyi exploration shaft	-	1,040	183	-	-	-	**1,538**
Haulage crosscut on Dolinnoe and Obruchevskoe	-	-	-	418	560	560	**1,126**
TEO conditions and reserve estimation	-	-	-	-	-	115	**115**
Total	**160**	**5,111**	**2,627**	**818**	**1,415**	**2,261**	**12,392**

The Work Programme also includes conceptual mining plans for Dolinnoe and Obruchevskoe based on mining output capacities of 250,000tpy and 350,000tpy respectively. These capacities and all other parameters related to mining are subject to revision and renegotiation at the appropriate time.

To date, Kazzinc has drilled two pilot holes: 850m deep hole at the proposed site of the Dolinnoe exploration shaft and a 1,020m deep hole at the site of the Obruchevskoe exploration shaft.

8.4 Historical Reserve Estimates

8.4.1 Dolinnoe

Previous geological reserve estimates were made on completion of both stages of exploration, in 1994 (GKZ) and 1997 (Geolen).

8.4.1.1 Conditions

The reserve conditions on which the estimates were based were approved in December 1991 (Protocol No 2-t dated 30 December 1991) after a review of TEO by the State Committee produced to justify detailed exploration of the Dolinnoe deposit, and are summarised below:

- Sample cut-off grade= 3% Zn_{Eq};
- Minimum economic (commercial) grade in the block = 4.45% Zn_{Eq};
- The Zn_{Eq} formula used: Zn% + (Cu% x 0.7) + (Pb% x 0.7) + (Au g/t x 0.73) + (Ag g/t x 0.02);
- Grades below 0.12% Zn, 0.01% Cu, 0.03% Pb, 0.28g/t Au and 3.5g/t Ag are not convertible into Zn_{Eq};
- Minimum grade in intersections along the margins of the estimation blocks = 3.3% Zn_{Eq};
- Minimum thickness of ore = 1m, or appropriate grade x thickness values at thicknesses less than 1m;
- Maximum thickness of waste and low grade partings = 4m; and
- Minimum tonnage in isolated mineralised bodies (as below):

Content of Conditional Zinc %	Unit of Measurement	Reserves in Ore Zones and Blocks Isolated from the Main Ore Bodies		
		100m	150m	200m
5	kt	3.1	4.6	6.1
6	kt	1.5	2.2	2.9
8	kt	0.7	1.0	1.4

- Cut-off grade for off balance reserves: 2% Zn_{Eq};
- Zinc, lead, copper, gold, silver, cadmium and sulphur grades determined for the balanced and off-balance reserve blocks.

8.4.1.2 GKZ Reserves (1994/1995)

The Dolinnoe deposit was explored by core drilling from surface to a depth of 800m, the programme comprising 146 holes with a total depth of 70,309m.

The reserves were approved by the RK State Mineral Reserves Protocol No 26 dated 23.03.1995, confirming the provisional estimates of 01.08.1994 and are summarised in Table 8.12.

Table 8.12: Dolinnoe - Reserves Approved by GKZ KR (1995)

	Units	Balanced			Off Balance
		C_1	C_2	C_1+C_2	
Ore Reserves:	**kt**	**1029.4**	**1497.9**	**2527.3**	**949.3**
Copper	kt	6.0	4.8	10.8	1.4
Lead	kt	18.8	18.7	37.5	5.0
Zinc	kt	37.7	34.5	72.2	10.0
Gold	kg	10,887.4	9,329.9	20,217.3	2,175.8
Silver	t	147.9	118.9	266.8	30.5
Cadmium	t	-	252.7	252.7	-
Sulphur	'000t	-	88.7	88.7	-
Average Grade					
Copper	%	0.59	0.32	0.43	0.15
Lead	%	1.83	1.25	1.48	0.53
Zinc	%	3.67	2.30	2.86	1.05
Gold	g/t	10.58	6.23	8.00	2.29
Silver	g/t	143.72	79.38	105.57	32.13
Cadmium	%	-	0.01	0.01	-
Sulphur	%	-	3.51	3.51	-

8.4.1.3 TOO "Geolen" Reserves (1997)

Additional exploration of the high grade gold-polymetallic ores in the North-Eastern Lode was carried out during the period from 1994 to 1997 in accordance with Geological Assignment No. 99, when the drilling grid was reduced further to 20-25x25m.

The reserve classification was based on the drilling grid density; 20-30x25-30m - 40-50x50m were classified as C_1 with the remaining reserves (50-130x100-140m), allocated to the C_2 category, as were small isolated lenses.

The Geolen estimates are summarised in Table 8.13.

Table 8.13: Dolinnoe – Reserves (TOO «Geolen » 1997)					
	Units	Balanced			Off Balance
		C_1	C_2	C_1+C_2	
Ore Reserves	kt	945.82	1686.2	2632.02	949.3
Copper	kt	5.95	4.86	10.81	1.4
Lead	kt	19.81	19.63	39.44	5.0
Zinc	kt	38.92	38.01	76.93	10.0
Gold	kg	11358.8	9334.2	20693	2175.8
Silver	t	188.83	96.84	285.67	30.5
Average Grade					
Copper	%	0.63	0.29	0.41	0.15
Lead	%	2.09	1.16	1.50	0.53
Zinc	%	4.11	2.25	2.92	1.05
Gold	g/t	12.01	5.54	7.86	2.29
Silver	g/t	199.65	57.43	108.54	32.13

8.4.2 Obruchevskoe

The Obruchevskoe deposit was explored by drilling from surface on an initial exploratory grid of 50x70 m and 100x150 m during the same exploration programmes described for Dolinnoe.

8.4.2.1 Conditions

The RK State Mineral Resources Commission of the Ministry of Geology and Subsoil Resources protection approved temporary conditions for Obruchevskoe deposit ores by Protocol No. 8 dated 25.02.1994.

For balance reserves:

- The cut-off grade of the conditional zinc in samples – 4.0%;
- Minimal commercial content of conditional zinc in the evaluation block – 6.0%;
- Conversion factors to conditional zinc-zinc = 1.0; copper = 0.87; lead = 0.33. In the conversion to conditional zinc the following grades, zinc <0.2%, lead <0.1% and copper <0.03% are not considered;
- Minimum thickness of ore bodies included in the reserve evaluation = 3m; in the case of a lesser thickness and higher grade the appropriate grade x width equivalent is used. For each block, the average grade of the contained intersections are weighted by respective intersection lengths and the average grade of each intersection having been pre-estimated by the weighted average method (grade x sample length/intersection length) are calculated;
- Maximum acceptable thickness of waste partings and low grade material included in the ore body = 3.0m;
- A cut-off grade of 1% conditional zinc used for delineating off balance ores; and
- Zinc, lead, copper, gold, silver, cadmium and sulphur grades are to be determined for the balanced and off-balance reserve blocks.

8.4.2.2 GKZ Reserves (1995)

The reserves were not submitted for approval to the State Mineral Reserve Commission but recorded in the State Balance.

Table 8.14: Obruchevskoe – Reserves not Submitted for Approval to the SMR Commission (1995)					
		C_1	C_2	$C_1 + C_2$	*Off-balance*
Ore Reserves	**kt**	**964.3**	**2,792.3**	**3,756.7**	-
Copper	kt	12.5	30.2	42.7	-
Lead	kt	51.7	62.1	113.8	-
Zinc	kt	123.8	194.3	318.1	-
Gold	kg	1,121	,1979	3,100	-
Silver	t	31.6	58.0	89.6	-
Average Grade					
Copper	%	1.30	1.08	1.14	-
Lead	%	5.36	2.22	3.03	-
Zinc	%	12.84	6.96	8.47	-
Gold	g/t	1.16	0.71	0.82	-
Silver	g/t	32.77	0.71	23.85	-

8.4.2.3 TOO "Geolen" Reserves (2002)

Introduction

The most recent reserve estimation was conducted by Geolen in 2001 using all previously generated drilling data, reported as at 01.01.2002.

Conditions

- Sample cut-off grade to define mineralised intercept intervals - 2.0% Zn_{Eq}, where Zn_{Eq} = 1.8xCu + Zn + 0.2xPb, with grades less than 0.06% Cu, less than 0.3% Zn and less than 0.1% Pb not being subject to conversion;
- Minimum grade in estimation block = 5% Zn_{Eq};
- Minimum thickness = 1m; in the case of a lesser thickness and higher grade the appropriate grade x width equivalent is used;
- Maximum acceptable thickness of waste partings and low grade material included in the ore body = 3.0m; and
- Cut-off grade for delineating off balance reserve = 0.9% Zn_{Eq}.

The conditions are of an interim character and have not been submitted for GKZ RK approval.

> ***WAI Comment:*** *The formula for the ZnEq is based on the metal recoveries reported for the Ridder-Sokolny ores and on outdated metal prices. The formula does not account for gold and silver, both of which significantly contribute to the Ridder-Sokolny mine revenue. The use of cut-off grades based solely on the base metals may have led to a reserve understatement.*

Database

The database was compiled in 1993-1995, and consists of over 9,000 core samples with copper, lead, zinc, gold and silver grades from 136 boreholes, including some holes completed in the area before the prospecting-assessment programme was initiated. It also includes complete records of downhole surveys.

Geological Interpretation

Geological interpretation was originally performed manually on cross sections, longitudinal sections and plans of the levels. They were based on primary drilling and geophysical data and present the key geological features such as borehole intersections and traces, stratigraphy, lithology, mineralised bodies, folds, intrusives, faults, orientation of contacts, etc.

The main weakness is that the perimeters of mineralised bodies are constrained by the reserve condition parameters which make the interpretation appear final. Widths and grades of borehole intersections are shown only for composited lengths within the perimeters of mineralised bodies, which makes alternative interpretation impossible without the substantial effort involved in searching for, and plotting sample results.

The interpretation is based on 688 intersections in 111 drillholes, comprising 279 intersections with weighted average grades of 2-10% Zn_{Eq} and 92 intersection with >10% Zn_{Eq} (balance reserves) and 317 intersections with 0.9-2% Zn_{Eq} (off balance reserves).

Estimation Method

Geolen used the method of geological blocks on horizontal projection. In this method mineralised bodies are subdivided into large blocks with boundaries defined by faults or other geological boundaries, grade drift or arbitrarily on the drilling density. Each block is assigned the average grade of the contained intersections weighted by respective intersection lengths, the average grade of each intersection having been pre-estimated by the weighted average method (grade x sample length/intersection length). The area of each block is estimated in plan view, multiplied by the average vertical length of the contained intersections to estimate the volume, which is multiplied by the bulk density to obtain the block tonnage.

Geolen performed the estimates using the MORE program developed by Almaty-based consulting firm Geoincentr.

Geolen divided the reserve into two groups:

- Reserves in geological blocks (as defined above); and
- Reserves in small blocks centred on single isolated borehole intercepts.

Altogether, there are 82 blocks, including 33 blocks with the average Zn_{Eq} grade equal to, or greater than 5% Zn_{Eq}, which according to the reserve conditions were classified as a balance resource.

The blocks were sorted into three groups corresponding to the grades defined in the reserve conditions; namely:

- Blocks 20-52 - balance reserve (>2% Zn_{Eq});
- Blocks 1-13 – high grade reserves (>10% Zn_{Eq}) estimated within the balance resource; and
- Blocks 101-138 - off balance reserve (0.9-2% Zn_{Eq}).

In addition, Geolen estimated tonnage and grades of gold-bearing mineralisation contained within the balance reserve. These estimates were subdivided into:

- Low grade gold-bearing reserve(0.5-2g/t Au);
- Average gold-bearing reserve(2g/t-16g/t Au); and
- High grade gold-bearing reserve (>16g/t Au).

Low sulphide, gold-bearing quartz veins were estimated separately outside Kazzinc's reserve conditions criteria, and block volumes were converted to tonnages using the bulk density regression formula.

Reserve Classification

Geolen based its reserve classification on drilling density. Reserves in blocks with a drilling grid of 30-50x50-60m were classified as C_1 category, and with a drilling grid of 50-70x60-100m classified as C_2. Reserves in small blocks assigned to single isolated mineralised intercepts were also classified as C_2 and reported separately to the reserve contained in large geological blocks.

The results reported by Geolen are presented in Table 8.15.

Table 8.15: Obruchevskoe – Reserves (TOO «Geolen » 01.01.2002)					
	Units	**C_1**	**C_2**	**C_1+C_2**	***Off-balance***
Ore Reserves:	**'000t**	**4,047.201**	**581.531**	**4,628.732**	**6,657.947**
Copper	'000t	45.114	6.474	51.587	25.456
Lead	'000t	162.013	11.563	173.576	30.605
Zinc	'000t	388.958	26.562	415.520	94.874
Gold	kg	7,298.8	441.1	7,739.9	1,691.9
Silver		221.409	104.012	325.421	83.107
Cadmium	t	-	-	1455.3	-
Antimony	t	-	-	560	-
Arsenic	t	-	-	1816	-
Selenium	t	-	-	41.6	-
Molybdenum	t	-	-	225	-
Pyrite	'000t	-	-	490.342	-
Average Grade					
Copper	%	1.11	1.11	1.11	0.38
Lead	%	4.0	1.99	3.75	0.46
Zinc	%	9.61	4.57	8.98	1.42
Gold	g/t	1.8	0.76	1.67	0.25
Silver	g/t	54.71	178.86	70.3	12.48
Cadmium	%	-	-	0.03144	-
Antimony	%	-	-	0.0121	-
Arsenic	%	-	-	0.03924	-
Selenium	%	-	-	0.0009	-
Molybdenum	%	-	-	0.00529	-
Pyrite	%	-	-	4.5116	-

8.4.3 Mining Reserves

The mining reserves (commodity ore) used in the June 2008 TEO life of mine and other projections are derived from the geological reserves and the application of loss and dilution factors specific to each deposit (Table 8.16). By back calculation the net increases in the geological reserve comprise 11.7% and 12.7% for Dolinnoe and Obruchevskoe respectively.

Table 8.16: Dolinnoe & Obruchevskoe-Commodity Reserves of Ore and Metals Accepted for the Final Feasibility Study [TEO]						
	Tonnage	**Grade/Metal Content**				
		Zn ***%***	**Pb** ***%***	**Cu** ***%***	**Au** **g/t**	**Ag** **g/t**
Obruchevskoe						
Ore (t)	**5,214,300**	7.45	3.11	0.92	1.39	58.35
Metal (t)		388,511	162,293	48,234	7,237kg	304,268kg
Dolinnoe						
Ore (t)	**2,883,700**	2.54	1.30	0.36	6.82	94.20
Metal (t)		73,160	37,507	10,280	19,679kg	271,672kg
Total						
Ore (t)	**8,098,000**	5.70	2.47	0.72	3.32	71.12
Metal (t)		461,671	199,800	58,514	26,916kg	575,940kg

8.5 Current Mineral Resource Estimate (2011)

8.5.1 Dolinnoe & Obruchevskoe

8.5.1.1 Introduction

The mineral resource estimate presented here for the Dolinnoe ore zone in the Ridder-Sokolnoe deposit, is based on the model prepared by Kazakhstan Mineral Company (KMC) in January and February 2011. The mineral resource model considers drilling available to this date and the effective date of this resource estimate is 02/02/2011.

8.5.1.2 Database Compilation

The sample database was supplied by Kazzinc in Datamine Format. Checks were made for overlapping or duplicate samples and the database was found to be in good order. The database consists of 224 surface drillholes. Table 8.17 below lists the number of samples and Table 8.18 the basic statistics of the global database. The samples were analysed for Au, Ag, Cu, Pb and Zn.

Table 8.17: Summary of Assay Data

Sampling Method	Number of Holes	Total Metres	Average Hole Length	Number of Assays
Drillholes	224	152,445.7	680.6	10,858

Table 8.18: Basic Global Statistics

Element	Number Of Samples	Minimum	Maximum	Mean	Variance	Standard Deviation	CV
AU (g/t)	10858	0.01	213.80	1.16	35.50	5.96	5.14
AG (g/t)	10858	0.01	7187.00	15.43	20289.77	142.44	9.23
CU (%)	10858	0.00	6.50	0.08	0.09	0.30	3.99
PB (%)	10858	0.01	20.10	0.27	0.93	0.96	3.56
ZN (%)	10858	0.01	32.90	0.51	3.53	1.88	3.69

8.5.1.3 Domaining

Mineralised zone wireframes were created to a cut-off grade of 1.7% Zinc Equivalent (ZnEq) where:

ZnEq= 1.02*Pb + 3.15*Cu + 1.66*Au +0.03*Ag + Zn

Where grades of less than 0.03% Pb, 0.01% Cu, 0.28g/t Au, 3.5g/t Ag and 0.12% Zn were not converted. The minimum thickness of mineralised intercept is 2m and the maximum included thickness of barren or below cut-off grade samples is 2m. Examples are shown in Figure 8.7 of a plan view and an isometric view respectively. There are 2 ore zones within the deposit; Upper and Lower. Ore bodies from Upper Ore Zone are bedded, Lower Ore Zone bodies are steeply dipping to south-west.

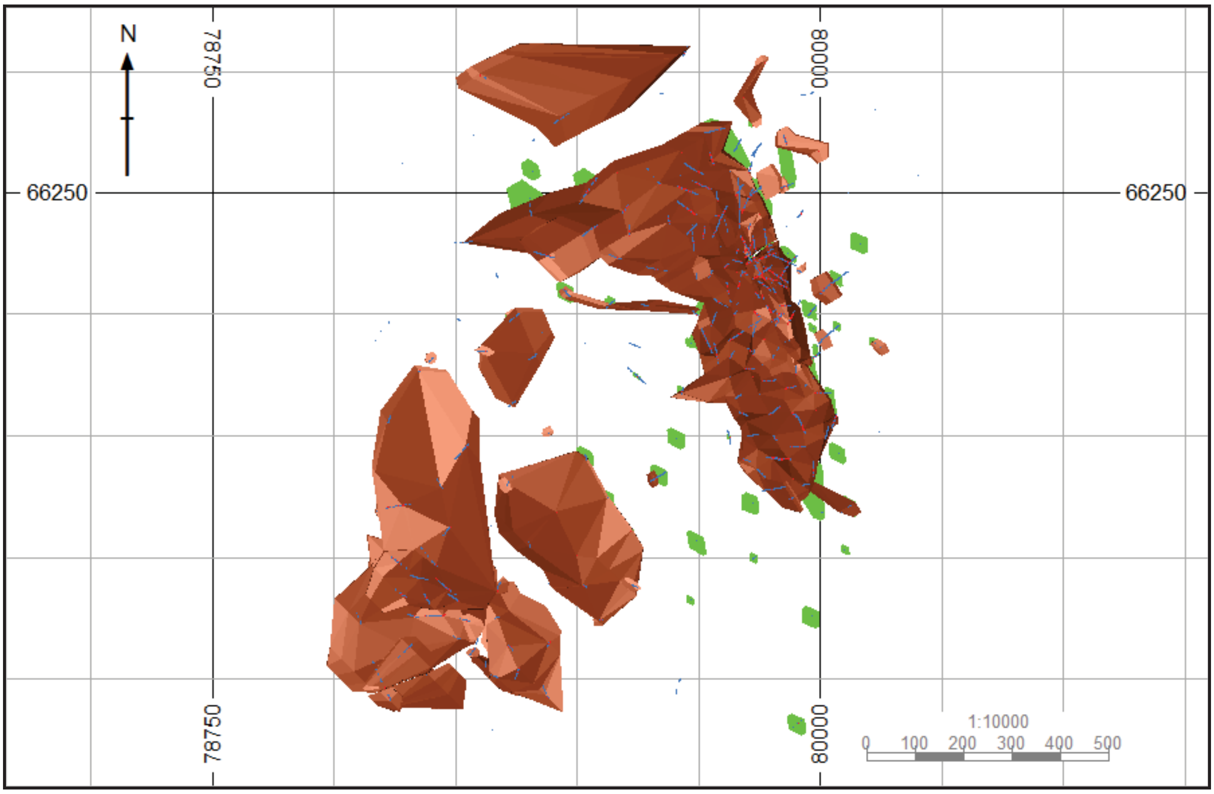


Figure 8.7: Plan View With Upper (Brown) and Lower (Green) Mineralised Zones

8.5.1.4 Global Geostatistical Analysis

Samples were selected within the mineralised zone wireframes for further processing. The basic statistics of those samples from within the mineralised zones are listed in Table 8.19.

Table 8.19: Basic Statistics of Selected Samples

Element	Number Of Samples	Minimum	Maximum	Mean	Variance	Standard Deviation	CV
AU (g/t)	3383	0.01	213.80	3.29	107.25	10.36	3.15
AG (g/t)	3383	0.01	7187.00	43.94	63912.31	252.81	5.75
CU (%)	3383	0.01	6.50	0.20	0.26	0.51	2.59
PB (%)	3383	0.01	20.10	0.73	2.57	1.60	2.20
ZN (%)	3383	0.01	32.90	1.40	10.03	3.17	2.26

The populations of each element are roughly log-normal with a positive skew. Each of the elements has a small high grade outlier population. To identify the need for top cuts, the log probability plots and quantile distribution for each domain were studied to identify the level of any outlier values. Top cuts were applied to these outliers in order to reduce any undue influence during grade estimation. Values above the top cut value are reduced to that value. These values were initially chosen as points on log probability plots where the sample population distribution changed. Assays above this level were checked to make sure that, spatially, the samples to be top cut were not clustered forming a distinct high grade zone. For Au a separate higher grade domain was given a higher top cut level. A summary of this top cutting is given in Table 8.20.

Table 8.20: Top Cutting Summary

Element	Cutting Level	No Samples Cut	Average Grades	
			Before Top Cutting	After Top Cutting
Au for ore body 1-1	98	4	6.29	5.81
Au for other ore bodies	55	9	2.59	2.53
Ag	2254	12	43.94	39.45
Cu	3.97	19	0.20	0.19
Pb	11.25	25	0.73	0.71
Zn	26.3	13	1.40	1.39

8.5.1.5 Variography

Experimental variograms were calculated and models fitted for the Dolinnoe ore zone in Micromine using the composited samples for Au, Ag, Cu, Pb and Zn in both the Upper and Lower ore zones. Figure 8.8 shows the along strike and down dip variogram models for Zn in the Lower ore zone.

8.5.1.6 Block Modelling

Block models were created within each of the mineralised zone wireframes. A parent cell size of 5m x 10m x 5m was selected. Sub cell splitting to a minimum block size of 1m x 2m x 1m in the X, Y and Z directions.

8.5.1.7 Density

A Regression formula was used post grade estimation to calculate density in to the block models based on metal content. The formula for bulk density used at Dolinnoe is:

Bulk Density = 2.8 + 0.047*Pb + 0.014*Cu + 0.013*Zn.

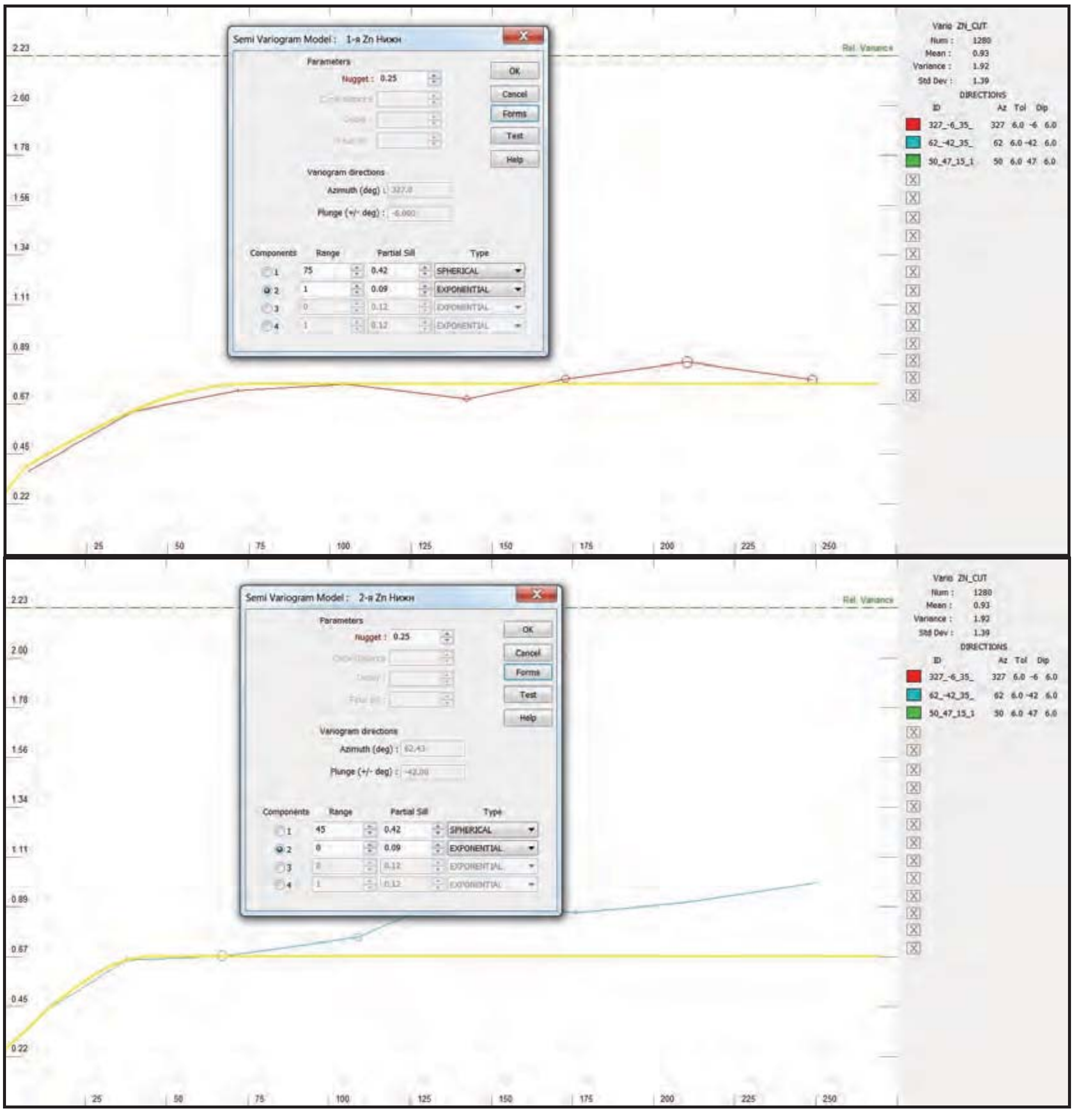


Figure 8.8: Along strike (Top) and down dip (Bottom) variogram models for Zn in the Lower Ore Zone.

8.5.1.8 Grade Estimation

Grade estimation was carried out using Ordinary Kriging (OK) as the principal interpolation method with Inverse Power of Distance (IPD) used for comparative purposes. Grades were estimated in to the block model using a zonal control based on domain. Grades were estimated into each individual subcell. Sample weighting during grade estimation was determined by the variogram model parameters for the OK method. Cell discretisation was set at 2 x 2 x 2. A multiple pass approach was used with up to three expansions of the search ellipse if minimum conditions were not met in the first or second ellipse. The first search ellipse is equal in size to 2/3 of the variogram ranges as outlined above. The second ellipse was equal in size to the range of the variograms and the third equal to three times the variogram range. The key estimation parameters are listed below in Table 8.21 for the Upper ore zone and in Table 8.22 for the Lower ore zone.

Post estimation a zinc equivalent grade (EqvZn) is calculated in to the block models from the estimated grades using the formula;

$$EqvZn = 1.02*Pb + 3.15*Cu + 1.66*Au + 0.03*Ag + Zn.$$

Table 8.21: Estimation Parameters for Upper Ore Zone of Dolinnoe deposit (KMC 2011)						
Ellipse	Parameter	Au	Ag	Cu	Pb	Zn
1st	Search Radii 1 (m) – across strike	41	52	23	23	24
	Search Radii 2 (m) – along strike	48	27	20	20	20
	Search Radii 3 (m) – down dip	20	3	5	6	5
	Minimum Composites	4	4	4	4	4
	Minimum Drill Holes	2	2	2	2	2
2nd	Search Radii 1 (m) – across strike	61	78	35	38	36
	Search Radii 2 (m) – along strike	72	40	30	30	30
	Search Radii 3 (m) – down dip	30	5	7	9	7
	Minimum Composites	2	2	2	2	2
	Minimum Drill Holes	2	2	2	2	2
3rd	Search Radii 1 (m) – across strike	183	234	105	114	108
	Search Radii 2 (m) – along strike	216	120	90	90	90
	Search Radii 3 (m) – down dip	90	15	21	27	21
	Minimum Composites	1	1	1	1	1
	Minimum Drill Holes	1	1	1	1	1

Table 8.22: Estimation Parameters for Lower Ore Zone of Dolinnoe deposit (KMC 2011)						
Ellipse	Parameter	Au	Ag	Cu	Pb	Zn
1st	Search Radii 1 (m) – across strike	39	47	32	47	51
	Search Radii 2 (m) – along strike	17	44	53	23	30
	Search Radii 3 (m) – down dip	15	19	32	13	10
	Minimum Composites	4	4	4	4	4
	Minimum Drill Holes	2	2	2	2	2
2nd	Search Radii 1 (m) – across strike	58	70	48	70	76
	Search Radii 2 (m) – along strike	26	66	80	35	45
	Search Radii 3 (m) – down dip	22	29	48	19	15
	Minimum Composites	2	2	2	2	2
	Minimum Drill Holes	2	2	2	2	2
3rd	Search Radii 1 (m) – across strike	174	210	144	210	228
	Search Radii 2 (m) – along strike	78	198	240	105	135
	Search Radii 3 (m) – down dip	66	87	144	57	45
	Minimum Composites	1	1	1	1	1
	Minimum Drill Holes	1	1	1	1	1

8.5.1.9 Validation

A model validation process included the examination of block model versus composites, and the building up of a model grade profile, to compare average grades on vertical slices, as derived from the composites directly, as well as from interpolated model grades.

8.5.1.10 Resource Classification

The Mineral Resource estimates for Dolinnoe set out below are classified in accordance with the guidelines of the JORC Code (2004)

The basis of the definition of the resource categories was the pass used in estimating blocks. Essentially this gives approximate drillhole spacings for the allocation of resources which can be summarised as 20m x 4m for *Measured* resources (along strike and down dip), 36m x 7m for Indicated resources and 108m x 21m for *Inferred* resources. Figure 8.9 is a plan view of Dolinnoe showing JORC classification.

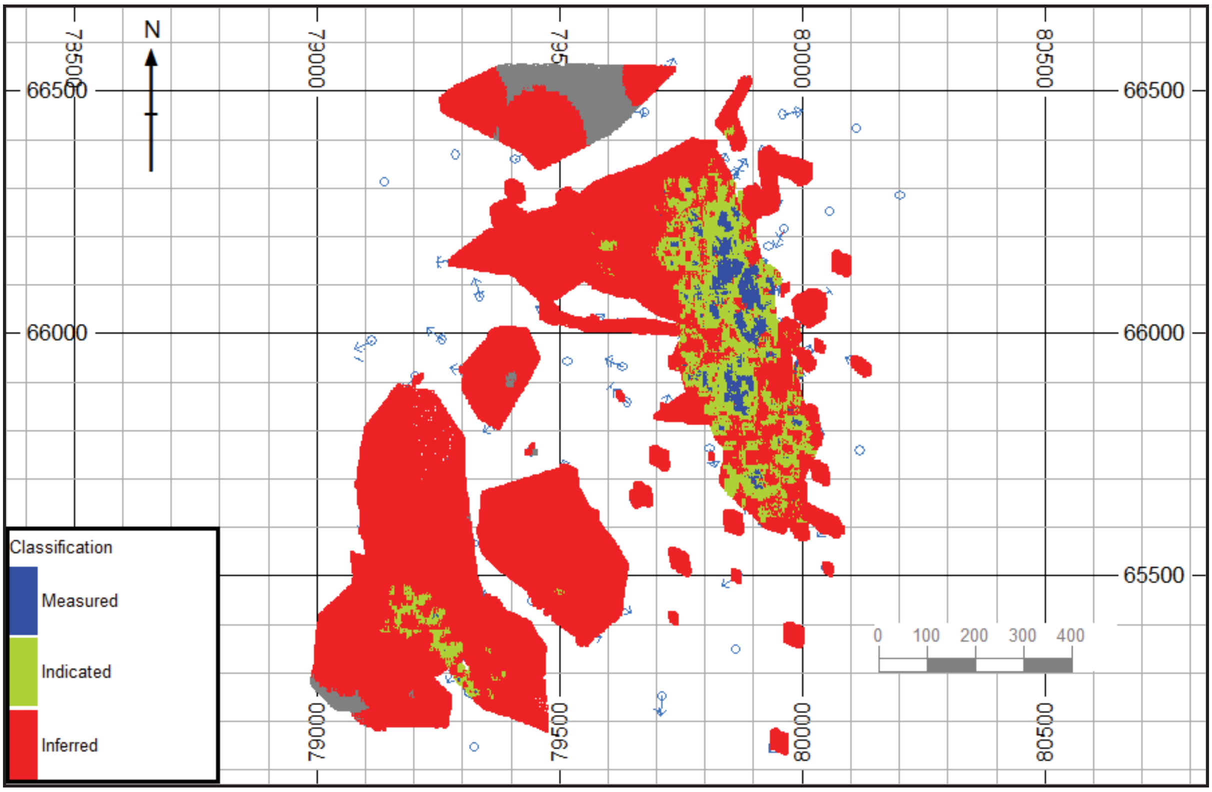


Figure 8.9: Plan view of JORC Classification at Dolinnoe.

8.5.1.11 Resource Evaluation

Grade-tonnage information for Dolinnoe is summarised in Table 8.23 for total in-situ resources at a cut-off grade of 1.7% EqvZn. The grades and classifications are reported as estimated by OK method with an effective date of 01 January 2011.

Table 8.23: Dolinnoe Polymetallic Deposit Total In-situ Resources - For All Orebodies at a cut off grade of 1.7% EqvZn
(In Accordance with the Guidelines of the JORC Code (2004))
(WAI 01.01.2011)

Classification	Tonnage (kt)	Density	Pb		Zn		Cu		Au		Ag		EQV
			%	kt	%	kt	%	kt	g/t	oz	g/t	oz	%
Measured	5,043	2.86	0.74	37.32	1.39	70.10	0.20	10.09	3.85	624,252	50.47	8,183,378	10.65
Indicated	2,707	2.84	0.48	12.99	1.00	27.07	0.14	3.79	2.32	201,879	28.05	2,440,821	6.60
Measured +Indicated	7,750	2.85	0.65	50.31	1.25	97.17	0.18	13.88	3.32	826,131	42.64	10,624,199	9.24
Inferred	6,907	2.84	0.48	33.15	0.86	59.40	0.12	8.29	1.59	353,085	15.88	3,526,405	4.84

Notes:
1. Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility study or pre-feasibility study.
2. Mineral Resources are reported inclusive of any reserves.
3. The contained Au represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery.

8.5.2 Obruchevskoe

8.5.2.1 Introduction

The mineral resource estimate presented here, is based on the model prepared by KMC and is in accordance with the guidelines of the JORC Code (2004) and considers drilling carried out as at 01.01.2011.

8.5.2.2 Database Compilation

The sample database was supplied by Kazzinc in Datamine format, and consists of 134 surface drillholes. Checks were made for overlapping or duplicate samples and the database was found to be in good order. Table 8.24 lists the number of samples and Table 8.25 the basic statistics of the database.

Table 8.24: Summary of Assay Data

Sampling Method	Number of Holes	Total Metres	Average Hole Length	Number of Assays
Drillholes	134	153,380.5	1,144.6	5,122

Table 8.25: Basic Global Statistics

Element	Number Of Samples	Minimum	Maximum	Mean	Variance	Standard Deviation	CV
AU (g/t)	5,122	0.00	71.20	0.59	8.86	2.98	5.04
AG (g/t)	5,122	0.00	5,019.20	18.94	12,055.61	109.80	5.80
CU (%)	5,122	0.00	11.30	0.33	0.60	0.78	2.39
PB (%)	5,122	0.00	26.80	0.99	10.24	3.20	3.24
ZN (%)	5,122	0.00	43.70	2.33	37.73	6.14	2.64

8.5.2.3 Domaining

Mineralised zone wireframes were created to a cut-off grade of 1.7% Zinc Equivalent (Zn_{Eq}) where:

Zn_{Eq}= 0.94xPb + 2.78xCu + 1.13xAu +0.02xAg + Zn

The minimum thickness of mineralised intercept is 1m and the maximum included thickness of barren or below cut-off grade samples is 3m. Eight major zones were domained in the process with two more consisting of smaller lenticular bodies (see Figure 8.10). Due cognisance was taken of the geological interpretation to limit the mineralised domains by the interpretation of the position of the host unit.

Figure 8.10: Isometric View Looking North East of Mineralised Zones

8.5.2.4 Global Geostatistical Analysis

Samples were selected within the mineralised zone wireframes for further processing. The basic statistics of those samples from within the mineralised zones are listed in Table 8.26.

Table 8.26: Basic Statistics of Selected Samples

Element	Number Of Samples	Minimum	Maximum	Mean	Variance	Standard Deviation	CV
AU (g/t)	1,936	0.00	71.20	1.25	21.13	4.60	3.69
AG (g/t)	1,936	0.00	5,019.20	44.25	30,609.95	174.96	3.95
CU (%)	1,936	0.00	11.30	0.76	1.21	1.10	1.45
PB (%)	1,936	0.00	26.80	2.46	23.37	4.83	1.96
ZN (%)	1,936	0.00	43.70	5.74	80.02	8.95	1.56

The populations of each element are approximately log-normal with a positive skew. Each of the elements has a small high grade outlier population.

A composite length of 1.5m was chosen for further processing in order to give a consistent level of support for geostatistical analysis.

The same approach for top cuts was applied as for Dolinnoe.

A summary of this top cutting is given in Table 8.27.

Table 8.27: Top Cutting Summary				
Element	Cutting Level	No Samples Cut	Average Grades	
			Before Top Cutting	After Top Cutting
Au	15	34	1.27	0.97
Ag	346.5	36	39.74	32.16
Cu	5.2	10	0.75	0.74
Pb	20.2	10	2.26	2.25
Zn	36.8	9	5.43	5.41

8.5.2.5 Variography

A single set of experimental variograms were calculated and models fitted for the Obruchevskoe ore zone in Micromine® using the composited samples for Au, Ag, Cu, Pb and Zn. Figure 8.11 shows the along strike and down dip variogram models for Zn.

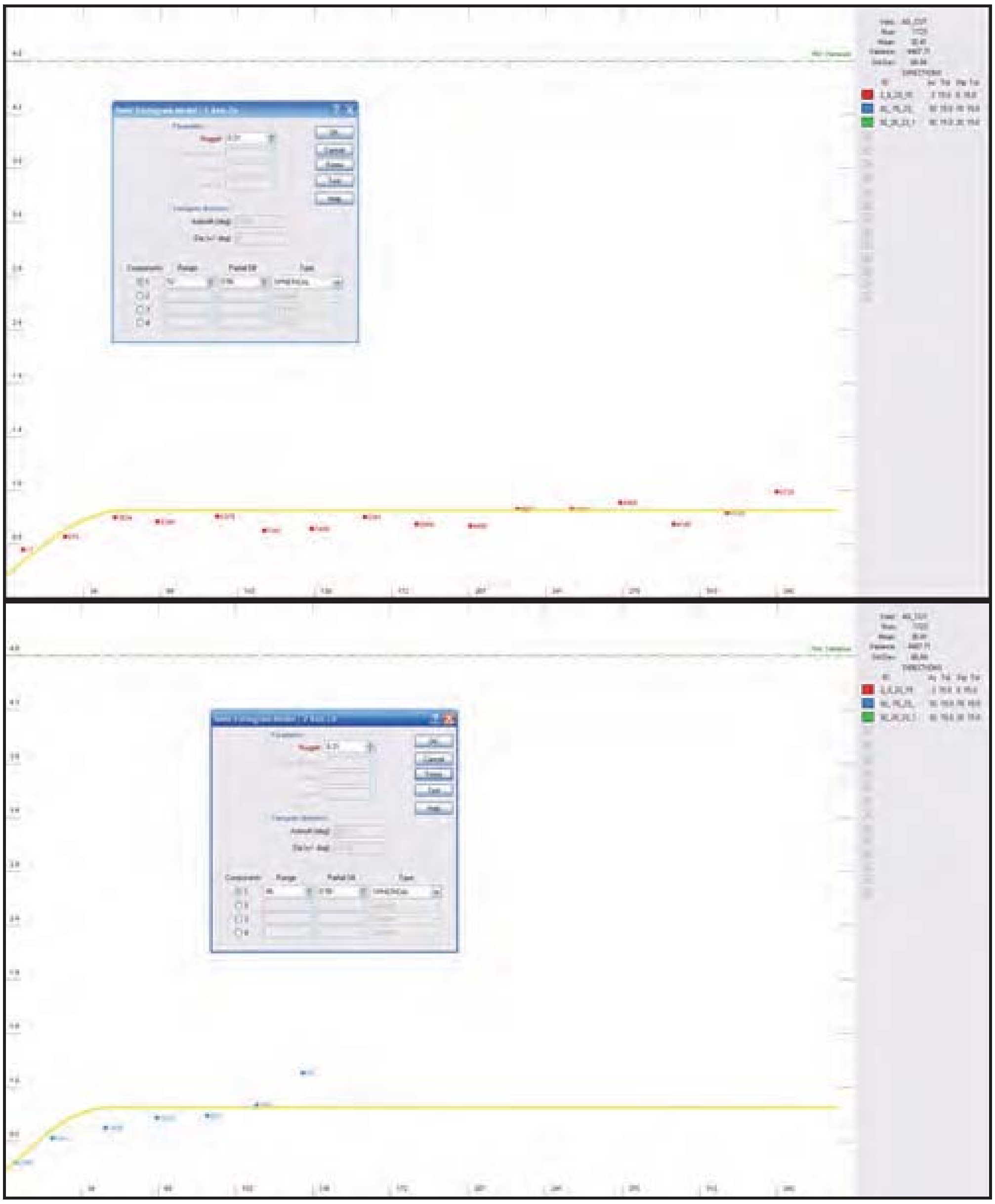


Figure 8.11: Along strike (Top) and down dip (Bottom) variogram models for Zn

8.5.2.6 Block Modelling

Block models were created within each of the mineralised zone wireframes. A parent cell size of 15m x 15m x 10m was selected. Sub cell splitting to a minimum block size of 3m x 3m x 2m in the X, Y and Z directions.

8.5.2.7 Density

A Regression formula was used post grade estimation to calculate density into the block models based on metal content. The formula for bulk density used at Obruchevskoe is:

Bulk Density = 2.743429 + 0.069044xPb + 0.022552xCu + 0.017698xZn.

8.5.2.8 Grade Estimation

A similar approach to grade estimation as for Dolinnoe was applied. The key estimation parameters are listed below in Table 8.28.

Post estimation a zinc equivalent grade (EqvZn) is calculated in to the block models from the estimated grades using the formula;

EqvZn = 0.94xPb + 2.78xCu + 1.13xAu +0.02xAg + Zn.

Table 8.28: Estimation Parameters for Obruchevskoe

Ellipse	Parameter	Au	Ag	Cu	Pb	Zn
1st	Search Radii 1 (m) – across strike	51	47	43	23	31
	Search Radii 2 (m) – along strike	37	62	37	41	35
	Search Radii 3 (m) – down dip	29	20	29	36	26
	Minimum Composites	9	9	9	9	9
	Maximum Composites	16	16	16	16	16
	Minimum Drill Holes	3	3	3	3	3
2nd	Search Radii 1 (m) – across strike	77	70	64	35	46
	Search Radii 2 (m) – along strike	55	93	56	61	52
	Search Radii 3 (m) – down dip	43	30	44	54	39
	Minimum Composites	6	6	6	6	6
	Maximum Composites	12	12	12	12	12
	Minimum Drill Holes	2	2	2	2	2
3rd	Search Radii 1 (m) – across strike	154	140	128	105	115
	Search Radii 2 (m) – along strike	110	186	112	183	130
	Search Radii 3 (m) – down dip	86	60	88	162	98
	Minimum Composites	4	4	4	4	4
	Maximum Composites	8	8	8	8	8
	Minimum Drill Holes	1	1	1	1	1

8.5.2.9 Validation

The same approach to model valuation was followed as for Dolinnoe.

8.5.2.10 Resource Classification

The Mineral Resource estimates for Obruchevskoe set out below are classified in accordance with the guidelines of the JORC Code (2004).

The basis of the definition of the resource categories was the pass used in estimating blocks. Essentially this gives approximate drillhole spacings for the allocation of resources which can be summarised as 35m x 31m for measured resources (along strike and down dip), 52m x 46m for Indicated resources and 130m x 115m for inferred resources. Figure 8.12 is an isometric view of Obruchevskoe showing JORC classification.

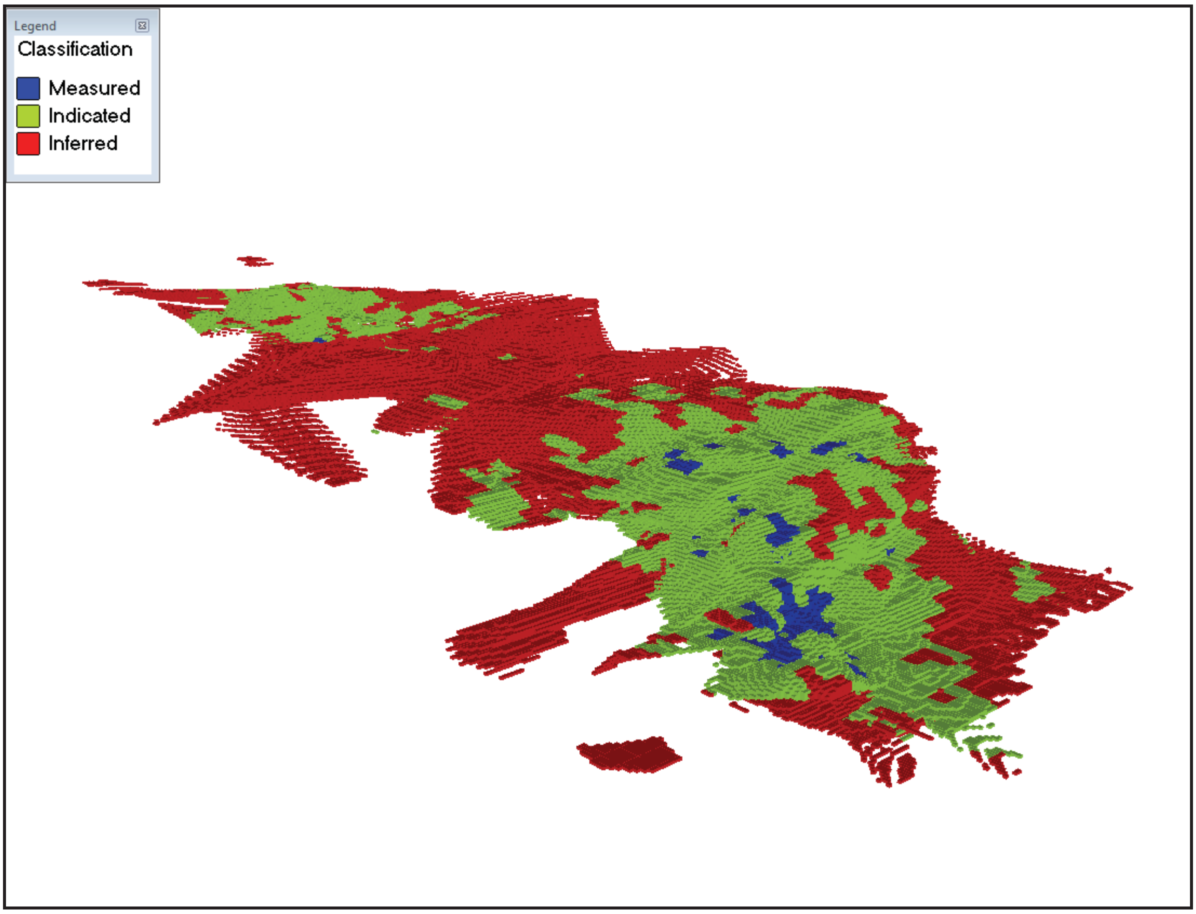


Figure 8.12: Isometric View to the North East view of JORC Classification at Obruchevskoe

8.5.2.11 Resource Evaluation

Grade-tonnage information for Obruchevskoe is summarised in Table 8.29 for total in-situ resources. The grades and classifications are reported as estimated by OK method to a cut off grade of 1.7% EqvZn with an effective date of 9 February 2011 and in accordance with the guidelines of the JORC Code (2004).

**Table 8.29: Obruchevskoe Mineral Resource Estimate
For All Orebodies at a Cut off Grade of 1.7% EqvZn
(WAI 01.01.2011)
(In Accordance with the Guidelines of the JORC Code (2004))**

Classification	Tonnage (kt)	Density	Zn		Pb		Cu		Au		Ag		EQV
			%	t	%	t	%	t	g/t	oz	g/t	oz	%
Measured	1,154	3.20	8.87	102,360	4.02	46,391	0.88	10,155	1.62	60,105	40.68	1,509,308	17.75
Indicated	7,783	2.96	4.64	361,131	1.78	138,537	0.73	56,816	0.67	167,654	25.36	6,345,814	9.61
Measured +Indicated	8,937	2.99	5.18	462,937	2.07	184,996	0.75	67,028	0.79	226,992	27.34	7,855,636	10.66
Inferred	5,500	2.83	1.75	96,250	0.64	35,200	0.41	22,550	0.50	88,415	24.97	4,415,423	4.56

8.6 Mining

8.6.1 Production Rate

8.6.1.1 Dolinnoe

Productivity of the mine has been based on the number of stopes in production at the any one time on each level and in each lode. The production rate is calculated on the assumption that one stope can be mined from the South-West Lode at a rate of 80ktpa and three stopes in operation from the North-East Lode at a rate of 50ktpa. Therefore the productivity of the mine will be 250ktpa.

8.6.1.2 Obruchevskoe

The production rate is calculated on the assumption that two stopes can be mined from the upper levels at a rate of 120ktpa and one stope in operation from the lower levels at a rate of 110ktpa. Therefore the calculated production rate will be 350ktpa. The combined Dolinnoe-Obruchevskoe production rate will be 600ktpa.

8.6.2 Life of Mine

For the Dolinnoe mine, the mine life is expected to be 11.5 years based on the reserve of 2.88Mt being mined at 250ktpa and for Obruchevskoe, the mine life will be 14.9 years based on 5.21Mt being mined at 350ktpa.

Taking into account the time required for mine development, the production overlap and the winding down of the mines, the mine life of the Dolinnoe-Obruchevskoe mine is expected to be 16 to 18 years.

8.6.3 Mine Design

The development of the Dolinnoe and Obruchevskoe deposits has been determined taking into account the following mining, geological, geographical and engineering conditions:

- The two deposits are only 2km apart;
- The depth of the ore bodies occur at 600 to 700m;
- Surface topography, depth of cover over the deposit, of thick mass of loose sediments and bed of the flowing Bystrukha river, flowing into Bystrushinskoye water reservoir;
- Spatial arrangement of main (in terms of reserves) gently dipping and steeply pitching ore chutes and bodies; and
- Annual productivity of the mine by extraction of ore and its value.

In local and international mines, where the working levels are anticipated to be at a depth of 800m and beyond, the mine is developed using two vertical shafts and two hoisting systems.

The Feasibility Study proposed to develop Dolinnoe and Obruchevskoe deposits using vertical shafts. The efficiency of combining the two deposits has been confirmed by a technical and economic assessment into the feasibility of developing, supplementary exploration and drilling of Dolinnoe and Obruchevskoe deposits performed by "Republic of Kazakhstan mining-and-processing integrated works" in 2004. Taking into account the combined development of both deposits, Kazzinc concluded with the Competent body of the Republic of Kazakhstan for conducting exploration and production of zinc, lead, copper, gold and silver at Dolinnoe and Obruchevskoe deposits, Registration number 2450 dated 20 August 2007.

8.6.3.1 Mine Design Options

Several project designs have been undertaken to date.

The 2008 Feasibility Study considered three scenarios for accessing the Dolinnoe and Obruchevskoe deposits:
Option 1: Three shafts from surface independent of Ridder-Sokolniy mine;

Option 2, 2A and 2B: Opening jointly with Ridder-Sokolniy mine; and
Option 3: Using two shafts from surface but independent of Ridder-Sokolniy mine.

Following an economic evaluation, Kazzinc selected Option 3 as this provided the best NPV and Internal Rate of Return (IRR) as well as lowest discounted payback period. As Option 3 was developed from Option 1, the two options are described below.

Option 1

This option involves opening of both deposits with three shafts, Dolinnoe and Obruchevskoe vertical shafts and a ventilation shaft which will service both mines. The depth of vertical shafts has been determined by depths of the ore bodies within deposits; Dolinnoe deposit from +420 to +250 level for the North-East orebody and from +350 to +250m level for the South-West orebody and at Obruchevskoe deposit from –20 to +130 level.

The ventilation shaft is to be driven from surface to –40 level, the Dolinnoe shaft to +250 level horizon and the Obruchevskoe shaft to -20 level. The height between the levels has been designed at 50m to allow for the development and mining activities on the different levels from both mines simultaneously. The stopes are expected to be either vertical or steeply dipping with varying widths ranging from 1.5 – 10m.

The ventilation shaft is to be 7.3m in diameter and equipped with one cage winding and a double-skip hoist facility. It will be designated for the movement of people, materials and equipment, and for the delivery of mined rock and supply of fresh air. The total depth of the shaft is 1,000m. A drift will developed at the +890 level so that when the rail cars are hoisted to surface, they are hauled to the unloading facility at the end of the drift and returned underground.

The Dolinnoe and Obruchevskoe shaft will be 5m in diameter and a depth of 640m from surface to +250 level, and 960m from surface to the -20m level, respectively. The shafts will be equipped to hoist materials and small mobile equipment and for the emergency winding of personnel.

The inclined Dolinnoe deposit will be opened by three main horizons; +350, +300 and +250 levels to access reserves in the North-East and South-West orebodies. There is also the +440m and +150m and +100m levels dedicated to the separate orebodies. The +440 level will serve as an air return level. All levels passing through both the North-East and South-West orebodies will be connected via internal decline, hoisting and ventilation shafts.

The +250m and +100m level will be a main loading and transportation drifts where the electric haulage equipment, ore and waste-passes at 150-200m intervals will be located.

There will be four levels developed in the Obruchevskoe mine, the +130m, +80m, +30m and the -20m levels. The levels will be connected via an internal decline, hoisting and ventilation shafts. The -20m horizon will be the main loading and transportation drift and will be equipped with electric haulage. Ore and waste passes on this level will be located at 150-200m intervals to optimise the movement of material along this level to the ventilation shaft for hauling to the surface.

The broken rock from the levels will be delivered to the sectional ore and waste passes and then to the main loading facility and transported to the ventilation shaft using electric haulage. Waste is hoisted to the +890m level where it is taken and discharged on surface. Ore is moved to the bottom of the mine via ore passes to the -40m level where it is fed into skips and hoisted to surface. From there it is tipped into an ore storage bin and then moved by conveyor to an ore stockpile on the surface and delivered to the Ridder plant by road transport.

Option 3

Option 3 is the preferred Option and is similar to Option 1 in that the ore is hoisted to surface and moved by road transport to the Ridder plant. The exception is that there are only two shafts. The ore is moved underground from both mines to the bottom of the Obruchevskoe mine and hoisted up the Obruchevskoe shaft.

The differences between Option 3 and Option 1 are:

- Removal of one cage winding shaft. The supply of fresh air and the hoisting of ore to the surface will be performed through Obruchevskoe shaft with ore handling facilities being constructed near this shaft;
- Fresh air for the Dolinnoe mine will travel along a dedicated drive from the Obruchevskoe shaft on the +100m level. It will be 1,370m in length with a cross sectional area of $10m^2$;
- Return air from the Obruchevskoe mine, will pass along a air crosscut which will be built at +130 level for 3,530m with a $12m^2$ section to connect to a exhaust raise up to the +470 level and further on through bleeding pit onto the surface; and
- For delivery of contaminated air from North-West orebody of Dolinnoe deposit at the rate of $30m^3/s$, an exhaust raise will be constructed at the main workings at +470 level and further on through dedecated raises to the surface. Contaminated air from South-West orebody will be delivered along the Dolinnoe shaft at the rate of $40m^3/s$.

In this option, ore from the Dolinnoe mine is transported to Obruchevskoe shaft at +100m level and travels through the ore pass system to the -20m level. Ore from the Obruchevskoe mine also moves through the internal ore pass system to the –20m level for loading into skips, hoisting to surface and is delivered to the concentrating plant by road transport.

8.6.4 Mine Scheduling

The mine scheduling for Option 3 is based on the geological cut-off grade of the Dolinnoe and Obruchevskoe deposits and envisages an ore production rate of 600ktpa as shown in Table 8.30. The mine reserve for Dolinnoe is 2,883,677t and for Obruchevskoe is 5,214,258t.

Table 8.30: Mine Schedule for Option 3 (ktpa)

	Total	2014	2015	2016	2017	2018	2019	2026	2027	2028	2029	2030	2031	2032	2033
Option 3															
Obruchevskoe deposit	**5,214,258**			70	350	350	350	350	350	350	350	350	150	94.3	
Dolinnoe deposit	**2,883,677**	100	250	250	250	250	250	33.7							
Total for Dolinnoe-Obruchevskoe mine	**8,097,936**	100	250	320	600	600	600	383.7	350	350	350	350	150	94.3	

8.6.5 Mining Method

When selecting the mining methods, the following mining and technical factors were taken into consideration:

- The depth of the ore bodies - 450-670m for Dolinnoe and 800-1,000m for Obruchevskoe;
- Mine safety;
- Inclination of ores and rocks of deposits in relation to seismic events;
- High ore value; and
- The need to preserve surface integrity at Dolinnoe with the Bystrushinskoye water reservoir above the mine.

Taking all of these mining and technical conditions into account, the extraction of ore bodies at Dolinnoe will be using the chamber mining method with backfill, and for Obruchevskoe chamber mining with caving. During the development of deposits, it is planned to use both conventional mobile equipment, if thickness of ore bodies is from 1 to 3m, and self-propelled equipment if the thickness of the ore bodies is greater than 3m. The technical and economic parameters are shown in Table 8.31.

Table 8.31: Summary of Technical & Economic Parameters

Indicator	**Unit**	**Deposit, method**	
		Dolinnoe, chamber with backfill	**Obruchevskoe, chamber-solid block with caving**
Thickness of ore bodies	m	1-18	15-25
Angle of inclination	degrees	0-20	0-50
Density of ore	tons/m^3	2.8	2.8
Density of rock	tons/m^3	2.7	2.7
Rock, ore hardness ratio	-	4-12	4-12
Ratio of fragmentation	-	1.5	1.5
Standard quality block	mm	400x400	400x400
Specific gravity of the system	%	100%	100%
Annual output - total	kt	250.0	350.0
Annual amount of preparatory works	m^3	15,000	12,000
Annual amount of first workings	m^3	9,000	28,000
Specific volume of mining preparatory works per 1,000 tons	m^3	60.0	37.0
Specific volume of stoping works per 1,000 tons	m^3	36.0	20.0
Losses	%	4.9	6.5
Dilution	%	13.2	17.0

8.6.6 Services

8.6.6.1 Supply of Compressed Air

The air supply to both Dolinnoe and Obruchevskoe mines will be from portable compressors with 3 compressors envisaged for Dolinnoe and 5 compressors for Obruchevskoe.

8.6.6.2 Water Supply

The water supply for drilling, washing of mine faces, fire fighting purposes and additional needs for both mines will be sourced from the Bystrushinskoye water reservoir.

8.6.6.3 Heat Supply

The demands for heating energy in relation to Option 3 are expected to be about 1.0MW, excluding administrative and household facilities.

The heating energy demand from the backfill plant is the same regardless of which option is used. It is expected that 0.372MW will be required and the plant will have its own heating system.

8.6.6.4 Electricity Supply

The combined supply of power to Dolinnoe and Obruchevskoe mines will be from the existing 110/35/6kV substation at the Ridder complex and then onto the relevant shafts by 6kV double-circuit high-voltage power lines each 1km length.

8.6.6.5 Surface Transport

It is anticipated that 40t capacity Volvo trucks will be used as the main vehicles for deliverying ore to the plant. On the return journey, the trucks will be used to deliver tailings to the backfill plant for the filling of worked out stopes underground. This will require construction of a dedicated 10km haulage road and along the road it is planned to construct two 360mm water pipelines to supply the backfill plant. The road will also be used for the movement of material and supplies to the mine.

8.6.7 Manpower

The manpower requirements for Option 3 have been determined by the "Kazgiprotsvetmet" OJSC for 2002 and have been summarised in Table 8.32 below.

Table 8.32: Number of Mining Personnel

Department	Option 3		
	Total	Workers	Engineers and technicians
Mining Operations			
Dolinnoe-Obruchevskoe mine	294	259	35
including:			
Backfill section	12	10	2
Mine Management	6		6

8.7 Financial

8.7.1 Introduction

Kazzinc have chosen Option 3 using two shafts from surface but independent of Ridder-Sokolniy mine, as this option provides the greatest Net Present Value (NPV) and Internal Rate of Return (IRR) and the lowest Discounted Payback Period. Table 8.33 summarises the saleable products from Dolinnoe and Obruchevskoe deposits

Table 8.33: Salable Products from Dolinnoe-Obruchevskoe Deposits

Item	Unit	Option3		
		Dolinnoe	Obruchevskoe	Total
Period of development of deposits		2014 - 2026	2016 - 2032	2014 - 2032
Production of concentrates including:				
Zinc concentrate	t	101,901	635,746	737,647
Lead concentrate	t	51,486	243,440	294,927
Copper concentrate	t	88,556	7,237	95,793
Gravitational concentrate	t	28,310	145,563	173,873
Sales of salable products	US$	666,745,155	1,207,575,033	1,874,320,187

8.7.2 Capital Expenditure

Estimated Capital Costs from the company's five year plan are summarised in Table 8.34 below.

Table 8.34: Summary of Capital Costs for Option 3	
Item	**Cost (US$M)**
Mine Construction	82.6
Mining Equipment	53.5
Environmental & Infrastructure Facilities Construction	35.7
Design Works	6.9
Total of Capital expenditures	**178.7**

8.7.3 Operating Costs

The operating costs have been calculated based on real costs from Tishinskiy mine which has a similar orebody, mining method, backfill techniques and pay structure. The operating cost for Option 3 are presented in Table 8.35 below.

Table 8.35: Summary of Operating Costs	
Item	**Cost (US$/t)**
Dolinnoe	
Mining	36.96
Royalty	10.02
Transportation	2.31
Processing	8.57
General and Administrative	5.71
Total costs	63.58
Obruchevskoe	
Mining	26.14
Royalty	9.76
Transportation	2.31
Processing	9.77
General and Administrative	5.71
Total costs	53.69

8.7.4 Economic Assessment

The key indicators of the Feasibility Study are presented in Table 8.36 which shows the payback period of 15.5 years, from the beginning of construction, and 10.5 years from the beginning of production. The IRR is 15.13% with a discount rate of 12.5% and a NPV of US$27.6M.

Table 8.36: Summary of the Financial Performance for Option 3		
Production Period	**years**	**2014 - 2032**
Zn Price	US$/t	1,900
Pb Price	US$/t	1,300
Cu Price	US$/t	4,000
Au Price	US$/oz	750
Ag Price	US$/oz	14.00
Internal rate of return (IRR)	%	15.13
Discounted payback period from construction	**years**	**15.5**
Rate of discount	%	12.50
Net present value (NPV)	US$	**27,621,904**
Production/processing of ore		10,215,800
Volume of Zinc concentrate	t	737,647
Volume of Lead concentrate	t	294,927
Gravitational concentrate	t	95,793
Copper concentrate	t	173,873
Sales	US$	1,874,320,187
Operating Costs	US$	(840,569,296)
EBIT with Amortisation	US$	1,033,750,891
Depreciation	US$	(228,498,733)
EBIT	US$	805,252,158
Income tax	US$	(247,032,286)
Net income	US$	558,219,872
Capital Costs	US$	(247,922,667)
Depreciation	US$	228,498,733
Accumulated net cash flow	US$	538,795,938
Discounted payback period from production	**years**	**10.5**

8.8 WAI Ore Reserve Estimation

8.8.1 Introduction

WAI has carried out stope design, and produced Ore Reserves for the Dolinnoe and Obruchevskoe deposits in accordance with the guidelines of the JORC Code (2004), based upon the most recent Mineral Resource Block Model. WAI has used GijimaAST Mine2-4D® (Mine2-4D) software to prepare the stope design.

8.8.2 Mine 2-4D Software

Mine2-4D is an automated mining software package that permits accurate design mine of excavations (development and stoping), and to apply time-dependent mining activities, such as backfilling and cable bolting, in a three-dimensional graphical environment. Following the design of excavations and associated activities, mining activities can be sequenced with time delays built into the sequence where appropriate.

8.8.3 Mining Parameters

The stope blocks for Dolinnoe and Obruchevskoe have been designed to a minimal average block grade of 4% Zn, or 4% Zinc Equivalent (ZnEQV).

8.8.4 Mine Layout

The Dolinnoe and Obruchevskoe mines have been laid out following the proposed mining methods laid out in section 8.6.

8.8.5 Dolinnoe

Dolinnoe is a greenfield site, and as such, principal mining levels have been designed in order to optimise mineral extraction. Stoping levels have been created at 15m vertical intervals from the 245m to 425m Levels.

All proposed new stopes for the Dolinnoe deposit have been designed as sub-level chamber stopes with backfill as outlined in section 8.6. Figure 8.13 shows the proposed stoping blocks for Dolinnoe.

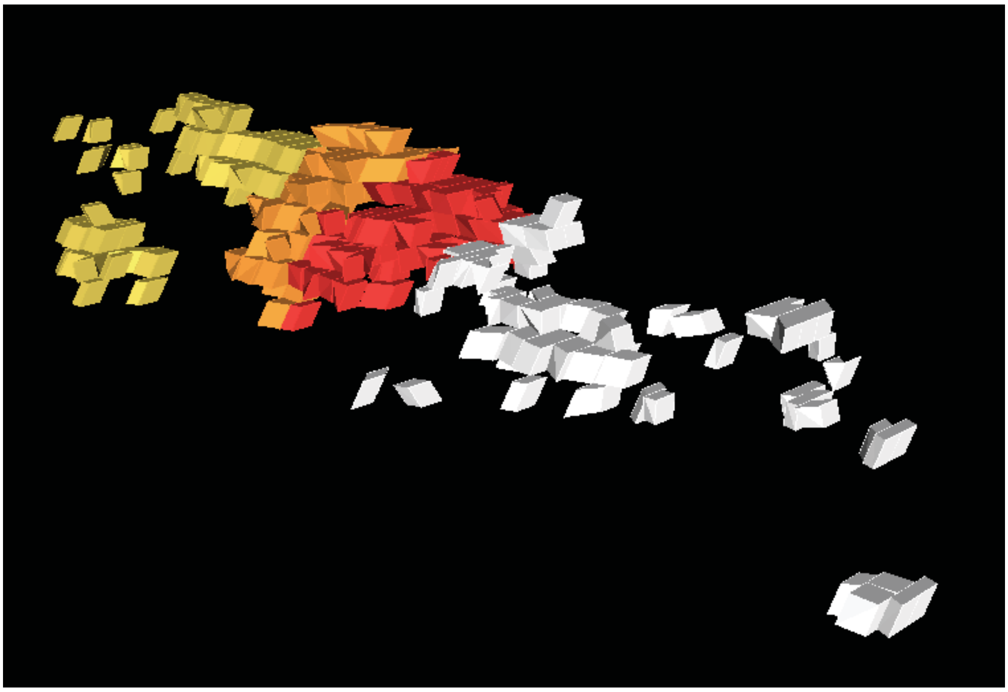


Figure 8.13: Dolinnoe Stope Blocks

8.8.6 Obruchevskoe

Stoping levels have been created at 15m vertical intervals from the -15m to +135m Levels. All proposed new stopes for the Obruchevskoe deposit have been designed as sub-level chamber stopes with backfill as outlined in section 8.6. Figure 8.14 shows the proposed stope layout for Obruchevskoe.

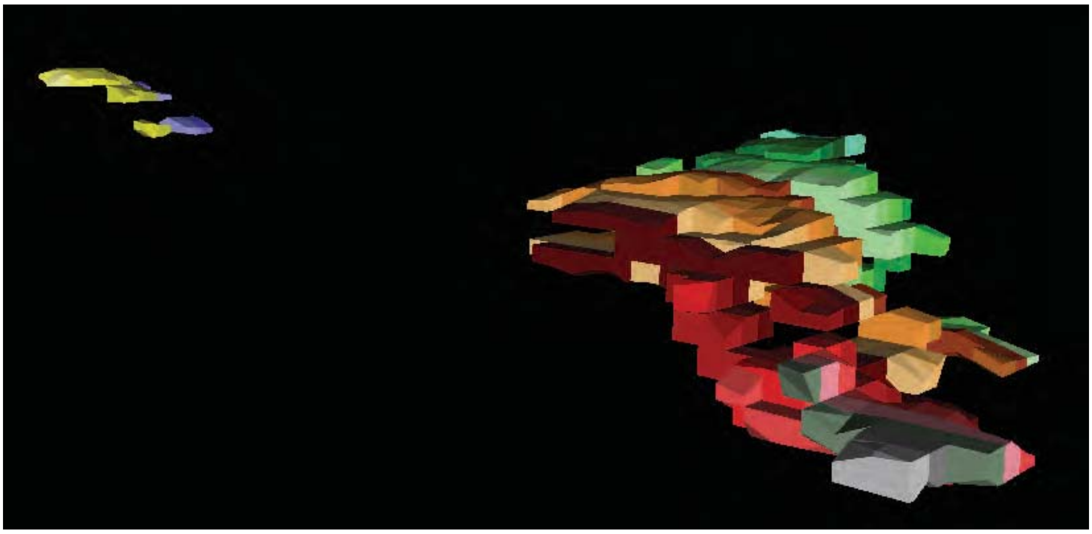


Figure 8.14: Obruchevskoe Stope Blocks

8.8.7 Ore Reserves

Ore Reserves for the Dolinnoe and Obruchevskoe deposits have been estimated in accordance with the guidelines of the JORC Code (2004). A summary of the Ore Reserves is presented in Table 8.37.

> ***WAI Comment:*** *It should be noted that in addition to the Ore Reserves outlined, 43,000t of Inferred material (at 3.52g/t Au, 18.42g/t Ag, 0.13% Cu, 0.68% Pb & 1.24% Zn) at Dolinnoe and 36,764t of Inferred material (at 3.79% Zn, 0.92% Cu, 0.79% Pb, 0.24g/t Au and 12.39g/t Ag) at Obruchevskoe have been modelled, but not reported as Ore Reserves. This material has been included in the production schedule, as it is not realistic to leave this material in-situ.*

Table 8.37: Dolinnoe & Obruchevskoe Ore Reserve Estimate (WAI 01.01. 2011) (In Accordance with the Guidelines of the JORC Code (2004))

Deposit	Reserves	Ore (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (pb)		Zinc (Zn)	
			Grade (g/t)	Metal Content (oz)	Grade (g/t)	Metal Content (oz)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)	Grade (%)	Metal Content (t)
Dolinnoe*	Proven	3.66	3.93	462,258	53.76	6,325,710	0.20	7,385	0.75	27,351	1.41	51,730
	Probable	0.96	2.38	73,822	29.82	923,296	0.14	1,338	0.50	4,849	1.02	9,792
	Total	***4.62***	***3.61***	***536,080***	***48.77***	***7,249,006***	***0.19***	***8,723***	***0.70***	***32,380***	***1.33***	***61,523***
Obruchevskoe	Proven	0.89	1.73	49,363	42.80	1,219,753	0.81	7,161	4.27	37,829	8.98	79,581
	Probable	3.25	0.90	94,019	33.21	3,466,977	0.83	26,845	2.66	86,520	6.50	211,092
	Total	***4.14***	***1.08***	***143,382***	***35.26***	***4,686,731***	***0.82***	***34,006***	***3.01***	***124,349***	***7.03***	***290,673***

*Dilution of 20% and losses of 5% applied

8.9 Processing

8.9.1 Dolinnoe Deposit

Technological studies of the ores from the Dolinnoe deposit were conducted on one technological sample (#1) weighing 339.5kg, and 9 low-volume samples at the "Kazmekhanobr" institute in 1992. Sample #1 is polymetallic and was selected from ore body 3 from the central part of the deposit, which is considered to represent the main value and characteristics.

Ores are of sulphide type, and oxidation is insignificant. The main ore minerals are; chalcopyrite, galenite, sphalerite, pyrites and fahl ore, and predominantly fine to medium grained.

Rational analysis of gold of sample #1 is presented in Table 8.38 below.

Table 8.38: Analysis of Sample #1 of Dolinnoe Ore

Occurrence form of gold and silver	Content, %	
	Gold	Silver
I. Free:		
a) with clean surface	26.7	3.9
b) covered with oxidized films	4.5	11.4
2. In intergrown pieces:		
a) with clean surface	12.7	31.0
b) covered with oxidized films	30.6	17.8
3. Associated with ore minerals, including:	24	30.2
a) with anglesite and cerussite	3.0	4.1
b) with galenite	4.3	6.4
c) with sphalerite	6.8	7.1
d) with pyrites	8.4	8.7
e) with chalcopyrite	1.5	3.9
4. Associated with barren rock	1.5	5.7
Head grades, (g/t)	3.0	30.0
Yield by class –0.074mm	70	
Colour	Reddish-yellow	
Form	Twig-like arborescent crystals, octahedrons	
Size of gold grains, (mm)	0.05-0.025	

Tests were performed using bulk-selective flotation flowsheet similar to the one used currently for processing of Pb-Zn ore at Ridder, recommended as the model for conducting tests of small-volume technological samples.

Test results on samples from Dolinnoe obtained the following concentrates; gold-containing gravitational concentrate with content of gold from 94.71-141.05g/t, copper – with content of copper 27% and recovery 71-72.38%, lead – with content of lead 52.79 – 55% and recovery 71.13-75.5%, zinc – with content of zinc 54.81 – 56% and recovery 75 – 76%, extraction of gold in commercial concentrates – upto 77.15%.

Due to similar processing properties of ore from Dolinnoe deposit, and Pb-Zn ore of Ridder-Sokolniy deposit, ore from Dolinnoe will be concentrated using the existing types of process equipment of concentrating plant of Ridder complex in accordance with processing flowsheet of polymetallic ore of Ridder-Sokolniy deposit.

Processing of Dolinnoe deposit envisages the following operations:

- Three-stage crushing;

- Two-stage grinding;
- Bulk flotation of sulphide minerals;
- Selection of bulk concentrate with acquisition of gold-containing flotation and zinc concentrates;
- Separation of gold-containing flotation concentrate into lead and copper concentrates, and
- Drying of concentrates.

Separation of the gold as a gravity concentrate from ore during the grinding cycle is performed on shaking tables. Five products are obtained as a result of beneficiation of polymetallic ore from Dolinnoe deposit: gravity concentrate, copper concentrate, lead concentrate, zinc concentrate and tailings.

8.9.2 Obruchevskoe Deposit

Technological studies of the Obruchevskoe deposit were conducted on technological sample (#1) weighing 2.87t ("Kazmekhanobr", 1993) and laboratory sample (#2) weighting 243.7kg ("VNIItsvetmet", 1991-1993), together with 11 low-volume samples weighting 34.6-88.7kg at "VNIItsvetmet" institute in 1991-1993.

Polymetallic ore prevail and copper-zinc and zinc ores differ from polymetallic ores only by low content of galenite and chalcopyrite. The content of oxidized and secondary minerals of copper fluctuates from 6% to 32.5%; of lead – from 2% to 27%; and of zinc – from 1-3%.

Tests were performed on the samples using a bulk-selective flotation flowsheet similar to the one used for processing of Pb-Zn ore at Ridder-Sokolniy deposit.

Test results on samples of Obruchevskoe obtained the following concentrates; copper – with content of copper 28.5% and recovery 88.7%, lead – with content of lead 59% and recovery 86.3%, zinc – with content of zinc 56% and recovery 90.9%. Tests on gravity separation of gold from ore of this deposit were not conducted, possibly due to low content of gold in the samples. Hence, only gross recovery of gold from ore is quoted as 74%.

Similar results were obtained by "Kazmekhanobr" on a bulk laboratory sample weighing 2.5t in semi-industrial conditions. With similar processing properties with Pb-Zn using ore from Ridder-Sokolniy, ore from Obruchevskoe will be concentrated using existing types of process equipment as at the Ridder complex. The same operations and products will be achieved at Obruchevskoe as at Dolinnoe.

8.10 Environmental

8.10.1 Introduction

The Dolinnoe and Obruchevskoe deposits are located, approximately 7.5km and 11km respectively, to the east of Ridder, and Dolinnoe is 2.5km from Bystrukha village. The two sites are in close proximity to each other and are both still at the exploration stage with no site development. Both sites are accessed by the Ridder-Biysk road Russian Federation.

8.10.2 Environmental & Social Setting and Context

8.10.2.1 Landscape, Topography

The Dolinnoe deposit is situated in Bystrukha valley with the Bystrukha River crossing the southern part of the deposit. The area is predominantly gently undulating topography with hills varying from 650m to 1,000m in height. The valley is surrounded by the Prohodny Ridge to the south, up to 1,800m in height. To the north, the Ivanovsky Ridges rise to 2,300m, with other lower mountain ranges also present.

Ground elevations range from 950m to 1,060m above Baltic sea datum and the site is dissected by shallow wetlands and streams flowing into the Bystrukha River. Surface formations comprise moraine, alluvial and deluvial deposits ranging in thickness from 120m to 475m. The area is overgrown with deciduous forest predominated by birch trees.

The region is seismically active with earthquakes up to 4 on the Richter scale being reported in the Ridder area in the last 10 years.

Soil conditions, flora and fauna are similar to those found at Ridder.

8.10.2.2 Climate

Climatic conditions are similar to those at Ridder.

8.10.2.3 Land Use and Land Cover

No development of the Dolinnoe and Obruchevskoe deposits has yet been undertaken. Dolinnoe is made up of two polymetallic deposits referred to as the north-eastern and south-western. Above the deposit is the Byslrushinshoye Reservoir which covers an area of 6,700m^2. The Bystrukha River flows into the Byslrushinshoye Reservoir on the western part of the deposit and is the primary the source of recharge water.

To the south of the Byslrushinshoye Reservoir is an abstraction point, and Kazzinc hold a permit to abstract up to 18Mm^3/year for the annual operational requirement of the mine. The water is pumped via a pipeline for this purpose.

8.10.2.4 Water Resources

No design for water supply has been developed for either project, but it is believed that if any additional water is required it will come from the reservoir.

> ***WAI Comment:*** *A full water balance assessment to establish the sustainable water needs of the Company to use the reservoir as its primary water source is assessed annually, and agreed with the State Water Resource body. The mine requirement will not be more than 5% of the discharge from the reservoir, and is not expected to have a negative affect on the water balance.*

8.10.2.5 Communities and livelihoods

A village is located c2.5km from the Dolinnoe deposit and although a mining plan is not yet available, it is understood from the outline plans that the village could be undermined.

> ***WAI Comment:*** *The mine design, as agreed with State authorities, ensures that measures to avoid subsidence in the areas of dwellings are implemented, such as mining occurring below 400m, and backfilling of voids. The OVOS for the project will address potential social impacts that may affect the local community.*

8.10.2.6 Infrastructure & Communications

There is no infrastructure related to mining on either site, both sites are connected by the same road.

8.10.3 Project Status, Activities, Effects, Releases & Controls

8.10.3.1 Project Description & Activities

Both Dolinnoe and Obruchevskoe deposits are polymetallic and were discovered in about 1979 following a programme of drilling. Further exploration work was undertaken from 1989 to 1990. As yet a project design has not been developed for either site.

> ***WAI Comment:*** *Details of the proposed mining of the deposit would appear to be at an early stage and no designs have been submitted to the state for endorsement.*

8.10.3.2 Land Ownership and Tenure

Kazzinc acquired the right to explore and mine the Dolinnoe deposit by tender in April 2004. The same tender included the nearby Obruchevskoe deposit. A geological allotment comprising two separate areas covering the Dolinnoe and Obruchevskoe deposits was issued to Kazzinc by the Ministry of Energy and Mineral Resources in July 2004. The contract was issued in August 2007 (contract No 2450). The contract defined the working boundary for Dolinnoe as 3.3km^2 and Obruchevskoe as 1.61km^2.

8.10.3.3 Energy Consumption & Source

There is currently no demand for energy at the projects, however, the energy requirements for mine construction and development will be substantial.

8.10.3.4 Mine Wastes – Rock

There are currently no waste rock dumps at the sites, however, when mining commences a considerable amount of waste rock will be generated and will require managed storage. This material may have the potential to generate Acid Rock Drainage (ARD) and leach heavy metals. It is intended to use this waste as backfill for the old (Andreevsky) open pit at Ridder. Nonetheless, testwork to assess ARD potential will be required.

8.10.3.5 Water Management & Effluents

For the planned project, mine water will be pumped to the water treatment facilities at Ridder. In 2011, the water treatment facilities at Ridder will be expanded to deal with the increase in volume.

8.10.3.6 Emissions to Air

There is a potential that wind blown dust/particles from exposed surfaces and exploration activities will be generated, and when the projects are developed, dust will be generated from a variety of sources such as vehicle movements, excavation, loading and deposition, which will need appropriate control measures.

8.10.3.7 Waste Management – General

Given the status of the projects, there are no man-made wastes currently present.

8.10.3.8 Security

Access to the sites is not currently restricted. It is understood that Kazzinc will secure their exploration activities.

8.10.4 Permitting

8.10.4.1 ESIA/OVOS

An OVOS has not been undertaken for proposed activities at either site. A single OVOS will be produced for both sites, given their proximity. Operation-specific 'Maximum Allowable Emissions' (MAEs) and 'Maximum Allowable Discharges' (MADs) will be determined and approved as part of the OVOS process for both sites.

> ***WAI Comment:*** *WAI would recommend that an ESIA conforming to international best practice is undertaken prior to implementation of further works. When the OVOS process is initiated, there is the opportunity to expand the EMP to meet the requirements of an ESIA. This has cost benefits and would*

be strongly recommended, however, it should be noted that additional monitoring, in terms of scope and frequency (seasonality), will be required for the ESIA.

8.10.4.2 Environmental Permits and Licenses

There are no current environmental permits held by Kazzinc for Dolinnoe and Obruchevskoe.

8.10.5 Environmental Management

8.10.5.1 Environmental Policy, Management, Training and Resources

This is not applicable at this time, given the current status of the projects. However, when operations commence, it is assumed that the Company-wide corporate management system and training will be adopted at both sites.

8.10.6 Social and Community Management

8.10.6.1 Stakeholder Dialogue and Grievance Mechanisms

Although not applicable at this time, it is assumed that the existing Company-wide approach will be adopted at both sites. Public hearings, regarding Dolinnoe and Obruchevskoe mine development, were held in Ridder in December 2010.

8.10.6.2 Social Initiatives and Community Development

Given the status of the projects, this has not been considered in detail at this stage. However, the Company demonstrates a commitment to community development at other controlled assets and performs a wide range of social initiatives at Ridder-Sokolniy Mine.

8.10.7 Health & Safety

8.10.7.1 Health & Safety Management Arrangements

Apart from Exploration-related health and safety practices, there is no current requirement for health and safety management at the sites. When development commences, it is assumed that Standard Operating Procedures (SOPs) will be developed for individual activities and that the Corporate Health and Safety management system and ethos will be applied.

Kazzinc is accredited under the internationally recognised OHSAS 18001 system.

8.10.8 Mine Closure & Rehabilitation

8.10.8.1 Mine Closure Plans

In the absence of mining rights, a conceptual Closure Plan has not been considered.

> ***WAI Comment:*** *WAI appreciates that it will not be necessary to consider closure issues until the mining licence has been granted and understands that although a preliminary closure cost estimate will be undertaken, a formal Closure and Rehabilitation Plan (MCRP) will not be prepared until the final phases of mine life. WAI would recommend that, in line with international best practice a fully costed framework MCRP is drafted as a priority.*

8.10.9 Conclusions

8.10.9.1 Environmental and Social liabilities & Risks

WAI understands that at present project designs for either site have not been formulated and subsoil mining licences have not been applied for. Anticipated dates for these applications are not confirmed. The current exploration licence for both sites was granted in 2007 and is valid for 19 years.

At this stage Kazzinc has not started or commissioned an OVOS for either site. However, WAI considers that Kazzinc demonstrates good environmental monitoring and management practices at other operational sites and demonstrates a commitment to meeting national legislative requirements.

Recommendations for ESAP

WAI would recommend that when the project is approved, an ESAP is prepared. This would also ensure that the following documents/systems/assessments are undertaken:

- Preparation of Environmental Management System to fulfil national and international standards
- Commissioning of an OVOS;
- Site Assessment and structural survey of all existing buildings;
- Collection of baseline data;
- Commence air quality monitoring; and
- Undertake a sustainable water resource assessment on the Byslrushinshoye Reservoir if/when the project designs are developed.

9 CURRENT EXPLORATION PROGRAMS IN THE RIDDER AREA

9.1 Exploration Drilling on Ridder-Sokolniy Flanks

Both surface and underground exploration is conducted annually at Ridder-Sokolniy. A summary of this drilling work for the period 2000-2008 is given in Table 9.1 below. Notably drilling was significantly curtailed during 2009 due the financial crisis.

Table 9.1: Exploration Drilling Summary 2000-2008

Type of Drilling	Unit	Period								
		2000	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Surface	m	15,672	14,872	8,712	10,953	11,256	13,250	18,542	56,502	62,539
U/Ground	m	45,329	49,110	47,410	51,645	55,142	55,794	57,613	71,401	77,200

9.1.1 South-Eastern Flank of Perspectivnaya Lode

Historically a Kazzinc drilling programme was conducted in 2005 to 2007 over a 2.2km^2 area situated between the Belkina, Perspectivnaya and Kriukovskaya lodes of the Ridder-Sokolny deposit on one side and the Bakhrushinskoye and Dolinnoye deposits on the other. It consisted of 66 diamond core drill holes, with wedge deflections, for a total of 43,990m.

The drill holes were sited on lines set up on an azimuth 55˚ at 150-200m intervals and generally angled north-east. Actual drilling grids, after deflections, varied from 100m by 50m to 100m in the central part of the area to 200m by 200m in the outlying areas. Spacing between drill holes on the south-eastern margin of the investigated area varied from 220m to 520m.

The drill hole diameter was 76mm and occasionally 59mm. The average core recovery was 83%.

Routine analyses, including fire assays for gold and silver, were performed at the chemical laboratory of the Ridder-Sokolny mine. External control analyses were performed by DGP VNIItsvetmet in Ust-Kamenogorsk. It is understood that internal and external control analyses did not reveal any analytical problems.

The drilled area contains shallow dipping stratabound gold-silver-bearing polymetallic and low sulphide mineralisation underlain by steeply dipping vein swarms with gold-polymetallic, polymetallic and low sulphide gold mineralisation.

9.1.2 Western, South-Western, South, South-Eastern and North-Western Flanks of the Ridder-Sokolny Deposit

Targets in these areas were first drilled from December 2006 to December 2008. The drilling programme was terminated as a result of an exploration budget cutback following the worldwide economic crisis of late 2008. A total of 169 diamond core drillholes were completed for 109,741m, which represented approximately 50% of the proposed drilling programme.

The following targets were drilled:

- South-western flank of the Bystrushinskaya Lode (named Sokolok Lode);
- Western flank of the Bystrushinskaya Lode;
- Southern flank of the Bystrushinskaya Lode;
- Western flank of the Ridder-Sokolny deposit;
- An area covering the south-eastern flanks of the Pobeda and Perspectivnaya lodes and the north-western and northern flanks of the Dolinnoye deposit;
- Northern and north-western flanks of the Bystrushinskaya Lode; and
- Western flank of the 2nd Ridder Lode

The programme involved deep diamond core drilling from surface, using directional wedges where required, targeting previously postulated P_1 prognosticated resource areas. Drillholes were sited on a 100m to 150m by 200m to 50m to 60m by 50m to 100m grid patterns and occasionally reached Level 22 (175 above Baltic Sea datum or 610m below surface). Drill core was taken over a total interval of 67,691m, with an average core recovery of 84%.

The **Sokolok Lode** is a south-western extension of the mineralisation that was earlier delineated in the South Bystrushinskaya area between drive lines 29 and 34.

The upper part of this lode consists of several thin stratabound lenses of gold-silver bearing polymetallic mineralisation situated at different levels within the upper member of the Kriukovskaya Formation. The largest of these lenses, and also hypsometrically highest, is called Orebody No 5. It is more or less an isometric body measuring 250m in diameter in plan view and 1 to 8m in thickness. All stratabound lenses follow a shallow NW-trending dome structure.

The lower part of the Sokolok Lode consists of a swarm of predominantly N-S trending veins that have been traced for 500m along strike.

The delineated resource is contained at levels 13 to 22 between drive lines 35-45 and crosscut lines 22-34.

Drilling on the **western flank of the Bystrushinskaya Lode** encountered a new lens of stratabound barite-polymetallic mineralisation in altered siltstones within Horizon I. The lens is centered on a shallow NW-trending dome and extends over a strike length of 200m with lateral extent of 40m to 80m and thickness of several meters.

The lens is underlain by a series of steep dipping veins of a lower grade polymetallic and gold-bearing polymetallic composition. The veins generally strike almost north-south, range from 1m to 3m in width and do not exceed 100m in strike and downdip extents. Some isolated drill intercepts returned high gold grades (>18 g/t) suggesting the presence of small high grade gold veins. A delineated resource is located at levels 10 to 15 between drive lines 36 to 41 and crosscut lines 8-15.

Several steep dipping veins were also delineated on the southern flank of the Bystrushinskaya Lode.

9.1.3 Exploration 2010

An aggressive exploration programme has been conducted by Kazzinc in 2010. This work has been conducted on the flanks (margins) of Ridder-Sokolniy, particularly on the south eastern flank of Perspectivnaya lode towards the Dolinnoe deposit (x2 drill rigs); the south-western flank of Pobeda lode (x4 rigs rigs) and on north-west flank of Perspectivnaya lode (x2 drill rigs) The location of the exploration holes are shown in Figure 9.1 below.

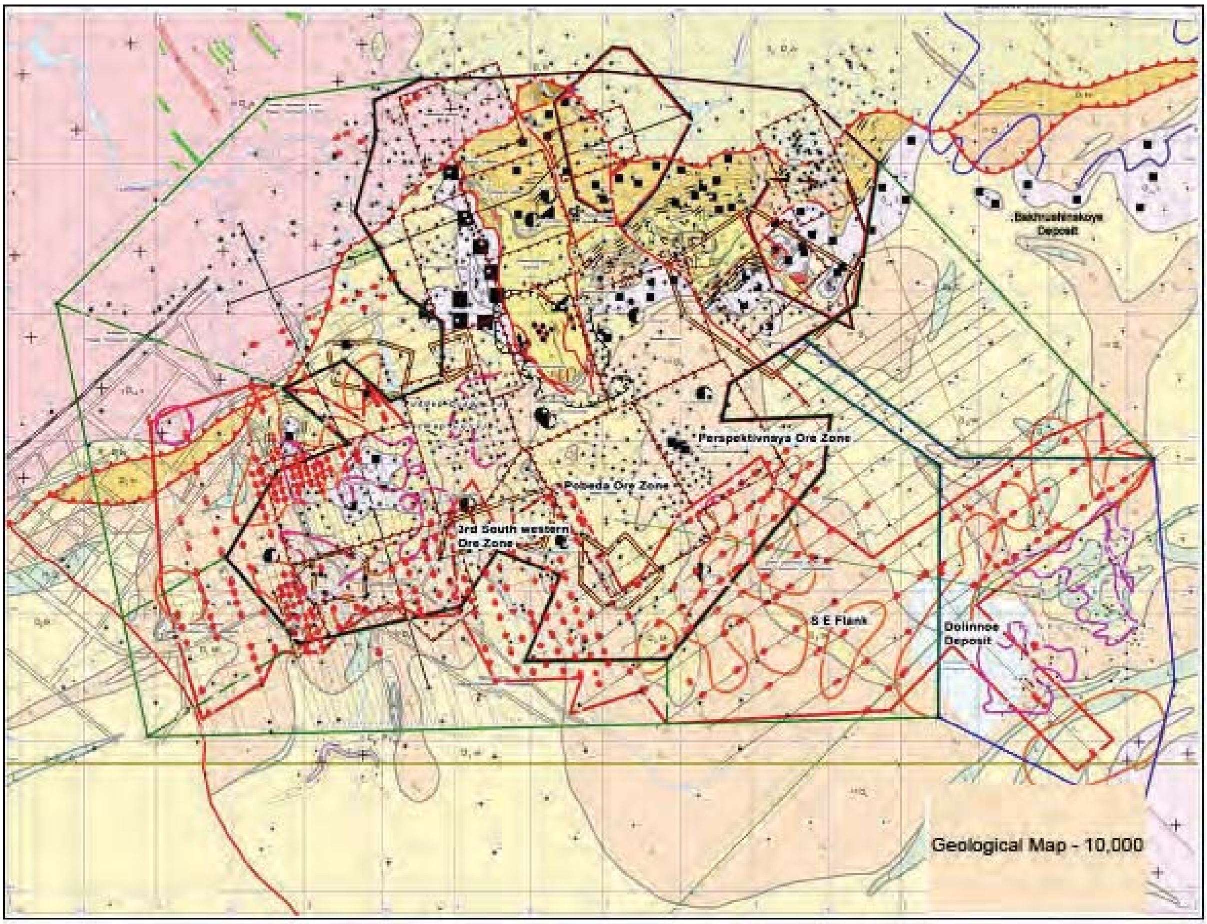


Figure 9.1: Plan showing Location of Exploration Drill holes on the Flanks of Ridder-Sokolniy Deposit (Collar locations shown in red) (Grid:200m)

In total x8 drill rigs are being utilised in the programme, some 65km of drilling for 2010, which will continue through 2011. Two contractors have been employed to conduct the works, namely LLP Geolen and LLP Corrund.

