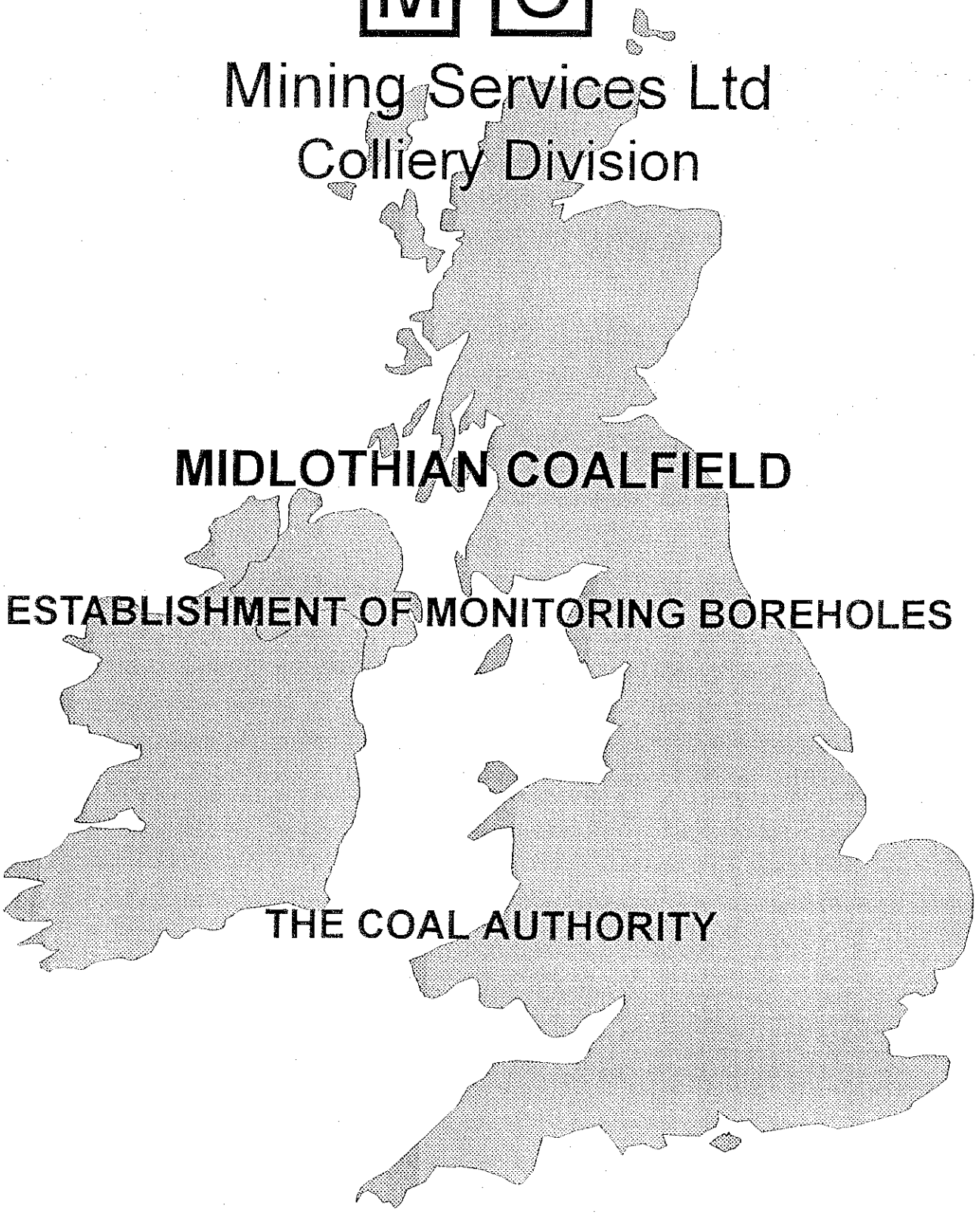
Mining Services Ltd
Colliery Division



MIDLOTHIAN COALFIELD

ESTABLISHMENT OF MONITORING BOREHOLES

THE COAL AUTHORITY

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CONTENTS

FIGURES

APPENDICES

PLATES

MIDLOTHIAN COALFIELD

Establishment of Monitoring Boreholes

1 Introduction

1.1 The Midlothian Coalfield, North of the Sheriffhall Fault, was drained principally at two locations, namely the day level which emerges into the public sewerage system at the coast at Joppa and those waters formally being controlled by underground pumping operations at Monktonhall Colliery. There would also appear, from observations, relatively small outflows to the surface which may be attributable to the presence of very old extensive mineworkings near to Musselburgh.

