Castle Hills Project

Introduction

The aim of this text is to outline the geological model conducted on the Castle Hill geology and structures located in the area. In which we used geological and structural field data sets of the area such as the eight different f lithologies in the area, grade of Au mineralization, topography, fault systems, mapping data, polylines and the drillhole data modelled in the area. The model created depicts the overall structure of the geology at Castle Hills.

Geological History

- Castle Hills is a structural depression which characterized by the deposition of eight geological units listed from youngest to oldest: The Quaternary sediments, Dolerite, Enys Formation, Amuri Limestone, Coleridge Sandstone, Iron Creek Greensand, Charter's bays Sandstone , Broken Rivers Formation and the Torlessse greywacke which is assumed to be the formation due the fact that it is not in contact with any of the other geological units and with only one drillhole that intercepts the formation. The exposure of an oldest unit on the top suggests an anticline
- The sequences have a general trend to the SW, each unit has a different dip angle in each fault block angles ranging from 48° – 20 °.
- The Castle hills successions were highly compressed which in turn folded the sequences into close - wide folds with a plunge direction of approximately 216.78° and angle of 22°. The compressional event than further created 3 subvertical faults in the area. The geological units are also cut by a dolerite dyke depicted by the drillholes the dyke trends SW-NE and dips NW and the Quaternary Sediments are not affected by faulting.

Table 1:Fault systems in model

Fault	Trend	Fault type	Dip direction and dip
Cheeseman Fault	Trends North, SE the central area.	Sinistral Fault strike slip fault.	Eastly at 68°
Craugieburn Fault	NE-SW	Reverse fault	NE at 85°
Sugarloaf Fault	NE-SW	Reverse Fault	NE at 85°

Data Processing

- Drillholes – drillhole were displayed on the model using the drillhole in which was exported into to Leapfrog. In the assay, the data type was changed to numeric.

Table 2: Corrected Errors in imported Data

Data	Error	Correction
Survey	Hole id not in collar table	Ignored
	Collar maximum depth exceeded	Set to maximum depth
Assay	Overlapping segments	Corrected overlapping intervals and ignored segments that did not comply with interval pattern
	No sample for collar warning	Warning not disruptive to data set
	Invalid value handling	Omitted missing intervals
Lith	Hole ID not in collar table	Ignored row

	From depth > = to depth	Ignored the row 196 and 14
	Collar maximum depth exceeded	Set maximum depth
	No sample for collar - warning	Warning not disruptive to data set
	Overlapping segments	Corrected overlapping intervals

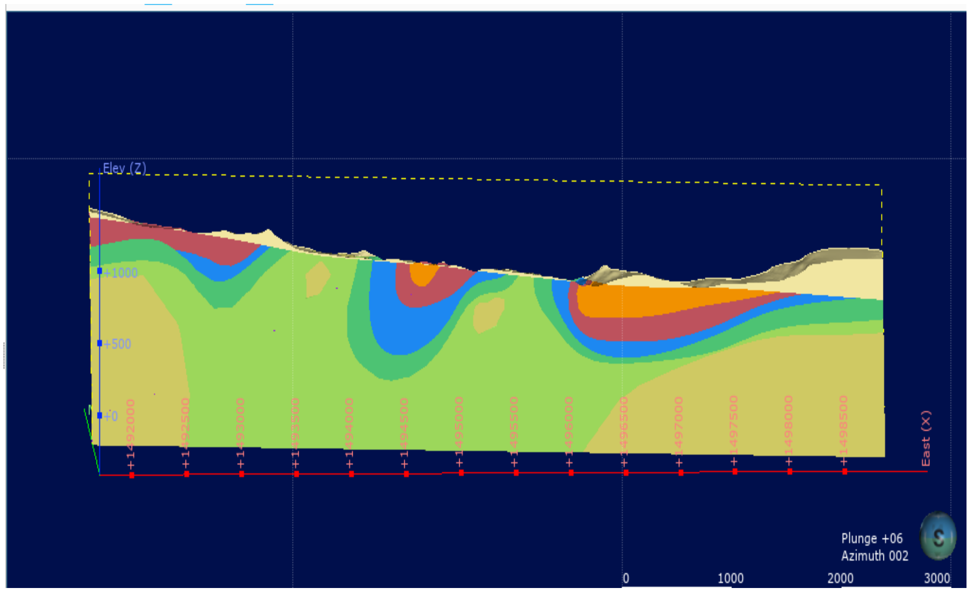
- Topographic data - Topographic mesh was imported into Leapfrog which provided elevation and boundary extents for the model.
- Structural data – was provided in which consisted with faults plots data that was processed and grouped into different faults groups before imported into leapfrog.
- Geological modelling – topography was used to set the boundary and elevation of the model. Geological units were then created from drillhole data from youngest to oldest. Fault systems were also activated in the model. Polylines were added to the appropriate lithology contacts.