LLP Geolen is currently drilling on the south-western flank of the Pobeda ore zone. LLP Corrund is currently drilling the south eastern flank of the Perspectivnaya ore zone towards the Dolinnoe deposit, with both a Boart Longyear LF 90 rig and a Russian manufactured ZIF 1200 rig (see Figure 9.2 below).

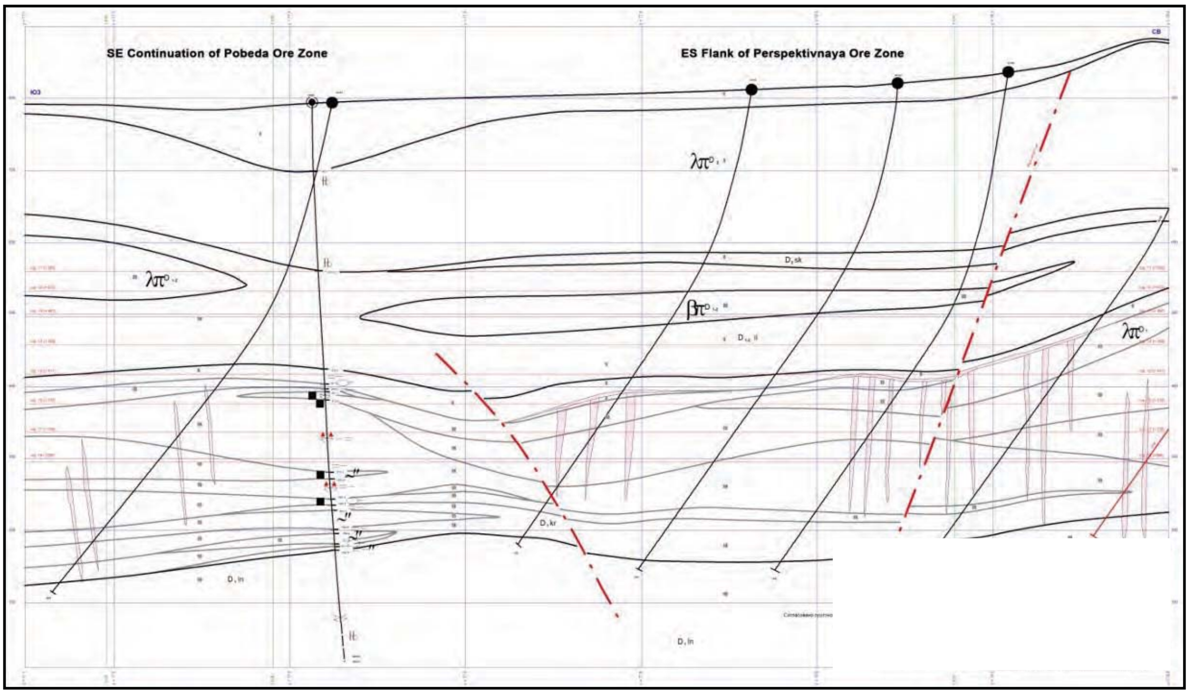


Figure 9.2: Cross Section of Proposed Exploration drilling on the South-eastern Flank of Perspectivnaya Ore Zone (proposed holes shown in red) (Grid:200m)

Additional drilling is also planned for the northern and southern flanks at the Dolinnoe deposit (15,000m of drilling) in an attempt to identify potential gold targets around the main known ore bodies. A cross section illustrating the proposed programme is shown in Figure 9.3 below.

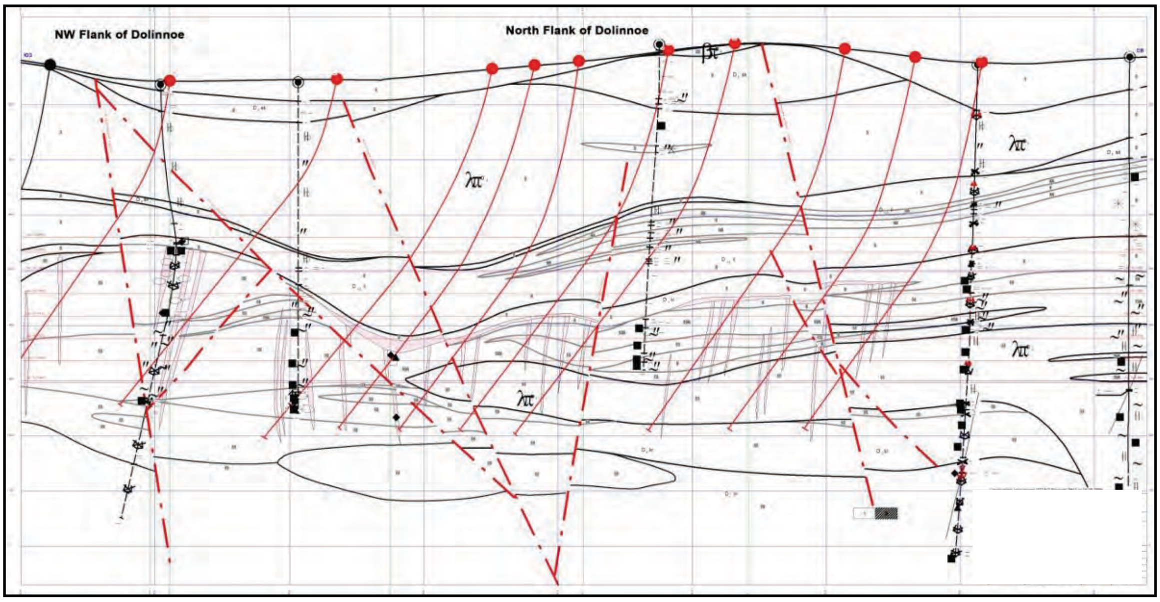


Figure 9.3: Proposed Exploration Drilling on the Northern Flank of Dolinnoe Deposit (proposed holes shown in red)

Exploration drilling is to be continued through 2011. The exploration budget and programme is given in Table 9.2 below.

WAI Comment: *WAI has reviewed the current drilling practices on site and has found them to be well implemented. The recording of drill hole data (logging and surveying), sampling procedures and drilling practices were of very good standard.*

WAI has reviewed the proposed exploration programme and budget for 2011 and has no reason to believe it is not fit for purpose.

Table 9.2: Planned Exploration Works For 2011 Proposed by Kazzinc

Object	Units	Total 2011	Same by Quarters			
			1	2	3	4
1. NW Flank of Bystrushinskaya Lode	m	5,600	1,400	1,400	1,400	1,400
	US$	685,714	171,429	171,429	171,429	171,429
	k tenge	100,800	25,200	25,200	25,200	25,200
2.Western Flank of Zavodskaya Lode	m	4,000	1,000	1,000	1,000	1,000
	US$	489,796	122,449	122,449	122,449	122,449
	k tenge	72,000	18,000	18,000	18,000	18,000
3.Western Flank of 2nd Ridderskaya Lode	m	8,000	2,000	2,000	2,000	2,000
	US$	979,592	244,898	244,898	244,898	244,898
	k tenge	144,000	36,000	36,000	36,000	36,000
4. Deep Horizons of Belkina Lode	m	20,000	5,000	5,000	5,000	5,000
	US$	2,448,980	612,245	612,245	612,245	612,245
	k tenge	360,000	90,000	90,000	90,000	90,000
5. South-East Flank of Pobeda Lode	m	11,000	3,000	3,000	2,500	2,500
	US$	1,346,939	367,347	367,347	306,122	306,122
	k tenge	198,000	54,000	54,000	45,000	45,000
6. Ore Occurence of Borehole No. 2426	m	10,400	2,600	2,600	2,600	2,600
	US$	1,273,469	318,367	318,367	318,367	318,367
	k tenge	187,200	46,800	46,800	46,800	46,800
7. Ore Occurence of Borehole No. 2437	m	10,400	2,600	2,600	2,600	2,600
	US$	1,273,469	318,367	318,367	318,367	318,367
	k tenge	187,200	46,800	46,800	46,800	46,800
8. Ilinskoye Ore Occurence	m	4,800	1,200	1,200	1,200	1,200
	US$	587,755	146,939	146,939	146,939	146,939
	k tenge	86,400	21,600	21,600	21,600	21,600
9. Bakhrushinskoye Deposit	m	16,000	4,000	4,000	4,000	4,000
	US$	1,959,184	489,796	489,796	489,796	489,796
	k tenge	288,000	72,000	72,000	72,000	72,000
10. Deep horizons of Tishinskiy Mine	US$	897,959	224,490	224,490	224,490	224,490
	k tenge	132,000	33,000	33,000	33,000	33,000
	m	**96,200**	**24,300**	**24,300**	**23,800**	**23,800**
Total Exploration Works of Ridder Mining and Processing Complex	**US$**	**11,942,857**	**3,016,327**	**3,016,327**	**2,955,102**	**2,955,102**
	k tenge	**1,755,600**	**443,400**	**443,400**	**434,400**	**434,400**
	US$	897,959	224,490	224,490	224,490	224,490

9.2 Exploration Drilling for Deep Horizons and Flanks at Tishinskiy

Kazzinc has proposed an extensive exploration programme of deep drilling at Tishinskiy in 2011. These holes envisage intersecting the main ore zone at depth for extension of the mine and on the flanks to

The programme consists of:

- Drilling of x17-18 drill holes in the center and on the western flanks (and to some extent on the eastern margin) of the Main ore zone between the -410 and -470m elevations at 18 to 21 levels; and
- Drilling x4 or 5 very deep directional drill holes to intersect the Main ore zone at the -600m elevation which lies just below -22 level. These holes will be from 1,500-1,600m long.

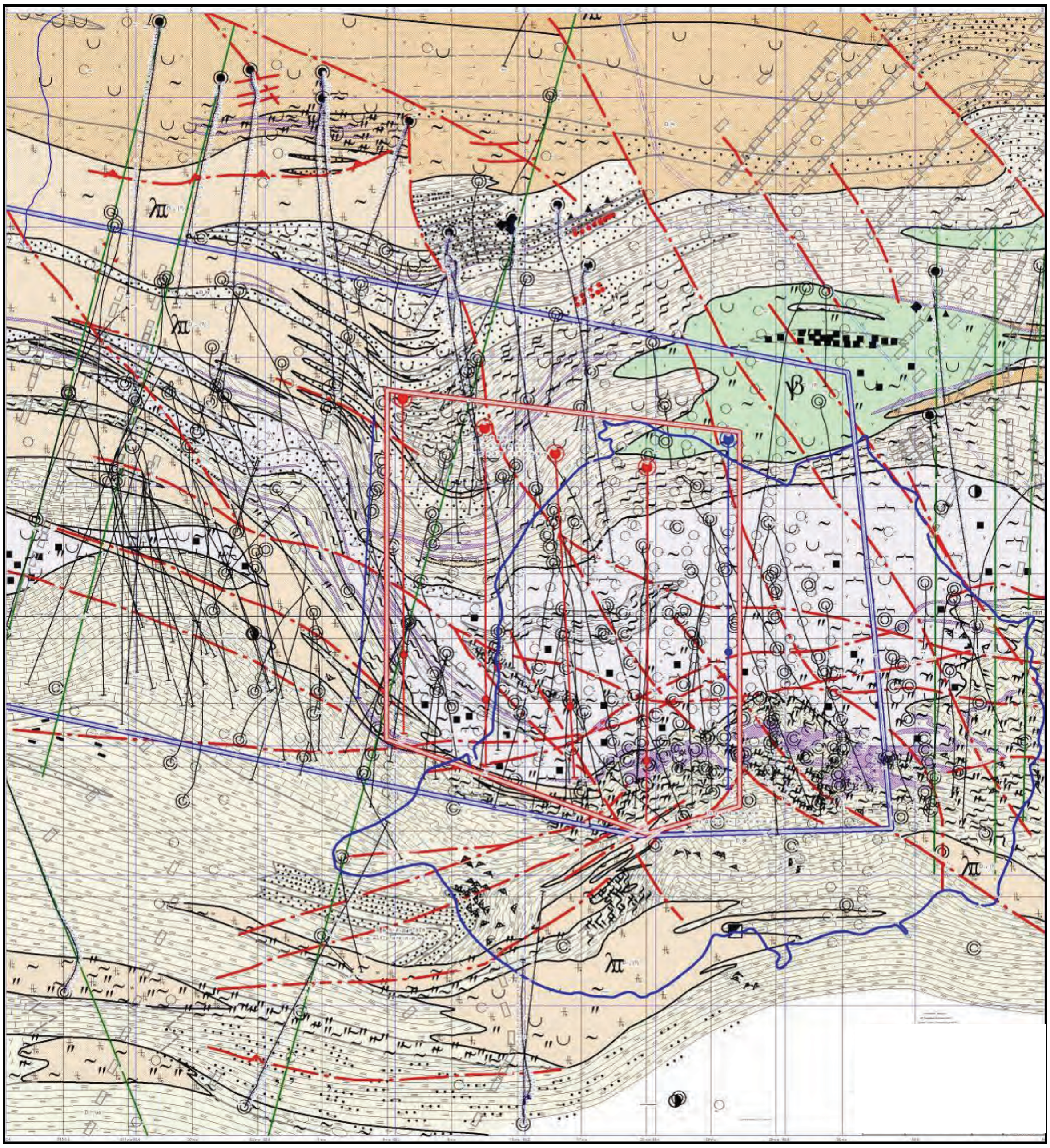


Figure 9.4: Plan showing Location of Deep Horizon (collars and traces shown in red) and Flank (collars shown in black with traces in green) Exploration Drill holes (Grid:200m)

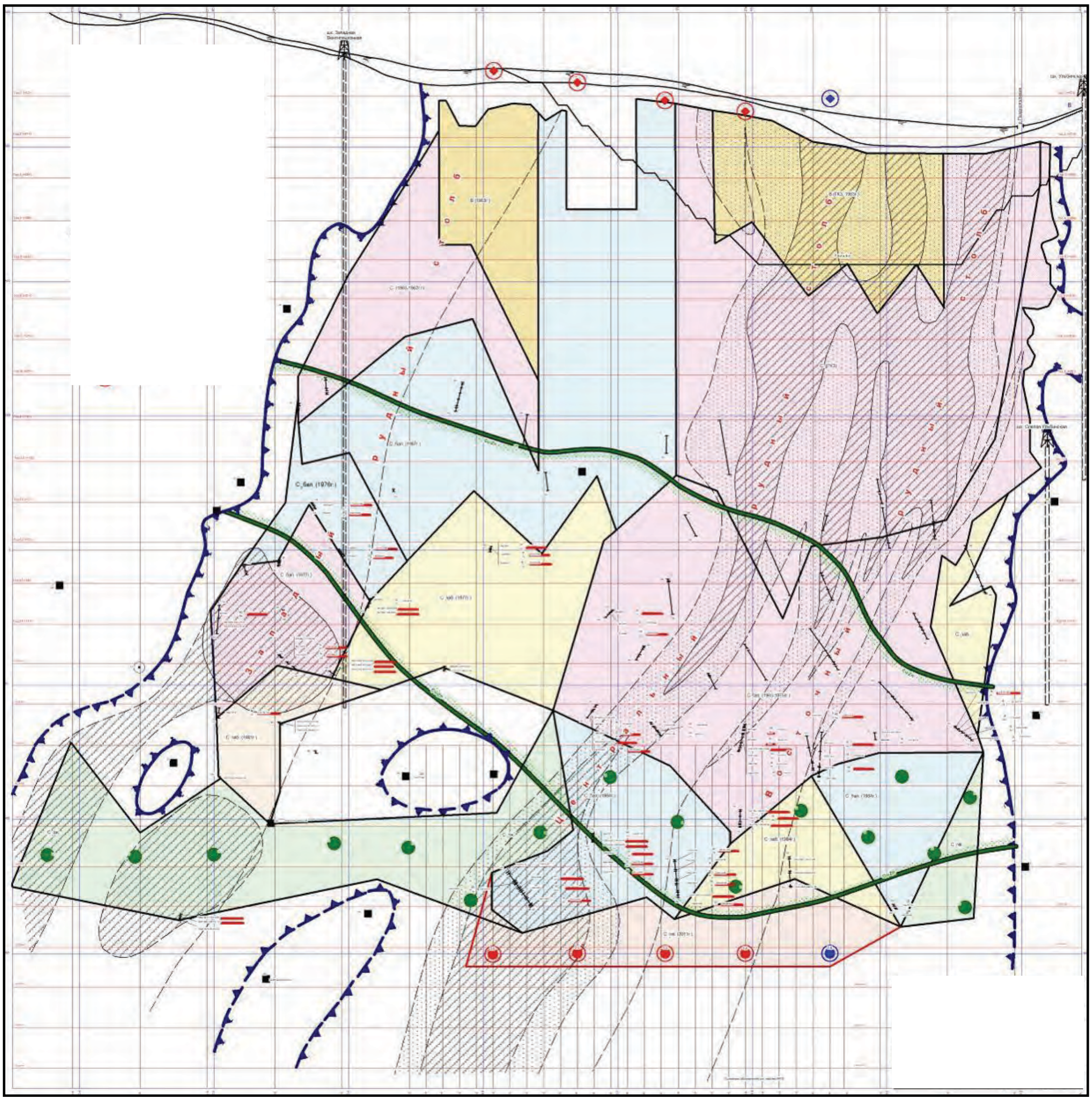


Figure 9.5: Long Section showing Location of Deep Horizon (Collars and targets shown in red) and Flank (targets shown in green) Exploration Drill holes (Grid:200m)

10 CHEKMAR

10.1 Introduction

The Chekmar deposit comprises three polymetallic ore zones, Chekmar, South-Eastern and Gusliakov. They are located in close proximity to each other in the centre of an 8km long mineralised trend which extends along the south-western slopes of the Gusliakov and Bolshoy Chekmar Mountains on the east side of the Uba River.

The deposit is situated 46km north of Ridder and linked with Ridder by a graded road, which is passable over the whole year except for short spells of wet weather and heavy snow fall.

Ground elevations at the sites range from approximately 860-1,196m above sea level at the peak of the Malyi Chekmar. The neighbouring peaks rise to 1,561m (Bolshoy Chekmar). The Uba valley is approximately 650m deep and its tributaries invariably have deep and steep sided V-shaped valleys.

The site and surrounding mountains are covered by thick forest with fir, birch, some spruce and pine and a variety of shrub species. The River Ulba is renowned as a prime trout fishing venue.

The climate is extreme continental with the average annual temperature of 1.6°C and seasonal variations from +35°C in July to -45°C in December. Mean annual precipitation is approximately 1,000mm, of which maximum falls as snow in winter months. Snow cover lasts from early October to April, and longer on north facing slopes and in forested river valleys.

> ***WAI Comment:*** *Notably the licence lies close to significant watercourse, which is a renown tourist site and lies with a designated nature reserve.*

10.1.1 Mineral Rights and Permitting

Kazzinc won a tender for the rights to carry out exploration and extraction of the polymetallic ore zones comprising the Chekmar deposit on 26 December 2008.

A geological lease was granted to Kazzinc on 21 May 2009, covering an area of 6.9km^2. The boundaries of the lease are defined as detailed in Table 10.1 below.

The Chekmar subsoil use contract is expected to be finalised and registered with the relevant Kazakhstan authority by the end of 2011. The Chekmar mining plan, which was submitted by Kazzinc to the relevant Kazakhstan authority, is currently going through the approval process.

Table 10.1: Chekmar Lease Boundary Points

Boundary Points	Geographical Co-ordinates	
	Latitude N	Latitude N
1	50°40'10"	83°35'35"
2	50°40'09"	83°36'32"
3	50°37'52"	83°37'56"
4	50°37'55"	83°36'02"

10.1.2 Project History

The three ore zones comprising the Chekmar Group (Gusliakov, Chekmar and South-Eastern) were explored during the period 1971-1981. Detailed exploration was completed at Gusliakov (1975) and Chekmar (1981), whilst exploration of the South-Eastern ore zone was stopped on completion of a preliminary exploration programme in 1977.

Subsequent activities funded by the government of the Republic of Kazakhstan included:

- The partial completion of a railroad from Ridder to the site;
- The development of a small trial open pit in the central part of the Chekmar ore zone;
- Process testwork on a 2,000t bulk sample conducted by VNIItsvetmet in Ust; and
- Limited exploration to define a silver resource at Chekmar, which was abandoned due to a shortage of funds in November 1993.

All works on the property were terminated in 1996. Kazzinc is currently undertaking a Feasibility study for re-starting the open pit on the Chekmar ore zone.

10.2 Geology and Mineralisation

10.2.1 Local Geology

The three ore zones are genetically associated with submarine rhyolite volcanism and comprise predominantly stratabound accumulations of sphalerite, galena, chalcopyrite and pyrite, which precipitated from hydrothermal fluids on or below the seafloor. The Chekmar ore zone is underlain by a stockwork feeder pipe with copper-zinc and copper mineralisation. No such features have so far been recognised at the Gusliakov and South-Eastern ore zones, which are developed in a stratigraphically higher horizon (see Table 9.2), and have not been explored to the same depths as the Chekmar ore zone.

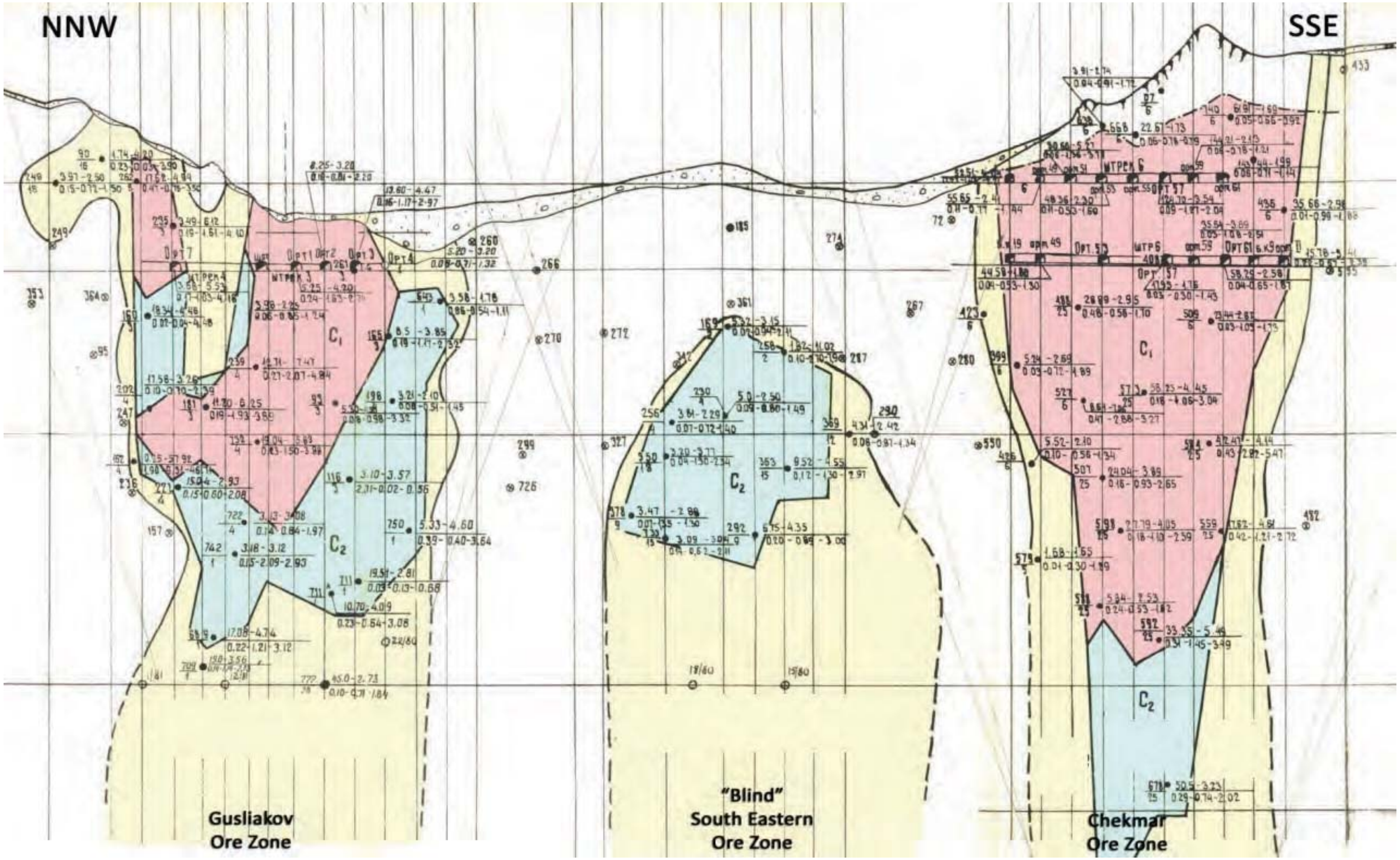


Figure 10.1: Long Section showing Three Ore Zones

Table 10.2: Stratigraphic Position of Polymetallic Mineralisation of the Chekmar Ore Zones

Stratigraphic Unit			Occurrence	Lithology	Mineralisation
Uspenskaya Formation	Upper Subformation	D_2e_2-gv_1us_2	From 20-30m at Chekmar to 70-100m at Guslakov	Carbonate Siltstones with carbonaceous matter and lenses of crinoidal limestones Tuffs, lavas and lavobreccias of intermediate composition with intercalations of green epicalastic rocks	
	Lower Subformation	Upper effusive pyroclastic member (UEMP) D_2e_2-$gv_1us_1^4$	Laterally most extensive member, sharply variable composition, fairly constant thickness: 250-300m at Chekmar, 300-400m at South-Eastern and 170-250m (not bottomed) at Guslakov	Lithic-vitric acid tuffs and flows of quartz rhyolite and quartz-feldspar rhyolite, lenses and intercalations of tuffaceous siltstones, siliceous siltstones, tuffaceous sandstones and tuffs of acid composition	Tuffaceous units host significant mineralisation at South-Eastern and Guslakov deposits
		Tuffogenic-sedimentary member (TSM) D_2e_2-$gv_1us_1^3$	Mainly at Chekmar (60-170m in thickness), reduced to 0-25m at South-Eastern Deposit	Siliceous tuffaceous siltstones sandstones, tuffites and tuffs derived from mottles quartz rhyolite, lenses of albitophyres and quartz rhyolites and crinoidal limestone at the top of the unit Boundinages and brecciated microquartzite horizon of variable thickness developed at Chekmar at the uppermost levels immediately below crinoidal limestone horizon, associated relics of hematite-quartz and hematite-carbonate-quartz cherts	The microquartzite horizon is the main host for stockwork mineralisation at the South-Western Zone of Chekmar
		Lower effusive-pyroclastic member (LEPM) D_2e_2-$gv_1us_1^2$	Thickness varies from 170-200m at Chekmar to 90-120m at South-Eastern presumably continuing into Guslakov	Alternating mottled quartz rhyolite and rhyolite tuffs, locally subordinate reworked tuffs Strong chlorite-sericite-quartz alterations, particularly at South-Western mineralised zone of Chekmar	Hosts mineralisation at Central and South-Western zones of Chekmar, mineralised at South-Eastern deposit
		Sedimentary-volcanic member (SVM) D_2e_2-$gv_1us_1^2$	A 90-110m in thickness in the core of Chekmar dome	Rhyolite lavas with intercalations and lenses of tuffaceous sandstones and crinoidal limestones at the top of the unit	Hosts mineralisation at Central and North-Eastern zones of Chekmar

Syn and post-depositional faulting appears to have played a key role in focusing the flow of the hydrothermal fluids. Subsequent folding and regional metamorphism strongly modified forms of mineralised bodies and metal distribution. Despite these modifications all three ore zones are stratabound and display many relic features normally associated with Kuroko-type VMS deposits.

10.2.1.1 Chekmar Ore Zone

The Chekmar ore zone contains about 40 mineralised bodies, predominantly of stockwork and stringer type, contained in a tight to isoclinal north-west striking double plunging anticline with two small subsidiary anticlines on the south-western and north-eastern limbs. Mineralised bodies that form the central part of the deposit, starting from the gossan cap and descending to about the 500m level (at 350-400m depth), are grouped together as Central Zone. Mineralised bodies on the south-western and north-eastern limbs of the anticline are grouped as South-Western and South-Eastern zones respectively.

The largest mineralised bodies occur in a boudinaged and brecciated microquartzite horizon, which appears to represent submarine siliceous precipitates within the tuffogenic-sedimentary member (TSM) of the Lower Uspenskaya Formation. In plan view, this horizon attains 600m in width and drapes over the hinge of the anticline and onto its south-western and north-eastern limbs. The mineralisation does not breach the overlying upper effusive-pyroclastic member (UEPM) The host microquartzite horizon contains cherty manganiferous hematite quartz and hematite-carbonate-quartz which are most probably relics of an exhalite horizon that formed an apron around the ore zone.

Pyrite-polymetallic stockwork with an iron content of more than 10% is found in the apical part of the Central Zone. Elsewhere, stockwork, stringer and disseminated lead-zinc mineralisation predominates and extends down to levels 600m and 500m, below which lead and zinc grades decrease and mineralisation becomes polymetallic (copper-lead-zinc). The same tendency has been noted within larger mineralised bodies as the distance from the hanging wall increases. Small massive sulphide bodies are locally developed but represent an insignificant proportion of the total volume. As indicated by drilling, the South-Western Zone does not extend below the -100m level (i.e. below a depth of 900-1,000m below the surface).

Copper-zinc and copper mineralisation assemblages occur at deeper levels of the Central Zone in the:

- Lower effusive-pyroclastic member (LEPM);
- Sedimentary-volcanic member (SVM);
- North-Eastern Zone, where they form a single NNW-elongated pipe, some 200-300m in width; and
- Footwall of lead-zinc and polymetallic mineralisation.

The associated hydrothermal alteration changes from sericite-quartz to chlorite-sericite-quartz. The pipe of the North-Western Zone is open at depth of 1,100-1,200m below the surface (level -200m).

Mineralised bodies included in the resource range from 100-400m in strike length, from 230-900m in down dip extent and from 6-230m in width.

The Central Zone crops out on top of the Chekmar Mountain, where it has given rise to massive gossan capping. The trial open pit is located in this capping and also exposes the adjacent microquartzite-hosted pyrite-polymetallic stockwork. Effects of superficial oxidation extend down to 200-300m below the surface and mixed partially oxidised mineralisation forms over 45% of the resource so far delineated at Chekmar.

10.2.1.2 South-Eastern Ore Zone

This ore zone was discovered whilst exploration was conducted on the Gusliakov and named to reflect its location in relation to Gusliakov. This is a blind ore zone of which only the top part has been explored. The structure is a NW-trending tight to isoclinal anticline with a moderate to steep (40-60°) NW plunge. It is thought to be an extension of the north-eastern subsidiary anticline of Chekmar rather than an extension of the main Chekmar anticline. The fundamental difference in relation to Chekmar is that the mineralisation occurs in tuffaceous units within the UEPM from where it has been traced down into the LEPM. The TSM fades out at this locality. The mineralisation is polymetallic with barite present at the uppermost and intermediate depth levels.

Eleven lenses of stockwork and stringer mineralisation have been delineated with strike lengths in the range of 175-290m. Down-dip dimensions vary from 90-185m and widths from 3-11m. Lead grades are about 40% higher than at Chekmar and zinc grades are around 25% higher.

10.2.1.3 Gusliakov Ore Zone

This ore zone occurs in a NW-trending double plunging tight to isoclinal anticline, which is correlated with the anticline of the South-Eastern ore zone. Due to faulting, this area is lifted up at least 200m in relation to the South-Eastern ore zone. As at the South-Eastern ore zone mineralisation at Gusliakov is polymetallic, with barite-rich lenses at the highest stratigraphic levels. Stockwork, stringer and disseminated mineralisation predominates but massive sulphide lenses are more abundant than at the South-Eastern deposit and account for over 5% of the mineralised volume. The mineralisation occurs in tuffaceous units within the UEPM. Twenty four mineralised lenses have been delineated with strike lengths of 60-150m. Down dip dimensions vary from 100-375m and widths from 7-10.5m. Average lead grades are 75-80% higher than at Chekmar and zinc grades are generally twice as high.

10.2.2 Mineralisation

Three natural primary sulphide mineral associations have been recognised within the Chekmar ore zones; they are: lead-zinc, polymetallic and copper-zinc. The polymetallic mineralisation differs from the lead-zinc mineralisation in that it contains more than 0.1% Cu and from the copper-zinc mineralisation in that it contains more than 0.1% Pb. The Chekmar ore zone displays lateral zoning with copper-zinc and polymetallic mineralisation in the centre passing outwards into polymetallic mineralisation, which in turn gives way to lead-zinc mineralisation on the flanks.

The main primary metalliferous minerals are sphalerite, pyrite and galena. Chalcopyrite is much less common except in the copper-zinc mineralisation. Accompanying minerals include arsenopyrite and tetrahedrite-tennantite. Barite occurs with polymetallic mineralisation, locally in significant quantities. The main gangue mineral is quartz. Calcite and fluorite occur in subsidiary quantities.

The polymetallic and copper-zinc mineralisation contains gold-bearing zones. A series of such zones have been traced for a strike length of 300-350m and for 300-350m down dip between Profiles 47-61 in the central part of the Chekmar ore zone. Gold-bearing zones have also been identified within lead-zinc mineralisation in the footwall of the South¬Western Zone. With exploration being focused on base metals, the importance and extent of the gold-bearing zones still remain to be assessed.

Gold in primary sulphide mineralisation occurs predominantly in its native form and as electrum intergrowths with quartz and sulphide minerals. Isomorphic admixtures in sulphide minerals, particularly in chalcopyrite, are less common. In the central part of the Chekmar deposit, for instance, only 7% of the gold occurs within sulphides. The average gold contents in sulphide minerals were stated as follows: 3.5g/t Au in chalcopyrite, 1.83g/t Au in pyrite, 0.6g/t Au in galena and 0.1g/t Au in sphalerite.

The size of gold is generally within a range of 0.003 - 0.07mm but grains as large as 0.45mm have been noted. Fineness varies from 740 to 890.

At the Chekmar deposit, superficial oxidation extends from the gossan cap down to depths ranging from 20-70m. Fracture zones show signs of oxidation to a depth of 120-150m. The main secondary minerals are: hydrogoethite, hydrohematite, chalcocite, malachite, limonite-cuprite, cerussite, smithsonite, plumbojarosite, covelite, cuprite, lepidochrosite, azurite, goslarite, chalcanthite, melanterite and relatively rare chrysocolla.

The weathered zone is enriched in gold, which is frequently found as high purity native grains occurring as nests in kaolin among partially oxidised sulphide veinlets.

The oxidation zone at Chekmar is underlain by a leached transition zone to primary sulphide mineralisation. Secondary supergene minerals (which include secondary galena, chalcocite and covellite) and effects of partial leaching extend approximately to a depth corresponding to the Ulba river (at absolute elevations of 650-670m or approximately at a 200m depth) and locally to a depth of 250m along fracture zones. This zone consists of partially oxidised mineralisation with secondary supergene sulphides alternating with primary unaltered sulphide mineralisation and hence is referred to as mixed mineralisation. The average Cu:Pb:Zn ratio is 0.2:1:3.

The classification into oxidised, mixed and sulphide mineralisation types is determined on the basis of phase analyses of lead and zinc in combination with the cyanide soluble copper analysis (see Table 10.3 below).

Table 10.3: Criteria for Classification into Mineralisation Types

Mineralisation Type	Sulphide Forms		CyanideSoluble Copper Content
	Lead	Zinc	
	%		%
Oxides	<50		>0.2
Mixed/Transitional	50-85	75-90	01-02
Sulphides	>85	>90	<0.1

10.3 Exploration Works

10.3.1 Sample Collection

The ore zones were explored by core drilling from surface augmented by underground exploration from two adits at Chekmar (Adit No.1 at +800m level and Adit No.2 at +670m level) and from another adit at Gusliakov (at +600m level).

The drilling grid density was selected on completion of early geological mapping and prospecting, when the targeted ore zones were assessed to represent Group III in the 4-tier classification of mineral deposits with respect to geological complexity. According to GKZ instructions, polymetallic lead-zinc deposits of Group III require a sampling grid of 50m by 50m for the delineation of a C1 category resource.

10.3.1.1 Surface Core Drilling

The drilling profile lines were cut at 50m spacing perpendicular to the overall strike. At the Chekmar and South-Eastern ore zones, profiles were cut on a bearing of 235°. At the Gusliakov ore zone, profiles were cut on a bearing of 230°. Profiles on the north-western and south-eastern flanks of the Chekmar ore zone were oriented at azimuths of 300° and 0° respectively to account for strike changes. In addition, four drill holes at Gusliakov were oriented either NW or SE to test a postulated NE strike.

The initial drill hole inclination angle depended on target depths. Most drill holes with target depths less than 300m were angled, at the start, at 75-78° from horizontal, whilst deeper drill holes were angled at 78-89°. Drilling trajectories were then controlled by utilising natural deviation tendencies resulting from the orientation of folded beds (holes at Chekmar had a tendency to deviate 15-25° clockwise and holes at Gusliakov 20-25° anticlockwise) and directional wedging. Overburden and barren formations at the Gusliakov and South-Eastern ore zones (to depths of 50-400m) were drilled by non-coring bits, but drill holes at Chekmar, where overburden depths are negligible, were cored throughout.

Some drill holes targeting shallow near-surface parts of the Chekmar and Gusliakov ore zones were drilled at angles ranging from a few degrees to 60° from horizontal.

External diameters at the start of each hole were variably 112mm, 93mm or 76mm, with subsequent reductions to 76mm, 59mm and 46mm respectively. Mineralised intervals were generally drilled with 59mm and 46mm drill bits, which recover core with diameters of 42mm and 31mm respectively. All unstable intervals were cased and cemented. Specialised drilling muds were used at Gusliakov.

Historical average core recoveries were estimated for each mineralised intercept included in the Soviet compliant resource estimates of 1981, (as length of core recovered)/(intersection length) but reported as percentages of the total number of intercepts included in the estimated C_1 and C_2 resource categories. An abridged summary for all mineralised intercepts included in that resource estimate (C_1 and C_2 categories combined) is given in the Table 10.4 below. It was also reported that recoveries of less than 70% were essentially limited to older drill holes and to shallow intercepts through weathered, leached and locally cavernous ground to depths of 200-250m. It was also mentioned that some caverns reached 1-3m in size. At that time, normal practice required that average recoveries from intercepts included in resource estimates had to be better than 70%.

No recent verification drilling has been undertaken at Chekmar to confirm the reliability of the data.

Table 10.4: Reported Drill Core Recoveries

Ore Zone	Average Core Recovery	Number of Intercepts	Proportion
	%		%
Chekmar	>70	678	83.4
	60 - 70	100	12.3
	50 - 60	15	1.8
	<50	20	2.5
Gusliakov	>70	278	62.5
	60 - 70	97	21.8
	50 - 60	41	9.2
	<50	29	6.5
South-Eastern	>70	33	73.3
	60 - 70	9	20.0
	50 - 60	2	4.4
	<50	1	2.2

10.3.1.2 Underground Exploration

Underground exploratory workings consisted of crosscuts developed at 100m intervals, drives and raises, some of which followed surface drill holes. Additional crosscuts were developed at 50m spacing through the largest mineralised bodies at Chekmar and occasionally at 25m spacing though gold-bearing mineralised bodies. Mineralised intervals totalled 5,920m, of which 4,990m were exposed at the Chekmar workings.

The geological mapping geology was documented on 1:50 scale drawings of walls, backs and faces (at approximately 5m intervals between successive rounds).

Direct underground exploration was augmented with underground diamond core drilling, aimed essentially at detailed delineation of morphology and compositional variations of the mineralised bodies, verification of structural and compositional continuity and, where necessary, infilling to a 50m sampling grid.

Inclination of underground drill holes ranged from +48° to -90° (vertical). Deviations were in the range of +/-5° for azimuth and up to 3° per 100m for inclination, which equates to approximately 2-3m per 100m.

The average core recoveries from mineralised intercepts were reported as 71% for Chekmar and 72% for Gusliakov.

10.3.1.3 Exploration Summary

A summary of all exploration undertaken at Chekmar is given in Table 10.5 below.

Table 10.5: Summary of Work Undertaken at Chekmar from 1956 To 1981

Stage and Scope of Work	Units	1956-1960	1961-1971	1972-1973	1973-1975	1975-1977	1977-1980	1980-1981	Total
Surface and subsurface prospecting:		100	50						150
Prospecting traverses	km	728	2,564						3,292
Prospecting pits	m	2,171	17,329		37,112				56,612
Diamond drilling	m	800	2,911		4,824				8,535
Sampling (drill core, channel)	samples								0
Prospecting-assessment:			13,422			7,564 654			
Diamond drilling	m		249						
Percussion drilling	m		3,178						
Sampling (drill core, channel)	samples								
Preliminary exploration:				1,252		16,549	2,258		
Trenching	m			3,063		300	64,933		
Underground exploratory workings	m			17,824		1,188	310		
Diamond drilling	m			135					
Percussion drilling	m			5,106					
Sampling (drill core and channel)	samples								
Detailed exploration:					103		12,044	5,964	
Underground exploratory workings	m				29,060		3,500	108,531	
Diamond drilling	m				443			595	
Percussion drilling	m				5,340			76,780	
Sampling (drill core and channel)	samples								

Gusliakov Ore Zone:
Commencement of work in 1971
Prospecting-assessment in 1971-1972
Preliminary and detailed exploration in 1972-1975
Technical-economic assessment (TEO) and resource estimation completed in 1975
South-Eastern Ore Zone: Commencement of work in 1973 Prospecting-assessment in 1974-1975 Preliminary exploration in 1976-1977 Interim resource estimation completed in 1977
Chekmar Ore Zone:
Preliminary and detailed exploration in 1976-1981
TEO completed in 1978
Detailed exploration completed in 1981

10.3.1.4 Drill Core Sampling

Drill core from mineralised intercepts was divided into samples not exceeding 1m in length or approximately 1m to coincide with visible contacts. Drill core intervals with low grade sulphide mineralisation were sampled over lengths not exceeding 2m.

Up to 1973, drill core samples from the Gusliakov and South-Eastern deposits were split by hand. From 1974, the whole core was taken except for short 10 to 15cm specimens from sample intervals where mineralisation appeared to be homogenous.

Drill core samples from Chekmar had been hand-split until 1978, when it was realised that control analyses on duplicate halves of core correlated poorly with the original results. The whole core was sampled thereafter.

Several different approaches were tried to test the reliability of core sampling. Results were generally ambiguous and simply indicating a high variability of the polymetallic mineralisation, copper in particular. Gold and silver analyses were not included in these tests. For instance, channel sampling in six raises, which were developed along traces of drill holes drilled from surface, and in five crosscuts to verify results of underground drilling, revealed only high short range variations in copper grades.

The most comprehensive test involved drilling of 15 underground holes and taking both the drill core and sludge samples over the same 2m intervals. The holes were angled from 30-60˚ from horizontal and ranged from 15-20m in length. It was established that copper, lead and zinc grades were on average lower in core samples than in the sludge. The results were then analysed in relation to core recoveries. Copper grades in solid drill core were on average 7% to >20% lower at the 0.14-0.23% Cu grade range. Lead and zinc grades correlated reasonably well for core at >70% core recovery, but differential loss of galena and sphalerite was clearly demonstrated for lower core recoveries.

Further work at Chekmar, involving control channel sampling and direct RRK measurements on drill core with different recoveries, confirmed the differential loss of galena and sphalerite. Average lead and zinc grades on drill core with 60-70% recovery were 16-24% lower than grades of the corresponding channel samples and RRK readings. Average lead and zinc grades in drill core with recoveries less than 60% were 35-44% lower.

Control channel sampling at Gusliakov returned totally different results suggesting a differential gain in respect of copper, lead and zinc at drill core recoveries below 60%. Core with recoveries in excess of 60% correlated reasonably well with channel sampling.

10.3.1.5 Underground Channel Sampling

Crosscuts at Gusliakov were channel sampled along horizontal lines over mineralised intervals exposed in crosscuts and from wall rocks up stepping out 3-5m from visible limits of the sulphide mineralisation. Channels were 10cm wide, 3cm deep and generally 1m in length. Only one side wall, generally north-western, was sampled, except in zones with sharp short distance variations, where samples were cut from both walls. Horizontal face samples were collected from advancing faces in drives.

Crosscuts at Chekmar were generally sampled along both walls. Drives on the Adit No.1 level were generally sampled along one side wall and from faces and results averaged for each round interval. Drives in Adit No.2 were sampled from faces only and those results were pooled and averaged with RRK readings taken along drive walls. As rocks at Chekmar were too hard to sample manually, mechanically driven chisels was developed by Leninogorsk GRE.

A variety of control sampling ranging from repeat sampling to bulk sampling did not indicate any systematic bias.

10.3.1.6 Composite Sampling for Gold and Silver Determination

The exploration in the Chekmar district was focused on lead-zinc and polymetallic (copper-lead-zinc) mineralisation. Precious metals were not the subject of detailed investigations and therefore their grades were determined on the basis of analyses of composited samples and statistical correlation with copper, lead and zinc.

Compositing was done over core intervals which passed the approved resource criteria with respect to copper, lead and zinc grades. Composited samples were then screened by multi-element spectral analysis, which included silver, and by gold spectral analysis. Samples with high spectral silver and gold were sent for fire assay. This method however, would have missed gold and silver mineralisation outside the mineralised bodies included in the sulphide resource model.

10.3.2 Sample Preparation

The sample preparation scheme used at all exploration stages was based on the Richard-Czeczott formula Q=kda. The coefficient k is the key parameter. In general terms, the lower coefficient k is, the better it accounts for the erratic distribution of minerals. In this instance, the k parameter of 0.16 was selected after a series of experiments using schemes with varying k coefficients.

Samples were jaw crushed in two stages to pass a 2mm sieve and then divided to obtain an approximately 1kg sub-sample. That sub-sample was ground in a roll grinder, sieved through a 0.8mm screen and pulverised to pass a 0.07mm screen. Sub-samples were then collected for Cu, Pb and Zn analyses (50g) and for gold and silver analyses (450g). A 500g duplicate of each was retained for reference purposes.

Control analyses on sample splits taken after each volume reduction did not reveal any systematic errors. Random errors were small. In total, 121 control samples were analysed for lead and zinc and 33 samples were analysed for copper.

10.3.3 Sample Analysis

Selection of core and channel samples for accurate analysis was made on the basis of results of 16-element spectral analysis. Samples that showed spectral values greater than 0.3% of Cu, Pb or Zn were submitted for chemical analysis for copper, lead and zinc and fire assay for gold and silver.

Chemical analyses for Cu, Pb and Zn were conducted by LPC and Vostkazgeologia laboratories.

Vostkazgeologia performed most of other analytical work, including:

- Fire assays for gold and silver and XRF analyses for barium on composited samples;
- Chemical analyses for copper, lead, zinc, cadmium, selenium, tellurium, indium and sulphur, atomic absorption analyses for iron, XRF analyses for barium and fire assays for gold and silver on grouped samples; and
- Phase analyses for copper, lead and zinc on grouped and routine samples.

Routine samples from the gold-bearing zone at Chekmar were analysed by spectral gold method and fire assay at LPC and partly at Vostkazgeologia.

Chemical spectral analyses for antimony and bismuth on grouped samples were performed by Altay Geological-Geophysical Expedition.

The methods used for accurate analyses for key elements are listed in Table 10.6.

Table 10.6: Analytical Methods Used During Chekmar Exploration

Element	Method	Detection Limits			HCAM Norm
Copper	Polarographic	0.05	3	%	155-XC
	Iodometric	0.05	~10	%	
	Atomic absorption	0.01	30	%	
Lead	Polarographic to 1977		5	%	155-XC
	Complex analysis	2	~10	%	
	Atomic absorption	0.05	30	%	
Zinc	Polarographic	0.05	5	%	155-XC
	Complex-metric	3	~10	%	
	Atomic absorption	0	50	%	
Cadmium	Polarographic	0	~10	%	
	Atomic absorption	0	10	g/t	
Gold	Fire assay	0.1		g/t	
Silver	Fire assay	2		%	
Barium	Yadro-physical	0.01		%	97-ЯФ

Internal and external control analyses were performed on duplicates of 5-10% of routine samples. Neither revealed any significant random or systematic errors.

10.3.4 Bulk Density Determinations

Bulk densities have been determined on the basis of measurements on laboratory scale waxed specimens (Chekmar -109, South-Eastern - 48, Gusliakov - 260) and systematic hydrostatic weighing of drill core specimens (Chekmar >6,000, Gusliakov c. 3,000).

Bulk densities are independent of moisture content, which varies from 0.02% to 0.44%.

Barite-bearing specimens were divided into three groups:

1. Barite-bearing (>1.3% BaO);
2. Barite-polymetallic (0.5-<1.3% BaO); and
3. Polymetallic (<0.5% BaO).

Based on statistical analysis, lead-zinc, polymetallic and copper-zinc mineralisation varieties follow the same trend but pyritic polymetallic mineralisation follows a different trend. The boundary between is approximately 3t/m^3. It was further established that bulk densities of mixed mineralisation are only slightly lower than bulk densities of sulphide mineralisation (by 0.05 to 0.07t/m^3).

The following regression formulas were developed (Jc = Cu + Pb + Zn, or Cu + Pb + Zn + Ba for barite-polymetallic mineralisation, C = correlation coefficient):

Chekmar Ore Zone:

1. Sulphide (based on 369 samples) d=0.01247 (Jc) + 2.72585 C = 0.57
2. Mixed (based on 375 samples) d=0.01841 (Jc) + 2.66849 C = 0.52
3. Average for sulphide and mixed d=0.0165 (Jc) + 2.69717
4. Massive polymetallic (128 samples)d=0.03251 (Jc) + 3.209 C = 0.44

Gusliakov and South-Eastern Ore Zones:

1. Polymetallic (93 samples) d=0.02375 (Jc) + 2.72215 C = 0.94
2. Barite-polymetallic (147 samples) d=0.02675 (Jc) + 2.89318 C = 0.65
3. Barite-bearing (85 samples) d=2.897 + 0.03715 BaO C = 0.81

The low correlation for massive sulphides is due to variations in the pyrite content. The relationship is non-linear because the pyrite content decreases with the increase in the content of base metals.

Bulk densities estimated from these regression formulas were compared with arithmetic means of the specimens used in the derivation of the formulas. Differences between bulk densities calculated from the regression formulas and arithmetic means were within a range of -3% to +4% (-3% for mixed, +4% for massive, -1% for sulphide mineralisation).

As a control measure, bulk density was also determined on 37 bulk samples (26 from Chekmar and 11 from Gusliakov). The average bulk density for the three ore zones is 2.93t/m^3 (for average 0.14% Cu, 0.89% Pb and 2.45% Zn). The average bulk density of host rocks was determined as 2.58t/m^3.

10.4 Mineral Resources

At present no Mineral Resources or Ore Reserves have been calculated in accordance with the guidelines of the JORC Code (2004) for the Chekmar deposit.

11 STAROYE TAILINGS DEPOSIT

11.1 Introduction

11.1.1 Location & Access

The Staroye tailings dam contains waste material discharged from the Leninogorsk[1] Polymetallic Combinat (LPC) during the period 1926 to 1953 inclusive, the western area until 1946 and the eastern area from 1946 to 1953. The feed for the concentrator during that period was derived exclusively from processing of polymetallic ores from the Ridder-Sokolniy deposit. Sulphide ores formed the bulk of the concentrator feed whereas oxidised ore fluctuated from 3% to 18% of the total feed.

From 1973 tailings material (from several sources) was transported to the Irtysh Polymetallic Combinate to be processed as fluxes. Thus from the western Staroye tailings dam some 24,334t were extracted (in 1986), and from the eastern Staroye tailing dam a further 47,010t (in 1988-1992) was removed.

Photo 11.1: North-West view over the Staroye Tailings Dam
(Ridder Concentrator to the left of the image)

The Staroye tailings dam is located some 300m to the northeast of the Concentrator of formerly named, Leninogorsk Polymetallic Complex (MCLPC) at Ridder (Figure 11.1). The dam extends from Ridder Hill eastwards towards the Filipovka River and the Malaya Talovka tributary. It is easily accessible by sealed road from Ridder and is some 5.5km from the Kazzinc main office.

The tailings cover a north-south elongated rhomboid outline approximately 1km in length and 700m wide. The surface elevation is at approximately 740m AOD and the average thickness is estimated to be 12.3m, with a maximum of around 21.0m.

In the 1970's some attempts to re-process tailings at the MCC were made. Based on exploration work carried out in 1969 by "Kazgiprotsvetmet" Research Institute, within the western Staroye tailings dam, the project for tailings re-processing was developed in 1976 indicating the main technical and economical indices. This evaluation demonstrated that the project could be viable. Thus having an 'approved' reserve of 1,490kt, within a designed pit outline, and excluding a protective pillar for the railway, containing 1.74g/t Au (2,606.3kg Au) and 16.44g/t Ag (24.5t Ag), a tailings re-processing capacity of 200ktpa over 7 years was proposed. At 59.3% gold recovery to concentrates and capital investments of 2.2M rubles, the total profit was estimated to be 4.8M Rubles for a payback period of 3.4 years. Furthermore the project did not consider additional recovery of gold from bulk flotation tailings by cyanidation due to the unsuitable performance of this process, as demonstrated in previous testwork by the "Kazgiprotsvetmet" Research Institute; "Feasibility study on processing of current quartz tailings of Leninogorsk Concentrator" in 1973.

[1] The name Leninogorsk was abandoned in June 2002 and replaced with the pre-1941 Revolution name Ridder.

Figure 11.1: Outline of Staroye Tailings Dam

11.1.2 Mineral Rights and Permitting

Kazzinc holds the right to mine the Staroye tailings under the terms of Contract No 559 dated 7 November 2000. The same contract covers the nearby Chashinskoye tailings. The Staroye mining lease covers an area of 61.5ha, the boundaries of which are defined by 8 corner points as detailed in Table 11.1 and shown in Figure 11.1.

Table 11.1: Staroye Tailings Mining Lease Boundaries

Boundary Points	Geographical Co-ordinates		Local Rectangular Co-ordinates		Local Interim Co-ordinates	
	Latitude N	Longitude E	X	Y	X	Y
1	50°21'39"	83°32'35"	98,191	-14,507	84,179.39	80,856.64
2	50°21'50"	83°32'55"	98,550	-14,180	84,550.12	81,337.03
3	50°21'50"	83°33'00"	98,548	-14,004	84,552.03	81,446.06
4	50°21'36"	83°33'20"	98,101	-13,607	84,128.33	81,859.58
5	50°21'23"	83°33'10"	97,693	-13,823	83,714.91	81,661.09
6	50°21'19"	83°33'06"	97,567	-13,903	83,586.76	81,586.20
7	50°21'14"	83°32'57"	97,436	-14,079	83,449.77	81,416.20
8	50°21'21"	83°32'41"	97,655	-14,381	83,652.40	81,105.58

11.1.3 Production History

Table 11.2 presents a summary of tonnage and grades of material deposited into the Staroye tailings dam from 1926 to its closure in 1953. The data were compiled by Durnev and Golubtsov (2001) on the basis of historical records of the LPC. It was recorded that a total of 14.3Mt of tailings were deposited at the site and a small amount (151kt) was subsequently removed prior to the start of the reprocessing operation in 1991, mainly from the eastern part of the impoundment, and sent to the Irtysh Polymetallic Combinat to be used as flux.

The average gold grade in the deposited tailings dropped from 11.1g/t Au in 1926/1927 to 2.15g/t Au in 1936, fluctuated at around 2.0-2.6g/t Au from 1937 to 1945 and then, as recoveries at the LPC gradually improved, fell to 0.5g/t Au in 1953. Silver grades are more erratic while copper, lead and zinc grades show a similar pattern. The grade variations reflect both concentrator metal recoveries, which in turn are directly linked to the history of the LPC, as well as mined grade. The first concentrator was destroyed by fire in 1927 and a new concentrator (Concentrator No 2) was constructed in 1928, but required two years of fine tuning to achieve target metal recoveries. Another concentrator (Concentrator No.3) was commissioned in 1936.

Table 11.2: Tailings Deposited in the Staroye Tailings Dam (1926-1953)

Year	Tonnes	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
1926/27	2,850	11.10	25.60	0.40	2.30	14.10
1927/28	5,855	8.24	34.85	0.29	1.90	9.90
1928/29	23,068	4.00	31.00	0.24	0.68	6.26
1929/30	45,496	6.00	29.00	0.11	1.05	5.85
1930	14,805	7.40	37.00	0.17	0.94	5.59
1931	106,487	6.60	33.00	0.16	0.84	4.33
1932	113,383	4.70	16.50	0.14	0.42	2.77
1933	118,170	3.67	13.26	0.18	0.48	2.05
1934	144,601	2.73	13.12	0.11	0.39	1.31
1935	207,003	2.56	15.23	0.09	0.65	1.68
1936	299,806	2.15	17.36	0.08	0.50	1.31
1937	382,709	2.48	18.00	0.07	0.47	1.39
1938	397,714	2.57	18.02	0.08	0.49	1.32
1939	473,622	2.26	20.67	0.08	0.46	1.26
1940	590,234	2.05	22.45	0.08	0.44	1.22
1941	878,000	2.01	22.35	0.10	0.44	0.88
1942	655,889	2.09	21.45	0.08	0.46	1.36
1943	435,684	2.40	27.20	0.09	0.55	2.26
1944	467,534	2.14	19.97	0.07	0.55	1.93
1945	471,513	2.36	21.00	0.08	0.53	1.75
1946	548,847	1.89	21.30	0.08	0.47	1.52
1947	549,223	1.39	13.40	0.07	0.42	1.43
1948	679,183	0.94	11.39	0.07	0.36	0.96
1949	812,022	0.87	10.40	0.05	0.30	0.56
1950	1,048,463	0.74	9.08	0.05	0.24	0.48
1951	1,212,948	0.66	8.40	0.05	0.21	0.37
1952	1,592,227	0.60	7.50	0.03	0.23	0.33
1953	1,997,111	0.50	8.70	0.03	0.24	0.26
Subtotal	14,274,447	1.47	14.45	0.06	0.37	0.98
Extracted 1970-1990	151,156	1.08	17.04	0.05	0.25	0.82
Total (1.01.1991)	14,123,291	1.48	14.42	0.06	0.37	0.98

11.2 Geology and Mineralisation

The Staroye tailings dam is a man-made feature and does not possess any recognised geological structure. The tailings are the waste products of the processing of gold and polymetallic ores (primarily silver, copper, lead and zinc) from the Ridder Mining and Concentrating Complex (MCC) and their composition thus reflects the major constituents of the ore.

11.2.1 Impoundment Development Stages

Tailings with the highest gold content were dispersed over a 100-400m wide area immediately to the north-east of the concentrator. Remains of old collection tanks and pipes indicate that the outlet for the old tailings was at 761.5-763.5mAOD level. The area filled from that outlet is known as the "upper tailings impoundment". The area located immediately to the east and south-east of the "upper tailings impoundment" was filled with tailings by approximately 1946. This area is known as the "lower tailings impoundment" and its upper level is at 740-741mAOD.

Thereafter the impoundment expanded to the same level eastwards and north-eastwards, which necessitated the diversion of the Filipovka River. The last dam was built along the eastern perimeter of the present impoundment area in early 1950's. The crest of the dam is at 746-750mAOD and the top of the tailings disposed during that period reached 745mAOD.

Subsequent to decommissioning, the western and south-western parts of the impoundment served as a dumping ground. Dumped material ranges from metallurgical slags to industrial and domestic rubbish.

11.2.2 Mineralisation

Microquartzite (silicified calcareous siltstone), quartz and other gangue vein material make up over 95% of the tailings material. Sulphides and much less common oxidised ore minerals occur in accessory amounts. Pyrite is the most common sulphide mineral. Oxidised ore minerals are common and include smithsonite, cerussite, anglesite and limonite. Marcasite and azurite occur in minor amounts.

Sphalerite occurs as inclusions in gangue minerals and less commonly as intergrowths with pyrite. Its size varies from 8-700µm, with the 50-60µm range being predominant.

Galena forms minute inclusions in sphalerite and gangue minerals and also forms rare intergrowths with pyrite and chalcopyrite. The grain size varies from 3-100µm with 20-35µm size predominating.

Chalcopyrite occurs intergrown with gangue minerals of sphalerite, pyrite and occasionally with galena. The grain size ranges from emulsion to 40µm with the 10-20µm range being most common.

From an economic standpoint the most important mineral is gold. Phase and rational analyses indicate that free gold contributes about 15% of the total gold (see Table 11.3). Its composition borders electrum and the principal grain size is 20-40µm.

Over 50% of silver occurs as intergrowths with other minerals and approximately 45-50% in sulphides or gangue minerals. Kerargirite was noted as one of the silver-bearing minerals.

Table 11.3: Forms of Gold and Silver Occurrence

Forms of Occurrence	Gold %	Silver %
Free with clean surface	4.6	
Free with film-covered surface	11.2	
Intergrowths with clean surface	53.4	45.1
Intergrowths with film-covered surface	3.0	6.9
In sulphides	27.8	42.2
Including pyrite	23.3	28.6
Associated with gangue	-	5.8

11.2.3 Granulometry

The granulometric composition of the tailings was determined by a sieve analysis on 110 samples at the process testwork facility of the LPC and at the Kazmekhanobr laboratory in Ust-Kamenogorsk. The samples came from holes drilled in 1974, mainly in the eastern and south-eastern parts of the tailings impoundment. Drillhole RU 94-3 was drilled in the northern part of the impoundment and drillhole RU 94-13 in the centre ("lower tailings impoundment"). None of the samples represent the "upper tailings impoundment".

Course sand faction is insignificant (about 2.0%) whereas medium and fine sands are generally widespread (about 48.0%) with the prevailing being silt, clay and fine sandy (about 50.0%). According to the data received from VNIITSVETMET Institute the tailings are represented by fine ground material with 48.0 to 60.0% grain size <0.074mm.

As seen in the percentage grain size distribution chart in Figure 11.2 below, silt size particles (shown in violet and indigo) dominate, making up 57.4% of the total. Sand grain size particles, which form the balance, range from very fine sand to very coarse sand. The overall proportion of coarse and very coarse sand is 3.9%. It is not unreasonable to expect that the tailings in the "upper tailings impoundment" would contain a higher proportion of sand size particles.

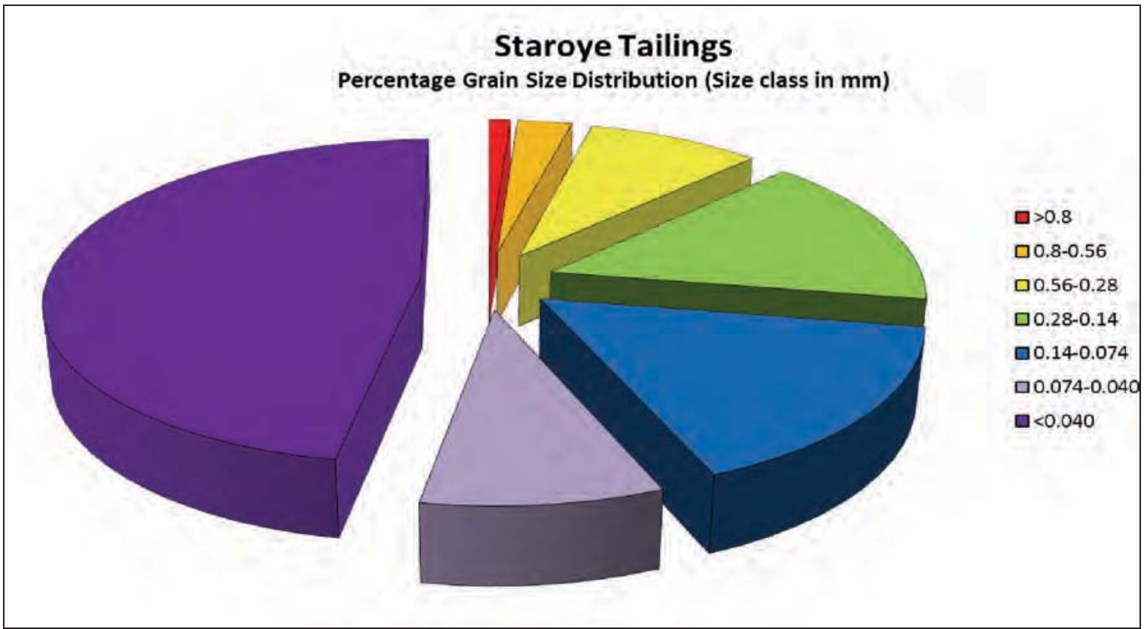


Figure 11.2: Percentage Grain Size Distribution in the Satroye Tailings

It must be borne in mind that the chart in Figure 11.2 (above) presents the average granulometric composition based on seven drillholes only. The average depth of the drillholes was 16m and samples were generally collected over 1m intervals. When considered individually, the drillholes display very diverse granulometric patterns, with the silt content ranging from 21.4% to 83.4%.

As a result of process efficiency the area of the dam (western) deposited from 1926 to 1946 displays a coarser, medium grain sand, fraction compared to the rest of the dam area which is characterised by a finer grain size. It is also noted that the percentage of silt and clay sized particles increase with depth.

11.2.4 Sample Analysis

The assay result of run-of-mine and composite samples (1974, 1991-1994) indicate that the gold content in Staroye tailings dam is approximately between 0.3-0.4g/t and 1.0-1.2g/t Au. From total number of these samples (437) only 8 samples contain less than 0.3g/t Au and 11 samples more than 2.5g/t Au. Samples from the first programme of drillholes (1969) have only 15 samples with a maximum value ≥3.0g/t Au. Boreholes 14 (10.8g/t Au) and 16 (11.5g/t Au) possess the highest gold content value but have only one sample for their entire length and are thus unreliable.

A collection of 347 run-of-mine samples from the last analysis period (1991-1994) demonstrate a relatively clear grain size distribution limit between 0.3-0.4g/t Au and less clear for 0.8-0.9g/t Au and 1.0-1.1g/t Au and with some degree of convention >2.0g/t Au.
There is evidence of a higher grade concentration in the western part of the tailings dam, which was filled during the early stages when richer ore was being mined and the process efficiency was lower. From 1947 onwards the depositional grade and grain size is more homogenous.

Grain size distribution has been studied using a number of drillholes from the 1994 period (RU94-3, RU94-5, RU94-6, RU94-7, RU94-13, RU94-15, RU94-16, and RU94-20) in the central and eastern parts of the dam (profiles II and VIII). This was also previously studied in 1974 by the Kazmekhanobr Institute in the western part of the tailings dam (1969 drilling period) at 100x100m grid using engineering-geological boreholes and excavated holes.

As a whole the average results were as follows:

- grain size >0.56mm (rough and coarse sands) = 1.2g/t Au (sample selection is not significant);
- grain size 0.56 – 0.10mm (medium and fine sands) = 0.72g/t Au; and
- grain size <0.10mm (fine sands, silt and clay particles) = 0.54g/t Au.

As seen in Table 11.4 below, and Figure 11.3 (below), there appears to be no correlation between particle size and the gold distribution. The same applies to silver and base metals.

Table 11.4: Grade Distribution versus Grain Size

Class	Yield	Grade						Distribution (%)					
		Au	Ag	Cu	Pb	Zn	Fe	Au	Ag	Cu	Pb	Zn	Fe
mm	%	g/t	g/t	%	%	%	%						
Feed Material		2.34	18.4	0.06	0.43	1.22	1.48						
0.4	4.7	2.9	20.1	0.07	0.5	1.3	1.7	5.8	5.1	5.0	5.6	5.0	4.3
0.2	15.6	2.1	18.2	0.05	0.2	0.5	1.0	13.9	15.4	11.7	7.5	6.7	8.9
0.1	26.8	2.9	13.4	0.04	0.3	0.9	1.2	32.8	19.5	17.6	15.2	20.6	17.3
0.074	5.8	2.6	18.6	0.05	0.3	1.4	1.5	6.4	5.6	4.7	3.8	6.7	4.7
0.044	7.8	2.7	21.3	0.07	0.5	1.5	2.6	9.0	9.0	8.4	8.1	9.6	11.0
0.022	10.2	2.3	19.6	0.07	0.5	1.4	2.4	10.0	11.8	11.2	10.7	11.7	13.3
0.011	9.3	1.7	17.8	0.07	0.5	1.8	2.5	6.8	10.8	10.1	9.7	13.7	12.4
0.005	8.7	2.2	21.2	0.19	0.8	2.0	2.5	8.2	10.1	12.2	16.2	14.2	11.7
<0.005	11.1	1.5	17.2	0.14	0.9	1.3	2.8	7.1	12.7	19.1	23.2	11.8	16.4

NB: The Class +0.074mm on scrambler. Class -0.074mm in sludge analyser

Source: Durnev and Golubtsov (2001) quoting results reported by VNIItsvetmet (1970-1972)

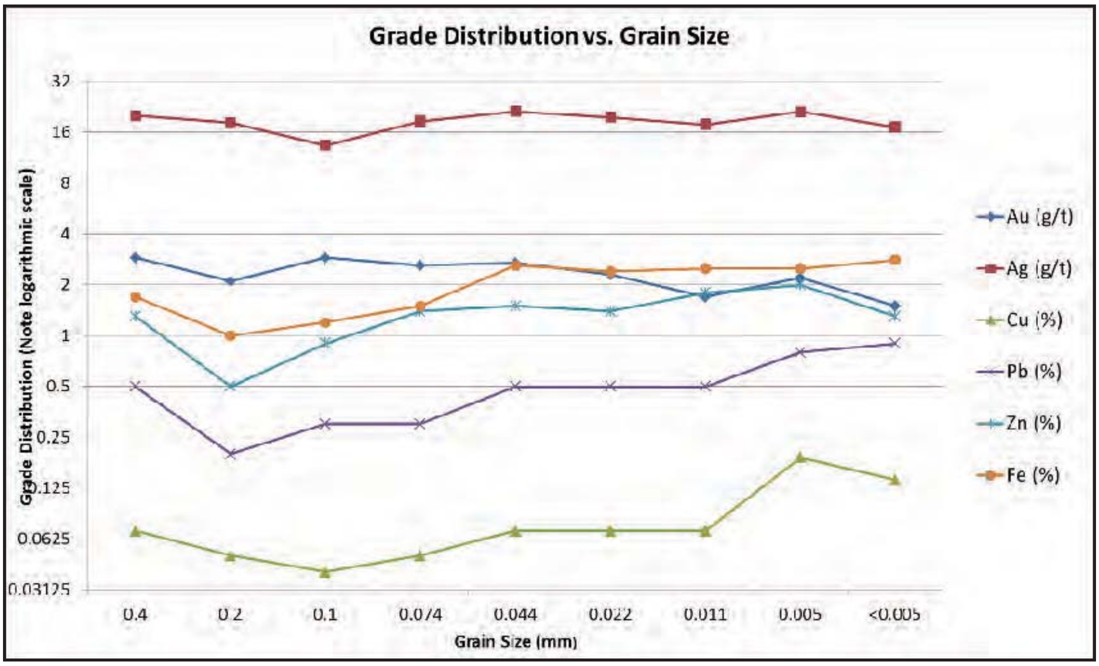


Figure 11.3: Grade Distribution versus Grain Size (Au, Ag, Cu, Pb, Zn, and Fe)

11.3 Topographic Base and Surveying Data

The local survey grid, which was used during topographic surveys and for locating drillhole sites, is linked to 2nd and 3rd class triangulation points. The relative point location error is reported to be 0.12m.

Locations of drillhole collars were surveyed by theodolite traversing from survey grid points or by resection from a minimum of three co-ordinated points. Collar elevations were measured by trigonometric levelling from not less than two co-ordinated points. The mean square positional error did not exceed 0.9m in plan and 0.2m in elevation.

11.4 Exploration Works

11.4.1 Drilling

Drilling has been conducted in several campaigns since 1969 and a total of 98 holes (1,374m) have been completed on a nominal spacing of 50m x 50m, and up to 150m x 200m. The 1969 drill campaign produced a single sample for the entire length or intersection of tailings material but later campaigns sampled at 5.0m down to 1.0m intervals. The samples were analysed for gold, silver, copper, lead and zinc at the Leninogorsk GOK laboratory.

11.4.1.1 Historical Drilling

The tailings were evaluated from data obtained during three stages of drilling in 1969, 1974 and 1993-1994 respectively (Table 11.5). In addition, four verification holes were drilled in 1991-1993. A total of 98 evaluation holes were drilled on 22 section lines for a total of 1,374m. Most holes were drilled until they reached the base of the tailings impoundment.

Table 11.5: Staroye Tailings Evaluation Drilling

Year	Drilling method/drill rig	No of Drillholes	Total Depth	Grid	Main Purpose
1969	Cable tool/UTB-5A	40	490	50m x 50m	Evaluation of the western part of the tailings impoundment
1969	Cable tool/UTB-5A	7	103	120m x 250m	Preliminary assessment of other parts of the impoundment Infill in the 150-200m wide
1974	Cable tool/UKC-22	24	387	50m x 50m	Fringe around the previously drilled western fringe
1991	RC hydrolift/UGB-ZUK	3	42		Verification drilling
1993	Vibrodrill	1	19		Verification drilling
1993-1994	Vibrodrill	23	333	150m x 150m	Northern and Eastern parts of the impoundment
Total		**98**	**1,374**		

The first drilling programme (1969) focused on the western part of the impoundment, which contained tailings deposited during the period 1926-1946 and considered to be the richest. A total of 47 cable tool boreholes were completed, including 40 holes on a 50x50m grid to depths of 11-15m over the western part of the impoundment and 7 holes to 12-20m depth elsewhere. All holes were 110mm in diameter.

The 1974 drilling, again by cable tool method, covered the central area of the impoundment immediately to the east of the area drilled in 1969. A total of 24 holes were drilled on a grid of 50x50m to a depth of between 9m and 21m. All holes were 10 inches (254mm) in diameter.

In 1991, JV Kazgold drilled three 13-15m deep verification holes within the area drilled in 1969. Hole diameters varied from 377mm to 219mm. A verification hole was drilled to a depth of 19m using a vibrocore rig in 1993 with a diameter of 59mm.

In 1993-1994, Goldbelt Resources Limited and Pegasus completed, as part of the feasibility study for the tailings re-treatment, 23 vibroholes on a grid of 150x150m in the northern and eastern parts of the tailings area which had not been investigated earlier. The holes varied in depth from 1.7-23m and the hole diameter was 59mm. In addition, 15 holes were drilled for specific purposes, such as hydrogeological, geotechnical, etc. but these holes are not included in the database used in the resource estimates.

> ***WAI Comment:*** *WAI has not observed any of the drilling and sampling process followed but has reviewed the protocols applied, and in keeping with typical Soviet standards, considers the methods to be industry standard and appropriate for use in a mineral resource and ore reserve estimate in accordance with the guidelines of the JORC Code (2004).*

11.4.2 Sample Collection

Different sampling methods were employed at different stages of drilling. In the 1969 drilling programme only one sample per hole was collected. Each sample was dried, mixed and quartered. Approximately 8kg of material was then taken and reduced to 1kg.

In 1974 samples were collected over intervals of 5m, plus the remainder at the end of each hole ranging from 1m to 7m. Samples were stored, dried, mixed and quartered to between 10 and 12kg.

> ***WAI Comment:*** *Collecting one sample per drillhole is very poor practice. Sampling over 5m intervals is better but still inappropriate as it does not characterise the layered composition of the tailings. However, as grade distribution with depth is considered to be relatively uniform, and no selective mining is likely, this should not be too detrimental to the resource evaluation.*

During the 1991 verification drilling programme, samples were taken from each metre. This material was mixed and quartered to 50kg. After drying each sample was reduced in a Jones riffle splitter to about 19-20kg.

> ***WAI Comment:*** *This is a more appropriate sampling technique which allows a reasonable definition of metal grades within the vertical profile and reduces the risk of random errors being extrapolated over large volumes. It also provides representative material for other tests.*

In 1993-1994 samples were taken generally over 1m intervals with each sample reduced in a Jones riffle to 3kg.

Samples from the 1991 and 1993-1994 programmes were subdivided in a Jones riffle into:

- Samples for fire assay and chemical analysis (approximately 600 g each);
- Duplicate samples (approximately 600g each);
- Samples for sieve analysis (2.5-3kg each) taken from the western part of the tailings impoundment;
- Samples (12kg each) for compositing into technological samples;
- Control samples (150g each);
- Samples for process testwork (0.5kg); and
- A general 5kg sample was taken from the primary drillhole for drain size analysis for Au, Ag, Cu, Pb and Zn. The general sample comprised 100-300g duplicate samples (depending on the hole depth).

Samples for granulometric analysis and determination of gold, silver, copper, lead and zinc in various grain size classes obtained for every other hole by compositing 100-300g duplicates into 5kg composites.

> ***WAI Comment:*** *Sampling and sub-sampling methods implemented in the 1991 and 1993-1994 drilling campaigns are understood to conform to typical industry standards except for the apparent lack of measures to monitor the quality.*

11.4.3 Sample Analysis

All analyses were performed at the central chemical laboratory of Leninogorsk GOK. These include fire assay for gold and silver (475 samples) and chemical analyses for copper, lead and zinc (472 samples). A total of 218 samples were sent for fire and chemical analyses for Au, Ag, Cu, Pg and Zn by grain sizes at the central laboratory of Leninogorsky Metallurgical Complex. Granulometric analyses were performed on 110 samples at the process testwork laboratory of the LPC and from 1974 at the laboratory of Kazmekhanobr.

Results of internal and external control analyses are not available. Durnev and Golubtsov (2001) only mention that relative differences between results of control and routine analyses were within two standard deviations (+/-5%) from the population mean.

The following analysis has been undertaken:

Fire assay for Au and Ag was completed in the assay section of Leninogorsky Metallurgical Complex central laboratory and a total of 475 samples were assayed.

Chemical assay for Cu, Pb and Zn grade was also made in the central laboratory of Leninogorsk GOK (472 samples assayed).

- 218 fire and chemical analyses for Au, Ag, Cu, Pg and Zn by grain sizes were made in the central laboratory of Leninogorsky Metallurgical Complex;
- Quarterly internal and external geological control was taken to check sampling accuracy; and
- The findings of internal and external geological control proved acceptable tolerance of grade test results.

Grain size (granulometry) sieve analysis of residues was made in the experimental and research section of Leninogorsky Metallurgical Complex (110 samples). The samples taken along the western extension of the tailing dam were analysed in 1974 at the Kazmekhanobr laboratory.

11.4.4 Bulk Density, Moisture Content and Porosity

Density and moisture content were determined on 17 samples collected in December 1991. Wet bulk density above the water saturation level was found to be 1.42-1.64t/m^3 (average 1.52t/m^3) rising to 1.71-1.91g/cm^3 (average 1.80g/cm^3) below the water saturation level.

Porosity was determined on drill samples from depths of 2-12m by KazGIIZ in 1964 and 1970-1971. The measurements varied from 45.6-51.05%, with the average porosity being 48.1%. Based on the 48% porosity, dry bulk density was estimated to be in the range of 1.40-1.44t/m^3.

> ***WAI Comments:*** *It would appear that the results for bulk density, moisture content and porosity are based on 17 samples taken in December 1991 as well as density determination values from the 1964 testwork programme, which Durnev and Golubtsov believe to be most representative.*

11.5 Extraction and Reprocessing

Extraction and processing data for the period from 1991 to April 2009 inclusive are provided in Table 11.6 and Table 11.7.

Table 11.6: Staroye Resource Depletion Data (1991-April 2009 Inclusive)						
	Tonnes (Mt)	**Au (g/t)**	**Ag (g/t)**	**Cu (%)**	**Pb (%)**	**Zn (%)**
Deposited Tailings	14.274	1.5	14.4	0.06	0.37	0.98
Extracted prior to 1991	0.151	1.1	17.0	0.05	0.25	0.82
Mined 1991-2008	4.679	1.4	12.4	0.07	0.31	0.79
Mined Jan-April 2009	0.284	1.4	14.0	0.07	0.35	0.90
Mining Losses (4.4%)	0.000002	1.4	12.5	0.07	0.31	0.79
Balance Remaining	9.161	1.5	15.4	0.06	0.40	1.09

Currently the Staroye tailings are being mined at a rate of approximately 0.5Mtpa and re-processed at the Ridder plant. The process involves a two stage grinding followed by a gravity-flotation scheme with the recovery of gravity concentrate, auriferous concentrate and zinc concentrate. Production data for the period from 1991 to 2008 inclusive are given in Table 11.6. Note that various process routes have been tried since 1991 before the scheme summarised was established.

During the period from 1991 to 2008 inclusive, Kazzinc recovered approximately 4.0t of gold, 31.1t of silver, 18,000t of zinc, 6,000t of lead and almost 2,000t of copper from 4.679Mt of processed tailings.

Based on the metallurgical balance the average head grade of the re-processed tailings was 1.37g/t Au, 12.43g/t Ag, 0.07% Cu, 0.31% Pb and 0.79% Zn.

Resource depletion calculations based on the extraction data are given in Table 11.7 below. The depletion includes resource losses during mining and transportation, which Kazzinc has estimated at 4.4% of the total depleted resource. Using the tonnage and grades as at 01 January 1991 (see Table 11.7) as the initial resource, the resource remaining at the Staroye impoundment, as at 1 May 2009, should amount to 9.1Mt at 1.5g/t Au, 15.4g/t Ag, 0.06% Cu, 0.4% Pb and 1.1% Zn.

Table 11.7: Production Figures for Staroye Tailings Reprocessing (1996 - September 2010)						
Year	**Tonnes (t)**	**Au (g/t)**	**Ag (g/t)**	**Cu (%)**	**Pb (%)**	**Zn (%)**
1996	64,563	2.25	16.42	0.08	0.36	1.25
1997	42,971	1.30	10.47	0.04	0.26	0.52
1998	2,047	0.98	7.82	0.05	0.20	0.29
1999	0	-	-	-	-	-
2000	178,606	1.73	13.08	0.10	0.37	0.80
2001	484,766	1.28	10.30	0.05	0.27	0.58
2002	490,660	1.49	11.64	0.07	0.29	0.67
2003	572,932	1.62	11.69	0.08	0.30	0.76
2004	755,630	1.03	9.82	0.05	0.22	0.57
2005	942,336	1.14	12.66	0.06	0.32	0.75
2006	286,142	1.01	11.70	0.08	0.35	0.89
2007	346,230	1.73	16.79	0.07	0.44	1.18
2008	421,880	1.65	16.56	0.07	0.37	0.92
2009	937,143	1.76	14.99	0.15	0.35	0.97
2010	414,636	1.12	11.16	0.06	0.26	0.72
Total	**5,940,542**	**1.41**	**12.70**	**0.08**	**0.31**	**0.79**

Mining and re-processing of the tailings material continues, as witnessed during the WAI site visit, with production expected to increase to 1.0Mtpa with the proposed construction of a new dedicated process plant in the near future. The plant is also intended to re-process tailings from Chashinskoye tailings dam as well.

11.6 Kazzinc Reserve Estimation

The previous resource estimation by Kazzinc, as of 01.01.2000, updating that produced at 01.09.1994, was completed taking into account all historical exploration, chemical-analytical works and technological research performed since the tailings dam ceased being operational in 1953, and is summarised in Table 11.8 and Table 11.9.

Table 11.8: Staroye Tailings Reserve Estimate (01.09.1994)

Tonnes (kt)	Grade and Contained Metal				
	Au g/t (kg)	Ag g/t (kg)	Cu % (t)	Pb % (t)	Zn % (t)
12,545.5	1.25 (15,538.3)	13.07 (162,752)	0.04 (5,287)	0.31 (38,207)	0.74 (92,228)

Table 11.9: Staroye Tailings Reserve Estimate (01.01.2000)

Tonnes (kt)	Grade and Contained Metal				
	Au g/t (kg)	Ag g/t (kg)	Cu % (t)	Pb % (t)	Zn % (t)
12,345	1.24 (15,335.7)	13.06 (161,226)	0.04 (5,216)	0.31 (37,863)	0.74 (91,195)

Subsequent to the previous reserve estimations, and in light of production from Staroye tailings, Kazzinc have completed an updated reserve estimate (as at 01.01.2010) as summarised in Table 11.10 below.

Table 11.10: Staroye Tailings Reserve Estimate (Kazzinc 01.01.2010)

Classification	Tonnes (Mt)	Grade				
		Au g/t	Ag g/t	Cu %	Pb %	Zn %
C_1	0.5788	2.55	26.43	-	-	1.17
C_2	6.311	1.04	13.16	-	-	0.70
Total	**6.9**	**1.17**	**14.23**	**-**	**-**	**0.74**

11.6.1 Method Validation and Estimation Limits

The Staroye tailings dam has largely been studied during two phases of investigation by drillholes from 1969 to 1974, when 71 cable percussion holes were completed in the western area on a 50m by 50m grid, and again in 1993-1994 when 23 'vibrocore' holes on irregular 150m spacing were completed over the remainder of the dam. There were an additional 4 verification holes completed on the dam in 1991 and 1993.

Based on this drilling, and to assess the contained resource, 22 vertical sections were constructed at 50m intervals in an east-west orientation. In total 98 boreholes were included in this resource estimation; including 69 boreholes of 'Block 1' drilled at 50x50m grid, and 29 boreholes of 'Block 2' drilled at 150x150m grid.

The surface area of the tailings dam considered for the resource estimation is 870x1,160m.

11.6.2 Categorisation and Reserve Distribution per Block

Based on the drilling density it is possible to distinguish two resource 'blocks'. Block 1 occupies the western area of the tailings dam on a 50m grid and is presented on profiles 8 – 19 and is considered to represent C_1 category 'reserves'. Block 2 occupies the remainder of the tailings dam and is studied largely on 150m spacing and represents C_2 category 'reserves'. It should be noted that when estimating the 'reserves' in Block 2 the bordering drillholes from Block 1 were included for grade determination.

11.6.3 Grade and Density Determination

Previous studies have considered the grade distribution within the tailings deposit and the use of a gold cut-off-grade (COG) in its evaluation. The VNIITSVETMET Institute considered that a 1.48g/t Au COG be applicable and several other studies considered separating the low grade (<0.5g/t Au) and high grade (>3.0g/t Au) zones into definable areas. However, mechanical extraction of tailings material and the gold distribution throughout the deposit means that selective mining is not an option and the deposit as a whole is considered economically viable.

Consequently the entire drillhole intersection, along each vertical profile, is considered in determining the average grade.

No cut-off has been applied by Kazzinc to the mineral resource. Equally no grade factors or top-cuts to grades have been applied in estimating the mineral resource grades.

Average grade is determined by its weighted average over the entire sample length, exceptions are boreholes from 1969 where the entire thickness of tailings equates to 1 sample.

In addition two boreholes from this early period (№ 14 and 36) have high gold content of 10.8 and 11.5g/t Au respectively (14 also containing 47.7g/t Ag). However while estimating the 'reserves' of Block 1 these were omitted. These gold values are more than 5 times the average value of the block (3 times more for silver).

The bulk weight was accepted by comparison with previous 'reserve' estimation and on the basis of earlier research (KazGIIZ, 1964, 1970-1971) which is accepted as being 1.6t/m3.

Estimation of block section areas, using 1:1,000 scale, was carried out with the aid of computer generated drawings (AutoCAD-14).

11.6.4 Historical 'Reserve' Estimation

A summary of the 'reserve' data for gold and all metals per separate blocks are shown in Table 10.11 below. Analysis of these data shows that one part of the tailings dam drilled at 50x50m grid (Block 1: C1 'reserve' category) contains 3,087kt with an average grade of 2.04g/t Au, 17.27g/t Ag, 0.05% Cu, 0.42% Pb and 1.06% Zn. The main percentage of these reserves concentrates from profiles 8 to 14. Interestingly, profiles 15-19 are characterised by an average gold content higher than from profiles 8-14.

Block 2 contains 'reserves' of C_2 category equal to 9,498kt with an average grade of 1.03g/t Au, 12.40g/t Ag, 0.04% Cu, 0.28% Pb and 0.66% Zn.

A comparison of the historic estimation figures are presented in Table 11.11 below.

Table 11.11: Historical 'Reserve' Estimates

	Tonnes (kt)	Grade (g/t)		Metal (kg)		Notes
		Au	Ag	Au	Ag	
1969 (LPC)	2,191.84	2.80	19.70	6,337.2	43,179.2	Western part of tailings dam only
1974 (LPC)	472.56	1.54	16.50	729.5	7,777.0	
Total 1969 and 1974	2,664.40	2.65	19.12	7,066.7	50,956.2	
1994 (LPC)	**12,454.54**	**1.25**	**13.07**	**15,538.3**	**16,2751.6**	
Block 1	3,053.29	2.01	16.94	6,137.1	51,722.8	
Block 2	9,401.25	1.00	11.81	9,401.2	111,028.8	
2000 (LLP «Geos»)	**12,585.0**	**1.28**	**13.59**	**16,103.0**	**171,065.0**	
Block 1	3,087.0	2.04	17.27	6,310.0	53,327.0	
Block 2	9,498.0	1.03	12.40	9,793.0	117,738.0	

Table 11.11 shows that the western part of the tailings dam (Block 1) contains 24.5% of the total gold 'reserve' bearing sands but almost 40% of the contained gold and 31% of the contained silver. The average gold grade in Block 1 is twice that in Block 2.

According to the estimate made in 1969, the far western part of the tailings dam is characterised by an elevated gold content with a grade of 2.8g/t Au and it is estimated that the protective pillar of the railroad contains 450kt with an average grade of 2.89g/t Au.

Estimation of the C_1 category 'reserves' shows the following results:

- average thickness 13.62m;
- total block area 156,350m^2;
- weighted average gold grade is 2.02g/t;
- total 'reserve' at 1.6g/cm^3 bulk weight is 3,407kt;
- contained gold is 6,882.5kg (214koz).

Due to the low values of copper and lead (oxidised form) in the tailings, and the inability to recover these elements at this time, they are not included within the 'reserve' estimation.

Differences in the historic 'reserve' estimation are considered a result of several factors as follows. The grain size distribution is represented by fine sand and 'slime' fractions of <0.1mm. The tailings dam has a surface area of approximately 0.6km^2 and is open to the elements, apart from in the far southwest which is occupied with a shallow pond. Some parts of the dam area have also succumb to incursion of poplar trees.

Climatic conditions, high and prolonged periods of windy conditions, are therefore considered to have effectively removed surface layers of the dam and further losses have occurred as a result of storm water (rain and flooding) and washout from the Phillipovka River.

In addition an unreliable metallurgical balance from the Leninogorskaya Concentrator in the 1920's and 30's may also have an impact on these historic discrepancies.

It should also be noted that some areas of the Staroye tailings dam were used, and therefore removed, as inert filler for producing mortar and finishing mixes as well as concrete for local urban development.

11.7 WAI Mineral Resource Estimate

11.7.1 Topography

Two digital terrain models (DTMs) were created for the Staroye TMF. The first DTM was of the current surface level of the TMF (dated 09/09/2010) and was created from information supplied by Kazzinc.

The survey file was drawn as a set of planar strings which were imported and manipulated in Datamine Studio 3 to the correct elevations. The DTM was then created from these strings.

The second DTM is of the base of the TMF. This was created primarily using information from 22 cross sections (dated 01/01/2000) drawn across the deposit at an azimuth of 080˚ showing the base of the TMF based on drilling results. These sections were supplied by Kazzinc in five separate dxf format files. Stings were created within Datamine Studio using this information and from these an initial DTM was created. This DTM was then adjusted to take in to account the drilling information between the section lines.