In the absence of mining information relating to these mineworkings, it is not known whether the outflows are from mineworkings in the Productive coal measures or from a localised extraction of coal from the outcrops segregated by faulting and an igneous intrusion.

1.2 In light of the discharge capabilities of the known day level and the potential problems which could arise as a direct result of cessation of underground pumping operations associated with Monktonhall Colliery, the "Considerations for Possible Closure" report produced by JMC Mining Services Ltd in May 1997 recommended that :-

1 Upon the cessation of underground pumping of groundwater at Monktonhall Colliery, no increased pressure should be placed on the existing groundwater regime.

2 Monktonhall No1 shaft should be prepared for filling and capping with a reinforced concrete cap. Monktonhall No2 shaft should be treated in line with the recommendations of the Shaft Option Report with provisions for the establishment of a submersible pumping station to control groundwater rebound within the Midlothian Coalfield. This pumping system should initially maintain the water level in the Monktonhall shafts at or below the level of the intersection of the Five Feet waste at a level of 192 metres from the surface.

3 A programme should be established to monitor the rising water levels and qualities within the coalfield by regular measurements to the groundwater at Newcraighall and Gilmerton Shafts.

4 A programme should be established to regularly inspect the condition of the outflow of the day level at the intersection with the public sewerage system at Joppa Park.

5 With the benefit of groundwater pumping facilities to control waters within the coalfield and establishment of monitoring facilities, a programme should be established with the agreement of the Scottish Environmental Protection Agency to amend pumping levels to achieve the most effective level for control of waters to prevent uncontrolled discharges to the surface.

1.3 This document discusses the parameters surrounding the determination of an additional minewater monitoring location in the vicinity of the River Esk and identifies one site.

2 Geological and Geographic Considerations

2.1 Monktonhall Colliery is situated in the Northern part of the Lothians Coalfield, about 8 km South of the City of Edinburgh and some 2km from the A1 trunk road in the heart of the oldest mining district in Scotland. Mining operations have been undertaken in this locality since the beginning of the 13th Century.

2.2 The Colliery surface is some 45 metres above Ordnance Datum with the land rising to the West and South and dipping towards the coast some 3km to the North and Easterly to the valleys of the River Esk and its tributary the South Esk before rising again.

2.3 The coalfield consists of a large synclinal basin extending from Rosewell to Musselburgh and Northwards under the Firth of Forth. This Northern part of the basin is limited by outcrops to the East and West and truncated to the South by the Sheriffhall Fault. The coal seams dip almost vertically from the Western outcrops. Thereafter, they level out in the centre for approximately 3km before rising at an even gradient to the Eastern outcrop.

2.4 The Limestone Coal Group as worked at Monktonhall comprises of mudstones, siltstones and sandstones which can achieve a thickness in excess of 20 metres. The coal seams worked all have a low sulphur content of about 1%.

The overlying Passage Group, Millstone Grit, is predominantly comprised of sandstones which, from experience, have been proven to be water bearing.

The Productive Coal Measures, Middle and Lower separated by some 60 metres of strata containing thin coals, comprise of mudstones, siltstones, seatearths and sandstones in addition to the numerous coal seams. The coal seams worked generally have a low sulphur content of less than 1%.

The superficial deposits vary between Boulder Clay to Sand and Gravel and Alluvium.

3 Mining and Pumping

3.1 Examination of the abandonment plans for Monktonhall Colliery indicate that there are no direct underground connections to adjacent Collieries within the Limestone coals. However, in the sinking of the two mine shafts, 8 old wastes from the overlying Productive Coal Measures were encountered.

Interconnections to Newcraighall, Woolmet and Dalkeith are via the sinking of the shafts through old wastes. Woolmet is also connected to Gilmerton from the Five Feet seam to a roadway in the Millstone Grit. In turn, Gilmerton is interconnected within the Limestone Coal group through Niddrie Collieries to the day level which comes to the surface at the coast at Joppa.

3.2 Water inflows were experienced during sinking from the horizon of the Splint Coal to that of the Jewel. From 165 metres to the base of the Productive Coal Measures (320m), there was very little water encountered and the wastes of the Cowpit Five Feet, Salters and Nine Feet seams were found to be dry.