Table 3: How different geological units were added to the model

Geological Unit	Data	Surface chronology type	Additional parameters
Quaternary Sediments	Base lithology from drillhole data	Erosion	none
Dolerite	Base lithology from drill hole data	vein	Lithology dlrt was grouped with lithology dolerite to create the vein

Enys Formation	Base lithology from drill hole data	deposit	Enys formation – Amuri Limestone contact, polylines added
Amuri Limestone	Base lithology from drill hole data	deposit	Amuri – Coleridge Sandstone contact, polylines added
Coleridge Sandstone	Base lithology from drill hole data	deposit	Coleridge – Iron Creek contact, polylines added
Iron Creek Greenstone	Base lithology from drill hole data	deposit	Iron Creek – Charters Bay sandstone contact.
Charter’s Bay Sandstone	Base lithology from drill hole data	deposit	Charter’s Bay – Broken rivers contact
Broken River Formation	Base lithology from drill hole data	deposit	none
Torlesse Graywacke	Base lithology from drill hole data	deposit	Added as background

Table 4: Cross section of modelled lithologies



- Numeric Model – Numeric model was constructed using assay drillhole data on the Au grade. The model consisted of a low-grade Au cut off value <0.3 g/t. And a high-grade Au cut off value of <1.3 g/t.

Table 5: low grade Au model

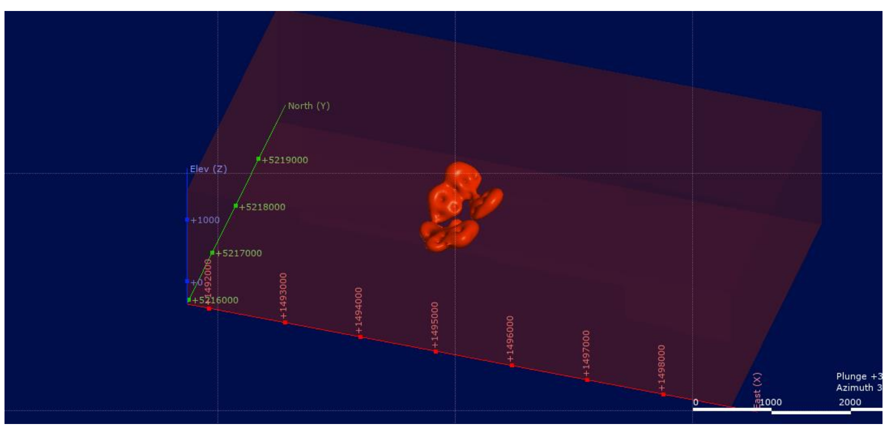
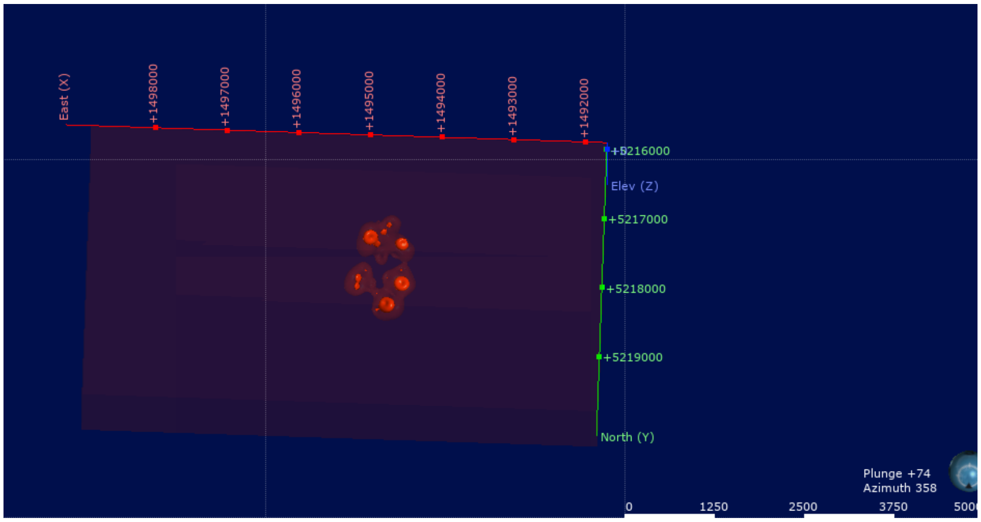