11.7.2 Database Compilation

All of the sample data collated for the current project are summarised below in Table 11.12. A general plan of these drillholes are shown in Figure 11.5. The holes were drilled in 5 campaigns concentrating on different areas of the TMF with the 1991 campaign primarily being for the purpose of verification of older holes. The

1969 campaign, mainly concentrated in the west of the TMF, was drilled on a close spaced pattern with holes drilled on a grid 50x50m with profile lines aligned towards 080˚ azimuth. The 1974 campaign was essentially an extension of this 50m x 50m grid in to the centre of the TMF. The holes drilled between 1993 and 1994 were mainly in the eastern part of the TMF on an irregular basis with holes usually between 80m and 110m apart. All holes were drilled vertically.

Table 11.12: Sample Data Summary

Campaign	Type	No. Of Holes	No. Of Samples	Holes Lengths (m)	
				Total	Average/Hole
1969	Cable Percussion	**47**	47	593	13
1974	Cable Percussion	**24**	104	387	16
1991	RC	**3**	42	42	14
1993	Vibrocore	**1**	19	19	19
1993-1994	Vibrocore	**23**	291	333	14

Different sampling methods were used for different stages of the exploration of the Staroye TMF. In the 1969 drilling program only one sample for each hole was collected, effectively a composite sample over the entire length of each hole but only 1kg. During the 1974 campaign samples were generally collected over a length of 5m with an irregular sample length at the end of the hole though these end of hole samples range from 1-7m in length indicating an inconsistent strategy. These samples consisted of 10-12kg of material. For the 1991 and later holes samples were taken from each metre of drilling with each sample consisting of 19-20kg of material.

Statistical analysis was carried out on the samples by campaign to identify any potential bias that may be present within the data. The campaigns for which the most samples were taken show similar variances and roughly log-normal populations. The campaigns show differences in mean grade but no significant bias is considered to be present as a result of the different sampling methods.

The campaigns show differences in mean grade of Au. The basic statistics for Au by year sampled are listed in Table 11.13 and this shows a general decrease in Au grade for the later campaigns apart from the 1991 holes drilled as twinned holes amongst the 1969 holes. This is expected because of the locations of the different campaigns and the recorded decrease in discharge grade over time. The initial campaign was located close to the discharge point and subsequent campaigns more distal. The initial deposition of tailings was very high grade at 11.1g/t Au in 1926/27 dropping to 2.15g/t Au by 1936 and then dropping to 0.5g/t Au by 1953 as plant recovery improved (see Figure 11.4). The higher grade material is concentrated around the discharge point towards the south west of the site where the earlier campaigns were concentrated. Because of this and the similar variances shown by the campaigns no significant bias is considered to be present from the different campaigns. However, RC drilling is not considered to be a suitable method of sampling for the material and so the three holes from 1991 were removed from the database.

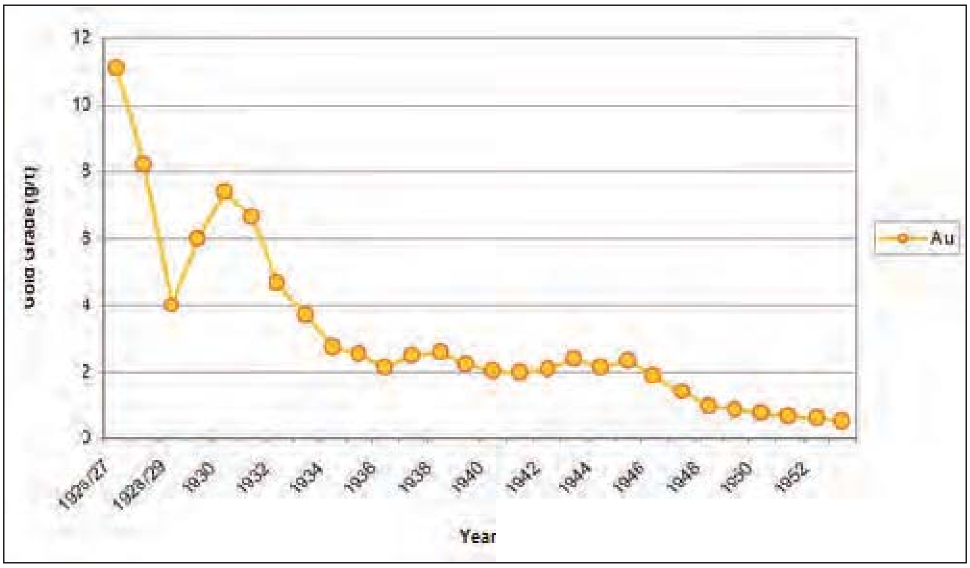


Figure 11.4: Average Au Grade of Deposited Tailings over Time (Based on LPC Data)

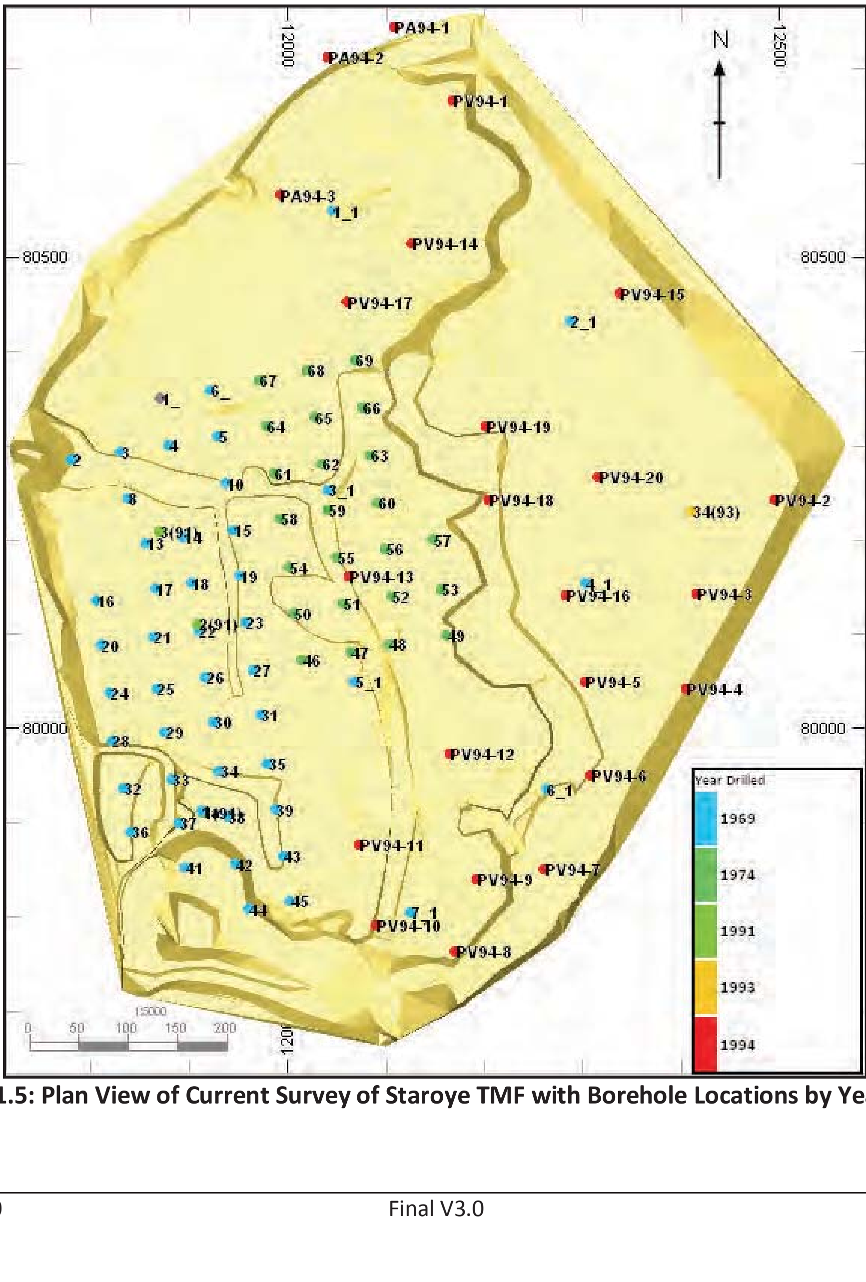


Figure 11.5: Plan View of Current Survey of Staroye TMF with Borehole Locations by Year Drilled

Table 11.13: Statistical Summary of Au by Year Drilled								
Year	**Number**	**Minimum**	**Maximum**	**Mean**	**Variance**	**Standard Deviation**	**Log Estimate of Mean**	**Coefficient of Variation**
1969	47	0.80	11.50	2.49	3.90	1.97	2.42	0.79
1974	104	0.00	3.20	0.88	0.53	0.73	1.16	0.83
1991	42	0.30	4.80	1.76	0.85	0.92	1.83	0.52
1993	19	0.50	1.10	0.81	0.03	0.16	0.81	0.20
1994	292	0.00	4.00	0.82	0.25	0.50	0.87	0.61

11.7.3 Sample Data Processing

The DTMs of the base and the current surface of the TMF were used to select and allocate the drillhole data. The data selected is summarised in Table 11.14. Most of the rejected samples are from parts of the TMF that have already been excavated. For those holes where only a single sample was taken the samples were reduced in length to fit to the current surface topography.

Table 11.14: Selected Sample Summary				
	No. Of Holes	**No. Of Samples**	**Holes Lengths (m)**	
			Total	**Average/Hole**
1969	44	44	208	5
1974	23	33	132	6
1993	1	17	17	17
1993-1994	24	181	210	9

All of the drillhole samples have been assayed for Au, Ag, Cu, Pb and Zn. Most of these indicate a single roughly log-normal distribution. A statistical summary of the selected samples is shown in Table 11.15 below.

Table 11.15: Statistical Summary of Selected Samples								
FIELD	**Number**	**Minimum**	**Maximum**	**Mean**	**Variance**	**Standard Deviation**	**Log Estimate of Mean**	**Coefficient of Variation**
AU	271	0.00	11.50	1.11	1.34	1.16	1.15	1.04
AG	271	0.00	47.70	11.92	40.30	6.35	12.11	0.53
CU	271	0.00	0.69	0.04	0.00	0.05	0.04	1.04
PB	271	0.00	2.33	0.33	0.05	0.23	0.33	0.70
ZN	271	0.00	3.20	0.69	0.20	0.45	0.70	0.64

A decile analysis was completed on the selected gold grades, as shown in Table 11.16 below. From this and the log-probability plot a top cut of 4g/t Au was applied to the selected

Table 11.16: Decile Analysis of Au Grades							
Q%_FROM	**Q%_TO**	**NSAMPLES**	**MEAN**	**MINIMUM**	**MAXIMUM**	**METAL**	**METAL%**
0	10	27	0.16	0.00	0.30	4.39	1.43
10	20	28	0.41	0.30	0.50	11.50	3.75
20	30	27	0.54	0.50	0.60	14.60	4.77
30	40	28	0.61	0.60	0.70	16.95	5.53
40	50	27	0.74	0.70	0.80	20.00	6.53
50	60	28	0.83	0.80	0.90	23.34	7.62
60	70	27	1.04	0.90	1.20	27.95	9.13
70	80	28	1.40	1.20	1.70	39.18	12.79
80	90	27	1.94	1.70	2.20	52.25	17.06
90	100	28	3.43	2.25	11.50	96.10	31.38
90	91	2	2.28	2.25	2.30	4.55	1.49
91	92	3	2.38	2.34	2.40	7.14	2.33
92	93	3	2.45	2.40	2.50	7.35	2.40
93	94	3	2.51	2.50	2.54	7.54	2.46
94	95	3	2.63	2.60	2.65	7.90	2.58
95	96	2	2.80	2.80	2.80	5.60	1.83
96	97	3	2.95	2.86	3.00	8.86	2.89
97	98	3	3.30	3.20	3.40	9.90	3.23
98	99	3	3.65	3.46	3.82	10.96	3.58
99	100	3	8.77	4.00	11.50	26.30	8.59
0	**100**	275	1.11	0.00	11.50	306.26	100.00

The most common sample interval in the selected sample set was 1m, but a significant amount (30%) of the samples, from the earlier drilling campaigns, are longer than this. A composite length of 5m was chosen for the data. This length was chosen to ensure that there was no significant decompositing of data which would lead to an unrealistic view of the data which would suggest less sample variability than actually exists. Approximately 5% of samples were logged as being longer than 5m; all these were from the 1969 campaign from which a single sample was assigned to the entire drillhole length.

A statistical summary of the composites is shown in Table 11.17. The statistical summary shows an increase in grade from the sample mean because the longer samples from the west of the TMF, which are effectively decomposited, are generally of higher grade than the 1m samples which are drilled in the east of the deposit. The decompositing leads to these holes having a greater influence on the mean grade. The effect of this during grade estimation was mitigated by the estimation parameters used as described below.

Table 11.17: Statistical Summary of Composites								
FIELD	**Number**	**Minimum**	**Maximum**	**Mean**	**Variance**	**Standard Deviation**	**Log Estimate of Mean**	**Coefficient of Variation**
AU	131	0.00	4.00	1.43	0.84	0.91	1.46	0.64
AG	131	0.00	47.70	14.37	43.05	6.56	14.45	0.46
CU	131	0.00	0.29	0.05	0.00	0.03	0.05	0.61
PB	131	0.00	2.33	0.39	0.11	0.33	0.38	0.83
ZN	131	0.00	3.20	0.86	0.23	0.48	0.88	0.56

11.7.3.1 Variography

Variography was undertaken test for any spatial continuity of the TMF metal grades, and to assist with the selection of suitable search parameters upon which to base the resource estimation.

For the vertical direction variography was carried out using the 1m sample data from the holes drilled in the 1993-1994 campaigns as these were considered the most suitable. The holes from the earlier campaigns give an unrealistic view of grade continuity downhole as they were sampled over a much greater length.

Variography was carried out horizontally on the 5m composite data contained within the modelled TMF zone. Absolute, as well as relative variograms were generated for AU grades, with a spherical model being used for modelling purposes. Variograms were generated and modelled for the principal directions at azimuths 080˚ and 350˚ in which significant anisotropy was apparent.

These indicated ranges of approximately 233m towards 080˚, 52m towards 350˚ and 2m vertically.

11.7.4 Block Modelling

A model prototype was set up with a 20x20x5m parent block size. The details of the prototype are shown in Table 11.18 below. This prototype was then used as the basis to set up a volumetric model, as controlled by the TMF wireframes. Sub-blocks were generated within the structure near the edges, in order to better fit the wireframe geometry, down to minimum dimensions of 5x5x0.5m.

Table 11.18: Block Model Prototype

	Origin	Maximum	Distance	Block Size	Number
X	11,700	12,600	900	20	45
Y	79,600	80,800	1,200	20	60
Z	700	780	80	5	16

11.7.5 Density

An overall average density value of 1.60t/m^3 was used.

11.7.6 Grade Estimation

Grade estimation was carried out using Inverse Power of Distance Squared (IDW^2) for all metal grades, although Ordinary Kriging (OK) and Nearest Neighbour (NN) were also used for comparative purposes on the AU grade.

The estimation was run in a three pass plan, the second and third passes using progressively larger search radii to enable the estimation of blocks unestimated on the previous pass. Grades were estimated using the 5m composite drillhole data. The search parameters were derived from the variographic analysis, with the first search distances corresponding to the distance at 2/3^{rds} of the variogram sill value and the second search distance approximating up to the variogram range. Block discretisation was set to 5x5x2 to estimate block grades. Sub-cells received the same estimate as the parent cell. A summary of the estimation parameters is shown in Table 11.19.

Table 11.19: Estimation Parameters

Search Distances (m)							
1st Search			2nd Search			No. Of Composites	
350˚	80˚	Vertical	350˚	80˚	Vertical	Min	Max
34	150	1	50	230	2	3	5

- 3rd search up to 500m with a minimum of 1 composite required
- IPD^2 used for Au, Ag, Cu, Pb, Zn grades

11.7.6.1 Resource Classification

The resource classification for the Staroye TMF is classified in accordance with the Australian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves JORC Code (2004).

In the case of the Staroye TMF the resource classification is driven by sample quality and sample spacing. Approximately 47% of holes were drilled in the 1969 campaign and 24% of holes were drilled in the 1974 campaign. The sampling methodology for these campaigns is unlikely to give a true representation of the layered nature of the TMF and therefore variations in grade vertically. The 1969 drilling campaign assumes constant grade over the hole length from a relatively small sample and the 1974 campaign assumes sample continuity over 5-7m lengths. This is at odds with the information from the holes drilled in the 1993-1994 campaign which were sampled at 1m intervals.

The reliability of grades recorded in the 1969 and 1974 campaigns is questionable and these holes are the main source of information for half of the TMF. Over the rest of the TMF, though samples are of better quality, holes are irregularly spaced up to 200m apart in the direction of 080˚ azimuth and generally over 100m apart in the direction of 350˚ azimuth. The variographic studies carried out during this resource estimation suggest a drillhole spacing of 200x50m in these directions would be required for classification as an Indicated resource. This drillhole spacing is only present in the Staroye TMF where the holes are of uncertain quality.

The following criteria were established for the classification of resources:

Measured: No material was in this category, owing chiefly to lack of closely spaced sample data;
Indicated: Blocks within this category had to be covered by at least 50x50m spaced drillhole data; and
Inferred: All other blocks within the TMF, but outside of 50x50m drilled areas, were assigned as inferred.

A plan view showing this resource classification methodology is shown in Figure 11.6.

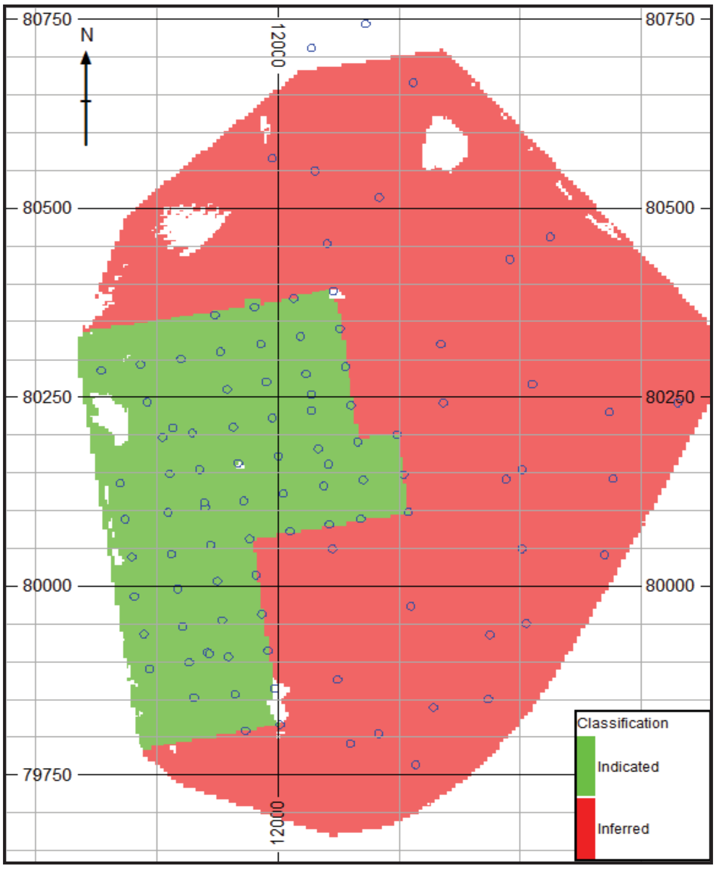


Figure 11.6: Plan View of the Staroye TMF Showing JORC Classification

11.7.7 Validation

Following grade estimation a statistical and visual assessment of the block model was undertaken to assess successful application of the estimation passes and to ensure that as far as the data allowed, all blocks within the defined TMF domain were estimated. The model validation methods carried out included:

- A visual assessment of grade;
- Global statistical grade validation; and
- Model grade profile (swath plot) analysis.

A visual comparison of composite sample grade and block grade was conducted in cross section and in plan. An example section through the block model, with the estimated AU grades, is shown in Figure 11.7. Visually the model was generally considered to spatially reflect the composite grades.

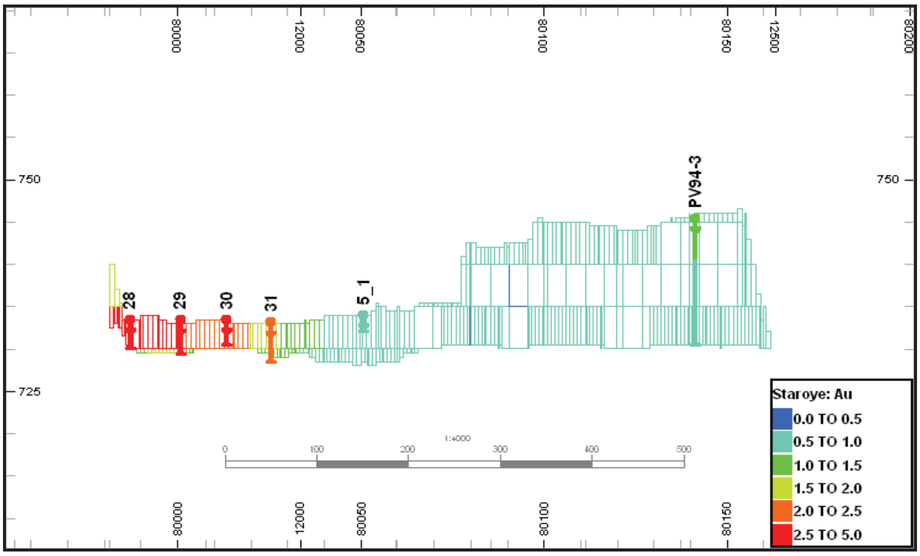


Figure 11.7: Vertical Section at 10 x Vertical Exaggeration (Approximately E-W Section Showing Composite Vs Block Au Grades)

A comparison of global average grades is summarised below in Table 11.20. As well as the principal inverse-distance grades in the block model, this table includes alternative estimates made using nearest neighbour and ordinary kriging. Overall these global average grades compare very well to the original sample grades and not the mean composite grade which is slightly skewed as a result of decompositing of several of the higher grade samples from the earlier campaigns which had a single grade assigned to their entire lengths.

Table 11.20: Comparison of Global Average Grades

FIELD	Unit	Average Grades		Block Model Grades		
		Samples	Composites	ID	NN	OK
AU	g/t	1.14	1.44	1.05	1.01	1.06
AG	g/t	12.02	14.34	12.09	-	-
CU	%	0.04	0.05	0.04	-	-
PB	%	0.33	0.39	0.32	-	-
ZN	%	0.72	0.86	0.69	-	-

Notes:

1. No cut-off grades applied
2. OK (ordinary kriging), NN (nearest neighbour), ID (inverse distance)

Model grade profiles (swath plots) were generated from the model by averaging both the drillhole composites and blocks along 20m-spaced E-W slices. Overall the drillhole composite average grades and the block model average grades compare extremely well.

As a general comment, the validations only determine whether the grade interpolation has performed as expected. Acceptable validation results do not necessarily mean the model is correct or derived from the right estimation approach. It only means the model is a reasonable representation of the data used and the estimation method applied.

11.7.8 WAI Resource and Reserve Evaluation

The resource classification for the Staroye TMF is classified in accordance with the Australian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves JORC Code (2004).

The final block model of the TMF was used as the basis for resource evaluation. Summary results of the evaluation of the resources are shown in Table 11.21.

No cut off has been applied as it is assumed that there will be no selection of material mined and the whole deposit will be processed.

Table 11.21: Staroye Tailings Mineral Resource Estimate (WAI 01.01.2011) (In Accordance with the Guidelines of the JORC Code (2004))

Classification	Tonnes (Mt)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)	AuEq (g/t)
Indicated	0.82	2.01	18.78	0.05	0.48	1.11	3.19
Inferred	5.90	0.91	11.16	0.04	0.30	0.63	1.72

Notes:

- AuEq calculation based on prices of:
  - Au 1287 US$/oz
  - Ag 23 US$/oz
  - Cu 7341 US$/t
  - Pb 2422 US$/t
  - Zn 2420 US$/t

WAI has calculated Ore Reserves based upon the above Mineral Resource Estimate. WAI has applied losses of 4.4% based upon historical data, and dilution of 0.5% to take into account minimal dilution from the bunds and floor.

Table 11.22: Staroye Tailings Ore Reserve Estimate (WAI 01.01.2011) (In Accordance with the Guidelines of the JORC Code (2004))

Classification	Tonnes (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (pb)		Zinc (Zn)	
		Grade (g/t)	Metal Content (koz)	Grade (g/t)	Metal Content (koz)	Grade (%)	Metal Content (kt)	Grade (%)	Metal Content (kt)	Grade (%)	Metal Content (kt)
Proven	-	-	-	-	-	-	-	-	-	-	-
Probable	0.79	2.00	50.97	18.69	475.89	0.05	0.38	0.48	3.80	1.10	8.72
Total	***0.79***	***2.00***	***50.97***	***18.69***	***475.89***	***0.05***	***0.38***	***0.48***	***3.80***	***1.10***	***8.72***

12 CHASHINSKOYE TAILINGS DEPOSIT

12.1 Introduction

12.1.1 Location & Access

The Chashinskoye tailings dam contains waste material discharged from the concentrator of the Leninogorsk Polymetallic Combinat (LPC) during the period 1953 to 1978 inclusive, after the closure of the Staroye tailings dam.

Photo 12.1: General View of the Chashinskoye Tailings Dam (looking northeast)

The Chashinskoye tailings dam is located on the southern side of the Filipovka River valley, opposite to the confluence with the Chashino stream, and some 3.5km east of the, formerly named, Leninogorsk Mining and Concentrating Complex (MCC) at Ridder (Photo 12.1). The impoundment is readily accessible from the Ridder-Chekmar deposit graded road, which runs along the northern margin of the site and is a road distance from the Kazzinc office at Ridder of approximately 11km.

The tailings were deposited by the LPC during the period 1953-1978, after the closure of the Staroye tailings site, and cover an area of some 2.2km (ESE) by 1.7km (NNE). The tailings dam was filled by the products of processing Ridder-Sokolny and Tishinsky polymetallic and pyrite-polymetallic ores at Leninogorsk Concentrator. Up to 1964 only Ridder-Sokolniy tailings were deposited, and since 1965 both Ridder-Sokolny and Tishinsky tailings were deposited. In addition, and over different time periods, the concentration plant processed insignificant amount of other ores from the deposits throughout the former Soviet Union (oxidized ores of the Far East, Zhairem deposit ores; Dzhidinskoye and Gorevskoye deposits' ores in Trans-Baikal).

Tailing deposits generated in previous years of Ridder-Sokolny processing were dumped in the Staroye tailings dam. Since late 1978 tailings from the LPC have been deposited into the new Talovskoye tailings dam.

From 1973, and for many years, some of the deposited tailings were sent to the Irtysh Polymetallic Combinate to be processed as fluxes. From Chashinskoye tailings dam some 103,185t (in 1973-1983, 1987) was removed for this purpose.

The initial dam, which was constructed at the northern end of the impoundment, is now entirely covered by tailings. The current earth dam runs along the western and northern margins of the impoundment. The crest of the dam is at an elevation of 825-827m above Baltic Sea datum whist the elevations of the top surface of the tailings are generally in the range of 815-825m. The average thickness is 17.25m with a maximum thickness of 60m at a trough which extends over an area of 900m (ESE) by 100-350m, adjacent to the northern dam.

The south-eastern part of the site is utilised as a settlement pond for water pumped from the Talovkoye tailings site. The depth of the pond varies from less than a metre to over 5m; and as a consequence no drilling has occurred in this area of the tailings dam.

The base of the tailings impoundment is composed of fine grained calcareous loam, locally with abundant rock debris. The thickness of the loam layer reportedly varies from several metres to 50m and due to its high clay content this layer is considered impervious.

12.1.2 Mineral Rights and Permitting

Kazzinc holds the right to mine the Chashinskoye tailings under the terms of Contract No 559 dated 7 November 2000. The same contract covers the nearby Staroye tailings and is valid for 30 years until 6 November 2030. The Chashinskoye mining lease covers an area of 265.1ha, the boundaries of which are defined by 56 corner points as detailed in Table 12.1 and shown in Figure 12.1.

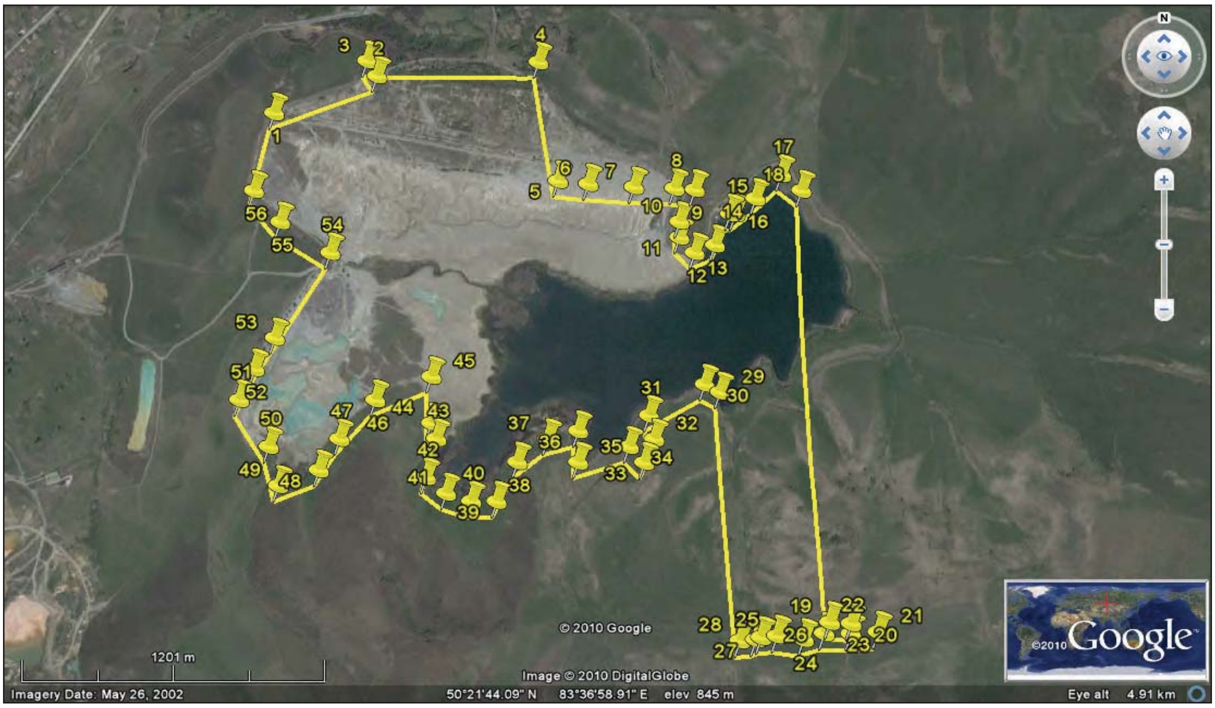


Figure 12.1: Chashinskoye Licence Outline

Table 12.1: Chashinskoye Tailings Mining Lease Boundaries

Boundary Points	Geographical Co-ordinates		Local Rectangular Co-ordinates		Boundary Points	Geographical Co-ordinates		Local Rectangular Co-ordinates	
	Latitude N	Longitude E	X	Y		Latitude N	Longitude E	X	Y
1	50°22'10"	83°34'48"	29,125.0	-11,875.0	29	50°21'34"	83°36'16"	28,030.0	-10,130.0
2	50°22'15"	83°35'08"	29,280.0	-11,482.5	30	50°21'35"	83°36'13"	28,040.0	-10,202.5
3	50°22'17"	83°35'06"	29,372.5	-11,127.5	31	50°21'31"	83°36'02"	27,911.0	-10,420.0
4	50°22'17"	83°35'40"	29,355.0	-10,837.5	32	50°21'28"	83°36'03"	27,827.0	-10,400.0
5	50°22'1.3"	83°35'44"	29,225.0	-10,760.0	33	50°21'25"	83°36'01"	27,795.0	-10,442.5
6	50°22'0.9"	83°35'50"	29,102.5	-10,650.0	34	50°21'27"	83°35'58"	27,816.0	-10,495.0
7	50°22'0.5"	83°35'59"	28,985.0	-10,465.0	35	50°21'25"	83°35'48"	27,731.3	-10,685.2
8	50°22'0.3"	83°36'07"	28,917.5	-10,309.0	36	50°21'29"	83°35'48"	27,877.5	-10,700.3
9	50°22'0.1"	83°36'11"	28,844.0	-10,237.5	37	50°21'28"	83°35'42"	27,836.2	-10,818.3
10	50°21'56"	83°36'08"	28,704.0	-10,295.0	38	50°21'25"	83°35'36"	27,740.5	-10,923.1
11	50°21'54"	83°36'08"	28,595.0	-10,295.0	39	50°21'20"	83°35'32"	27,604.9	-11,001.3
12	50°21'52"	83°36'11"	28,560.0	-10,238.0	40	50°21'20"	83°35'27"	27,594.6	-11,101.1
13	50°21'53"	83°36'15"	26,600.0	-10,155.0	41	50°21'21"	83°35'22"	27,637.8	-11,205.3
14	50°21'57"	83°36'18"	28,735.0	-10,102.5	42	50°21'23"	83°35'18"	27,698.9	-11,277.4
15	50°21'57"	83°36'19"	28,780.0	-10,067.5	43	50°21'28"	83°35'20"	27,823.5	-11,236.1
16	50°21'59"	83°36'23"	28,785.0	-9,995.0	44	50°21'30"	83°35'19"	27,910.6	-11,262.3
17	50°22'02"	83°36'28"	28,880.0	-9,890.0	45	50°21'36"	83°35'19"	28,081.0	-11,272.5
18	50°22'00"	83°36'32"	28,815.0	-9,810.0	46	50°21'33"	83°35'08"	27,985.7	-11,480.2
19	50°21'5.6"	83°36'36"	28,680.0	-9,740.0	47	50°21'28"	83°35'01"	27,851.1	-11,621.7
20	50°21'5.5"	83°36'40"	26,657.5	-9,662.5	48	50°21'24"	83°34'57"	27,719.7	-11,700.6
21	50°21'4.5"	83°36'45"	28,351.0	-9,557.5	49	50°21'22"	83°34'49"	27,658.1	-11,850.9
22	50°21'4.2"	83°36'40"	28,265.0	-9,667.5	50	50°21'27"	83°34'47"	27,798.4	-11,905.1
23	50°21'4.2"	83°36'35"	28,248.0	-9,765.0	51	50°21'33"	83°34'41"	27,984.3	-12,021.8
24	50°21'3.5"	83°36'31"	28,040.0	-9,640.0	52	50°21'37"	83°34'44"	28,132.0	-11,955.8
25	50°21'3.9"	83°36'26"	28,175.0	-9,938.0	53	50°21'41"	83°34'48"	28,257.7	-11,879.3
26	50°21'3.7"	83°36'23"	28,100.0	-10,000.0	54	50°21'52"	83°34'59"	28,581.1	-11,660.5
27	50°21'3.4"	83°36'22"	27,995.0	-10,028.0	55	50°21'56"	83°34'49"	28,700.8	-11,845.2
28	50°21'3.2"	83°36'19"	27,955.0	-10,088.0	56	50°22'00"	83°34'44"	28,832.2	-11,941.0

12.1.3 Production History

Based on the LPC records some 95.4Mt of tailings were discharged during the period 1953-1978. Of these 3.1Mt were taken directly from the LPC for backfill and other purposes and the balance (92.3Mt) deposited at the Chashinskoye impoundment. During the period 1963-1978 a further 4.4Mt of tailings were removed from three shallow pits in the western part of the impoundment for use as backfill and construction material. This leaves a balance of 87.9Mt remaining in the current impoundment site (Table 12.2 below).

Table 12.2: Material Disposal at Chashinskoye Tailings Dam

Year	Tailings Deposited (t)	Grade		Tailings Removed		Sub-total (t)
		Au (g/t)	Ag (g.t)	From LPC (t)	From Dam (t)	
1953	2,002,529	0.50	10.00			2,002,529
1954	2,390,667	0.67	9.18			4,393,189
1955	2,741,804	0.62	8.49			7,134,993
1956	2,875,690	0.55	9.30			10,010,683
1957	2,961,119	0.58	10.70			12,971,802
1958	3,046,960	0.76	9.40			16,018,762
1959	3,156,682	0.87	8.90			19,175,444
1960	3,333,322	0.78	8.80			22,508,766
1961	3,423,848	0.87	8.24			25,932,614
1962	3,506,688	1.08	7.11			29,439,302
1963	3,602,690	0.89	5.64		23,800	33,018,192
1964	3,614,513	0.80	6.26		4,200	36,628,505
1965	3,717,838	0.81	5.21		2,700	40,343,643
1966	4,071,120	0.87	5.29		1,400	44,413,363
1967	4,244,248	0.72	5.26		54,800	48,602,811
1968	4,263,521	0.70	4.01		30,000	52,836,332
1969	4,352,837	0.63	3.62	55,543	62,350	57,071,276
1970	4,370,394	0.63	4.19	228,792	47,570	61,165,308
1971	4,434,219	0.59	4.16	167,751	36,410	65,395,366
1972	4,521,107	0.71	4.95	318,560	134,758	69,463,155
1973	4,600,214	0.63	4.41	315,500	81,025	73,666,844
1974	4,533,428	0.62	3.82	334,893	79,311	77,786,068
1975	4,683,286	0.52	3.16	438,842	139,257	81,891,255
1976	4,380,272	0.47	2.70	510,933	110,060	85,650,534
1977	4,514,692	0.39	4.51	467,814	99,244	89,598,168
1978	2,079,617	0.45	4.43	277,092	172,149	91,228,544
1979-1992					3,311,417	87,917,127
Total	**95,423,298**	**0.68**	**5.81**	**3,115,720**	**4,390,451**	**87,917,127**

With regards to the gold grade, tailings deposited during the period from 1958 to 1970 averaged more than 0.6g/t Au, with a high of 1.08g/t Au in 1962, though on the whole remained fairly constant (≈0.7g/t Au). Gold grade dropped below 0.5g/t Au in 1976 while silver grade shows a gradual drop from 10.7g/t Ag in 1957 to less than 5.0g/t Ag from 1968 onwards, as shown in Figure 12.2.

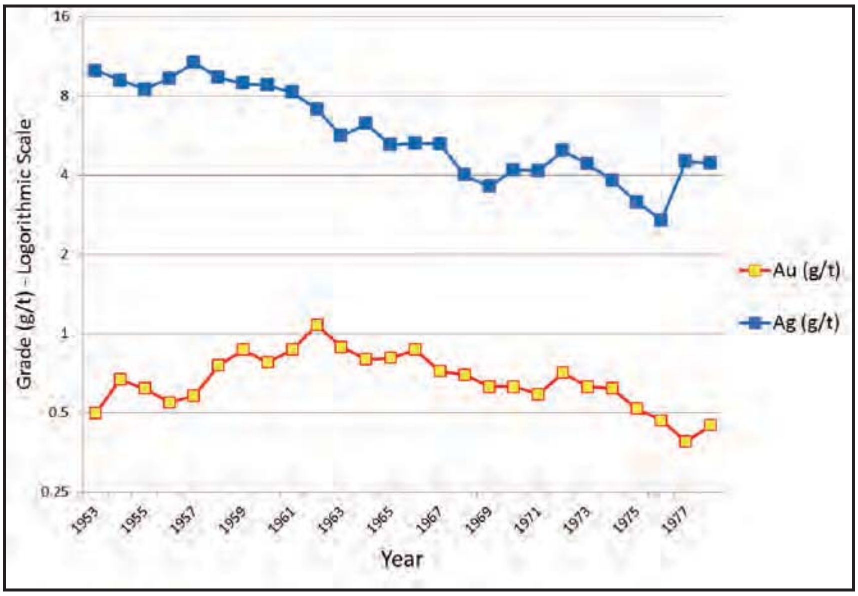


Figure 12.2: Production Grades from 1953 to 1977

The composition of the tailings should correspond to the types of ore processed at LPC during the period of 1953-1978, with inevitable secondary changes due to oxidation of sulphides and leaching of metals. Over the first 12 years from 1953 the feed for the concentrator consisted almost exclusively of auriferous polymetallic sulphide ores from the Ridder-Sokolniy mine. From 1965, the LPC also treated pyritic-polymetallic ores from the Tishinsky mine. The proportion of Tishinsky ores varied from 1.4-16% of the total ore feed, for the initial 3 years, but increased to 20-30% from 1969 onwards. The overall contribution of the Tishinsky ore to the end of 1978 was 14%.

Mining and treatment of copper-zinc and copper ores from the Ridder-Sokolniy mine began in 1970 and gradually increased to 23% of the total Ridder-Sokolniy mine output by 1978. Overall, the proportion of these ores to the total ore processed at LPC during the period to 1978 inclusive was estimated at 5%. By inference, therefore, the proportion of tailings derived from processing of auriferous polymetallic sulphide ores should be approximately 20% of the total tailings deposited at the Chashinskoye site.

It has also been estimated that sulphide ores made up 89% of ore processed at the LPC during the period from 1953 to 1978. The balance came from processing of oxidised ores mined at shallow levels of the Ridder-Sokolniy deposit and from the open pit at the early years of the Tishinskiy mine operation.

The LPC also periodically processed ores from various polymetallic mines in the former Soviet Union, including oxidised and sulphide ores from the Zhayrem deposit in central Kazakhstan and from the Gorevskoe deposit in the Transbaikal region. However, the proportion of tailings derived from those sources is not considered to be significant.

12.2 Geology and Mineralisation

The Chashinskoye tailings dam is a man-made feature and does not possess any recognised geological structure. However, there is some evidence that in vertical section the tailings display a layered structure in terms of fluctuating gold grade though there is no discernable pattern.

Deposition of tailings into a tails dam is largely driven by the beaching characteristics and the water accumulation on the surface of the dam. Because of this very little continuity can be expected to exist. As the tailings are deposited in layers some minor vertical continuity may exist as the coarser/heavier particles tend to drop out first and the lighter finer particles tend to migrate more into the centre of the dam. However, this is further complicated by channelling which can cause coarser grained material to deposit closer to the centre.

The tailings are the waste products of the processing of gold and polymetallic ores (primarily silver, copper, lead and zinc) from the Ridder Mining and Concentrating Complex and their composition thus reflects the major constituents of the ore.

12.2.1 Mineralisation

According to a mineralogical examination conducted at the laboratory of Kazzinc concentrator at Zyryanovsk (Kostorev 2007), 95% of material deposited (i.e. waste from the concentrator and not material sampled directly from the tailings) in the Chashinskoye tailings dam consists of quartz-sericite rock, with minor admixture of sandstone, quartz and carbonate. The observed particle size was in the range of 0.006-2.0mm and the content of primary sulphide minerals was less than 4% by volume, of which the pyrite content was estimated at 1.5-2% by volume. Ore minerals identified included sphalerite, chalcopyrite, galena and minor amounts of grey ore (tetrahedrite-tennantite group). Magnetite was an accessory mineral. The results of this study are summarised in Table 12.3. Secondary minerals mentioned in the above report (Kostorev 2007) include:

- Secondary sulphides (chalcocite and covelline), which occurred as films on surfaces of sphalerite and rims around chalcopyrite;
- Smithsonite, ochres of limonite and hematite; and
- Jarosite, which formed rims around pyrite grains and veinlets infilling microfractures within pyrite.

The examination was conducted on a sub-sample obtained from a 150kg sample of tailings, which contained 0.8g/t Au, 0.3% Zn, 0.1% Pb and 0.06% Cu. The report did not specify the location from which the sample was collected.

Table 12.3: Sulphide Mineralogy of Chashinskoye Tailings (*Kostorev* 2007)

Component	Sulphide Content (% by volume)		Size of Liberated grains (mm)	Composition and Size of Intergrowths (mm)
	Free	Intergrowths		
Sphalerite	51	49	0.006 to 0.1 Sporadically 0.12-0.045 to 0.1-0.36	ZnS (0.0015-0.075) intergrown with gangue (0.06-0.1)
Chalcopyrite	44	56	0.015 to 0.72-0.36	CuFeS2 (0.0015-0.054) intergrown with gangue (0.06-0.1)
Galena	35	65	0.008 to 0.03	ZnS (0.03-0.075)
Pyrite	≈100	0.006-0.06		
Gangue	90	10	0.006 to 2.0	CuFeS2 (0.22) intergrown with ZnS (0.075)
Magnetite			0.012-0.03	

The main ore minerals within the tailings material are pyrite, sphalerite, galena and chalcopyrite; as summarised below:

- **Sphalerite** is mainly found in aggregations with rocks, galena and chalcopyrite; sometimes with hydrous ferric oxides and smithsonite. Grain size – from 7-30 µm (more often) up to 100-300µm.
- **Galena** occurs in the form of inclusions in enclosing rock and sphalerite, in aggregations with pyrite, chalcopyrite, sometimes with anglesite. Grain size varies from 5 to 30µm, prevailing size being 7-15µm.
- **Pyrite** occurs in aggregations with rocks and sphalerite. Grain size – from 7 to 15-20µm, mainly 7µm.
- **Chalcopyrite** is found in aggregations with rocks, sphalerite and pyrite; grain size varies from emulsive impregnation to 7-40µm (prevailing grain size 10-20µm).

12.2.2 Gold and Silver Occurrence

The data on phase analysis of the Concentrator material deposited, including western Staroye tailings dam, show that gold is found in different forms: nuggets, aggregations, association with sulphide, and sometimes with rocks. About half of the gold occurs in aggregations; up to 1/3 of the gold is found in association with sulphides (pyrite, chalcopyrite and galena). Free gold amounts to around 10% (sometimes up to 20%). Gold grain size is 20-75µm and the grains are generally of plate-like or tabular form though sometimes found in isometric form.

Silver is mainly found in aggregations or association with sulphides, occasionally occurring as nuggets or sulphides (fahl[2] ores) or chlorides (cerargyrite[3]). Gold and silver mineralisation occurs in a variety of forms and associations (see Table 12.4) with the proportion of free gold roughly estimated at 10% of the total gold and with a dominant size range of 25-75µm.

Moderately rich and rich classes are found mainly the deepest part of the impoundment, along the western and northern margins. This is most likely due to gravity settling of heavier particles, including gold, close to the discharge outlet for the disposed tailings. Durnev and Golubtsov (2001) mentioned that tailings were generally deposited along the northern dam in warmer seasons and along the western dam during the winter period.

The distribution of gold in various grain size classes was investigated in 2-5kg samples collected from 12 drillholes (2, 7, 7/7, 10, 13, 17, 19, 21, 23, 25, 29 and 33) completed in 1992. Results showed that gold grades are generally in the range of 0.3-1.0g/t Au, with the higher grades correlating with the coarse grain fractions.

Table 12.4: Forms of Gold and Silver Occurrence in Chashinskoye Tailings Dam

Form of gold & silver occurrence	Collective flotation tailings sample № 7/72 (Qtr 4 1974)				Collective flotation tailings sample № 11/76 (Qtr 1 1965)				Disposed tailings (1974)		Quartz Tailings (1977)	
	Gold		Silver		Gold		Silver		Gold		Silver	
	g/t	%	g/t	%	g/t	%	g/t	%	Abs %	Rel %	Abs %	Rel %
Free	-	-	-	-	-	-	-	-	0.00004	20.0	0.008	38.1
With clean surface	0.03	7.0	ND	-	0.04	10.5	ND	-	-	-	-	-
Covered with oxidation films	0.02	4.6	ND	-	ND	-	ND	-	-	-	-	-
In intergrowths	-	-	-	-	-	-	-	-	-	-	-	-
With clean surface	0.23	53.5	0.85	44.7	0.19	50.0	0.91	50.3	-	-	-	-
Covered with oxidation films	0.01	2.3	0.28	14.7	0.02	5.3	ND	-	-	-	-	-
Associated with ore minerals	-	-	0.39	20.6	0.11	28.9	0.87	48.1	0.00016	80.0	-	-
1. Oxidised lead minerals	0.03	-	-	-	-	-	-	-	-	-	-	-
2. sphalerite	0.02	-	-	-	-	-	-	-	-	-	-	-
3. other	0.07	-	-	-	-	-	-	-	-	-	-	-
Sulphide forms	-	-	-	-	-	-	-	-	-	-	0.002	9.5
With gangue	0.02	4.6	0.38	20.0	0.02	5.3	0.03	1.6	-	-	-	-
Kerargyrite	-	-	-	-	-	-	-	-	-	-	-	-
Insoluble residue	-	-	-	-	-	-	-	-	-	-	0.011	52.4
Total	**0.43**	**72.0**	**1.90**	**100**	**0.38**	**100**	**1.81**	**100**	**0.0002**	**100**	**0.021**	**100**
Size of free gold (mm)	**0.025 – 0.075**											

[2] Grey copper ore (fahlerz)

[3] Former name for chlorargyrite; mineral form of silver chloride (AgCl)

12.2.3 Granulometry

Initial grain size composition of Chashinskoye tailing dam was defined by a number of boreholes located in 2 profiles: in profile 5 – boreholes 17, 19, 21, 23, 25 (1992-1993), in profile 1 – boreholes 103, 110, 116, 126, 129, 133 (1993).

According to the fragment classification (V.A. Priklonsky and V.V. Okhotin) several material size classes were combined which allowed a more general characterisation of tailings material. Subsequently three size classes were specified: > 0.56 mm – coarse, gravel sands; 0.56-0.1 – medium and fine sands; <0.1mm – fine sands, coarse dust, silty and clay particles.

Table 12.5: Grain Size Classification according to Priklonsky & Okhotin

Fractions by grain size (mm)							
>1.6 - 1.25	**1.25 - 0.8**	**0.8 - 0.56**	**0.56 - 0.28**	**0.28 - 0.10**	**0.10 - 0.071**	**0.071 - 0.04**	**<0.04**
"coarse, gravel sands"			**"medium and fine sands"**		**"fine sands, coarse dust, silty and clay particles"**		
Very coarse sand	Very coarse & coarse sand	Coarse sand	Medium sand	Fine sand	Ultra-fine sand	Ultra-fine sand & coarse dust	Silt & clay particles

The coarse fraction forms an insignificant part of the tailings volume with an average percentage from 0.2-8.0% (averaging to 3.3 %). The most common fractions are sand fraction (medium and fine sand) and fine fragmented fraction (ultra-fine sand, silt and clay particles).

The tailings dam was filled by pulp discharge from the main discharge pipeline to the dam's inner part, starter dam filled first. As the dam was filled the floodwalls (along which the pulp was discharged) were subsequently built up by tailings. Coarser sand material accumulated at the point of pulp discharge and finer sand dispersing along the slope to the deeper parts of the pond. As a result the sand fractions prevail (over 50% of total volume) in the upper part of the tailings while the lower part contains mainly ultra-fine particles. Such occurrence is also likely to be a result of the function and efficiency of the plant; initially the average grinding coarseness was 0.11mm while later it was increased to 0.18-0.21mm due to the increased recovery of valuable ore components. Farther from the pulp discharge point there is a lower sand component content.

The percentage of coarse sand is quite insignificant (about 2.0%) while fine and medium sands are more common (48.0%). Fine fragmented fractions – silt, clay and ultra-fine sand fractions prevail (over 50.0%). According to "VNIItsvetmet" Research Institute data, the tailings are formed by finely ground material (48.0-60.0% of -0.074µm) with great amount of slimes.

The granulometric composition of the tailings was determined on samples from 6 drillholes on Profile 1 and 5 drillholes on Profile 5. As seen in the chart of percentage grain size distribution in Figure 12.3, silt size particles (shown in two shades of blue 45.1% and 18.2% respectively) predominate. The balance (36.7%) are sand grain size particles (shades of brown and yellow) ranging from very fine sand to very coarse sand. The overall proportion of coarse to very coarse sand is 3.1%.

Durnev and Golubtsov (2001) also noted that the overall grain size decreases southwards from the initial northern dam and eastwards from the western dam. This is consistent with the sequence of tails disposal, which began at the initial northern dam, and also with the quality of grinding. Earlier deposited tailings were ground to an average size of 0.11-0.21mm. The grinding quality improved in the 1970's and reached 48-60% of 200 mesh (0.074mm). The overall conclusion is that the fine fraction (silt, clay and very fine sand) predominate; particularly in the central, eastern and southern parts of the impoundment. The coarse sand fraction forms only about 2% of the total volume and the medium and fine sand fractions form 48% of the volume.

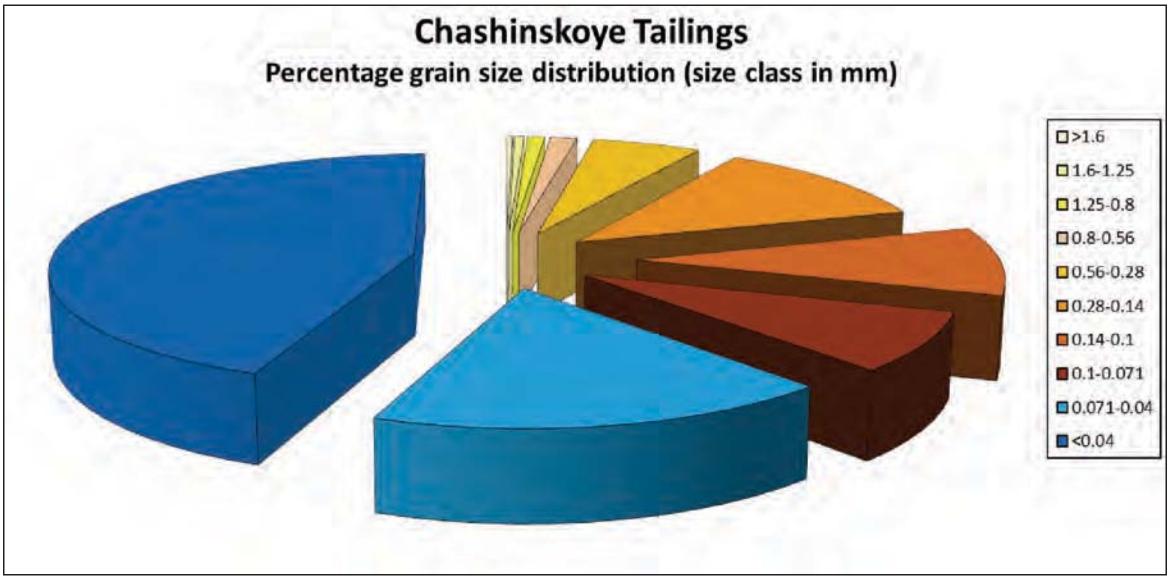


Figure 12.3: Percentage Grain Size Distribution Chashinskoye Tailings

12.3 Exploration Works

12.3.1 Topographic Base and Surveying Data

The topographic base map, which was used in the conventional resource estimates of 2000 and in a Datamine model that was prepared by Kazzinc, was compiled from data generated in two topographic surveys, both on a 1:1,000 scale. The earlier survey of 1960 covered the northern and eastern part of the area while the more recent survey, completed in 1988, covered the western part of the area. Archive material, including a 1:2,000 topographic map, thought to date from 1939, and engineering plans from 1974 were also utilised. The map compiled in this way has a scale of 1:2,000 and shows 5.0m contour lines for the base of the tailings impoundment.

The current configuration of the tailings top surface is derived from a 1:5,000 scale map prepared by the survey department of Kazzinc in April 2009. The map shows spot heights at various points, and the outline of three shallow pits in the western and central parts of the impoundment left after the extraction of material for backfill and construction, and locally contour lines at 1m intervals.

The local survey grid, which was used during topographic surveys and for locating drillhole sites, is linked to 2nd and 3rd class triangulation points. The relative point location error is reported to be 0.12m.

Locations of drillhole collars were surveyed by theodolite traversing from survey grid points or by resection from a minimum of three points with known co-ordinates. Collar elevations were measured by trigonometric levelling from at least two reference points. The mean square positional error was reported as less than 0.9m in plan and 0.2m in elevation.

12.3.2 Drilling

The Chashinskoye tailings dam has been evaluated during two stages of drilling. Stage 1 involved 25 holes being completed for 846m by Leninogorsk Mining and Processing Combinat (Leninogorsk GOK) from November 1991 to January 1992. From May to June 1993 a further 36 holes for a total of 873.9m completed by Goldbelt Resources Limited (Canadian company).

12.3.2.1 Historical Drilling

Drillholes were sited on nine profiles set up on an azimuth of 015° with spacing between profiles of 300m in Stage 1, reduced to 150m for Stage 2. The drillholes completed during Stage 1 were sited at 75-280m intervals along profile using a cable tool rig (UGB-ZUK) with an initial diameter of 377mm and reduced diameters of 273mm and 219mm as depth increased. Some of those holes were stopped above the base of the tailings.

For Stage 2, drillholes were sited at intervals of 75-125m along profiles using a Canadian vibrating rig ('vibrocore') with a hole diameter of 59mm. All drillholes completed during this stage reached the base of the tailings.

The resultant overall drilling grid varied from 150x100m in the western and northern parts of the impoundment to 300m by 100-200m in the area adjoining the settlement pond. All drillholes were vertical and there is no drilling over the area covered by the settlement pond in the southeast.

Table 12.6: Chashinskoye Tailings Evaluation Drilling

Year	Drilling method/Drill rig	No of Drillholes	Total Depth	Spacing	Main Purpose
1997-92	Cable tool/UGB-ZUK	25	846.0	300	Qualitative and quantitative characterisation
1993	Vibrocore	36	873.9	≈150	Confirmatory drilling
Total		**61**	**1,719.9**		

WAI Comment: *WAI has not observed any of the drilling and sampling process followed but has reviewed the protocols applied, and in keeping with typical Soviet standards, considers the methods to be industry standard and appropriate for use in a mineral resource and ore reserve estimate in accordance with the guidelines of the JORC Code (2004). In addition this drill data was used for a GKZ approved resource estimation in 2000 that offers additional assurance to the standards applied and protocol followed.*

12.3.3 Sample Collection

Most drillholes were sampled over intervals of 1.0m though sample recoveries are not mentioned in the available documentation.

Samples from Stage 1 were collected in metal trays, mixed, quartered and reduced to 50kg weight. The next step involved reduction to about 20kg in a Jones riffle. The following samples were obtained by further splitting in the Jones riffle:

- Samples for fire assay (approximately 600g each);
- Duplicates for external control analyses (approximately 600g each);
- Samples for compositing into a 12kg technological sample;
- Control sample (150g);
- Samples for sieve analysis (2.5-3.0kg each) from Profile 5;
- Samples for process testwork (0.5kg); and
- Samples for determination of gold, silver, copper, lead and zinc in various grain size classes (taken from every other hole).

Samples collected during Stage 2, each weighing about 3kg per metre, were subdivided to obtain the following reduced samples:

- Samples for fire assay and chemical analysis (approximately 600g each);
- Duplicates (approximately 600g each); and
- Samples for sieve analysis from Profile 1 (1.8kg each).

12.3.4 Sample Analysis

The results of standard fire assay showed that the gold content in Chashinskoye tailing dam varies from 0.3-0.4 and up to 0.8-1.0g/t Au. Of 1,754 samples only 6 samples contained <0.3g/t Au and 107 samples >1.2g/t Au.

The maximum values of 2.0-3.3g/t Au were found in 11 samples. This analysis suggests a homogenous distribution of grade classes.

All analyses were performed at the central chemical laboratory of Leninogorsk GOK. They included fire assays for gold and silver, chemical analyses for copper, lead and zinc and granulometric analyses.

The quality assurance/quality control (QA/QC) programme relied on internal and external control analyses of analytical duplicates. External control analyses were conducted on analytical duplicates of 24% of routine samples by "Voskazgeologia" in Ust-Kamenogorsk.

Results of control analyses are available only in summary tables arranged by grade classes. Average relative differences for paired internal control analyses for gold and silver are within a range of 0-2%, which suggests a high precision of fire assays at Leninogorsk GOK. A summary of external control analyses shows similar results with the exception of gold analyses performed in 1992. There, results of external analyses were on average higher than the corresponding results of routine fire assays (28.86% for the 0.25-0.5g/t class, 11.31% for the 0.5-1.0g/t class and 6.21% for the 1.0-4.0g/t class). According to the ex-Soviet NSAM instruction, which remains in use in Kazakhstan, these results suggest that Leninogorsk GOK have understated gold in 1992. However, without results on certified reference material or arbitrary analyses by an independent laboratory, it is impossible to judge which laboratory was correct. There are no sample preparation rejects or analytical duplicates left in storage that could be submitted for check analysis.

The QA/QC summary data for copper, lead and zinc, which were presented in the 2001 report of Durnev and Golubtsov, are not specific to samples from the Chashinskoye drilling programmes. According to Durnev, they refer to the overall internal control results of the Leninogorsk GOKs laboratory in 1991-1993. The grade classes shown in the summary are too high for the grades encountered at the Chashinskoye tailings. It is therefore impossible to assess the reliability of analytical results for copper, lead and zinc. However, as these elements occur at very low concentrations, resulting uncertainties will have no material impact on resource estimations.

12.3.5 Bulk Density, Moisture Content and Porosity

Due to a highly variable composition of the Chashinskoye tailings, determinations of dry bulk density proved to be a challenging task. Durnev and Golubtsov (2001) quote results of particle density and porosity determination conducted in 1964, 1970-1971 and 1991. The results of those determinations were erratic and inconclusive. Consequently Durnev and Golubtsov resolved to select a dry bulk density of 1.6t/m^3 based on a porosity of 48% indicated by measurements reported in 1964. The density of 1.6t/m^3 was used in the resource estimate of 2000.

Specific weight (γ - g/cm^3) and gravimetric (natural) moisture content (WB %) were determined from 17 samples taken from the deposits in early December 1991. In addition to specific weight, WB determination of porosity (n %) and dry bulk weight, it was required to calculate bulk weight (δ - g/cm^3).

Analysis of granulometric parameters shows that the deposit, in section, is generally heterogeneous and the deposit cannot be classified by granulometric composition. Therefore using of "δ" value (given in reference literature specifying "n" values) for calculations may lead to substantial errors.

The "KazGIIZ" studies (1964 and 1970-1971), using samples taken from 2-12m depth, estimated that the "n" value varied from 45.6%-51.05%, averaging to 48.3%.

Assuming that tailing deposits are mainly formed by silt-sand of medium density (density coefficient e = 0.7), then:

$$n = e / 1+ e * 100 = 41\%$$

According to the "KazGIIZ" research data, the dry density (δск) is slightly variable from 1.34-1.47g/cm^3, averaging to 1.40g/cm^3. Reference literature values vary from 1.30 to 1.85g/cm^3.

At different "n" values, calculated values according to the formula: $\delta ск = \gamma (1 – n)$ are as follows:

n = 48.3 % – δск = 1.42 ÷ 1.46 g/cm^3, average – 1.44g/cm^3;
n = 41.0 % – δск = 1.62 ÷ 1.67 g/cm^3, average – 1.64g/cm^3.

According to the "KazGIIZ" data in 1964 the bulk weight of the deposits (δск) averaged 1.77g/cm^3; and in 1970-1971 – 1.51g/cm^3.

Calculated values determined by the formula $\delta = \delta ск (1+ WB)$, and based on the analysis of available data, surmises that the following conclusions may be made:

1. Probability value: n ≈ 48%, δск = 1.40-1.44 g/cm^3.
2. Above the water level, bulk weight varies from 1.42-1.64g/cm^3 average value being 1.52g/cm^3 (samples No.1, 9, 13, 14, 15, 16, 17), below the water level bulk weight varies from 1.71-1.91g/cm^3 averaging at 1.80g/cm^3 (samples № 3-8, 10, 12).

As the valuable component content was determined for dry raw material (tailings) to calculate tailings and metal 'reserves', the (dry) bulk weight must be used. At a porosity value of n = 41.0% the average calculated (dry) bulk weight was 1.64g/cm^3 which generally complies with the data of "KazGIIZ" Research Institute.

> ***WAI Comment:*** *WAI has reviewed the methods employed and protocols followed in acquiring the sample data (drilling and sampling) and testwork procedures; including assay, granulometry, bulk density, moisture content and porosity, and believes that the results obtained are appropriate for use in a mineral resource estimate in accordance with the guidelines of the JORC Code (2004). Furthermore this data has been accepted by GKZ in their approval of the resource/reserve estimate of 2000. It should also be noted that a dry bulk weight (specific gravity) of 1.6g/cm^3 has been applied to all resource/reserve estimates.*

12.4 Process Testwork

The results of the most recent (2003 to 2007) process testwork on the Chashinskoye tailings conducted at the mineral processing laboratory of the Zyryanovsk concentrator were reviewed and reported by Kostorev (2007). The same report mentions earlier testwork results and these results are also summarised in Table 12.8.

The sample (150kg) used for the 2007 testwork at the mineral processing laboratory of the Zyryanovsk concentrator contained 0.82g/t Au. In particle size terms, it contained approximately 75% of very fine to medium sand and 17.85% of minus 200 mesh size particles. The bulk of the gold (73.5%) was contained in the sand size particle.

By comparison, the average grade of all drillhole intercepts at the Chashinskoye tailings is 0.7g/t Au and the average content of sand size particles is approximately 35-40%. Therefore the sample tested represents only the sand fraction of the tailings material which cannot be selectively extracted (as it is interlayered with silt size material) but could be separated by screening or gravity concentration prior to processing.

Table 12.7: Specific Weight, Bulk Weight, (Dry) Bulk Weight, Porosity and Gravimetric Moisture of Chashinskoye Tailings (based on samples taken on 4-9.12.1991 at Chashinskoye tailing dam)

№	Sampling Point	Sampling depth (m)	Position Relative to Waters Level	Parameter Values		Calculated Parameter Values				
						(Dry) Bulk Weight δ ск., g/cm^3		Deposits Bulk Weight, δ, g/cm^3		
						at porosity value (n), %		"KazGIIZ" data	Calculated at porosity value (n), %	
				Specific Weight (g/cm^3)	Gravimetric Moisture Content (%)	**48.3**	**41.0**	$\delta_{ск}$ = 1.40 г/см^3	**48.3**	**41.0**
1	Borehole 1/17	0.0 – 1.0	above, but increased water saturation during drilling	2.76	14.8	2.43	1.63	1.61	1.64	1.87
2		10.0 – 11.0		2.76	27.1	1.43	1.63	1.87	1.81	2.07
3		30.0 – 31.0		2.80	23.7	1.45	1.65	1.73	1.79	2.04
4		40,0 – 41.0	below	2.80	27.9	1,45	1.65	1.79	1.85	2.11
5	Borehole 2/19	10.0 – 11.0	below	2.78	21.5	1.44	1.64	1.70	1.75	1.99
6		20.0 - 21,0	below	2.81	29.3	1.45	1.66	1.81	1.87	2.15
7		30.0 – 31.0	below	2.77	22.0	1.43	1.63	1.71	1.74	1.99
8		38.0 – 39.0	below	2.77	30.4	1.43	1.63	1.83	1.86	2.13
9	Borehole 3/21	0.0 – 1.0	above	2.81	9.1	1.45	1.66	1.53	1.58	1.81
10		10.0 - 11.0	below	2.82	30.5	1.46	1.66	1.83	1.91	2.17
11	Borehole 11/	0.0 - 1.0	above, though water saturated	2.77	20.5	1.43	1.63	1.69	1.72	1.96
12		5.0 - 6.0	below	2.77	26.5	1.43	1.63	1.77	1.81	2.06
13	Outcroppings	0.2	above	2.82	2.0	1.46	1.66	1.43	1.49	1.69
14	Northern wall of pit No.3	0.3	above	2.75	3.6	1.42	1.62	1.45	1.47	1.68
15	Deposits intake for filling works	1.0	above	2.77	1.4	1.43	1.63	1.42	1.45	1,65
16		2.0	above	2.83	1.9	1.46	1.67	1.43	1.49	1,70
17		2.0	above	2.75	15.0	1.42	1.62	1.61	1.63	1,86
Average		-	-	**2.78**	--	**1.44**	**1.64**	-	-	-

The testwork carried out on this sample focused on gravity and flotation. Overall concentrate yields, grades and recoveries are summarised in Table 12.8.

Flotation tests were carried on the tailings feed (without any pre-concentration) and on gravity tails. These tests were performed on feed material comprising various proportions of -0.074mm and -0.020mm size fractions. The tests demonstrated that flotation recoveries tend to deteriorate as the proportion of the -0.020mm increases due to fine silica forming screens around metallic minerals.

The best results on the tailings feed were obtained by close circuit flotation on the feed grind 85% to -0.074mm using a 60:40 mixture of Butyl Xanthate and Butyl Aeroflot, or alternatively of Max Gold S101104 collector and X-133 frothing agent. The concentrate grade was 15.3g/t Au equating to the gold recovery of 65.5% and concentration degree 3.6 (see Table 12.8).

The best results on the gravity tails were obtained by close circuit flotation after additional grinding to 97% -0.074mm. The concentrate yield was 1.74%, concentrate grade was 19.0g/t Au equating to 58.4% gold recovery and concentration degree 33. The use of Max Gold S101104 combined with Aeroflot improved the gold recovery to 62.5% but the concentrate yield increased to 2.24% and concentrate grade was 16g/t Au.

Results of previous testwork are also shown in Table 12.8. It should be noted that direct cyanidation of tailings recovered 62.5% of gold, however no report on those test are available and were therefore not reviewed by Kostorev (2007).

Table 12.8: Summary of Results of Process Testwork on Chashinskoye Tailings

Testing Laboratory	Year	Processing Method	Product	Feed Grade	Yield	Product Grade	Gold Recovery
				g/t Au	%	g/t Au	%
Kazmekhanobr	2003	Direct cyanidation	Doré	0.62	0.23	16.90	62.50
		Gravity concentration followed by cyanidation of gravity tails	Doré	0.62	0.07	50.43	57.77
Ridder Concentrator	2005	Gravity-flotation	Gravity concentrate	0.62	1.08	10.50	17.45
			Flotation concentrate	0.62	1.05	21.00	33.92
TOMS	2007	Gravity-flotation	Gravity concentrate	0.56	0.18	43.60	14.14
			Flotation concentrate	0.56	2.27	8.00	32.42
Zyryanovsk Concentrator	2007	Close circuit flotation	Flotation concentrate	0.82	3.67	15.30	70.00
		Gravity concentration in Mozley	Gravity concentrate	0.82	72.46	0.96	84.08
		Gravity concentration in Knelson separator	Gravity concentrate	0.82	8.40	3.40	34.96
		Flotation of Knelson gravity tails	Flotation concentrate	0.82	1.74	19.00	58.35

12.5 Mineral Resource and Ore Reserve Estimation

12.5.1 Introduction

The mineral resource of Chashinskoye tailings dam has been investigated following each stage of investigation. In 1994 Leninogorsk MCC estimated the deposit based on previous studies and drilling works per-formed by

"Kilborn" company. The most recent, and considered current, estimation was completed using all available data as of 01.01.2000.

12.5.2 Kazzinc Reserve Estimation

The current (2000) estimate was based on the results of exploration works carried out by Leninogorsk Exploration Company (drilling performed in November 1991-January 1992) and Goldbelt Resources Limited (check drilling in May-July 1993) with co-operation of Leninogorsk Polymetallic Combinate (LPC) and Comptoir International du Commerce C.A. (Comptair) from Luxembourg.

The works were commenced based on the Letter of Intent dated December 15, 1990 and concluded between Australian Mineral Resources (AMR), acting as the agent of Comptoir and the State Committee on Foreign Economic Relations of Kazakh SSR. The agreement stating the main terms and conditions of the Joint Venture Agreement was signed on June 27, 1991 and on December 15, 1991 the Parties signed the Letter – protocol on agreement to final contract award. The Agreement between LPC and Comptoir on formation of a Joint Venture ("Kazgold") for processing of gold bearing concentration tailings was concluded on February 19, 1992 and registered by the Ministry of Finance of the Republic of Kazakhstan (registration No. 290).

According to the Protocol of intent, on formation of the Joint Venture for processing the Concentrator's tailings dated October 15, 1991, and signed by LPC and AMR, drilling works at Chashinskoye tailing dam were performed in November 1991 – January 1992. Drilling works were aimed to qualitative and quantitative characterise the tailings dam material and tenor of gold bearing mineralisation. Leninogorsk Exploration Company drilled 25 exploration boreholes along five profiles located 300m away from each other for a total of 846m.

It should be noted that initial program of drilling and sampling works, suggested in the Protocol of intent by AMR, was completely changed and developed by the Geological department of Leninogorsk MCC and then completed under the supervision of Mr G.S. Durnev, Chief Geologist, in the presence and under control of the AMR represented by Mr. J. Searle. The drillhole pattern was completely changed, the scope of works was performed in full, and the sampling interval was reduced to 1m (instead of 4m).

As a result of these works a 'reserve' was calculated as being 82,765.99kt containing 48,081kg of gold at an average grade of 0.58g/t. In addition grain-size classification of the tailings was studied (5 boreholes in one profile) with classification of valuable components by classes; samples were taken for metallurgical analysis; chemical composition of the waters of Chashinskoye, Talovskoye tailing ponds and Ridder-Sokolniy mine water treatment facilities was studied; specific weight (density) and gravimetric (natural) moisture content of the Chashinskoye tailing dam deposit were investigated.

In February 1992 LPC prepared and approved the report based on the results of performed works.

In January 1993, the National Kazakhstan Agency for foreign investments addressed the European Bank for Reconstruction and Development (EBRD) with a proposal to carry out an independent examination of the previous exploration works. In May-June 1993 confirmatory drilling was performed according to a drillhole pattern at half the distance of previous investigation, and as required by independent examination.

Results obtained confirmed the information obtained during the work completed in 1991-1992. In addition to sampling and chemical-analytical study, grain size composition of tailings material in one profile, parallel to the earth-fill dam, was studied. All the works were carried out by LPC and the drilling was contracted to a Canadian company (Goldbelt Resources Limited).

Variation coefficient for gold and silver content determined from 1,687 standard samples analyses is 56.2% and 47.0% respectively. These values are compared with coefficient variations for the deposits of Rudny Altay referred to complexity Class III. According to the classification of the State Reserves Committee of the Republic of Kazakhstan, the Chashinskoye tailing dam can be referred to Class III of geological structure complexity.

12.5.3 Historical Mineral Resource Estimates

The first resource estimate was prepared in 1993 and is summarised in Table 12.9 below. However, the Leninogorsk Mining and Concentrating Complex (MCC) removed 401,391t from the Chashinskoye tailings dam in 1996-1998.

Table 12.9: Chashinskoye Tailings Dam Resource Estimate (01.09.1993)

Tonnes (kt)	Metal (grade/metal reserves)				
	Au g/t (kg)	Ag g/t (kg)	Cu % (t)	Pb % (t)	Zn % (t)
87,373.8	0.62 (53,834)	5.01 (437,901)	0.04 (37,216)	0.13 (114,315)	0.36 (317,238)

As a result of this removal of material, a revised resource estimate was completed which is summarised in Table 12.10 below.

Table 12.10: Chashinskoye Tailings Dam Resource Estimate (01.01.2000)

Tonnes (kt)	Metal (grade/metal reserves)				
	Au g/t (kg)	Ag g/t (kg)	Cu % (t)	Pb % (t)	Zn % (t)
86,972.4	0.62 (53,575)	5.01 (435,819)	0.04 (36,528)	0.13 (113,064)	0.36 (315,710)

12.5.4 Approved Resource ("Balance Reserve")

Resource estimation has been undertaken in 1994 and in 1999, the former are now only of historical significance, the latter being performed by Durnev and Golubtsov and reported in their report dated 2001. Their estimate was reviewed and approved by the Government Commission for Mineral Resources of the Republic of Kazakhstan ("GKZ RK").

For purposes of tonnage and grade estimation, Durnev and Golubtsov divided the tailings area into four blocks as follows:

1. Block I drilled on the 100x150m grid.
2. Block II drilled on the 100x300m grid.
3. Block III covering the strip of ground along the margin of the settlement pond and tested by six drillholes along its north-western perimeter.
4. Block IV covering the settlement pond and devoid of any drilling.

Estimates for Blocks I and II were performed using the conventional cross sectional method. Blocks III and IV were also estimated by the same method with average grades for both blocks estimated from the six holes around the north-western perimeter of Block III.

The tailings were considered to be bulk mineable and therefore no cut-off grade or top cut was applied. Average grades for each drillhole intercept were estimated as arithmetic means of sample grades weighted by respective sample lengths. Each cross section was assigned the arithmetic mean of the drill intercepts located on and close to the section. These grades were then weighted by volumes assigned to each cross section. The areas were calculated in AutoCAD-14 and the dry bulk density of 1.6t/m^3 was used to convert volume into tonnage.

In accordance with the ex-Soviet Classification of Reserves and Prognosticated Resources (which remains in use in Kazakhstan), the resource contained within Block I was classified as C_1 category and within Block II as C_2 category, and both as 'Balance Reserve'. Tonnages and grades estimated for Block III and Block IV were classified as Prognosticated Resources of P_1 and P_2 categories. The combined tonnage was estimated to be

88.1Mt and the average grades are 0.6g/t Au and 5.0g/t Ag. The tonnage is 2.8% higher than the tonnage of the deposited tailings but the gold and silver grades are lower by 11.5% and 15.7% respectively (Table 12.11).

Durvev and Golubtsov also estimated copper, lead and zinc grades and the average grades are 0.04%, 0.13% and 0.36% respectively. GKZ took a view that only gold and silver resources should be placed on the state balance and that copper, lead and zinc should be considered as by-products.

GKZ RK reviewed and approved those estimates in June 2001 (Protocol No 103-01-U dated 27 June 2001). In the same document, GKZ RK also confirmed its acceptance of the estimated Prognostic resource.

Table 12.11: Balance Reserves and Prognostic Resources for the Chashinskoye Tailings (01 January 2000)

Category	Tonnes (Mt)	Grade	
		g/t Au	g/t Ag
GKZ Approved 'Balance Reserve'			
C_1	33.278	0.76	5.97
C_2	20.001	0.58	4.49
GKZ RK Accepted Prognostic Resource			
P_1	22.147	0.49	4.40
P_2	12.739	0.49	4.40

The reserves quoted in the table above have not been prepared in accordance with the guidelines of the JORC Code (2004). These reserves have been classified under the standards of the State Commission on Mineral Reserves (Gosudarstvennaya Komissia po Zapasam) of the Republic of Kazakhstan (GKZ (RK)) which were adopted from GKZ of the Russian Federation.

The JORC Code (2004) differs in certain respects from GKZ (RK), but WAI considers that the standards are broadly comparable. The level of detail of information required to support a submission of mineral "resources and reserves" to GKZ (RK) is both systematic and comprehensive and classification under GKZ (RK) is subject to rigorous review comparable with the guidelines of the JORC Code.

WAI have completed a Mineral Resource and Reserve estimate of the Chashinskoye tailings deposit which is in accordance with the guidelines of the JORC Code (2004), and is presented in Section 12.6 below.

12.6 WAI Mineral Resource and Ore Reserve Estimation

12.6.1 Introduction

WAI have completed a Mineral Resource and Ore Reserve estimate of the Chashinskoye tailings deposit in accordance with the guidelines of the JORC Code (2004) and based on data provided by the Client including a drillhole database and topography plans.

12.6.2 Topography

The wireframe envelope of the TMF deposit was supplied by KMC. The current surface topography is derived from a 1:5,000 scale map prepared by the survey department of Kazzinc in April 2009. Some parts of the TMF are up to 60m deep.

12.6.3 Database Compilation

All of the sample data collated for the current project are summarised below in Table 12.12.

Table 12.12: Sample Data Summary

	No. of Holes	No. of Samples	Hole Lengths (m)	
			Total	Average/Hole
Drillholes	89	2,243	2,393	27

A general plan of these drillholes are shown in Figure 12.4. As can be seen from the plan, the drillholes have generally been laid out approximately on a 150m spaced sections, with spacings of between 80–120m along each section line. All drillholes are vertical and no down hole survey conducted. The area of the tailings dam towards the southeast is furthest away from the original discharge points and thus has the lowest elevation. Consequently this part of the dam is covered in water to a depth of around 5m and as a result has not been subject to drilling.

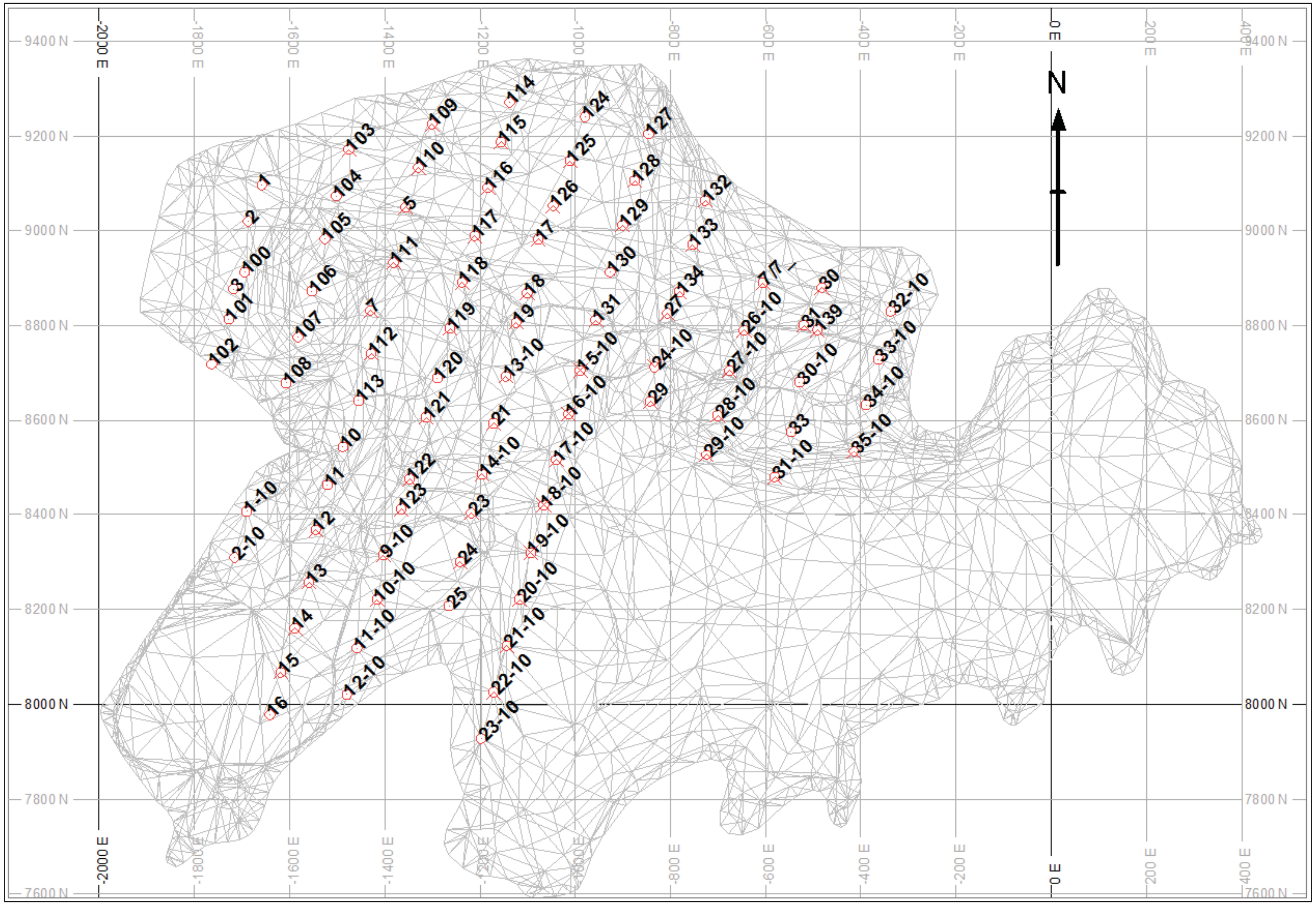


Figure 12.4: Plan View of Drillholes and WAI Resource Envelope

12.6.4 Sample Data Processing

The supplied wireframe model was used to select and allocate all of the drillhole data.

Table 12.13: Selected Sample Summary

	No. of Holes	No. of Samples	Hole Lengths (m)	
			Total	Average/Hole
Drillholes	89	2,126	2,278	26

Most of the 117 rejected samples are from parts of the tailings dam that have already been removed for re-processing.

All of the drillhole samples have been assayed for Au, Ag, Cu, Pb and Zn. Most of these indicate principally a single log-normal distribution. A statistical summary of the selected samples is shown in Table 12.14. Most samples were 1m in length.

Table 12.14: Statistical Summary of Selected Samples

Field	Number	Minimum	Maximum	Mean	Variance	Standard Deviation	Log Estimate of Mean	Coefficient of Variation
AU	2,126	0.2	4.1	0.65	0.09	0.30	0.65	0.46
AG	2,126	0.3	45.0	5.08	5.55	2.36	5.07	0.46
CU	2,126	0.0	0.42	0.05	0.00	0.02	0.05	0.54
PB	2,126	0.01	17.0	0.15	0.06	0.25	0.14	1.66
ZN	2,126	0.02	2.08	0.38	0.02	0.16	0.38	0.41

A decile analysis was also completed on the selected gold grades, as shown in Table 12.15. From this and the log-probability plot, there does not appear to be a significant problem with outlier grades, so no top-cuts were applied.

Table 12.15: Decile Analysis of Au Grades

Q%_FROM	Q%_TO	NSAMPLES	MEAN	MINIMUM	MAXIMUM	METAL	METAL%
0	10	212	0.30	0.2	0.4	63.0	4.4
10	20	213	0.40	0.4	0.4	85.2	6.0
20	30	212	0.45	0.4	0.5	94.8	6.7
30	40	213	0.51	0.5	0.6	108.1	7.6
40	50	213	0.60	0.6	0.6	127.8	9.0
50	60	212	0.63	0.6	0.7	134.0	9.4
60	70	213	0.73	0.7	0.8	154.7	10.9
70	80	212	0.82	0.8	0.9	173.3	12.2
80	90	213	0.98	0.9	1.0	208.2	14.7
90	100	213	1.26	1.0	4.1	269.3	19.0
90	91	21	1.00	1.0	1.0	21.0	1.5
91	92	21	1.00	1.0	1.0	21.0	1.5
92	93	21	1.08	1.0	1.10	22.6	1.6
93	94	22	1.10	1.1	1.1	24.2	1.7
94	95	21	1.18	1.1	1.2	24.7	1.7
95	96	21	1.20	1.2	1.2	25.2	1.8
96	97	22	1.23	1.2	1.3	27.1	1.9
97	98	21	1.31	1.3	1.4	27.5	1.9
98	99	21	1.42	1.4	1.5	29.9	2.1
99	100	22	2.10	1.5	4.1	46.1	3.3
0	**100**	**2,126**	**0.67**	**0.2**	**4.1**	**1,418.33**	**100**

The data was then converted into 5m composites. A statistical summary of the composites is shown in Table 12.16.

Table 12.16: Statistical Summary of Composites								
FIELD	**Number**	**Minimum**	**Maximum**	**Mean**	**Variance**	**Standard Deviation**	**Log Estimate of Mean**	**Coefficient of Variation**
AU	462	0.23	1.42	0.65	0.04	0.20	0.65	0.31
AG	462	2.37	13.10	5.08	3.55	1.88	5.07	0.37
CU	462	0.02	0.13	0.05	0.00	0.02	0.05	0.37
PB	462	0.07	1.70	0.15	0.01	0.10	0.15	0.70
ZN	462	0.17	0.93	0.38	0.01	0.12	0.38	0.32

12.6.4.1 Variography

Variography was undertaken to test for any spatial continuity of the metal grades, and to assist with the selection of suitable search parameters upon which to base the resource estimation.

Variography was carried out on the 5m composite data contained within the modelled zones. Absolute, as well as relative variograms were generated for AU grades, with the spherical scheme model being used for modelling purposes. Experimental and fitted model variograms, horizontally and vertically, are shown in Appendix 1. These indicated ranges of approximately 300m vertically and 30m vertically. In the horizontal direction no particular anisotropies were apparent.

12.6.4.2 Block Modelling

A model prototype was set up with a 50x50x10m parent block size. The details of this prototype are shown in Table 12.17.

Table 12.17: Block Model Prototype					
	Origin	**Maximum**	**Distance**	**Block Size**	**Number**
X	-2,200	500	2,700	50	54
Y	7,500	9,500	2,000	50	40
Z	750	850	100	10	10

This prototype was then used as the basis to set up a volumetric model, as controlled by the supplied TMF envelop. Sub-blocks were generated within the structure near the edges, down to minimum dimensions of 10x10x1m.

12.6.4.3 Density

An overall average density value of 1.60t/m^3 was used, as had been determined from previous Kazzinc measurements.

12.6.4.4 Grade Estimation

Grade estimation was carried out using Inverse Power of Distance Squared (IDW^2) for all metal grades, although Ordinary Kriging (OK) and Nearest Neighbour (NN) were also used for comparative purposes on the AU grade.

The estimation was run in a three pass plan, the second and third passes using progressively larger search radii to enable the estimation of blocks un-estimated on the previous pass. Grades were estimated using the 5m composite drillhole data. The search parameters were derived from the variographic analysis, with the first search distances corresponding to the distance at 2/3^{rds} of the variogram sill value and the second search distance approximating up to the variogram range. Block discretisation was set to 5x5x2 to estimate block grades. Sub-cells received the same estimate as the parent cell. A summary of the estimation parameters is shown in Table 12.18.

Table 12.18: Estimation Parameters					
Search Distances (m)				No. Of Composites	
1st Search		2nd Search			
Horizontal	Vertical	Horizontal	Vertical	Min	Max
150	15	300	30	5	15

Note:

- 3rd search >1,000m, with a minimum of only 1 composite
- ID^2 used for all Au, Ag, Cu, Pb, Zn grades

12.6.4.5 Resource Classification

The resource classification for the Chashinskoye tailings dam is classified in accordance with the Australian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves JORC Code (2004).

The following criteria were established for the classification of resources:

- ***Measured:*** No material was in this category, owing chiefly to lack of closely spaced drillholes and sample data;
- ***Indicated:*** Blocks within this category had to be covered by at least 150x150m spaced drillhole data. These blocks were assigned using perimeters defined on each 10m bench of the TMF; and
- ***Inferred:*** All other blocks within the TMF, but outside of 150x150m drilled areas, were assigned as inferred.

An example horizontal model section through the block model, showing this resource classification, is shown in Figure 12.5.

12.6.4.6 Validation

Following grade estimation a statistical and visual assessment of the block model was undertaken to assess successful application of the estimation passes and to ensure that as far as the data allowed, all blocks within the defined domain were estimated. The model validation methods carried out included:

- A visual assessment of grade;
- Global statistical grade validation;
- Model grade profile (swath plot) analysis; and
- Comparison with historical estimates.

A visual comparison of composite sample grade and block grade was conducted in cross section and in plan. An example section through the block model, with the estimated AU grades, is shown in Figure 12.6. Visually the model was generally considered to spatially reflect the composite grades.