At the time of sinking, minewater in the Productive Coal Measures was being controlled by pumping (3350gpm) from four neighbouring Collieries which all closed by 1979.

The pumping rate at each location is tabulated below.

Colliery	Year Pumping Ceased	Quantity Pumped (gpm)
Gilmerton	1961	750
Woolmet	1966	450
Newcraighall	1972	1,700
Dalkeith	1979	450
Total		3,350

From completion until 1972, little water was apparent in either shaft above the 1400 feet pumping level. After 1975, there was a steady increase in the water entering the two shafts above the 1400 feet level coinciding with the rising water level in Newcraighall shaft. When the water reached the Five Feet waste level, the maximum inflow of water in the Monktonhall Shafts was recorded, indicating that the Five Feet waste level is the critical connection in the area.

3.3 The water level at Newcraighall has now reached some 5.9 metres 'Above Ordnance Datum' similar to the outflow of the day level at Joppa.

3.4 During 1997, access was made into one of the Gilmerton Colliery shafts via a pipe through the plug to the surface for both monitoring the water level and obtaining a water sample for analysis (Gilmerton was formally used as a water monitoring station by British Coal until 1976). The water level was measured as 29.3 metres Above Ordnance Datum, this level was difficult to obtain and further works have to take place before this level can be accurately measured. If this is a true indication of the water level at Gilmerton, then the hydraulic gradient to the outflow at the day level at Joppa (5.8km) is some 1 in 250.

The steepness of this gradient is evidence of potential difficulties in achieving an outflow from the coalfield via the day level and the interconnection between the Productive Coal Measures and the Limestone Coals, and increases the risk in the future for transmission of minewater to the surface in the valley of the River Esk.

3.5 Examination of available mine plans indicates that mining is almost continuous from the Edge Coals in the West of the Coalfield at Niddrie especially in the Lower Coal Measures embracing Newcraighall, Woolmet and Dalkeith Collieries. Mining on the Eastern limb of the synclinal basin is more prone to geological disturbances which has caused discontinuances in migratory paths, limiting the potential for overflow towards the coast.

4 Determination of Borehole Site

4.1 There are a number of factors to be taken into consideration in determining a suitable site for the monitoring of underground waters.

1 Current use of site.

2 Accessibility from Public Highways.

3 Public and Private Services.

4 Nature and depth of Superficial Deposits.

5 Nature of superadjacent strata including old coalworkings.

6 Type and likely condition of underground mineworkings.

7 Depth from the surface to target mineworkings.

8 Degree of interconnection to adjacent Colliery workings.

4.2 The site chosen for the establishment of a monitoring borehole is the former Dalkeith Mines (Drifts from the surface to underground), some 3.5 km South East of Monktonhall Colliery shafts.

4.2.1 The site of the proposed boreholes is currently under agriculture, possibly linked to the adjacent farmstead 0.5km to the North at Smeaton, between areas used for grazing of horses and sheep adjacent to the former Colliery powder magazine which is still visible although overgrown. The site is also between high voltage overhead power cables suspended from steel pylons. (Plate 1)

4.2.2 Access to the proposed site is by a metalled road from the A6094 highway which now leads to a permanent residence for travelling people. There is a locked barrier, approximately 2 m above ground, to prevent unauthorised access and further height restriction barriers, 4.9 m above ground, in respect of the overhead power cables. At the entrance to the former Colliery site there are locked gates to prevent vehicular access.

4.2.3 No research into the existence of public and private services additional to the visible overhead high voltage power cables has been carried out to date.

4.2.4 The superficial deposits, as shown on the published geological mapping, are Boulder Clay overlying Lower Coal Measures strata with a depth of some 3 metres. Boreholes, shown on the Dalkeith Five Foot Seam abandonment plan, in the vicinity of the River Esk indicate a small variance with some 4 metres being a typical example.

4.2.5 The superadjacent strata above the Dalkeith Five Foot Seam is nominally that of the Lower Coal Measures comprising of mudstones, siltstones, seatearths and sandstones. No detailed examination of Borehole Logs in the locality has been carried out to date to ascertain the exact strata to be found in the locality of the surface mines. The shaft logs for Monktonhall Colliery show a greater percentage of sandstones in the strata above the Five Foot Seam horizon.