Table 6: high grade Au volume refined in low grade Au volume.



Questions

1. The lithological control of the Au mineralization is the Amuri limestone and the Coleridge Sandstone because they have the highest Au grade. Amuri Limestone with the highest mean of 0.42 g/t and Coleridge Sandstone with 0.105 g/t. The structural control of the Au mineralization is the compressional event that took place and created the Sugarloaf fault the Au ore body is cut by the fault indicating the that the mineralization occurred during the fault formation.

Name	Count	Length	Mean
grade	12,166	12,209.9	0.277
Amuri Limestone	6,597	6,581.2	0.428
Coleridge Sandstone	4,556	4,604.0	0.105
Charter's Bay Sandstone	20	19.9	0.101
Iron Creek Greensand	101	114.5	0.080
Quaternary Sediments	125	116.7	0.076
dolerite	401	420.2	0.074
Enys Formation	105	97.3	0.073

Table 7: Table representing the Au grade means in the different lithologies.

3. Limestone specific gravity = 2.7kg/m^3

Sandstone specific gravity =2.7 kg/ m^3

Low grade volume = 1527491160.1 m^3
Tonnage
1527491160.1 x 2.7=4124226132 kg
High grade volume = 15592973.1318 m^3
Tonnage
15592973.1318 m^3x 2.7 = 42101027 kg.

4.

Drill hole	Depth(m)
Phase_001	500
Phase_002	350.17
Phase_003	300
Phase_004	250
Phase_005	400
Phase_006	200
Phase_009	400.5

Table 8:Planned drillholes

Total depth of Drillholes = 2400,67 metres

Total cost of drilling = 2400,67 x $200 = $480134

Change $19866

<u>Reasoning</u>

As I mentioned earlier that the control of the Au mineralization is the result of the fault system in which can provide a provide a pumping system that would allow the flow of Au rich fluid complexes. Limestone can go through Karstification providing spaces for fluid flow and the deposition of gold. From the imported drillhole data I observed that the gold ore is concentrated on the limb of the syncline. The gold deposit is a characteristic of a orogenic gold deposit, whereby deposition occurs between a limestone and sandstone contact (Robb, 2005). Hence planned drillholes are located near the central fault below the Amuri limestone and close to the fold limb.

References

Robb, L.J. 2005. *Introduction to ORE-FORMING PROCESSES*. 1st ed. Malden: Blackwell Science Ltd.