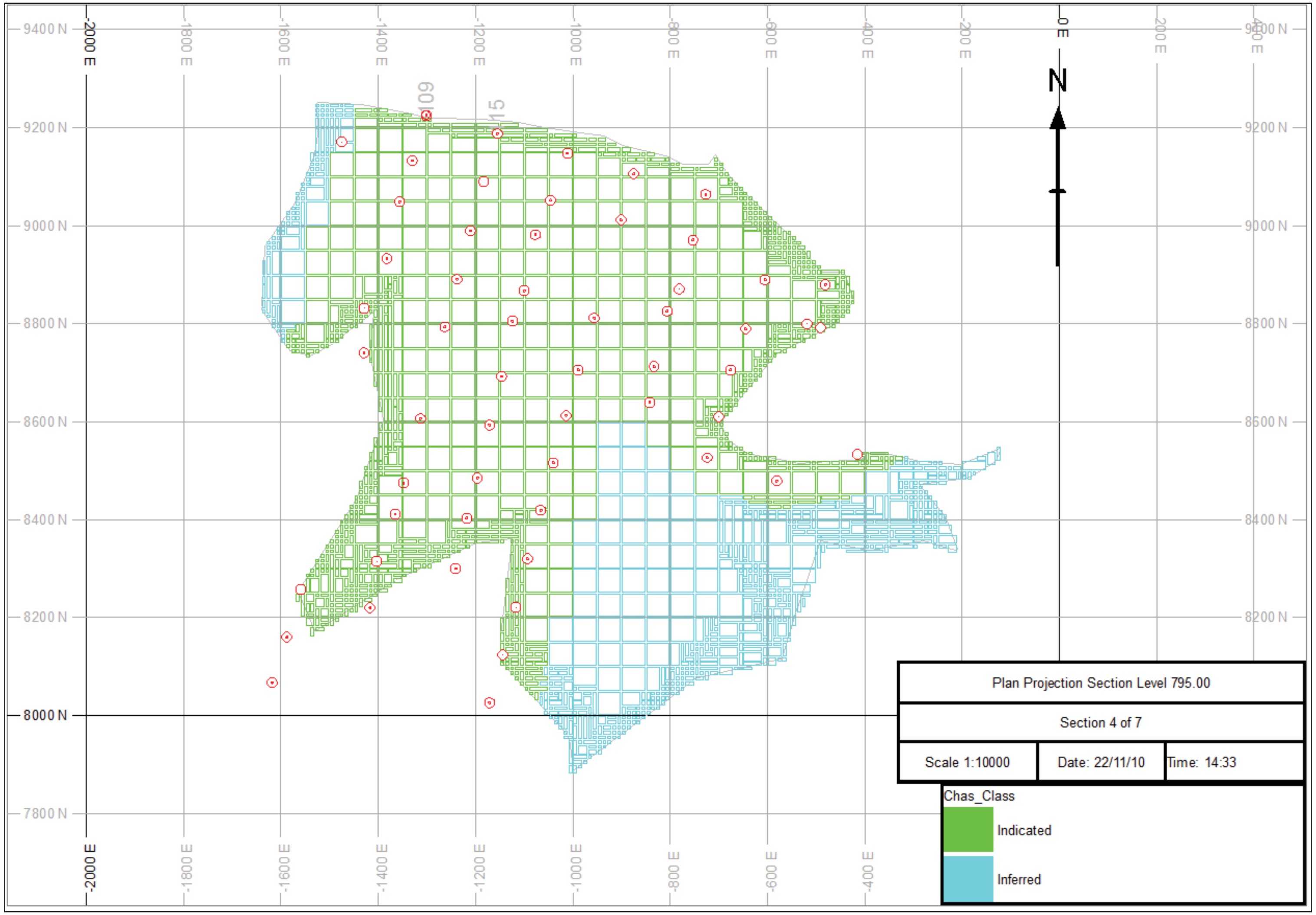


Figure 12.5: Bench Plan at 795mRL showing Resource Classification (Green = Indicated, Blue = Inferred)

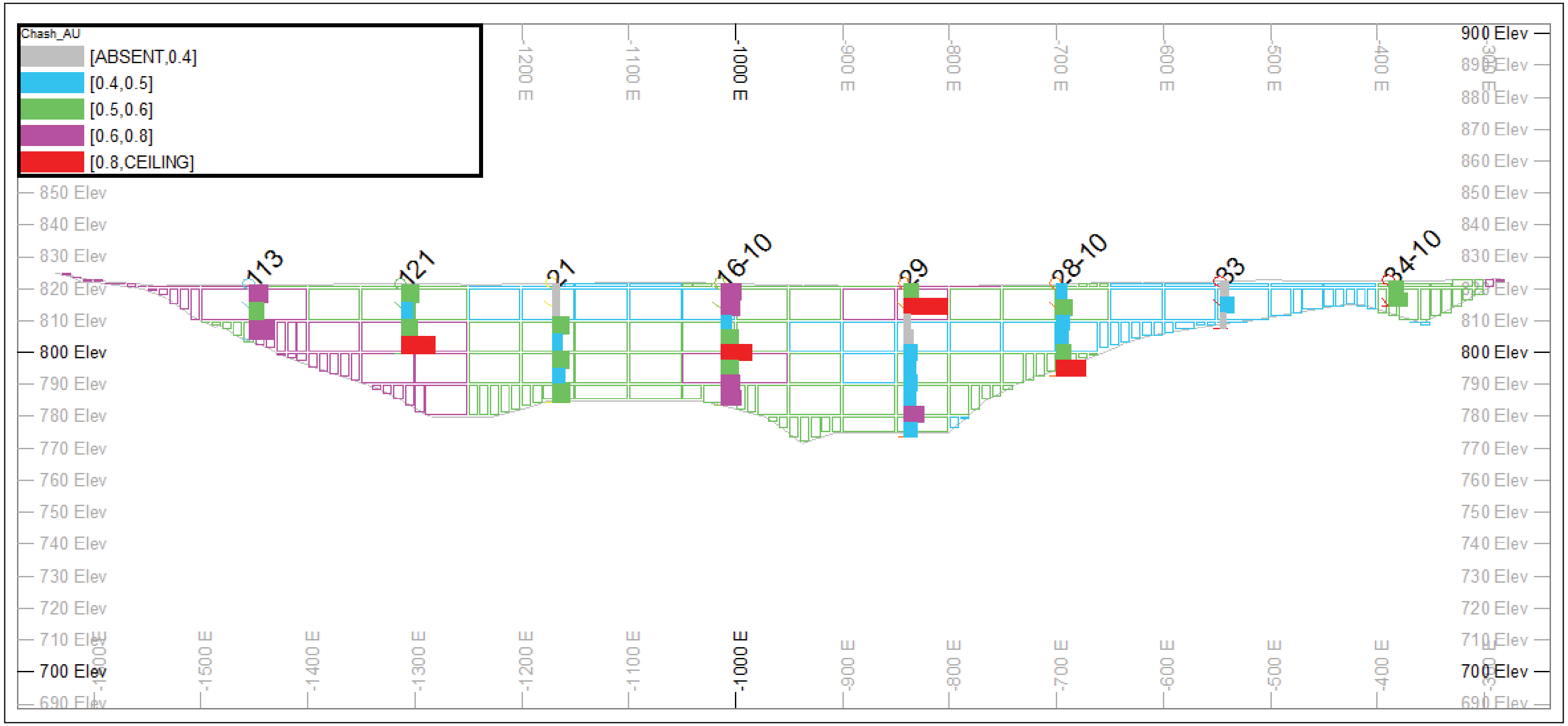


Figure 12.6: Vertical Section at 8,600mN (Vertical exaggeration), Showing Composites and Block Model Au Grades

A comparison of global average grades is summarised below in Table 12.19. As well as the principal inverse-distance grades in the block model, this table includes alternative estimates made using nearest neighbour and ordinary kriging. Overall these global average grades compare very well.

Table 12.19: Comparison of Global Average Grades

FIELD		Average Grades		Block Model Grades		
		Samples	Composites	ID	NN	OK
AU	g/t	0.65	0.65	0.67	0.68	0.67
AG	g/t	5.08	5.08	5.25		
CU	%	0.05	0.05	0.04		
PB	%	0.15	0.15	0.15		
ZN	%	0.38	0.38	0.38		

Note:

- Block model grades are for Indicated resources only
- No cut-off grades applied
- OK (Ordinary Kriging), NN (Nearest Neighbour), ID (Inverse Distance)

Model grade profiles (swath plots) were generated from the model by averaging both the drillhole composites and blocks along 100m spaced W-E slices. The model average grades were derived from indicated resources only. Overall the drillhole composite average grades and the block model average grades compare extremely well.

A comparison of this resource estimate is shown with reference to an earlier Kazzinc estimate from 2001 in Table 12.20. This shows a small increase in the estimated gold content (indicated versus C_1+C_2) of approximately 5%.

Table 12.20: Historical Comparison of Resource Estimates

	Kazzinc (2000)			WAI (01.01.2011)		
Classification	**C_1 + C_2**	**P_1**	**Total**	**Indicated**	**Inferred**	**Total**
Tonnes	53.3	22.1	**75.4**	57.8	30.0	**87.8**
Au g/t	0.69	0.49	**0.63**	0.67	0.50	**0.61**
Ag g/t	5.42	4.40	**5.12**	5.16	4.57	**4.96**
Cu %	0.04	0.05	**0.04**	0.05	0.06	**0.05**
Pb %	0.13	0.13	**0.13**	0.15	0.19	**0.16**
Zn %	0.35	0.38	**0.36**	0.38	0.45	**0.41**

As a general comment, the validations only determine whether the grade interpolation has performed as expected. Acceptable validation results do not necessarily mean the model is correct or derived from the right estimation approach. It only means the model is a reasonable representation of the data used and the estimation method applied.

12.6.5 Resource and Reserve Evaluation

The resource classification for the Chashinskoye tailings deposit is classified in accordance with the guidelines of the JORC Code (2004).

The final block model of the tailings deposit was used as the basis for resource evaluation. Summary results of the evaluation of the resources are shown in Table 12.21.

Table 12.21: Chashinskoye Tailings Mineral Resource Estimate (WAI 01.01.2011) (In Accordance with the Guidelines of the JORC Code (2004))							
Classification	**Tonnes (Mt)**	**Au (g/t)**	**Ag (g/t)**	**Cu (%)**	**Pb (%)**	**Zn (%)**	**AuEq* (g/t)**
Indicated	57.8	0.67	5.16	0.05	0.15	0.38	1.15
Inferred	30.0	0.50	4.57	0.06	0.19	0.45	1.06

* AuEq (Gold Equivalent) is based on the following commodity prices:

- Au = US$1,287/oz
- Ag = US$23/oz
- Cu = US$7,341/t
- Pb = US$2,422/t
- Zn = US$2,420/t

WAI has calculated Ore Reserves based upon the above Mineral Resource Estimate and in accordance with the guidelines of the JORC Code (2004). WAI has applied losses of 4.4% based upon historical data, and dilution of 0.5% to take into account minimal dilution from the bunds and floor.

Table 12.22: Chashinskoye Tailings Ore Reserve Estimate (WAI 01.01.2011) (In Accordance with the Guidelines of the JORC Code (2004))											
Classification	**Tonnes (Mt)**	**Gold (Au)**		**Silver (Ag)**		**Copper (Cu)**		**Lead (pb)**		**Zinc (Zn)**	
		Grade (g/t)	**Metal Content (koz)**	**Grade (g/t)**	**Metal Content (koz)**	**Grade (%)**	**Metal Content (kt)**	**Grade (%)**	**Metal Content (kt)**	**Grade (%)**	**Metal Content (kt)**
Proven	-	-	-	-	-	-	-	-	-	-	-
Probable	55.53	0.70	1,245	5.37	9,589	0.05	28.9	0.16	86.7	0.40	219.6
Total	**55.53**	**0.70**	**1,245**	**5.37**	**9,589**	**0.05**	**28.9**	**0.16**	**86.7**	**0.40**	**219.6**

13 TISHINSKIY TAILINGS DEPOSIT

13.1 Introduction

The Tishinskiy slimes ponds (tailings) are the accumulation of 'fines' deposited via a pipeline from the Ridder concentrator where, prior to August 2002, sulphide ore from the Tishinskiy deposit was processed. In August 2002 a filter press was commissioned at the RMCC which allowed dewatering of the slimes to occur and to be re-processed.

In the summer of 2003 an initial exploration programme was undertaken on slimes pond No.2 whereby mapping and 7 drillholes were completed in an effort to evaluate their re-processing potential as well as reduce their environmental impact. The ponds contain significant quantities of non-ferrous metals that have been exposed to oxidation through natural processes, including filtration into the underlying ground water and Ulba River.

13.1.1 Location & Access

The ponds are located some 500m south and southwest of the Tishinskiy complex, and are formed within the body of the waste rock dump derived from overburden stripped between 1965 and 1976 from the Tishinskiy deposit.

Pond No.1 is currently used as an emergency discharge facility for the Ridder complex and is flooded, however once this purpose ceases to be required it is intended to dewater and assess (complete a small drilling programme) as for Pond No.2.

13.1.2 Mineral Rights and Permitting

Kazzinc holds the right to mine under the terms of Contract No 2693 dated 19 June 2008 which expires on 19 May 2013. The Tishinskiy slimes collector's No. 1 and 2 covers an area of 30ha, the boundaries of which are defined by 8 corner points as detailed in Table 13.1 and shown in Figure 13.1.

Table 13.1: Tishninskiy Slimes Mining Lease Boundaries

Boundary Points	Geographical Co-ordinates	
	Latitude N	Longitude E
1	50°15'23"	83°21'28"
2	50°15'28"	83°21'29"
3	50°15'34"	83°21'28"
4	50°15'42"	83°21'16"
5	50°15'38"	83°21'46"
6	50°15'33"	83°21'53"
7	50°15'28"	83°21'52"
8	50°15'21"	83°21'38"

Figure 13.1: Outline of Tishinskiy Tailings Licence

13.2 Geology and Mineralisation

The Tishinskiy slimes ponds are a man-made feature and does not possess any recognised geological structure. The tailings are the waste products of the processing of gold and polymetallic ores (primarily silver, copper, lead and zinc) from the Ridder Mining and Concentrating Complex (MCC) and their composition thus reflects the major constituents of the ore.

13.3 Exploration Works

13.3.1 Drilling

13.3.1.1 Introduction

The Tishinskiy slimes ponds are relatively small structures, less than 500m in length and 200m wide, and so have few drillholes. Slimes Pond No.1 has had no exploratory investigation at it is flooded and still in use as an emergency discharge facility and therefore retains a high moisture content making it impossible to safely support a drill rig. It is intended to dewater this pond once its use as an emergency discharge facility has come to an end and engage in a drilling programme. Conversely Slimes Pond No.2 has been investigated by 2 drill campaigns in 2003 and 2008 using cable tool technique.

13.3.1.2 Historical Drilling

The initial drilling campaign in 2003 involved the completion of only 7 holes for a total of 123m using a cable percussion rig and 220mm diameter tools. The drill casing is driven in advance of the sampling tool (shell and bailer) to minimise cross-contamination and improve drilling and sampling results. In 2008 a further 12 holes were completed for an additional for 181m (Table 13.2).

All holes have been completed by LLP "Trias LTD" using cable percussion technique at a diameter of 220mm and are vertical.

Table 13.2: Drilling Campaigns at Tishinskiy Slimes Pond No.2			
Profile	**Drillhole No**	**Depth (m)**	
		Planned	**Actual**
7-7	AQS. 1	13	13
7-7	2 NCR.	23	23
7-7	AQS. 3	19	19
6-6	AQS. 4	21	21
6-6	AQS. 5	26	26
5-5	AQS. 6	12	12
2-2	AQS. 7	9	9
	Total 2003	**123**	**123**
6-6	7-p	14	14
5-5	8-p	15	15
5-5	9-p	15	15
3-3	10-p	16	16
4-4	11-p	16	16
3-3	12-p	16	16
2-2	13-p	16	16
2-2	14-P.	16	11
2-2	15-p	12	12
1-1	16-p	17	16
1-1	17-p	17	17
1-1	18-p	17	17
	Total 2008	**187**	**181**
	TOTAL	**310**	**304**

The interval between drillhole profiles is 80-110m, with hole spacing along profiles of approximately 40-50m, which complies with the requirements of Recommended practices of exploration and evaluation according to ETS GKZ at MG & ON RK dd. 2 June 1995 for evaluation of C_1 category reserves.

13.3.1.3 Sampling

To ensure qualitative and quantitative evaluation of the material found in the slime ponds samples were taken from each meter providing a total number of 295 samples (Table 13.3). There were no samples taken from the last 9m of hole 19-P since the hole passed through into the underlying material of the waste rock dump. All slime samples were processed in accordance with the scheme developed based on the existing grinding equipment, NSAM (analytical methods research council) requirements (Methods of geological control of analytical sample, VIMS, MG USSR, 1982). Samples are treated in accordance with the scheme developed at K=0.1, final grinding up to 0.07mm. All slime samples were analysed for copper, lead, zinc, gold and silver.

Combined samples (totalling 5) were taken at various levels of holes to analyse for trace elements and harmful impurities.

21 samples of 5kg were taken at various depth to analyse grain size composition and physical and mechanical properties of the slimes. Four bulk samples (1m^3 each) were taken to determine bulk weight and moisture content.

There were no samples taken for analysis of underground waters chemical composition since the holes were dry.

Table 13.3: Summary of Sampling from Slimes Pond No.2				
Type	Unit	No.	Analysis	
			Reduced	Complete
Slimes sample for chemical analysis	Sample	295	295	
Combined samples	Sample	5		5
Grain size, water-physical and physical and mechanical properties	Sample	21		21
Bulk samples for determination of bulk weight and moisture content	Sample	4		4

13.3.2 Laboratory Analysis

13.3.2.1 Introduction

Analytical studies were conducted in Kazzinc JSC RMCC chemical-analytical laboratory in compliance with the existing (Kazhak) requirements of quality assurance and accuracy of measurements.

Samples were processed (prepared) using a jaw crusher and disk pulveriser based on standard practices as per Chechett formula:

$$Q = kd^2$$

Where:

- Q = representative weight of sub-sample (kg);
- k = mineralisation discontinuity coefficient for Tishinsky ore equal to 0.1; and
- d = maximum diameter of sample chips (mm).

The initial ≈61.8kg was mixed and quartered until a sub-sample of 3.8kg which was subject to crushing (passing 2mm), splitting to 1.9kg and pulverised, and final splitting for a 1.3kg duplicate sample, 0.1kg sample for Cu, Pb and Zn analysis and a 0.5kg sample for Au and Ag analysis.

As well as standard internals controls the sample set also underwent external control at the "DGP Vniitsvetmet" laboratory for Au, Ag, Cu, Pb, and Zn, and in accordance with recommended State guidelines, with the results deemed acceptable.

13.3.2.2 Chemical and Analytical Study

Determination of grain size composition, water-physical and physicomechanical properties were carried out at the pilot production area of the concentrator. Samples were analysed for grain size composition; bulk weight, specific density, porosity, moisture content, moisture holding capacity as well as content of metal ions of copper, lead, zinc, iron in water extract were also determined; and chemical analysis for 15 elements was undertaken.

The granulometric composition of the slimes is summarised in Table 13.4 below, and as can be seen the slimes possess a very fine grain size with over 70% of the slimes -0.011mm but with grade being more evenly distributed throughout.

Table 13.4: Granulometric Composition of the Slimes									
Class Size (mm)	Removed	Grade (%)				Extraction (%)			
	%	Cu	Pb	Zn	Fe	Cu	Pb	Zn	Fe
-0.56 +0.32	1.05	0.29	0.41	1.86	4.46	0.98	0.96	0.76	0.87
-0.32 +0.12	4.8	0.14	0.19	1.05	3.50	2.18	2.03	1.97	3.11
-0.12 +0.074	7.32	0.21	0.22	1.61	4.36	5.02	3.60	4.60	5.90
-0.074 +0.044	1.7	0.30	0.28	2.20	4.84	1.66	1.07	1.46	1.52
-0.044 +0.022	1.02	0.62	0.79	4.69	8.96	2.05	1.80	1.87	1.69
-0.022 +0.011	9.76	0.76	0.72	6.60	9.70	24.2	15.7	25.13	17.5
-0.011 +0.005	30.71	0.34	0.48	2.93	5.72	34.04	32.92	35.10	32.47
-0.005	43.64	0.21	0.43	1.71	4.58	29.87	41.92	29.11	36.94
Source	**100**	**0.31**	**0.45**	**2.56**	**5.41**	**100**	**100**	**100**	**100**

13.4 Topographic Base and Surveying Data

The local survey grid, which was used during topographic surveys and for locating drillhole sites, is linked to 2nd and 3rd class triangulation points. The relative point location error is reported to be 0.12m.

Locations of drillhole collars were surveyed by theodolite traversing from survey grid points or by resection from a minimum of three co-ordinated points. Collar elevations were measured by trigonometric levelling from not less than two co-ordinated points. The mean square positional error did not exceed 0.9m in plan and 0.2m in elevation.

13.5 Kazzinc Reserve Estimation

Kazzinc have produced an internal reserve estimate (01.11.2008) as summarised in Table 13.5 below.

Table 13.5: Kazzinc Reserve Estimate for Tishinskiy (01.11.2008)						
Class	Tonnes (kt)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)
C_1	491.4	0.37	9.52	0.23	0.71	2.49

However it should be noted that as the initial deposition (pre 01.06.1992) into the slimes dam was during State ownership there is an amount within the dam that is the property of the State. Resultantly the slimes belonging to Kazzinc JSC are 279,457t (01.11.2008).

According to the working programme between MÈiMR and Šubinskoe LLP, for the processing of slimes at a rate of 200ktpa, it is anticipated that this reserve will be depleted in 3 – 5 years (before 2013). Slimes from No.2 pond are loaded onto road trucks, or rail cars, and transported to the beneficiation plant at Ridder a distance of 20km for processing together with ore from Tishinskiy mine.

13.6 WAI Mineral Resource Estimate

13.6.1 Topography

Two digital terrain models (DTMs) were created for the Tishinskiy tails. The first DTM was of the base of the TMF and was supplied by Kazzinc. Figure 13.2 is a plan view of the survey supplied by Kazzinc showing the base of the Tishinskiy TMF The second DTM is of the current surface level of the TMF (dated 27/09/2010). For each of the survey files the relevant strings were imported in to Datamine Studio® edited to the correct elevation and used to create wireframe surfaces. The two resultant wireframes delineated a volume, representing the remaining material, for sample selection and block model creation as described below.

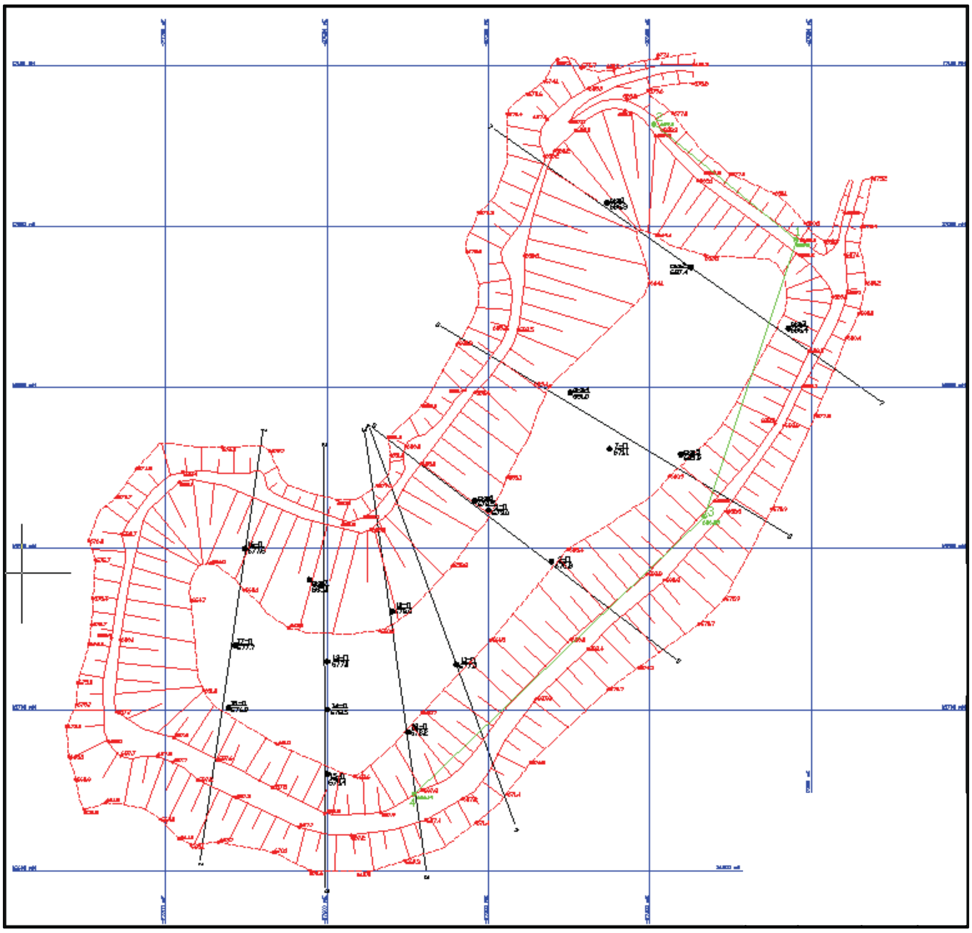


Figure 13.2: Plan View of Survey of Base of Tishinskiy TMF (100m grid)

13.6.2 Database Compilation

All of the sample data collated for the current project are summarised below in Table 13.6. A general plan and cross-section of these drillholes are shown in Figure 13.3 and Figure 13.4 respectively. The holes were drilled in two campaigns and as can be seen from the plan, the drillholes have generally been laid out on irregularly spaced sections between approximately 50m and 110m apart, with spacings of between 10m and 65m along each section line. The profiles were laid out across the strike of the direction of flow of the slimes. All drillholes are vertical.

Table 13.6: Sample Data Summary

	No. Of Holes	No. Of Samples	Holes Lengths (m)	
			Total	Average/Hole
Drillholes 2003	7	123	123	18
Drillholes 2008	12	181	181	15

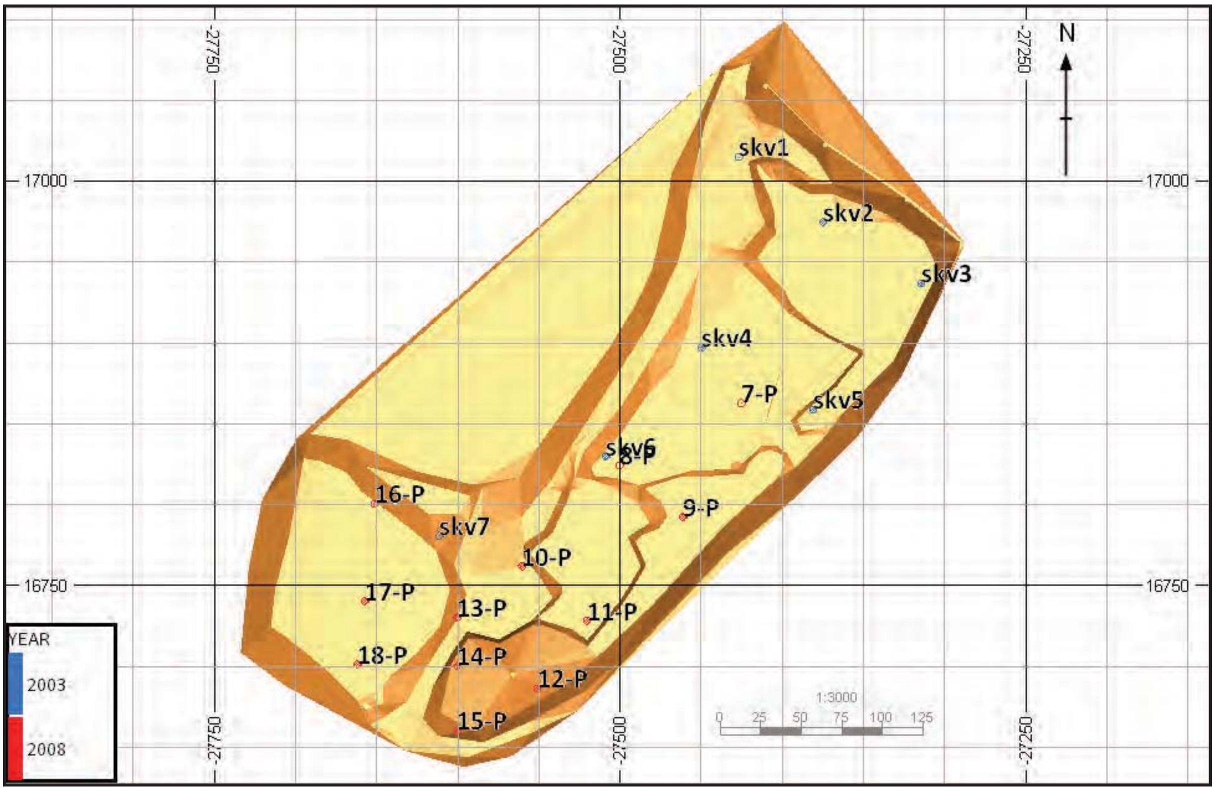


Figure 13.3: Plan View of Drillholes and TMF Resource Envelope

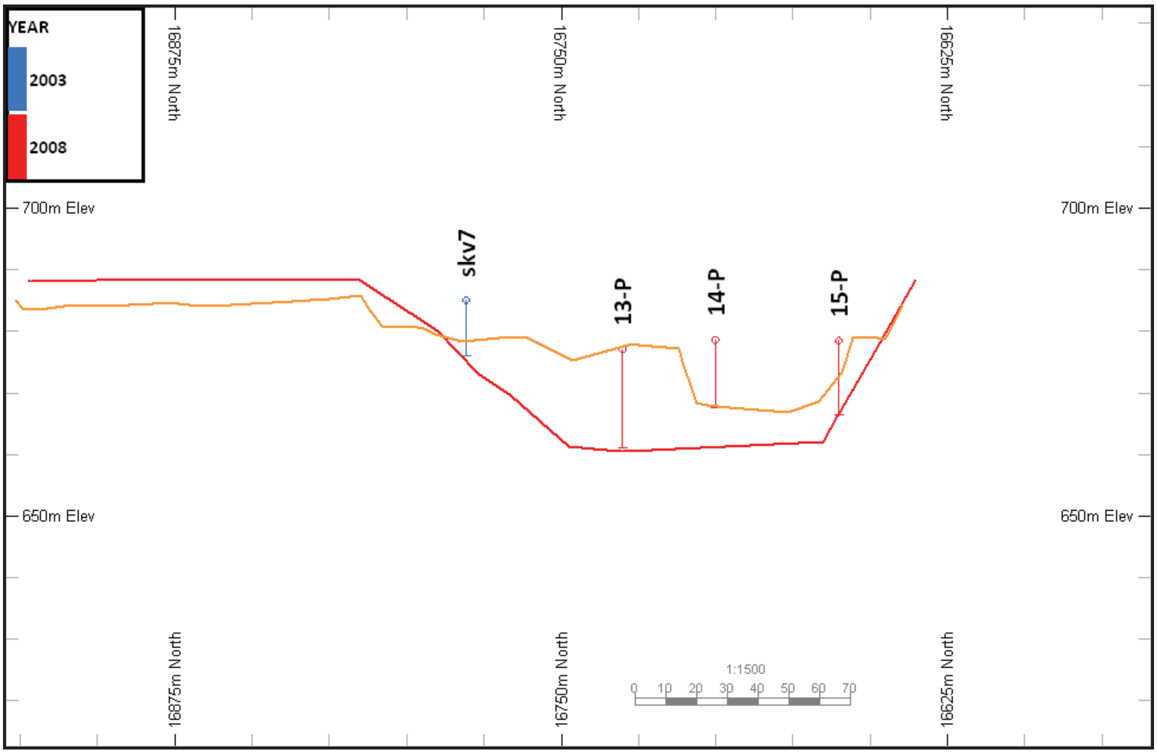


Figure 13.4: Vertical Section at 2 x Vertical Exaggeration -27600mE

13.6.3 Sample Data Processing

The supplied wireframe envelope was used to select and allocate all of the drillhole data. The data selected within the envelope is summarised in Table 13.7. Most of the 164 rejected samples are from parts of the pond that have already been excavated for processing.

Table 13.7: Selected Sample Summary

	No. Of Holes	No. Of Samples	Holes Lengths (m)	
			Total	Average/Hole
Drillholes	16	140	140	9

All of the drillhole samples have been assayed for Au, Ag, Cu, Pb and Zn. Most of the probability plots principally indicate a single log-normal distribution. A statistical summary of the selected samples is shown in Table 13.8. All samples were 1m in length. The two drilling campaigns show differing mean values but a similar variance and so are treated as a single population.

Table 13.8: Statistical Summary of Selected Samples

FIELD	Number	Minimum	Maximum	Mean	Variance	Standard Deviation	Log Estimate of Mean	Coefficient of Variation
AU	140	0.10	1.90	0.34	0.04	0.19	0.34	0.57
AG	140	1.00	17.40	9.61	11.71	3.42	10.32	0.36
CU	140	0.03	0.44	0.22	0.00	0.07	0.23	0.32
PB	140	0.04	1.29	0.72	0.04	0.20	0.75	0.28
ZN	140	0.18	3.95	2.39	0.50	0.70	2.47	0.29

A decile analysis was also completed on the selected gold grades, as shown in Table 13.9. From this and the log-probability plot, there does not appear to be a significant outlier population and so no top-cuts were applied to the data.

Table 13.9: Decile Analysis of Au Grades

Q%_FROM	Q%_TO	NSAMPLES	MEAN	MINIMUM	MAXIMUM	METAL	METAL%
0	10	14	0.10	0.10	0.10	1.40	2.94
10	20	14	0.18	0.10	0.20	2.50	5.25
20	30	14	0.20	0.20	0.20	2.80	5.88
30	40	14	0.30	0.30	0.30	4.20	8.82
40	50	14	0.30	0.30	0.30	4.20	8.82
50	60	14	0.36	0.30	0.40	5.10	10.71
60	70	14	0.40	0.40	0.40	5.60	11.76
70	80	14	0.40	0.40	0.40	5.60	11.76
80	90	14	0.49	0.40	0.50	6.90	14.50
90	100	14	0.66	0.50	1.90	9.30	19.54
90	91	1	0.50	0.50	0.50	0.50	1.05
91	92	1	0.50	0.50	0.50	0.50	1.05
92	93	2	0.50	0.50	0.50	1.00	2.10
93	94	1	0.50	0.50	0.50	0.50	1.05
94	95	2	0.50	0.50	0.50	1.00	2.10
95	96	1	0.60	0.60	0.60	0.60	1.26
96	97	1	0.60	0.60	0.60	0.60	1.26
97	98	2	0.60	0.60	0.60	1.20	2.52
98	99	1	0.70	0.70	0.70	0.70	1.47
99	100	2	1.35	0.80	1.90	2.70	5.67
0	**100**	140	0.34	0.10	1.90	47.60	100.00

The data were then converted into 2m composites. A statistical summary of the composites is shown in Table 13.10.

Table 13.10: Statistical Summary of Composites								
FIELD	**Number**	**Minimum**	**Maximum**	**Mean**	**Variance**	**Standard Deviation**	**Log Estimate of Mean**	**Coefficient of Variation**
AU	74	0.10	1.03	0.34	0.02	0.15	0.34	0.44
AG	74	1.00	14.20	9.56	7.42	2.72	9.78	0.28
CU	74	0.04	0.38	0.22	0.00	0.06	0.22	0.27
PB	74	0.08	1.02	0.71	0.03	0.17	0.73	0.23
ZN	74	0.29	3.72	2.39	0.34	0.59	2.43	0.25

13.6.4 Variography

Variography was undertaken test for any spatial continuity of the metal grades, and to assist with the selection of suitable search parameters upon which to base the resource estimation.

Variography was carried out on the 2m composite data contained within the modelled zone. Absolute, as well as relative variograms were generated for AU grades, with a spherical model being used for modelling purposes. These indicated ranges of approximately 47m horizontally and 5m vertically. In the horizontal direction no particular anisotropies were apparent.

13.6.5 Block Modelling

A model prototype was set up with a 10x10x4m parent block size. The details of this prototype are shown in Table 13.11.

Table 13.11: Block Model Prototype					
	Origin	**Maximum**	**Distance**	**Block Size**	**Number**
X	-27,700	-27,200	500	10	50
Y	16,600	17,100	500	10	50
Z	640	700	60	4	15

This prototype was then used as the basis to set up a volumetric model, as controlled by the supplied TMF envelop. Sub-blocks were generated within the structure near the edges, in order to better fit the wireframe geometry, down to minimum dimensions of 1x1x0.5m.

13.6.6 Density

According to data received from water-physical testwork on the properties of the slimes the following parameters apply:

- specific density ranges 1.36 - 3.36t/m^3 (average 2.44t/m^3); and
- volumetric weight is 0.675 - 1.205t/m^3.

The mean volumetric weight is considered to be 0.88t/m^3 in dry weight taken from 17 samples from percussive drilling and 4 bulk samples (1m^3) to determine the volumetric weight.

WAI have consequently applied an average (dry) density value of 0.88t/m^3 to mineral resource estimation.

13.6.7 Grade Estimation

Grade estimation was carried out using Inverse Power of Distance Squared (IDW^2) for all metal grades, although Ordinary Kriging (OK) and Nearest Neighbour (NN) were also used for comparative purposes on the AU grade.

The estimation was run in a three pass plan, the second and third passes using progressively larger search radii to enable the estimation of blocks unestimated on the previous pass. Grades were estimated using the 2m composite drillhole data. The search parameters were derived from the variographic analysis, with the first search distances corresponding to the distance at 2/3^{rds} of the variogram sill value and the second search distance approximating up to the variogram range. Block discretisation was set to 5x5x2 to estimate block grades. Sub-cells received the same estimate as the parent cell. A summary of the estimation parameters is shown in Table 13.12.

Table 13.12: Estimation Parameters

Search Distances (m)					
1st Search		**2nd Search**		**No. Of Composites**	
Horizontal	Vertical	Horizontal	Vertical	Min	Max
31	3	47	5	5	15

- 3rd search up to 250m with a minimum of 1 composite required
- IPD^2 used for Au, Ag, Cu, Pb, Zn grades

13.6.8 Resource Classification

The resource classification for the Tishinskiy slimes pond is classified in accordance with the Australian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves JORC Code (2004).

The following criteria were established for the classification of resources:

Measured No material was in this category, owing chiefly to lack of closely spaced and sample data;
Indicated Blocks within this category had to be covered by at least 40x40m spaced drillhole data; and
Inferred All other blocks within the TMF, but outside of 40x40m drilled areas, were assigned as *Inferred*.

An example horizontal model section through the block model, showing this resource classification, is shown in Figure 13.5.

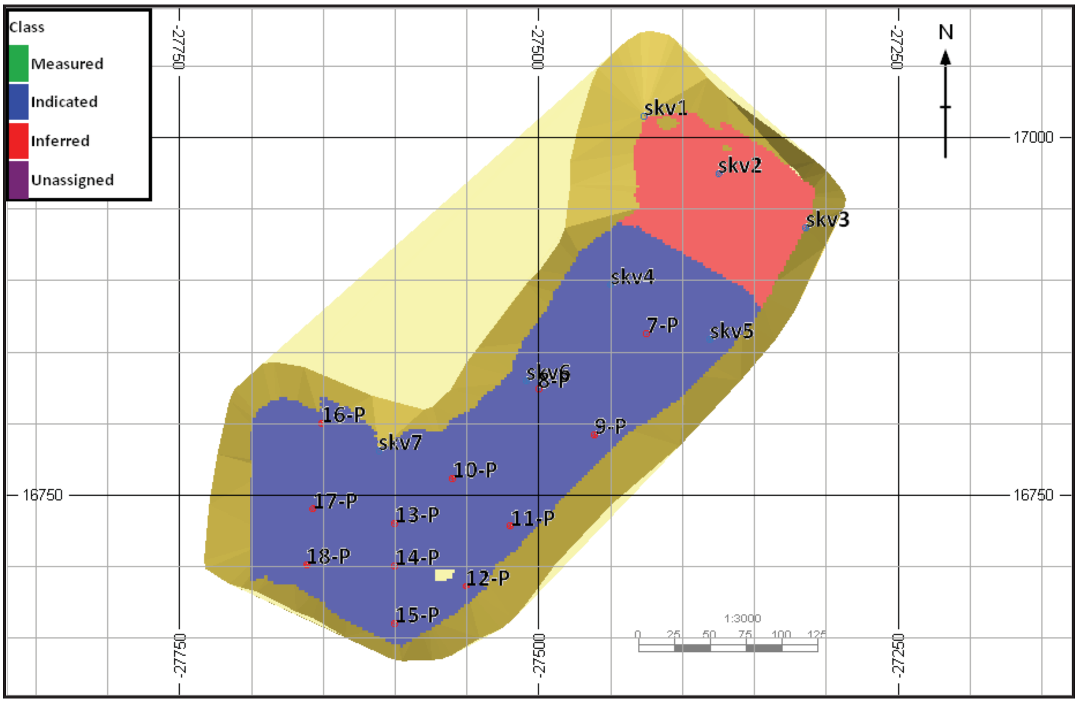


Figure 13.5: Plan View at Surface Showing Resource Classification

13.6.9 Validation

Following grade estimation a statistical and visual assessment of the block model was undertaken to assess successful application of the estimation passes and to ensure that as far as the data allowed, all blocks within the defined TMF domain were estimated. The model validation methods carried out included:

- A visual assessment of grade;
- Global statistical grade validation; and
- Model grade profile (swath plot) analysis.

A visual comparison of composite sample grade and block grade was conducted in cross section and in plan. An example section through the block model, with the estimated AU grades, is shown in Figure 13.6. Visually the model was generally considered to spatially reflect the composite grades.

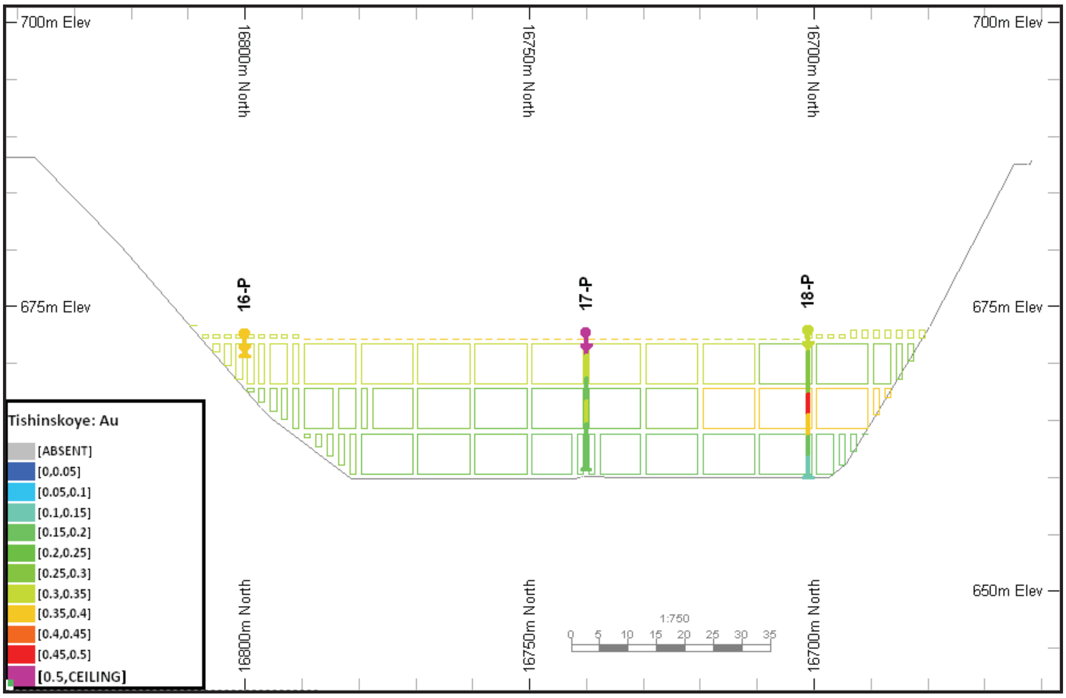


Figure 13.6: Vertical Section at -27660mE Showing Composite and Block Model Au Grades (2 x Vertical Exaggeration)

A comparison of global average grades is summarised below in Table 13.13. As well as the principal inverse-distance grades in the block model, this table includes alternative estimates made using nearest neighbour and ordinary kriging. Overall these global average grades by compare very well.

Table 13.13: Comparison of Global Average Grades

FIELD	Unit	Average Grades		Block Model Grades		
		Samples	Composites	ID	NN	OK
AU	g/t	0.34	0.34	0.34	0.35	0.33
AG	g/t	9.61	9.56	9.85		
CU	%	0.22	0.22	0.23		
PB	%	0.72	0.71	0.74		
ZN	%	2.39	2.39	2.44		

Notes:

1. Block model grades are for indicated resources only
2. No cut-off grades applied
3. OK (ordinary kriging), NN (nearest neighbour), ID (inverse distance)

Model grade profiles (swath plots) were generated from the model by averaging both the drillhole composites and blocks along 40m spaced N-S and E-W slices. The model average grades were derived from indicated resources only. Overall the drillhole composite average grades and the block model average grades compare extremely well.

As a general comment, the validations only determine whether the grade interpolation has performed as expected. Acceptable validation results do not necessarily mean the model is correct or derived from the right estimation approach. It only means the model is a reasonable representation of the data used and the estimation method applied.

13.6.10 Resource and Reserve Evaluation

The resource classification for the Tishinskiy simes pond is classified in accordance with the Australian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves JORC Code (2004).

The final block model was used as the basis for resource evaluation. Summary results of the evaluation of the resources are shown inTable 13.4, and are valid as at 01.01.2011.

Table 13.14: Tishinskiy Slimes Mineral Resource Estimate (WAI 01.01.2011)
(In Accordance with the Guidelines of the JORC Code (2004))

Classification	Volume (m^3)	Tonnes * (kt)	Au (g/t)	Ag (g/t)	Cu (%)	Pb (%)	Zn (%)	AuEq (g/t)
Indicated	378,744	333	0.33	9.93	0.22	0.76	2.46	2.77
Inferred	50,909	45	0.58	8.73	0.23	0.56	2.64	3.01

* Based on volume and an average density value (mean volumetric weight) of 0.88t/m^3.

Notes:

- AuEq calculation based on prices of
  - Au 1287 US$/oz
  - Ag 23 US$/oz
  - Cu 7341 US$/t
  - Pb 2422 US$/t
  - Zn 2420 US$/t

WAI has calculated Ore Reserves based upon the above Mineral Resource Estimate and in accordance with the guidelines of the JORC Code (2004). WAI has applied losses of 4.4%, based upon historical data, and dilution of 0.5% to take into account minimal dilution from the bunds and floor.

Table 13.15: Tishinskiy Slimes Ore Reserve Estimate (WAI 01.01.2011)
(In Accordance with the Guidelines of the JORC Code (2004)

Classification	Tonnes (Mt)	Gold (Au)		Silver (Ag)		Copper (Cu)		Lead (pb)		Zinc (Zn)	
		Grade (g/t)	Metal Content (koz)	Grade (g/t)	Metal Content (koz)	Grade (%)	Metal Content (kt)	Grade (%)	Metal Content (kt)	Grade (%)	Metal Content (kt)
Proven	-	-	-	-	-	-	-	-	-	-	-
Probable	0.32	0.33	3.41	9.89	101.79	0.22	0.71	0.76	2.42	2.44	7.82
Total	**0.32**	**0.33**	**3.41**	**9.89**	**101.79**	**0.22**	**0.71**	**0.76**	**2.42**	**2.44**	**7.82**

14 SHAIMERDEN DEPOSIT

14.1 Introduction

The Shaimerden structure was discovered in 1956 during prospecting for bauxite, exploration for which continued in the area until 1992. In 1989 a programme to investigate scandium levels in the bauxite deposits was commenced and was later extended to detect additional elements. The expanded investigations revealed anomalous lead and zinc concentrations in the Shaimerden area. Exploration drilling to define the resource was undertaken in 1993 by the Stepnaya exploration team of the Zhetigera Expedition, as part of a State run regional investigation programme, which was terminated in 1995 consequent upon a lack of finance.

In 1996 the deposit was taken over by the Zinc Corporation of Kazakhstan (ZCK) comprising joint venture between Ennex International plc and Acier, who implemented a cored borehole drilling programme with the intention of undertaking a bankable feasibility study into the potential for developing the deposit through an open pit operation.

In 2001 ZincOx, formed as a Dutch company in 1997 by Andrew Woollett and Noel Masson formerly with Reunion Mining plc acquired a 95% interest in the Shaimerden zinc oxide deposit.

Due to the deteriorating market conditions, ZincOx sold its 95% interest in the deposit to Kazzinc, Kazakhstan's largest producer of zinc, in December 2003. The consideration for the sale was US$7.5M in cash and, subject to the reconciliation of expected and actual zinc contained additional deferred payments.

The deferred payments, which were made in the January following the year end, amounted to US$0.2375 in every dollar that the zinc price was above US$800/t on the first 200kt Zn mined from the deposit. In order to ensure that the payments were spread over a number of years, there were deemed minimum 40ktpa and maximum 60ktpa zinc mining rates assumed in the agreement.

By utilising heavy duty machinery for the project Kazzinc revised and reduced the term of the pit development by a factor of more than 4 times. ZincOx envisaged mining over 17 years averaging 250ktpa whilst Kazzinc planned to complete development of the same volume within 5.5 years averaging up to 1Mtpa. Latest projections indicate that stockpiled ore will provide raw material to the Ridder Zinc Plant until 2019.

The Shaimerden mine commenced production on 17 September 2006. In spite of considerable problems caused by water ingress to the open pit, which culminated in it flooding in March 2008, the water problem was stabilised and the operation is currently extracting zinc at the rate of about 30kt per month.

14.1.1 Location & Access

Shaimerden is located some 200km SSW of the city of Kostanay and about 110km south west of Lisakovsk, in the Kamysty region of the Kostanay District of northern Kazakhstan (Figure 14.1).

The nearest settlements comprise the village of Krasnogorsk 7km south-east and KrasnoOktyabrsky 14km north-east from the deposit, whilst the regional centre, Kamysty lies 50km to the west.

Figure 14.1: Shaimerden - Location Plan

14.1.2 Access and Infrastructure

The access to the mine from Kostanay is via metalled roads, initially of a reasonable standard comprising a four lane highway to Rudnay but deteriorating thereafter. The open pit lies about 7kms west of Krasnogorsk a small village where the mine hostel is located. Travelling time from Kostenay is from 2.5 hours upwards depending on immediate weather conditions.

Rail links are excellent, connecting the Kostanay district with Russia and the rest of Kazakhstan at Tobol and Arka stations and there exists a short spur to the mine loading facility from the main line.

Mining and ancillary industries developed in the region (within a radius of 200km) include KrasnoOktyabrsky Bauxite Mine (KBRU - Aluminum of Kazakhstan OJSC branch) which is contiguous with the Shaimerden licence, Zhitikara Asbestos Complex, Lisakovsky Iron Ore Mining & Dressing Complex (LGOK) and Sokolovsko-Sarbaisky Iron Ore Mining & Dressing Complex (SSGPO).

There are no permanent rivers in the area, but there are many fresh and saline water lakes, the largest being Lakes Sorkol, Koyandykopa, Sunaly and Tunkuyukty. The nearest permanent water source is the Tobol river which is in 60km north of the deposit.

The region lacks power resources; coal from Karaganda and Kushmurun, and oil products are brought in and electric power is supplied from the Ural power system lines (Russia) via the Troitsk –Rudny–Lisakovsk–Krasnogorsk 110kv power line. Potable and domestic water supply is provided from underground sources.

In addition to the widespread bauxite deposits there are numerous clay deposits suitable for brick production and sand and stone suitable for construction.

There is an available supply of skilled labour in the region.

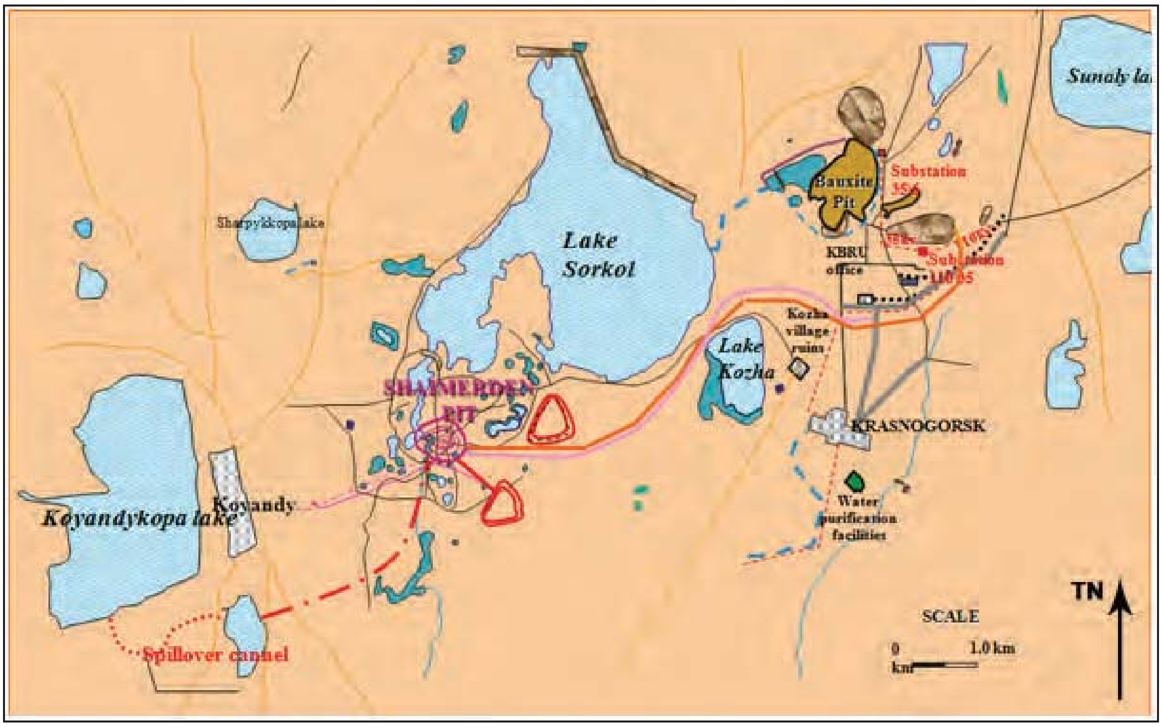


Figure 14.2: Shaimerden – Detailed Location Plan

14.1.3 Topography and Climate

The local relief is flat with absolute levels in the area of the deposit in the range of 239–247m, although in some places undulating with lakes, salt pans and occasional 'ravines' and gullies.

Vegetation is minimal comprising sparse grassland with very occasional low stunted bushes; the whole area is dotted with salt pans and the high water table has produced a level of salinity in the soil inimicable to plant life, in addition to the problems caused by water inflow to the pit.

The climate of the region is typical continental, with short, hot dry summers and extended extremely cold winters. The average annual air temperature is +3°C (Dzhetikara meteorological station +2.66°C). The hottest month is July, with an average monthly temperature of +20.5°C, and a highest temperature of 39.3°C. The lowest temperatures are normally in January, with an absolute minimum of -42.3°C and average temperature varying in the range 12.5 to – 22.2°C. Winds are a permanent feature of the regional climate.

The amount of precipitations per month from the Zhetigara weather station for period from November 2007-March 2010 is summarised in Table 14.1.

Table 14.1: Precipitation Recorded at the Zhetigara Weather Station

Month	1	2	3	4	5	6	7	8	9	10	11	12	Total
2007	-	-	-	-	-	-	-	-	-	-	21.7	5.0	-
2008	8.5	27.0	40.0	26.5	46.6	22.7	23.3	1.0	11.3	21.2	6.1	5.8	240.0
2009	17.1	10.4	22.2	27.3	36.7	28.1	10.8	29.6	1.9	42.3	1.1	50.4	277.9
2010	21.7	13.7	21.6	-	-	-	-	-	-	-	-	-	-

The deepest snow cover in the open areas is not more than 25cm which produces soil freezing (down to 2.0-2.5m) during the winter months.

> ***WAI Comment:*** *The Shaimerden mine is located in an area of unremarkable steppe, and although winter weather conditions can be harsh, the location presents no major obstacles to the operation of the mine.*

14.1.4 Mineral Rights and Permitting

The licence for the right of subsoil use for prospecting and development by the "Shaimerden Joint Venture" for 25 years was approved on 04.05.1997. The licence, comprising 5 years exploration and 20 years mining, comfortably accommodates the revised mining and ore processing schedule noted in section 13.4.5. The mining licence covers an area of 3.23km^2, and the total area under licence is 12.1km^2. The mining licence co-ordinates are given in Table 14.2 below.

Table 14.2: Co-ordinates of Mining Licence Area		
Point	**Northing**	**Easting**
1	51°59'21"	62°14'35"
2	51°59'21"	62°16'14"
3	51°58'32"	62°16'14"
4	51°58'32"	62°14'35"

> ***WAI Comment:*** *An inspection of the licence documentation has shown that all are in good order and suitable for the future needs of the Company.*

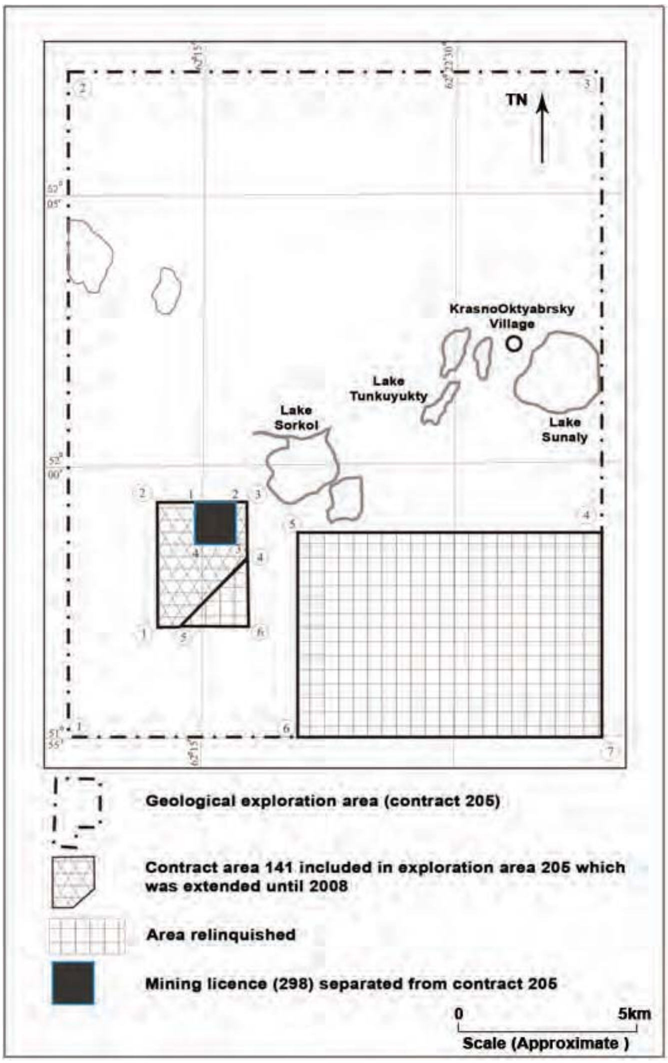


Figure 14.3: Shaimerden – Plan of Exploration and Mining Licence

14.2 Geology and Mineralisation

14.2.1 Regional Geology

The Urals Orogenic belt is divided by the major north-south Main Urals fault. To the west are Precambrian and early Palaeozoic shield and intraplate rift basins. The east is characterised by a mainly oceanic crustal regime with ophiolitic complexes and island arc related volcano-sedimentary basins (andesite-basalt, spilite and trachyte), as well as volcano-plutonic belts and intervening sedimentary basins characteristic of an active continental margin.

Arc complex rocks of Silurian to Carboniferous age are preserved adjacent to the Main Urals fault, while late Devonian to Permian synorogenic granitoid complexes are found in the southern section of the eastern Urals. Shaimerden is located on the eastern side of the north-south trending transcontinental Urals Orogenic belt within the 700km long Valerianovsky belt characterised by Carboniferous sediments and volcanics, and at the southern end of the Kostenay megasyncline and on the eastern limb of the Krasnoktyabr syncline.

The smaller Krasnoktyabr syncline strikes north-south and comprises sedimentary-volcanogenic rocks of Lower Carboniferous age. These rocks are generally characterised as andesite porphyries and occasionally andesite-basalt porphyries, along with their corresponding tuffs, breccias, sandstones and limestones. These volcanic units are cut by dioritic intrusive rocks of Lower Carboniferous age which form massifs and dykes.

Considerable weathering has occurred and the entire sequence is overlain by early Mesozoic alluvial weathering crust formations and Cainozoic sedimentary overburden.

Geological units which occur in the Shaimerden area are summarised below in order of decreasing age.

14.2.1.1 Basement Rocks

The Palaeozoic basement rocks in the Shaimerden area were formed by intensive volcanism, alternating with periods of carbonate accumulation and the formation of terriginous rocks. The thickness of the sedimentary-volcanogenic sequence exceeds 2,000m.

The Shaimerden deposit is hosted by the middle Sokolov formation which was formed in a shallow sea during a period when volcanic activity was dormant. The strata are characterised predominantly by limestone, which is described as organic, dark grey to pink, fine grained, massive and infrequently bedded. Remains of algae, foraminifera, crinoids, corals and brachiopods have been logged within the limestone and dolomitisation is present in places.

The limestone band has a northeasterly strike with a strike length of approximately 25km. The width of the limestone varies from a few hundred metres to more than 3km. In restricted areas, the central part of the limestone band is interbedded with tuffs. At the margins of the limestone unit, transitional zones including volcanic ash and vegetation detritus are noted and the limestone tends to be dark grey and clayey.

The volcanic rocks to the northwest and southeast of the limestone band comprise predominantly fine grained andesite porphyrite which is intensely altered. Tuffs consisting of unsorted volcanic fragments in a chloritised matrix are also present.

Intrusive formations in the Shaimerden area include small massifs and dykes and are composed of diorite or dioritic porphyrite. The composition of these bodies is generally consistent with the composition of the volcanogenic sediments.

14.2.1.2 Weathering Crust

A long break in sedimentation occurred through the Triassic and early Cretaceous periods, accompanied by the formation of a weathering crust on the Palaeozoic rocks. Weathering crusts were preferentially developed over tuffs, porphyrites and strata comprising interbedded limestone and volcanogenic rocks. In areas of comparatively pure limestone, weathering was restricted to a thickness of a few metres and was concentrated in fractured zones.

Although the composition of the weathering crust varies according to the source rocks and the position, the weathering profile is generally represented by a reduction of silica, alkaline and alkaline earth elements. Composition of the weathering crust is generally clay, except over granite porphyry where mica and quartz may be present and in areas where ferric oxides have formed carbonate or chalcedony formations. The thickness of the weathering crust is highly variable, and can extend to between 50 and 200 m in basement depressions. The degree of weathering is strongly controlled by structure. Tectonic faults in the Palaeozoic basement have resulted in the generation of deeply developed, linear weathering crusts, limestone karst formation and development of karst erosion forms in the pre-Cretaceous surface. Linear weathering crusts are also formed over contacts between limestone and volcanogenic rocks.

14.2.1.3 Cretaceous Sediments

Overlying the weathering crust is a sequence of Cretaceous continental clayey sediments which include all the bauxite deposits in the area. The clays have limited regional extent but are present over most of the Sorkofov limestone which hosts the Shaimerden deposit. The Cretaceous clays generally infill karstic and erosional basins in the underlying rocks and their thickness is therefore highly variable; the clays are fairly thin on a regional basis, but locally the thickness can reach 80-100m.

The base of the Cretaceous clay unit is represented by multicoloured fragmental clays which result from minimal transportation and reworking of the weathering crust clays. Sedimentary material tends to be unsorted and brecciated, and inclusions of fragments of Palaeozoic rocks have been noted. In the upper section of Cretaceous clays, argillic bauxite and kaolin are more prevalent.

14.2.1.4 Alluvium

The overburden in the Shaimerden area is of Oligocene age and everywhere comprises alluvial sediments. The sediments are between 30 and 40 m in thickness and include a mixture of laminated clays, sands and sandy clays, with occasional pebble or gravel inclusions. The clays are yellow, grey, brown and generally firm or stiff. The sands comprise micaceous quartz, while pebbles have been described as rounded siliceous rocks. At the base of the alluvial sequence a stiff, plastic olive green clay layer is commonly intersected, with a thickness between a few centimetres and several metres and is referred to as the Chigansk Clay. In some areas the Chigansk Clay is replaced by a quartz glauconitic sand but over the Shaimerden deposit itself it is represented by a dense plastic clay. The Chigansk Clay tends to be present in lenses up to a few kilometres in width and one such lens is present over the Shaimerden deposit.

14.2.1.5 Structure

The limestone sequence of basement rocks identified at the Shaimerden deposit extends approximately 25km in a northeast-southwest orientation and has a width which ranges from a few hundred metres to more than 3km. The northwestern and southeastern margins of the limestone unit are interpreted to be conformable contacts with the surrounding volcanic rocks and represent a change in depositional environment. The abrupt truncation of the limestone unit at the southwestern and northeastern boundaries is attributed to the presence of northwesterly orientated faults. A series of faults with this orientation are interpreted to cut the limestone unit in the Shaimerden region.

Tectonic breaks in the area follow three main structural trends:

1) Northeast-southwest trending breaks which parallel the main strike of the sedimentary-volcanogenic sediments and are associated with a regional structure called the Livanian Fault.
2) Crosscutting northwest-southeast trending faults which in some cases are associated with intrusive bodies and may have controlled volcanism.
3) Minor faults of various orientations with limited offset and throw.

The depth to unweathered basement rocks is strongly controlled by these tectonic features and varies considerably throughout the area. A number of basement troughs have been identified which are associated with tectonic breaks or with lithological contacts. Gravity surveying was used to help locate positions of these troughs.

14.2.2 Local Geology

14.2.2.1 General

In the Shaimerden area the lithologies comprise a sequence of intertidal to open-marine carbonates and evaporites of Viséan (Early Carboniferous) age and andesitic volcanics that are intruded by small diorite and granite bodies (Figure 14.4). Upper Cretaceous sediments fill karst depressions within the Carboniferous limestone and host bauxite deposits. Overlying the whole area are 40m of Tertiary-Quaternary sands and clays (Figure 14.4, Figure 14.5 and Figure 14.6).

The Shaimerden lead zinc orebody is located in a deep depression in karstic limestone of the Sorkolov formation. The depression is associated with a west northwest tectonic break which is accompanied by elongated linear intrusive bodies composed of andesite and diorite porphyry/rite. Cross-cutting structures are also present with the orebody being located at the intersection of these structures.

The alluvium in the deposit area is relatively uniform in thickness while the Cretaceous clays and weathering crust are variable in thickness. The greatest thickness of clay material occurs at the deposit location. The deep troughs of weathered limestone, which appear to follow faults, are narrow in extent and steeply dipping.

Table 14.3: Mine Stratigraphic Succession

Geochronological Period	Lithology	Thickness (m) and Occurence
Quaternary (Q)	Soil, sandy loam, loam	1 – 2m to 3-5m (north west area)
Paleogene(Oligocene) (P_3)	Sandy clay and fine grained sand with minor Clay component	20-25m to 35-40m (western area)
Paleogene(Oligocene-Eocene) (P_{2-3})	Predominantly glauconitic clay	5 – 15m from east to west (Level 220-210)
Upper Cretaceous (K_2)	Hard and soft bauxitic clay' Variegated dense clay and lignite	5-10 to 30-40m (pit perimeter, NE to SSW (Level 210 – 200)
Upper Trias – Lower Cretaceous ($T_{3-}K_2$)	Weathered alluvial shales and limestones	Levels 210 – 190m
Lower Carboniferous (C_1)	Grey limestones and dark grey shales	Ore hosting horizons below Levels 200 = 190m

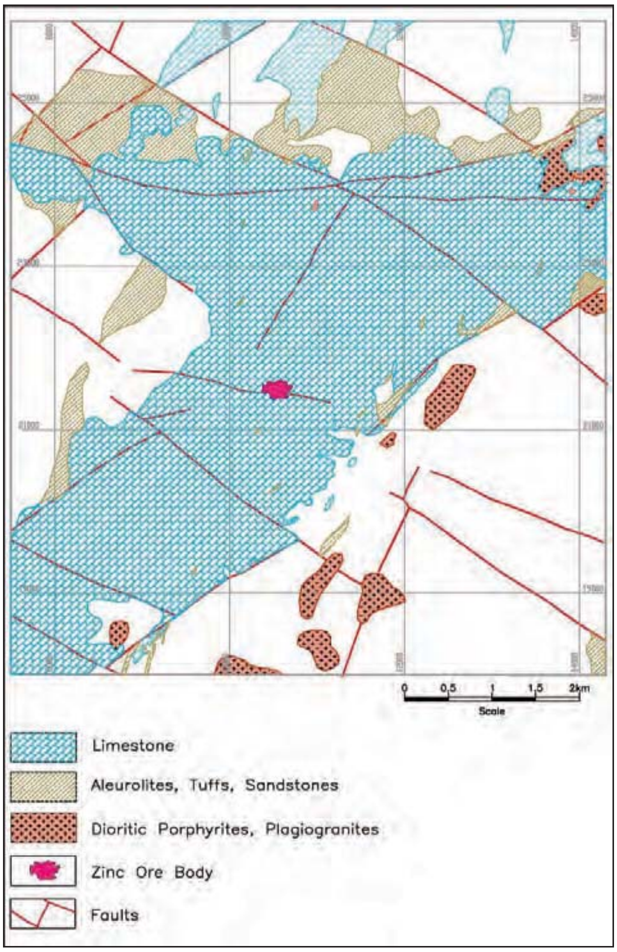


Figure 14.4: Shaimerden – Area Geology

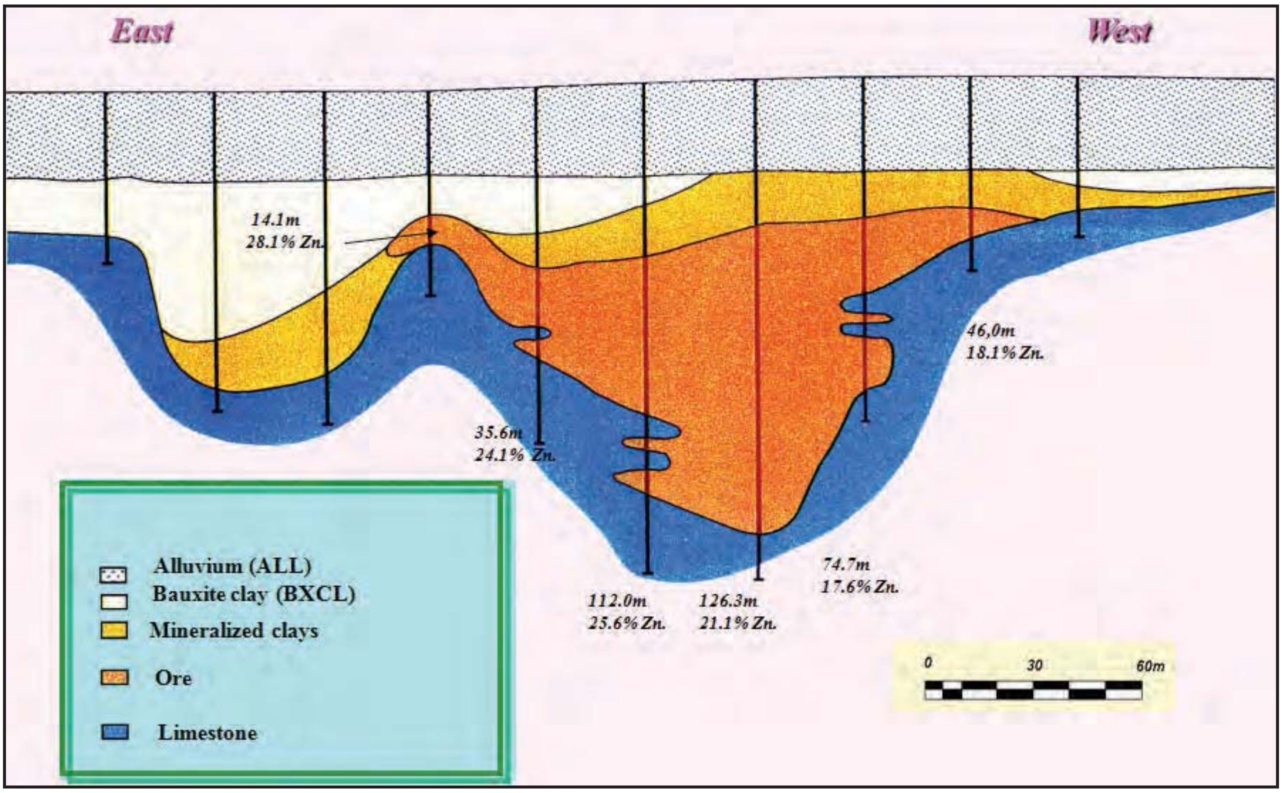


Figure 14.5: Geology of the Shaimerden Pit Area – East-West Section

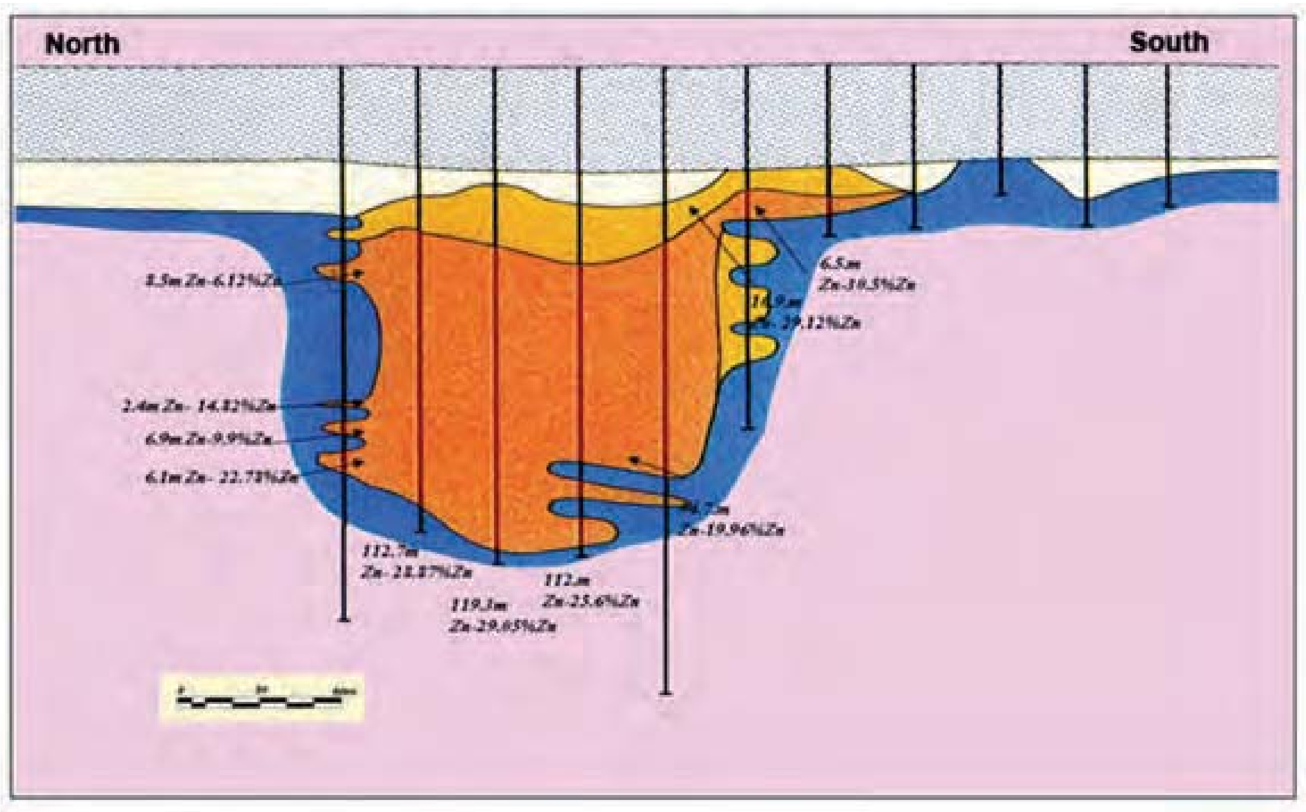


Figure 14.6: Geology of the Shaimerden Pit Area –North-South Section. (Legend as for Figure 14.5)

14.2.2.2 Ore Body

The deposit is hosted in a massive, clean Carboniferous limestone and has resulted from the in-situ oxidation during the Triassic-Cretaceous period of a body of massive sphalerite mineralisation. The deposit occurs within a weathered depression measuring 450m east-west, 150m north-south with mineralisation occurring to a depth of 240m below the surface topography.

Emplacement of the orebody is thought to have resulted from the circulation of ore-bearing geothermal solutions in the period after deposition of the rocks and prior to the Triassic weathering. The tectonic structures present in the area provided a channelling device and an extensional zone during emplacement. The limestone rocks are likely to have acted as a geochemical barrier resulting in the deposition of the ores.

Although drilling did not intersect faulting, significant faulting in the area is suggested by the presence of polymict debris flows comprising a wide range of carbonate facies and by large variations in micropaleontologic dates. Sulphide deposits replaced hydrothermally dolomitized carbonates and were subsequently reworked into polymict conglomerates of probable Carboniferous age that were deposited in a marine environment.

14.2.3 Mineralisation

14.2.3.1 Ore Body Composition

The main Shaimerden orebody comprises supergene oxidised zinc ores with remnant sulphides towards the centre, indicating oxidation from the outside margins to the centre of the deposit. There is an outward zoning comprising five categories, based on macroscopic and microscopic studies of the ore:

- Massive sulphides – (2.8% of the reserves) preserved in the centre of the orebody and consisting mainly of remnant massive sulphides consist of 90% sphalerite with minor galena and pyrite and an average grade of 46% Zn, 1.2% Pb, 6.1g/t Ag;
- Massive hemimorphite-smithsonite – (11.7% of the reserve) surrounding and intimately related to the massive sulphides and varying from a massive fine-grained ore to a brecciated vuggy rock; the zone comprises fine grained hemimorphite-smithsonite clasts in a fine grained carbonate-hemimorphite-smithsonite matrix which has a sharp 2-5mm transition to the massive sulphides, with a similar texture and always intimately related to the massive sulphides. There are additional gangue mineral clays, carbonates and oxides. This ore type assays 30 to 45% Zn, with an average resource grade of 35.2% Zn;
- Stony ore – (8.2% of the reserve) a dark green to dark red weathered, competent and sometimes friable material with a relict breccia texture. It is an intermediate weathered material between the massive hemimorphite-smithsonite and the mineralised clays;
- Mineralised clays – characterised by their grey/green colour and high percentage of gritty and fragmental material. The zinc occurs mostly as small fragments of hemimorphite and smithsonite and partly as clay minerals. The detailed composition is:
  - CL3 - (38.1% of the reserve) grey-green chlorite-smectite, kaolinite and/or montmorillonite clays with more than 40% gritty material (hemimorphite and smithsonite with minor sauconite and zincite) and a gangue of lesser calcite, dolomite, siderite and quartz and grades averaging 24.9% Zn,
  - CL2 - (28.8% of the reserve) similar grey-green clays to CL3 but with 10-40% gritty material (hemimorphite and smithsonite again) with grades averaging 13.1% Zn.
  - CL1 - (4.5% of the reserve) mottled, multicoloured, white to orange brown, massive and plastic clays with a grit content of less than 10% and averaging 1.8% Zn which is found above and sometimes laterally to the main massive sulphides and massive hemimorphite-smithsonite.
- Mineralised limestone – (5.9% of the reserve) occurs along the margin of the weathered trough and consists of intervals of mineralised clays within the limestone.

Weathering of the sulphide mineral deposits took place during the Triassic Period, following uplift during the late Paleozoic. The weathering occurred in situ, and small intervals of relict sulphides were preserved in the centre of the deposit.

14.2.3.2 Mineralogy

Historically, smithsonite, or zinc spar (ZnCO3), was identified with hemimorphite before it was realised that they were two distinct minerals. The two minerals are very similar in appearance and the term calamine has been used for both, leading to some confusion.

Smithsonite is a variably colored trigonal mineral which only rarely is found in well formed crystals. The typical habit is as earthy botryoidal masses. It has a Mohs hardness of 4.5 and a specific gravity of 4.4-4.5. It occurs as a secondary mineral in the weathering or oxidation zone of zinc-bearing ore deposits. It sometimes occurs as replacement bodies in carbonate rocks and as such may constitute zinc ore. It commonly occurs in association with hemimorphite, willemite, hydrozincite, cerussite, malachite, azurite, aurichalcite and anglesite. It forms two limited solid solution series, with substitution of manganese leading to rhodochrosite, and with iron, leading to siderite.

Hemimorphite ($Zn4Si_2O_7(OH)_2$ H_2O), is a sorosilicate mineral which has been mined from days of old from the upper parts of zinc and lead ores, chiefly associated with smithsonite. The silicate was the rarer of the two, and was named hemimorphite because of the hemimorph development of its crystals. This unusual form, which is typical of only a few minerals, means that the crystals are terminated by dissimilar faces. Hemimorphite most commonly forms crystalline crusts and layers, also massive, granular, rounded and reniform aggregates, concentrically striated, or finely needle-shaped, fibrous or stalactitic, and rarely fan-shaped clusters of crystals. Some specimens show strong green fluorescence in shortwave ultraviolet light (253.7mm) and weak light pink fluorescence in longwave UV.

14.3 Exploration Works

14.3.1 Historical Works

The Shaimerden structure was discovered in 1956 during prospecting for bauxite, exploration for which continued in the area until 1992. In 1989 a programme to investigate scandium levels in the bauxite deposits was commenced and was later extended to detect additional elements.

The expanded investigations revealed anomalous lead and zinc concentrations in the Shaimerden area. Exploration drilling to define the resource was undertaken in 1993 by the Stepnaya exploration team of the Zhetigera Expedition, as part of a State run regional investigation programme, which was terminated in 1995 consequent upon a lack of finance.

The subsequent exploration of the deposit comprising vertical coring holes from surface was completed by "Shaimerden" a Kazakh-British joint enterprise and consisted of a single phase. The scope and types of main exploration works are summarised in Table 14.4.

Table 14.4: Summary – Exploration Programme Works		
Scope and Types of Geological Exploration	**Meas. units**	**Work Volume**
Exploration-evaluation works	R.m./Boreholes	6501.1/58
Exploration	R.m./Boreholes	5853.6/51
Drilling for sampling	R.m./Boreholes	551.3/3
Ore body outline (contour) drilling	R.m./Boreholes	239.9/3
Geological and engineering research	R.m./Boreholes	716.2/9
Hydrogeological and engineering works	R.m./Boreholes	714.8/14
Sampling:		
Samples;	Samples	3,935
Geochemical samples;	Samples	598
Hand specimen	Specimen	342
Lab research:		
Spectral testing;	Tests	4,329
Chemical testing for main components	Tests	3,935
Technological investigation of laboratory samples	Samples	267
Geophysical research: - directional logging	B/hole	15

The density of the exploration borehole grid was 25-50x12.5-25m for the C_1 category and 50x100m for the C_2 category; borehole profiles were orientated east–west and the average recovery of core through the mineralised intersections used in the reserve estimate was 87%.

Reserves of oxide-bearing ore were estimated to a depth of 250m. The majority of boreholes intersected the ore zone fully, with the exception of three (Bhs 8831, SH9, and 9004) where drilling was stopped in the ore body.

The deepest bore-hole (Bh 9021 in profile 21500) was drilled and sampled to 305m, and in consequence no conclusions could initially be drawn about the probability of finding sulphide ore at depth below the main ore body and the genesis of the deposit.

Ore intervals were sampled by sectional method according to lithological variation. Hand specimens were used to study the material constitution of the ore, its texture and structural features, as well as physical and mechanical properties.

In the course of borehole exploration geophysical downhole logging was used to a limited extent. From this it was evident that future exploration in the area for zinc-lead deposits similar to Shaimerden would involve x-ray and radiometric well logging and x-ray and radiometric core sampling which would facilitate the evaluation of zinc grade in field conditions (with 10-15% accuracy), reduce the volume of expensive core sampling, and enable continual adjustments to be made to the drilling programme grid in accordance with the prospectivity or complexity of the mineralised intersections.

In 1998 Ennex announced the outcome of analysis and checking of its confirmatory drilling programme completed in 1997. The results confirmed both the thickness and grades obtained within the main mineralised body which was estimated to contain a resource of approximately 4Mt at a grade of 25% Zn.

This resource was calculated originally by indigenous operators and verified during 1997 by Ennex and its consultants. The company also announced that samples from seven earlier drillholes not previously assayed had been analysed and that a new detailed drilling programme was being prepared for feasibility study purposes, including mine design and production scheduling.

Table 14.5: Results from Ennex Drilling (1997)					
Hole No	**From (m)**	**To (m)**	**Interval (m)**	**Zn %**	**Notes**
8830T[1]	51.00	221.00	170.00	27.80	Twinned
8605T[1]	112.25	149.45	37.20	15.56	Twinned
SH1[2]	62.98	90.38	27.40	24.90	New
SH2[2]	72.55	121.85	19.30	18.03	New
9011[3]	68.4	171.3	102.9	30.89	Previous
9020[3]	84.0	196.0	112.0	25.60	Previous
9021[3]	73.6	164.2	90.6	21.97	Previous
9022[3]	53.5	79.3	25.8	24.19	Previous

[1] Twinned with earlier drilling. Both were drilled to greater depths and each encountered the original mineralisation, as well as additional mineralisation at lower grades

[2] Sited within the mineralised body but away from previous drillsites. The results from these holes also confirmed the presence of economic grade mineralisation

[3] Four boreholes of the seven not assayed previously, sited within the mineralised body

The other three drillholes outside the main mineralised body contained thin intercepts (3–6m) with low grade zinc (5.0-7.5% Zn).

All the analytical results were calculated using a 5% grade cut-off.

> ***WAI Comment:*** *The Western Torgai exploration asset, comprising the Karabaitalsky and Sakharovsko-Adaevskiy sites, lies immediately to the south west of the original Shaimerden exploration licence and contracts are in the process of registration at the Ministry of Industry and New Technologies. At the Karabaitalsky site, a 3 year programme of drilling (19,000m) and geophysics is planned to investigate previously identified anomalies representing porphyry gold and polymetallic deposits; at the Sakharovsko-Adaevskiy site a similar 3 year programme has been drawn up to investigate the Klochkovskoye quartz diorite porphyry Cu/Mo deposit (intersected in old soviet boreholes) with 13,000m drilling and geophysics.*

14.3.2 Sample Collection

14.3.2.1 ROM Ore Sampling

Sampling at Shaimerden is carried out in pit during mining and before and after crushing. Blast hole sludge sampling is routinely undertaken in all blast areas in the pit, and the number of blast holes checked depends on the components of the block being mined i.e. ore, contact zone or waste.

A shift geologist is always present during mining operations to make an initial assessment of the grades of the samples from the blast holes and the ore being mined, using a portable XRF Spectrometer, and the information is supplied to the pit foreman and a controller from the technical and analytical control services. The latter makes an informed decision on the appropriate ore storage 'zone', based on the initial grade estimate, lithology and moisture content of the material and gives directions to the pit foreman, geologist and dump truck operator for its dispatch.

The ROM ore (±500mm size) is transported to the crushing plant storage 'zone' in a 'Caterpillar' dump truck of $30m^3$ capacity, after passing over a 'two way' weighbridge; here a member of the sampling department directs the driver and records the truck number, weight of ore, unloading zone, lithology, sample number and time of load arrival. A composite grab sample from three trucks weighing >2kg is transferred to the laboratory.

14.3.2.2 Crushed Ore Sampling

Crushed ore is sampled by an automatic belt sampler and a composite sample, of 25 or 50 'cuts' is collected, representing 50 or 100t batches respectively. The sampling process is controlled automatically and the crushed ore is transferred to the various compartments (8 @ 400t each) of the storage bin by a movable conveyor belt.

14.3.3 Sample Preparation

All samples sent to the laboratory are split, one part sent for moisture determination and the other for analysis; the sample for analysis is dried at 105-110°C and crushed to <10mm through a jaw crusher. A reduction in sample size and further drying is followed by grinding in a rotary mill.

A laboratory sample of >0.25kg is ground in a ring mill, and sieved through an 0.080mm mesh, the oversize being re-circulated through the mill and sieve. The <0.080mm fraction is quartered and two samples of >100g are separated, one for analysis and the other sent to storage as a duplicate for re-analysis if required.

The sample material is compressed into a disc prior to analysis in the Spectro Expos Spectrometer.

> ***WAI Comment:*** *The laboratory is clean, well organised and run efficiently and is fit for purpose to provide analysis for the stockpiles of mined material and the crushed ore from the crushing plant, transferred to the storage bins, where blending occurs.*

14.3.4 Quality Control

10% of all the mining, geological and crushing plant samples are subject to internal checks using duplicate and standard samples. External sample checks include the dispatch of 3% of all samples to the certified SEVKAZGRA laboratory in Kostanai, every three months.

The average deviations for the four randomly chosen 'orders' range from -0.5%-0.21% Zn whilst the lowest and highest individual sample deviations are zero to 1.0%Zn; the two data sets are plotted on the regression curve (Figure 14.7).

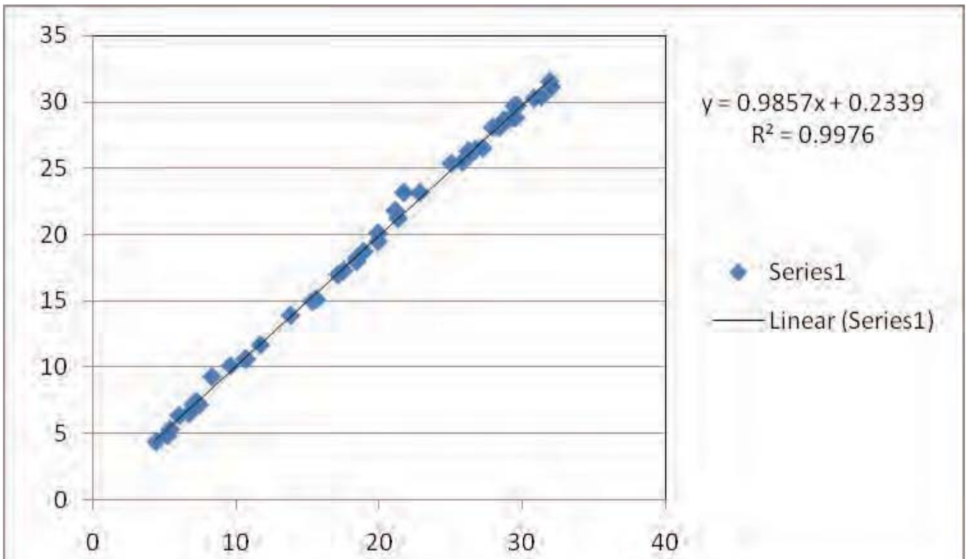


Figure 14.7: Regression Curve - Original Shaimerden Analyses (Horizontal Axis) and the Duplicate SEVKAZGRA Control Analyses (Vertical Axis)

> ***WAI Comment:*** *The two sets of analyses exhibit a high level of correlation and indicate that the Shaimerden laboratory is run competently and has the appropriate QA/QC protocols in place.*

The zinc plant at the Ridder Metallurgical Complex (RMC) samples 10% of the Shaimerden product; the error tolerance between the two sets of analyses are summarised in Table 14.6.

Table 14.6: Tolerated Error – Shaimerden/Ridder Metallurgical Complex		
Component	**Ore grade, %**	**Relative Tolerated Error (%)**
Zn	>5	3.5
	3 - 5	6.0
	1 - 3	8.0
	0.3 – 1.0	11.0

WAI Comment: *It was stated that Shaimerden has never incurred any penalties and that the RMC has always confirmed the validity of the original analyses within the tolerances given above. Although both operations are within the Kazzinc organisation, the reconciliation data from the external laboratory supports this statement.*

14.4 Mining

14.4.1 Introduction

The Shaimerden mine has been in production since 2005 but is expected to cease mining in May 2011. The near surface zinc orebody has meant it is suitable for conventional truck and shovel open pit mining. Zinc ore is mined from a single pit, hauled to stockpiles, crushed and transported by rail to Ridder in east Kazakhstan.

Figure 14.8 below is the general Shaimerden site layout showing the location of the pit, stockpiles, fuel storage and the railway loading facilities.

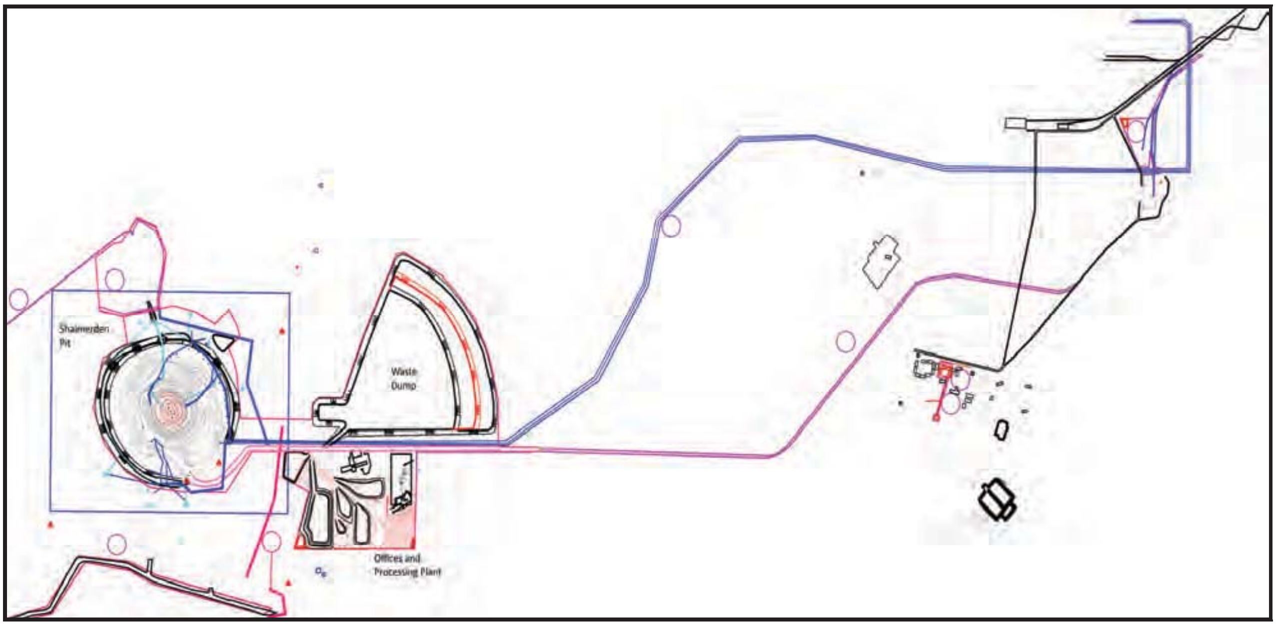


Figure 14.8: Shaimerden Site Layout

14.4.2 Geotechnical Assessment

The initial pit slope designs are based on criteria developed by Golder Associates Ltd. ("Golder") in their 1999 report. Golder recommended slope angles of 22° for the weathered alluvium material, ranging from 11-15° for the cretaceous/triassic clays and 56◦ for the limestones.