The outcropping seams were accessed by steep drifts (1 in 2 to 1 in 3) from the surface to intersect the seam which dips at approximately 1 in 5 to the west. There is no overworking above the Five Foot Seam in the locality of the surface mines save the Little Splint Seam which would not interfere with any proposed monitoring borehole.

4.2.6 The underground roadways in the Five Foot Seam from the base of Nos 5 and 6 Mines are conjectured to be arched roadways. Notes on Ordnance Survey Plans obtained at the Mining Records Office at Bretby are annotated as such to indicate some subsidence movement at the surface, probably due to collapses in the roadways. This needs to be confirmed from Coal Authority / British Coal Archives.

4.2.7 The surface level at the Nos 5 and 6 Mines is some 45 – 48 metres A.O.D. and falls Westwards to the River Esk. From the base of the surface Mines (27 – 22 metres A.O.D.), the seam dips Westerly at approximately 1 in 5.

4.2.8 Whilst it is proposed to locate a borehole into either the underground roadways in the Five Foot Seam from the base of Nos 5 and 6 Mines or into the No 9 Mine which goes to the Six Foot Seam, the interconnections between Newcraighall and Dalkeith are in the Salters and Nine Foot Seams and to Dalkeith in the Six Foot Seam. There are some small unworked 22 metre blocks of coal between Dalkeith and both Newcraighall and Woolmet Collieries in the Five Foot Seam.

These seams are connected underground at Dalkeith by interseam drivages. The static head on these unworked blocks of coal is some 300p.s.i.. Newcraighall and Woolmet Collieries are interconnected in the Five Foot, Salters and Nine Foot Seams.

As Dalkeith pumped to maintain the water levels within the Productive Coal Measures, the degree of interconnection with the main body of water is sufficient and no perched water table is envisaged.

5 Conclusions

5.1 With respect to the availability of Gilmerton and Newcraighall mine shafts, the Dalkeith Mines offer an ideal location for monitoring of underground waters in the Midlothian Coalfield by enclosing Monktonhall Pumping Station within a triangle.

5.2 The interconnections between Newcraighall and the Dalkeith Mines will allow a direct comparison to be made of water levels within the Productive Coal Measures, and will allow further consideration to be made as to whether the recorded water levels at Gilmerton are a true reflection of undeground waters within the Coalfield.

5.3 The chosen site is accessible by a suitable drilling rig subject to clearances from surface owners, public services and the power company responsible for the overhead electricity supply.

FIGURES

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MIDLOTHIAN COALFIELD

PLAN SHOWING LOCATION OF MONKTONHALL COLLIERY

Scale	Plan Ref No	February 1998
1 / 50,000	MID / MON / 1 / 1	Figure 1

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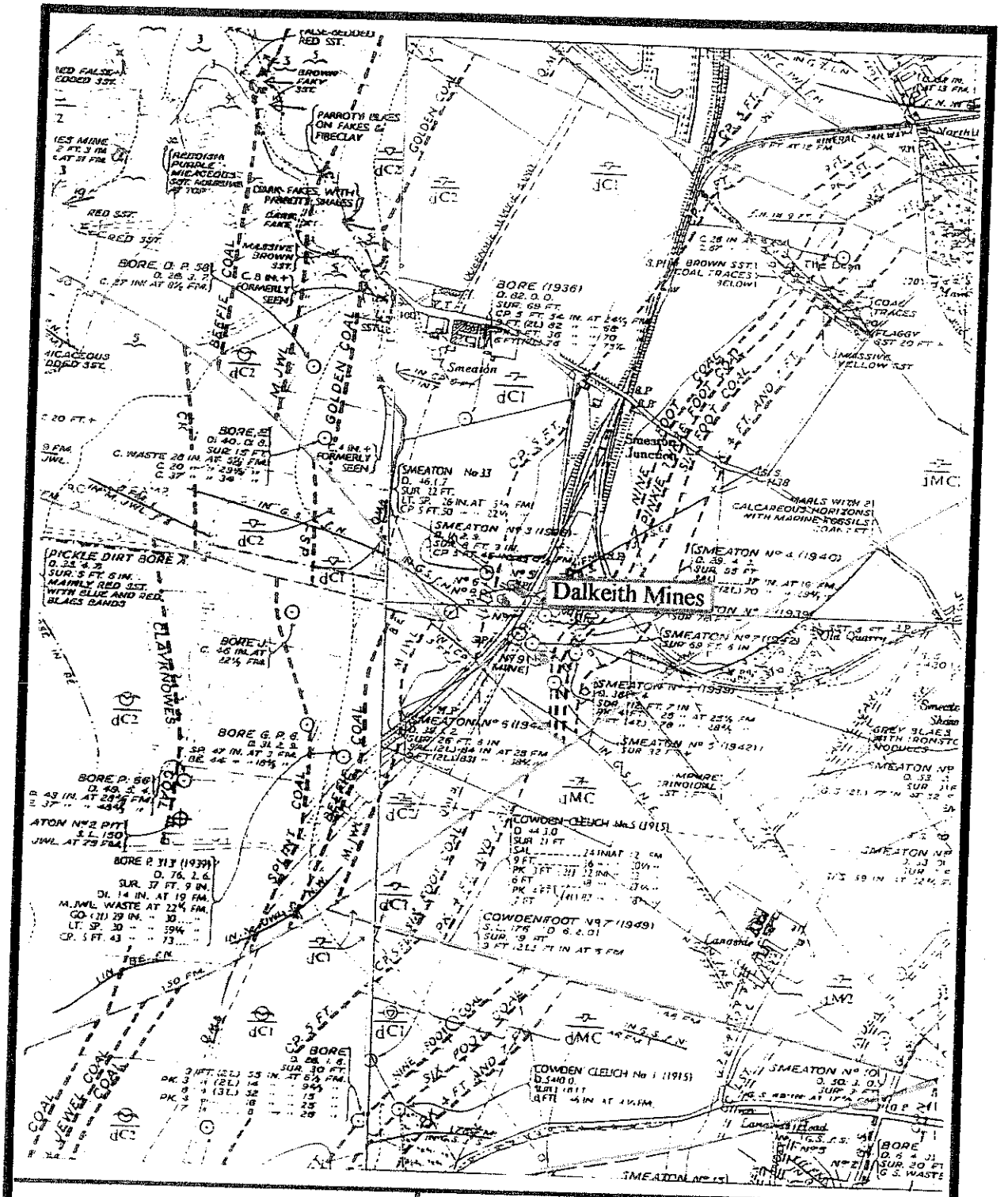
MIDLOTHIAN COALFIELD

PLAN SHOWING LOCATION OF DALKEITH MINES

Scale	Plan Ref No	February 1998
1 / 50,000	MID / MON / 1 / 2	Figure 2



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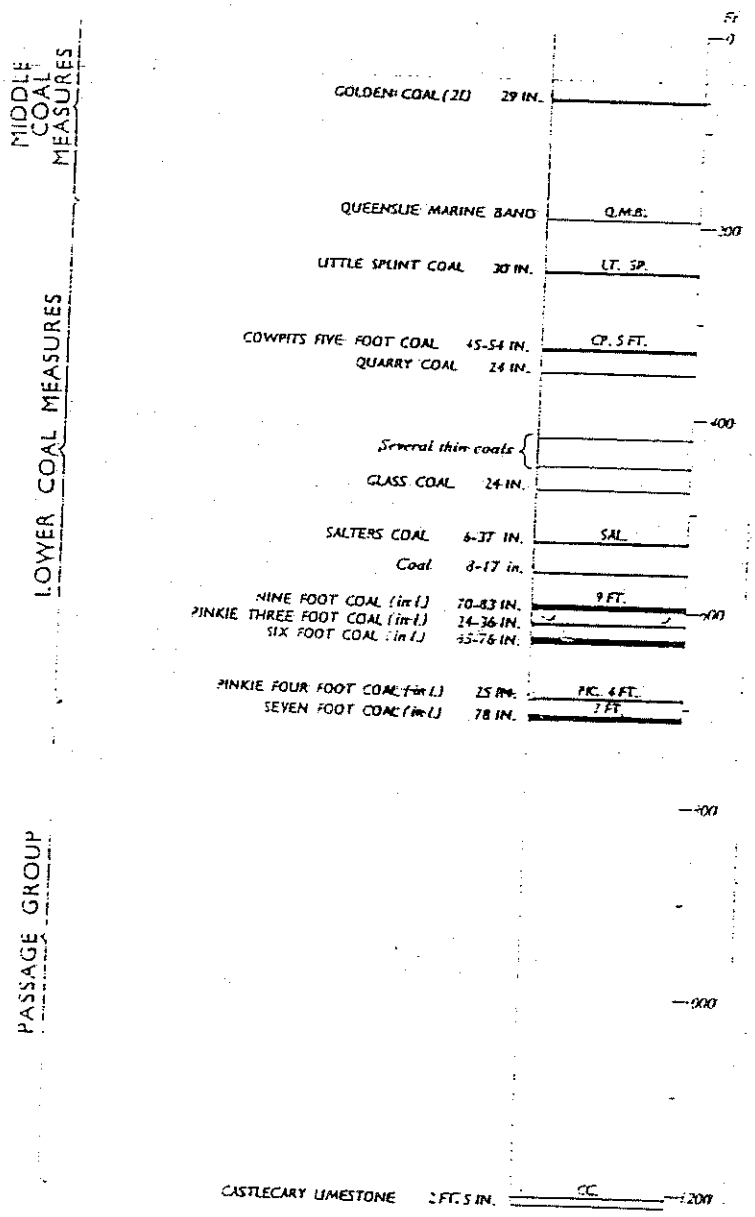
PLAN SHOWING GEOLOGICAL STRUCTURE DALKEITH MINES