Golder have been regular trips to site over the duration of the mine life and the current recommended slope angles are ranging from 12-17° for the weathered alluvium material , 50◦ for the cretaceous/triassic clays and 70° for the limestones.

Photo 14.1: Shaimerden Pit Looking East

> ***WAI Comment:*** *Having reviewed the geotechnical reports, WAI feel that all aspects of the final wall stability have been covered and the ongoing stability of the pit are in hand.*

14.4.3 Pit Outlines

The Shaimerden deposit has 12 orebodies. The main bodies are No.1 and No.3, which contain 96% of the ore reserve. The pit outlines are determined for each ore body according to lateral and longitudinal geological cross sections, based on the condition of mining the maximum amount of ore reserve.

The deposit has been developed as one pit. The balance reserve is represented by ore bodies, having confluent bedding and being mined in one section. For the purposes of mine design, a balance reserve for the Shaimerden zinc ore of C_1+C_2 category was accepted on 01 January 2003 and approved by the State Reserve Committee of the Republic of Kazakhstan.

Table 14.7: Reserves Approved for Pit Design

Indices	Units	C1 +C2 Balance reserve
Balance Reserve of the deposit as on January, 1st of 2003		
Raw ore reserve	kt	3808.5
Dry ore reserve*	kt	3475.7
Zinc reserve	kt	914.0
Average zinc grade	%	26.29
Including industrial reserve within the pit outline		
Raw ore reserve*	kt	3805.3
Dry ore reserve	kt	3472.8
Zinc reserve	kt	913.2
Average zinc grade	%	26.30
Commodity reserve (3.7% losses, and 4.5% dilution)		
Raw ore reserve*	kt	3853.3
Zinc reserve	kt	879.4
Average zinc grade	%	22.82
Dry ore reserve	kt	3501.9
Zinc reserve	kt	879.4
Average zinc grade	%	25.11
*Average moisture of 9.12%		

14.4.4 Pit Design

The initial pit designs were performed by Golder Associates in 1999 using Gemcom software with the overall open pit wall slopes varying from 11-56° as part of the 1999 Feasibility Study. This design has since been modified by Golder Associates to incorporate several final wall slips that occurred in 2006 in the soft rock at the top of the open pit mine.

The current pit design parameters for the Shaimerden pit are:

- Height between safety berm – 10-15m;
- Bench height – 5m, mining on 2.5m flitches;
- Safety berm width – 6m, with a 15m berm at the 205 level;
- Haul road width – 24m above the 110 level, two way traffic;
  – 16m below the 110 level, one way traffic;
- Haul road gradient – 1:10;
- Final Wall Angles: 12-70°, and
- Cut-off Grade: 2% Zn.

The mine dimensions are approximately 745x845m at the top of the pit and approximately 300m in diameter at the bottom. At the time of the visit, the production activity was on the 100 level and mining will finish on the 40 level. Table 14.8 summarises the pit dimension, and volume.

Table 14.8: Pit Dimensions and Volumes

Design Dimensions		Total volume, (000m^3)	Overburden volume (000m^3)	Av. Strip Ratio	
Dimensions (m)	Depth (m)			m^3/t	m^3/ m^3
710 x 845	207	22,350	20,847	5.95	13.87

14.4.5 Production Schedule

The development of the mine commenced in 2005 and ore was first mined in 2006. Since the mine commenced operations, a total of 21.6Mbcm has been excavated up until 1 October 2010 and the breakdown of materials excavated are shown in Table 14.9 below.

Table 14.9: Total Mining Volumes from the Inception of Mining until 01.10.2010

Component	m^3
Total mined material :	**21,587,500**
Overburden Including :	
Waste dump	11,660,804
Road construction, (dumps)	6,862,853
Bauxite stockpile	53,229
Off- balance stockpile	63,028
Limestone stockpile	1,715,846
Total Overburden	**20,355,760**
Ore	**1,231,740**

The production rate has gradually increased over the life of the mine to peak at 950ktpa in 2009. The reason for the slow start up was the constant delays to production caused by the inflow of ground water into the pit. This situation is now under control and production is expected to reach 895kt for 2010 and 410kt for 2011 with the mine being exhausted in May 2011. Table 14.10 below shows the historical and scheduled production for the life of the Shaimerden pit.

Table 14.10: Historical and Scheduled Production for Shaimerden Pit									
Work Title	Unit	Quantity	Mining period						
			2005	2006	2007	2008	2009	2010	2011
Dry ore mining	kt	3,502	-	53	439	755	950	895	410
Overburden operations	(000)m^3	20,847	4,253	5,277	3,263	3,135	3,343	1,375	201
Total mined material	(000)m^3	22,350	4,253	5,300	3,451	3,459	3,750	1,760	377

All of the ore from the pit is hauled to various stockpiles corresponding to zinc grade. The stockpiled ore is blended through a crusher to maintain a constant head grade. As the crushing rate is lower than the mining rate, it is intended that the crusher will continue after the open pit has been exhausted. Table 14.11 shows the historical and scheduled production from the stockpiles.

Table 14.11: Historical and Scheduled Production from Shaimerden Stockpiles			
Year	Ore from Stockpile (kt)	Zinc grade (%)	Zn (t)
2006	53	19.27	10,212
2007	439	20.64	90,610
2008	755	20.39	153,982
2009	-	-	-
2010	-	-	-
2011	80	23	18 400
2012	100	23	23 000
2013	280	22,5	63 000
2014	296,272	21,73	64 381
2015	300	21,66	64 975
2016	300	21,66	64 975
2017	300	21,66	64 975
2018	300	21,66	64 975
2019	300	21,66	64 975
2020	315,157	21,85	68 275

14.4.6 Mining Operations

Mining is based on 5m benches for ore and 10m for waste; excavated on 2.5m flitches in ore and 5.0m flitches in waste. Safety berms are left every 10 or 15m depending on the ground conditions. The main ground engaging tools are three CAT 5110B backhoe excavators with 85 tonnes CAT 777D haul trucks.

Shaimerden is also mining small quantities of limestone which may be used as a raw material in the processing plant at the Ridder Works.

14.4.6.1 Drilling and Blasting

Drilling and blasting at Shaimerden is very straightforward as the site uses diesel drilling rigs with hydroperforators and a modern emulsion explosive. All blasting is performed by contractors who deliver the explosives on the day of the blast so there is no need for magazine facilities.

An Atlas Copco DM45 rig is used for drilling 165mm diameter blast holes. The drilling grids are 3.0m x 3.0 and 4.0m x 4.0m depending on the ground conditions. Two smaller rigs, an Atlas Copco RocL8 and Ingersoll Rand CM780D rigs are used to drill 102mm and 114mm diameter holes.

The main explosive is an emulsion matrix which has a chemical gassing agent added to it in the explosive truck. It is pumped from the truck through a hose into the blast holes and becomes sensitized on discharge from the hose. The main charge is initiated with cast boosters and non electric detonators. The explosive supplier also provides the shotfiring services.

14.4.6.2 Selective Digging

There are 4 ore types at Shaimerden based upon zinc grade. The selective digging of the different ore types is supervised by mine geologists who take zinc grade readings using a handheld x-ray fluoresces (XRF) spectrometer which can quickly indicate the zinc grade. The geologist then tells the truck operator which stockpile the ore has to be taken.

14.4.6.3 Load and Haul

Ore is hauled from the Shaimerden pit on a well maintained haul road with a gradient of 10% by Shaimerden Ltd personnel in the CAT 777D haul trucks to the various stockpiles depending on the zinc grade. The stockpiles are:

- SP25: 2-5% Zn;
- SP23: 5-15% Zn;
- SP22: 15-25% Zn, and
- SP24: over 25% Zn.

Ore is then taken from the stockpiles and blended through a crusher to maintain a constant head grade prior to being shipped by rail to the Metallurgical Complex in Ridder. All material with a Zn grade less than 2% is hauled to the waste dump.

14.4.6.4 Pit Dewatering

The Shaimerden pit has had a history of water management as the site was located in a lake when it was discovered. Bunding was constructed to allow the exploration and the mine development to take place. A dewatering programme was implemented to minimise disruptions to production.

The dewatering system consists of 3 in-pit bores located in the bottom of the pit and several bores located on the 205 level. New bores are being drilled on the 205 level by contractors. The diameter of these bores will 490mm to a depth 210m and will give a 30m draw down from the final working level.

Submersible pumps are being used to pump water from the bores and out of the pit. Currently the mine is moving approximately 3,600m^3/hr. The water from the pit is discharged into holding pond to the north west of the pit and then pumped to a lake 12km west of the site.

14.4.7 Mining Fleet

The current mining fleet includes the CAT 5110B Backhoe Excavators, CAT 777D Haul Trucks, CAT 16G and 16M Motor Graders, the three drill rigs and four CAT D9 tracked dozers.

The ancillary equipment includes smaller excavators and front end loaders for the stockpiles, water trucks, service vehicles and light vehicles. A complete maintenance shop is located adjacent to the mine site offices. Table 14.12 below shows the primary mining fleet and their function.

Shaimerden management have made plans for the sale or the redeployment of the equipment to other Kazzinc sites as the mining activity draws to an end in 2011. It is intended for the CAT777D haul trucks to be redeployed at Vasilkovskoye mine whereas the decision to sell the large excavators and drill rigs will be made when production finishes.

Table 14.12: Shaimerden Mining Fleet		
Type	**No.**	**Function**
CAT 5110 Backhoe Excavators	3	Mine Production
CAT 77D Haul Trucks	10	Mine Production
CAT D9 Tracked Dozers	4	Mine Production
Atlas Copco DM45	1	Mine Production
Atlas Copco Roc L8	1	Mine Production
Ingersoll Rand CM780	1	Mine Production
CAT 16 Motor Graders	2	Road Maintenance
CAT GS683E Road Roller	1	Road Maintenance
Hitachi 450H Backhoe Excavators	2	Stockpile Management
Hitachi 470H Backhoe Excavator	1	Stockpile Management
CAT 988 Wheel Loader	1	Stockpile Management
CAT 966 Wheel Loaders	3	Stockpile Management

14.4.8 Mine Personnel

There are 209 personnel associated with the mining activities including mine management, geology, mining, surveying and operations. Management and Technical Services work day shift 5 days a week, whereas the mining operations are based on two 12hr shifts (9-9) with 2 hours per shift dedicated to maintenance, shift change over and blasting. The miners work an 8 on/8 off roster with day shift changing to night shift after 4 days.

14.4.9 Operational Costs

Table 14.13 below summarises the mining operating costs for the Shaimerden mine.

Table 14.13: Shaimerden Mining Operating Costs			
		Planned	**Actual**
Volume Excavated	m^3	3,750,000	3,750,200
Ore Mined	t	1,000,000	951,057
Loading	US$	2,434,414	2,714,071
	US$/$m^3$	0.65	0.72
	US$/t ore	2.43	2.85
Hauling	US$	5,732,791	4,586,086
	US$/$m^3$	1.53	1.22
	US$/t ore	5.73	4.82
Drill & Blasting	US$	3,223,093	3,041,274
	US$/$m^3$	0.86	0.81
	US$/t ore	3.22	3.20
Dewatering	US$	1,866,933	2,559,527
	US$/$m^3$	0.50	0.68
	US$/t ore	1.87	2.69
Roads & Dumps	US$	2,248,349	1,503,977
	US$/$m^3$	0.60	0.40
	US$/t ore	2.25	1.58
TOTAL Operating Costs	**US$**	**15,505,579**	**14,404,935**
	US$/$m^3$	**4.13**	**3.84**
	US$/t ore	**15.51**	**15.15**
Indirect costs	US$	4,890,933	3,458,551
	US$/$m^3$	1.30	0.92
General & Administrative Costs	US$	5,845,545	1,563,851
	US$/$m^3$	1.56	0.42
Total Costs	**US$**	**26,242,057**	**19,427,337**
	US$/$m^3$	**7.00**	**5.18**
	US$/t ore	**26.24**	**20.43**

14.5 Ore Reserves

14.5.1 Introduction

The initial in situ reserve base and the ongoing depletion of reserves have been estimated 'in-house' using Datamine®, the former comprising 4,230kt at a grade of 21.92%.Zn containing 927,034t of zinc metal. The original model is shown in Figure 14.9.

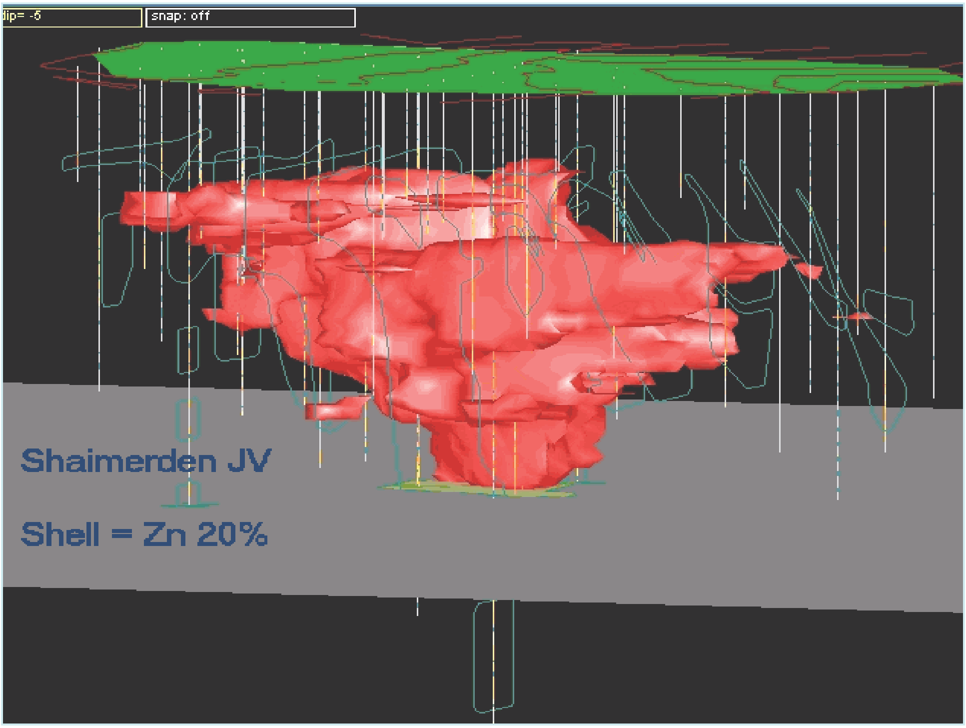


Figure 14.9: Original Datamine Model of the Shaimerden Ore Body

At the time of the WAI visit (12.10.2010) mining was being completed on the 105 Level.

Although the ore body extends to 20 Level the intention is to deepen the pit only as far as 40 level and leave the relatively inaccessible reserves between the 40 and 20 levels.

The blending of different grades to achieve a saleable product of ±21% Zn occurs after crushing and belt sampling in the laboratory.

14.5.1.1 Datamine® Summary of the Creation of the Block Model

Topographic Survey

The initial topography was surveyed in 1958-1959 on a scale of 1:2000 using a plane table in initial reconnaissance stages of the exploration of the KrasnoOktyabrsky bauxite deposit.

Top cutting

Top cutting of high values was not necessary, in the absence of any anomalous values for the components being modelled.

Parameters Used for Reserve Estimation (Conditions)

The 'conditions' constraining the modelling of the ore body were:

- Cut-off grade of zinc - 5%;
- Minimum mining thickness - 2m; and
- Maximum thickness of the waste rock and low grade mineralisation included in the ore body outline - 10 m.

Geostatistics

Reserve calculation was carried out using the inverse square method and therefore no variography was done.

Lithological Coding and Relative Density

Density was determined according to the lithologic code by estimating the relative densities of all lithological varieties of ores, limestones and other surrounding rocks. Relative densities were estimated separately for high and low grade ores and waste rock and for the individual lithotypes within each of these groups. These are summarised in Table 14.14.

Table 14.14: Lithotypes and Relative Densities

Code	Description of Lithotypes	Density
ALL	Chegansky Clays	1.92
BXCL	Bauxitic Clays (lignite/kaolin)	1.89
MCL	Multicoloured Clays	1.89
KCL		
BX	Stony Bauxites	2.30
	Weathering Crust (General)	
FF	Limonite	1.89
CL1	Clay Ores	1.75
	Low Grade	1.65
CL2	Rubble-Clay (10-40%)	2.06
	Rubble Clay (Low Grade)	1.81
CL3	Clay-Rubble Ores (>40%)	2.27
	Clay-Rubble Ores (Low Grade)	1.55
CSM	Stony, Dense, Breccia like Ores	2.35
	Stony Ore (Low Grade)	2.35
STO	Calamine (Smithsonite) Ore	2.56
	Calamine (Smithsonite) Ore (Low Grade)	2.56
SUL	Sulphide Ores	3.63
BXCL	Bauxitic Clays (Rich Ore)	2.30
LST	Limestone-High Grade Ore	2.68
LST	Limestone-Low Grade Ore	2.56
LST	Limestone	2.68
VOL	Volcanics	2.68

Cell Dimensions

The parent cell and sub-cell dimensions used in model are summarised in Table 14.15.

Table 14.15: Block Model Cell Dimensions (m)

Axes	Parent Cell Dimensions	Sub-cell Minimum Dimensions
X	5	1.5
Y	5	1.5
Z	2.5	0.1

Parameters of the search ellipsoid:

- the angles of the volume of the search: SANGLE 1 = 90, SANGLE 2 = 0, SANGLE 3 OF =-30;
- axes of rotation (1=X, 2=Y, 3=Z) SAXIS 1 = 3, SAXIS 2 = 1, SAXIS 3 = 2;
- the axes of the volume of the search: SDIST 1 = 37.5 m, SDIST 2 = 37.5m, SDIST 3 = of 3m;
- minimum samples required - 4, maximum – 20;
- form of the search volume – ellipsoid;
- axis multiplication factor – 2;
- no search on the octants; and
- a maximum of 4 samples per borehole.

Interpolation Parameters

Blocks were not discretised. Interpolation within separate ore bodies was limited to the use of those samples which lie within their outline (contour).

Checks

No checks on the adequacy of the procedures were carried out on the model.

Reserve Classification

The entire reserves of the ore body were classified in the C_1 category.

14.5.1.2 Mined and Processed Ore Stockpiles

A range of zinc grades is specific to each ore stockpile and the stockpile numbers and grade categories are summarised in Table 14.16.

Table 14.16: Stockpile and Dump Grade Summary

Stockpile No	Zn%	Notes
(No 20)	(18.06)	
No 21	>25	
No 22	15 - 25	
No 23	5 - 15	
	2 - 5	Out of balance
Rock	<2	Waste

14.5.2 Combined Pit and Stockpile Reserves (01 01 2011)

The Shaimerden 'reserves' as at 01 01 2011 comprised the following components:

a) Remaining 'in situ' reserves in the pit, and
b) Mined and processed ore including:
   - Stockpiles (ore dumps) classified on the basis of a range of zinc values;
   - 'Zones' consisting of ore stacked to allow draining of the high moisture content;
   - Railway stockpile, and
   - Overburden stock.

The reserves remaining 'in pit' as of 01.01.2011 are 474,420t of ore at a grade of 21.6% Zn containing 102,487t of metal. The remaining resources and reserves of the various stockpiles as at 01.01.2011 are summarised in Table 14.17.

Table 14.17: Stockpile Mineral Resources and Ore Reserves (WAI, 01.01.2011) (In Accordance with the Guidelines of the JORC Code (2004))			
Description	**Ore (kt)**	**Zn %**	**Total metal (t)**
Stockpile Ore *Indicated* Resources	**2,483.86**	**21.71**	**539,143**
Stockpile Ore *Probable* Reserves	**2,483.86**	**21.71**	**539,143**

14.6 Process

Kazzinc LLP purchased the Shaimerden oxide zinc deposit from Irish company ZincOx, in the spring of 2004. The deposit is situated in the territory of Kamistin district about 200km to the SW of the regional centre, Kostanay. In 1998 the approved reserves were 3.5Mt of ore containing 879,400t of zinc at an average zinc grade of 25.11% Zn. Subsequently, a mining and crushing operation was established at the site, with a rail connection to transport the crushed ore to the Ridder Metallurgical complex for processing operations began in 2005.

Ore from the open pit mine is transported to an intermediate ore stockpile using 777D Caterpiller trucks, each carrying approximately 96t each, where it is stockpiled ready for crushing. At the intermediate ore stockyard ore is stacked into heaps with the help of 2x HITACHI ZX 450 loaders in a particular position as to take advantage of the prevailing wind and ambient temperature to reduce the moisture content to a level of 9% as well as to perform ore blending to produce an ore grade in the range 18-21% Zn.

Run of Mine ore of -500+0mm size is crushed in three stages. This crushing cycle of Shaimerden ore operates from May to November 20 hours/day. Ore from intermediate ore stockyard (specially positioned heaps as to take advantage of prevailing wind) is moved to MMD 500 S154-0871 primary crusher (manufactured in England) with the help of CAT 988G loader. Final product size after primary crushing is -100+0mm.

A MMD 500 S154-0870 crusher (manufactured in England) is used for the secondary crushing to produce the final -40 +0mm crushed product. A Chinese 2DSKP 75200 crusher is installed for tertiary crushing to produce the final -10+0mm crushed product. In June 2010, a DG 1000 roll crusher manufactured by KazzincMash Ltd was installed in parallel with Chinese 2DSKP 75200 rolls crusher for tertiary crushing. The crushed product size is currently P80 =10mm.

For quality control purposes, before and during crushing, samples for analysis are taken after every 50-100t of ore has passed through the crushers. Sampling is performed with the help of an automatic sampling system and the Zn content of the sample is determined using a SPECTRO XEPOC X-ray spectrometer. Size analysis of the ore is also checked every shift and there are weightometers positioned within the crushing circuit to monitor and record the tonnes that have been crushed.

After crushing, the ore is delivered by conveyor to a stockyard with 8 sections holding 400t each from which the ore is blended in certain proportions using a CAT 988 G loader to achieve the required grade. This finished product is then transported in 25t MAN trucks to the railway siding. Ore is loaded from the intermediate stockyard to a receiving bin of the railway wagon loading complex with the help of a CAT 966 H Wheel Loader. Loaded rail wagons are shipped to Ridder Metallurgical Complex.

Note that the mining rate, currently about 1Mtpa, is not synchronous with the crushing rate, nominally about 330ktpa. The remainder of uncrushed ore is taken up by the stockpiles which have been increasing in size since the start of production to the present 2Mt. The mining operation is scheduled to cease in May 2011, whereas the crushing and delivery of ore will continue for a further 5 years after this.

WAI Comment: *The Shaimerden operation is modern, well managed and well maintained.*

14.7 Environmental

14.7.1 Environmental Setting

Shaimerden is located approximately 200km SSW of the city of Kostanay and approximately 110km southwest of Lisakovsk, in the Kamysty region of the Kostanay District of northern Kazakhstan. The nearest settlements comprise the village of Krasnogorsk, 7km southeast and KrasnoOktyabrsky 14km northeast from the project, whilst the regional centre, Kamysty lies 50km to the west.

There are no permanent rivers in the area, but there are many fresh and saline water lakes, the largest being Lakes Sorkol, Koyandykopa (a land allotment of the project), Sunaly, and Tunkuyukty. The nearest permanent river is the Tobol River which is in 60km north of the project.

The local relief of the project is flat with absolute levels in the area of the deposit in the range of 239-247m, although in some places undulating with lakes, salt pans and occasional gullies.

The vegetation within the vicinity and surrounding area of the project comprises saline steppe habitat and species. This land has been categorized as having no land use value by the state. Such a status means that it is not deemed suitable for any contemporary farming practices; however Red Book (rare) species of fauna are present within this area.

The climate of the region is highly continental, with short, hot dry summers and extended extremely cold winters. Annual precipitation is low with an average of 295mm.

14.7.2 Current Environmental Status

The licence for the right of subsoil use for prospecting and development by the "Shaimerden Joint Venture" is for 25 years and was approved on 04 May 1997. The licence comprises 5 years exploration and 20 years mining. The mining licence covers an area of 3.23km^2, and the total area under licence is 12.1km^2.

> ***WAI Comment:*** *An inspection of the licence documentation has shown that all are in good order and suitable for the future needs of Kazzinc.*

The land allotments are licensed to the project for 20 years, in consistency with the mining licence period.

The lease area of the neighbouring bauxite operation (KBRU) is adjacent to Shaimerden's mining lease area.

> ***WAI Comment:*** *Although the mining lease and several of the land allotments of the project are contained within the same geographical area as the bauxite operation, the projects operate on an independent basis which works well. The only obligation to which Shaimerden is subject, as per government requirements, is to stockpile any bauxite recovered from the open pit in their lease in a separate stockpile.*

The open pit is mined by the use of blasting and then removal of rock by truck. Waste rock material is taken to rock dumps and ore bearing rock is stockpiled according to grade and then crushed to form a blend with an average grade of 20% zinc. The ore is then taken by trucks to the rail head (spurring to the project from the main line through Krasnogorsk) and transported by rail to the Kazzinc Ridder Metallurgical Complex for further processing. No other processing is undertaken on site; however an assay laboratory to determine rock grades is located adjacent to the crusher.

14.7.3 Review of Environmental/Social Studies

A revised OVOS was issued in 2006 in relation to the Shaimerden project and is valid until the project closes, or there is a significant change in the nature of the operations. The OVOS includes all extraction, processing, ancillary and auxiliary facilities.

> ***WAI Comment:*** *The project is forecast to remain in an extraction phase until 2012, with crushing and transportation activities continuing until 2016, or later by State agreement.*

An environmental monitoring plan to enable the project's compliance with the OVOS is reviewed and updated on an annual bases, and is based on operational changes and project emissions and discharges. It was reported that the 2011 plan has been reviewed and passed by the state.

> ***WAI Comment:*** *Shaimerden is well aware of its obligations with regard to meeting national requirements and is performing the appropriate environmental studies in this regard. WAI was not able to review the complete OVOS document in English; however it is understood to be fully compliant with State requirements. It is suggested that a gap analysis should be performed to assess compliance with international requirements.*

14.7.4 Security

All security for the project is undertaken by an international subcontracted company called Group 4 Security (G4S). G4S provide round the clock surveillance for all of Shaimerden's facilities.

> ***WAI Comment:*** *The project is fragmented into 13 land allotments, therefore it would be impractical to prevent the public accessing the entire area. The security at the project is generally good.*

14.7.5 Environmental Management and Training

Environmental management is undertaken in accordance with the environmental improvement programme, which is stipulated for compliance with the OVOS. The programme is approved annually by the Kostanay Environmental Department. An annual environmental budget is drawn up in accordance with the programme.

All environmental training is undertaken by the personnel department and is tailored to the role of the individual member of personnel.

> ***WAI Comment:*** *Environmental management at the project is compliant with Kazakh requirements. The mine itself has not been accredited under ISO 14001. However, it is subject to the request of the corporate certification. All mining in the OP which affects the environment will be completed in 2011 and mine closure will then occur.*

14.7.6 Social Management and Training

Shaimerden employs 465 personnel, approximately 60 of which are on shift rotation (2 weeks on, 1 week off) from Kostanay (60km east). A number of the technical staff are not from Kazakhstan and have relocated for the project.

Shaimerden has a personnel manager and department. The role of the department is to:

- Source suitable personnel for the project by
  - Advertising employment opportunities
  - Identifying suitable candidates for employment
  - Identifying employed personnel who could be trained into higher positions
  - Providing regular training/refresher programmes to personnel in health safety and environment awareness etc
- Maintain suitable working conditions for personnel
  - Providing and maintaining suitable accommodation, services and facilities for rotational personnel i.e. laundry, television, canteen etc
  - Providing Personal Protective Equipment (PPE)
  - Provision and maintenance of the Medical Station (based in Krasnogorsk), whose roles include

    - Testing for alcohol and drug use before shifts
    - Providing regular health check to personnel
  - Provision of a negotiated social package
  - Provision of daily transportation from and to Lisakovsk and Krasnogorsk
- Maintain a balanced working relationship between personnel and managers
  - Providing an interface between managers and personnel
  - Organising meetings between managers and personnel
  - Provision of working contracts
  - Insuring all facets of the project are working within the law
- Maintain a strong, positive relationship with the local population of Krasnogorsk.

WAI Comment: *The personnel department provides a comprehensive, well planned and successful service to employees. This is in compliance with Kazakh and international requirements.*

14.7.7 Environmental Monitoring and Compliance

All environmental monitoring is undertaken in accordance with the requirements of the annual emissions and discharges report in line with the OVOS. The purpose of all environmental monitoring at the project is to ascertain whether the project is complying with specified standards.

Water quality monitoring is undertaken quarterly by Shaimerden internally and includes the following locations:

- 7 boreholes in and the 3 around the open pit;
- Settlement pond;
- Discharge pond (Karakol Lake);
- Monitoring boreholes around the projects sanitary protection zone (allotted as part of the OVOS); and
- Potable water borehole based in Krasnogorsk.

The water samples are sent for analysis at the Kazzinc laboratory based in Ust-Kamenogorsk. The analyses consists of heavy metals, pH, hydrocarbon compounds and explosives residues. The concentrations of contaminants identified in the discharge pond are the basis of the MPC permit issued in the revised OVOS. The environmental manager also undertakes rudimentary calculations to estimate the concentrations of contaminants outside of the sanitary protection zone.

Air quality monitoring is undertaken by the Kostanay Oblast Epidemiological Department on a quarterly basis. The monitoring consists of a number of points around the project and on the boundary of the sanitary protection zone. The monitoring is undertaken by hand held equipment and includes noise, vibration, dust, nitrogen oxide compounds (NOx) and carbon monoxide (CO). These determinands are undertaken to identify risks to human health, and risks to environmental receptors.

Soils and vegetation (plant uptake of contaminants) monitoring is undertaken within the project and along the boundary of the sanitary protection zone. The samples are collected by Shaimerden and sent to an independent laboratory in Kostanay for analysis.

WAI Comment: *An inventory of pollution sources for the operation was produced, and the monitoring programme has been developed in response to this. The monitoring programme has been designed to ensure compliance with Kazakh requirements, and would need to be compared against international standards to assess compliance with these.*

14.7.8 Stakeholder Dialogue and Grievance Mechanisms

The internal dialogue and grievance mechanism is managed and operated through the personnel department.

An annual review and forthcoming operations is provided to the Akim by Shaimerden. The Akim in turn presents this information to the populations of Krasnogorsk and Lisakovsk.

In case of complaints, the local populations are encouraged to communicate with the Akim, who then reports problems to the Personnel Manager or Director of the project. People are able to complain in person; however this has been deemed a more effective way of understanding the population's concerns.

> ***WAI Comment:*** *The internal stakeholder dialogue and grievance mechanism is appropriate to the size and nature of the operations. With regard to external dialogue, whilst national obligations are being met, it is recommended that external stakeholders have further opportunity to inform the company's decision making, to ensure that both company and community aspirations and concerns are satisfied.*

14.7.9 Water Management, Sourcing and Consumption

The abstracted water from the open pit is pumped via a pipeline into an unlined settlement pond to enable the reduction of suspended solids. The settlement pond was once an area of low lying wetland, which has been enclosed at its lower end by a waste rock berm. Once settled, the water is then pumped via a pumping station, adjacent to the settlement pond, to Lake Karakol where it is released. The pumping station has a capacity of 3,330m^3/hr via 2 pumps; a third is on standby. The evaporation potential of Lake Karakol is 25Mm^3/year. Lake Karakol was once a seasonal water body; however it is now a permanent feature as a result of the project.

Chemical analyses is undertaken at each stage of the abstraction process on a quarterly basis (Section 14.7.7), in accordance with the OVOS requirements. Non-soluble explosives are used in the open pit in order to reduce the contamination of groundwater.

Potable water is abstracted from 2 boreholes located in Krasnogorsk. The boreholes supply the village and the potable needs of the project. The water is transported to the project via pipeline to tanks to provide water for washing, and in containers for drinking and cooking purposes. The borehole abstracts from the limestone and is approximately 40m deep.

> ***WAI Comment:*** *The potential impacts on receiving waters from open pit discharge were assessed as part of the OVOS.*

14.7.10 Energy Consumption and Source

The region lacks power resources; coal from Karaganda and Kushmurun, and oil products are brought in and electric power is supplied from the Ural power system lines (Russia) via the Troitsk –Rudny–Lisakovsk–Krasnogorsk 110kv power line to a single substation owned by Shaimerden JSC. Another power supply source comprises three 6kV power lines from the KBRU-owned substation. Shaimerden has a reserve diesel 1MW/hr power generator should the electricity supply fail (the whole project requires approximately 7MW/hr at any one time).

> ***WAI Comment:*** *The substation is well managed and maintained, and energy usage is reviewed as part of the Company-wide resource minimisation scheme. The 5% target is thought to be met in the energy department, apart from with regard to heating.*

14.7.11 Waste Management

Scrap (including empty used oil barrels) is initially stored at the workshops and the settlement pond before being collected and stockpiled at the rail head to be transported to a scrap recycling company (Kozneasen) based in Kostanay. The amount of scrap produced is variable; however 100t was produced in 2009.

Used oil is emptied back into oil barrels and sent to the Ridder project by rail, where it is disposed of by burning.

Waste tyres are stockpiled outside the workshops. The tyres will remain in situ until there is a suitable facility identified for their disposal within a reasonable distance of the project, or until the project is closed. They will then be transported to the closest available facility.

Domestic waste and sewage are disposed of in a location known as the 'filtration field' a land allotment of the project located less than 0.5km and east of the open pit. The filtration field contains an open manmade pond into which sewage, pumped by tanker from sewage collector tanks, is deposited. Whilst still in the sewage tanks, the sewage is treated with chlorine to retard microbiological activity. Once disposed of into the sewage pond, no further treatment is undertaken. The sewage is intentionally allowed to passively drain into groundwater; hence the pond is not lined.

Domestic waste is disposed of in temporary trenches. The trenches are dug to a depth of 3.5m, 5m width and approximately 20m length. They are backfilled approximately every 5 days by the excavated soil arisings. No domestic waste separation is undertaken.

It was reported that no waste is produced by the assay laboratory.

The waste rock (>1% zinc) is stockpiled awaiting reprofiling as part of the project's closure plan.

From mid 2011 operations will cease and full mine closure will be initiated. The current dumping area will be rehabilitated.

14.7.12 Handling and Storage

The whole fuel farm area is concrete bunded below ground level and has soil bunds at surface. Below the rail refuelling point, is a subsurface sump and tank, within a further concrete bund and clay liner. The ground surface has been contoured to enable surface runoff to enter the sump. The total capacity of the subsurface tank is 140,000l. The sump is periodically pumped out to remove precipitation and this is taken to a specialist facility based in the neighbouring KBRU operation. It was reported that Shaimerden has never had a significant incident at the fuel farm.

Petrol is not stored on site and any required (for vehicles) is obtained from a public station in Krasnogorsk.

Oil for use in plant and machinery is brought in via train by barrel and is stored in the maintenance sheds in small quantities (<50 barrels).

The storage of spare machinery is next to fuel farm.

Ore stockpiles are classified into low (5-15%), medium (15-20%) and high (20-25%) zinc grade ore. Each stockpile is numbered. 24 stockpiles exist. The material from the stockpiles is taken by truck to the crusher. The stockpiles are blended as part of the crushing process. Crushing takes place between May and October. The crushed rock is then taken by trucks to the rail head for transportation.

In addition to zinc ore, the open pit also contains some bauxite (aluminium bearing rock). The bauxite is stockpiled separately. 21Mm^3 of bauxite has been mined at Shaimerden to date. The bauxite is given over to the neighbouring bauxite operation KBRU as a result of the Shaimerden operating inside the KBRU's mining licence.

> ***WAI Comment:*** *The project's storage areas are appropriate and well maintained, and there is an observation monitoring well to assess potential contamination in the vicinity of the fuel farm.*

14.7.13 General Housekeeping

General housekeeping at the project is good, with most areas being maintained in a tidy manner.

14.7.14 Fire Safety

Fire fighting equipment is located at various points around site facilities and plant. All staff and contractors are given training in fire fighting protocols. The project maintains a fire fighting team on a 24 hour basis.

> ***WAI Comment:*** *Fire fighting provisions appear appropriate to the size of the operations.*

14.7.15 Health and Safety Management, Training and Emergency Response

The project has a health and safety officer and deputy officer. Health and safety procedures at the project are undertaken in accordance with the state handbook on health and safety. In addition, there are site specific risk assessments for different tasks.

Employees are given training by the personnel department in health and safety procedures in accordance with their role within the project and with regard to emergencies such as fires or spills. All personnel are provided with adequate Personal Protective Equipment (PPE) and its use is enforced.

The management of health and safety includes the production of emergency plans, the inclusion of contractors and exterior personnel into site visit briefings and investigations after accidents have occurred.

Health and safety inspections are undertaken by the Kostanay Oblast Epidemiological Department on a quarterly basis. The inspections include noise, vibration, dust and potable water quality monitoring and reporting.

The stability of the rock dumps is measured via visual inspection by the project's surveyor on a monthly basis and also by instruments on an annual basis.

> ***WAI Comment:*** *Health and safety is fully compliant with state requirements. The site is not separately OHSAS 18001 accredited, but is covered by the corporate OHSAS 18001 accreditation.*

14.7.16 Environmental Liability

The environmental liabilities of the project are relatively minor given that all plant and machinery can be dismantled and removed and that other than crushing, no other mineral processing activities are undertaken on site. The most significant liabilities are the area of waste rock dumps and the open pit.

> ***WAI Comment:*** *The Company considers that the Mine Closure and Rehabilitation Plan (MCRP) addresses the main environmental liabilities posed by the project, and given the imminent closure of the project in 2011, feels these will be adequately addressed. The MCRP design has been submitted to the State authorities for expertise assessment.*

14.7.17 Mine Closure and Rehabilitation

Under State legislation, the local community provisions for mine closure should be made by the State. However, Kazzinc is also considering isues regarding community impacts of closure.

The closure plan for Shaimerden is being designed by a state registered institute concurrent with the writing of this report. Once completed, the report will be submitted to the Ministry of Environmental Protection for review. The closure fund has yet to be determined.

Although the closure plan has yet to be officially completed Shaimerden unofficially has made the following closure plans.

Prior to the construction of the project's facilities, the topsoil from these areas was stockpiled. The topsoil will be replaced once the facilities are dismantled and removed. Remediation will be progressive as facilities become redundant.

The remediation of the waste rock dumps will consist of the reduction in slope angle from 60° to 10°, producing a plateau to the edge of the rock dump land allotment. The area of the rock dumps was stripped of topsoil (36,000m^3) previously and as such the topsoil will be placed over this area and left for passive remediation. The re-profiling of the rock dumps will proceed in 2011 and will continue throughout the remaining life of the project (forecast 2016), subject to the removal of the ore stockpiles within this area (providing the required space).

It is proposed that the haul road to the open pit will be removed. The soil safety bund, currently present around the open pit, will be reinforced with crushed waste rock. The water pipelines will be removed. It is assumed that on closure of the open pit that this will be allowed to flood. It is assumed that the dam in Sorkol Lake will remain in place.

The waste rock berm at the settlement pond will be removed to allow this to once again become an area of wetland.

The local administration is in the town of Lisakovsk.

> ***WAI Comment:*** *The MCRP has been prepared by a local environmental contractor, and is currently undergoing environmental expertise review by the government. Approval is expected in April 2011. It is recommended that Kazzinc's community closure initiatives should be incorporated in a formal plan, with a supporting fund. The fund should be adequate to cover both environmental and community aspects of closure, including post closure monitoring.*

14.7.18 Social Initiatives and Community Development

Prior to the operation of Shaimerden by Kazzinc, the village of Krasnogorsk was failing. The village had no sewage system and an unreliable water supply, as well as high and increasing rates of unemployment.

The project has provided Krasnogorsk with street lighting, a sewage system, potable water, funding and equipment to local schools, employment to a large proportion to the viable population, funded the redevelopment of many of the town's buildings, replaced heating systems in houses and public places, provided machinery, roads, wage supplements to those employees with children and low incomes, vaccinations for children, an ambulance service and a medical station (staffed by nurses), amongst other initiatives.

The potential health impacts of the project on the local community have not been assessed by Shaimerden. However there have been no known illnesses reported as a result of the project.

> ***WAI Comment:*** *Shaimerden is working well with the local community, and has provided much needed and required assistance to it. Kazzinc always renders assistance to Krasnogorsk village. The following works are performed: cleaning of roads, school maintenance, purchasing of equipment and clothes for orphan homes and boarding schools of Lisakovsk town which is in compliance with social business responsibility. It would also be recommended to focus on skills provision to enable local business development in other sectors (outside of mining).*
>
> *WAI recommends carrying out a local needs assessment which can be used to inform a social development plan and initiatives.*

15 NOVOSHIROKINSKOYE DEPOSIT

15.1 Introduction

15.1.1 Location & Access

The Novoshirokinskoye gold-polymetallic mine is located in East Zabaykal in the Gazimuro region of Chita province, Russian Federation. The geographical coordinates of the centre of the licence area are 51°34´45"N and 118°42´15"E.

The deposit is located some 23km to the northeast of the rayon centre of Gazimurskiy village, 191km southeast of the railway station at Sretensk, and some 288km to the southwest of the railway station at Borzya (Figure 15.1).

Transport to the mine is via a 10km long un-metalled road which joins the Sretensk - Nerchinsk provincial highway. The total distance to the railway siding at Priiskovaya where concentrates are loaded into railcars for their transport to Ust-Kamenogorsk is some 230km.

Figure 15.1: Location of Novoshirokinskoye, Russian Federation

Travel time by car from Chita to the northwest, which is served by daily flights to Moscow, is between 7 – 8 hours, a distance of over 500km. The road conditions are generally good, particularly in the first half of the journey from Chita.

The deposit is bordered by China to the east (some 70km in a straight line) and Mongolia to the south.

15.1.2 Topography & Climate

The Gazimuro region is home to basic agriculture concentrated in the main valleys, whilst the majority of the land is typical boreal birch and pine forest.

The Novoshirokinskoye mine lies at an altitude of around 935m between the Gazimura and Uryumkana rivers. Relief is generally moderate, although there are some steeper slopes. Within the vicinity of the mine, absolute elevations vary from 700-1,200m, with relative changes of between 100-300m.

The climate of the region is sharply continental, and is characterised by a prolonged (5½ to 6 months) of winter with frosts as low as -60°C, and by a comparatively short summer with a maximum temperature of +39°C. The average annual temperature is -4°C, which has caused the development of localised permafrost on the northern slopes and in the valleys.

The annual average precipitation is 392mm, with approximately 85% (333mm) occurring during the short summer months (July and August), whilst the remainder falls as snow in winter (heaviest in January and February). Groundwater levels around the mine are quite low, and the mine only makes around $50m^3$/hr of water at the current 750m depth.

Snow cover varies from 2-19cm, but can reach 33cm in extreme cases. First snows are evident in October and remain until March, sometimes April. In winter, all rivers, except the Gazimura and Uryumkana, are frozen throughout.

Winds are at their strongest in spring and in autumn, predominantly from a southeast and southwesterly direction.

The dryness of the air is a special feature of the climate of the Transbaykal. The average monthly relative humidity of air is fairly consistent, although the lowest relative humidity is seen in May (52%), whilst during the rest of the year it varies from 58 to 80% with an annual average value of 70%.

15.1.3 Infrastructure

With the recent opening of the mine (December 2009), infrastructure in the region has greatly improved, as without mining, there is little else in the vicinity of the mine with the exception of basic agriculture. The electric power supply for the mine comes from the Chita power system via a 110KVa line.

Although limited, the immediate region does produce building materials in the form of clay bricks, limestones, rubble stone, gravel, sand, and also timber for construction and firewood.

15.1.4 Mineral Rights & Permitting

The Novoshirokinskoye mine is surrounded by a $1.4km^2$ Mining Licence which is granted for extraction of polymetallic ores to the 600m elevation, but with a larger Land Allotment to accommodate mining infrastructure and tailings surrounding the licence (Table 15.1).

Table 15.1: Mining Licence Coordinates

Coordinate	Easting	Northing
1	118° 41' 25"	51° 36' 20"
2	118° 42' 10"	51° 36' 00"
3	118° 43' 10"	51° 35' 50"
4	118° 43' 05"	51° 35' 35"
5	118° 42' 10"	51° 35' 40"
6	118° 41' 15"	51° 36' 15"

The licence was granted on 30th September 2004 for a period of 20 years, expiring 1st October 2024. The Novoshirokinskoye licence is held by a Russian legal entity, OAO Novoshirokinskiy Rudnik and Kazzinc owns 48.3% of the shares in OAO Novoshirokinskiy Rudnik.

> ***WAI Comment:*** *The licence documentation has been inspected and is in order. Moreover, the conditions of the licence are sufficient for the life of mine.*

15.2 Geology & Mineralisation

15.2.1 Regional Geology

15.2.1.1 Introduction

The area of the Novoshirokinskoye ore field is composed of sedimentary and volcanogenic-sedimentary formations of early-Middle Cambrian, Early Middle Jurassic, and Late Jurassic ages, with Upper Jurassic intrusive rocks.

15.2.1.2 Stratigraphy

The oldest rocks present in the area are those of a Cambrian age (Cm1-2al) sedimentary package (Altachinskaya series), comprising predominatly micaceous siltstones with interlayers of sandstones and quartzites. In the upper part, siltstones and schists, with interlayers of limestone and quartzites predominate.

These rocks are seen in the northwest part of the area, and are bounded to the southeast by the Uryumkanskim Fault.

Above the Cambrian lie rocks of Jurassic age. The Lower-Middle Jurassic (J1-2) sediments occupy a large portion of the southeastern part of the Novoshirokinskoye area, with less exposure in the west, where they are faulted against the Cambrian rocks of the Altachinskaya series. In the east, they overlap with Upper Jurassic sediments.

Compositionally, the Lower-Middle Jurassic is characterised by polymict sandstones with lens-like siltstones occurring in the upper parts, thin clay shales (1-2m thick), and localised conglomerates between 5-10m thick.

The Upper Jurassic (Shadoronskaya series) is composed of a volcano-sedimentary sequence (J3šd) well developed in the central part of the Novoshirokinskoye area where they form a large synclinal structure, elongated in a northeasterly direction. In detail, the series comprises a lower sequence (J3šd1) of tuffaceous sandstones, siltstones, conglomerates, tuff breccias, and thin andesite porphyries. This sequence is approximately 700m thick and attains 1,400m width in the central part of the area.

Above this, the middle sequence (J3šd2) is divided into a lower unit (J3šd21) which comprises andesite and andesite-basalt porphyries, interbedded lava-breccias, tuffs, tuffites, and tuff breccias of those. The thickness of this lower layer is 800m.

Quaternary sediments (Q) of the region include sands, sandy clays, clays, silts, and pebbly gravels in the valleys and terraces, which have thickness from 5 to 30m. Recent, thin (0.1-5m), eluvial-deluvial sediments, which occur on mountain slopes, mostly comprise rudaceous debris, with sand-clay infill. Figure 15.2 shows the regional geology of the Novoshirokinskoye area and the main stratigraphic units.

15.2.2 Local Geology

As outlined above, the Novoshirokinskoye area is characterised by a sequence of Jurassic sediments folded into a synclinal structure with variable dip, but most commonly 45-55° and 30-40°. Sediments are cut by many faults with hydrothermal alteration and brecciation associated with their development. Four main fault directions have been identified: Northeasterly, Northwesterly, North-South, and East-West. The Northwesterly and East-West trending faults can be traced for up to 6km.

The principal magmatic activity within the area is represented by a series of Late Jurassic intrusions comprising granodiorite stocks and dykes which are sometimes, but not always, related to the steeply dipping zones of hydrothermal alteration which host the mineralisation. It is likely that these intrusives, and particularly a small stock adjacent to the main area of mineralisation may well be the driving engine for the hydrothermal activity and subsequent metal emplacement.

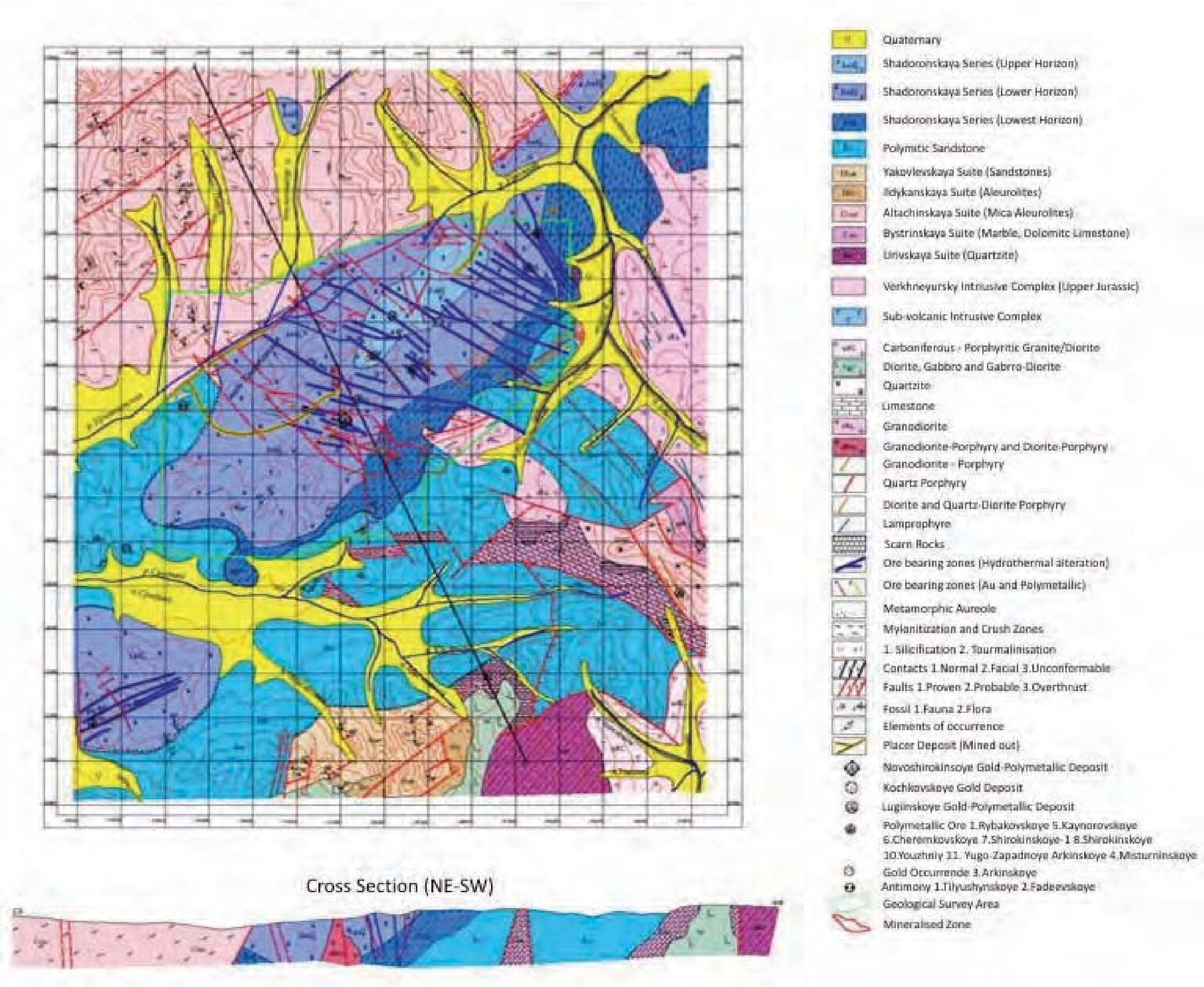


Figure 15.2: Regional Geology of the Novoshirokinskoye Area

15.2.3 Mineralisation

15.2.3.1 Introduction

Economic mineralisation at Novoshirokinskoye is constrained within broader zones of hydrothermal alteration, which in turn are related to several fracturing systems. The ore-bearing phases may be later than the principal hydrothermal phase – the fluids using these zones as pathways for migration and precipitation.

Mineralisation within the alteration zones is seen as lensoid and can be continuous over several hundred metres along strike and has been traced to over 900m in depth where the structure remains open in some parts of the system.

Orebodies are generally oxidised in their upper parts (where close to surface), followed by a thin transition zone grading into sulphide where the predominant economic mineralisation comprises galena and sphalerite with associated gold and silver.

The Main ore zone is the most persistent, and in the central part, 16 orebodies have been identified. In the footwall of the Main orebody are found orebodies 5, 11, 7, 4, 3, 2, 1, 13, 14 and 16, whilst in the hangingwall 8, 6 and 12 are located.

15.2.3.2 Orebody Morphology

The Novoshirokinskoye tectonic zone is characterised by strong metasomatism of quartz-micaceous-dolomite composition. The width of the metasomatic zone varies from 20-300m, and has been traced down-dip for more than 750m. Ore mineralisation is concentrated in the centre of the zone.

The footprint of the mineralisation at surface and on the 853m level is practically identical and comprises 2,130m and 2,150m of strike length respectively. With depth, on the 750m and 650m levels, due to some thinning on the southwest flank, strike extent decreases 1,900-1,960m, whist at 550m this decreases further to 1,780m, at 450m to 1,150m, and at 350m some 1,060m.

Figure 15.3 shows a typical section through the mineralisation.

The internal structure of the mineralised zone is very complex, and is seen as a series of en echelon-like fractures, with mineralisation concentrated within them and disseminated within the surrounding metasomatised envelope.

Disseminated mineralisation predominates which is developed along the systems of small fractures, brecciated mineralisation is also common, as is massive ore which is found within the breccias and less commonly symmetrically-banded and crustiform textures which are characteristic for mineralisation filling cavities.

The disseminated ore types can only really be defined by assay, whilst the breccias and massive ores show more definitive, visual mineralisation.

Overall, the Novoshirokinskoye zone can be considered a linear stockwork with a strike varying from 255-335°, and dipping generally to the southwest at angles from 30-90°. The zone extends for 50-1,450m along strike, and from 40-760m (Main orebody) down-dip, and economic mineralisation has been proven down to the 450m level. A likely finite depth to mineralisation exists at around the 200m level, where the change of volcanic rock favourable to mineralisation by unfavourable pyroclastic and fragmentals occur.

Deep drilling has also revealed a "blind" granodiorite stock of Late Jurassic age in which although orebodies are outlined, they appear to be thinner and branching.

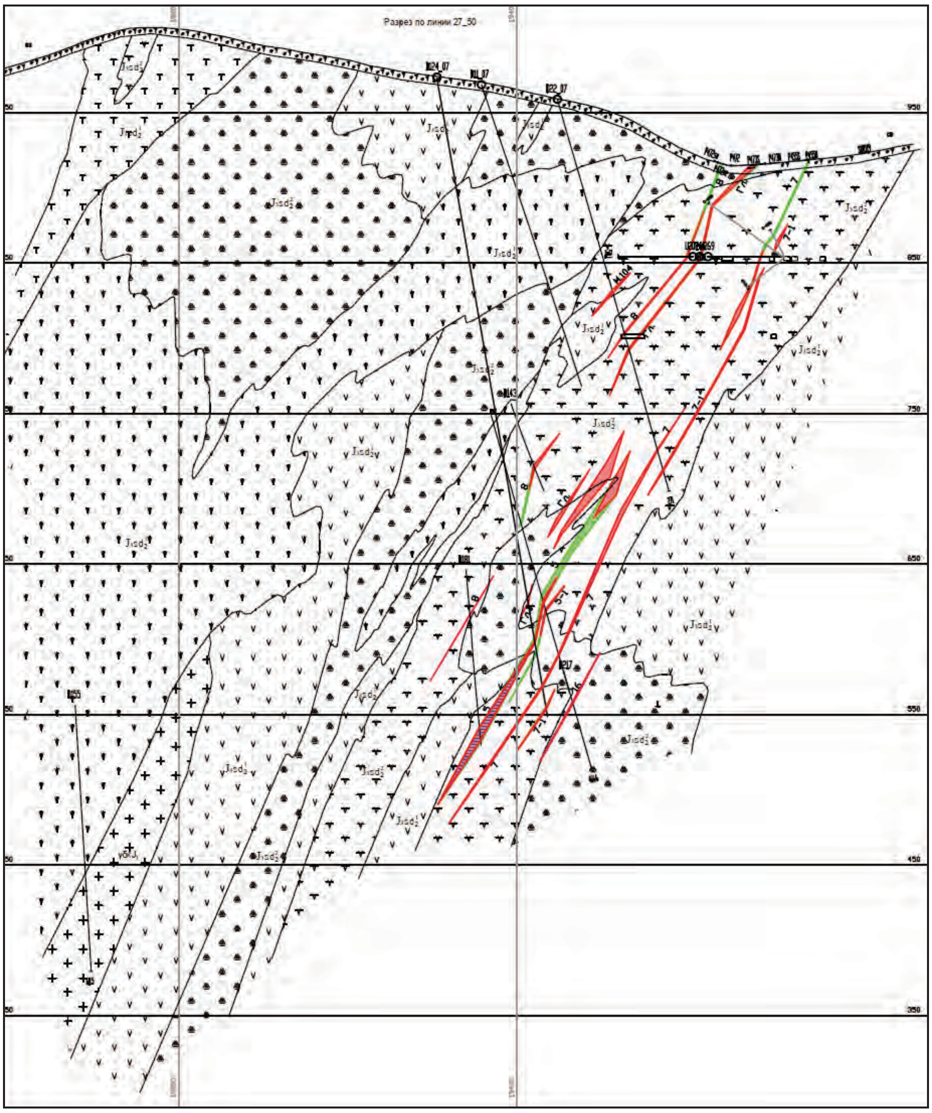


Figure 15.3: Section 27+50 through Main Zone Mineralisation

15.2.3.3 Orebodies

Introduction

The principal orebodies within the Novoshirokinskoye mineralised area are Main, 5 and 7. The details of these are given below.

Main Orebody

The Main orebody typically pinches and swells (and nearly merges with Orebody 5 on section line 95), but in the centre is persistent over considerable distance, with an overall length of 1,330m, maximum down-dip depth of 760m, strike of 290-300°, and dip of between 33-82°. Thickness varies from 0.20 to 22.1m. The thicker areas are often related to breccias (tectonic) zones.

At a 3g/t Au equivalent cut-off grade (calculated in 2007 – see below), the average thickness is 4.52m. On the surface, the length of the orebody is 915m; at 853m it reaches a maximum of 1,330m, whilst at horizons 750m and 550m, the strike length decreases to 1,020 and 1,040m respectively. At these lower horizons, barren areas create a column-like appearance to the ore zone. The most extensive of them occurs at the southeastern end where mineralisation has been traced to the 350m level.

The orebody is folded within the metasomatic envelope of predominantly quartz-dolomite composition with the dissemination, veins, and groups of veins of pyrite, galena and sphalerite.

Orebody 7

This orebody is the second largest and occurs in the central and southeastern part of the deposit on the footwall of the Main and Orebody 5. The orebody thins to the southeast and northwest both along strike and down-dip. At the surface, the length of the orebody is some 480m, whereas at the 700m level, strike length approaches 1,510m, with a maximum down-dip extension of 460.

Morphologically, Orebody 7 is column-like with a "blind" offshoot in the region of profiles 16-27 with a length of up to 600m. In general, Orebody 7 has relatively consistant strike and dip exemplified on the 650m level where the strike only varies between 280-290°, although there are occasional abrupt changes.

However, the general dip is to the southwest, varying from 54-80°, and averaging 65°. Thickness varies from 0.26-15m, with the average thickness at a 3g/t Au equivalent cut-off grade is 2.73m. Mineralisation comprises an uneven dissemination, and by the veins of pyrite, galena and sphalerite.

Orebody 5

Orebody 5, which is the third most important orebody at Novoshirokinskoye, lies in the central part of the area, in the footwall of the Main orebody, some 5-50m away from it, although sometimes merging, although down dip, the orebodies become more seperate.

The maximum strike length (270-335° azimuth) of Orebody 5 is some 1,060m, and has been traced down-dip for some 775m. Thickness is highly variable from 0.19 – 18.15m, with an average of 3.04m using the 3g/t Au equivalent cut-off grade.

Orebody 5 is morphologically quite complex, varying in dip (steeper on the flanks than in the centre), but with an average of 61°, and structure.

Mineralogically, the mineralisation is characterised by a pyritised metasomatic zone of chlorite-dolomite and quartz-chlorite-dolomite composition, predominantly breccia-like in texture. In the majority of cases, mineralisation is related to the quartz veins and accumulations of dolomite and quartz. Principal ore-bearing minerals are galena and shalerite.

Orebody 8

Orebody 8 lies in the hangingwall of the Main orebody at a distance from 10 to 30m from it. Broadly, the orebody structurally mimics the Main orebody, generally dips to the southeast at between 79-80°, but overall at 65°. Localised sharp bends in strike are noted.

Overall strike length is around 945m, with a delineated down-dip length of 460m. Thickness varies from 0.22-12.66m, average 3.21m at a 3g/t Au equivalent cut-off grade.

Other

A number of other ore zones occur within the Novoshirokinskoye area. Zones vary in width from 0.2-17.24m, with averages between 6.25-11.8m. Strike lengths can be >500m, but down-dip depths are around 100m.

In addition, several smaller ore zones, localised in the hangingwall of the Main orebody, also occur, dipping to the southeast at 40-74°. Zones tend to be approximately 100m along strike and 100m down-dip.

15.2.3.4 Mineralogy

More than 60 ore and vein minerals have been identified at Novoshirokinskoye. Principal mineralogy comprises galena, pyrite and sphalerite, with hydroxides of iron and manganese, lead ochres, quartz, dolomite and sericite. The typical average grades are 3.72% lead, 1.79% zinc, 3.51g/t Au and 96.91g/t Ag.

Secondary minerals include chalcopyrite, hematite, covellite, malachite, smithsonite, cerussite and calcite.

Three types of mineralisation have been identified:

- copper-pyrite;
- quartz-polymetallic; and
- carbonate-polymetallic.

There does appear to be some zonation of the ore types, with at the northwestern end, carbonate-polymetallic ores predominating, in the centre, quartz-polymetallic, whilst at the southeastern end, the copper-pyrite ores are most common.

The most significant gold contents are found in the copper-pyrite stage of mineralisation, where values up to 186.1g/t have been found. In the ores of the quartz-polymetallic stage, significant quantities of gold are also encountered where the gold is found in nearly all sulphides, vein quartz and the hematite. The ores of the carbonate-polymetallic stage are the least gold-bearing, with gold associated almost exclusively with galena.

Economic quantities of silver in the form of isomorphous admixtures within galena and fahl ore is seen, the latter is capable of accumulating silver in significant quantities. In addition, up to x10 more silver reports to the copper concentrate than the lead concentrate, whilst comparatively small quantities of silver are connected with virgin gold.

The bulk of the zinc is isolated in the quartz-polymetallic stage of mineralisation, and its content somewhat decreases with depth. The majority of the copper is found in the cupper-pyrite stage of mineralisation, whilst a smaller quantity is found in the quartz-polymetallic stage. In the ores of the latest, carbonate-polymetallic stage, the content of copper is very insignificant.

Alteration zones are quite common, but unless ore-bearing, are mostly pyrite with very low galena and sphalerite.

The ores of the deposit are divided into two types: sulphide and mixed (oxidised-sulphide). The oxidation zone is weakly developed with an average depth of 18m, whilst the mixed ores do not exceed 2% of the total.

15.2.3.5 Exploration Potential

There are two properties nearby, not owned by the Company, one within 1km (Kochkovka), another within 5km (Arkya). These may be available for acquisition, but they are believed to be relatively small.

15.3 Exploration Works

15.3.1 Background

The Novoshirokinskoye mine has had a long history of exploration before production finally commenced late in 2009. Work commenced in 1960 and followed a series of specified protocols which has continued to the present day.

15.3.2 Historical Works

Table 15.2 summarises data on exploration undertaken at Novoshirokinskoye from 1960 – 2010.

Table 15.2: Historical Exploration Works

Description	Units	Total Works	Until 1962	1962 – 1/7/2010
Geological Survey Work at 1:10,000 Scale	km^2		50	
Geological Survey Work at 1:2,000 Scale	km^2	?		
Geophysical Studies (Magnetic, Electrical)	km^2	55	55	
Hydrogeological Survey	km^2	150	150	
Metallometric Survey	km^2	20	20	
Trenches	m^3	73,725	73,725	
Pitting	m	9,282	9,282	
Pit Samples of $1.8m^2$ Area	m	3,029	3,029	
Surface Channel Samples	m	4,128	4,128	
Surface Drillholes	m	95,660	73,630	22,030
Core Samples	m	36,998	20,291	16,706
Borehole Logging	%		50	
Hydrogeological Drillholes	No.	14	10	4
Pump Tests	No.	31	31	
Technological Sample Tests	No.	15	6	9
Underground Exploration Development	m	2,960.8	1,284	1,676.8
Underground Mine Development	m	8,037.5		8,037.5
Production Development	m	7,090.5		7,090.5
Stopes	m	2,249		2,249
Underground Channel Samples	No.	3,323	1,299	2,024
Underground Drilling	m	24,309	1,385	22,924
Core Samples	No.	13,786	781	13,005

15.3.3 Sample Collection

From the Russian protocols, the original surface core drilling, the majority of which took place before 1962, sent half cores for assay, whilst underground drilling, due to the small size of the core, sent whole cores for assay.

Due to the very historic nature of much of the exploration at Novoshirokinskoye, unfortunately none of the original drill cores were available for inspection.

Samples were often 1m in length, but varied from 0.25-2.2m. For the underground channel samples with dimensions of 10x5cm, which were collected along all development drives and cross-cuts (often on both sides of a cross-cut), sample lengths varied from 0.2-2.0m, with an average of 1m.

In addition, as part of the mine's development, a number of Technological Samples were collected. These included 11 lab samples with weights from 200-2,000kg, and 5 semi-industrial samples from 5-1,100t.

15.3.4 Sample Preparation

The sample preparation flowsheets for the core and channel samples differed slightly, however, as with all Russian sample preparation for assay, the ultimate grain size for the final sample split for both methods was 0.074mm.

> ***WAI Comment:*** *Although it was not possible to review the historic methods used, from experience of auditing many former Soviet operations, sample preparation is done in a very prescriptive manner and to a consistent good standard. In that respect, WAI is satisfied that these works will have been done properly.*

15.3.5 Sample Analysis

The early exploration works saw some 3,500 channel and core samples sent to the Chita Central Laboratory (1952-57) for lead, zinc and some copper analysis, as well as 17,800 fire assays for gold and silver, and some 23,000 tests done under an umbrella group of laboratories. In addition, analyses of copper, sulphur, cadmium were executed on 110 group tests.

The determination of the content of lead and zinc was done using a classical volumetric chromate method in the tests on samples with a lead content of >2%.

ICP analysis was undertaken at "Alex Stewart" (Moscow), "SGS" (Chita) and the Transbaikal scientific research institute (Chita) from 2007 until 2009. In 2010, analyses were undertaken at the mine laboratory.

15.3.6 Quality Control

As with all deposits explored under the regime of the Former Soviet Union, the level of sample quality control which was undertaken followed strict GKZ protocols, with detailed internal and external control on assaying. Novoshirokinskoye is no exception to this.

The internal and external control of analyses was conducted for the purpose of the detection of random and systematic errors within chemical and fire assays during the entire period of the exploration works.

For internal checks, some 6.6% of samples were re-run for lead and 6.1% for zinc at the Chita laboratory, and some 3.8% and 3.4% respectively at the group laboratories. The test laboratory also controlled some 1.7% of analyses for gold and silver.

Rather than present the voluminous data that relates to this topic, WAI has undertaken a thorough inspection of these data and can conclude that with the exception of occasional discrepancies (which were always rectified at the time), the quality of the data can be deemed to be good and fit for use in any resource estimation exercise.

However, what is clearly evident from these data, and particularly from an analysis of channel sample "twins" is that there is a high degree of variability within the gold values seen.

In isolation this may have proved a problem, although the issue is somewhat ameliorated by the sheer volume of available data giving the reader comfort as to the approximate overall grade of the deposit. Moreover, recent production data has borne out the grades estimated from the historic exploration programme.

15.3.7 Current Exploration & Grade Control

Exploration is now undertaken using channel samples and underground Diamec 251 and 252 rigs, producing a small diameter 32mm core.

Fans of holes are drilled to achieve a 12x12m orebody pierce-points, with whole core sent for assay. Sludge drilling takes this spacing down further to 6 x 6m.

Channel samples are taken approximately every 3m along strike drives and faces, and occasionally as duplicates on either side of x-cuts.

These data are used to update the model and modify the underground development programme.

All exploration assays are currently done in the laboratory on site, although during the time of the visit, there were major sample preparation bottlenecks.

As an example, the mine produces some 200 channel samples (weighing approximately 15kg each), 600 drill chip samples (20kg each), and 1,000 cores (1-4kg each) per month. These relatively large samples make the sample preparation process very slow.

As a consequence, there is an estimated 8,000 sample back-log in the laboratory caused by insufficient and poorly utilised equipment.

Of these, some 3,500 are ground, whilst the remainder are un-prepared. However, the sample preparation facility currently can handle only 44 samples per day.

> ***WAI Comment:*** *The back-log of unassayed samples within the sample preparation facility basically renders the current grade control measures undertaken at the mine obsolete as the mine will have moved on before the assays are known for a particular stope or development drive (WAI was informed that the laboratory runs the grade control holes as a priority, although this was not confirmed). Nevertheless, the laboratory is meant to handle some 400 samples per day, but is currently only doing some 240. The issue has been raised to shareholders, but no action has yet been taken.*
>
> *If the mine has been working efficiently without the benefit of good grade control data, the volumes of samples needed for this exercise may not be necessary, given the lack of blending and generally relatively wide stopes Suffering slightly more dilution might be preferable to the collection and analysis of so many control samples.*

15.4 Mineral Resources

15.4.1 Introduction

Resources were first approved in 1967 by GKZ at B + C_1 for both mixed oxide (near surface) and the larger sulphide resource at depth. These were updated in 2010 (shown on Form 5GR) to indicate the minor production that had taken place.

In November 2010, WAI produced a new resource and reserve estimate, prepared in accordance with the guidleines of the JORC Code (2004).

15.4.2 Density Determination

The volumetric mass of the sulphide ores was determined at a laboratory of construction materials in Irkutsk (Oblpromstroma) and gave a value of 3.10t/m^3.

The volumetric mass of the mixed ores was determined by the laboratory "MITsMIZa", and gave a value of 2.89t/m^3.

Additionally, the calculation of the volumetric mass is carried out statistically using the correlation of the contents of elements and volumetric mass of the existing models, in which were determined the contents of Pb, Zn, Au and Ag.

In the TEO, for the calculation of reserves, an equation for the regression between the volumetric mass (Y) and the content of lead:

$Y = 0.0249Pb + 2.9016$

15.4.3 WAI 2010 Mineral Resource Estimate

15.4.3.1 Introduction

Resources using three-dimensional geostatistical block models were initially estimated in 2008 which included all ore bodies within the deposit. In 2010 Resources were updated for five of the ore bodies (Main, 5, 7, 8 and 16).

15.4.3.2 Database Compilation

Drilling

Copies of the drillhole databases were provided to WAI in Excel format. The database included 563 holes drilled since 2005 and 261 holes drilled prior to 2005.

The density of drilling is greatest in the central part of the deposit where drilling includes underground fan drilling from three horizons (+930m, +850m and +800m Levels). A total of 117,083m of diamond drilling is now included in the drillhole database and includes 35,868 samples with Au assays, 34,566 samples with Ag assays, 25,414 samples with assays for Pb, and 42,885 samples with Zn assays.

The location of all drillholes at Novoshirokinskoye are shown in Figure 15.4.

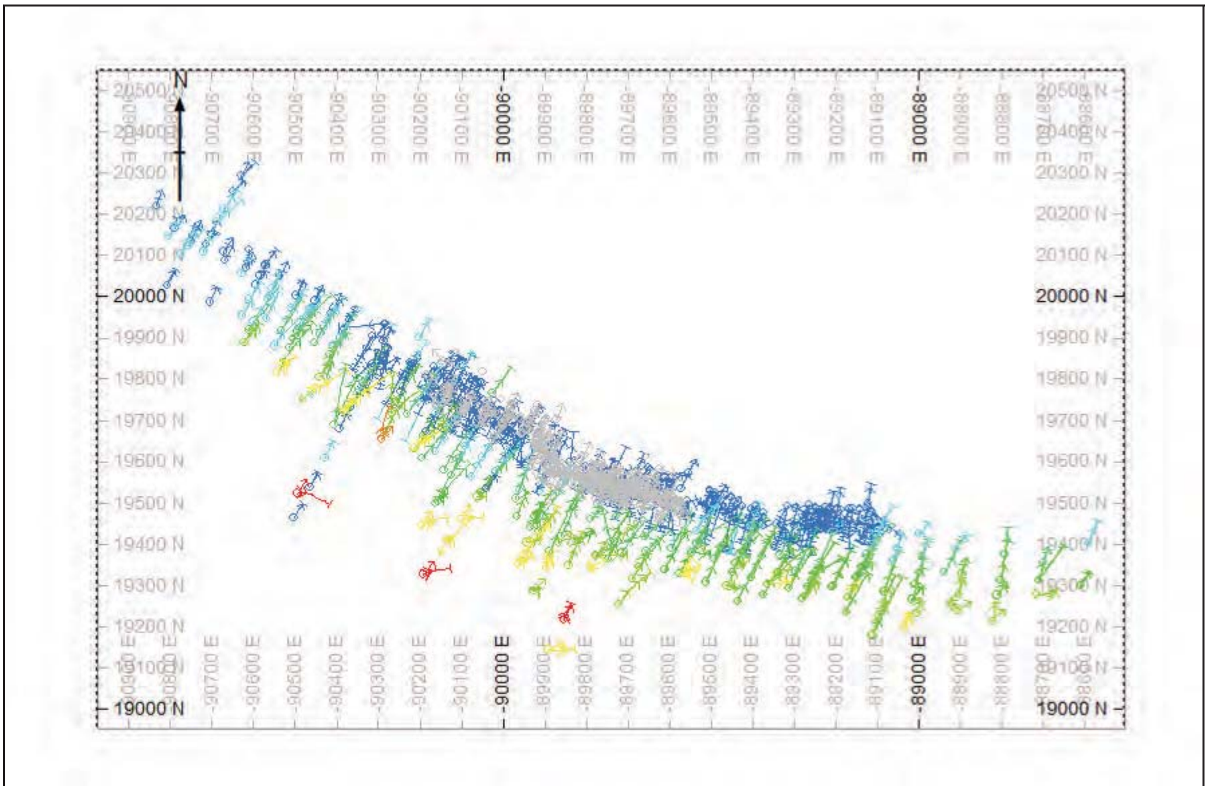


Figure 15.4: Novoshirinskoye Drillhole Locations

Channel Sampling

Channel sampling has been carried out at the Novoshirokinskoye deposit from the underground drives. A total of 7,476 channel samples with Au, Ag, Pb and Zn assays are included in the database.

15.4.3.3 Geological Interpretation

Introduction

Wireframes are constructed based on a 3g/t gold metal equivalent (Aueq) the prices and recoveries used in constructing the wireframes is detailed in Table 15.3. The prices used were those of 2007, the markets have seen significant changes since 2007 and as such metal prices have gone up significantly thus potentially impacting the geological interpretation. As such WAI undertook a sensitivity analysis of changing metal prices and cut-off grades (COG).

Table 15.3: GKZ Novoshirokinskoye Au(eq) 2007

Metal	cost per unit (LME) US$	price units	Convert Unit	Price per Unit, US$	Recovery	Co-Ef
Au	603.46	oz (troy)	1g	19.4	0.92	1
Ag	11.54	oz (troy)	1g	0.37	0.887	0.0184
Pb	1288	t	1%	12.88	0.875	0.632
Zn	1637	t	1%	16.37	0.787	0.722

Sensitivity Analysis

A sensitivity analysis was undertaken using metal prices taken from averages for the next 5 years, the details of which are shown in Table 15.4. The price of gold has increased disproportionately to the other metals and as such the new metal equivalent grades tend to be reduced slightly. Due to the increase in metal prices, a COG for the wireframes of 3g/t Aueq is too high and as such it is deemed a lower COG of 2g/t Aueq would be more feasible.

Table 15.4: Novoshirokinskoye Au(eq) 2010

Cost per Unit (LME) US$	Price Units	Convert Unit	Price per Unit, US$	Recovery	Co-Ef
1287	oz (troy)	1g	41.37865	0.92	1
23	oz (troy)	1g	0.739479	0.887	0.01723
2422	t	1%	22.21	0.875	0.510496
2420	t	1%	20.8	0.787	0.430005

Visual checks were done on sections looking at the wireframes based on the original 2007 3g/t Aueq alongside the drillholes coded with the new metal equivalent.

An analysis was also undertaken in Excel whereby the drillhole orebody intercepts were coded and cross-checked with the new metal equivalent grades.

As a result of both of the checks, it was identified that changing metal prices would have no significant effect on the geological interpretation and wireframing. Due to the dip of the orebodies and the dip of the drillholes the changes in metal equivalent would potentially add less than half a metre in actual width to an orebody and this is only in limited sections.

Therefore, for reporting continuity, WAI has continued with the 3g/t Aueq for modelling purposes. Figure 15.5 shows wireframes in plan for Novoshirokinskoye, whilst Figure 15.6 shows a typical cross-sectional view through the deposit.

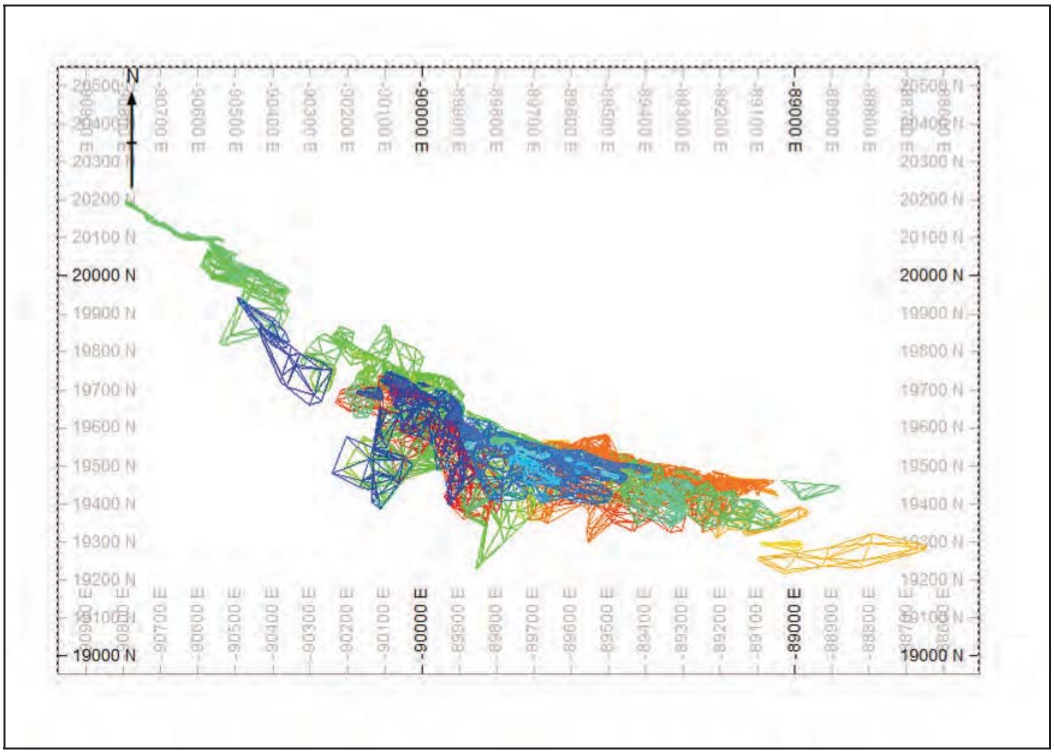


Figure 15.5: Plan View of Novoshirokinskoye Orebody Wireframes

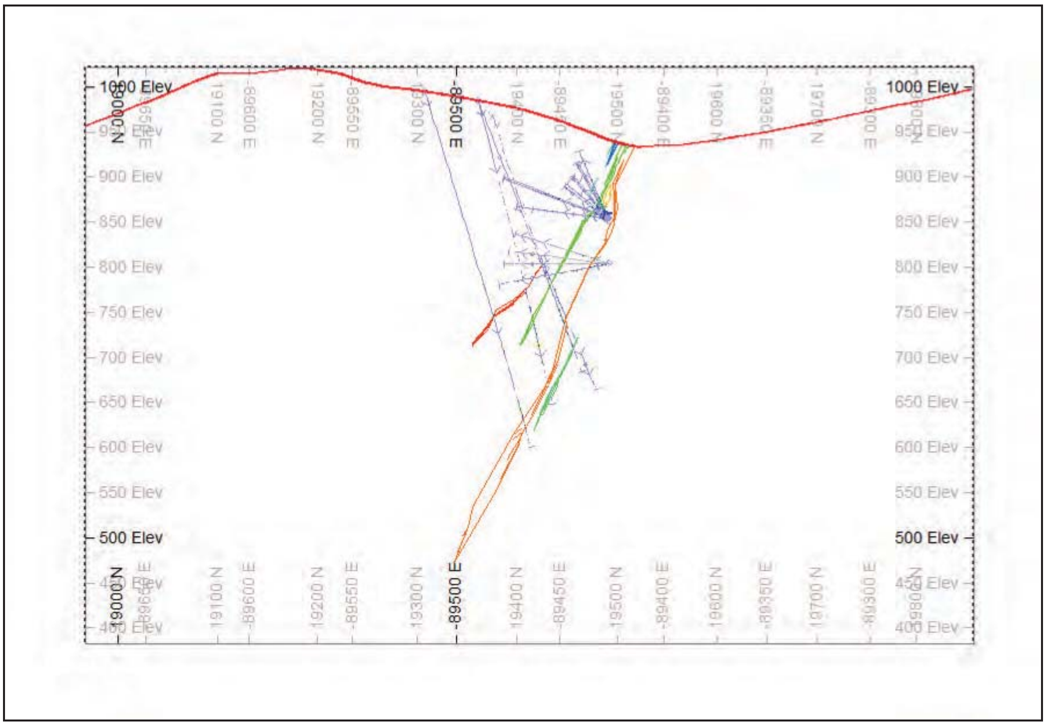


Figure 15.6: Cross Sectional View of Deposit

15.4.3.4 Sample Data Processing

The drillhole samples contained within the orebody wireframes were selected for further data processing. The samples were coded according to each orebody. Gold data show strong log normality.

Top cutting was applied to Au, Pb, Zn and Ag, with the value validated by using decile analysis. The top-cut values used were:

Pb: 16.6%;
Zn: 6.82%;
Au: 22.62g/t; and
Ag: 360.43g/t.

It has been assumed that drillhole sample intervals where assay values are absent were not sampled as they were not considered to contain mineralisation. Assay values which are absent have therefore been replaced with zero values.

A 1m composite length was used to provide a consistent level of support. WAI checked this and agrees that a 1m composite interval is suitable.

The statistical analysis of the Novoshirokinskoye sample (incl Channel samples) database is summarised below:

- Chip samples have been included in the resource estimate;
- Top-cutting was applied; and
- A 1m composite interval has been applied to standardise sample length.

15.4.3.5 Variography

Introduction

WAI undertook variography to review the estimation and search parameters that had been used as well as:

- To estimate the presence of anisotropy in the deposit;
- To derive the spatial continuity of mineralisation along the principal main anisotropic orientations;
- To produce suitable variogram model parameters for use in geostatistical grade interpolation; and
- To check the validity of search parameters upon which the resource estimates were based.

The variography was carried out based on the 1m composite intervals, and analysis was performed using Datamine Studio v3 software.

Variogram Parameters

Directional semi-variograms for the along strike, down dip and downhole directions were generated for Au, Ag, Pb and Zn using 1m composite sample data. The nugget variances were modelled from average downhole variograms based on a 1m lag reflecting the downhole drillhole composite spacing. Separate semi-variograms were generated for each element and each orebody.

Variography Interpretation

The principal direction of continuity was selected from the generated experimental semi-variograms and modelled with two-structure spherical models. The three orthogonal orientations represented the predominant along-strike, down-dip and cross-strike directions. Overall the semi-variograms generated are considered to be well structured and interpretable.

15.4.3.6 Block Modelling

Separate block models were constructed for each orebody in the deposit, each one having its own prototype. Each model comprises parent cells of $2m^3$ with sub cell splitting to a minimum block size of $0.5m^3$ used where additional cell resolution is required. The models are all un-rotated. WAI recommends that future modelling should aim to include all the ore bodies within one model prototype with an integrated coding for each ore zone.

15.4.3.7 Density

Density has been calculated based on lead content of each block, the formula outlined below was calculated based on regression analysis.

$$SG=2.7971+Pb*0.0316$$

15.4.3.8 Grade Estimation

Grade estimation was carried out using Inverse Power of Distance Cubed (IDW^3). Each of the ore bodies was estimated separately.

The estimation process comprised six different search radii, each one progressively larger than the last. These six search radii and the sample constraints are shown in Table 15.5.

Table 15.5: Novoshirokinskoye Search Estimation Parameters

Interpolation Run No	Search Axis (m)			Min No Samples	Max No Samples	Min No Holes/Channels
	Strike	Down Dip	Across strike			
1	2.5	2.5	2.5	1	12	1
2	15	15	5	3	12	2
3	30	30	10	3	12	2
4	60	60	20	3	12	2
5	120	120	40	1	12	1
6	240	240	80	1	12	1

For the estimation, a block discretisation of 2x2x2 was applied, each parent cell in the model was estimated individually with all sub-cells of a given parent cell receiving the same grade. Octants were used in the estimation with a maximum number of samples per octant of 3.

15.4.3.9 Validation

Introduction

A statistical and visual assessment of the block models was undertaken to assess the robustness of the grade estimations within each model and to ensure that the grade estimates and search radius passes were acceptable. The model validation methods carried out included a visual assessment of grade, global statistical grade validation and SWATH plot (model grade profile) analysis.

Visual Assessment of Grade Estimation

A visual comparison of composite sample grade and block grade was conducted in plan view and cross section. Visually the model was generally considered to spatially reflect of the composite grades.

SWATH Analysis

SWATH plots have been generated from the model by averaging both the composites and blocks along northings, eastings and vertically. The dimensions of each panel are controlled by the dimensions of the block size. SWATH plots were generated for all block model estimation methods. Each estimated grade should exhibit a close relationship to the composite data upon which the estimation is based.

WAI Comment: *Globally, no indications of significant over or under estimation is apparent in the models nor were any obvious interpolation issues identified. From the perspective of conformance of the average model grade to the input data, WAI considers the model to be a satisfactory representation of the drillhole data used and an indication that the grade interpolation has performed as expected.*

15.4.3.10 Resource Classification

The resource classification for Novoshirokinskoye is classified in accordance with the Australian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (JORC Code (2004)). Criteria for defining resource categories were also derived from the geostatistical studies.

Classifications are:

- ***Measured*** resources - 30 x 30m search radii (along-strike x down-dip);
- ***Indicated*** resources - 60 x 60m search radii (along-strike x down-dip); and
- ***Inferred*** resources - within defined mineralised zones.

Adjustments to the classifications were also made on a visual basis. Where ore bodies had very limited number of intercepts, the classification was downgraded, typically in small, separate outlying areas.

15.4.3.11 Resource Estimate

The grades in the final resource block model were derived from diamond drillhole and channel sample composites based on Inverse Power Distance Cubed method for Au, Ag, Pb and Zn. Complete block models were built reflecting both the remaining in-situ parts, as well the parts which has already been mined out.

The resource estimate for Novoshirokinskoye is given in Table 15.6 below.

Table 15.6: Novoshirokinskoye Mineral Resource Estimate - COG of 3g/t Au_{eq} (WAI 01.01.2011)
(In Accordance with the Guidelines of the JORC Code (2004))

Classification	Volume (m^3)	Tonnes (Mt)	Density (t/m^3)	Au (g/t)	Ag (g/t)	Pb (%)	Zn (%)
Measured	835,326	2.43	2.90	4.43	87.74	3.43	1.47
Indicated	1,603,523	4.64	2.89	4.30	94.82	3.07	1.15
Measured + Indicated	2,438,849	7.06	2.89	4.34	92.39	3.19	1.26
Inferred	525,673	1.51	2.87	2.08	57.02	2.44	1.81

Notes:
1. Mineral Resources are not reserves until they have demonstrated economic viability based on a Feasibility study or pre-feasibility study.
2. Mineral Resources are reported inclusive of any reserves.
3. Grade represents estimated contained metal in the ground and has not been adjusted for metallurgical recovery.

WAI Comment: *Given the nature of the mineralisation at Novoshirokinskoye, the relatively simple structure of the ore zones and their good continuity, WAI is satisfied that the resource model presented above is a good reflection of the magnitude and tenor of mineralisation within the deposit.*

15.5 Mining

15.5.1 Introduction

Operations at Novoshirokinskoye mine started relatively recently with industrial scale production first achieved early in 2010. Currently the mine is producing around 35-38kt of ore per month, targeting 450kt annual production.

15.5.2 GKZ Resources and Reserves

The latest GKZ-approved resource/reserve estimation was performed in 2007. Since that time the overall tonnages have been depleted to correspond with the actual mined material. During the 2007 estimation economical and technical parameters were applied and formed the base for an equivalent gold ore grade estimate.

It should be noted that since 2007 the original economical factors used for the evaluation have not been updated. As the prices for metals contained within this deposit have changed, there is a strong potential for a resource/reserve base improvement.

15.5.3 Mine Design and Current Mining Activities

The original mine design dates to the late 1960's when the deposit was intensively studied and pilot underground mine design took place. The design had been revisited in the late 1980's and a new mine was mostly built. Due to a number of reasons (mainly due to financial and political instability in Russia during that time) the project remained inactive until 2004.

In 2004 an updated design was performed, considering the requirement for rehabilitation works (as the underground workings remained abandoned for some time) and modernised infrastructure facilities. According to this design, the mine is accessed via two shafts (which have been constructed but required some repairs – as shown in Table 15.7). One of the shafts "Skiovaya" is used to hoist the ore (In skips), whilst the other "Kletievaya" is used for man, materials and waste hoisting (cage), providing an annual production rate of 450kt.

> ***WAI Comment:*** *In summary, the design has inherited old, labour-intensive mining methods, involving overhead tracked loaders, scrapers and tracked electrical haulage.*

Currently, mining operations are performed to the design described above, with the majority of production coming from sub-level stoping (79% of production) and ore shrinkage stoping (conventional short hole shrinkage stoping). The shafts extend to the 750m level (with skip loading and weighing facilities below that level).

First production from the mine took place in January 2010, with full year production details available in Table 15.7 below.

Table 15.7: Summary of Novoshirokinskoye Production (2010)						
January	**Ore**			**kt**	**10,890**	
	Metal	%	Pb	t	2.06	224
		%	Zn	t	0.84	91
		g/t	Au	kg	3.02	33
		g/t	Ag	kg	62.17	677
February	**Ore**			**kt**	**18,882**	
	Metal	%	Pb	t	2.73	516
		%	Zn	t	0.80	151
		g/t	Au	kg	4.16	79
		g/t	Ag	kg	74.54	1,407
March	**Ore**			**kt**	**21,346**	
	Metal	%	Pb	t	2.04	436
		%	Zn	t	0.80	171
		g/t	Au	kg	3.34	71
		g/t	Ag	kg	65.66	1,402
April	**Ore**			**kt**	**22,357**	
	Metal	%	Pb	t	2.35	525
		%	Zn	t	0.87	195
		g/t	Au	kg	3.71	83
		g/t	Ag	kg	76.69	1,714
May	**Ore**			**kt**	**24,700**	
	Metal	%	Pb	t	2.12	523
		%	Zn	t	0.88	218
		g/t	Au	kg	2.80	69
		g/t	Ag	kg	63.72	1,574
June	**Ore**			**kt**	**27,407**	
	Metal	%	Pb	t	2.19	600
		%	Zn	t	0.97	266
		g/t	Au	kg	3.18	87
		g/t	Ag	kg	61.47	1,685
July	**Ore**			**kt**	**34,902**	
	Metal	%	Pb	t	2.21	770
		%	Zn	t	0.91	316
		g/t	Au	kg	4.10	143
		g/t	Ag	kg	55.40	1,934
August	**Ore**			**kt**	**38,505**	
	Metal	%	Pb	t	2.21	851
		%	Zn	t	0.74	285
		g/t	Au	kg	3.57	137
		g/t	Ag	kg	59.90	2,306
September	**Ore**			**kt**	**37,550**	
	Metal	%	Pb	t	2.23	837
		%	Zn	t	0.85	319
		g/t	Au	kg	4.1799	157
		g/t	Ag	kg	64.3	2,414
October	**Ore**			**kt**	**37,183**	
	Metal	%	Pb	t	2.24	83
		%	Zn	t	1.02	380
		g/t	Au	kg	3.52	131
		g/t	Ag	kg	63.84	2,374
November	**Ore**			**kt**	**38,025**	
	Metal	%	Pb	t	0.86	327
		%	Zn	t	1.88	715
		g/t	Au	kg	3.56	135
		g/t	Ag	kg	58.91	2,240
December	**Ore**			kt	33,990	
	Metal	%	Pb	t	0.77	262
		%	Zn	t	2.14	727
		g/t	Au	kg	2.87	976
		g/t	Ag	kg	66.40	2,325

The main orebodies which are currently being mined are Glavnoye, Orebody No.5, and Orebody No.7. Stope access is from the 933m, 850m, 800m and 750m levels which are the only developed levels. Production in 2011 will mainly be focused on Orebody No.7 (30% of overall quantity of the ore). A long section of Orebody No.7 is given in Figure 15.7 below.

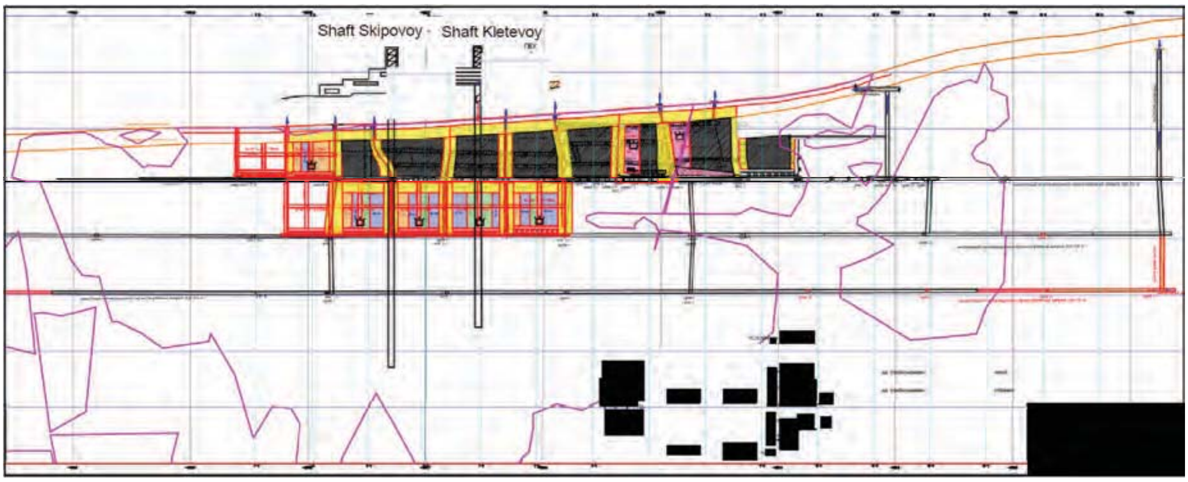


Figure 15.7: Long Section through Orebody No.7. Extracted areas – Hatched; Areas to Mine in 2011 – Shown in Colour; Safety Pillars –Yellow; Orebody No.7 Contours – Pink

Mining works are progressing from the centre of the deposit to the flanks, mining reserves on the top levels first. Currently, one of the most developed levels is the 850m level, a plan of which is presented in Figure 15.8 below. The plan shows the Glavnoye orebody, Orebody No.7 and Orebody No.5 accessed by drifts and a number of access drives used for an overhead loader.

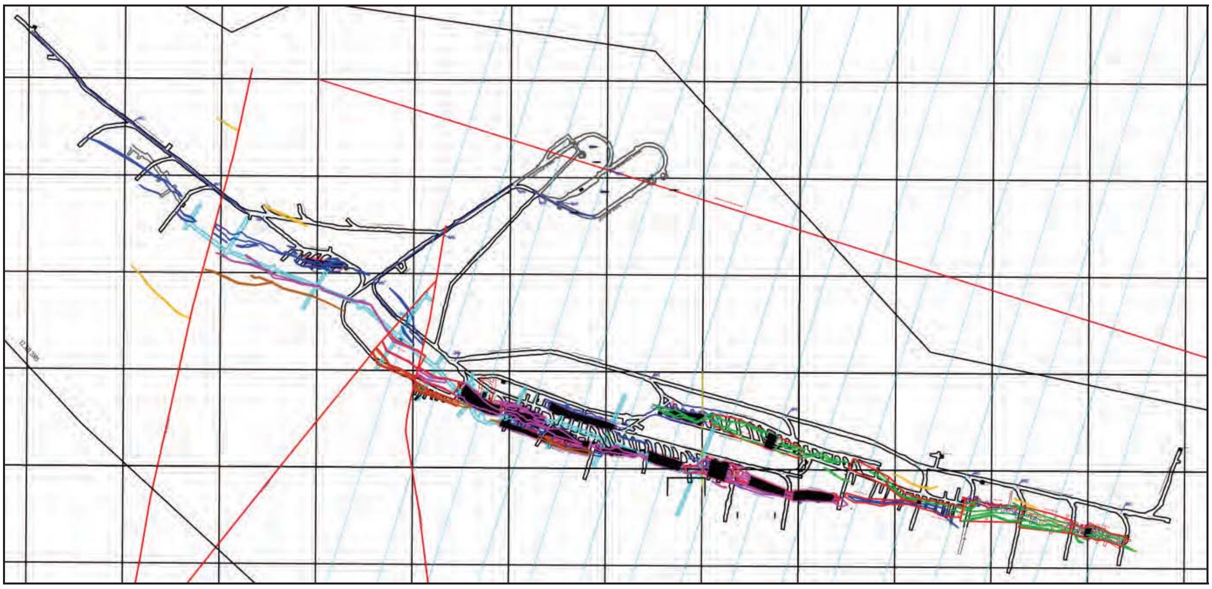


Figure 15.8: Plan of 850m Level

15.5.4 Mining Schedule

It is intended that the current production rate of 450ktpa be maintained in 2011 and increased to 550ktpa by 2013. The summary of mining schedule for 2011 is given in Table 15.8 below.

Table 15.8: Summary of Mining Schedule for 2011									
	Ore Mined (Total)	Pb		Zn		Au		Ag	
Unit	***t***	**%**	**kt**	**%**	**t**	**g/t**	**kg**	**g/t**	**t**
January	32,500	2.55	828	1.18	384	2.62	85	70.22	2,282
February	34,000	2.48	842	1.31	446	2.44	83	73.03	2,483
March	34,000	2.37	805	1.39	472	2.53	86	72.53	2,466
I Quarter	**100,500**	**2.46**	**2,475**	**1.30**	**1,302**	**2.53**	**254**	**71.95**	**7,231**
April	35,500	2.60	924	1.36	484	2.76	98	72.14	2,561
May	39,000	2.71	1,055	1.26	492	3.51	137	68.54	2,673
June	39,500	2.69	1,064	1.18	468	3.85	152	66.10	2,611
II Quarter	**114,000**	**2.67**	**3,043**	**1.27**	**1,444**	**3.39**	**387**	**68.82**	**7,845**
July	39,000	2.74	1,070	1.14	444	3.54	138	64.36	2,510
August		3.30	1,303	1.34	530	4.25	168	63.72	2,517
September	39,000	2.98	1,162	1.29	502	4.18	163	67.13	2,618
III Quarter	**117,500**	**3.01**	**3,535**	**1.26**	**1,476**	**3.99**	**469**	**65.06**	**7,645**
October	39,000	3.12	1,216	1.22	475	3.92	153	53.51	2,087
November	40,000	2.95	1,180	1.21	483	3.88	155	54.48	2,179
December	39,000	2.96	1,156	1.39	544	3.82	149	56.87	2,217
IV Quarter	**118,000**	**2.91**	**3,552**	**1.23**	**1,502**	**3.76**	**457**	**52.01**	**6,483**
Total	**450,000**	**2.80**	**12,605**	**1.27**	**5,724**	**3.48**	**1,567**	**64.90**	**29,205**

In addition, it is planned that 2,050m (17,600m^3) capital development works; 2,438m (9,750m^3), primary development works; 2,549m (15,294m^3), preproduction mining and 240m (1,152m^3) of exploration works are to be carried out during 2011.

Expected dilution and mining losses are 12.5% and 8.8% for sublevel stoping respectively; and 21.7% and 6.1% for shrinkage stoping respectively.

The majority of the ore in 2011 will be mined via a sub-level open stoping method. The remainder is planned to be mined via conventional shrinkage stoping. A description of the mining methods is given below.

15.5.5 Mining Methods

15.5.5.1 Introduction

The majority of production at Novoshirokinskoye is now performed using hand-held jack-leg mining equipment with scraper winches. The principal haulage is by tracked equipment.

The main mining method to date is sub-level open stoping (75% of total ore tonnage produced) accompanied by short hole stoping and shrinkage stoping (21% of total ore tonnage produced). In accordance with the design, four ore types are present at the deposit, and are designed to be mined employing different methods.

Type I: steeply dipping continuous orebodies with medium thickness of 5-15m, to be mined using sub-level stoping;
Type II: steeply dipping orebodies with medium thickness of 3-5m, to be mined using longhole shrinkage;
Type III: steeply dipping thin orebodies (up to 3m) are supposed to be mined using shorthole shrinkage;
Type IV: shallow dipping (40-55O) orebodies with thickness from 0.8m to 7.0m, to be mined using stull mining. Such orebodies are not common in the deposit and therefore this system is used very rarely;

15.5.5.2 Sub-level Open Stoping

The majority of ore is extracted using the Sub-Level Open Stoping method. The average block parameters for this system area as follows:

- Length – 50m;
- Rib pillar – 10-12m;
- Width – defined by orebody thickness; 7.5m on average; and
- Total height of full level – 50m.

The ore is accessed via waste haulage cross-cut drives and block raises. Subsequently access drives are cut and drilling drives are made. Extraction starts by developing a slot between the stope and rib pillar, which represents an expanded slot raise. The ore is blasted in vertical layers, having two or three such layers in a blast. Ore is withdrawn via a discharge hole at the bottom of the stope, where it is mucked by overhead loader into a wagon.

Blasting of ore is in vertical blast hole rings. The ore is broken in several sublevels at a time (over the whole chamber height without taking the crown pillar into account), with the upper sublevel being ahead of the lower one by 2-4m in order to maintain the access to the next hole rings. The ore is drawn from stoping zone by two methods:

1. Through the ore passes to scraper drift worked out in the bottom of a mining unit. Then it is delivered to wagons via scraper winch; and
2. Through the ore passes to access cross-drifts in the bottom of a mining unit as well, then it is loaded by pneumatic rocker shovel (PPN type) into wagons.

After a stope has been mined, temporary pillars are removed and the stope is left unfilled. This may potentially lead to caving of the rock above. Such caving, may hole to surface causing subsidence crater emergence, exemplified by holes, fractures and crack zones. The surface area potentially affected by caving is thoroughly assessed and fenced at surface. All major buildings are located beyond the boundaries of this area, taking into account appropriate distances for safety pillars.

15.5.5.3 Shrinkage Stoping

Short Hole Shrinkage

This method is applied when mining thin (up to 3m), steeply dipping ore bodies in medium to stable rock. The method is based on the temporary storage of crushed ore within the stope (two thirds of overall volume), providing a floor for further hole drilling.

After the ore is blasted, a potion of the crushed ore from the bottom of the stope is fed to wagons from draw points using LHD. The faces are accessed via a timber ladder-way (raise) which would normally be surrounded by crushed rock.

The method is used for extraction of around 21% of the overall tonnage. Typical shrinkage stope parameters are as follows:

- Length – 50m;
- Width – defined by orebody thickness, average 2.0m;
- Crown pillar – 4m; and
- Height – 50m.

Long Hole Shrinkage

The method is similar to conventional shorthole shrinkage. It is used for thicker orebodies (up to 5m) than shorthole shrinkage, providing a higher production rate by blasting more material at a time.

Blastholes are drilled from chambers driven in block raises in every 8.4m (chamber height is 2.4m). Holes are drilled from the horizontal to vertical, and hole length varies from 4 to 30m. As for shorthole shrinkage, a portion of the ore is stored within the stope to provide support for the walls.

> ***WAI Comment:*** *The majority of ore is extracted employing sub-level stoping using low-productivity equipment and techniques, such as hand-held drill rigs, scrapers and tracked overhead loaders. A more effective mining method should be considered in order to increase production.*

15.5.6 Rock Properties and Geotechnical Conditions

The ore of the deposit is generally stable and hard; the hardness factor for the ore is in the region of 8-14, and for waste 11-16 on the Protodyakonov scale. The density of the sulphide ore is 3.10t/m^3, transitional ore 2.89t/m^3, and ore bearing rock and waste 1.5 to 1.6t/m^3. Average moisture content is 4-5%.

15.5.7 Drilling and Blasting

Hand-held drill rigs are widely used for drilling and blasting works. The majority of short holes are made by PP-63V and PT-48A Russian-manufactured rigs. 42mm diameter holes are normally used, and the depth of holes varies, depending on direction: horizontal holes 1.8-2.0m; and vertical holes 1.4-1.6m. Ammonit No.6 ZhV (explosive mix of Ammonium Nitrate, trotyl and fatty acids salts) is used for blasting these holes, initiated by both electric (EDNZ) and non-electric (SINV-Sh, DSh) detonators.

Long holes (mostly blasting) are normally drilled by a BP-100N and/or LPS-3U drill rig to a maximum depth of 30m. Standard hole diameter is 110mm. Granulated explosives, such as Granulit A-6, AS-8 and Igdanit are used for charging the holes using a pneumatic charging machine. Explosives are delivered to the site from local underground magazines.

15.5.8 Losses and Dilution

The inconsistent shape of the orebodies forming the deposit, and the bedding conditions, dictate that dilution and losses are variable. The two mining methods used for ore extraction also produce variable losses and dilution values. Monthly production reports containing detailed data on actual dilution and losses were provided to WAI at the site. Monthly results show that the expected dilution and mining losses are 12.5% and 8.8% for sub-level stoping; and 21.7% and 6.1% for shorthole shrinkage respectively.

15.5.9 Ore and Waste Transportation

15.5.9.1 Underground

Ore and waste transportation from stopes is performed by K-10 and 7KRM1 electric locomotives. Each locomotive is capable of towing up to 11 wagons, with volume of 2.2 or 0.8m3 depending on the type of material to be moved. Smaller wagons are used for waste transportation. Wagons are discharged by rotary wagon tippers (OVK-1-2.2-750. At the top of the Kletyevaya Shaft there is a wagon exchange and discharge complex installed for waste removal.

The average transportation distance within a haulage horizon (750, 800 or 850m) is normally around 0.6km (see plan of 850m level on Figure 14.22 above), and the standard locomotive travel speed is 7-12km/h.

Ore from stopes is normally loaded into 2.2m^3 wagons by PPN overhead loaders and then delivered to ore passes connected to the 750m level crusher. The ore pass also functions as an ore accumulating buffer before the crushing facilities. After the ore is crushed to the required size, it is loaded into one of two 3.0m^3 capacity skips and hoisted to the surface via Skipovaya Shaft. At the surface the skip is discharged to a bunker which is directly connected to the processing plant.

15.5.9.2 Hoisting Facilities

The Skipovaya shaft is equipped with an SHPU 2Ts-4x2.3 hoisting machine (drum diameter 4m, width 2.3m) which is used for ore hoisting (two 3.0m^3 skips). The winder is equipped with an AKN-14-16-10 electrical motor, with an installed capacity of 630kW providing a maximum skip travel speed along the shaft of 6.2m/s.

The Kletyevaya Shaft has the same hoisting machine as the Skipovaya Shaft, operating with cage and counterweight. This shaft is used for waste hoisting, men and materials delivery. The shaft is equipped with an AKN-13-66-10 electric motor, and the installed capacity of 500kW providing a maximum cage travel speed of 6.2m/s.

> ***WAI Comment****: Inspection of the hoisting facilities showed that these are operated to a high standard of maintenance and are in good working condition. Based on the Skipovaya Shaft technical parameters, it is expected that it can operate to a higher capacity than current.*

15.5.10 Dewatering System

There are two pumping stations at the mine. One is located in close proximity to the Kletyevaya Shaft, and another (smaller) at the Skipovaya Shaft. Water from Kletyevaya Shaft is collected at the bottom of the shaft and then drained to Skipovaya shaft. Then water is pumped to the horizon 750m settling sumps, using two TsNS-38-66 pumps (one operating, one on stand-by). The specification of the pumps installed at both stations is given in Table 15.9 below.

After the water has settled, it flows into collecting sumps and then is pumped to the surface.

Expected water inflow into the shafts is 92m^3/h. The inflow rate into horizontal development at levels 850m, 800m and 750m is 200, 325 and 454m^3/h respectively.

Table 15.9: Major Dewatering Facilities

Installation area	Pump Model	Capacity (m^3/h)	Head (m)	Quantity Installed
Skipovaya Shaft	TsNS-38-66	38	66	2
Kletyevaya Shaft	TsNS-300-240	300	240	5

15.5.11 Ventilation

The mine has forced ventilation. Fresh air is supplied through Kletyevaya Shaft by a VO-24K main ventilation fan (a second fan is on stand-by of the same make and model). The main ventilation fan is reversible, performed by changing the fan blade direction. The supplied air is heated when required.

The air is delivered to the operating levels via the Kletyevaya shaft, and then it splits into two directions – east and west. Both ventilation paths provide air to the operating faces, and connect to ventilation raise leading to surface (eastern and western ventilation raise respectively). Airflow for each path is adjusted by isolating doors. Skipovaya shaft is also used for exhaust air discharge.

The forced ventilation scheme benefits from the ability to provide fresh, heated air from a centralised location, minimising shaft freezing; and reducing unintentional air intake from collapsed stopes and cracks connected to the surface.

Remote areas, such as active production faces, are supplied with air by means of local fans (VME-6, VME-5) using vent ducting.

The approximate distribution of airflow is as follows:

- Eastern Sector – 38.5m³/s;
- Central Sector – 66.5m³/s;
- Western Sector – 12m³/s.

WAI Comment: *It was noticed by WAI during the underground visit that ventilation is operating to a good standard, providing fresh air to remote parts of the mine as required.*

15.5.12 Mine Personnel

A total of approximately 1,150 people are employed by Kazzinc at Novoshirokinskoye. The mine has a developed structure of departments, each of which has specific designated areas and scope of works. A list of departments together with number of administrative and non-administrative staff employed is given in Table 15.10 below.

Table 15.10: Mine Administrative and Non-Administrative Personnel			
Mine Administrative		**Mine Non-Administrative**	
Management	8	Underground Mining Department	172
Engineering Service	16	Underground Transportation Department	126
Geology Service	6	Drilling and Blasting Department	53
Surveying Service	5	Ventilation Service	4
Health and Safety Service	9	Maintenance Service (UG)	38
Financial Service	15	Equipment Maintenance Service	8
HR Department	15	Compressor Service	5
Commercial Service	12	Explosives storage	1
Project Manager Team	4	***Total for the mine personnel***	***407***
Quality Control Service	1	Processing Plant	159
Total Administration	***91***	Quality Control Department	15
Mine	32	Laboratory	26
Processing Plant	14	Transport Department	79
Plant Quality Control Department	4	Maintenance Service (Surface Equipment)	18
Transport Department	2	Heating and Water Supply Service	20
Maintenance	2	Power Supply Service	9
Power Supply Service	1	Electrotechnical Laboratory	2
Electrotechnical Laboratory	3	Measuring Facilities Service	4
Measuring Facilities Service	4	Automation Service	5
Automation Service	3	Engineering Service	45
IT Department	5	Building and Construction Service	3
Building and Construction Department	1	Storage Facilities Department	20
Storage Facilities Department	5	Domestic Services Department	105
Domestic Services Department	2	Safety Department	6
Safety Department	6	**Total**	**884**
Plumbing and Sewerage Department	3		
Total	**269**		

WAI Comment: *The mine is remote from any inhabited area, and therefore all labour resources are brought to the site, mainly from Chita. Considering the fact that this part of Russia is known for its historical and present mining activities, no major employment issues are anticipated.*

15.5.13 Prospective Mine Development

It is intended that the production rate of 450ktpa be maintained in 2011 and increased to 550ktpa by 2013. Most of the mining works will still be focused on the three main orebodies Glavnoye, Orebody No.5, and Orebody No.7. The increase of the production is planned to be achieved by employing mobile trackless equipment.

A preliminary assessment of potential mining method options, and estimated operational and capital expenditures has been made. On the basis of these estimations, a LOM production schedule has been designed.

15.5.14 WAI Reserve Estimation

WAI has performed an evaluation of the Novoshirokinskoye mine Ore Reserves in accordance with the requirements of the JORC Code (2004). The evaluation has been performed using geological block model produced by WAI dated 01.01.2011 and considers modifying factors, such as dilution and losses, with respect to the current mining operations and methods.

The stope boundaries were generated to correspond with the standardised dimensions of the existing stopes and development in the mine and also be above the minimum cut-off grade for exploitation. A summary of typical stope parameters is given in Table 15.11 below.

Table 15.11: Typical Stope Parameters

Length (m)	50
Width	Decided upon orebody thickness and method: SLOS: 5-15m LongHole Shrinkage: 3-5m Conventional Shrinkage: 0.8-3m
Height (m)	50
Minimal Au_{Eq} Average Grade (%) For a MU	3.0
Dip Angle (Deg)	50-90

Datamine® Mineable Stope Optimiser® (MSO) software was used to assess whether mineable stopes can be generated for certain parts of the deposit. MSO computes the optimal size, shape and location of stopes for an underground mine using an input block model containing grades or values. $Au_{Equivalent}$ grades were used for Novoshirokinskoye evaluation.

MSO searches for the optimal mineable shapes taking into account the orebody geometry. The programme generates stope shape outlines on adjacent sections, and links these to create a wireframe shape for evaluation against the block model. The sectional outlines are defined by four points on the roof and floor. Constraints are to be applied on the dip and strike of the final stope shape.

The stopes produced by MSO are then evaluated against the geological block model in order to quantify average grades of the economic minerals and the metal content, together with ore and waste tonnages.

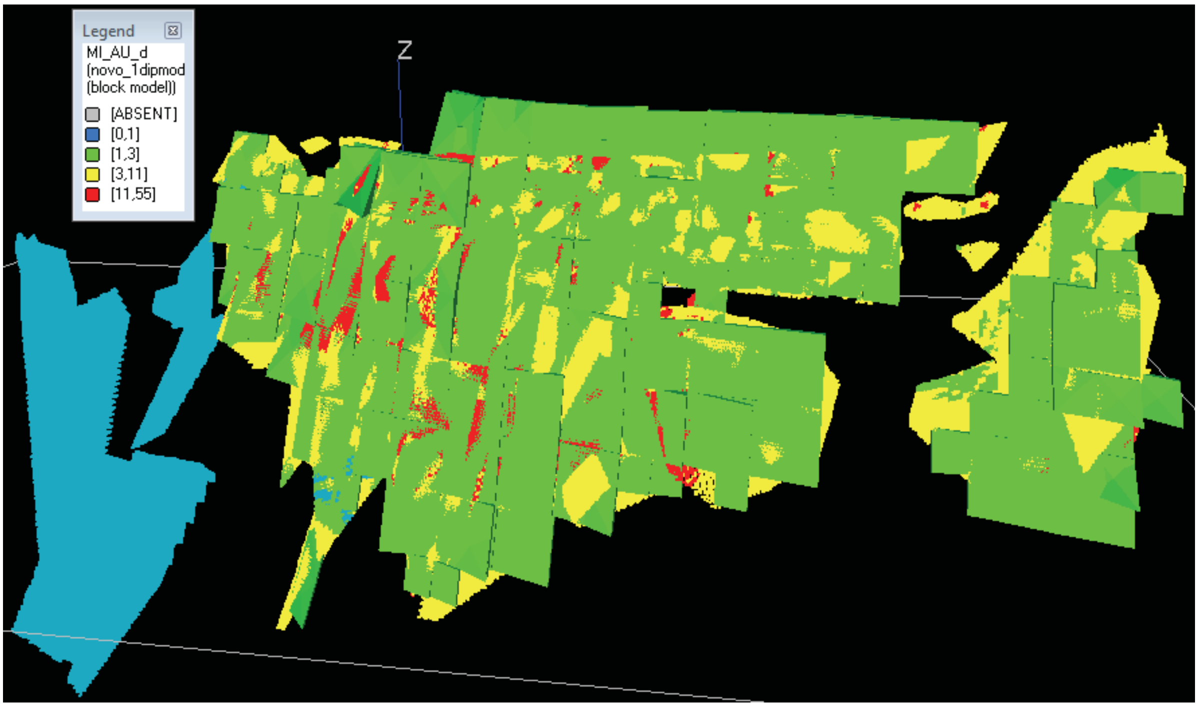


Figure 15.9: Stope Layout for Novoshirokinskoye (Orebody No.1)
(Blue – low grade or Inferred material; green – MSO stopes, yellow, green, and red cells – model blocks with 0-1, 1–3, 3–11, and >11 g/t of AuEq in Measured and Indicated categories)

A total of approximately 3,500 stopes were produced to justify the Novoshirokinskoye ore reserves. The greatest part of the reserve is contained in the central part of the deposit, but there is a significant portion of reserves located in the western part of the deposit. A summary of ore reserves is given in Table 15.12 below.

Table 15.12: Novoshirokinskoye Ore Reserves (WAI 01.01.2011)
(In Accordance with the Guidelines of the JORC Code (2004))

	Tonnes (Mt)	Au_{Eq} (g/t)	Au_{Eq} (kg)	Ag (g/t)	Ag (kg)	Au (g/t)	Au (kg)	Pb (%)	Pb (t)	Zn (%)	Zn (t)
Proven	2.44	7.89	19,233	77.0	187,676	3.89	9,473	2.98	72,601	1.28	31,089
Probable	4.43	7.78	34,463	84.3	373,276	3.89	17,200	2.69	118,896	0.99	43,912
Total	***6.87***	***7.82***	***53,695***	***81.7***	***560,953***	***3.89***	***26,673***	***2.79***	***191,498***	***1.09***	***75,000***
Inferred material within stopes	*0.048*	*5.16*	*249*	*53.3*	*2,577*	*1.5*	*74*	*1.94*	*937*	*1.14*	*549*

15.5.15 Conclusions

The Novoshirokinskoye mine is a relatively new operation at which full capacity has only been approached in 2010. Currently developed reserves and exploration campaigns performed in the area ensure availability of a reserve until 2025 and beyond.

The mine is operated to a high standard. Employment of qualified and skilled personnel provides stable production rates, although existing underground infrastructure has a spare capacity in case an increase in production rate is planned.

Despite the fact that the mine is remotely located and mining methods involved are labour-intensive, reasonable mining costs for such a type of operation have been achieved.

15.6 Process

15.6.1 Introduction

The plant at Novoshirokinskoye began treating ore in December 2009. Construction of the plant buildings commenced in the early 1990's but work was stopped due to the break up of the Soviet Union. The plant uses the standard minerals processing techniques of SAG-ball milling, gravity and flotation to produce a gold-rich lead concentrate and a zinc concentrate.

15.6.2 Flowsheet

Novoshirokinskoye ore processing flow sheet comprises the following stages:

- Coarse ore crushing (≤300 mm) in the underground jaw crusher to 150 mm;
- Semiautogenous grinding and sizing to 80% - 1mm passing size;
- Jigging of 1st stage grinding discharge;
- Ball milling and sizing to 82% -0,074mm passing size;
- Jigging of 2 stage grinding discharge;
- Sizing and after-grinding of jig concentrate in the ball mill;
- Gravity concentration of crushed concentrate on the shaking table and in the centrifugal concentrator;
- Cyanide-free flotation of gravity tailings (82% -0,07mm passing size) to produce Pb-Au-Pyrite concentrate;
- Selective flotation of bulk concentrate to produce gold-rich lead and pyrite concentrates;
- Flotation of bulk flotation tailings to produce Zn concentrate;
- Fine grinding of pyrite concentrate and sizing to 80% -0,020mm passing size;
- Gravity flotation of ground pyrite concentrate in the centrifugal separator to produce gold-rich concentrate; and
- Thickening and filtration of gold-rich lead concentrate and zinc concentrate.

15.6.2.1 SAG and Ball Milling

Ore is crushed underground and hoisted directly into coarse ore bins (four times 320t and two times 550t.) Ore is hoisted 6½ days per week.

Ore is recovered from the bins using 16 vibrating feeders and passes via a conveyer belt, fitted with a weightometer, magnet ainstalled above the conveyoer belt nd a metal detector, to the milling section. There are two grinding lines each consisting of one MPS 50x23 SAG mill and one MShTs 3.2x3.1 ball mill. The circuit is flexible and during the WAI site visit one SAG mill and two ball mills were being used.

1st stage grinding discharge undergoes two sizing cycles – primary sizing is performed in КСН-24 classifier with underflow recycled in the bank of Cavex 400CVX10 hydrocyclones. The hydrocyclone underflow is fed to a 2nd sizing cycle with discharge being the primary feed for rougher bulk flotation.

The through put capacity of one grinding line is 350ktpa. During the WAI site visit this through put was being exceeded which necessitated the use of the second Ball mill. The grinding circuit is shown in Photo 15.1.

The total grind in capacity is therefore 700,000tpa.

Photo 15.1: Novoshirokinskoye Grinding Circuit

Gold-rich lead concentrate in the grinding cycle is produced in MOD-2 jigs with the underflow being rough gravity concentrate and overflow pumped for sizing.

The rough gravity concentrate is fed to the after-treatment section for sizing in hydrocyclones and after-grinding in a MShTs 2.1x3.0 ball mill is then treated on SKO-15 shaking tables with three tables used for main after treatment and one for cleaner flotation of middlings after the main after treatment.

Rougher and cleaner flotation tailings are the fed to a KC-CVD20-1 centrifugal separator with continuous discharge. After the separator, the concentrate undergoes scavenger concentration on the shaking table. Rougher, after-treatment and scavenger concentrates are combined and fed to the thickener. Scavenger concentration tailings are pumped to the leaf thickener with its discharge fed to flotation.

15.6.2.2 Flotation

Bulk and selective flotation is applied to produce saleable lead and zinc concentrates.

The hydrocyclone discharge (82% -74µm) is pumped to the bulk lead-pyrite flotation cycle comprising rougher, scavenger and cleaner flotation stages. A conventional reagent suite of xanthate, pineoil frother and sodium carbonate for media control is applied. Bulk flotation tailings are pumped to zinc flotation.

The bulk flotation concentrate is pumped to lead flotation comprising rougher lead flotation, one cleaner and one scavenger flotation cycle. Flotation lead concentrate is fed to thickening stage, where it is mixed with gravity concentrate. Lead flotation tailings are pumped to an ultrafine grinding section for gravity separation in the centrifugal separator.

The zinc flotation cycle comprises cleaner zinc flotation with three cleaner and one scavenger stages. Zinc concentrate is pumped for thickening. Zinc scavenger tailings are waste tailings, they are pumped to the TMF.

Lead concentration tailings (the pyrite concentrate) are reground in a Metso Vertimill METSO VERTIMILL VTM-150WB to 80% passing 20µm. They are passed through KC- CV-20 Knelson concentrators with continuous discharge to recover free gold from the ground lead concentration tailings. The produced concentrate is mixed with both the flotation lead concentrate and the gravity concentrate from the milling circuit to produce a single final gold rich lead concentrate product.

Tailings from gold recovery cycle (from the pyrite product) are combined with zinc flotation tailings and pumped to the TMF.

All cells in the plant are new and supplied by CETCO (South Africa). The flotation plant has generally limited process control and instrumentation. The cells have built-in pH meters although lime addition is manual. The cells have manual level controls. There is no On-Stream-Analyser (OSA). An improved SCADA system is planned for next year. The Novoshirokinskoye flotation plant is shown in Photo 15.2.

Photo 15.2: The Novoshirokinskoye Flotation Plant

15.6.2.3 Concentrate Dewatering

Combined lead flotation concentrate, together with the gravity concentrates are dewatered in a conventional STs-9 thickener. The zinc concentrate is also dewatered in a second STs-9 thickener. There is a third SP-6 leaf thickener to dewater the gravity tailings streams.

The lead and zinc thickener underflow products are filtered using VDFK-30 - 30m^2 Ceramec vacuum filters. These are considerably oversized (concentrate filtering area), with the lead filter operating only 8 hours per day, and the zinc filter operating 4 hours per day.

The filtered concentrates are transferred at 7-8% moisture to Big Bags using mechanical grabs. The Big Bags are currently trucked a distance of some 250km, to a rail head at Priiskovai and then transported by rail to Ust-Kamenogorsk. A new rail link is currently being constructed which will result in a rail head some 17km, from the mine.

15.6.3 Plant Metallurgical Balance

The plant metallurgical balance for the month of October 2010 is given in Table 15.13.

Table 15.13: Plant Metallurgical Balance for October 2010							
					Grades		
Product	Weight %	Tonnes	Au g/t	Ag g/t	Cu%	Pb%	Zn%
Ore		37183.0	3.51	65.20	0.14	2.17	1.06
Pb Conc	5.8	2166.8	46.98	955.14	2.05	33.84	4.01
Zn Conc	1.5	574.9	4.78	126.68	0.52	1.53	43.92
Tails	92.6	34441.3	0.75	8.19	0.01	0.19	0.16
					Distribution		
		Product	Au	Ag	Cu	Pb	Zn
		Ore	100	100	100	100	100
		Pb Conc	77.99	85.37	86.94	90.79	21.97
		Zn Conc	2.11	3.00	5.87	1.09	63.79
		Tails	19.91	11.63	7.19	8.12	14.24

The Metallurgical Balance shows a satisfactory degree of upgrading. The overall gold recovery is lower than the target figure of 88.4%.

15.6.4 Analytical Laboratory and OTK Department

15.6.4.1 Introduction

The management of the analytical facility and the OTK (quality control department) are the responsibility of one individual. There are a total of 37 people employed in the analytical laboratory and 21 are employed within the OTK department

15.6.4.2 Analytical Laboratory

A Laboratory manager is responsible for this facility and is supported by two chemical engineers who are heads of the Fire Assay and Wet Chemistry Departments. The laboratory works 24 hours per day and 7 days a week. The Assay Laboratory processes mine exploration, plant and a limited number of environmental samples.

The sample preparation laboratory is equipped with two soil drying ovens, Rocklabs jaw and rolls crushers as well as ring mills for fine grinding. The sample preparation facility has proved to be a serious bottleneck and its capacity is limited to 42 samples per shift. There is therefore a serious backlog of several thousand mine exploration samples. The company is planning to expand this facility and will be using an adjacent building as additional work space and storage in the near future.

Gold analysis is undertaken in duplicate using standard fire assay techniques. Analysis is undertaken on 10–20g samples using a flux manufactured from borax, lead oxide, silica and soda ash. The lead products are subjected to the standard cupellation process and the beads from cupellation are parted using nitric acid, the final gold bead is weighed on a microbalance to an accuracy of 0.001mg.

Lead, zinc and iron analyses are undertaken using an Ametek XRF analyser. The analysis of lead and zinc concentrates is undertaken using titrimetric techniques. The laboratory is also equipped with two Varian atomic adsorption spectrometers (AAS). One is used for Cu, Pb, Zn, Fe, and Ag. The other is used for gold analysis using an organic solvent method. The laboratory also undertakes a limited number of environmental analyses for dust, noise, light and radioactivity.

The laboratory is attested by the federal agency "Technical Regulation and Measurements" (Chita Region). This is valid until 2013. The plant utilises a regular program of external cross check analysis with an accredited laboratory. The internal control consists of resubmitting 10% of samples as recoded duplicates. The laboratory initially used internationally recognised standard reference materials as part of its QA/QC procedures, but has recently began manufacturing in-house standards with cross check analyses at accredited laboratories.

15.6.4.3 OTK Department

The OTK department is responsible for monitoring plant performance and the preparation of metallurgical balances. There are automatic samplers installed on the flotation feed, flotation tailings and thickener feed streams. Separate samples are taken of the lead flotation concentrate, the gravity concentrates, and the combined concentrates in order that an overall balance on each process stream can be made. The automatic samples are taken every hour and then combined on a shift or daily basis and the results of the analyses are used to prepare metallurgical balances. The plant's belt weightometers are checked by the automation department using control weights and the truck weigh-scales are checked on an annual basis using a certified contractor.

15.6.5 Conclusions

The plant at Novoshirokinskoye achieves a satisfactory metallurgical performance using a combination of Russian and western equipment. The plant could be improved by the addition of further process control and instrumentation. The grinding section is capable of processing up to 700ktpa of ore, although further flotation cell capacity may be required to achieve this throughput. The plant appears to be well managed and there is a high standard of housekeeping.

15.7 Environmental

15.7.1 Introduction

Novoshirokinskoye mine is located approximately 450km east of the city of Chita in Eastern Siberia, Russia. The mine is located within the Zabaikalskig Krai Oblast with Chita as the Regional Oblast Centre. It is connected by a metalled road, and freight and passenger railway lines (part of the Trans Siberian Railway) are present at the rail head at Priskovaya approximately 250km from the mine. The Mine operates its own siding at this railhead. A new railway line for Norilsk Nickel is currently under construction which when complete will come within 17km of the Site.

15.7.2 Environmental & Social Setting and Context

15.7.2.1 Landscape, Topography

Land around Novoshirokinskoye Mine is predominantly undulating topography with hills varying from 650-1,000m in height. The region is not particularly seismically active but earthquakes up to 4 on the Richter scale have been reported in the last 10 years.

Soil horizons are expected to be thin and lacking in fertile topsoil.

There are numerous tree and grass species, in a mosaic habitat with deciduous species including birch found predominately at higher altitudes. There are wooded hillsides (birch, larch and scrub) around the mine site and village.

15.7.2.2 Climate

The climate is sharply continental with hot summers reaching temperatures in excess of 30°C and cold winters dropping to below -40°C. Snow cover is present from November to April. The prevailing wind is from the northwest.

15.7.2.3 Land Use and Land Cover

The site has unoccupied buildings mostly dating from the later part of the 20th century but most of the current mine facilities are modern in design and construction dating from the last few years. A series of hardcore roads link the infrastructure at site and public highways link the mine to the mine camp and dangerous goods storage areas.

15.7.2.4 Water Resources

The mine currently has water ingress of 40-60m³/h and is pumped at a rate of 450m³/d to surface for use in the mineral processing circuit and dust suppression on the roadways around the Mine Site. It is understood that 5m³ water per tonne of ore treated in the mineral processing plant is required, with makeup water supplied by return water from the Tailings Management Facility (TMF) and from local streams (when flowing).

Potable water is supplied by boreholes from the ground water at an abstraction rate of up to 900m³/d.

15.7.2.5 Communities and Livelihoods

A mine camp is located approximately 1km from the main site entrance and the main village of Novoshirokinskoye a few kilometres further along the same asphalt road. The village developed originally with the early mining activities and contains administration buildings and schools serving a wider region. Mining and agricultural activities form the principal livelihoods.

15.7.2.6 Infrastructure & Communications

The mine is served by asphalt roads. Currently the closest rail head is over 200km from the site but it is understood that a new rail line is under development and will bring the rail link to within 17km of the mine.

The total (permanent) population of the village is around 600.

A shift camp for Mine personnel has been established comprising dormitories, sauna, gym and camping facilities. The field camp is served by a 400kW boiler fuelled by heavy oil and is equipped with a 7.0m^3 oil tank. Solid waste is collected from the camp and taken to the village landfill. It is understood that the possibility of changing to coal firing from the present heavy oil system is under consideration. Such a change would be implemented after the opening of the rail project that would enable a rail head to be created 17km from the Mine Site.

> ***WAI Comment:*** *WAI notes the mine plans to utilise a new rail head once the line has been constructed. WAI considers that this will offer environmental advantages and reduce road haulage mileage considerably. Once operational, further consideration will be given to replacing diesel oil boilers with a coal fired boiler. These actions will be subject to the OVOS procedure and will need approval by the environmental regulatory authorities.*

15.7.3 Project Status, Activities, Effects, Releases & Controls

15.7.3.1 Project Description & Activities

The project comprises an active underground mine, all surface facilities associated with the operation of such a mine, a mineral processing plant producing separate lead and zinc concentrates, a TMF for disposal of the tailings from the mineral processing plant, water storage tanks and pumping stations, waste rock stockpiles, heating boilers at the mine and, shift camp and village, a shift camp for the accommodation of staff and off-site storage of hazardous materials (explosives and sodium cyanide).

Vehicle maintenance facilities are located in (old) buildings within the mine complex with refuelling facilities provided by dedicated diesel road tanker (parked semi-permanently minus the tractor unit).

Two shafts and an adit access the underground workings. An electric railway line (narrow) gauge is installed in the adit and is used to bring ore to the surface.

The mineral processing plant consists of a conventional circuit comprising crushing and grinding using two SAG mills followed by flotation to produce separate lead and zinc (sulphide) concentrates. Pyrite is present in the ore and flotation is inhibited by the use of cyanide. Currently cyanide is used at a rate of 50g per tonne of ore processed.

Principal (solid) wastes produced by the project include waste rock, from mine development, tailings from the mineral processing operation, general wastes from industrial operations, sludges from the water treatment plant and ash if coal fired boilers are used.

Aqueous effluents are produced at the mineral processing plant and are transported with solid tailings (20% solids) to the TMF. A water treatment facility treats all sewage from the Mine Site and following solids removal treated water is discharged to the TMF. Waste rock and tailings are known to contain pyrite and hence acid rock drainage (ARD) could be expected.

> ***WAI Comment:*** *The mine sub-station and transformers are modern and should not contain potential contaminants such as PCB's.*

15.7.3.2 Land Ownership and Tenure

OAO Novoshirokinskiy Rudnik Mine JSC holds a licence to exploit (mine) polymetallic ores for 20 years from 2004. Kazzinc owns 48.3% of the shares in OAO Novoshirokinskiy Rudnik Mine JSC. As is normal for such licences, details are contained concerning expected production rates and when activities are expected to cease. After cessation of mining the Mining Company has 2 years to carry out a closure plan. Currently this has to have occurred by 2026. It is believed that the mining licence can be extended in duration by mutual agreement with the regulatory authority.

> ***WAI Comment:*** *WAI has not examined the mine licence and permit in any detail but believes that these have been obtained in line with State requirements. It is understood that the current mining and any future expansion of mining activity would not necessitate relocation of communities within the current licence boundary. Furthermore, mining induced subsidence is not anticipated to represent a significant risk to present habitations.*

15.7.3.3 Energy Consumption & Source

Power to the Mine is supplied from the National Grid via two transformers. The Mine operates a sub-station owned by South East Electricity Network Company. Kazzinc operate a Hydroelectric Power Plant at Bukhtarma in Kazakhstan, but this will not supply to Novoshirokinskoye.

WAI understands that one of the boilers in the village has retained coal as the energy source using coal from the Urtuisky Mine which is understood to be the closest thermal coal. This coal has a heating value of 17.8MJ/t, sulphur content of 0.2% and ash content of 7.3%. Ash from this boiler is currently sent to the municipal landfill. It is understood that this coal would be the preferred supply should the Mine change from oil.

At the mine site there is a (modern) boiler house with 4x1750kW boilers. These are supplied from 5 single-skin unbunded tanks, each of 90m^3 capacity. Off-gas quality (CO, NOx) is measured regularly to determine the operational efficiency of the plant. A derelict old boiler plant (estimated to date from 1960's) including brick stack remains at the site but it is believed that this has never been used by the current Mine owners.

Mine energy usage is quoted at 3MkWh/month. This figure covers power demand at all facilities including administration and accommodation at the shift camp. Electricity is supplied direct from the National Grid and the Mine operates a substation owned by South East Electricity Network Company and 2x10MVA transformers. These are of a modern design and installed within the last few years. It is understood that (most) nearby power stations are coal fired.

15.7.3.4 Mine Wastes – Waste Rock and Tailings

Novoshirokinskoye Mine produces a small quantity of waste rock which is dumped adjacent to the road connecting the Mine with the TMF. Tailings produced by the mineral processing plant are disposed of in the TMF (see above section for more detail).

A dedicated TMF was constructed and completed in 2009 to receive up to 450,000tpa tailings by damming an existing valley with an earth dam. The dam walls are protected by rip-rap rocks. The facility has a total storage capacity of 8.7Mt and is considered adequate for the current 12 year mine life. A first, upstream raise is planned for Spring 2012.

Topsoil and vegetation was not stripped from the site of the TMF prior to operation and no artificial liner system is included in the design. It is understood that naturally clays underlying the TMF offer some protection to the underlying groundwater. It is understood that the design allows for a minimum of 1m free-board and was designed to accommodate a 1:20 year storm event. It is noted that no spillway is included in the design. Downstream of the TMF drainage ditches are present to intercept any contaminated waters. These are pumped back to the TMF. There are three boreholes 200m downstream of the TMF for groundwater pollution control purposes. A control station is located 500m downstream in the Pad Shirokaya Brook.

> ***WAI Comment:*** *WAI notes that the current TMF is not lined. Seepage rates were calculated in 2008 by Mekhanobr Engineering JSC (St Petersburg, Russia) for each year of the TMF operation and concluded that seepage was not expected and did not predict any significant impact on water resources in the area. The current TMF operation includes dam stability control points, monitoring boreholes, visual dam slope inspection and other regular control procedures all performed in accordance with current environmental legislation.*

15.7.3.5 Water Management & Effluents

The mine operates a water treatment facility (biological treatment process using bacteria) and treated water is delivered by pipeline a further 1km to the TMF. The Water Treatment Plant became operational in October 2009.

Water balances have been made for the site. Ground water is monitored from 3 boreholes around the TMF, from within the TMF and 500m downstream in the River below the TMF. Water is analysed for a comprehensive suite of parameters and although tested for, no cyanide has ever been detected in any of the analyses. WAI understands from the mine management that results of monitoring are not needed to be sent to the regulatory authorities.

A series of interception ditches exist downstream of the main TMF dam. These are designed to intercept any seepage through the dam and prevent ingress into the local river network. There is no spillway included in the TMF design.

Pollution of surface waters could result from:

- Acid rock drainage and leaching from ore/waste rock/tails stockpiles;
- Run off from contaminated soils at the Mine site;
- Unplanned discharge of untreated minewaters;
- Uncontrolled seepage (e.g. catastrophic failure) from the TMF avoiding the intercept ditches; and
- Road run off.

Additional processes which may result in groundwater contamination include:

- Unsegregated deposition of (hazardous)waste to landfill;
- Absorption/dissolution of explosives residues and gases;

- Hydrocarbons, especially diesel spillages from the mobile fleet;
- Leakage from oil storage tanks;
- Leaching from contaminated soils; and
- Rebound of contaminated minewater at cessation of/or interruption to pumping.

WAI Comment: *WAI considers that ARD test work on tailings and waste rock should be undertaken. However, it is noted that at the time of the site visit there were no visible signs of ochre staining which might be indicative of ARD. WAI notes that as much water as possible is reclaimed from the TMF for reuse in the processing plant. Given the use of cyanide in operations, it is recommended that the Company seeks compliance of its activities with the International Cyanide Management Code.*

15.7.3.6 Emissions to Air

The background air quality in the Novoshirokinskoye area is considered to be good and there are no other significant industrial sources in the immediate locality.

An emission stack associated with the main boiler plant at the Mine is included in the monitoring regime and has not revealed any unacceptable emissions that would pose significant risks to either the environment or site users. Road sprinkling is carried out to prevent windblown dust. At the time of the site visit, the entire site was covered with a few centimetres of snow, which did not display evidence of any dust deposition. Air quality monitoring is carried out weekly in the sanitary protection zone.

Emissions of combustion gases resulting from underground explosions and particulates from the underground mining activities will be potentially emitted from any ventilation shafts.

Air pollution at Novoshirokinskoye could result from the following processes:

- Exhaust gases from mobile fleet and combustion processes;
- Gases from explosives usage; and
- Localised chemical and solvent volatilisation.

WAI Comment: *WAI do not consider that the current activities cause a significant negative impact on air quality. If the boiler plants are converted to run on coal; further studies will be carried out to comply with environmental requirements of the legislation. Emission control at each emission source and at the boundary of the residential area is carried out according to approved procedures*

15.7.3.7 Waste Management – General

General waste management is reasonably well managed. The mine assists with the operation of the local landfill that is utilised by the external local community. Tailings and waste rock arising from the mining operations are well managed.
Scrap metal is stored around the site and sent for recycling.

WAI Comment: *In general WAI considers that there is a reasonably efficient waste management system in place at the mine. Hazardous waste management is under the control of government authorities and is performed in accordance with legislative requirements.*

15.7.3.8 Hazardous Materials Storage & Handling

Fuel delivery is subcontracted and the mine maintains a number of oil storage tanks.

Explosives are delivered by road to an explosives magazine remote from the mine site and village. The storage facility comprises a number of semi-underground bunkers designed to withstand blasts and the facility is protected by armed guards. From here, the explosives required for underground use are transported to the mine in sealed containers in dedicated road vehicles and lowered down the shaft to an underground storage area prior to use.

Adjacent to the explosive storage area is a containerised storage area dedicated to the storage of solid sodium cyanide in sealed metal canisters. The containment area is equipped with air conditioning to regulate (summer) temperatures. An outside shower is provided for emergency use.

The dangerous goods storage area is located due east of the village and was sited taking into consideration the prevailing wind direction. The facility has to be inspected by external Environmental Specialists from the State on a quarterly basis.

> ***WAI Comment:*** *Contractors are made aware of the company policy and their responsibilities with respect to materials storage handling and recycling They are fully conversant with the Company protocols clear lines. Clear lines of responsibility, in the event of an incident, such as a cyanide or fuel spill, exist and emergency contingency planning included for spillage clean up. It is noted that the location of the hazardous and dangerous materials store means that both explosives and cyanide is transported on public road adjacent to areas where people live (e.g. the shift camp). Transportation of hazardous goods is effected by a permit issued by the authorised government agency with special measures indicated which need to be taken in the event of, for example, a cyanide spillage.*

15.7.3.9 General Housekeeping

General housekeeping at Novoshirokinskoye mine is considered to be good, with most open areas and operational buildings maintained in a tidy and orderly manner. The recent age of many of the mine buildings facilitates this aspect.

15.7.3.10 Fire Safety

A fire protection plan has been developed for Novoshirokinskoye mine, this would appear to be comprehensive and cover both above and below ground facilities. The plan covers fire drills and training and the company ensures that contractors are included.

> ***WAI Comment:*** *The fire management systems appear appropriate to the size and nature of the operations.*

15.7.3.11 Security

Security at Novoshirokinskoye mine is provided by Group 4 Security (G4S), a leading expert in mine security. Security is in place on all internal roads/site accesses used during the visit. The security service is provided round the clock.

> ***WAI Comment:*** *It was noted that security was in attendance at site. There is a special register at a secure checkpoint for visitor registration and issue of temporary passes.*

15.7.4 Permitting

15.7.4.1 ESIA/OVOS

An OVOS have been produced for Novoshirokinskoye mine that is in accordance with the requirements of Russia legislation.

15.7.4.2 Environmental Permits and Licenses

OAO Novoshirokinskoye Rudnik Mine JSC holds the right to utilise polymetallic ores under the terms of a licence which is valid for 20 years from 2004. A water abstraction licence and discharge for potable water is in place.

> ***WAI Comment:*** *The WAI team has viewed a number of mine licences and permits and considers the mine licences to have been obtained in line with National requirements.*

15.7.5 Environmental Management

15.7.5.1 Environmental Management Staff & Resources

Environmental management is evolving rapidly at Novoshirokinskoye Mine. Currently there is no separate Environmental Department with Stepanvna Guseva, the Senior Environmental Engineer reporting directly to the H&S Director. The central analytical laboratory employs two assistants responsible for environmental monitoring.

15.7.5.2 Systems and Work Procedures

Environmental effects need to be examined and integrated into all existing work procedures at the Mine. Presently, this has not yet commenced and should be seen as a priority for the Mine.

15.7.5.3 Environmental Monitoring, Compliance & Reporting

A programme of monitoring has been agreed with the regulatory authorities although it would appear that in many cases formal transmission (reporting) to the authorities is not required.

> ***WAI Comment:*** *The scope of the environmental monitoring programme has been developed in line with national legislative requirements. Maximum permissible discharge limits cover all releases from the project and are enforced in current environmental legislation. Groundwater monitoring occurs around the TMF. This includes quarterly chemical and bacteriological analysis.*
>
> *WAI notes that the mine has committed to a weekly monitoring programme needed to establish baseline data for the sanitary protection zone at two locations in the sanitary zone for noise and air quality (NOx, SOx, CO and Dust) during 2010-11. Russian legislation is developed with mandatory health risk assessment for air emissions. WAI considers that the aerial emissions associated with the Mine, processing plant boiler house are relatively insignificant and minimal impact on health risk is expected.*
>
> *WAI recommends extension of monitoring to include ARD and leaching tests.*

15.7.5.4 Emergency Preparedness & Response

Emergency Response plans include for all potential abnormal situations, including catastrophic failure at the TMF and cyanide spillage. WAI considers that the current response planning should be regarded as a Work in Progress.

15.7.5.5 Training

The mine is committed to the implementation of Kazzinc Corporate policy of Environment and training matters.

16 KAZZINC SMELTER

16.1 Introduction

The principle metallurgical processing facility is located at Ust-Kamenogorsk and comprises a number of integrated individual plants including;

- Conventional lead smelter;
- Conventional electrolytic zinc refinery;
- Precious metal refinery;
- Existing acid plants;
- ISAMELT™ Copper furnace, converters and electrolytic tank house (under construction); and
- Dual contract absorption technology acid plant (under construction).

At Ridder the metallurgical processing facilities comprise a conventional zinc refinery, using essentially similar technology to that in the zinc refinery at Ust-Kamenogorsk, and an (existing) acid production facility. Until recently a conventional lead (Pyrometallurgical) processing plant with an annual production capacity of 15ktpy was located at Ridder alongside the zinc refinery. However, it is understood that this is currently mothballed and not in use and was not visited as part of the October 2010 site visit.

16.2 Provenance of Ores Treated

The Metallurgical Complexes operated by Kazzinc treat primarily ores produced at Kazzinc mining operations. Historically, installed production capacity is greater than that required just to treat internally produced concentrates and ore has been accepted from 3rd parties. The current situation in this respect is as follows:

16.2.1 Zinc

Production of refined zinc at the two zinc smelters (i.e. At Ust and Ridder combined) has been at 300kt since 2008. Of this total approximately 240,000t is derived from Kazzinc produced ore. Kazzinc continues to expect to purchase up to 130kt of zinc concentrates with grades of up to 45% zinc from external sources. Hence around 60kt of refined metal is expected to be produced from concentrates purchased from 3rd parties.

16.2.2 Lead

Kazzinc has the capacity to smelt 380kt of the lead concentrates. Between its own lead concentrates, and precious concentrates which will be processed through the lead smelter, Kazzinc will utilise approximately 280kt out of 380kt capacity. This means that Kazzinc is able to buy 100kt of lead concentrates and secondary lead feed together. The average content of this feed is approximately 50-60% Pb, so Kazzinc is going to produce on average 55kt of the refined lead from purchased concentrates.

16.2.3 Copper

After fully commissioning the Cu-Isa-smelt furnace and tank house, Kazzinc expect to have the capacity to produce 87.5kt of refined metal. Approximately 50kt of metal will derive from Kazzinc Cu-concentrates, an additional 6kt will continue to result from Cu-cakes produced as a by-product of lead smelting and 4kt from zinc smelting making a total of 60kt of refined copper from Kazzinc produced ore. From 2012, Kazzinc expect to purchase 50kt of concentrate with an average copper content of 20% Cu and by 2015 Kazzinc intend to purchase up to 137.5kt concentrates giving the ability to produce an additional 27.5kt of refined metal from concentrates produced by 3rd parties.

16.3 Ust-Kamenogorsk Metallurgical Complex Technology

16.3.1 Existing Lead Smelter

16.3.1.1 Background

Currently, lead is produced at the Ust-Kamenogorsk metallurgical complex (Ust) using a traditional flow sheet involving feed preparation, sintering, smelting in blast furnace refining, and lead bullion sales. Refined lead output is projected to be over 109kt in 2010, which is up significantly from the production level of 79,494t in 2009. The tonnage of lead produced in 2009 was dramatically lower compared to the previous few years (production between 2002 and 2008 was never lower than 87kt with a high of 104,507t in 2002). A lead recovery of >94.6% (lead in feed reporting to lead bullion) is anticipated in 2010. Recoveries have remained consistent between 2001 and 2010 varying between 94.01% and 95.49%. However, it should be noted that if lead recovery from by-products downstream is included overall total recovery of lead is in the region of 98-98.5%. Approximately 1,225 people are employed in the lead production section of the Complex.

16.3.1.2 Ore Preparation

Ore arrives at Ust by rail in large bags. It is offloaded from rail trucks to a feed storage area from where ore is blended to provide a consistent feed grade to the sinter plant. Three ore stockpiles of approximately 3kt each are kept on site, each containing lead sulphide concentrate (27-70% PbS) together with smaller stockpiles of materials including; fluxes, limestone, silica and iron oxide (to control slag viscosity). Coke is added from a separate stockpile prior to feeding to a traditional Dwight-Lloyd updraft sintering machine.

16.3.1.3 Sintering

A traditional updraft sinter process is used in the sinter plant with oxygen enriched air. An oxygen plant capable of producing up to 15,000m^3/h, of oxygen serves the lead and zinc plant at the complex.

The sinter plant has a maximum rate of 150tph (usually operating at between 130-150tph) of feed comprising ore plus all flux and coke. Heavy fuel oil (HFO) is used to supply heat to the pre-combustion zone of the sinter plant. The sinter machine operates semi-continuously with a planned 2hr maintenance shut down every Thursday. SO_2 containing off-gas with sulphur dioxide (SO_2) contents of > 4-5% goes to the 'Haldor Topsoe' acid plant for conversion to sulphuric acid (H_2SO_4).

Sinter lumps with a particle size of larger than 100mm are regarded as "coarse sinter" and sinter with a particle size of 0-30mm as "fine sinter". Sinter fines are cooled and returned via milling to the feed preparation area. Sinter forms the feed to the lead blast furnace and is transferred at a nominal temperature of 250-350°C. Exhaust from the end stage of the sinter plant goes via bag filtration to atmosphere.

16.3.1.4 Blast Furnace Section

There are 3 traditional blast furnaces within the lead plant, 2 of which are operational at any one time and one of which is held as a reserve. One of the blast furnaces receives lead sinter feed and zinc bearing (lead) slags. The zinc content is fumed with the collection of zinc oxide dust and molten lead bullion (95% lead purity) tapped to ladles which are transferred to the refining section. The second operating blast furnace is used for short duration re-melting of recycled lead products. Any copper content is removed as a matte (molten sulphide phase) which is sent to traditional (small scale) copper convertors to process to blister copper. It is assumed that once operational this will be carried out in future at the Pierce-Smith Convertors installed adjacent to the Cu-ISASMELT™ furnace. Currently however, there are 4x12t capacity convertors (2 operational, 1 in reserve and 1 undergoing maintenance). The average copper content of the matte is reported to be 40% and the copper grade of the blister copper that is the product of the convertors is 97% Cu (blisters weighing approximately 1 tonne are cast).

Zinc (from zinc bearing lead slag) is removed as a fume of zinc oxide (ZnO) by blowing air and coal dust into the blast furnace. The off-gases (at around 1,000°C) go via a waste heat boiler to recover energy with the zinc rich dusts collected at around 250°C.

Wearing of respirators is mandatory in the lead plant and the current occupational hygiene standards are maintained at a maximum of 4% dust in the atmosphere with a limit of 0.01% Pb content.

Photo 16.1: Tapping Lead Bullion from Lead Blast Furnace

16.3.1.5 Refining

Molten lead bullion (95% Pb) is transferred by ladle to the refining kettles. Principal impurities (not in strict weight percentage order) comprise Cu, Sb, As, Ag, Au, Bi, Se and Tl. All are recovered separately and with the exception of Arsenic sold as products.

Lead is charged to the first refining kettle at approximately 800°C and dross removed. The molten bullion is then charged to a second kettle and allowed to cool to 400°C over 24hrs. Sulphur is added during a decopperisation stage (ca 6hr) with copper removed as a sulphide. In the same kettle tellurium is removed during a vitrolisation process. The tellurium rich material is sent for alkaline leaching to produce ultimately elemental tellurium. Arsenic, tin and antimony are removed in a Harris Furnace at temperatures between 550 and 700°C.

Desilverisation is performed in the next stage of refining where silver and gold is removed as a silvery crust. This material is sent to the Precious Metals Refinery for recovery of pure silver and gold. During the last refining stage debismuthisation occurs by an oxidation process with the high purity lead bullion sent to one of two casting machines (induction furnaces), each of which is capable of producing up to 600tpd lead ingots. The ingots are placed onto pallets and loaded by forklift truck directly onto rail wagons for export.

> ***WAI Comment:*** *Currently a traditional lead circuit is adopted, sintering – blast furnace smelting – refining. The actual process metallurgy is rather complex and the circuit has been developed over the years to ensure maximum recovery of by products. It is noted that during 2011 an alternative front-end lead extraction process will become operational and ultimately the existing sinter plant and blast furnaces will become redundant. WAI believes that the current operation is well understood and well managed. Dust extraction could be improved in the ore handling section. WAI considers that the sinter plant and blast furnaces are well managed and that there is little scope for further process optimisation. Likewise the (current) operation of the refining section is well understood and further optimisation is probably not viable. Although it is envisaged that the refining section will remain "as is" following commissioning of the ISASMELT™ furnace there will inevitably be subtle metallurgical differences which will require investigation (and time) to understand complete and allow optimisation to the same extent as present.*

16.3.2 Zinc Refinery

16.3.2.1 Introduction

The zinc refinery at Ust uses conventional zinc roasting leaching purification process flow-sheet. This flow-sheet is essentially replicated at the zinc refinery at the Ridder Metallurgical Complex. The existing refinery at Ust-Kamenogorsk was constructed in the early 1960's as an upgrade and extension to an earlier (now completely decommissioned and demolished) zinc refinery. The plant has been gradually expanded and improved (installation of computer control, installation of modern fluidised bed roasters using oxygen enriched air etc) and has produced >190kt salable zinc per year (pure metal and zinc alloy) since 2008. Presently almost 1,100 people are employed in the zinc production section of the Complex. High levels of overall zinc recovery to final product (>98%) are achieved at the plant.

16.3.2.2 Feed Preparation

Concentrate is delivered to Site by rail and off-loaded into charge bins from where it is sent by conveyor to crushers and the feed hoppers to the fluidised bed roasters.

16.3.2.3 Roasting

Roasting is performed in 4 fluidised bed roasters. Three have a diameter of 5.5m and are 14m high and one is slightly larger with an effective volume of 42m^3. The three standard sized roasters can produce between 400-450tpd calcine whereas the larger reactor can produce >500tpd calcine. Only two roasters are operational at any one time, one is kept in reserve and one is usually undergoing planned maintenance. The roasting step takes place at a nominal temperature of 980°C and utilises oxygen enriched air (25-35% O_2).

Presently all charging is computer controlled from a central control room and feed materials are maintained so that lead in feed is at or below 2% and a maximum concentration of 0.06% arsenic is tolerated.

Off-gases from the roasters are cleaned of particulate using electrostatic precipitators (ESP's) to remove particulate levels to below 200mg/m^3 and the SO_2 rich gas delivered to the existing single contact acid plant.

Zinc slurry, zinc rich filtercake and some slag material is processed in one of two Waelz kilns. The smaller of the two kilns is 40m long and has an internal diameter of 3.6m and the larger is 60m long and has a diameter of 4m. These kilns can produce 185 and 240tpd of calcined material. The kilns use coke from Zarinsk, Russia, as primary fuel and the heat requirement is quoted at 692MJ/tonne feed. There are essentially three sections in each kiln. The first (10-15m) is where drying takes place, followed by the reaction zone (ca. 20m) and finally clinker formation. Temperatures in these three sections are 750-850°C, 1,100-1,250°C and 1,100°C respectively. Off-gas from the kilns goes to a mechanical bag filter where solid zinc oxide (ZnO) is removed and sent back to the leaching process, prior to venting to atmosphere (note: these gases are largely sulphur free).

The smaller of the two kilns was installed in 1971 and the larger is more modern, installed in 2006. Dust losses are reported as 10%. However, during the site visit fugitive emissions were noted from the (small) kiln and it is not known whether this figure includes fugitive emissions.

> ***WAI Comment:*** *The ore preparation and roasting sections of the plant can be considered to be entirely conventional in design and operation and similar to other zinc smelters around the World. Manning levels would appear to be above average for the zinc plant as a whole. Recent innovations have included computer control and optimisation of the use of oxygen enriched air and WAI believe there is little to optimise metallurgical performance further in this section.*
>
> *WAI believes that investigation of fugitive dust losses from the kilns, especially from the older, smaller kiln is warranted to establish whether the metallurgical and environmental performances can be improved.*

16.3.2.4 Leaching Section

Roasted ore is transferred by elevated conveyer via ball mills to the leaching plant where oxidised zinc ore is leached using spent electrolyte solution (essentially sulphuric acid) at a pH of around 1.5. Leaching is carried out in agitated tanks (two banks of 4 agitators) and during the leaching process pH gradually increases to around 4.5 when the solution is pumped to 18m diameter thickeners. Zinc solution containing 130g/l zinc in solution is pumped at a rate of 6,500m^3/day to the refinery with a copper/cadmium residue sent to other parts of the Complex for further processing. The zinc solution is filtered using a Difenbach press filter.

> ***WAI Comment:*** *The leaching section comprises conventional zinc processing technology and is essentially similar to most other electrolytic zinc plant around the World (including the plant at Ridder) and can be regarded as an essentially optimised circuit.*

16.3.2.5 Refinery

Zinc solution at a temperature of around 45°C is mixed with spent electrolyte solution at a ratio of 1:15 to optimise the zinc concentration for the electrolysis process, pumped to vacuum distillation equipment and ultimately delivered to the tank house (commissioned in 1967). The tank house comprises a total of 282 cells arranged in 4 banks of cells connected in series. Anodes in the cells are made of zinc metal (containing 1% silver) and cathodes made from aluminium. Busbars supply direct current at 22 amps and 99.99% purity zinc is plated onto the cathodes. An average of 1,200kW/t zinc plated is consumed in the process. The current electrolytic circuit comprises relatively modern polymer-concrete cells that replaced the previous lead lined cells (over the last 5 years). Other improvements have been made to the electrolytic cooling system, with cooling now effected by Hamon air cooling towers.

Up to 525tpd cathode zinc is removed manually and transferred by fork lift truck, 50kW induction furnaces of which there are 9, for re-melting and casting into high purity zinc ingots. At this stage aluminium can be added and a zinc-aluminium alloy produced if required. Production of these speciality alloys can be up to 4kt/month. Ingots are cooled batched on pallets and loaded onto railway trucks for export.

> ***WAI Comment:*** *The electrolytic process employed at Ust-Kamenogorsk can be considered as conventional technology. The fundamental process is little changed since its introduction in the 1950s' although recent improvements have been made to the electrolytic cell design and materials of constructions and cooling efficiencies. Overall there would appear to be little scope for significant improvements to process efficiency and the plant is considered to be operating at, or close to, optimised levels.*

16.3.3 Precious Metals Refinery

Ust-Kamenogorsk Metallurgical Complex operates a precious metals refinery producing 99.99% silver and 99.99% gold ingots. Estimated 2010 outputs of refined silver and gold are 171,514kg and 18,480kg respectively.

A schematic process flow sheet for the Precious Metals Refinery is shown in Figure 16.1.

High levels of recovery for silver and gold are reported, with the principal being to final discard slag. Minor variations are apparent but over the last few years have been relatively stable at around 12% or less.

All refined silver and gold is exported from site, up to three times per month, by rail using dedicated (Kazzinc) bullion wagons.

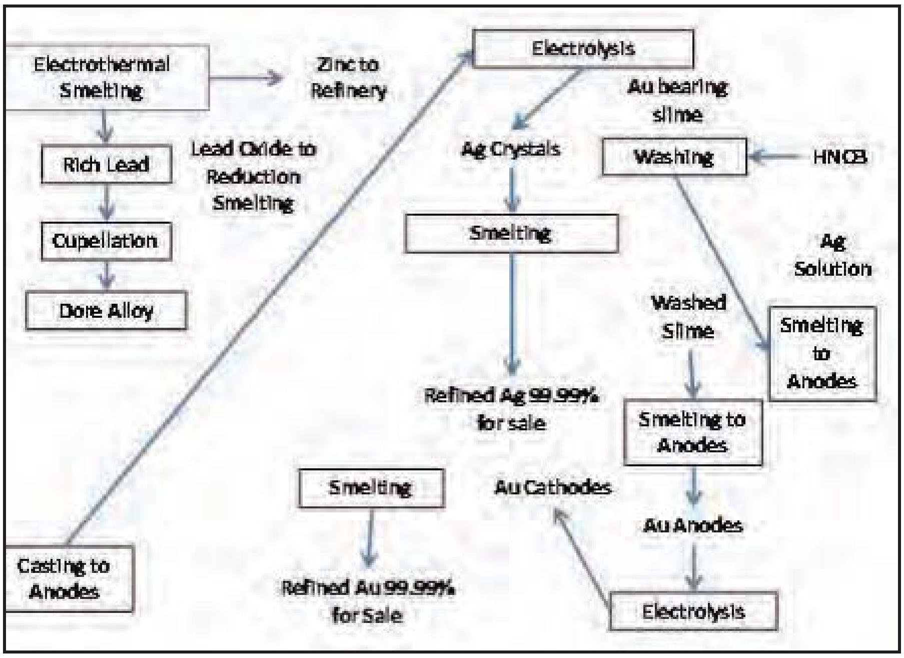


Figure 16.1: Precious Metals Refinery Ust-Kamengorsk Schematic Process Flow Sheet

The electrolytic cells used to produce silver crystals are protected by Kazzinc Patent No. KZ(A) 5555 (filed 15.12.1997) and have the ability to produce 4 nines grade (i.e. 99.99%) silver in a single stage. The silver is removed from the electrodes and smelted to form ingots (28-32kg in weight). Facilities exist to enable production of powered metals should this be required by the customer, although the vast majority of production is as ingots.

Security at the metallurgical complex is provided by G4S however, State regulations dictate that security within the previous metals refinery is provided by the State owned security company Kuzet and movement into and out of the buildings is controlled. As would be expected, housekeeping in the plant is excellent.

The refinery comprises 12 electrolytic cells and was commissioned in 1991 with a capacity to produce between 45-60t of silver per month. The gold plant at the refinery first produced refined gold in 1992.

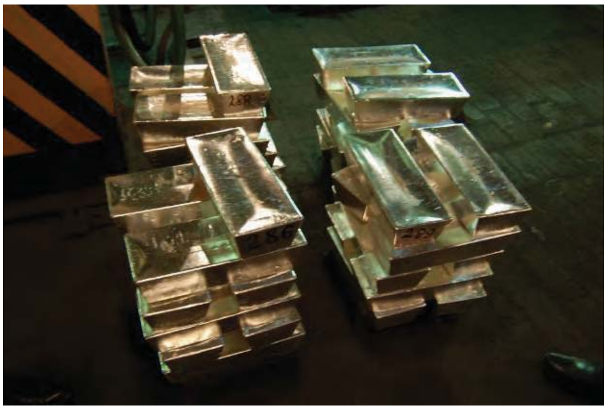


Photo 16.2: 99.99% Silver Ingots, Ust-Kamenogorsk

Photo 16.3: 99.99% Gold Ingot for Export

> ***WAI Comment****: The precious metals refinery is well managed with good process efficiencies. The metallurgy has been optimised over a number of years and the ability to precipitate silver at the required grade in a single stage is impressive. WAI considers there is little potential for enhanced gold or silver recoveries*

16.3.4 Existing Acid Plants

Two different acid plant technologies were operational in October 2010:

- Single contact process using zinc roaster gases; and
- Wet Catalytic (also known as Wet gas Sulphuric acid – WSA) using Danish Haldor Topsoe technology with blend of off-gases from lead and zinc processing.

The single contact plant was commissioned originally in 1955 (although it should be noted that the oldest parts of the current plant are approximately 10 years old) and has a limit of 0.3%SO_2 in the inlet gas. Any gases below this concentration of SO_2 are vented directly to atmosphere. In 2004, a 895tpd wet catalytic (Haldor Topsoe) Danish technology acid plant was installed capable of treating 125,000Nm3/h gases with SO_2 contents as low as 0.06%SO_2 and with a maximum concentration at the inlet to the reactor of 6.5%. Installation of the Haldon Topsoe plant reportedly decreased SO_2 emissions into the atmosphere from the complex by an estimated 40%.

These traditional technologies for sulphur capture and acid production will be supplemented by the use of a dual contact "state of the art" acid plant designed by SNC Lavalin which will become operational in 2011. This plant is designed to treat (all) high sulphur content off-gases produced by the ISASMELT™ copper furnace (Off-gas from the ISASMELT™ lead furnace will be treated in the current Haldon Topsoe plant).

An environmentally significant impurity in the off-gas (once particulate matter has been removed) is mercury and the relatively small amounts of elemental mercury are removed in filter cakes and sold as a by-product. Off-gas for both plants should be relatively particle free and it would appear that the gas cleaning performance (i.e. gas filtration) standards for SO2 containing gases are established by the acid plant minimum requirements.

All acid, produced by whichever route, is either re-used within the metallurgical processes on site or piped to rail tanker for export.

> ***WAI Comment****: Kazzinc deploys conventional technologies to scrub sulphuric gases to form sulphuric acid. The single contact plant cannot reach the scribbling efficiencies of the existing (Haldon Topsoe), stage process or the dual contact plant currently under construction.. Adding a second stage to the single contact plant would result in higher scrubbing efficiencies although the overall effectiveness and cost implications would need to be understood further before such a strategy could be recommended.*

16.3.5 ISASMELT™ Lead Furnace

16.3.5.1 ISASMELT™ Process

ISASMELT™ is a bath smelting process utilising lance technology (ISASMELT™ lance). The lance is inserted into a molten slag bath contained within a stationary, refractory lined furnace (ISASMELT™ Furnace). The injection of air, or oxygen enriched air, through the lance results in the formation of a highly turbulent molten bath. Feed materials (ore, sinter etc) falling into the molten bath from above can react rapidly resulting in extremely high productivity for a relatively small bath volume (high intensity smelting rates).

The ISASMELT™ process was first developed by Mt Isa Mines (MIM) and developed into a commercial scale during the 1980s' and 1990s' at MIM's smelting operation at Mt. Isa in Australia. Commercial operations now exist in at least 8 different countries, including applications for secondary lead, secondary copper, copper concentrates and lead concentrates. Further applications of the technology for tin smelting have been investigated. Key features of the ISASMELT™ process report in the literate include:

- Relatively simple design;
- Flexibility of fuel (coal, coke, natural gas);
- Long lance life;

- Ease of operation;
- Minimal feed preparation requirements;
- High specific smelting rates;
- Low dust production;
- Small size (footprint);
- Efficient gas capture; and
- Ability to utilise oxygen enriched air.

16.3.5.2 Other ISASMELT™ and similar Lead Plants

Although the ISASMELT™ technology was originally developed to smelt Mt Isa lead ores the original pilot plant was decommissioned in 1995 and currently Mt Isa does not employ an ISASMELT™ furnace.

Secondary lead smelting has been carried out successfully in an ISASMELT™ furnace by Britannia Refined Metals at Northfleet, UK, since 1991 and at Metal Reclamation Industries in Palau Indah, Malaysia. A lead ISASMELT™ plant was designed and commissioned in 2005 by Yunan Metallurgical Group, Qujing, Yunnan Province China, to produce 80ktpa of lead from concentrates. A lead blast furnace is included in the process flow sheet and the lead ISAMELT™ furnace effectively replaces the sinter plant of a traditional lead smelter. AUSMELT™ is essentially a similar lance technology to ISASMELT™. Recyclex operates an AUSMELT™ furnace for primary and secondary lead smelting at Nordenham and Hindustan Zinc operate a primary lead AUSMELT™ furnace at its smelter in Chanderiya.

16.3.5.3 ISASMELT™ Furnace – Ust- Kamenogorsk

A lead ISASMELT™ furnace is currently under construction at the Ust-Kamenogorsk Metallurgical Complex. The furnace has been designed by Xstrata (owners of the ISASMELT technology) and construction is being supervised by engineers from Xstrata. Commissioning is scheduled for 2011. Total investment in this furnace is estimated at over US$100M.

Blended ore will be fed to the lead ISASMELT™ furnace at a maximum feed rate of 150tph and the main plant has been designed to produce 140ktpa of lead metal. The ISASMELT™ facility will effectively replace (eventually) the sinterline and it is noted that the blasé furnaces will remain operational after the ISASMELT™ furnace has been commissioned. Product from the ISASMELT™ furnace will be fed to a hot briquetting plant and will form feed to the blast furnaces.

> ***WAI Comment:*** *WAI considers that ISASMELT™ technology is well proven and that there are commercial examples of the technology operating to produce lead. However, there have been difficulties in the past in attaining economic viability. WAI notes that the furnace design, the supervision of construction and training of key operatives is all under the management of Xstrata and considers this to be important. Operation of the ISASMELT™ furnace will enable more efficient collection of off-gas and conversion of SO_2 to H_2SO_4 resulting in reduced emissions of SO_2 to atmosphere. The feeding of hot-briquetted feed and operation of the lance bath should result in (significantly) improved particulate emissions compared to the levels produced currently during the sintering process.*
>
> *ISASMELT™ is considered an appropriate technology for implementation at Ust-Kamenogorsk and has the potential to reduce manning levels and produce lead more cost effectively than in the current process flow sheet as well as improve environmental performance It is understood that commissioning of the lead ISASMELT™ furnace is planned for the third quarter 2011.*

16.3.6 ISASMELT™ Copper Furnace and Tank House

16.3.6.1 ISASMELT™ Copper Process

A number of ISASMELT™ furnaces for the production of copper from both primary ore and secondary sources have been installed and are operational or are under construction or waiting commissioning around the World. The first furnace, a 700ktpa copper smelter treating primary copper concentrates was installed in 1992 by FMI Miami in Arizona, USA. This was followed rapidly by a 1Mtpa furnace operated by Mount Isa Mines Ltd in Australia. Subsequently furnaces have been commissioned by Sterlite Industries in Tuticorin, India (500ktpa); Yunnan Copper at Kunming, China (800ktpa); Mopani Copper Mines at Mufulira, Zambia (650ktpa); Southern Peru Copper at Ito, Peru (1.2Mtpa); Yunnan Copper at Chambishi, Zambia (350ktpa); and Yunnan Copper at Chuxiiong, China (500ktpa). In addition to the furnace under construction at Ust-Kamenogorsk, other Cu-ISASMELT furnaces (up to 1.36Mtpa throughputs) are under construction in China, India and Peru.

16.3.6.2 Cu-ISASMELT™ Furnace and Ancillary Equipment at Ust-Kamenogorsk

A US$400M investment has been made to construct an ISASMELT™ furnace (and ancillary equipment) and electrolytic tank house. The plant was largely complete at the time of the site visit (October 2010) and it is understood that commissioning is scheduled for the first quarter of 2011. Off-gases from the smelting section will be cleaned using Electro Static Precipitators (ESP) to reduce the particulate content to below 50mg/m^3 and delivered to a new acid plant which is also under construction and which has been designed to be commissioned alongside the ISASMELT™ furnace (cold commissioning planned for end February 2011). Once fully operational this facility is expected to produce up to 87.5kt of refined copper.

The ISASMELT™ furnace is fitted with waste heat boilers to recover heat. Molten product (matte) from the furnace is transferred to conventional Pierce-Smith Rotary Coverters where blister copper is produced. Blister copper is tapped to an anode furnace for casting into (impure) copper anodes for further refining in the electrolytic tank house.

> ***WAI Comment:*** *WAI considers that the choice of ISASMELT™` technology is most appropriate. There are many examples of successful operation of this process around the World and the technology choice is considered low risk. The technology offers the potential for Kazzinc to become a relatively low cost copper producer and offers the potential to toll treat third party ores to supplement production from internal ores. In this respect the ability to treat arsenic bearing concentrates may be significant as there are few sites that can treat high arsenic concentrates and therefore may attract a premium. WAI believes that the significant involvement of Xstrata staff in the training of Kazzinc operators is important and should assist commissioning and start up of commercial operation.*
>
> *All other unit operations in the new plant which is under construction can be regarded as conventional and represent a low level of technical risk. The design of the smelting operation allows for flexibility and ease of operation and incorporates mechanisation wherever possible. The involvement of outside staff in the training of Kazzinc operators is important and should facilitate successful commissioning and operation.*

16.3.6.3 Copper Tank House

As part of the new investment a traditional, modern copper tank house comprising 264 electrolytic cells in 6 sections is under construction. Cold commissioning is underway and the whole facility should be operational in the first quarter of 2011.

> ***WAI Comment:*** *The tank house is a conventional design and WAI do not consider that there are any significant risks associated with the technology. Kazzinc believe that commissioning should be relatively straight forward and WAI has no reason to doubt this.*

16.3.7 (New) Dual – Contact Absorption Process Acid Plant

Kazzinc has invested approximately US$150M in a new acid plant designed by SNC Lavalin using a dual-contact absorption process. This plant will meet all off-gas from the copper ISASMELT™ process.

The plant has been subjected to rigorous appraisal and (together with the copper smelter) has an OVOS which has been reviewed and approved by the Ecological Committee of the Republic of Kazakhstan.

Extensive off-site training has been provided by SNC Lavalin for Kazzinc employees. The new acid plant underwent cold commissioning at the end of 2010 and is designed to become operational once the copper ISASMELT furnace commences operation.

> ***WAI Comment:*** *WAI notes that the new acid plant represented state of the art technology and should convert all SO_2 to H_2SO_4 in most of the plant operations.*

16.4 Ridder Metallurgical Complex Technology Description and Comment

16.4.1 History

The Ridder Metallurgical Complex (RMC) was built to incorporate separate lead and zinc production areas. However, the lead plant is currently mothballed and it is understood that the plant is unlikely to work again, especially as a new ISASMELT™ lead furnace is under construction at UST-Kamenogorsk.

Construction of a zinc plant to process ore from Tishinskiy Mine started in 1959, with the roasting section completed in 1963 and the 1st stage acid plant commenced operation in October 1964. The first zinc (metal) was produced on 27 March 1966. In 1981 a hydrometallurgical plant, comprising high temperature leaching of zinc concentrates in acid with iron removed in the form of jarosite was commissioned, and in the 1990s' the process was changed to the current process flowsheet.

16.4.2 Current Process Flow-Sheet

Zinc concentrates from the Ridder Mining and Concentrating Complex (Tishinskiy Mine, Ridder-Sokolniy Mine and Shubinskiy Mine) are treated at RMC in a conventional roasting (fluidised-bed) – leach circuit and ore from the Shaimerden Deposit is treated at RMC in a Waelz Kiln – leach circuit. A simplified, schematic process flow-chart is shown in Figure 16.2. The design capacity for the current zinc plant is 105,00tpy of saleable zinc (since 2004 sales of zinc metal from RMC have exceeded 105ktpa with sales of 110,847 in 2009).

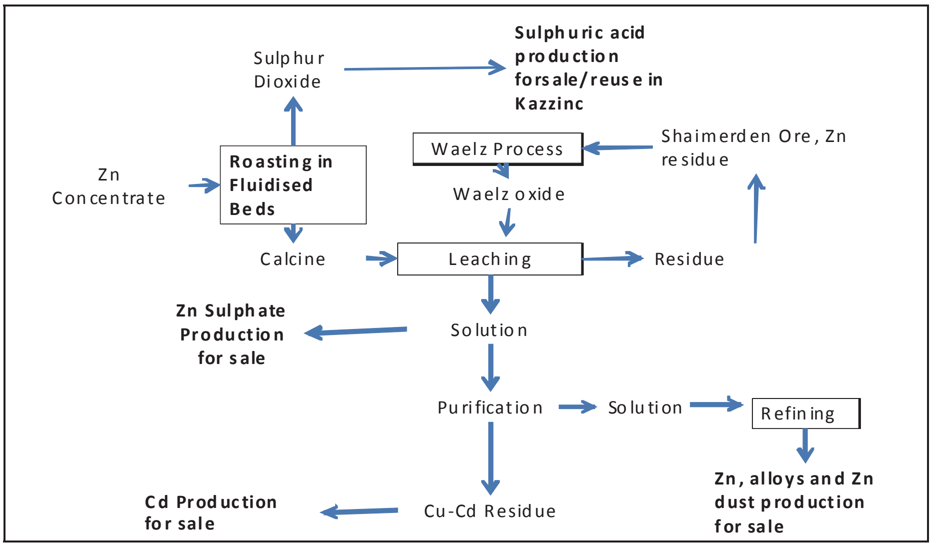


Figure 16.2: Schematic Process Flow Sheet – Showing Zinc Production Process at RMC

16.4.2.1 Roasting

Zinc sulphide ores are treated in one of 4 fluidised bed roasters. These have a hearth area of 31-32m² with a diameter of 6-7m. At any one time there are 2 working fluidised bed roasters one, held in reserve and one undergoing maintenance. The fluid-bed roasters are refractory lined and are relined every 4- 5 years after approximately 3,000 operating hours.

16.4.2.2 Waelz Section

Three 5m diameter Waelz kilns (70 and 75m long) are present at Ridder. The newest kiln was installed after a US$30M investment in 2008. The kilns can each produce up to 77t of Zinc per day and are equipped with waste heat boilers and a bag-house to collect dust with particulate emissions to atmosphere reported at 0.02g/m³. The kilns are inclined at 2.5% and rotate at up to 1rpm. The additional investment in 2008 was primarily so that Shaimerden ore (and zinc residues) can be processed. A schematic process flow sheet is shown in Figure 16.3.

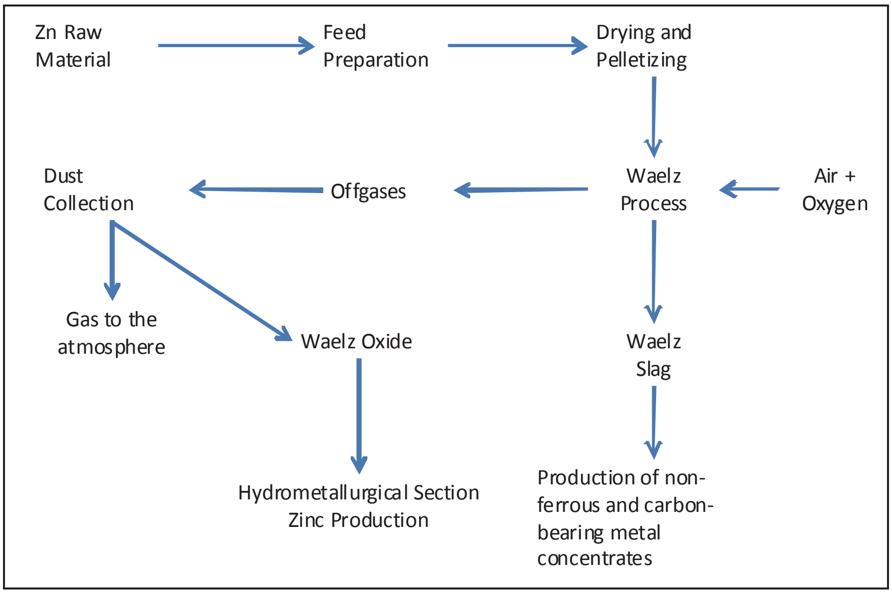


Figure 16.3: RMC Waelz Section: Schematic Process Flowsheet

16.4.2.3 Hydrometallurgical (Leaching) and Electro winning Sections

Waelz Oxide, or calcine, produced in the fluidised bed roasters is leached using sulphuric acid in standard agitated tanks (130-150g/l Zn in solution) and fed via thickeners and a Dieffenbach filter to electro winning cells. Zinc cathodes are produced by electrolysis of the solution. The hydrometallurgical/ electro winning sections of the RMC are essentially similar to those at the Ust-Kamenogorsk plant. The principal difference between the two metallurgical complexes is that at Ridder pneumatic agitators are employed whereas mechanical agitators are used at Ust. Three vacuum evaporators are used in the mixing/cooling section.

Solution containing up to 150g/l zinc is transferred at a rate of 125m³/h from the leaching plant to the electrolytic cells. Zinc is predicated as cathodes with spent electrolyte solution (essentially H_2S0_4) recycled to the leach section. Schematic process flow sheets are shown as Figure 16.4 and Figure 16.5. Zinc metal is produced by the electrochemical decomposition of an aqueous solution of acidified zinc sulphate by the application of a direct current passing through the cells. Aluminium cathodes and Pb-Ag cathodes act as the electrodes. Zinc metal is stripped manually from the cathodes once per day and sent to induction furnaces where high purity ingots are cast. These furnaces operate at 430-500°C at a specific power consumption of 94.5 to 100kW/h. Each furnace has a capacity of up to 40t molten metal. Ingots are produced on a batch basis.

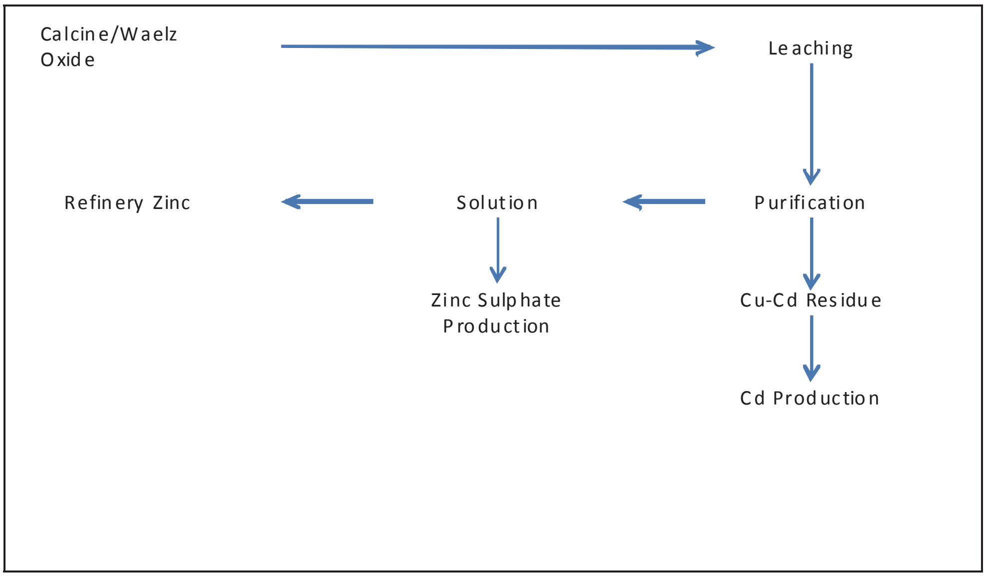


Figure 16.4: RMC Leaching Area: Schematic Process Flowsheet

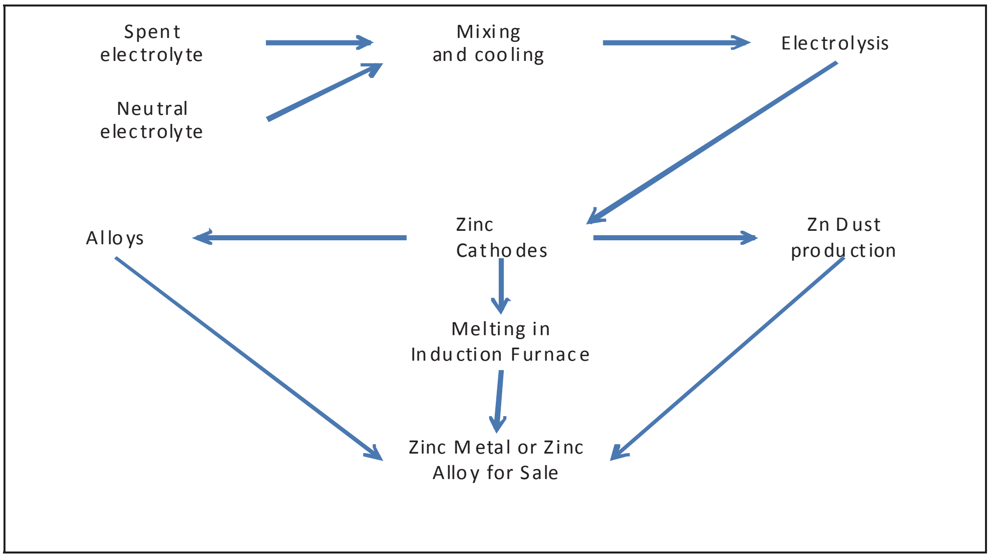


Figure 16.5: RMC Leaching Area: Schematic Process Flowsheet

In addition to high purity zinc metal, specific zinc alloys can be produced in the same induction furnace by addition of high purity alloying metals. Zinc ingots/alloys are exported from the RMC to consumers by rail.