Scale	Plan Ref No	February 1998
1 / 10,560	MID / MON / 1 / 3	Figure 3

GENERALIZED VERTICAL SECTION
(Scale: 1 Inch to 200 Feet)



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PLAN SHOWING STRATAGRAPHICAL SEQUENCE LOWER COAL MEASURES

Scale	Plan Ref No	February 1998
1 / 2,400	MID / MON / 1 / 4	Figure 4

	Thickness			Depth from Surface		
	Fathoms	Feet	Inches	Fathoms	Feet	Inches
Sandstone	4	0	0	79	5	0
Blaes		1	6	80	0	6
Fakes		1	0	80	1	6
Coal			9	80	2	3
Faky Fireclay			9	80	3	0
Fakes	1	3	0	82	0	0
Sandstone	1	1	6	83	1	6
Blaes		3	0	83	4	6
Coal		2	0	84	0	6
Faky Fireclay		2	0	84	2	6
Fakes	2	4	0	87	0	6
Faky Sandstone, micaceous		4	0	87	4	6
Sandstone		1	6	88	0	0
Faky Sandstone	1	1	0	89	1	0
Coal		4	0	89	5	0
Fireclay		1	0	90	0	0
Fakes		5	0	90	5	0
Faky Sandstone		2	0	91	1	0
Sandstone		4	6	91	5	6
Blaes		1	10	92	1	4
Coal			8	92	2	0
Faky Fireclay		2	6	92	4	6
Sandstone	8	1	6	101	0	0
Faky Sandstone		1	0	101	1	0
Fakes		1	0	101	2	0
Fakes with irony bands		4	6	102	0	6
Fakes		2	6	102	3	0
Faky Sandstone		1	6	102	4	6
Coal			6	102	5	0
Sandstone	1	0	0	103	5	0
Waste		1	6	104	0	6
Waste, Coal etc		2	6	104	3	0

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STRATA ABOVE FIVE FOOT SEAM

AT MONKTONHALL COLLIERY SHAFTS

Scale	Plan Ref No	February 1998
Not to scale	MID/MON/1/5	Figure 5

APPENDICES

1. Table of Abandoned Mine Plans Inspected

APPENDIX 1

Table of Abandoned Mine Plans Inspected

Catalogue No	Colliery	Seam
S608	Newcraighall	Five Feet
S436	Newcraighall	Nine Feet
	Newcraighall	Salters
S437	Woolmet	Five Feet
	Woolmet	Nine Feet
	Woolmet	Salters
S568	Woolmet	Fifteen Feet
	Woolmet	Salters
S673	Dalkeith	Five Feet
S671	Dalkeith	Six Foot
S743	Dalkeith	Six Foot
	Dalkeith	Nine Foot
S614	Dalkeith	Nine Feet
S2932	Dalkeith	Jewel
	Dalkeith	Beefie
S1943	Dalkeith/ Smeaton/ Elphingstone	Splint and Various Others
S709	Dalkeith	Little Splint
S874	Policies	Jewel
S876	Policies	Beefie

PLATES

1. View of Proposed Borehole Site

View of Proposed Borehole Site