16.4.2.4 Acid Plant

Sulphur dioxide gas (SO_2) produced by the roasting of zinc (sulphide) concentrates is ducted to the acid plant. The acid plant can be considered reasonably conventional and comprises 3 sections.

1) Weak acid washing;
2) Drying; and
3) Contacting (using a Vanadium Catalyst).

The process is based on the reaction $SO_2 + ½\ 0_2 \leftrightarrow SO_3$. The process flow-sheet is shown as Figure 16.6. Product sulphuric acid (H_2SO_4) is pumped to storage tanks from where it is loaded into railway tank wagons for delivery to customers. The plant produces 160-170,000tpa H_2SO_4 with a reported efficiency of SO_2 recovery of 98.7 – 98.9%

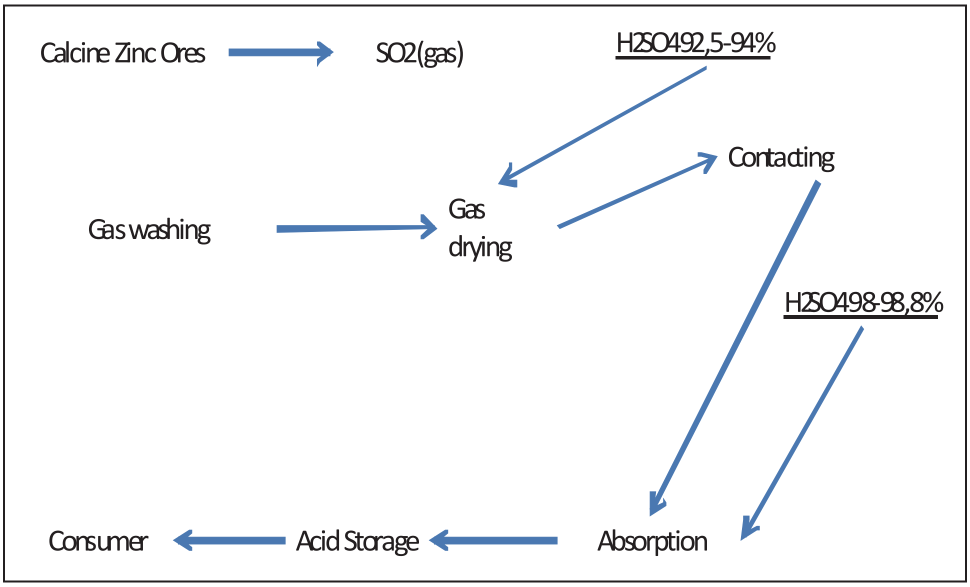


Figure 16.6: Schematic Process Flowsheet, Sulphuric Acid Production, Ridder Metallurgical Complex

16.5 Environmental

16.5.1 Background

Ust-Kamenogorsk is the capital of the East Kazakhstan Region. It is a highly industrialised city situated at the confluence of Irtysh and Ulba Rivers. The city has over 300,000 inhabitants (2010) with over 750,000 people living in the Region. It is served by an International airport and is located on a railway (branch) line with services to Ridder (eastwards) and westwards into Russia. Immediately north-east of Ust-Kamenogorsk the land rises towards the Altai Mountains and the border with Russia. The nearby West Altai National Park was created in 1991.

At Ust-Kamenogorsk metallurgical industries (including the Kazzinc Metallurgical Complex) and supporting engineering industries are important employment providers as well as uranium processing and thermal power generation. The city, befitting its Regional status, contains the administrative centre, university and college establishments and primary healthcare (hospital) facilities for the Region. Industry around Ridder is dominated by the activities of Kazzinc, namely mining, mineral processing and metals production.

East Kazakhstan has an extreme continental climate. Average January temperatures range between -19 and -4°C with average July temperatures between 19 and 26°C. Extremes in the East Kazakhstan Region can reach -40°C and +35°C respectively. Rainfall (precipitation) is relatively low with around 400mm in Ust-Kamenogorsk, although levels are higher in the mountains around Ridder.

Kazakhstan has a complex ethnic mix which explains the Country's religious diversity. Ethnic Kazakhs are historically Sunny Muslims and Islam is the largest faith. However, over one third of the inhabitants belong to the Russian Orthodox faith.

Kazzinc operates corporate integrated management systems, including:

- Quality Assurance (ISO 9000);
- Environmental Management Systems (ISO 14001); and
- Health & Safety Management (OHSAS 18001).

These management systems are somewhat generic at the moment but the desire is to roll out across all sites in the Company. Ultimately, the existing high level documents will need to be supported by individual site specific documents which will detail how environmental issues (and Health & Safety) are managed and performance standards maintained at each operating site.

16.5.2 Ust-Kamenogorsk Metallurgical Complex

16.5.2.1 Current Status – General Comments

The Ust-Kamenogorsk Metallurgical Complex is situated in a highly industrialised sector of the city. Adjacent to the site boundary is a major thermal power station (operated by AES) and a Uranium processing facility. Residential areas and a hospital complex are located just over 1km from the site boundary.

An OVOS covers all the activities at the Metallurgical Complex (including the new plant currently under construction) and establishes maximum permissible concentrations for all significant emissions from the complex. Discussions with environmental managers at the site indicate that no closure plans exist for the complex as these are not required (and would not be considered appropriate) under current Kazakh legislation/permitting.

WAI witnessed a number of individual monitoring results, all of which demonstrated compliance with requirements of environmental and occupational hygiene legislation. Occupational hygiene monitoring and general site air quality monitoring around the Complex is also carried out regularly for a variety of parameters including, NO_2, SO_2, CO_2, Pb, As, Zn and noise and vibration. General air quality testing is carried out around the Complex daily (Monday-Friday) using the Company's mobile testing laboratory.

Particular attention is paid to the occupational hygiene limits for lead and blood lead levels for workers exposed to lead (i.e. those working in the lead section) and are measured twice yearly.

General standards of housekeeping were good around the Complex at the time of the site visit (October 2010), especially considering the amount of construction (and demolition) activities taking place at the time. Major construction projects which were on-going at this time included the Cu-ISASMELT™ furnace and tank house, and the Pb-ISASMELT™ furnace and new acid plant. Regular dust suppression of the internal roadways occurred using dedicated road sweepers.

There is no electricity generation at the Complex and all power is obtained via the National Grid. It is noted however, that Kazzinc operate a hydroelectric power station, the Bukhtarma Hydroelectric Power Station, located on the Irtysh River and are responsible for the upkeep of roughly 650km of electricity transmission lines.

Security at the Complex is provided by G4S. All access to the Complex is controlled through one principal entry which is gated. All vehicles are inspected on entry and on leaving the site. G4S provide all internal site security including the provision of (armed) guards for the Precious Metals Refinery.

> ***WAI Comment**: WAI has not had the opportunity to review the OVOS in any detail but WAI considers that the document has satisfied National requirements.*
>
> *It is believed that Kazzinc has established some form of bond to facilitate closure of adjacent mining areas but it is unclear whether the Ust-Kamenogorsk (or Ridder) Metallurgical Complex is included within the provisions of this bond. WAI would recommend that the provisions of this bond are examined and if necessary extended to include the metallurgical complexes. Ground water samples are obtained from 20 monitoring boreholes across the site on a quarterly basis. WAI have been informed that asbestos materials are not present and that in 2010 an inventory of waste and active PCB materials was made. A National programme of work PCB disposal at a centralised site for the whole of Kazakhstan is under development currently.*
>
> *WAI notes that the new plants under construction (principally the copper and lead ISASMELT™ furnaces and the dual contact acid plant) should improve the overall environmental performance of*

the Complex, in particular by improving local air quality (reduced SO_2 and particulate emissions) and improved energy efficiency of copper and lead production.

Electrical power is supplied to the Complex from the National Grid and hence, in reality, the electricity could have been generated by any route. However, as Kazzinc operate a hydro-electric plant that supplies an amount of power to the Grid similar to that consumed at Ridder and Ust, it could be argued that the Complex should be regarded as essentially carbon neutral.

16.5.2.2 Air, Water and Solid Emissions

Air Emissions

Emissions to atmosphere represent arguably the most significant environmental impacts posed by the Complex. Local air quality has been poor historically (both visible emissions resulting from particulates as well as SO_2 emissions) but has improved in recent times partially as a result of environmental improvements implemented by Kazzinc. SO_2 concentrations in air around the city have decreased by almost two thirds between 1997 and present day, although are currently just above the maximum permitted concentration (MPC) limits. It is expected that the completion of the lead smelter upgrade and copper smelter in 2011 will ensure SO_2 concentrations in air decrease to below the MPC levels. The Complex has a large number (114 individual stacks, 6 of which are over 80m in height) of point source (stack) emissions, all of which requiring abatement to a greater or lesser degree. Currently most stacks are equipped with bag filters prior to venting to atmosphere but none are equipped with any form of continuous monitoring for particulates or SO_2. Deviations from normal operation of abatement equipment (vacuum, temperature, gas flow rate) are monitored from the control room by alarms. IS0-kintic air sampling to demonstrate compliance with the maximum permitted particulate emission rate of <5mg/m³ is carried out as necessary.

Commissioning of the new lead and copper plants will result in capture of a greater proportion of the SO_2 produced at the Complex and the commissioning of the new acid plant is designed to coincide with the commissioning of the copper plant.

WAI Comment: *WAI considers that SO_2 represent the most significant environmental impact from the Complex. WAI considers that the introduction of new process plant in the form of ISASMELT™ furnaces and a new dual contact acid plant in 2011 will reduce the impact of the complex on local air quality.*

WAI recognises that the emissions from smelting operations are (under normal operation) relatively stable and predictable. The Environmental Department predicts likely emissions and determines what sampling frequency is appropriate. Emissions monitoring occurs once a month and this frequency can be increased if warranted. Furthermore, the complex utilises an on-site mobile laboratory which can obtain air samples from around the site, several times a day.

WAI understands that the Ust-Kaemenogorsk atmosphere air monitoring programme requires a centralised monitoring system of main sources of emissions (stacks) within the city.

Water Emissions

No water is abstracted currently from surface rivers. All make up water used in processes at the Complex is obtained from boreholes. The complex has a licence to abstract 1,000m3pa from groundwater.

Water at the Complex is used in an essentially closed system (about 6,000m³/h water in circulation at any one time, 4,000m³/h of which needs to be treated and an estimated 2,000m²/h which is not contaminated and not subject to treatment). Discharges to the river (<2% of the water usage) are made periodically after the water has been treated in a water treatment facility where pH is controlled by the addition of "lime milk" and suspended solids precipitated by addition of a flocculent. The water treatment plant was designed to treat 4,500m³/h process water.

Water chemistry is established at the Environmental Analytical Laboratory using principally standard atomic absorption spectrometry (AAS) instruments. Samples of pre and post treatment are analysed on a regular basis for quality control as well as routine analysis of river samples (upstream, downstream and at the discharge point

> ***WAI Comment****: WAI considers that water management is good at the Complex and has not seen any evidence (monitoring results) that indicate that the plant has been responsible for emitting (grossly) contaminated water to the river system.*

Solid Waste Disposal

A number of above ground, solid waste dumps are present within or immediately adjacent to the Complex. These include stockpiles of slags (4 in total) and calcium arsenate (2 in total). The slags include stockpiles of historic (+15year old) arising (estimated at a number of Million tonnes in total) from pre-Kazzinc operations which are believed to remain in the ownership of the State who retains any liability for the stockpile as well as 600kt slag for which Kazzinc is responsible. The slag stockpiles are all uncovered and have not been subject to any closure/remedial operations. It should be noted that the State regards all these stockpiles as "temporary" in nature and they are regarded as "assets" containing potentially recoverable metal values. As such, they are not subject to any National requirements for closure planning. The historic dumps are sources of particulate emissions.

The Ust-Kamenogorsk Metallurgical Complex recovers most useful components from the primary ores. Arsenic is associated with many sulphide ores due to the presence of the mineral arsenopyrite – (iron arsenide sulphide – FeAsS – the most ubiquitous arsenic bearing mineral species) and is present in a number of ores processed at Ust-Kamenogorsk. In theory arsenic could be recovered at the plant as either arsenic trioxide or as elemental arsenic. However, practically there are no economically viable markets for arsenic remaining as the vast majority of its former uses (e.g. in wood preservatives) have been banned in many countries. Hence, for a number of years arsenic has been removed (as calcium arsenate and calcium arsenite from the metallurgical circuits and considered as a solid waste.

There is currently a (filled) capped calcium arsenate and arsenite stockpile and a current (two cell) active calcium arsenate stockpile present on site. The filled stockpile/dump remains in the ownership of the State who retains all liabilities associated with the stockpile. (see Photo 16.4). The stockpile has been capped with a relatively thin layer of clay over a synthetic (impermeable) geosyntheic membrane. Once capped the stockpile was subject to revegetation trials in 2003 and plants cover much of the exposed surface.

**Photo 16.4: Historic Capped Calcium Arsenate Stockpile
Showing Instability on Cap**

Signs of instability are evident on the slopes of the stockpile (where the clay has slumped) where the membrane has been exposed.

Current arsenic disposal is to a single cell with multi-layered impervious walls with a clay lined base with concrete and asphalt surfaces. The cell is estimated to be half full with a further 18-plus months of disposal volume remaining. Cell construction methods and disposal operation has been with government approval.

Boreholes to the groundwater have been installed up gradient and down gradient of the calcium arsenate and arsenite disposal areas and are monitored regularly. It is reported that no groundwater pollution plume of arsenic has been identified by this monitoring.

Kazzinc internal R&D teams are evaluating and finalising the design of an alternative arsenic disposal method using Scorodite, a hydrated iron arsenate mineral with the chemical formula $FeAsO_4.2H_2O$, which is significantly less soluble in water compared to calcium arsenate. The ultimate plant will have the capacity to produce up to 9,000tpa scorodite but the detail of the disposal containment structures and ultimate location are uncertain at present. These works are at preliminary design status and completion is anticipated in the first half of 2011. It is understood that the primary impetus for this development work was the decision to construct a copper ISASMELT furnace as this will generate significantly more arsenical residues than are produced currently.

> ***WAI Comment**: WAI notes that the historic slags present on site remain the responsibility of the State.*
>
> *WAI notes that the capping on the historic (State responsibility) calcium arsenate dump would benefit from remedial measures however, it is noted that legal ownership resides with the state.*
>
> *The current calcium arsenate disposal cells will become redundant once the scorodite process that is currently under development is implemented. WAI understands that this is contemplated to be by the middle of 2012. As per project approval the existing cells will require capping and revegetation and should be considered as permanent disposal locations.*
>
> *WAI concurs that scorodite is a more stable arsenic species compared to calcium arsenate or calcium arsenite. Waste tips in Saxony that are many hundreds of years old have been found to contain scorodite and suggest that this species is appropriate for long term disposal of arsenic. It is important to appreciate that scorodite is not completely stable environmentally and good operational control of the process is essential to ensure optimum performance. It is recommended that all process designs are examined in detail before the process is implemented but, in principle, WAI would support the concept and consider disposal of arsenic as scorodite to offer environmental advantages compared to the present system.*

16.5.3 Ridder Metallurgical Complex (RMC)

16.5.3.1 Current Status

The RMC is situated in the town of Ridder approximately 160km east of Ust-Kamenogorsk. Construction of a zinc plant started in 1959 with metal and acid production by the early 1960's. In April 2008 Kazzinc acquired the lead production facilities from Kaz-Tyumen JSC. This plant had an annual production capacity of 15,000t lead but from 2009 production was switched to the metallurgical complex at Ust-Kamenogorsk and the plant is currently mothballed.

Current activities at RMC are restricted to the production of zinc (design capacity 105,000tpa – 2009 production 110,800t) and sulphuric acid (design capacity 480tpd). Sulphuric acid is supplied to external customers as well as used on-site within the metallurgical process. Some materials are delivered to the metallurgical complex at Ust-Kamenogorsk for further reprocessing (Waelz fumes, lead cake).

Environmental challenges at the Ridder Complex are essentially the same as those faced at Ust. However, it should be appreciated that the RMC is significantly less complex than the Ust Complex.

Issues are tackled in a similar way. Aerial emissions are dominated by particulates and sulphur dioxide gases and mitigated in the same manner as in Ust. SO_2 rich gas is cleaned of particulates and sent to a catalytic acid plant to be converted into sulphuric acid. The Waelz kilns now treat Shaimerden low sulphur (up to 1%) ore which has decreased overall SO_2.

At the time of the site visit the general level of housekeeping across the site was regarded as reasonably good.

Untreated aqueous effluent is absent 18,000,000m^3 water is treated at two waste water treatment plants annually and the site produces little solid wastes for disposal presently. Historic waelz slag and jarosite from previous processing activities are dumped in above ground stockpiles. It is understood that Kazzinc do not possess any liabilities associated with these historic dumps. Liabilities are retained by the State who remains the owner of the dumps. As these are regarded as temporary structures (awaiting development of new process technology) by the State they are not subject to closure planning or permanent disposal plans.

> ***WAI Comment:*** *WAI considers that many of the comments made regarding the metallurgical complex at Ust are equally applicable to Ridder.*
>
> *The impact of historical dumps on groundwater is assessed quarterly across odservation holes.*

16.5.4 Community Relations

Kazzinc is a major employer in East Kazakhstan. Senior management reported that the Company enjoyed good relationships with the local community in both Ust-Kamenogorsk and Ridder and the Company supported many local causes and organisations. This includes sponsorship of the regional ice hockey team in Ust-Kamenogorsk and the local football team in Ridder.

> ***WAI Comment****: WAI would concur that based on limited time spent in the region that good relationships exist with the local community. Corporate Social Responsibility (CSR) initiatives undertaken by Kazzinc are documented in memoranda. The community is informed in accordance with the Company's Community and Media Relations Plan.*

16.6 Summary and Conclusions

There is a long history of metallurgical processing at both Ust-Kamenogorsk and Ridder ensuring a well qualified, knowledgeable workforce is available. The metallurgical complex at Ust-Kamenogorsk is particularly complex with recovery of a number of metals, principally lead, zinc, copper, gold and silver.

The current process flow sheets are considered to be fully optimised and further process efficiencies will be difficult to realise.

WAI considers that the copper ISASMELT™ process (with associated dedicated tank house) offers significant potential for Kazzinc to become a low cost producer. In addition to Kazzinc ore there should be potential to toll treat third party concentrates. The process and site infrastructure should be capable of testing high arsenic containing copper ores which might attract a premium smelting rate. There are numerous examples of operational ISASMELT™ furnaces smelting primary copper concentrates and WAI considers that the technical risk associated with this technology to be low. The close involvement of Xstrata during the commissioning and operator training period is noted and considered vital to the successful introduction of this technology.

There are fewer operational lead ISASMELT™ furnaces smelting primary concentrates. It is noted that the current investment programmes should result in reduced total environmental emission at Ust-Kamenogorsk.

Current arsenic disposal at Ust-Kamenogorsk is in the form of calcium arsenate and arsenite production and disposal to pits with three impermeable layers. Internal research has identified a scorodite (iron arsenate) as the preferred arsenic species for long term disposal. WAI would agree with this evaluation. WAI understands that this is scheduled for mid-late 2012.

WAI notes the continuing commitment of Kazzinc to the implementation and maintaining of internationally recognised management systems, including ISO 14001 and OSHAS 8001. Implementation of these systems is regarded as best practice.

17 BUTACHIKHINSKO-KEDROVSKIY

17.1 Introduction

17.1.1 Butachikhinsko-Kedrovskiy Block

The Butachikhinsko-Kedrovskiy Block is located in the East Kazakhstan Oblast, some 40km northeast of Ust-Kamenogorsk and to the southwest of Ridder (Figure 17.1). The licence block covers an area of 700km^2 and a contract was sent to the Ministry for approval, and which is awaited to be received by Kazzinc. It should be noted that the Tishinskiy deposit/mine is enclosed within this licence block.

Kazzinc was awarded the tender by the Ministry of Energy and Mineral Resources of Kazakhstan for regional exploration for non-ferrous metals and primary gold in the Butachikhinsko-Kedrovsky district in November 2009.

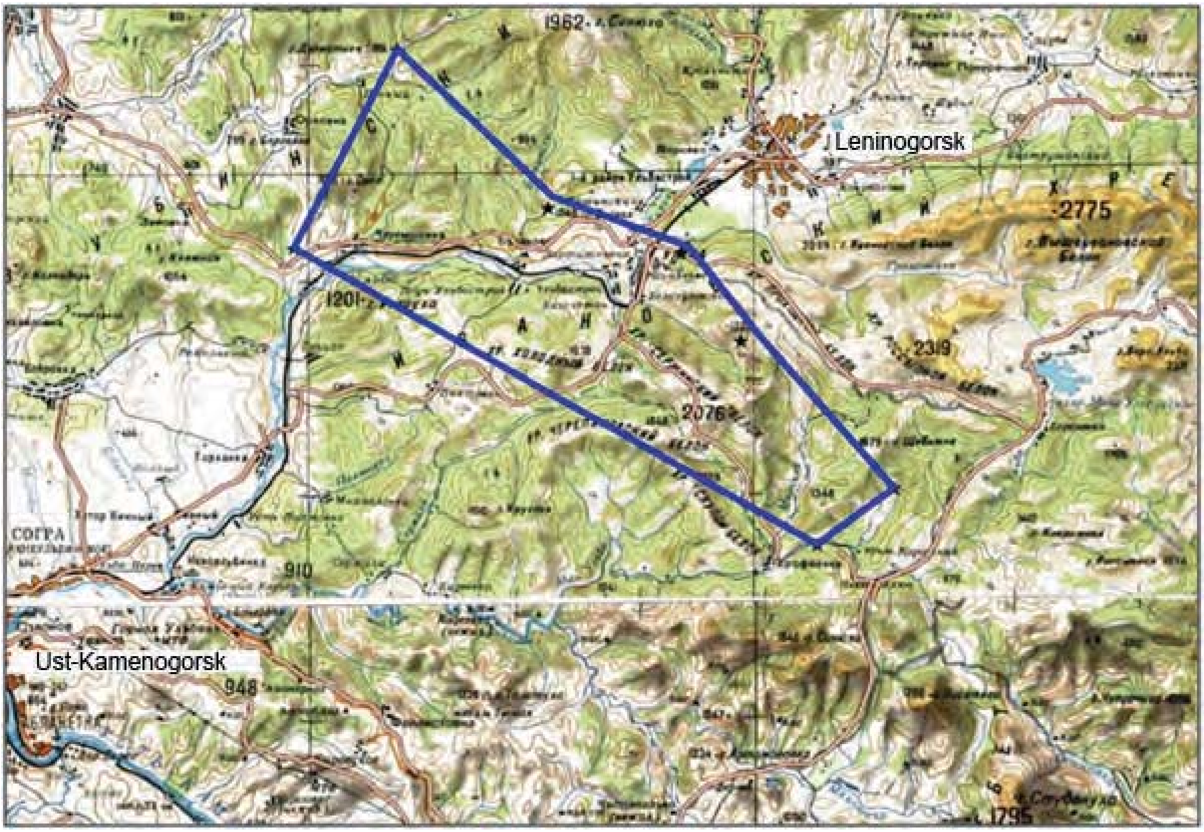


Figure 17.1: Location of Butachikhinsko-Kedrovskiy Block

The Butachikhinsko-Kedrovskiy Block lies within the Rudny Altay (VMS) province and predominantly comprises Lower to Upper Devonian geological units, with a small area of Carbonaceous in the extreme west of the block. The Rudny Altay province extends over 500km along the north eastern border of Kazakhstan. The southern half exposes Permian intrusive units while to the northeast massive granitoid units are present. The Mid to Lower Devonian units comprise intrusive host rocks though prophylitic alteration of Upper Carboniferous to Lower Permian age is evident within and around intrusive units and deposits.

Currently the most prospective target is the Grekhovskiy deposit, located to the west of the Tishinskiy deposit, which is proposed by Kazzinc to be explored to a depth of 1.5km.

Regional prospecting has been conducted within the Butachikhinsko-Kedrovskiy Block since the early 1900's, initially involving geological mapping and later through geochemical and geophysical surveys.

Although preliminary in nature this work has identified several prospective areas which will require considerable follow-up investigation to establish their true potentialExploration.

17.1.1.1 Introduction

Although Kazzinc have yet to receive approval for the licence a fairly significant amount of regional exploratory work has already been completed over the Butachikhinsko-Kedrovskiy Block including:

- High-resolution satellite images interpretation (5-6 m) with relief processing;
- Geochemical surveys using 'IONEX' – method and bed rock geochemistry;
- Complex airborne magnetic survey, scale 1:50 000 – 1:25 000, (magnetic survey + gamma-ray spectrometry);
- Geological and mineragenetic mapping at a scale 1:100 000 with 1:50 000 details, to define productive structures; and
- Petrophysical studies for analysis and interpretation of geophysical data.

Recent geophysical surveys have included Audio Magnetic Telluric (AMT) and Magneto Telluric (MT) 'sounding' in 2007 and 2010 along SW-NE profiles.

17.1.1.2 Historical Exploration

Early prospecting and information on the geology within the region is very fragmented and sparse. The first post-revolutionary prospecting by V.K. Kotul'skim Geolkoma started in 1917 (to 1920-1921) and drafting of the first geological maps of the area Ridder were produced in 1925. The first geological maps of the pre-war period are at a scale of 1:87,000 - 1:100,000 and from the northern area.

Systematic study of the area began in the 1950's culminating in a drafted geological map (geological map sheet m-44-XXVIII scale 1:200,000) in 1956. This was based on the whole of the Altay stratigraphic pattern, the principal provisions of which has survived to the present.

Between 1959 and 1973 most of the area was covered by survey work at a scale 1:50,000 (APSÈ). Survey work, including geophysical, formed the basis for the projection of metallogenic maps at a scale 1: 50 000 produced in 1973 by a team of geologists (VKTGU) and leading research institutes.

In 1988, Altai GGÈ completed the central part of Leninogorsk region covering Leninogorsk, Leninogorsk GOK, Tishynsky and Guslâkovskogo, at a scale 1:50,000, as well as producing a photographic library.

Thus, to date, almost the entire territory of the region (except the extreme South) is covered by the geological survey at a scale of 1:50,000.

Along with geological mapping, from 1953 to 1982 the "Leninskaya Geological Expedition" conducted detailed 'search and exploration', which included excavating pits and trenches, structural and exploratory drilling, and deep geochemical and geophysical research in the Butachikhinsko-Kedrovskiy Block. As a result of these works the Tishinskiy deposit was discovered with subsequent development and detailed underground exploration beginning in July 1963. Exploration was initially (to 1957) conducted by Altay Base Metals Exploration (ACMR), then jointly by Leninogorsk Geological Exploration Expedition (Leninogorsk GRE) and Leninogorsk Polymetallic Complex (LPC) and, from 1997, by OAO Kazzinc (successor to LPC). Actual mining commenced in 1964, from an open pit in the centre of the deposit, and operated until 1978, overlapping with underground mining which began in 1969.

Geological and mineral genetic mapping (scale 1:100,000) conducted (as shown in Figure 17.2) included 8,750m of trenching, 10,507m of 'structural' drilling, and 5,138m of core drilling.

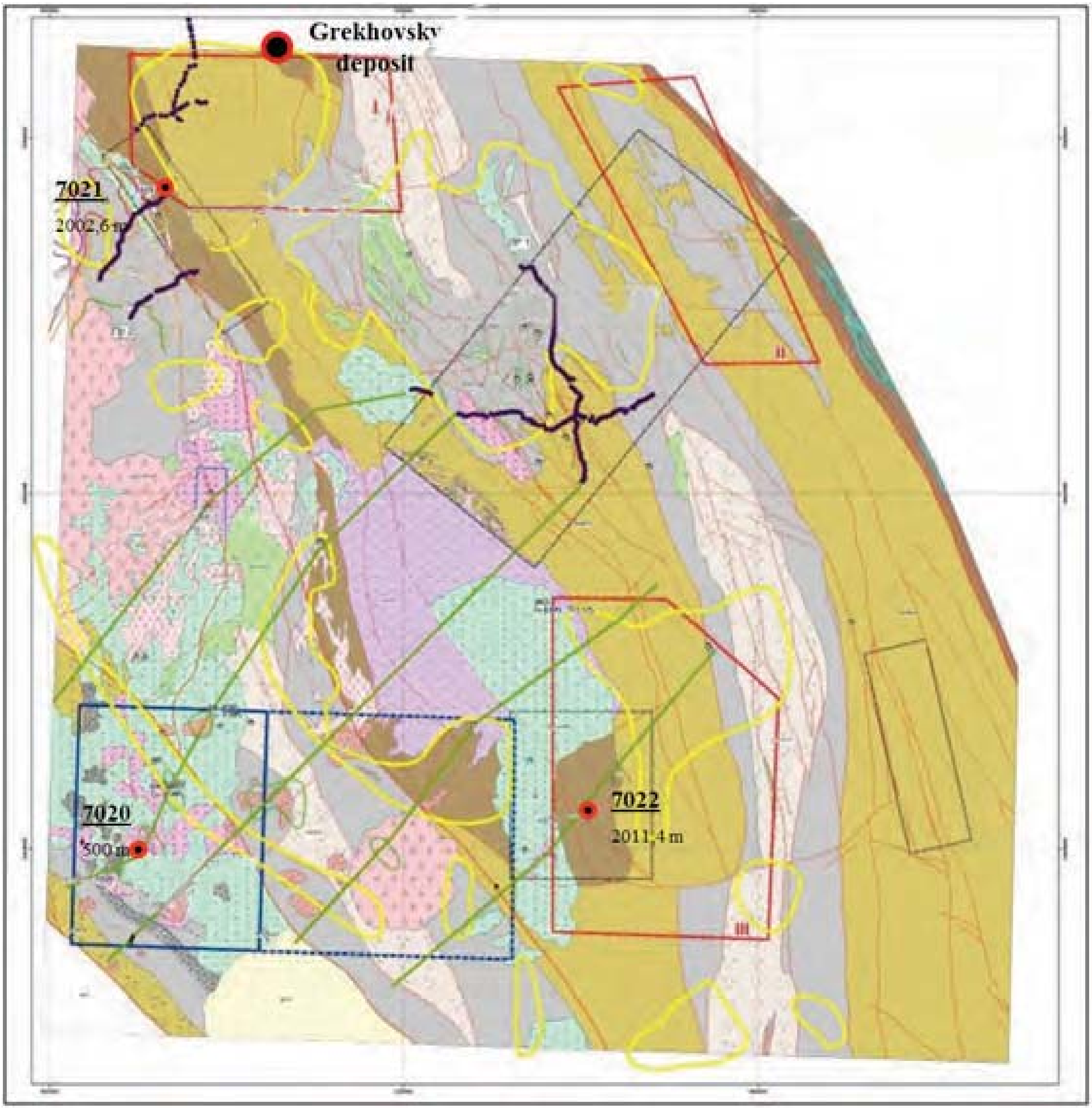


Figure 17.2: Geological and Mineragenetic Mapping (ГМК-100 (50)

In 1958 a drillhole was completed to a depth of 180m (No.779) in the southern area (Sub-block 6) to specifically target polymetallic mineralisation but instead intersected vein/stockwork gold mineralisation. Quartz veins, exposed on surface at 1.5 to 2.0m wide, reveal an east-west orientation with associated polymetallic mineralisation. Resultantly the area has become more of a gold target with high background gold geochemistry anomalies from sediment/soil sampling.

Historical drilling (limited) was only to shallow depths (300–400m) and was largely inclined due to the sub-vertical structures present in the region. Resultantly the coverage was irregular and fundamentally unreliable, particularly in previously considered areas of mineralisation, and their actual locations are also unclear.

17.1.1.3 Kazzinc Exploration

Since 2005 Kazzinc have undertaken a limited amount of preliminary (regional) exploration within the Butachikhinsko-Kedrovskiy Block, prior to the issuing of the licence but with State agreement. Initial work comprised the collation of available historic data, including drillholes and trench data. Subsequent to this a preliminary, confirmatory, programme was conducted with sampling that identified elevated levels of mineralisation, particularly copper.

Stratigraphic, structural, alteration (incl. hydrothermal) and geochemistry anomalies, as well as satellite images have all been combined and sequenced to form generalised images in an effort to identify the most promising areas. These will subsequently be investigated by Kazzinc in more detail through mapping, trenching and drilling, once the exploration licence is issued.

Geochemical 'Mode of Metal' occurrence surveys identified anomalous zones over the block, notably gold at Kedrovsky (Sub-Block 6) as well as several other locations for gold and polymetallic mineralisation. Prospective sites were considered on several parameters including historical and recent geochemistry, hydrothermal geology (potassium levels) and alteration etc. An initial 5km grid over the block was reduced to 1km and 250m grids over more prospective areas, including to the southwest of Tishinskoy which showed a strong anomaly and elevated levels of copper with zinc targets showing up further to the south and west.

Aero gamma/magnetic surveys, undertaken by a Moscow based contractor, have also been conducted to confirm the basic geological framework as well as reveal elevated levels of potassium. The use of AMT sounding surveys, initially tested on the Ridder area deposits to test the results which demonstrated positive correlation, has also demonstrated its potential value to exploration over the block.

17.1.2 Geological Setting

The Butachikhinsko-Kedrovskiy Block is located within the northwest striking, mid-Palaeozoic, Rudny Altai VMS (Volcanogenic Massive Sulphide) belt which is the host of numerous world-class VMS deposits, including Leninigorsk, Zyryanovsk and Maleevsky as well as smaller Grekhovskiy, Putintsevskie, Snegirevskie, and May. The Rudny Altai belt (VMS terrane) extends over 500km along the north eastern border of Kazakhstan and is ranked in the top four VMS belts of the world. As a note the Tishinskiy deposit is situated in the central portion of the Butachihinsko-Kedrova shear zone, which adjoins the south-western flank of the Ridder graben.

17.1.3 Resource Estimates

At present no Mineral Resources or Ore Reserves have been estimated in accordance with the guidelines of the JORC Code (2004) for the Butachikhinsko-Kedrovskiy Block.

***WAI Comment**: The amount of work (historical and recent), and level of detail, allied to a meticulous work ethic demonstrates a strong desire to fully investigate the Butachikhinsko-Kedrovskiy Block in its entirety. In addition the senior personnel involved with Kazzinc have a long and proven experience of working in these geological environments. The combination of this knowledge together with modern exploration techniques and a methodical programme provides a high possibility of success. Notwithstanding these comments there is a huge amount of exploratory work necessary before the true potential of the area, and an 'ore' deposit, can be revealed.*

18 SOLOVIEVSKIY

18.1 Introduction

18.1.1 Solovievskiy Block

The Solovievskiy Block is located in the eastern Kazakhstan region, Katon-Karagaiskiy District, some 100km south southeast of Ridder and 140km east southeast of Ust-Kamenogorsk. The nearest large town is Zyryanovsk where Kazzinc operate the Maleevskoye mine and processing plant. There is also a sample preparation facility as well as assay laboratory at the Zyryanovsk mine complex which was inspected by WAI as part of the site visit.

The main town and administrative centre for the region is Zyryanovsk, which is the centre of the Zyryan District, and is located outside the northern edge of the licence block with a population of around 45,000 (est). At the southern margin of the licence block is the village of Bolshenarymskoe, and Kazzinc operate a 'Geological Department' incorporating an exploration facility (office, core preparation and storage) at a location some 10km to the west of this town. This exploration office lies approximately 10km south of the Novokhairuzovskoie deposit.

Figure 18.1: Outline of Solovievskiy Block

The Solovievskiy Block lies within the Rudny Altai Palaeozoic province, or belt, and predominantly comprises Carboniferous and Devonian rocks. The Rudny Altai metallogenic belt extends over 500km along the eastern border of Kazakhstan from the Altaisky region of Russia southwards, through east Kazakhstan, into northwest China. The mineral hosting rocks are typically of late Devonian age.

The Solovievskiy Block is the most advanced exploration licence currently in operation by Kazzinc and the only one to possess a valid licence (at the time of the site visits in 2010). The Solovievskiy Block has an area of 4,300sq.km and is registered under Contract No.2114 dd. 25.07.2006.

Paved roads connect Ridder with Ust-Kamenagorsk and Zyryanovsk and access within the licence block is available via limited, but passable, dirt tracks. The distance from Ust-Kamenagorsk to Zyryanovsk is some 196km (by road) and takes approximately 3 hours, the licence area (south) is a further 1 hour travel time.

Kazzinc are undertaking a comprehensive and thorough exploration programme within the Solovievskiy block that commenced in 2005 culminating in a diamond drilling campaign as witnessed by WAI during the site visit in October 2010. This structured work has resulted in the identification of three targets; Novokhairuzovskoie (Au), Khairuzovskoie (Cu-Zn) and Greizenovoie target area, which are all located in the south-southwest of the licence block. The most advanced of which, Novokhairuzovskoie, is currently being drilled and a preliminary mineral resource estimation and model has been completed. To date (01.07.2010) some 30,510m of surface trenching and 16,544.8m of diamond drilling (in addition 41,180m of Reverse Circulation drilling for shallow geological/structural data acquisition) has been completed as since 2007.

Based on the work to date a preliminary resource estimate has been produced at different cut-off-grade (COG) for the Novokhairuzovsky deposit using Micromine® software to generate wireframes of Au and Re. However, the current exploration is widely spaced and as such can only be classified as P_1 in accordance with the Soviet classification system.

A preliminary mineral resource model has also been constructed by Kazzinc using Micromine® software to generate a 3D wireframe of the deposit and provide an estimate of Soviet classified P_1 resources of some 216.8Mt at 0.67g/t Au (0.3g/t Au cut-off grade).

18.1.2 Geological Setting

The region containing the Solovievskiy Block is considered by Kazzinc to be highly prospective, being within the Rudny Altai metallogenic, Volcanogenic Massive Sulphide (VMS), belt. Rocks of the Carboniferous and Devonian are developed within a strong NW - EW structural setting. Although the 'Central' part presents deeper (1 – 2km) targets, the northwest structure and southwest volcanics are considered to offer the better opportunities. In addition the southwest area shows evidence of ancient copper oxide (malachite) extraction and indication of copper oxide mineralisation is evident within granodiorites of the area. This area is also subject to potassic alteration, containing feldspars, biotite, phlogopite, and chlorite minerals, which is considered to represent an alteration stage or type in a porphyry copper deposit and is also typical of lode gold deposits.

As the Solovievskiy Block is some 120km in length (northwest-southeast) and some 60km in width the following description is focused on the Khairuzovsky area which encompasses the Novokhairuzovskoie, Khairuzovsky and Greizenovoie deposits.

18.1.3 Exploration

18.1.3.1 Introduction

Between 2005 and 2007 Kazzinc completed systematic geological exploration around the Leninogorsk and Ziryanovsk mining areas. These works included geophysical, geochemical, hydro-geochemical and remote (aero-geophysics) research aimed at rapidly gaining information to enable Kazzinc to evaluate the entire area for potential targets. To achieve this Kazzinc employed various organisations from Kazakhstan, Russia and Australia.

In 2005 some 25,000km^2, which includes the Leninogorsk and Ziryanovsky areas, were surveyed by geochemical studies on a 5km network, accompanied by sampling for assessment of physical properties. In 2006 this work culminated, together with geochemical data from previously completed work, in a thorough hydro-geochemical study at a scale of 1:200,000 - 1:500,000.

In summary, and following these initial studies, the Leninogorsk district presents the most prospective areas; however these have largely been explored and exhausted and the possibilities of discovering new deposits are low. Conversely, within the Solovievskiy Block the first stage work recognised areas of positive mineralisation, as well as identify similar geological settings with elevated mineralisation which form the primary targets in follow-up exploration.

18.1.3.2 Historical Exploration

Mineralisation, and ore minerals, has been recognised in the Solovievskiy Block since the 19th century (Murzincevskoe, Aleksandrovskoe II Hlopinskoe etc.). Although from this historical study the possibility of identifying prospective ore deposits within the block was considered poor. This may have been partially the result of mineral deposits being discovered and developed in the Ridder-Leninogorsk district and Maleevskoye. Conversely, their discovery, as well as a number of medium and small scale deposits, is also the rationale and counterargument for the areas potential.

The last complete and most consistent work on this area has been geological mapping at a scale of 1:50,000. More recently the area was relatively well studied following various geological surveys and simultaneous high quality geophysical studies, though these have mainly been shallow investigations.

Based on the set of criteria identified, three promising areas have been outlined:

1. South of Grekhovskiy deposit;
2. Murzincevskogo District (deposit); and
3. Nazarovskogo District.

The Solovievskiy Block has undergone an accelerated period of study by Kazzinc since 2005 with geological, geochemical, and geophysical studies. The main objective of this work has been to quickly assess the prospects within the area for pyrite-polymetallic mineralisation and to select prospective sites for follow-up investigation.

18.1.3.3 Kazzinc Exploration

Kazzinc have adopted a geostatistical approach to exploration, based on known parameters and characteristics to produce a 'mathematical probability' which has resulted in approximately 90% of the area being considered to be promising. However, in practice this process is seldom so simple because every mineral deposit has some uniqueness to its characteristics, such as alteration zoning. Nevertheless, the system has identified several targets which are currently subject to more detailed investigation and exploration, the most advanced of which is the Novokhairuzovskoie deposit which has already received a Prognostic resource estimate.

Having considered the entire Solovievskiy Block Kazzinc have focused on more detailed exploration of the Novokhairuzovskoie (Au) deposit, and the Khairuzovsky (Cu-Zn) and Greizenovoie mineralized zone, which are all located in the south-southwest of the licence block. Of the three the Novokhairuzovskoie deposit is the most advanced with 30,510m of surface trenching and 16,544.8m of diamond drilling (in addition 41,180m of Reverse Circulation drilling for shallow geological/structural data acquisition) completed as at 01.07.2010 (since 2007).

First stage mineralisation is related to volcanic and terrigenous andesite-basalt formations of the Upper Devonian, at the final stage of Bolshynarymsky brachysyncline formation. Stratiform copper pyrite mineralisation is formed at this period of time, and localised on several stratigraphic levels (Khairuzovskoye). Second stage is related to the volcanic and terrigenous formations of Larikhinsky series, and small porphyritic intrusions of Bukhtarminsky complex of rhyolitic and rhyodacitic porphyry. Predominant elements at this stage are copper and gold. Third stage is related to the diorite and granodiorite formations of the Zmeinogorsky complex. Gold-bearing copper and molybdenum mineralisation is referred to cataclasis and eruptive brecciation zones.

Sample Collection, Preparation, Analyses and QA/QC Procedures

This section refers specifically to the exploration conducted on the Novokhairuzovskoie deposit which is far more advanced than at the other prospects within the Solovievskiy block and comprises surface trenching and sampling and exploration drilling.

(a) Sample Preparation

Diamond drill core is transported off site to the Kazzinc facility near where the core is inspected by a geologist (partially logged) before being fully dressed and split with diamond saw. After this the core is logged in detail, and a basic magnetic survey conducted, before the core is marked with sample intervals.

Samples are typically 2–3m in length (half core) and small polished section samples are also removed for analysis. The remaining half core is retained in storage for further inspection, re-logging, and/or for technological samples.

The samples are bagged (in cloth bags) and clearly labelled with drillhole ID, depth and interval, before being transported to the sample preparation facility at Zyryanovsk. It should be noted that no control samples (blanks, duplicates or standards) are introduced at this facility.

As well as the basic drillers log from the field another 2 geological logs are produced with geological description (including sample interval) and for technological details, including sample details and magnetic survey data. Logs are entered into an Excel® spreadsheet daily and rock codes are assigned.

Hand drawn cross-sections are also updated daily, as logs are received, and include any other salient information as well as geophysics data (IP anomalies). Data is further managed and manipulated using MapInfo GIS software whereby additional information, including topographic surveys, surface geological maps, geophysics, aerial photographs and exploration data, is included for review.

> ***WAI Comment**: WAI visited the 'Geological Department' on 07.10.2010 and found the facility to be busy and well run. A clear protocol was in place and being followed. The facility was in a state of upgrading, particularly the office building, and so improvements are expected in the general layout and order of the office.*
>
> *However, the vast majority of core was stored outside and exposed to the elements. An effort should be made to improve this situation as contamination to the core can occur as well as oxidation and damage as a result of water ingress, and frost.*
>
> *The practice of control samples into the sample stream should be introduced as a matter of urgency at this stage, prior to the sample preparation facility, to both test and improve the QA/QC procedures. All companies need to obtain an accurate estimate of the quantity of an economic mineral in a given deposit. It is this estimate which ultimately drives the development decision and with the ever increasing sophistication in resource and process modelling, the precision and accuracy of the earliest stage of exploration sampling is becoming increasingly significant. Implementation of a rigorous well-conceived QA/QC programme at an early stage allows for the ready acceptance of the data and its conclusions by external organisations and saves both money and time by removing the necessity to back-track at the resource drilling or feasibility study stage in an attempt to obtain reliable and compatible data.*
>
> *Kazzinc should obtain Certified Reference Material (CRM) samples urgently to introduce into the sample stream, as well as inclusion of suitable blanks and duplicates. These QC samples should represent the deposit geology and mineralogy as well as form. Furthermore, QA/QC samples should be submitted 'blind', as part of the routine sample sequence to eliminate risk of spotting.*

(b) Sample Preparation Laboratory

The sample preparation laboratory, situated within the Zyryanovsk process facility, was visited by WAI on 07.10.2010 and escorted by the Head of the Sample Preparation Laboratory (Denikina Liliya Borisovna) during the visit.

This facility only handles samples from Kazzinc exploration programmes and does not prepare mine samples which are treated on their relative mine site laboratories.

Samples are received in batches, or 'orders', directly from the field and weighed before being dried as required or requested by the 'client'. A set of "Retsch" jaw crushers then operate a 2 Stage process to initially reduce to <5mm and secondly to <2mm (1 – 2mm). The crushed sample is then 'mixed', or rolled, and quartered to obtain two samples of 500g. The remaining material is disposed of and not stored or returned to the 'client'. The primary 500g sample is then pulverised (ring and puck) to passing a 200 mesh (0.074mm), mixed again and split into 2 sub-samples, 1 for assay determination and the other a duplicate.

After each sample the crusher is cleaned with compressed air and at the end of the shift (laboratory operates 2x12 hour shifts) is further washed with water and cloth. The same protocol is applied to the scales except that a fine brush is used between samples.

> ***WAI Comment****: The laboratory, although relatively small, is well laid out and only handles a limited amount of samples per shift (approximately 19 samples per person per 12 hour shift). However, samples are handled on square/angular sample trays whereas most international laboratories have introduced rounded trays to minimise cross-contamination and ease cleaning between samples. No control samples are introduced and no barren material or quartz is used to clean crushers/pulverisers between samples or at regular intervals. The floor of the laboratory is also uneven in places which is a potential safety issue that should be addressed.*
>
> *Preparation must ensure that the correct particle size and sample size reduction schemes are used in order to minimise errors. Entire samples should be crushed to 90% -2mm, then 1kg of crushed material should be riffle split and pulverised to 90% <75µm. In order to monitor this, laboratories should conduct wet screen analysis on a small but regular selection of samples.*
>
> *Overall the laboratory is acceptable in terms of facilities and sample preparation protocols. However, WAI would recommend that the use of rounded sample trays be introduced to replace the current angular ones and the use of barren quartz also be introduced between batches and/or at regular intervals to improve cleanliness and minimise cross-contamination between samples. The splitting of samples should also be conducted exclusively with the use of industry standard riffle splitters to improve the quality of the split. Coarse reject, as well as the pulp duplicate, should be returned to the 'client' for storage and QA purposes.*
>
> *Duplicate and blank samples should be randomly submitted into the sample stream as a standard procedure to monitor subsequent assay laboratory performance with regards accuracy and precision.*

Assay Laboratory

(a) Gold Assay Analysis

All the primary gold assay analysis for the Kazzinc exploration programmes is conducted at the TOPAZ laboratory in Ust-Kamenagorsk. In the period 2007 to 2010 a total of 22,227 samples have been analysed at this laboratory. This facility was visited by WAI on 06.10.2010 and it has operated as an independent laboratory for some 65 years. The office is currently undergoing an upgrade though this is not affecting the actual laboratory facilities. The laboratory is accredited to ISO 17025:2007 'Laboratory Management System' (plus ISO 9001:2000).

The laboratory receives a 'log' from Kazzinc that accompanies the samples and details the ID (trench or drillhole), depth and interval, and a brief geological description. The pulverised samples are received in 500g paper 'wraps' from the Kazzinc preparation laboratory in Zyryanovsk. The samples are logged in with all the relevant details into a hand written log book although the final results are provided in electronic format. An internal duplicate sample is taken every 5 or 6 samples and results are provided if requested or if there is a discrepancy. External laboratory control is conducted in Almaty or Karaganda depending on the analyses required or Client request.

Gold is analysed by standard fire assay techniques as follows:

- Samples mixed with flux (flour potassium);
- Samples placed into cup and into furnace in batches of 18;
- Glass material broken off and remaining 'plug' placed into cupel; and
- Remaining 'bead' is conveyed to the laboratory to be beaten, weighed and dissolved in nitric acid before being roasted and re-weighed to determine quantity of gold.

The final weighing process is undertaken in a purpose room where temperature and humidity is controlled (no external ventilation) and the electronic weighing scales are mounted onto a solid bench. The scale is calibrated annually by the manufacturer.

> ***WAI Comment**: WAI considers that the laboratory was clean, well organised and run efficiently and is fit for purpose to provide gold assay analysis. Internal and external QA/QC protocols are in place in order to meet the requirements of ISO 17025:2007 accreditation.*
>
> *It is recommended that Kazzinc obtain the results of all internal and external check analysis, regardless of results, as these can be used for QC monitoring and reporting. However, without the insertion of control samples (blanks, duplicates and standards) by Kazzinc there is a lack of QA protocol, which should be standard practice, to ensure that the laboratory being utilised is producing accurate and precise results continuously*.

(b) Polymetallic Assay Analysis

All polymetallic (multi-spectral) analysis is conducted at the "OC RPC Plazma-Analyt" (Open Company Research and Production Centre) in Ust-Kamenagorsk In the period 2007 to 2010 a total of 27,744 samples have been analysed at this laboratory for 34 analyte (not including Au). This facility was visited by WAI on 08.10.2010 and as it also operates as a uranium facility the level of security is very high and access restricted.

Samples are received in paper 'wraps' and registered electronically giving each sample a new laboratory ID, in addition to the client (Kazzinc) ID. The sample is mixed and 'cone and quartered' to reduce the original sample to a 50g weight, the final analysed sample is only 0.5g. The electronic scale used to weigh these sub-samples is audited annually (by the manufacturer) as well as being checked daily, and possibly through the day if deemed to be required, using registered weights.

Several methods for analysis are available depending on the anticipated grade or detection limit required. For lower grade samples ICP-MS (Inductively Coupled Plasma - Mass Spectroscopy) is used whereby the sample is dissolved (acid dissolution) to obtain a 50ml sample which goes forward to produce a 1:10 (sample:solution) ratio. The ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectroscopy) is applied where there is a higher concentration of elements and a 1:1 ratio, i.e. a higher solution concentration is used.

Approved' laboratories in Kazakhstan enter into a 'round robin' series of testing in order to obtain accreditation. The "National Centre for Accreditation" disperses samples to different laboratories, and in effect acts as the client as results are monitored by the centre who then advises the laboratories on results.

> ***WAI Comment**: It was clearly evident from the visit by WAI that the laboratory operates under a strict protocol in terms of internal and external quality control, as well as under stringent security measures. However, to enable the quality control samples to be of any use it is important that Kazzinc obtain the results in order to monitor and report these checks as part of the whole QA/QC process. In addition it is also essential that Kazzinc introduce their own quality control samples into the original sample set at an early stage and monitor the results accordingly in respect of the sample preparation and subsequent analysis.*

Conclusion and Recommendations

Both (independent) analytical laboratories were visited by WAI and are considered to operate and provide a high calibre service. The TOPAZ facility has achieved ISO 17025:2007 (ISO 9001:2000) and so demonstrates appropriate and approved management systems. The OC RPC Plazma-Analyt laboratory in Ust-Kamenogorsk introduces National standard (sourced from Ingredmet) and blank samples, prepared in-house, into each batch of samples. In addition random samples are selected, re-coded, and re-introduced into the sample stream as part of an internal control. External control is also undertaken but only at the 'clients' request.

Whilst the laboratories both present a good standard of assay analysis the lack of control samples introduced by Kazzinc presents a serious issue with regards QA.

Quality Assurance relates to the planned or systematic actions necessary to provide adequate confidence in the data collection and estimation process, and Quality Control means the systems and mechanisms put in place to provide the Quality Assurance. The four steps of quality control include; setting standards; appraising conformance; acting when necessary and planning for improvements.

QA/QC must be addressed during the collection, recording and storage of any of the data ultimately used in mineral resource and ore reserve estimation. This programme should be concerned with, but not limited to: data verification, drill sample recovery, sample size, sample preparation, analytical methods, the use of duplicates/blanks/standards, effects of multiple periods of data acquisition and consistency of interpretation in three dimensions. The results of the QA/QC programme form part of the database and must be recorded.

18.1.4 Metallurgical Testwork

At this stage only preliminary metallurgical testwork has been conducted on 3 samples (Table 18.1). Subject to continued positive results it is proposed to undertake more decisive testwork as the project proceeds.

Table 18.1: Ore Process Characteristics of Tested Samples

	Grade (%)						Grade (g/t)	
	Pb	**Zn**	**Cu**	**Fe**	**S total**	**C**	**Au**	**Ag**
Sample T-1	0.03	0.05	0.04	3.20	0.83	0.25	**0.40**	0.60
Sample T-2	0.01	0.07	0.05	3.40	0.95	0.30	**0.90**	1.5
Sample T-3	0.03	0.08	0.18	3.53	1.31	0.25	**1.30**	3.8

Ore process characteristics have determined the following:

1. Gold is the most valuable metal in the tested ore. The gold in the ore has basically ultrafine and fine structure (<0.5–2.0mk^2) with occasional larger dust-like gold grains up to 7.4x16.9mk^2;
2. Gravity and flotation testing as well as successive coupling of these testing methods was applied with the following findings made:
    - This type of ore can be processed by gravity separation in centrifugal devices.
    - Flotation re-extraction of gold from gravity separation tailings seems to make sense for higher gold extraction; and
3. Combined gravity-flotation separation of ore is recommended with total gold recovery to gravity and flotation concentrates 85.69% with total gold content in combined concentrate 85.69% with combined concentrate output 10.73%.

18.1.5 Resources

There are currently no Mineral Resources estimated in accordance with the guidelines of the Jorc Code (2004) for the Solovievskiy Block.

***WAI Comment**: Considerable resource definition will be required in order to realise the full potential of the deposit.*

Furthermore, the lack of a full QA/QC programme by Kazzinc during their drilling programme will make verification of the database inconclusive. The inadequacies or apparent problems with the sample and analytical database will have to be resolved before an estimate in accordance with the JORC Code of these resources is possible. Fortunately the core is halved and so 50% remains which could be re-assayed at an internationally accredited and independent laboratory so as to provide credence to results obtained to date. However, this should be removed from an urgent evaluation of the current QA/QC protocol.

19 WESTERN TORGAI

19.1 Introduction

The Torgai Basin in northern Kazakhstan represents a complex petrographic province in which the distinctive features of the magmatism are a consequence of its location in a region where the influence of two different orogenic events (Caledonides of Kazakhstan and the Hercynides of the Urals) is evident. Volcanism and intrusive magmatism are ubiquitous over a significant area, exhibit a wide range of compositions from ultrabasic to alkaline and acid varieties and developed over a long period of time from the Precambrian to the Triassic, inclusive.

The Valeryanovskaya synclinorium, in the north west of the Torgai Basin and within which the Western Torgai exploration area lies, is limited to the west and east by successive upthrow faults and has an asymmetric structure, its axis being displaced to the west and plunging to the north. It is divided into a several large blocks by WNW-ESE, E-W and ENE-WSW striking faults, delineated from the results of magnetic and gravity surveys, and extends for a considerable distance to the north and south beyond the exploration area.

Almost the entire Western Torgai area has been covered by aerial photography on a scale of 1:50,000 and geochemical and geophysical surveys were completed at the same time. The whole of the Valeryanovskaya synclinorium has been subject to extensive investigation, and drilling through the iron ore and bauxite horizons intersected gold, copper, polymetallic and other minerals (titanium, molybdenum).

As a consequence five promising sectors were identified, of which two; Karabaytalsky and the Sakharovsko-Adaevskiy, have been prioritised for further investigation and specifically the Belozersk and Kamyshlykolskaya target areas in the former and the Klochovskaya target area in the latter.

The Klochkovskaya showing of copper-porphyry mineralisation has been delineated as the most promising target area in the Sakharovsko-Adaevskiy Sector in the southern part of the Adaevskogo 'ore' unit. However, there is insufficient exploration data to allow the estimation of resources.

19.2 Background, Location, Access, Topography and Climate & Infrastructure

19.2.1 Background

The earliest geological investigation of the Western Torgai region comprised exploration along the Trans-Siberian railway main line, and hydrogeological studies for water supply to migratory settlements in the 1880's.

Interest in the region developed at the beginning of the C20th with the discovery of the Dzhetygarinskogo gold deposit and Akkarginskoya chromites and the most active period of exploration resulted from the discovery and investigation of iron-ore, bauxite and lignite deposits in the northern part of the Torgai Basin which led to a systematic and detailed study of the region.

Almost the entire Western Torgai area has been photographed on a scale of 1:50,000 and geochemical and geophysical surveys were completed at the same time. The whole of the Valeryanovskogo structural basin (synclinorium) has been subject to extensive investigation, and drilling through the iron ore and bauxite horizons intersected gold, copper, polymetallic and other minerals (titanium, molybdenum).

The initial exploration effort was not directed towards the polymetallic potential of the region although the geological parameters for the discovery of polymetallic deposits had been identified.

In the Sakharovsko-Adaevskiy exploration site, copper-porphyry type mineralisation has been identified at Klochkovskoe, Kungurtausskoe and, to the south, Benkalinskoe, the first named being considered the most prospective.

19.2.2 Location and Access

The Karabaytalsky and the Sakharovsko-Adaevskiy exploration sectors extend for a further 70km to the south south-west of Shaimerden open pit zinc operation which is located some 200km SSW of the city of Kostanay and about 110km south west of Lisakovsk, in the Kamysty region of the Kostanay District of northern Kazakhstan (Figure 19.1).

Geographically the region comprises the Torgaiskaya-Kostanayskaya plain, which passes into the western Siberian steppe. The Karabaytalsky Sector in the southern part of the exploration area adjoins an elevated plateau (Aral-Irtysh watershed) which is the source of the Tobol and Torgai rivers.

The topography is gently undulating with elevations between 170-260m, characterised by numerous basins, small depressions and hollows and low ridges (5-15m).

The region is open to the north (towards the Arctic and Central Asian deserts) and has limited protection to the west (South Urals) and east (Kazakh uplands). Its location dictates the climate which is extreme continental, with little precipitation, prolonged sunshine, constant winds and a wide range of diurnal and annual air temperatures.

19.2.3 Infrastructure

The exploration areas are located in the southern part of the extensive north western mining region of Kazakhstan with well-developed asphalt road and railway networks; the access is good although the condition of the road surfaces is variable. Nearest settlements comprise Adaevka, Kamysty, Bestobe and Krasnooktyabrskiy, with the larger conurbations of Tobol and Lisakovsk to the north and the city of Zhitikara to the northwest.

Agricultural activity predominates in the region; there are no available local energy resources and coal and petroleum products are imported. Electric power is supplied from the branches of Urals power system (Russia) through lines via Lisakovsk and Krasnogorsk.

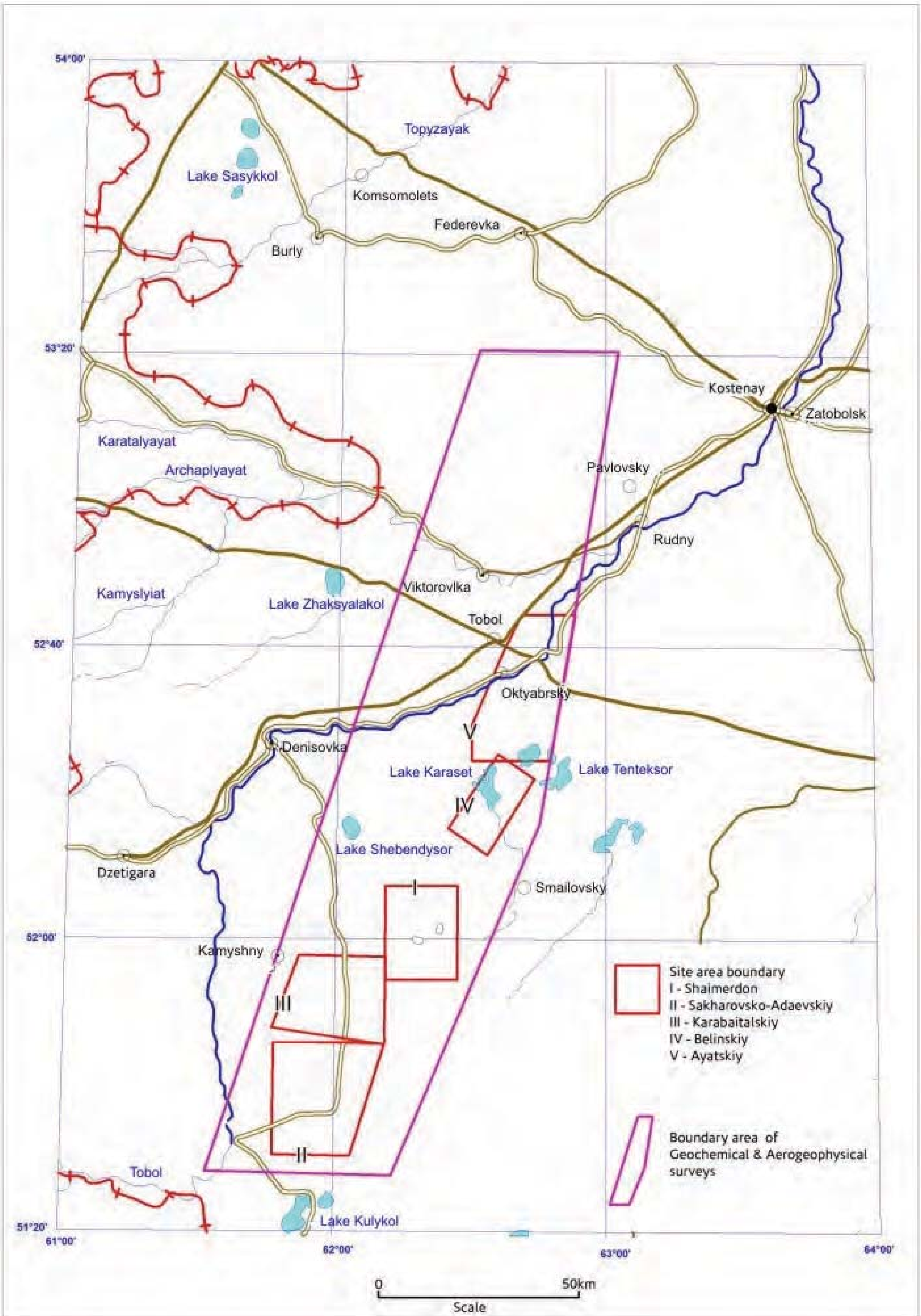


Figure 19.1: Location of the Karabaytalsky and the Sakharovsko-Adaevskiy Sectors of the Western Torgai Exploration AreaTopography and Climate

19.3 Mineral Rights and Permitting

Kazzinc has made applications for the various exploration licences and contracts are in the process of registration at the Ministry of Industry and New Technologies, approval is being awaited.

The boundary point co-ordinates of the limits of the original geochemical and aerogeophysical survey area and the Karabaytalsky and Sakharovsko-Adaevskiy sectors and their proposed target areas are summarised below (Table 19.1 to Table 19.5).

The Karabaytalsky and Sakharovsko-Adaevskiy sectors are 570km^2 and 734.4km^2 respectively.

19.3.1 Karabaytalsky Sector and Target Exploration Areas

Table 19.1: Karabaytalsky Sector-Boundary Co-ordinates

Boundary Points	Co-ordinates	
	Latitude N	Longitude E
1	51°58'13"	61°51'56"
2	51°58'07"	62°11'06"
3	51°46'13"	62°11'01"
4	51°48'24"	61°46'23"

Table 19.2: Belozerskoye Exploration Target Area-Boundary Co-ordinates

Boundary Points	Co-ordinates	
	Latitude N	Longitude E
1	51°58'00"	62°02'00"
2	51°58'00"	62°08'00"
3	51°54'00"	62°08'00"
4	51°54'00"	62°06'00"
5	51°53'00"	62°05'00"
6	51°53'00"	62°03'00"

Table 19.3: Kamyshlykolskoya Exploration Target Area-Boundary Co-ordinates

Boundary Points	Co-ordinates	
	Latitude N	Longitude E
4	51°53'38"	62°05'57"
7	51°53'38"	62°07'16"
8	51°52'17"	61°07'18"
9	51°52'16"	62°04'41"
10	51°53'04"	62°04'40"

19.3.2 Sakharovsko-Adaevskiy Sector and Target Exploration Area

Table 19.4: Sakharovsko-Adaevskiy Sector-Boundary Co-ordinates

Boundary Points	Co-ordinates	
	Latitude N	Longitude E
1	51°46'20"	61°46'29"
2	51°46'14"	62°11'02"
3	51°30'49"	62°03'39"
4	51°30'52"	61°46'29"

Table 19.5: Klochovskaya Exploration Target Area-Boundary Co-ordinates		
Boundary Points	Co-ordinates	
	Latitude N	Longitude E
1	51°42'00"	61°58'00"
2	51°42'00"	62°02'00"
3	51°39'00"	62°02'00"
4	51°39'00"	61°58'00"

19.4 Geology and Mineralisation

19.4.1 Regional Geology

19.4.1.1 Stratigraphy

Silurian deposits are the oldest formations underlying the western section of the area on the east of the Trans-Ural uplift, and comprise significant thicknesses of terrigenous sandstones- schistose lithologies in the lower part of the succession and predominantly volcanogenic rocks in the upper.

The stratigraphy of the Valeryanovskaya synclinorium consists of stratified deposits from the Lower-Middle Devonian to the Permian, divided into two complexes:

- Upper Devonian-Lower Carboniferous; and
- Middle-Upper Carboniferous-Permian.

The oldest deposits in the eastern part of the Valeryanovskaya synclinorium belong to the Frasnian Stage of the Upper Devonian; in the lower horizons a Givetian fauna has been recorded. The undifferentiated Frasnian Stage (D2gv-D3fr), comprising limestones and fine-fragmentary terrigenous lithologies occurs in the core of extensive anticlines in the southern sector of the synclinorium.

The overlying undifferentiated Famennian and lower Tournaisian Stages (D3fm-C1t1) are represented by intercalations of limestones, aleurolites and sandstones and subordinate andesite-basalts and their associated tuffs.

The Upper-Tournaisian-Lower-Visean substages (C1t2-v1) are undifferentiated and represented by a unique arenaceous-argillaceous sequence at the base of which argillites, aleurolites, shale and argillosilicon schists with a comminuted carbonaceous component and pyrite occur. The upper part of the sequence is characterised by the occurrence of frequent interlayers of tuffs and tuffstones and, at the top, interlayers and lenses of limestones are encountered.

The 3-4,000m sedimentary-volcanogenic lithologies of the Valeryanovskoy series, comprising the Sarbayskaya, Sokolovskaya and Kurzhunkulskaya formations, lie above the volcanogenic- carbonate- terrigenous sequence of the Upper Devon-Lower Visean (Carboniferous).

19.4.2 Geology of the Karabaytalsky and Sakharovsko-Adaevskiy Sectors

19.4.2.1 Karabaytalsky Sector

Geology and Structure

The Karabaytalsky sector is located on the interface of two structural-formation zones separated by the Livanovskaya fault, a major regional feature striking north-northeast. On the west lies the eastern flank of the Aleksandrovsk–Denisovskoy structural subzone consisting of folded, mainly Silurian and Devonian deposits, whilst the western edge of the Valeryanovskaya structural formation zone is located to the east and comprises predominantly Lower Carboniferous and, to a lesser extent, Permian deposits (Figure 19.2).

Intrusives of different ages and ranging from ultrabasic to acid in composition occur and the area is covered by flat lying Mesozoic-Cenozoic deposits up to 60m thick.

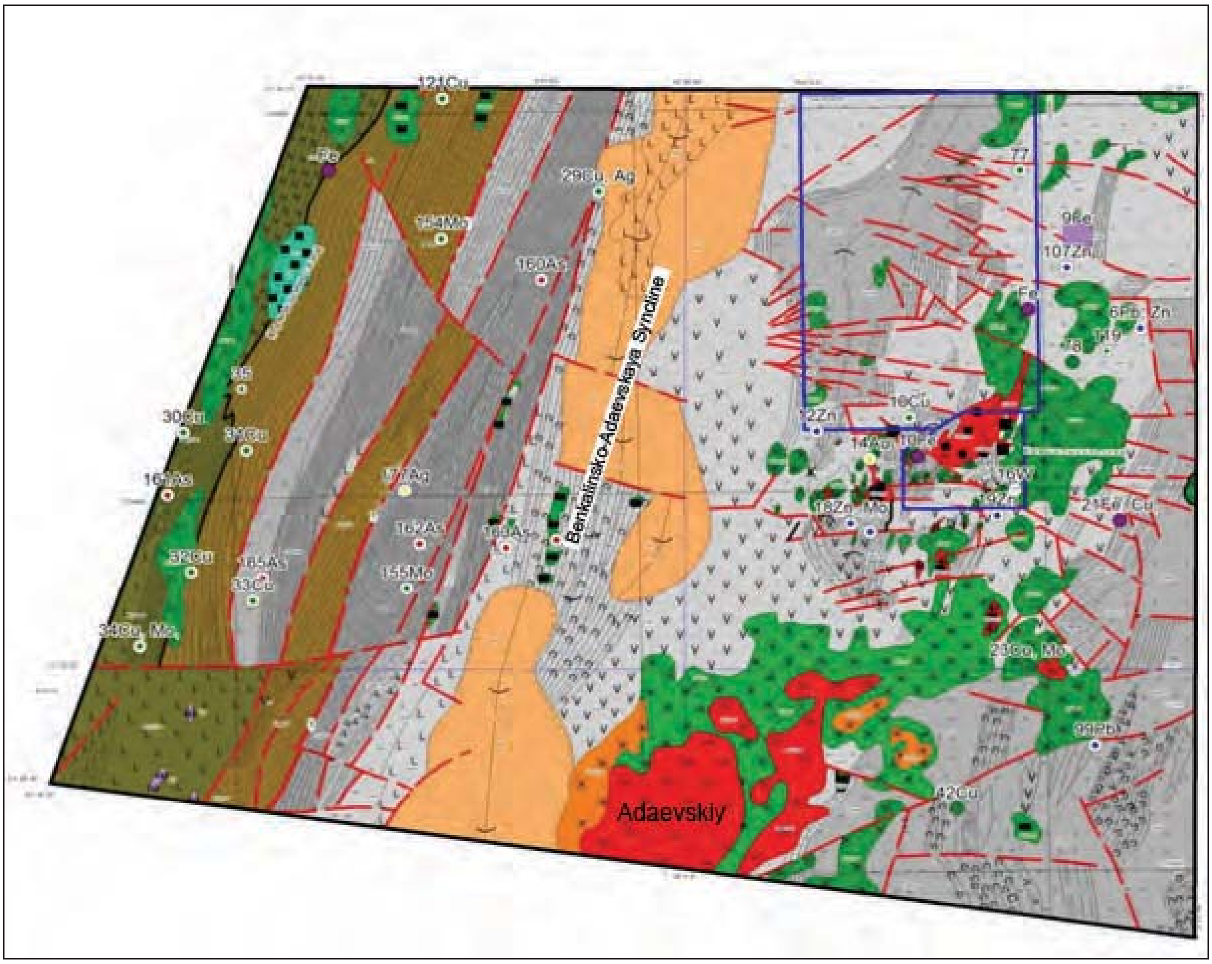


Figure 19.2: Karabaytalsky Sector-Geology showing the Western Edge of the Valeryanovskoy Structural-Formation Zone and the Belozersk (N) and Kamyshlykolskaya (S) Target Areas (Outlined in Blue)

Mineralisation

The Karabaytalsky Sector is located in the south eastern part of the Valeryanovskaya structural-formation zone (synclinorium), includes the southern flank of the main iron ore bearing horizon (skarn-magnetite) of the Torgai basin and is characterised by the presence of numerous deposits and showings of iron, bauxite, copper, polymetallic ores and gold.

Although the iron deposits are significantly inferior to those on the northern flank of the Valeryanovskaya zone, it appears that there is a corresponding improvement in copper deposits.

Amongst non-ferrous metals aluminium has the highest economic value followed in order of abundance by copper, polymetallic, nickel and cobalt deposits, although these are of limited extent, and molybdenum, tungsten, tin, arsenic, antimony and bismuth are even less abundant.

Increased concentrations of the natural associations of Cu-Ni-Co, Cu-Pb-Zn, Pb-Zn, accompanied by rare and noble metals have been identified both in the weathering profiles of Triassic-Lower Cretaceous age and in the volcanogenic-sedimentary thicknesses of the Devonian and Carboniferous, and are encountered in practically all stratified horizons.

These natural concentrations are diverse and relate to different genetic, mineralogical-geochemical and morphological types including magmatic, volcanogenic-sedimentary, skarn-magnetite, hydrothermal, sedimentary and weathering products (lateritic and eluvial). Leached polymetallic, eluvial clay rare-metals, gold-copper porphyry, gold-sulphide-quartz and pyritic polymetallic mineralisation have been identified.

Copper mineralisation is probably associated with acid intrusions; lead-zinc mineralisation, conversely, does not seem to be associated with the composition or presence/absence of volcanogenic lithologies.

19.4.2.2 Sakharovsko-Adaevskiy Sector

Geology and Structure

The major part of the Sakharovsko-Adaevskiy sector is occupied by the central section of the Adaevskaya syncline of the Valeryanovskaya structural formation zone whilst the formations of the eastern flank of the Aleksandrovsk-Denisovskoy structural sub-zone, occupy a narrow strip to the west. The two structural-formation zones are separated, as in the case of the Karabaytalsky Sector, by the Livanovskaya fault (Figure 18.3).

Intrusives of different ages and ranging from ultrabasic to acid in composition occur and the area is covered by flat lying Mesozoic- Cenozoic deposits with a thickness of 100m or more.

Mineralisation

Two areas of mineralisation identified in the Sakharovsko-Adaevskiy sector are Adaevskiy in the north east and Bestyubinskiy located south of Adaevskiy.

In the southern part of the Adaevskiy area, in addition to several copper and polymetallic showings, the Klochkovskoe copper-porphyry prospect has been identified as the most promising target.

The Bestyubinskiy mineralisation is characterised by a significant number of copper and polymetallic showings evidenced by the anomalous halos of copper, lead, zinc and the Kungurtauskim copper occurrence.

Mineralisation is associated with the granodiorite of the Milyutinsko-Mikhajlovsk intrusive complex with the maximum concentration of 0.36- 0.89%Cu, 0.2-3.15g/t Au and 1-3g/t Au in diorite intersected by several boreholes. The maximum content of gold is 6.4g/t whilst the copper content in volcanic rocks is usually from 0.1-0.31% and rarely up to 1.2%.

Gold in economic concentrations in the section has not been established. Nevertheless, borehole intersections at the Klochkovskom and Kungurtauskom demonstrate that gold grades of economic interest are present with copper-molybdenum.

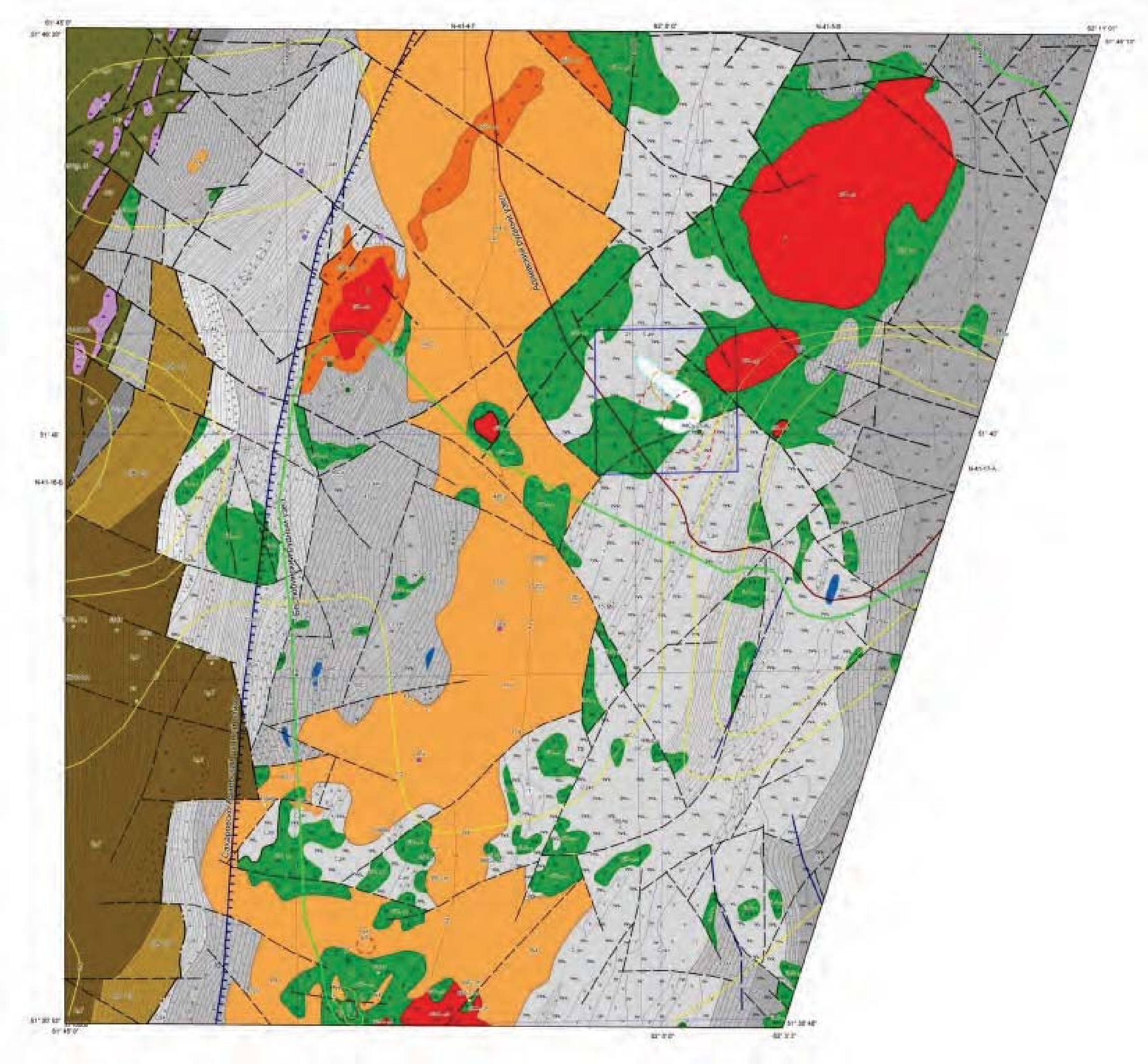


Figure 19.3: Sakharovsko-Adaevskiy Sector and the Klochovskaya Target Area (Blue square) Geology

19.5 Exploration

19.5.1 Introduction

Geological and mineral maps (1:200,000 scale), with brief explanatory notes covering the Western Torgai area, were produced as a result of geological surveys in the period 1954-60.

In the Karabaytalsky Sector the Karabidaiksky copper-molybdenum mineralisation and a number of lead and zinc anomalies, as well as the Karabaytalsky bauxite deposit, were identified. Further work in 1965-66 failed to produce any positive results at Karabidaikskoe.

During 1983-84 a significant number of boreholes (300m), and electrical geophysical surveys were completed and despite the intersection of small mineralised bodies with up to 5% Cu, economic deposits were not discovered, the prognostic resource (P_1) of copper being estimated as 95kt. However, the existence of copper-porphyry type mineralisation and economic concentrations of gold in weathering 'crusts' and karstic depressions was established and led to a recommendation for a continuation of exploration.

The majority of the Sakharovsko-Adaevskogo section has been mapped from aerial surveys on a scale of 1:50,000, with the exception of the eastern area which is covered by an earlier geological map (sheet M-17).

In the Adaevskiy granitoid massif several occurrences of bauxites, magnetite and sulphides of copper, lead and zinc, have been identified, as well as copper-gold porphyry (Kungurtauskoe) and magnetite (South-Sakharovskoe).

Geological and-geophysical exploration in 1971 identified the Klochkovskoe copper-gold mineralisation and in 1981 more detailed investigation established the mineralisation as being copper-porphyry type with up to 2% Cu.

On the basis of geological-geophysical exploration for copper-molybdenum in 1975-78, and the earlier 1:200,000 metallogenic regional map, it was concluded that in general the Valeryanovskaya structure zone copper mineralisation was associated with paleo-volcanic units and copper-porphyry type mineralisation with the contacts of granodioritic massifs.

In 2001-06 a complete geological reappraisal of the area led to the production of revised and updated geological and mineral maps on a scale of 1:50,000 and also maps of the geological-tectonic structure of the plicated Palaeozoic basement and its metallogeny. These served as a basis for the interpretation of the results of magnetic and gravitational surveys.

In 2007 Kazzinc and the Committee of Geology and Subsoil Use of the Ministry of Energy and Mineral Resources of the Republic of Kazakhstan, jointly commenced exploration on the Valeryanovsky structural formation zone of Western Torgai with specific reference to Shaimerden, Sakharovsky-Adaevskiy, Karabaytalsky, Belinsky and Ayatsky areas.

Exploration, focusing on areas prospective for polymetallic and gold mineralisation, was completed by 2009 and identified the optimum techniques for the location of copper-porphyry, polymetallic and precious metal deposits as well as the areas for further exploration work.

At present there are no Mineral Resource estimates in accordance with the guidelines of the JORC Code (2004) for the exploration target areas presented in this section.

19.6 Target Areas

19.6.1 Karabaytalsky

In the Karabaytalsky Sector two promising areas, Belozersk and Kamyshlykolskaya have been identified on the basis of structure and mineralised intersections established from earlier exploration programmes.

19.6.1.1 Belozersk

Numerous favourable factors for the occurrence of possible economic accumulations of both oxide (mainly zinc) and sulphide (pyritic-polymetallic) stratiform deposits are considered to exist over the Belozersk area.

Proposed Exploration Drilling

Inclined boreholes will be drilled on 14 identified promising mineralised zones in the Belozersk target area, with complementary down hole geophysical logging. A total of 26 boreholes, comprising 11,230m, are planned on the 14 zones at Belozersk to a depth of over 500m.

19.6.1.2 Kamyshlykolskaya

The area has been investigated by deep geochemical boreholes on seven east-west sections on an initial grid of 600x200m, with the subsequent infilling to 400x100m, and by three deep investigative boreholes. In geochemical bore holes, gold content varies from 0.1-1.0g/t and occasionally higher (borehole 80: 4.66g/t Au was recorded over 4.6m, including 1.1m at 18g/t Au).

Indications are favourable for the occurrence of copper-porphyry type mineralisation both in the Kamyshlykolskogo intrusive massif and its surrounding lithologies; gold appears to be directly associated with the copper and represents an additional positive feature.

Proposed Exploration Drilling

The presence of friable superficial deposits (≈40m), and the depth and steep dip of the predicted mineralised zones require the drilling of inclined (65°) coring boreholes with associated down hole geophysical surveys. A total of 15 boreholes, comprising 7,830m, on 4 profiles is planned to depths of up to 650m.

19.6.2 Sakharovsko-Adaevskiy

The Klochkovskoe showing of copper-porphyry mineralisation has been delineated as the most promising target area in the Sakharovsko-Adaevskiy Sector in the southern part of the Adaevskogo 'ore' unit.

19.6.2.1 Klochovskaya

In 1974 after completion of a comprehensive programme of geophysical surveys for the identification and evaluation of sulphide mineralisation, a north northwest striking IP anomaly extending for about 5km was delineated. In the centre of this (Klochkovskaya) anomaly, deep geochemistry revealed halos with 0.03-0.5% Cu and up to 0.3g/t Au.

Proposed Exploration Drilling

It is planned to drill 27 holes (total length 13,550m, and depth up to 730m), including a first phase of 9 holes (total length 4,820m) which will be drilled immediately adjacent to the three holes with mineralised intersections from the earlier programme. The completion of the holes will help in the verification of earlier predictions and facilitate any necessary modifications to the second phase.

20 BUKHTARMA HYDRO PLANT

20.1 Introduction

The Bukhtarma Hydroelectric Power Plant is a hydroelectric power plant on the Irtysh River, 5km upstream of the town of Serebryansk, in Eastern Kazakhstan. The plant has 9 individual turbines with a total generating capacity of 675MW. It was designed by a St Petersburg design bureau Lenhydroproject (now part of RusHydro) and constructed during 1953-1968. Since 1997 the plant has been operated by Kazzinc under a long-term concession which finishes in 2022. The owner of the Bukhtarma Hydro Plant is joint stock company Bukhtarmiskaya Hydro Power Plant which is part of "Samruk Kazyna" National Welfare Fund. The plant generates around 2.6 billion kilowatt-hours of electricity per year which covers 100% of the company's electricity needs. It is integrated into the Unified Power Grid of Kazakhstan and provides Kazakh national grid with a peak capacity. Financial and operational activities are the responsibility of Kazzinc and power generation is controlled by KEGOC JSC (Kazakhstan Electricity Grid Operating Company). The hydroelectric power generated by the plant is transmitted by high-voltage electric transmission lines at 220 and 110 kV to the Unified Power Grid of Kazakh

Outline technical details of the plant are given in Table 20.1 below.

Table 20.1: Technical Details of the Bukhtarma Hydro Plant

Unit Rated Capacity	75MW
Generator Rating	94,117kVA @ 0.8
Number of Units	9
Number of Functional Units (as on 18/11/2010)	7
Total Installed Capacity	675MW
Total Functional Capacity	525MW
Turbine weight (1 unit)	281t
Generator weight (1 unit)	655t
Generator rotary parts weight (1 unit)	363t
Generation Voltage	13.8kV
Transmission Voltage	110kV and 220kV

The main objectives of Bukhtarma Hydro Plant are:

- To generate reliable and clean energy for uninterrupted supply for the purposes of mining and processing energy needs of the Kazzinc operations; and
- To provide the Unified Power Grid of Kazakhstan with a peak capacity.

20.2 The Dam

The dam is a reinforced concrete gravity type dam. The intake structure comprises nine intakes permitting flow from the reservoir into the penstocks. Each intake comprises a series of trash racks and gates, each operated by hydraulics.

The dam's crest length is 380m, maximum height is 90m, dam's head is 68m, width on the top of the dam is 19m, width at the bottom is 70m and dam has one 18m long surface spillway span. The maximum height for the spillway gates to open is 5.6m. The dam spillway is equipped with a wave generator which produces waves on the water surface in the winter period to prevent ice formation. The river depth at the bottom of the dam is 12m. The dam has a lock located on the left bank.

20.2.1 Civil Engineering

The dam was robustly constructed to Soviet Russian engineering standards. The dam appears to be operating well and within its capability. There appeared to be no leakage at the abutments and to date the dam had been operating as required with no functional failures advised.

In 2002, 60 samples of dam's concrete were taken from different parts of the dam and tested by two independent labs. The results were the same for both labs: concrete strength increased compared with the samples taken after construction.

The banks of the river downstream of the dam are of rock origin and were reinforced with concrete to prevent erosion and to preserve integrity of the hydro plant.

20.2.2 Mechanical & Electrical

Gantry cranes were reported to be functional.

The design life of some of the electrical and mechanical equipment at the dam is likely to be in the region of 30 to 35 years. Modernisation and change of main items of equipment started in 1999 and is planned to be completed by 2011, the same year the plant is planning to run at full capacity.

20.3 Reservoir

Filling of the reservoir began in 1960; long-term regulation of the discharge has been in effect since 1966. The reservoir consists of two sections: the river section (along the valley of the Irtysh River) and Lake Zaisan, where a wide reach was formed. The reservoir has an area of 5,500km^2, volume of 53km^3, length of more than 500km, maximum width of 35km, and average depth of 9.6m. The Bukhtarma Reservoir is very important in ensuring an increase in the electric power capacity and production of the Bukhtarma and Ust'-Kamenogorsk hydroelectric power plants as well as of the hydroelectric power plants planned for construction lower on the river. Water is discharged from the reservoir every spring to irrigate hundreds of thousands of hectares of floodplains in of the East Kazakhstan city of Semipalatinsk, Pavlodar, and other oblasts. The reservoir creates a deep waterway and improves navigation conditions for ships on the Irtysh up to the city of Omsk in Russia.

Silt levels in the reservoir are low and are not problematic for the operation of a plant. The operational range for reservoir levels at the dam is reported as being around 7m.

20.4 Bukhtarma Lock

Bukhtarma Hydro Plant has a four section lock with a spillway from the second section. The lock is extremely important for shipping on Irtysh river and is not operated by Kazzinc.

20.5 Bukhtarma Plant

The power station is an integrated structure comprising an intake arrangement, turbine hall housing nine generating units, administration building and outlet arrangement. The station has an open switchyard (220kV) and separate building housing 110kV switchgear (see Figure 20.1).

The plant works in a fully automated mode. The plant has the following communication: telephone, trunked radio, power line communication and Kazzinc special channel connection.

20.5.1 Civil Engineering

There are no records of any settlement of the Hydro Station and leakage at abutments is not evident. Some leakage is evident at the upper gallery of the dam but it is believed that such leakage is insufficient to cause any concern.

Figure 20.1: Aerial view of the Bukhtarma Hydro Plant

20.5.2 Turbine, Generator & Auxiliaries

All generators are still in operation since the first installation and were supplied by Novosibirsk Turbogenerator Plant "Sibelectrotyazhmash" (The Science and Production Corporation "ELSIB"). The condition of the generators was reported to be satisfactory for machines of this age and design. Throughout the plant old relay protection equipment was being changed for modern microprocessor based protection. Electrical systems, turbine auxiliaries and control equipment appeared to be functional and gradually being changed for new. New voltage regulators were installed. The plant has a standby power supply and as an automatic monitoring system.

Two types of transformers are being installed: 5 transformers rated at 125MVA 13.8/110kV and 4 transformers rated at 120MVA 13.8/110/220/kV. The manufacturers are Zaporozhtransformator (Ukrane) and Tolyatinsky Transformator (Russia) factories. The transformers are located in a bunded enclosure to prevent oil spillages.

20.6 Access and Security

The station is closed for public access. Access to the plant is made via main security gate. A manned security lodge is located adjacent to the gate. The station has two security check points with guards checking for documents and looking for permission to access the plant. Armed patrols undertake regular walks around the plant. Security firms operating at Bukhtarma Hydro Plant are LLP Berkut Vostok and the specialised security service of East Kazakhstan region.

20.6.1 Roads, Paving and Railway

The station has a railway track access leading to the power house for transport of heavy loads. The road leading to the plant is in good condition and is made of concrete blocks. The roads and paving located within the confines of the plant are in good condition throughout.

20.6.2 Security

The perimeter of the station is protected by an adequate fence.

20.7 Generation Capacity

20.7.1 Reservoir Storage

- Reservoir surface area is – 5,500km^2;
- Total volume – 53km^3
- Useful volume – 30,810Mm^3
- Full Reservoir Level – 403m, and
- Minimum Drawdown Level – 395m.

The operational range for reservoir levels at the dam is reported as being around 7m.

20.7.2 Water Availability

Figure 20.2 shows Bukhtarma reservoir capacity between 2001-2009 and Figure 20.3 shows Bukhtarma Hydro Plant dam water balance for the same period.

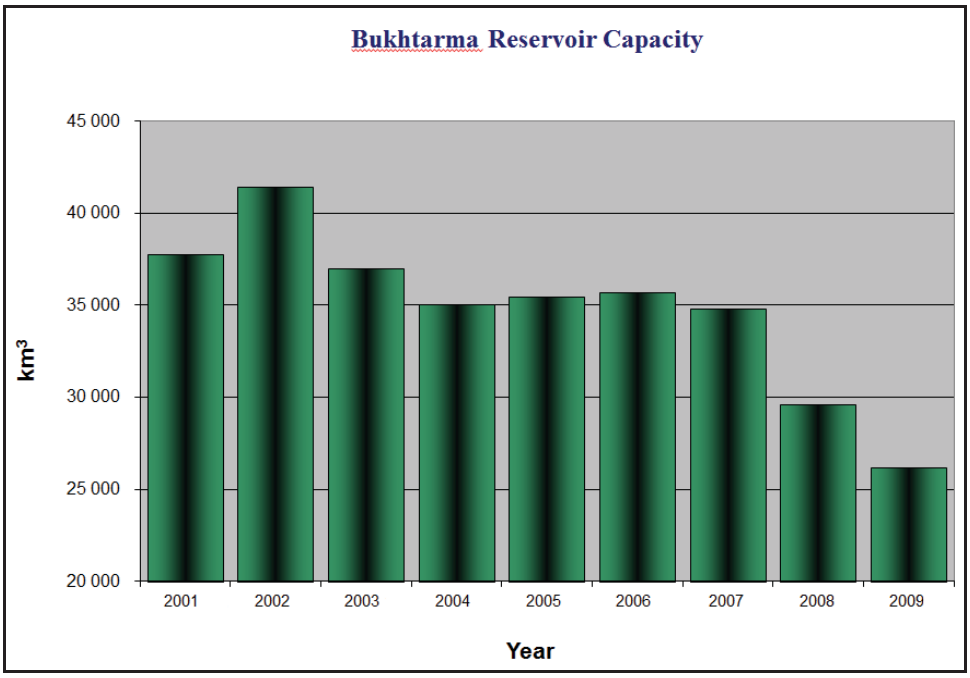


Figure 20.2: Bukhtarma Hydro Plant Reservoir Capacity

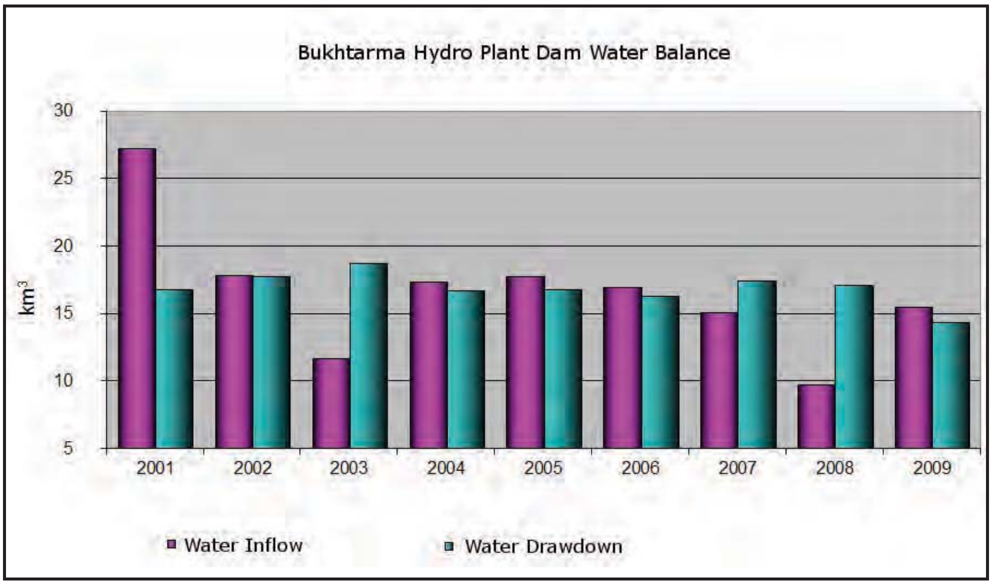


Figure 20.3: Bukhtarma Hydro Plant Dam Water Balance

Water flow through the turbines is approximately 126 – 142m^3/s and through the spillway (when open) is 440 – 975m^3/s. The maximum water flow through the hydro plant is 2,120m^3/s, including a total of 1,140m^3/s through the turbines.

The water usage licence was granted by the Committee for Water Resources of the Ministry of Agriculture of Kazakhstan for a period between 01/06/2010 – 31/12/2012.

20.8 Annual Generation

Since the beginning of its operation, Bukhtarma Hydro Plant has generated 116.5billion kWh of electricity.

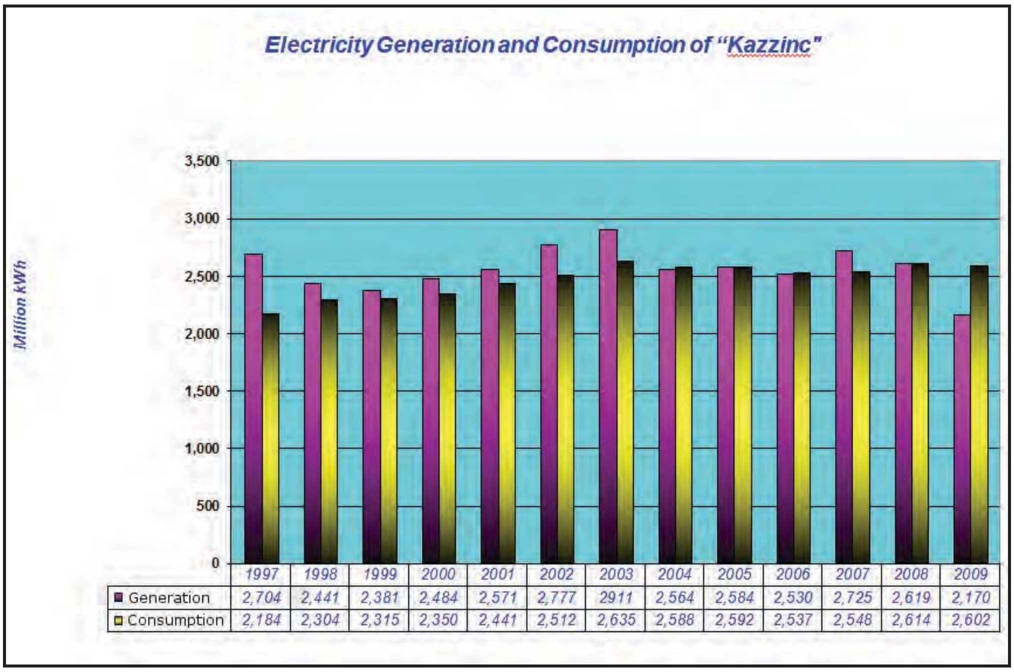


Figure 20.4: Bukhtarma Hydro Plant Annual Power Generation and Kazzinc Consumption

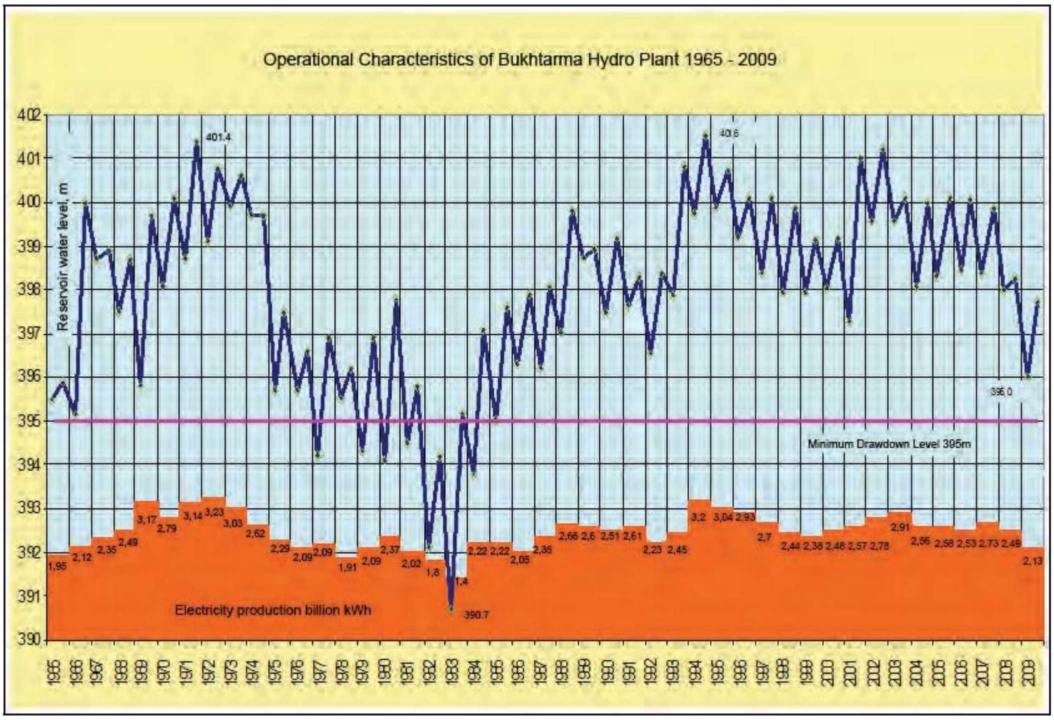


Figure 20.5: Operational Characteristics of Bukhtarma Hydro Plant

The plant's annual power generation and reservoir annual water level are shown in Figure 20.4. As can be seen from Figure 20.5, in 1983 the water level in reservoir was at its lowest because of low water inflow into the reservoir due to a weather anomaly. The possibility of this happening in the future is considered very low.

20.8.1 Capacity

All turbines have been changed for more efficient ones built with better fluid dynamics. As a result, the plant's generating capacity has increased from 675MW to 720MW with the efficiency increasing from 88% to 94.5%.

20.9 Environmental Consideration

In 2006 Kazzinc was certified by TUV under the ISO 14001:2005 management system international standard (valid till 18/05/2012). As part of Kazzinc the Bukhtarma Hydro Plant has implemented this standard also.

20.10 Health and Safety

Safety boards with explanations of what to do in emergency are available throughout the plant. First aid kits are available at the station. Also a health and safety processes and procedures are available in the powerhouse. It was reported that health and safety training sessions are take place frequently. Fire training for each department takes place every six months.

It is believed that no major accidents have happened during the history of the plant apart from a serious accident which took place in 1994 when transformer number 4 caught fire.

20.11 Financial Overview

Construction of the hydro plant cost 139.5M rubles in 1960's. The capital cost per kW installed was 119 rubles.

Total Kazzinc investments into equipment modernisation of the plant can be seen in Figure 20.6. The total capital investments into the plant for the period 1996 – October 2010 is US$93,451,897.11.

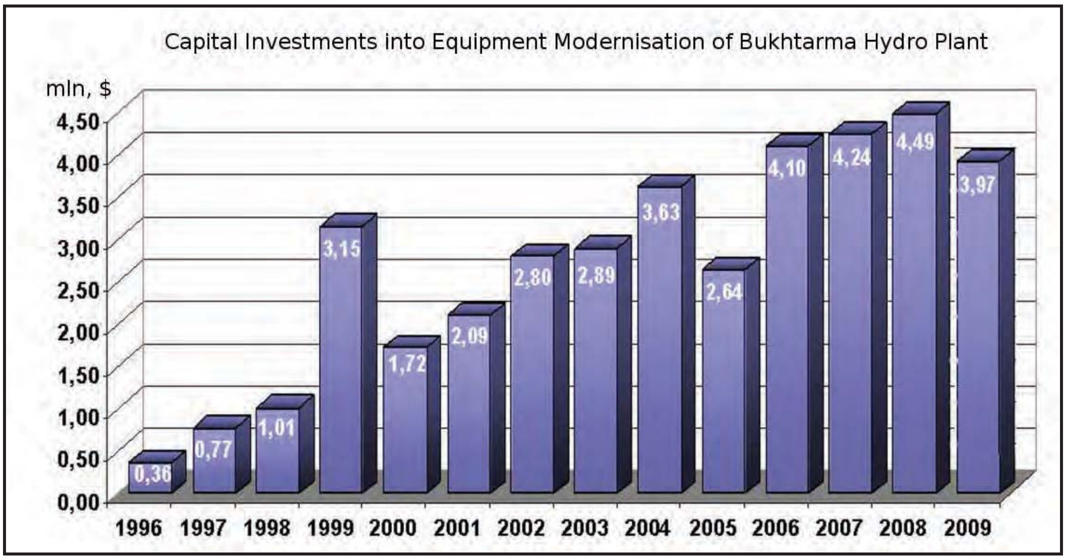


Figure 20.6: Total Investments into Equipment Modernisation

21 VALUATION

21.1 Financial Modelling Parameters

WAI has undertaken a valuation of the Kazzinc operations using discounted cash flow analysis to determine the Net Present Value ("NPV") of both the operations as a whole and each individual mine. A post-tax un-geared cash flow model was constructed for each operation based on the JORC Code (2004) compliant Ore Reserves estimated by WAI.

Ore production rates, operating costs and metallurgical recoveries for each mine were estimated on the performance over the last 3 years along with Kazzinc's forecast for 2011 production. Capital expenditure for 2011 to 2016 is based in Kazzinc's 5 year plan; thereafter, WAI has estimated likely capital expenditure based on the 2008 to 2016 expenditure.

In order to derive an individual valuation for each mine, a Net Smelter Return ("NSR") has been assumed for each concentrate product based on typical refining and treatment charges for that concentrate type. For the combined operations scenario, Kazzinc smelts its own concentrate and therefore benefits from the sale of by-products and other penalty elements, which are not included in the individual mine valuations. Third party concentrates smelted by Kazzinc are also included in the combined scenario but not in the individual mine valuations.

21.1.1 Operating Costs

The main operating costs for each operation have been divided into mining costs, processing costs and general & administrative costs. Group annual average operating costs are summarised in Table 21.1 below.

Table 21.1 Group Average Annual Operating Costs (2011 onwards)

Operation	Units	Mine Operating Costs	Process Operating Costs	General & Administrative Costs	Total Operating Cost
Vasilkovskoye	**US$M/Year**	40.54	71.34	18.17	130.5
Maleevskoye	**US$M/Year**	47.71	34.07	16.76	98.54
Ridder-Sokolniy	**US$M/Year**	69.67	22.63	12.04	104.33
Tishinskiy	**US$M/Year**	49.89	19.54	7.79	77.23
Novoshirokinskoye	**US$M/Year**	17.14	13.11	8.80	39.06
Shaimerden	**US$M/Year**	10.44	4.08	3.52	18.04
Dolinnoe	**US$M/Year**	9.08	2.67	1.40	13.15
Obruchevskoe	**US$M/Year**	8.84	4.09	1.93	14.86
Staroye Tailings	**US$M/Year**	1.06	6.44	3.83	11.33
Chashinskoye Tailings	**US$M/Year**	4.5	28.17	3.10	35.77

Smelter operating costs per tonne of finished metal product are shown in Table 21.2 below.

Table 21.2: Operating Costs at Kazzinc Smelter Complexes

Product	Production Costs (2010 actual)
Ust-Kamenogorsk Metallurgical	
1 tonne 99.99% Zinc	US$372.94
1 tonne 99.99% Lead	US$551.12
1 tonne Blister Copper	US$1016.88
1kg 99.99% Silver Bullion	US$12.26
1kg 99.99% Gold Bullion	US$743.77
Ridder Metallurgical Complex	
1 tonne 99.99% Zinc	US456.72

21.1.2 Capital Expenditure

The mining capital expenditure for 2011 to 2016 has been based on Kazzinc's 5 year plan. This data, as provided by the client, is summarised in Table 21.3, Table 21.4, Table 21.5 and Table 21.6.

Table 21.3 Kazzinc Capital Expenditure 2012-2016 (excluding VAT) (US$M)

Vasilkovskoye	Total	2012	2013	2014	2015	2016
Mining Capex	85.0	25.0	20.0	20.0	20.0	-
Tailings Dam	8.0	-	-	-	8.0	-
Contingency	3.3	2.5	-	-	0.8	-
Total	**96.3**	**27.5**	**20.0**	**20.0**	**28.8**	**-**
Maleevskoye Mine	**Total**	**2012**	**2013**	**2014**	**2015**	**2016**
Capital Mining Works	79.3	3.7	4.3	4.6	48.9	17.8
Surface Facilities and Other Expenses	5.0	3.3	0.8	0.3	0.3	0.3
Other ZMC Facilities	1.0	0.2	0.2	0.2	0.2	0.2
Total	**85.3**	**7.2**	**5.3**	**5.1**	**49.4**	**18.3**
Ridder-Sokolniy Mine	**Total**	**2012**	**2013**	**2014**	**2015**	**2016**
Drifting Operations	82.9	36.0	29.4	6.8	4.7	6.0
Stripping, Kryukovsky Section	11.8	-	3.2	4.4	3.2	1.0
Industrial Exploration	9.5	4.1	3.3	2.1	-	-
Bahrushinskaya Deposit	6.0	-	-	2.0	2.0	2.0
Other Surface Facilities	13.2	-	5.1	7.0	1.1	-
Total	**123.4**	**40.1**	**41.0**	**22.3**	**11.0**	**9.0**
Tishinskiy Mine	**Total**	**2012**	**2013**	**2014**	**2015**	**2016**
Development of Levels 11-21	13.5	1.3	3.0	3.5	3.0	2.7
Capital Mining World Levels 11-16	1.9	1.9	0.6	-	-	-
Total	**16.0**	**3.2**	**3.6**	**3.5**	**3.0**	**2.7**

Table 21.4 Kazzinc Capital Expenditure 2012-2016 (excluding VAT) (US$M)

Novoshirokinskoye	Total	2012	2013	2014	2015	2016
Capital Mining Works	3.5	1.5	2.0	-	-	-
Concentrating Operations	0.5	0.1	0.1	0.1	0.1	0.1
Equipment Concentrating Operation	9.5	0.2	0.6	0.1	1.6	7.0
Infrastructure Facilities Construction	2.1	0.3	0.4	0.3	0.04	1.1
Design Prospecting Works	0.3	0.08	0.08	0.08	0.08	
Total	**15.9**	**2.18**	**3.18**	**0.58**	**1.82**	**8.2**
Dolinnoe & Obruchevskoe	**Total**	**2012**	**2013**	**2014**	**2015**	**2016**
Mine Construction	82.6	4.3	11.5	18.0	28.9	19.9
Mine Equipment	53.5	-	-	0.4	0.9	52.2
Environmental Facilities Construction	35.7	3.6	9.1	12.4	5.1	5.5
Design Works	6.9	6.9	-	-	-	-
Total	**178.7**	**14.8**	**20.6**	**30.8**	**34.9**	**77.6**

Table 21.5 Kazzinc Capital Expenditure 2012-2016 (excluding VAT) (US$M)						
ZMCC	**Total**	**2012**	**2013**	**2014**	**2015**	**2016**
Tailings Dump	1.8	-	-	-	1.8	0.04
Modernization of Equipment	27.6	14.1			10.0	3.5
Upgrade of Filtering Equipment	0.6	-	-	0.6		
Ore Treatment Flowsheet Improvement	2.5	0.5	0.5	0.5	0.5	0.5
Upgrade of secondary crushing equipment	1.7	1.7	-	-	-	-
Filtering Equipment Upgrade	1.1	1.1	-	-	-	-
Other	0.5	0.1	0.1	0.1	0.1	0.1
Total	**35.8**	**17.5**	**0.6**	**1.2**	**12.4**	**4.14**
RMCC	**Total**	**2012**	**2013**	**2014**	**2015**	**2016**
Talovsky Tailings Dump Expansion	3.4	1.7	0.7	-	0.8	0.2
Reconstruction of Talovsky Tailnigs	4.4	1.5	1.6	-	-	1.3
Other Concentrator Facilities	42.5	14.5	0.1	1.4	25.9	0.6
Equipment Upgrade	8	-	-	-	8.0	-
Other	0.5	0.1	0.1	0.1	0.1	0.1
Total	**58.8**	**17.8**	**2.5**	**1.5**	**34.8**	**2.2**

Table 21.6 Kazzinc Capital Expenditure 2012-2016 (excluding VAT) (US$M)						
UKMC	**Total**	**2012**	**2013**	**2014**	**2015**	**2016**
Zinc Concentrates Roasting Plant	35.7	10.6	6.1	11.3	7.5	0.2
Hydrometallurgical Plant	18.4	-	-	-	0.8	17.6
Electrolysis Plant	22	6.9	7.6	7.5	-	-
Total	**76.1**	**17.5**	**13.7**	**18.8**	**8.3**	**17.8**
Ridder Smelter	**Total**	**2012**	**2013**	**2014**	**2015**	**2016**
Electrolytic Plant	2.6	1.6	0.5	0.5	-	-
Integrated Plant No.1	13.3	3.7	2.3	2.3	2.5	2.5
Waelz Plant	6.6	3.2	3.4	-	-	
Hydrometallurgical Plant	1.0	1.0				
Lead Smelter	12.8	6.4	1.7	3.9	0.3	0.5
Total	**36.3**	**15.9**	**7.9**	**6.7**	**2.8**	**3.0**

21.1.3 Commodity Prices

WAI has modelled each cash flow based on Glencore commodity price assumptions, as summarised in the Table 21.7.

Table 21.7 Glencore Commodity Price Assumptions											
		2011	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**
Zinc	**US$/t**	2,500	2,475	2,431	2,388	2,326	2,228	2,195	2,162	2,130	2,100
Lead	**US$/t**	2,450	2,401	2,353	2,305	2,258	2,181	2,126	2,095	2,042	2,000
Copper	**US$/t**	9,600	9,208	8,822	8,347	7,880	7,240	6,859	6,397	6,036	6,000
Gold	**US$/tr. oz**	1,350	1,343	1,336	1,330	1,323	1,284	1,189	876	863	850
Silver	**US$/tr. oz**	29.00	28.89	28.79	28.68	28.58	27.78	20.12	14.42	14.21	14.00

21.1.4 Discount, Inflation and Taxation Rates

The purpose of the discount rate is to reflect not only the time value of money but also the investment risk of the project. Traditionally, mining type projects use higher than average discount rates, in the 10-15% range. This is due to the often longer term nature of the projects as well as the perceived higher level of risk to the investor. An annual discount factor of 10% has been applied to the Kazzinc cash flow.

Cost inflation has not been applied to the cash flow model on operating or capital costs.

The main taxation applied to the financial analysis is an excess profit tax applied to net income at the rate of 20% in 2011 and 2012, reducing to 17.5% in 2013 and 15% thereafter, in line with Kazakh tax policy. A recoverable Value Added Tax (VAT) at a rate of 12% is applied to all capital expenditure. Production royalties, land and property taxes and transport taxes are applied as operating costs.

21.2 Economic Statistics

A summary cash flow forecast for the operations as a whole and each individual mine - as modelled by WAI and using Glencore Commodity Price Assumptions - are presented in the following sections.

21.2.1 Combined Kazzinc Operations

A summary of the combined Kazzinc operations cash flow forecast, including third party concentrates, between 2011 and 2027 is provided in the table below. Total operating costs for the operations are estimated at US$9,941.5M with a cumulative operating free cash flow of US$8,395.2M and EBIT of US$10,186.1M. The operations generate a positive NPV of **US$4,513.8M.**

Table 21.8 Kazzinc Combined Operations - Summary Economic Statistics

Summary	Units	Value
Ore Mined	**Mt**	263.2
Zn Concentrate Produced	**kt**	6,490.1
Pb Concentrate Produced	**kt**	1,127.1
Cu Concentrate Produced	**kt**	1,209.6
Au Concentrate Produced	**kt**	1,085.4
Zinc Metal Recovered	**kt**	2,628.0
Lead Metal Recovered	**kt**	610.9
Zinc Metal Recovered	**kt**	314.1
Gold Metal Recovered	**t**	278.1
Silver Metal Recovered	**t**	1,523.9
Gross Revenue Generated	**US$M**	21,330.8
Operating Costs	**US$M**	9,941.5
Capital Expenditure	**US$M**	1,323.2
Depreciation	**US$M**	1,203.2
Cash Taxes	**US$M**	1,671.0
Total Operating Free Cash Flow	**US$M**	**8,395.2**
EBIT	**US$M**	**10,186.1**
NPV	**US$M**	**4,513.8**

21.2.2 Vasilkovskoye

A summary of the Vasilkovskoye forecast cash flow between 2011 and 2026 is provided in the table below. Total operating costs for the life of mine are estimated at US$2,072.1M , with a cumulative operating free cash flow of US$2,595.1M and EBIT of US$3,028.8M. The project generates a positive NPV of **US$1,466.6M**.

Table 21.9 Vasilkovskoye Summary Economic Statistics (as modelled by WAI)

Summary	Units	Value
Ore Mined	**Mt**	124.0
Gold Recovered	**koz**	5,617.8
Gross Revenue Generated	**US$M**	5,675.7
Operating Costs	**US$M**	2,072.1
Capital Expenditure	**US$M**	222.0
Depreciation	**US$M**	287.7
Cash Taxes (20%)	**US$M**	492.6
Cumulative Operating Free Cash Flow	**US$M**	2,595.1
EBIT	**US$M**	3,028.8
NPV	**US$M**	1,466.6

21.2.3 Maleevskoye

A summary of the Maleevskoye Mine forecast cash flow between 2011 and 2019 is provided in Table 21.10. Life of mine operating costs are estimated at US$633.0M, with cumulative operating free cash flow of US$1,420.7M and EBIT at US$1,825.4M. The Maleevskoye Mine generates an NPV of **US$1,075.3M**.

Table 21.10 Maleevskoye Summary Economic Statistics (as modelled by WAI)

Summary	Units	Value
Ore Mined	**Mt**	12.1
Zinc Recovered	**kt**	744.6
Lead Recovered	**kt**	149.8
Copper Recovered	**kt**	131.5
Gold Recovered	**koz**	158.0
Silver Recovered	**koz**	19,574.0
Gross Revenue Generated	**US$M**	2,393.3
Operating Costs	**US$M**	633.0
Capital Expenditure	**US$M**	146.3
Depreciation	**US$M**	61.6
Cash Taxes (20%)	**US$M**	325.7
Cumulative Operating Free Cash Flow	**US$M**	1,420.7
EBIT	**US$M**	1,825.4
NPV	**US$M**	1,075.3

21.2.4 Ridder-Sokolniy

A summary of the Ridder-Sokolniy forecast cash flow between 2011 and 2019 is provided in Table 21.11. The cash flow indicates life of mine operating costs of US$1,028.5M, cumulative operating free cash flow of US$221.5M and an EBIT of US$304.6M. Ridder-Sokolniy generates an NPV of **US$134.4M.**

Table 21.11 Ridder-Sokolniy Summary Economic Statistics (as modelled by WAI)		
Summary	**Units**	**Value**
Ore Mined	**Mt**	21.1
Zinc Recovered	**kt**	100.2
Lead Recovered	**kt**	57.9
Copper Recovered	**kt**	63.5
Gold Recovered	**koz**	837.2
Silver Recovered	**koz**	5,592.8
Gross Revenue Generated	**US$M**	1,469.5
Operating Costs	**US$M**	1,028.5
Capital Expenditure	**US$M**	43.5
Depreciation	**US$M**	10.4
Cash Taxes (20%)	**US$M**	50.1
Cumulative Operating Free Cash Flow	**US$M**	221.5
EBIT	**US$M**	304.6
NPV	**US$M**	134.4

21.2.5 Tishinskiy

A summary of the Tishinskiy Deposit forecast cash flow between 2011 and 2031 is presented in Table 21.12. The cash flow indicates life of mine operating costs of US$1,877.3, with a cumulative operating free cash flow of US$299.5 and EBIT at US$473.9. The project generates a positive NPV of **US$220.6M**.

Table 21.12 Tishinskiy Summary Economic Statistics (as modelled by WAI)		
Summary	**Units**	**Value**
Ore Mined	**Mt**	25.1
Zinc Recovered	**kt**	1,015.4
Lead Recovered	**kt**	125.6
Copper Recovered	**kt**	75.5
Gold Recovered	**koz**	338.0
Silver Recovered	**koz**	5,234.9
Gross Revenue Generated	**US$M**	2,601.8
Operating Costs	**US$M**	1,877.3
Capital Expenditure	**US$M**	161.8
Depreciation	**US$M**	84.3
Cash Taxes (20%)	**US$M**	96.9
Cumulative Operating Free Cash Flow	**US$M**	299.5
EBIT	**US$M**	473.9
NPV	**US$M**	220.6

21.2.6 Novoshirokinskoye

A summary of the Novoshirokinskoye Mine forecast cash flow between 2011 and 2027 is provided in the table below. Operating costs for the life of mine are estimated at US$569.3M, with a cumulate operating free cash flow of US$324.7M and EBIT of US$392.7M. The NPV of the project as calculated from the WAI model is **US$187.3M**.

Table 21.13: Novoshirokinskoye Summary Economic Statistics (as modelled by WAI)		
Summary	**Units**	**Value**
Ore Mined	**Mt**	7.3
Zinc Recovered	**kt**	84.3
Lead Recovered	**kt**	176.0
Copper Recovered	**kt**	17.2
Gold Recovered	**koz**	650.3
Silver Recovered	**koz**	13,029.9
Gross Revenue Generated	**US$M**	1,136.8
Operating Costs	**US$M**	569.3
Capital Expenditure	**US$M**	33.8
Depreciation	**US$M**	29.7
Cash Taxes (20%)	**US$M**	63.9
Cumulative Operating Free Cash Flow	**US$M**	324.7
EBIT	**US$M**	392.7
NPV	**US$M**	187.3

21.2.7 Shaimerden

A summary of the Shaimerden Mine forecast cash flow between 2011 and 2020, as modelled by WAI, is provided in the table below. The cash flow indicates life of mine operating costs estimated at US$216.6M, cumulative operating free cash flow of US$462.2M and an EBIT of US$535.5M. The Shaimerden Mine generates an NPV of **US$287.3M**.

Table 21.14: Shaimerden Summary Economic Statistics (as modelled by WAI)		
Summary	**Units**	**Value**
Ore Mined	**Mt**	2.5
Zinc Recovered	**kt**	539.2
Gross Revenue Generated	**US$M**	804.7
Operating Costs	**US$M**	216.6
Capital Expenditure	**US$M**	10.1
Depreciation	**US$M**	19.0
Cash Taxes (20%)	**US$M**	86.5
Cumulative Operating Free Cash Flow	**US$M**	462.2
EBIT	**US$M**	535.5
NPV	**US$M**	287.3

21.2.8 Dolinnoe

A summary of the Dolinnoe project forecast cash flow between 2011 and 2033, as modelled by WAI, is provided in the table below. The cash flow indicates life of mine operating costs estimated at US$255.5M, cumulative operating free cash flow of US$-67.8M and an EBIT of US$-78.8. The Dolinnoe project generates an NPV of **US$10.2M**.

Table 21.15: Dolinnoe Summary Economic Statistics (as modelled by WAI)		
Summary	**Units**	**Value**
Ore Mined	**Mt**	4.6
Zinc Recovered	**kt**	53.4
Lead Recovered	**kt**	28.0
Copper Recovered	**kt**	7.7
Gold Recovered	**koz**	169.3
Silver Recovered	**koz**	221.4
Gross Revenue Generated	**US$M**	285.7
Operating Costs	**US$M**	255.5
Capital Expenditure	**US$M**	82.6
Depreciation	**US$M**	82.6
Cash Taxes (20%)	**US$M**	-
Cumulative Operating Free Cash Flow	**US$M**	-67.8
EBIT	**US$M**	-78.8
NPV	**US$M**	10.2

21.2.9 Obruchevskoe

A summary of the Obruchevskoe project forecast cash flow between 2011 and 2028, as modelled by WAI, is provided in the table below. The cash flow indicates life of mine operating costs estimated at US$235.0M, cumulative operating free cash flow of US$355.1M and an EBIT of US$426.0M. The Obruchevskoe project generates an NPV of **US$65.8M.**

Table 21.16: Obruchevskoe Summary Economic Statistics (as modelled by WAI)		
Summary	**Units**	**Value**
Ore Mined	**Mt**	4.1
Zinc Recovered	**kt**	281.8
Lead Recovered	**kt**	115.3
Copper Recovered	**kt**	33.4
Gold Recovered	**koz**	107.5
Silver Recovered	**koz**	94.0
Gross Revenue Generated	**US$M**	849.9
Operating Costs	**US$M**	235.0
Capital Expenditure	**US$M**	165.3
Depreciation	**US$M**	165.3
Cash Taxes (20%)	**US$M**	70.9
Cumulative Operating Free Cash Flow	**US$M**	355.1
EBIT	**US$M**	426.0
NPV	**US$M**	65.8

21.2.10 Staroye Tailings

A summary of the Staroye Tailings forecast cash flow between 2011 and 2021, as modelled by WAI, is provided in the table below. The cash flow indicates estimated life of mine operating costs of US$99.8M, cumulative operating free cash flow of US$54.6M and EBIT of US$64.7M. The NPV of the project as calculated from the WAI model is **US$36.0M**.

Table 21.17: Staroye Tailings Summary Economic Statistics (as modelled by WAI)		
Summary	**Units**	**Value**
Ore Mined	**Mt**	6.9
Zinc Recovered	**kt**	23.5
Lead Recovered	**kt**	9.4
Copper Recovered	**kt**	2.0
Gold Recovered	**koz**	132.3
Silver Recovered	**koz**	1,454.8
Gross Revenue Generated	**US$M**	207.7
Operating Costs	**US$M**	99.8
Capital Expenditure	**US$M**	-
Depreciation	**US$M**	-
Cash Taxes (20%)	**US$M**	10.8
Cumulative Operating Free Cash Flow	**US$M**	54.6
EBIT	**US$M**	64.7
NPV	**US$M**	36.0

21.2.11 Chasihinskoye Tailings

A summary of the Chashinskoye Tailings forecast cash flow between 2011 and 2026, as modelled by WAI, is provided in the table below. Life of mine operating costs are estimated at US$515.1M, with a cumulative operating free cash flow of US$390.9M and EBIT of US$461.3M. The Net Present Value of the project as calculated from the WAI model is **US$188.4M.**

Table 21.18: Chashinskoye Summary Economic Statistics (as modelled by WAI)		
Summary	**Units**	**Value**
Ore Mined	**Mt**	55.5
Gold Recovered	**koz**	1,076.5
Silver Recovered	**koz**	3,659.2
Gross Revenue Generated	**US$M**	1,040.1
Operating Costs	**US$M**	515.1
Capital Expenditure	**US$M**	20.0
Depreciation	**US$M**	20.0
Cash Taxes (20%)	**US$M**	70.5
Cumulative Operating Free Cash Flow	**US$M**	390.9
EBIT	**US$M**	461.3
NPV	**US$M**	188.4

22 GLOSSARY OF TERMS

"º"	Degrees.
"°C"	Degrees Celsius.
"accretionary prism"	A mass of sediment and oceanic crust that is transferred from a subducting plate to the less dense, overriding plate with which it converges.
"acid"	An igneous or volcanic rock containing more than about 60% silica (SiO_2) by weight, most of the silica being in the form of silicate minerals, but with the excess of about 10% being free quartz.
"acid rock drainage" or "acid mine drainage"	Refers to the outflow of acidic water from metal mines or coal mines.
"actinolite"	A metamorphic ferromagnesian mineral of the amphibole group; forms a series with tremolite.
"adit"	A horizontal or sub-horizontal underground development providing access to underground workings from surface.
"adularia"	A colourless, moderate to low-temperature variety of orthoclase feldspar.
"aero-magnetic"	A geophysical prospecting (by air) method that maps variations in the magnetic field of the Earth that are attributable to changes of structure or magnetic susceptibility in certain near-surface rocks.
"Ag"	The chemical symbol for the element silver.
"agate"	A very fine grained form of silica.
"agglomerates"	Coarse accumulations of large blocks of volcanic material.
"Al"	Chemical symbol for aluminium.
"albite"	Sodic feldspar, Na(AlSi3O8); variety of plagioclase feldspars.
"albitization"	The development of the mineral albite in a rock as a result of metasomatism.
"allochthonous"	Formed or produced elsewhere than in its present place.
"alkaline"	A term applied to igneous rocks in which the feldspar is dominantly sodic and/or potassic.
"alluvial"	*Detrital* material which is transported by a river and deposited at points along the flood plain of a river.
"Alpine"	Alpine orogeny mountain-building event that affected a broad segment of southern Europe and the Mediterranean region during the middle Tertiary Period.
"alteration"	Changes in the chemical or mineralogical composition of a rock, generally produced by weathering or hydrothermal solutions.
"aluminosilicates"	Minerals consisting of aluminium and silica.
"alunite"	A trigonal mineral, $KAl_3(OH)_6(SO_4)_2$; massive or disseminated; in pale tints; formed from sulphuric acid acting on potassium feldspar in volcanic regions (alunisation), and around fumaroles. Formerly called alumstone, alum rock, alumite.
"amethyst"	A violet/purple variety of quartz.
"amphibole"	A mineral group characterised by double chains of silica tetrahedral, in the

	orthorhombic or monoclinic crystal systems.
"amphibolite"	A faintly foliated metamorphic rock developed during regional metamorphism.
"amphibolization"	The development of amphibole group minerals, usually at the expense of other minerals in the rock.
"amydaloidal"	Containing cavities in lava formed by the evolution of gas.
"andesite"	A fine-grained igneous rock with no quartz or orthoclase, composted of about 75% plagioclase feldspars, balance ferromagnesian silicates.
"anglesite"	A mineral in the supergene parts of lead-ore veins, a minor ore of lead.
"anhedral"	A term applied to mineral grains having no development of crystal form whatsoever.
"ankerite"	Is a calcium, iron, magnesium, manganese carbonate mineral with formula: $Ca(Fe,Mg,Mn)(CO_3)_2$.
"anticline"	A fold that is convex up and has its oldest beds at its core.
"anticlinorium"	A series of anticlines and synclines, so grouped that taken together they have the general outline of an arch.
"antiform"	An antiform is a fold that is convex up in which the stratigraphic sequence is not known.
"antimony"	An extremely brittle metal with a flaky, crystalline texture. Chemical symbol, Sb. Sometimes found native, but more frequently as the sulphide, stibnite.
"aphanitic"	Textural term used to describe igneous rocks such as fine grain size that the individual constituents are not visible to the naked eye.
"aphyric"	Said of the texture of a fine-grained or aphanitic igneous rock that lacks phenocrysts.
"apical"	Apex or tip.
"aplite"	A light-coloured igneous rock characterised by a fine-grained saccharoidal (i.e. aplitic) texture.
"apophyses"	A term applied to a body of igneous rock.
"Arc (Island Arc)"	A series of volcanoes that lie on the continental side of an oceanic trench, resulting from the subduction process.
"arenaceous"	A sedimentary rock consisting of wholly or in part sand size fragments of rock.
"argentite"	A silver sulphide mineral.
"argillic/argillite"	Pertaining to clay or clay minerals; e.g. argillic alteration in which certain minerals of a rock are converted to minerals of the clay group.
"arkosic"	A detrital sedimentary rock formed by cementation of individual grains of sand size and predominantly composed of quartz and feldspar. Derived from disintegration of granite.
"arsenic"	Metallic, steel-grey, brittle element. Chemical symbol, As.
"arsenopyrite"	Monoclinic mineral, 8[FeAsS]; metallic silver-white to steel grey; the most common arsenic mineral and principal ore of arsenic; occurs in many sulphide ore deposits.
"As"	Chemical symbol for arsenic.
"asl"	Above sea level.

"ASTER"	Advanced Spaceborne Thermal Emission and Reflection Radiometer) is an imaging instrument flying on Terra, a satellite launched in December 1999 as part of NASA's Earth Observing System.
"atomic absorption"	A wet chemical assay method.
"Au"	The chemical symbol for the element gold.
"aureole"	A circular or crescentic distribution pattern about the source or origin of a mineral, ore, mineral association or petrographic feature.
"aurichalcite"	A mineral found in oxidised zones of copper and zinc deposits. A guide to zinc ore.
"auriferous"	Pertaining to gold.
"axial trend"	A plane through a rock fold that includes the axis and divides the fold as symmetrically as possible.
"azimuth"	An angular measurement in a spherical coordinate system.
"azurite"	A supergene mineral in oxidised zones of copper deposits, an ore of copper.
"Ba"	Chemical symbol of Barium.
"ball mill"	A rotating drum containing steel balls used to grind ore.
"barite"	An orthorhombic mineral, $4[BaSO_4]$; occurs as masses of crystals with sand and clay (desert roses); in veins or in residual masses on limestone; the principal source of barium.
"barren"	Of rock or vein material containing no minerals of value.
"basalt"	A fine-grained igneous rock dominated by dark-coloured minerals, consisting of plagioclase feldspars (over 50%) and ferromagnesian silicates.
"base metals"	Any of the more common and more chemically active metals, e.g., lead, copper.
basement"	Oldest rocks exposed in an area.
"batholith"	A discordant pluton that increases in size downward, has no determinable floor, and shows an area of surface exposure exceeding $100km^2$.
"Bauxite"	A residual deposit of hydrated aluminium oxides formed under special climatic conditions in tropical regions. The most important aluminum ore.
"bedding"	A collective term used to signify existence of beds or layers, in sedimentary rocks.
"bedrock"	A mining term for the un-weathered rock below the soil.
"Bi"	Chemical symbol for bismuth.
"bioleach"	The use of bacteria to leach gold from sulphide-rich ores.
"biotite"	A monoclinic mineral of the ferromagnesian micas.
"bismuth"	A white crystalline, brittle metal with a pink tinge. Chemical symbol, Bi.
"block caving"	A general term that refers to a mass mining system where the extraction of the ore depends largely on the action of gravity.
"borehole intersection"	That part of a drilled hole that contains the economic mineralised section.
"bornite"	A copper ore mineral, Cu_5FeS_4; often found in hydrothermal veins.
"boudinage"	A structure formed by the stretching, thinning, and breaking at regular intervals into bodies resembling boudins or sausages. They form elongated parallel to the fold axes.

"breccia"	Clastic rock made up of angular fragments of such size that an appreciable percentage of rock volume consists of particles of granule size or larger.
"Bt"	Billion tonnes.
"bulk density"	The weight of a material (or object) divided by its volume.
"bullion"	Refined bars/ingots of gold or silver.
"bund(s)"	Any artificial embankment used to control the flow of water.
"cadmium"	Soft, bluish-white metal, chemical symbol, Cd.
"calcareous"	A substance that contains calcium carbonate. When applied to a rock name, it implies that as much as 50% of the rock is calcium carbonate.
"calcine"	Ore or concentrate after treatment by calcination or roasting and ready for smelting.
"calcite"	Mineral composed of calcium carbonate, CaCO3.
"caldera"	Roughly circular, steep-sided volcanic basin with diameter at least three or four times depth.
"Caledonian"	Major mountain building episode which took place during the lower Paleozoic Era.
"Cambrian"	Geologic period of time from 590 to 505Ma.
"carbonate"	Refers to a carbonate mineral such as calcite $CaCO_3$.
"carbonatite"	Intrusive or extrusive igneous rocks defined by mineralogy that comprises more than 50% volume carbonate minerals. Carbonatites may be confused with marble, and may require geochemical verification.
"Carboniferous"	A period of geologic time from about 345 to 280Ma.
"Category A"	Soviet "ore reserves" where the reserves in place are known in detail. The boundaries of the deposit have been outlined by trenching, drilling, or underground workings. The quality and properties of the ore are known in sufficient detail to ensure the reliability of the projected exploitation.
"Category B"	Soviet "ore reserves" where blocks are delineated by mine workings on three or more sides (approximately equivalent to *Measured* Mineral Resources under the JORC. CIM and IOM^3 Reporting Codes).
"Category C_1"	Soviet 'ore reserves" whose blocks are delineated by mine workings above and below (approximately equivalent to *Indicated* Mineral Resources under the JORC, CIM and IOM^3 Reporting Codes).
"Category C_2"	Soviet "ore reserves extrapolated from Category C_1 but with more complex geology or limited mine workings (approximately equivalent to *Inferred* Mineral Resources under the JORC, CIM and IOM^3 Reporting Codes).
"Category P_{1-3}"	Soviet "Prognostic" ore reserves extrapolated beyond more definable reserves and resources. The category is subdivided into three sub-categories P_1 to P_3, with the level of confidence decreasing progressively from sub category 1 to 3.
"Cathodes"	An electrode through which electric current flows out of a polarized electrical device.
"Cd"	Chemical symbol for cadmium.

"Cenozoic"	Era of geologic time, from the beginning of the Tertiary period to the present, considered to have begun about 65 million years ago.
"cerussite"	An aragonite group mineral found in the oxidised and carbonated parts of lead-ore veins. A source of lead.
"chacocite"	A copper ore, chemical symbol Cu_2S, found mainly in the enriched zones of sulphide deposits.
"chalcedony"	General name applied to fibrous cryptocrystalline silica with waxy lustre. Deposited from aqueous solutions and frequently found lining or filling cavities in rocks.
"chalcopyrite"	The mineral sulphide of iron and copper, CuFeS.
"chalcostibnite"	A subsidiary sulphide ore mineral of copper and antimony.
"channel samples"	Continuous rock-samples, where an even channel is cut into the rock to obtain the sample. If competently sampled, the quality of such sampling is comparable to drill-hole assays.
"chemical assay"	To analyse the proportions of metals in an ore via chemical analysis.
"chert"	Very fine grained silica.
"chlorite"	Tetrahedral sheet silicates of iron, magnesium, and aluminium, characteristic of low-grade metamorphism. Green colour, with cleavage like mica.
"chloritisation"	Alteration of rocks to chlorite as a result of low-grade metamorphism.
"chromite"	Mineral oxide of iron and chromium, $FeCr_2O_4$, only ore of commercial chromium. One of first minerals to crystallize from magma.
"chromium"	Rare mineral occurring in contact zones between ultramafic rocks and marble.
"chrysocolla"	A soft bluish green mineral forming in incrustations and thin seams in oxidised parts of copper mineral veins, a source of copper.
"CIL"	A recovery process in which a slurry of gold ore, carbon granules and cyanide are mixed together. The cyanide dissolves the gold content and the gold is adsorbed on the carbon. The carbon is subsequently separated from the slurry for further gold removal.
"CIM"	Canadian Institute of Mining, Metallurgy and Petroleum.
"CIP"	Similar to carbon-in-leach process, but initially the slurry is subjected to cyanide leaching in separate tanks followed by carbon-in-pulp. Carbon-in-pulp is a sequential process whereas carbon-in-leach is a simultaneous process.
"CIS"	Commonwealth of Independent States.
"clast"	A particle of broken-down rock. These fragments may vary in size from boulders to silt-sized grains.
"clasts"	Fragments of pre-existing rocks.
"cleavage – mineral"	Property possessed by many minerals of breaking in certain preferred direction along smooth plane surfaces.
"cleavage – rock"	Property possessed by certain rocks of breaking with relative ease along parallel planes or nearly parallel surfaces.
"clinochlore"	A chlorite group mineral occurring in greenschists.
"clinopyroxene"	A group name for monoclinic pyroxenes.

"CN"	Chemical symbol for Cyanide.
"CO_2"	Carbon dioxide.
"cobalt"	A tough, lustrous, nickel-white or silvery gray metallic element often associated with nickel, silver, lead, copper and iron ores.
"cockade"	Concentric bands surrounding earlier fragments of host rock or vein.
"coke"	Bituminous coal from which the volatile constituents have been driven off by heat.
"colbaltine"	Cobalt sulfarsenide (CoAsS).
"colloform"	Curved or contorted bands on various scales defined by variable composition, grain form and size.
"colloidal"	A dispersion of ultra-fine particles suspended in a dispersion medium.
"conglomerate"	Detrital sedimentary rock made up of more or less rounded fragments of such size that an appreciable percentage of volume of rock consists of particles of granule size or larger.
"Cordillera"	Mountain chain.
"costean"	Trench cut across the conjectured line of outcrop of a seam or orebody to expose the full width. In prospecting, to dig shallow pits or trenches designed to expose bedrock.
"covellite"	A copper ore mineral, chemical symbol CuS, found in the zones of secondary enrichment of copper veins.
"cratons"	Parts of the earth's crust which have attained stability, and have been deformed little for a long period.
"Cretaceous"	Geologic period of time from 144 to 65Ma.
"cross-cut"	A tunnel driven often perpendicularly to intersect underground mineralisation.
"crustiform"	Successive sub parallel bands defined by variable mineral compositions, grain form and size. The bands are usually sub parallel to the vein wall.
"cryptocrystalline"	Very fine grained rock in which the crystals are so small that they are indistinguishable by the naked eye.
"Cu"	The chemical symbol for copper.
"cuprite"	A red mineral found in oxidized parts of copper veins, and important source of copper.
"cut-off grade"	Lowest grade of mineralised material considered economic, used in the calculation of ore resources.
"cyanidation"	Is a metallurgical technique for extracting gold by leaching from low-grade ore, converting the gold to water soluble aurocyanide metallic complex ions.
"cyanide leach"	Chemical extraction method using a dilute cyanide solution to leach gold from the mineralisation.
"dacite"	Fine-grained igneous rock with composition between rhyolite and trachyte.
"Datamine®"	Complex mining software used primarily for orebody modelling, resource estimation and pit optimisation.
"deposit"	Coherent geological body such as a mineralised body.
"detrital"	Term applied to any particles of minerals or rocks which have been derived from

	pre-existing rock by the processes of erosion.
"Devonian"	Geological period of time from 408 to 362Ma.
"dextral"	Term applied to a fault to describe the apparent direction of relative movement of each side, in this case to the right.
"diabase"	Metamorphosed medium-grained igneous rock (see dolerite).
"diamond drill hole"	Hole made by a rotary drill using diamond-edged bits which produces a solid continuous core sample of the rock.
"diamond drilling"	Drilling method which obtains a cylindrical core of rock by drilling with an annular bit impregnated with diamonds.
"diatreme"	A volcanic vent piercing sedimentary strata, usually the result of an explosive eruption.
"dilution"	The amount of barren or low-grade material that has to be extracted to recover the ore.
"diopside"	A mineral of the pyroxene group, $CaMgSi_2O_6$.
"diorite"	Coarse-grained igneous rock with composition of andesite (no quartz or orthoclase), composed of 75% plagioclase feldspars and balance ferromagnesian silicates.
"dip"	The true dip of a plane is the angle it makes with the horizontal plane.
"discount rate"	Is the value used in accounting procedures to determine the present value of future cash flows arising from a project, i.e. the discounted value of all future cashflows.
"dislocation"	Displacement, general term to describe a break in the strata.
"disseminated"	Of a mineral deposit in which the desired minerals occur as scattered particles in the rock, but in sufficient quantity to make the deposit an ore.
"dolerite"	*See diabase*
"dolomitized"	A limestone which has been wholly converted to dolomite rock or dolomitic limestone by the replacement of calcium carbonate (calcite).
"doré"	Unrefined silver that contains a variable but usually appreciable percentage of gold.
"drawpoint"	A spot where gravity fed ore is loaded into a hauling unit.
"drift and fill"	A type of cut and fill mining method that uses fill to develop the stope upwards.
"drive"	A horizontal underground tunnel.
"drusy"	A cavity in a rock or mineral vein into which crystals of the minerals forming the rock or vein project.
"dump leach"	Similar to heap leach except ore is not crushed.
"dunite"	Peridotite in which the mafic mineral is almost entirely olivine.
"dyke"	A sheet-like body of igneous rock which is discordant, generally steeply dipping.
"EA"	Environmental assessment.
"eclogite"	Metamorphic rocks of gabbroic composition, consisting primarily of pyroxene and garnet.
"EIA"	Environmental Impact Assessment.
"electrum"	Argentiferous gold containing more than 20% silver.

"EMP"	Environmental management plan.
"en echelon"	Said of geologic features that are in an overlapping or staggered arrangement, e.g. faults.
"enargite"	An orthorhombic mineral, Cu_3AsS_4; in vein and replacement copper deposits as small crystals or granular masses; an important ore of copper and arsenic; may contain up to 7% antimony.
"enrichment"	Process by which the relative amount of one constituent mineral or element contained in a rock is increased.
"Eocene"	Geologic epoch (relatively short period of time) from 55 to 38Ma.
"epidote"	A basic silicate of aluminium, calcium and iron.
"epigenetic"	Applied to mineral deposits of later origin than the enclosing rocks or to the formation of secondary minerals by alteration.
"epithermal"	Said of a hydrothermal mineral deposit formed within about 1km of the of the Earth's surface.
"EPS®"	Enhanced Production Scheduler allows the user to input specific production rates for individual activities and manipulate, in detail, the various mining activities by applying mining resources.
"ESIA"	Environmental and Social Impact Assessment.
"euhedral"	Term applied to grains displaying fully developed crystal form.
"evaporites"	A nonclastic sedimentary rock composed primarily of minerals produced from a saline solution as a result of extensive or total evaporation of the solvent.
"exploration"	Method by which ore deposits are evaluated.
"extrusive"	Said of igneous rock that has been erupted onto the surface of the Earth. Extrusive rocks include lava flows and pyroclastic material such as volcanic ash.
"fahlore"	Form of tetrahedrite; isometric mineral, $(Cu,Fe)_{12}Sb_4S_{13}$, copper replaced by zinc, lead, mercury, cobalt, nickel, or silver; forms a series with tennantite; metallic; occurs in hydrothermal sulphide veins and contact metamorphic deposits.
"Famennian"	Geological stage of the Late Devonian from 367 to 362Ma.
"fault"	Surface of rock fracture along which has been differential movement.
"fauna"	The entire animal population, living or fossil, of a given area, environment, formation or time span.
"Fe"	Chemical symbol for iron.
"feasibilty study"	An extensive technical and financial study to assess the commercial viability of a project.
"feldspar(s)"	The most important group of rock forming silicate minerals, with end-members, alkali feldspar $KalSi_2O_8$, sodium feldspar $NaAlSi_2O_8$ and calcium feldspar $CaAlSi_2O_8$.
"feldspathoids"	A group of rock-forming minerals containing sodium and potassium silicates.
"felsic"	Refers to silicate minerals, magmas, and rocks which are enriched in the lighter elements such as silica, oxygen, aluminum, sodium, and potassium.
"felsite"	A general term for any light coloured, fine grained or aphanitic extrusive or hypabyssal rock, composed chiefly of quartz and feldspar with a felsitic texture.

"ferromagnesian"	Consisting of iron and magnesium.
"fineness"	Referring to gold: purity.
"fire assay"	A dry thermal technique for gold analysis.
"flexure"	General term for a fold, warp, or bend in rock strata.
"flocculant"	A chemical used to aggregate fine particles to improve settling rates.
"flora"	The entire plant population of a given area, environment, formation or time span.
"flotation"	A mineral processing technique used to separate mineral particles in slurry, by causing them to selectively adhere to a froth and float to the surface.
"flow-banded"	The structure in a volcanic rock arising when the directional movement of a lava (for example) containing crystals causes these crystals to take up a parallel orientation.
"flysch"	A marine sedimentary facies of thinly bedded marls, sandy and calcareous shales, muds interbedded within conglomerates, course sandstones, and graywackes.
"fold"	A flexure in rocks.
"footwall"	One of blocks of rock involved in fault movement. One that would be under feet of person standing in tunnel along or across fault; opposite hangingwall.
"free gold/free-milling gold"	A metallurgical term, gold that has a clean surface so that it readily amalgamates with mercury after liberation.
"fuchsite"	Green chromium rich variety of muscovite.
"g/t"	Gramme per metric tonne.
"Ga"	Chemical symbol for gallium.
"gabbro"	Coarse-grained igneous rock with composition of basalt.
"gabbrodiorite"	Fine to medium-grained igneous rock between gabbro and diorite.
"galena/galenite"	Important sulphide ore of lead, PbS.
"gamma spectrometry"	The technique of measuring the spectrum, or number and energy, of gamma rays emitted as natural radioactivity by the formation.
"gangue"	General term for minerals that are not considered to be of economic significance. That part of the mineral deposit from which a metal or metals is not extracted.
"GDP"	Gross Domestic Product; total value of goods produced and services provided in a country in one year.
"Ge"	Chemical symbol for germanium.
"Gemcom®"	Complex mining software used primarily for orebody modelling, resource estimation and pit optimisation.
"geochemical"	Prospecting techniques which measure the content of specified metals in soils and rocks; sampling defines anomalies for further testing.
"geologic block"	The defined boundaries of an ore resource.
"Geologic Resource"	An approximate estimate of a mineral resource, based mainly on geological information, of less reliability than an Inferred Resource.
"geophysical"	Prospecting techniques which measure the physical properties (magnetism,

	conductivity, density, etc.) of rocks and define anomalies for further testing.
"geostatistics"	Complex method of resource estimation using regionalised variables i.e., grade and thickness.
"geothermal"	Pertaining to the heat of the interior of the Earth.
"GijimaAST Mine2-4D®"	Complex mining software used primarily for mine design.
"glauconitic"	Containing sufficient grains of glauconite.
"gneiss"	A term applied to banded rocks formed during high-grade regional metamorphism.
"goslarite"	A mineral formed though the decomposition of sphalerite.
"gossan"	Decomposed rock, usually reddish or ferruginous (owing to oxidised pyrites), forming the upper part of a metallic vein.
"gouge"	A layer of soft, earthly or clayey fault-comminuted rock material along the wall of a vein.
"GPS"	Global Positioning System.
"graben"	Elongated, trench-like, structural form bounded by parallel normal faults created when block that forms trench floor moves downward relative to blocks that form sides.
"grade"	Relative quantity or the percentage of ore mineral or metal content in an ore body.
"granite gneisses"	Metamorphosed (altered) granites.
"granite"	Coarse-grained igneous rock dominated by light-coloured minerals, consisting of about 50% orthoclase, 25% quartz, and balance of plagioclase feldspars and ferromagnesian silicates.
"granitoids"	Pertaining to or composed of granite.
"granodiorite"	Coarse-grained igneous rock intermediate in composition between granite and diorite.
"granulometry/ granulometric"	Relating to the size distribution or measurement of grain sizes in sand, rock or other deposits.
"gravimetric analysis"	Quantitative chemical analysis in which the different substance of a compound are measured by weight.
"greenschists"	Is a general field petrologic term applied to a low grade metamorphic and/or altered mafic volcanic rock.
"greenstone"	A term applied to any compact dark-green altered or metamorphosed basic igneous rock that owes it colour to the presence of chlorite, actinolite or epidote.
"grizzly"	A device for the coarse screening or scalping of bulk materials.
"ground water"	Water occupying openings, cavities, and spaces in rocks and soils.
Group 1 deposits	Large deposits, simple in form with uniform distribution of minerals (examples: coal, some iron and disseminated copper deposits). A normal density of drillholes allows the definition of a high level of A and B reserves.
Group 2 deposits	Large deposits with different and sometimes complicated forms and uneven

	distribution of minerals (examples: some iron and sedimentary copper deposits). Only B category reserves may be defined with a normal grid of drillholes. A combination of drilling and underground workings may be necessary to define the reserves. Category A reserves can be established only by close spaced drilling and underground workings.
Group 3 deposits	Smaller sized deposits with uneven distribution of minerals (examples: some veins, skarns, dykes, and pegmatite deposits). Drillholes can only establish C_1 reserves. A and B reserves can be established only with underground workings.
Group 4 deposits	Smaller sized deposits similar to Group 3 deposits or with even more complex shapes (examples: some veins, skarns, dykes, pegmatite deposits and gold placers). Category A reserves cannot be established with drilling or a normal grid of underground workings. Drilling in combination with underground workings is necessary to establish category B reserves.
Group 5 deposits	Small "pocket" type deposits. Category A and B reserves cannot be established by systematic prospecting. Only category C reserves can be established.
"gusano texture"	Silicified rock having a wormy texture composed of ill-defined masses of alunite and/or pyrophylite.
"gypsum"	A calcium sulphate mineral.
"h"	Hours.
"H_2SO_4"	Sulphuric acid.
"halo"	Circular or crescent distribution pattern about the source or origin of a mineral, ore, mineral association, or petrographic feature.
"hangingwall"	The overlying side of an orebody, fault, or mine working, especially the wall rock above an inclined vein or fault.
"HDPE"	High Density Polyethylene.
"heap leach"	Process used for the recovery of metal ore from weathered low-grade ore. Crushed material is laid on a slightly sloping, impervious pad and uniformly leached by the percolation of the leach liquor trickling through the beds by gravity to ponds. The metals are recovered by conventional methods from the solution.
"hematite"	Important ore mineral of iron, Fe_2O_3, found as an accessory in igneous rocks, in hydrothermal veins and replacements, and in sediments.
"hemimorphite"	A sorosilicate mineral found in the upper parts of zinc and lead ores, chiefly associated with smithsonite.
"Hercynian"	Is a geologic mountain-building event recorded in the European mountains and hills. This occurred in Paleozoic times (from ~390 to ~310Mya) and reflects continental collision.
"Hg"	Chemical symbol for mercury.
"hornfels"	A fine-grained rock composed of a mosaic of equidimensional grains without preferred orientation and typically formed by contact metamorphism.
"hydrocarbon"	Any organic compound, gaseous, liquid, or solid, consisting solely of carbon and hydrogen.

"hydrogeology"	The study of the water cycle.
"hydrogoethite"	A fibrous red mineral formed from hematite and goethite.
"hydrohematite"	A fibrous red mineral formed from hematite and goethite.
"hydrothermal"	Refers in the broad sense to the process associated with alteration and mineralization by a hot mineralised fluid (water).
"hydrozincite"	A secondary mineral in weathered zones of zinc deposits commonly associated with smithsonite or sphalerite. A source of zinc.
"hypogene"	Formed or crystallised at depths below the earth's surface; said of granite, gneiss, and other rocks.
"igneous"	Said of a rock or mineral that solidified from molten or partly molten material, i.e., from a magma.
"ignimbrite"	Rock formed by the widespread deposition and consolidation of ash flows and nuée ardentes.
"ignimbritic"	Consisting of fragmental volcanic material which has been blown into the atmosphere by explosive activity.
"illite"	Clay mineral.
"In"	Chemical symbol for indium.
"inclinometry"	Measurement of the angle of a drillhole below surface.
"inclusion"	Any size fragment of another rock enclosed in an igneous rock. A particle of nonmetallic material retained in a solid metal or alloy.
"*Indicated* Resource"	As defined in the JORC Code, is that part of a Mineral Resource which has been sampled by drill holes, underground openings or other sampling procedures at locations that are too widely spaced to ensure continuity but close enough to give a reasonable indication of continuity and where geoscientific data are known with a reasonable degree of reliability. An *Indicated* Mineral resource will be based on more data and therefore will be more reliable than an Inferred resource estimate.
"Indicated"	An estimate of mineral resources made from geological evidence as defined by the JORC Code for reporting ore reserves and resources. Means a mineral resource that has been sampled by drill holes or other sampling procedures at locations too widely spaced to ensure continuity but close enough to give a reasonable indication of continuity.
"*Inferred* Resource"	As defined in the JORC Code, is that part of a Mineral Resource for which the tonnage and grade and mineral content can be estimated with a low level of confidence. It is inferred from the geological evidence and has assumed but not verified geological and/or grade continuity. It is based on information gathered through the appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes which may be limited or of uncertain quality and reliability.
"Inferred"	An estimate of mineral resources made from geological evidence as defined by the JORC Code for reporting ore reserves and resources. It is inferred from geological evidence and assumed but not verified geological and/or grade

	continuity. It is based on information gathered through appropriate techniques from locations such as outcrops, trenches, pits, workings and drill holes which may be limited or of uncertain quality and reliability.
"intercalated"	Said of layered material that exists or is introduced between layers of a different character.
"intermediate"	The composition of igneous or volcanic rocks whose composition lies between those of basic and acid rocks.
"intermontane"	Between mountain ranges.
"intrusive"	Of or pertaining to intrusion – both the processes and the rock so formed.
"IOM_3"	The Institute of Materials, Minerals and Mining.
"IP"	Induced Polarisation; geophysical method whereby an induced electrical polarisation is manifested by a decay of voltage in the Earth following the cessation of an excitation current pulse.
"IRR"	Internal Rate of Return is a capital budgeting method used by firms to decide whether they should make long term investments. The IRR is defined as any discount rate that results in a net present value of zero, and is usually interpreted as the expected return generated by the investment.
"jamesonite"	Ore mineral of lead antimony sulphide.
"jarosite"	An iron oxide mineral.
"jasper"	A red variety of chalcedony.
"jaw crusher"	A primary crusher designed to reduce large rocks or ores to sizes capable of being handled by any of the secondary crushers.
"jog"	An offset in a flat plane consisting of two parallel bends in opposite directions by the same angle.
"JORC Code/JORC"	Joint Ore Reserve Committee Code. The Committee is convened under the auspices of the Australasian Institute of Mining and Metallurgy.
"Jurassic"	Geologic period of time from 190 to 135Ma.
"JV"	Joint Venture.
"kaolinite/kaolin"	A monoclinic mineral, $2[Al_2Si_2O_5(OH)_4]$; kaolinite-serpentine group; soft; white; formed by hydrothermal alteration or weathering of aluminosilicates, esp. feldspars and feldspathoids; formerly called kaolin.
"karstic"	An area of irregular limestone in which erosion has produced fissures, sinkholes, underground streams and caverns.
"kersantite"	Rock type of lamprophyre containing biotite and plagioclase, with or without clinopyroxene and olivine.
"km(s)"	Kilometres.
"km^2"	Square kilometres.
"km^3"	Kilometres cubed.
"Kriging"	Geostatistical estimation of ore reserves though the application of a weighted, moving average accounting for estimated values of spatially distributed variables and to assess the probable error associated with the estimates.
"kt"	Kilo tonnes (1,000 tonnes).

"kV"	Kilo-volt.
"kW"	Kilo-watt.
"lacustrine"	Pertaining to, formed in, growing in, or inhabiting lakes.
"ladderway"	Mine shaft, raise or winze between two main levels, equipped with ladders.
"lamprophyre"	Group of dark-coloured, porphyritic, hypabyssal igneous rocks with a high percentage of mafic minerals.
"lapilli"	Pyroclastic debris of fragments or clasts measuring between 4 - 32mm.
"leached"	A rock that is in the process of being broken down by the action of substances dissolved in water.
"leaching"	*See cyanidation*
"leucoxene"	Fine grained, opaque white alteration products of ilmenite, mainly finely crystalline rutile. A variety of sphene.
"limestone"	Sedimentary rock composed largely of mineral calcite, $CaCO_3$, formed by either organic or inorganic processes.
"Limonite"	Limonite is an ore consisting in a mixture of hydrated iron (III) oxide-hydroxide of varying composition. The generic formula is frequently written as $FeO(OH)nH_2O$, although this is not entirely accurate as limonite often contains a varying amount of oxide compared to hydroxide.
"lineament"	A large scale linear structural feature.
"lenticular"	Resembling in shape the cross section of a lens.
"listric"	A curved downward-flattening fault, generally concave upward.
"lithocap"	Rock unit conspicuously covering another, often formed by alteration.
"Lithology"	A term usually applied to sediments, referring to their general characteristics. A macroscopic hand-sample or outcrop-scale description of rocks.
"lithological"	A term usually applied to sediments, referring to their general characteristics.
"lithostratigraphic"	The variation of rock types in a sedimentary sequence.
"littoral"	Or pertaining to a shore. A coastal region.
"loam"	Soil containing sand, silt and clay in roughly equal parts.
"lode"	A mineral deposition consisting of a zone of veins, veinlets, disseminations, or planar breccias.
"low-sulphidation"	Quartz veins, stockworks and breccias carrying gold, silver, electrum, argentite and pyrite with lesser and variable amounts of sphalerite, chalcopyrite, galena, rare tetrahedrite form in high-level to near-surface environments. The ore commonly exhibits open- space filling textures and is associated with volcanic-related hydrothermal to geothermal systems.
"m"	Metre.
"m^3"	Metres cubed.
"Ma"	Million years.
"mafic"	A dark-coloured igneous rock which has a high proportion of pyroxene and olivine minerals.
"mafics"	Generally dark coloured, iron and magnesium rock forming minerals.
"magnesium"	A light, silvery-white, and fairly tough metal. Chemical symbol, Mg. Found in

	large deposits in the form of magnesite, dolomite, and other minerals.
"magnetics"	A geophysical technique used to measure the magnetic susceptibility of rocks.
"magnetite"	An iron ore mineral, Fe_3O_4.
"malachite"	A source of copper. Bright green monoclinic mineral, occurs with azurite in oxidized zones of copper deposits.
"manganese"	A grey white, hard, brittle metallic element. Chemical symbol Mn.
"MapInfo GIS®"	Professional 'Geographic Information System' mapping software.
"marble"	Metamorphic rock of granular texture, with no rock cleavage, and composed of calcite, dolomite, or both.
"massif"	A very large topographic or structural feature, usually of greater rigidity than the surrounding rock.
"MCRP"	Mine Closure and Rehabilitation Plan.
"Measured Resource"	Defined in the JORC Code, as that part of a Mineral Resource for which the resource has been intersected and tested by drill holes, underground openings or other sampling procedures at locations which are spaced closely enough to confirm continuity and where geoscientific data are reliably known. A measured resource estimate will be based on a substantial amount of reliable data, interpretation and evaluation which allows a clear determination to be made of the shapes, sizes, densities and grades.
"Measured"	An estimate of mineral resources from geological data as defined by the JORC Code for reporting ore reserves and resources. This is part of a mineral resource where exploration data are distributed in sufficient density and are of sufficient reliability to allow the estimation of the resource, volume, shape, tonnage and grade to a level of confidence in their accuracy to allow a detailed mining Feasibility Study to be carried out.
"melanterite"	A mineral formed from the decomposition of pyrite.
"Mesozoic"	An era of geologic time, from the end of the Paleozoic to the beginning of the Cenozoic, or from about 225 million years to about 65 million years ago.
"metalliferous"	Containing metal.
"metallogenic province"	A belt of rocks, often structurally controlled, that are host to a specific selection of minerals.
"metallogenic"	Study of the genesis of mineral deposits, with emphasis on its relationship in space and time to regional petrographic and tectonic features of the Earth's crust.
"metallurgical"	Describing the science concerned with the production, purification and properties of metals and their applications.
"metamorphism"	Process whereby rocks undergo physical or chemical changes or both to achieve equilibrium with conditions other than those under which they were originally formed (excluding process of weathering). Agents of metamorphism are heat, pressure, and chemically active fluids.
"metamorphosed"	Rocks which have been altered by temperature and pressure.
"metasomatic"	Process whereby rocks are altered when volatiles exchange ions with them.

"metasomatism/ metasomatic"	Metamorphic change which involves the introduction of material from an external source.
"Metavolcanics"	Metamorphosed volcanic rocks.
"Mg"	Chemical symbol for magnesium.
"micro"	Prefix that divides a basic unit by 1 million or multiplies it by 10^{-6}. A prefix meaning small. When modifying a rock name, it signifies fine-grained, as in microgranite.
"Micormine®"	Complex mining software used primarily for ore body modelling, resource estimation and pit optimisation.
"migmatite"	Rock formed under extreme temperature-pressure conditions during metamorphism, where partial melting occurs in pre-existing rocks.
"mill"	Equipment used to grind crushed rocks to the desired size for mineral extraction.
"mineral resource"	A concentration or occurrence of material of intrinsic economic interest in or on the Earth's crust in such a form that there are reasonable prospects for the eventual economic extraction. The location, quantity, grade geological characteristics and continuity of a mineral resource are known, estimated or interpreted from specific geological evidence and knowledge. Mineral resources are sub-divided into *Inferred*, *Indicated* and *Measured* categories.
"mineralisation"	Process of formation and concentration of elements and their chemical compounds within a mass or body of rock.
"Miocene"	Geological epoch of time from 23 to 5Ma.
"mixite"	A hexagonal mineral.
"mm"	Millimetre, one thousandth of a metre.
"mm^3"	Millimetres squared.
"Mo"	Chemical symbol for molybdenum.
"moisture content"	The percentage moisture content equals the weight of moisture divided by the weight of dry soil multiplied by 100.
"molybdenite"	Mineral compound of molybdenum and sulphur, MoS_2.
"molybdenum"	Silvery-white, very hard, metallic element. Chemical symbol, Mo. Does not occur native, but is obtained principally from molybdenite.
"monoclinic"	Of or denoting a crystal system or three-dimensional geometrical arrangement having three unequal axes of which one is at right angles to the other two.
"monzonite"	Intrusive igneous rock that contains abundant and approximately equal amounts of plagioclase and potash feldspar.
"Moz"	Million troy ounces.
"MPa"	Unit to measure rock strength.
"Mt"	Million tonnes.
"mW"	Mega-watt.
"NaCn"	*See sodium cyanide*
"nearest neighbour"	A method of assigning a sample value to a point in space.
"Neoproterozoic"	A geological era from 1000 to 542.0 Ma.
"NO_2"	Nitrogen Dioxide.

"NPV"	Net Present Value is a standard method in finance of capital budgeting – the planning of long-term investments. Using the NPV method a potential investment project should be undertaken if the present value of all cash inflows minus the present value of all cash outflows (which equals the net present value) is greater than zero.
"nuée ardente"	An incandescent cloud of gas and volcanic ash violently emitted during the eruption of certain types of volcano.
"nugget effect"	Anomalously high precious metal assays resulting from the analysis of samples that may not adequately represent the composition of the bulk material tested due to non-uniform distribution of high-grade nuggets in the material to be sampled.
"NUP"	Natural Use Permit.
"oceanic"	Of or relating to the ocean.
"ochre"	Natural pigments, usually iron hydroxides and hydrated iron oxides.
"Oligocene"	Geological epoch of time from 35 to 23Ma.
"open-pit"	A large scale hard rock surface mine.
"open stope"	An unfilled cavity.
"ophiolite"	Group of mafic and ultramafic igneous rocks, whose origin is associated with an early phase of the development of a geosyncline.
"Ordovician"	A period of geologic time from about 500 to 435Ma.
"ore body"	Mining term to define a solid mass of mineralised rock which can be mined profitably under current or immediately foreseeable economic conditions.
"ore reserve"	The economically mineable part of a *Measured* or *Indicated* mineral resource. It includes diluting materials and allowances for losses which may occur when the material is mined. Appropriate assessments, which may include feasibility studies, have been carried out, and include consideration of and modification by realistically assumed mining, metallurgical, economic, marketing, legal, environmental, social and governmental factors. These assessments demonstrate at the time of reporting that extraction could be reasonably justified. Ore reserves are sub-divided in order of increasing confidence into *Probable* and *Proven*.
"ore"	A mineral deposit that can be extracted and marketed profitably.
"orebody"	Mining term to define a solid mass of mineralised rock which can be mined profitability under current or immediately foreseeable economic conditions.
"ore-field"	A zone of concentration of mineral occurrences.
"orepass"	A vertical or inclined passage for the downward transport of ore.
"oreshoot"	An elongate pipelike, ribbon-like, or chimney-like mass of ore within a deposit (usually a vein), representing the more valuable part of the deposit.
"orogenic"	Mountain building.
"orthoclase"	A series of potassium feldspars.
"ounce/oz"	Troy ounce (= 31.1035 grammes).
"outcrop"	The area over which a particular rock type occurs at the surface – whether visibly

	exposed or not.
"OVOS"	Soviet Environmental Impact Assessment (EIA).
"pa"	Per Annum.
"palaeo"	A prefix common in geological terminology, meaning ancient, of past times, and sometimes suggesting an early or primitive nature.
"paleogene"	A geological time period from 65.5 to 23.03Ma. Part of the Cenozoic Era.
"paleosurface"	Original land surface.
"Paleozoic Era"	The first of the three eras of the Phanerozoic, spanning 570-248 million years.
"Paleozoic"	Geological era from 570 to 245Ma.
"paragenesis"	The relationship of minerals expressed in terms of a time sequence.
"paste backfill"	Cement and waste rock mixture used to backfill underground stopes.
"Pb"	The chemical symbol for lead.
"pelitic"	Pertaining to or characteristic of pelite.
"peridotite"	General term for a coarse-grained plutonic rock composed chiefly of olivine with or without other mafic minerals such as pyroxenes, amphiboles, or micas, and containing little or no feldspar.
"Permian"	Is a geologic period that extends from about 299.0Ma to 248.0 Ma.
"pH"	The measure of the acidity or alkalinity of a solution.
"Phanerozoic"	Rocks younger than 590 million years.
"phengite"	A variety of muscovite having high silica.
"phenocrysts"	Relatively large crystals which are found set in a finer-grained groundmass.
"phlogopite"	A manganese rich end member of the biotite crystal solution series. Found as an alteration mineral in sulfur rich hydrothermal assemblages.
"phosphorite"	Any rock containing calcium phosphate of sufficient purity and quantity to permit its commercial use as a source of phosphatic compounds or elemental phosphorus.
"phyllite"	A fine grained low-grade metamorphic rock.
"pillar"	A column of ore left to support the overlying strata or hanging wall in a mine.
"placer"	A mineral deposit formed by the winnowing action of either water, or air to concentrate minerals of different mass by gravity separation.
"plagioclase"	A series of sodium/calcium feldspars, plagioclase feldspars are common rock-forming minerals.
"plications"	Intense small scale folds.
"plumbojarosite"	A mineral of the alunite group. $PbFe_6(SO_4)_4(OH)_{12}$.
"plunge"	A fold is said to plunge if the axis is not horizontal.
"pluton"	An igneous intrusion.
"plutonic"	Pertaining to igneous rocks formed at great depths.
"polymetallic"	Refers to a mineral deposit or occurrence with several metal sulphides, common metals include Cu, Pb, Zn, Fe, Mo, Au and Ag.
"polymict"	Term describing detrital rock consisting of fragments of many different materials.
"porosity"	The space available to fluid penetration.
"porphyrites"	Porphyries that contain plagioclase phenocrysts.

"porphyritic"	A medium coarse-grained intrusive or volcanic rock which is conspicuous by containing more than 25% large well-formed crystals by volume.
"porphyry"	Igneous rock containing conspicuous phenocrysts (crystals) in fine-grained or glassy groundmass.
"potassium"	Highly reactive metallic element of the alkali group; it is soft, light, and silvery. Chemical symbol, K. Occurs abundantly in nature.
"ppb"	Parts per billion.
"ppm"	Parts per million.
"Precambrian"	Era before 590 million years.
"precious metal"	Gold, silver and platinum group minerals.
"propylitic"	Plagioclase in an igneous rock is altered to epidote, sericite and secondary albite, and ferro-magnesian minerals are altered to chlorite-calcite-epidote-iron oxide assemblages.
"Proterozoic"	Most recent geological Eon of three sub-divisions of the Precambrian, from 2,500 to 570Ma.
"pyrargyrite"	A trigonal mineral; chemical symbol Ag_3 SbS_3; soft; deep red; in late-primary or secondary-enrichment veins, and an important source of silver.
"pyrite"	A mineral compound of iron and sulphur, sulphide mineral, iron sulphide, chemical symbol FeS_2.
"pyrobitumen"	Naturally occurring hydrocarbon that is formed or affected by heat, or has a fiery colour.
"pyroclastic"	Rock consisting of fragments of volcanic material which has been blown into the atmosphere by explosive activity.
"pyroxene"	A group of chiefly magnesium-iron minerals.
"pyrrhotite/pyrrhotine"	A mineral compound of iron and sulphur found in basis igneous rocks.
"QA/QC"	Quality Assurance/Quality Control.
"quartz"	A mineral composed of silicon dioxide.
"quartzites"	Is a hard, metamorphic rock which was originally sandstone.
"Quaternary"	Geological period of time from 2Ma; youngest period of the Cenozoic.
"radiometry"	Measurement of gamma radiation within rocks.
"radon"	A heavy, radioactive, gaseous, inert element.
"raise"	A vertical or near-vertical opening driven upward form a level to connect with the level above.
"RC drlling"	Drilling method where samples are cut by percussion roller or blade drill bits and flushed to the surface using compressed air or water.
"recovery"	Proportion of valuable material obtained in the processing of an ore, stated as a percentage of the material recovered compared with the total material present.
"relief"	Terrain, or relief, is the third or vertical dimension of land surface.
"reserves"	**Proven**: measured mineral resources, where technical economic studies show that extraction is justifiable at the time of the determination and under specific economic conditions. **Probable:** measured and / or indicated mineral resources which are not yet

	proven, but where technical economic studies show that extraction is justifiable at the time of the determination and under specific economic conditions.
"resistivity"	A geophysical technique to measure the electrical resistance of rocks.
"resources"	**Measured**: a mineral resource intersected and tested by drill holes, underground openings or other sampling procedures at locations which are spaced closely enough to confirm continuity and where geoscientific data are reliably known. A measured mineral resource estimate will be based on a substantial amount of reliable data, interpretation and evaluation which allows a clear determination to be made of shapes, sizes, densities and grades.
	Indicated: a mineral resource sampled by drill holes, underground openings or other sampling procedures at locations too widely spaced to ensure continuity but close enough to give a reasonable indication of continuity and where geoscientific data are known with a reasonable degree of reliability. An indicated resource will be based on more data, and therefore will be more reliable than an inferred resource estimate.
	Inferred: a mineral resource inferred from geoscientific evidence, underground openings or other sampling procedures where the lack of data is such that continuity cannot be predicted with confidence and where geoscientific data may not be known with a reasonable level of reliability.
"rhenium"	A rare mineral which occurs in very small quantities in platinum ores and in columbite, gadolinite and molybdenite.
"rhodanine"	An organic compound derived from thiazolidine.
"rhodochrosite"	A manganese carbonate mineral.
"rhyolite"	A group of extrusive igneous rocks, typically porphyritic and commonly exhibiting flow texture, with phenocrysts of quartz and alkali feldspar in a glassy to cryptocrystalline groundmass.
"riffle splitter"	A device used to reduce the volume or weight of a sample.
"rift"	A regional-scale strike-slip fault, with offset measured up to hundreds of kilometres or a trough or valley formed by faulting.
"Riphean"	An era of the Middle Proterozoic, lasting from about 1675-825Ma.
"roasting"	The treatment of ore by heat and air, or oxygen-rich air, in order to remove sulphur and arsenic.
"rock chip"	A chip sample taken from one or more points within a restricted area.
"rod mill"	A rotating drum containing steel rods used to grind ore.
"run-of-mine"	Average grade of mineralisation to be extracted from a mine.
"rutile"	A titanium dioxide mineral tetragonal in nature.
"s"	Seconds.
"S"	Chemical symbol for sulphur.
"Sb"	Chemical symbol for antimony.
"sandstone"	Detrital sedimentary rock in which particles range from 1/16 to 2mm.
"saturated"	A rock or soil where all its interstices are filled with water, holding as much water or moisture as can be absorbed.

"scandium"	A metallic element which is extracted as a by-product from uranium mill tailings. It is also the principal component in the rare mineral thortveitite.
"scheelite"	A tungsten ore mineral, chemical symbol $CaWO_4$.
"schist or schistocity"	Metamorphic rock dominated by fibrous or platy minerals with parallel alignment that splits readily. Has schistose cleavage and is product of regional metamorphism.
"schistose"	Said of a rock displaying schistocity.
"schists"	Metamorphic rock dominated by fibrous or platy minerals.
"scoriaceous"	A term used to describe a pyroclastic rock containing cavities.
"Se"	Chemical symbol for selenium.
"sedimentary"	Rocks formed from material derived from pre-existing rocks by processes of denudation.
"selenium"	A non-metallic element and member of the sulphur family.
"self-potential"	A geophysical method used in mineral exploration to locate and delineate conductive mineral deposits.
"sericite"	A white mica.
"sericitization"	The formation of sericite, usually at the expense of other minerals in the rock.
"serpentinite"	A rock consisting almost wholly of serpentine-group minerals.
"shaft"	Vertical or inclined excavation into mine workings.
"shotcrete"	Is mortar or concrete conveyed through a hose and pneumatically projected at high velocity onto a surface for stabilisation purposes.
"shrinkage stope"	A stope in which part of the severed ore is removed during stoping, the balance being temporarily available as support of workings.
"siderite"	An iron mineral.
"Sigma-3D"	A plastic simulation software product.
"silica cap"	The chemically resistant dioxide of silicon, SiO_2. Resistant to erosion, capping often less resistant rocks below.
"silicate"	Is a compound consisting of silicon and oxygen (Si_xO_y), one or more metals, and possibly hydrogen.
"siliceous"	Of relating to or derived from silica.
"silicification"	The introduction of silica into a rock, either filling pore spaces or replacing pre-existing minerals.
"sill"	A tabular mass of igneous rock that has been intruded laterally between layers of older rock.
"siltstone"	Detrital sedimentary rock in which particles are less than 1/16mm.
"Silurian"	A period of geologic time from about 435 to 395 million years.
"sinistral"	A term applied to a fault to describe the apparent direction of relative movement of each side, in this case to the left.
"sinter"	A process for agglomerated ore concentrate in which partial reduction of minerals may take place and some impurities be expelled prior to subsequent smelting and refining.
"skarn"	An old Swedish mining term for silicate gangue (amphibole, pyroxene, garnet,

	etc.) of certain iron ore and sulfide deposits of Archean age, particularly those that have replaced limestone and dolomite. Its meaning has been generally expanded to include lime-bearing silicates, of any geologic age, derived from nearly pure limestone and dolomite with the introduction of large amounts of Si, Al, Fe, and Mg.
"slag"	Material formed during smelting operations through the combination of a flux and gangue/waste portion of the ore.
"slimes"	Extremely fine sediment produced in the processing of ore or rock.
"sludge"	Rock cuttings produced by a drill bit.
"smectite"	A swelling clay: originally applied to fuller's earth and later to montmorillonite; also to certain clay deposits that are apparently bentonite, and to a greenish variety of halloysite.
"smelting"	A metallurgical operation (at a smelter) in which metal is separated from impurities by a process that includes melting.
"smithsonite"	A variety of zinc carbonate and source of zinc.
"SO_2"	Chemical formula for sulphur dioxide.
"sodium cyanide"	An inorganic highly toxic chemical compound.
"specific density"	The ratio of the density of a substance to the density of a given reference material.
"sphalerite"	A zinc sulphide mineral.
"sphene"	An accessory mineral found in acid igneous rocks and in metamorphosed limestones.
"steppe"	An extensive, treeless grassland area in the semiarid mid-latitudes of southeastern Europe and Asia.
"stibnite"	An orthorhombic mineral, chemical symbol Sb_2S_3; may contain gold and silver; in low-temperature veins and around hot springs; the chief source of antimony.
"stock"	An intrusive mass of igneous rock.
"stockpile"	An accumulation of ore or mineral built up when demand slackens or when the treatment plant or beneficiation equipment is incomplete or temporarily unequal to handling the mine output.
"stockwork"	A mineral deposit consisting of a three-dimensional network of planar to irregular veinlets.
"stoping"	A mining method of extract ore by digging tunnels along the trend of the ore and extracting ore from above and below the tunnel.
"stratiform"	Having the form of a layer, bed, or stratum; consisting of roughly parallel bands or sheets.
"stratigraphy"	Study of the stratified rocks, sedimentary and volcanics, especially their sequence in time, the character of the rocks and the correlation of beds in different localities.
"strike length"	The longest horizontal dimension of an ore body or zone of mineralisation.
"strike"	Direction in which a horizontal line can be drawn on a plane, and determines the direction in which to measure the true dip.

"stringers"	Mineral veinlet or filament, usually one of a number, occurring in a discontinuous sub parallel pattern in host rock.
"stripping ratios/ strip ration"	A ratio of the waste relative to ore in a mining operation.
"sub-volcanic"	Pertaining to an igneous intrusion, or to the rock of that intrusion, whose depth is intermediate between that of abyssal or plutonic and the surface.
"sulphide"	Mineral containing sulphur in its non-oxidised form.
"sulfur/sulphur"	Soft yellow mineral.
"supergene alteration"	Near surface alteration.
"supergene"	Said of a mineral deposit or enrichment formed near the surface, commonly by descending solutions, used almost exclusively for processes involving water.
"syncline"	A basin shaped fold.
"syngenetic"	Said of a mineral deposit formed contemporaneously with, and by essentially the same processes as, the enclosing rocks
"synorogenic"	Said of a geological process or event occurring during a period of orogenic activity.
"t"	A metric tonne.
"tabular"	Said of a feature having two dimensions that are much larger or longer than the third.
"tailings"	Material that remains after all metals/minerals considered economic have been removed from the ore.
"Te"	Chemical symbol for tellurium.
"tectogenesis"	Structural history of an area.
"tectonic"	Said of or pertaining to the forces involved in, or the resulting structures or features of, tectonics: branch of geology dealing with the broad architecture of the outer part of the Earth; i.e., the regional assembling of structural or deformational features.
"tectono-magmatic"	Structural and intrusive history of an area.
"telluride"	Mineral containing tellurium.
"tellurium"	Soft semimetallic mineral associated with pyrite, sulfur, or in the fine dust of gold-telluride mines.
"tellurobismuthite"	A trigonal mineral from the tetradymite group.
"tenorite"	A copper oxide found in oxidised zones of copper deposits, a source of copper.
"tennantite"	Isometric mineral, $(Cu,Fe)_{12}As_4S_{13}$; forms a series with tetrahedrite; may contain zinc, silver, or cobalt replacing copper; in veins; an important source of copper.
"terrigenous"	Derived from the land or continent.
"Tertiary"	Geologic period of time from 65 to 2Ma; first period of Cenozoic.
"tetrahedrite"	A copper, iron, antimony sulphide mineral.
"thorium"	Element which is slightly radioactive.
"thrust"	Overriding movement of one crustal unit over another, such as in thrust faulting.
"tin"	The metal extracted from cassiterite.

"Tl"	Chemical symbol for thallium.
"TMF"	Tailings management facility.
"tonalite"	Alternative name for diorite.
"tonalities"	An igneous, plutonic (intrusive) rock, of felsic.
"top-cut"	Process applied to grade evaluation to eradicate "nugget-effect".
"topography"	The general configuration of a land surface or any part of the earth surface including its relief and the position of its natural and manmade features.
"tourmaline"	Is a complex silicate of aluminium and boron, its composition varies widely with sodium, calcium, iron, magnesium, lithium and other elements entering into the structure.
"Tournaisian"	Geological epoch from 362 to 349Ma.
"tpa"	Tonnes per annum.
"trachyte"	A fine grained igneous rock.
"trachytes"	Fine-grained, intermediate igneous rocks.
"transgressive"	Discrepancy in the boundary lines of continuous strata; i.e., unconformity.
"treatment plant"	A plant where ore undergoes physical or chemical treatment to extract the valuable metals/minerals.
"tremolite"	Monoclinic mineral, $2[Ca_2Mg_5Si_8O_{22}(OH)_2]$; amphibole group with magnesium replaced by iron, and silicon by aluminium toward actinolite; in low-grade metamorphic rocks such as dolomitic limestones and talc schists.
"trench sampling"	Sampling of a trench cut through the rock, generally in the form of a series of continuous channels (channel samples).
"Triassic/Trias"	Geological period of time from 250 to 200 Ma.
"trigonal"	Of or denoting a crystal system having three equal axes separated by equal angles that are not at right angles.
"truncation"	To shorten by or as if by cutting off.
"tuffite"	A tuff containing both pyroclastic and detrital material, but predominantly pyroclasts.
"tuffs"	Rock consolidated from volcanic ash.
"tungsten"	Hard, brittle, white or grey metallic element. Chemical symbol, W. Also known as wolfram.
"turbidite"	Means a sedimentary rock usually formed in deep water from a turbidite current (a slurry of sediment). It is typically graded in grain size from coarse at the bottom to very fine at the top.
"ultramafic"	An igneous rock composed chiefly of mafic minerals.
"unconformity"	Surface separating two rock masses, older exposed to erosion before deposition of younger. If older rocks were deformed and not horizontal at time of subsequent deposition, surface of separation is angular unconformity. If older rocks remained horizontal during erosion, surface separating them from younger rocks is called disconformity. Unconformity that develops between massive igneous or metamorphic rocks exposed to erosion and then covered by sedimentary rocks is called nonconformity.

"underground working"	Mine openings for evaluation for ore extraction excavated beneath the ground surface.
"UNDP"	United Nations Development Project.
"uranium"	A radioactive metallic element. Chemical symbol U.
"variogram"	A plot of the variance of paired sample measurements as a function of the distance between samples.
"variography"	A geostatistical method of determining the spatial variations in the grade and nature of mineralisation within a particular ore body.
"vein swarm"	Multiple and composite veining.
"vein"	A tabular deposit of minerals occupying a fracture, in which particles may grow away from the walls towards the middle.
"vesicular"	Small spherical or ellipsoidal cavities found in volcanic lavas, which are produced by bubbles of gas trapped during the solidification of the rock.
"VMS"	Volcanogenic Massive Sulphide ; accumulation of sulphide minerals which may include iron, copper, lead, zinc sulphides in varying proportions, together with gold and silver minerals, formed on the sea floor by mineralised fluids rising from the earth's crust and cooling by contact with sea water.
"volcano-clastic"	Volcanic rocks which have been at least slightly worked by the sedimentary process.
"vug"	A hole or cavity in a rock.
"W"	Chemical symbol for tungsten.
"weathering"	The breakdown of rocks and minerals in the near-surface environment by the action of physical and chemical processes, in the presence of air and water.
"willemite"	A trigonical mineral found in zinc deposits. A source of zinc.
"wireframed"	A technique to convert ore body intersections in a 3D computer model to assist interpretation.
"wollastonite"	A mineral of the pyroxene group, $CaSiO_2$, formed by the thermal metamorphism of impure limestone.
"xanthate"	Common specific promoter used in flotation of sulphide ores.
"xenoliths"	Rock fragment foreign to igneous rock in which it occurs.
"Zn"	The chemical symbol for zinc; bluish-white, lustrous metal.
"µm"	Micron (one millionth of a metre).
"zircon"	The chief source of zirconium ($ZrSiO_4$) widely occurs in granite.
ZVOS	Soviet EIA

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