

**Northern Quarries (788) Iron Deposit
Cuprona-Natone Iron Trend.
North West Tasmania -
Resource Estimate – remodelling June
2017**

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Executive Summary

Resource

An Inferred Resource has been re-estimated for the Northern Quarries (788) hematite deposit at Cuprona in northwest Tasmania utilising recent drill and historical drill and channel sample data and adding new structural data.

The total resource stands at **4,506,180t at 41.13% Fe** (and 34.15% SiO₂).

The resource is not likely to be viable beyond moderate depths at current metal prices. The 30m pit option chosen contains a total resource is **947,248t at 47.72% Fe** (and 27.12% SiO₂).

The resource is classified as Inferred on the basis of

1. the use of historical data from four sources with inherent potential positional inaccuracies in sample location, and
2. non-existent or inadequate QA/QC.
3. mixed data (four) sets with no field duplication.
4. use of dummy assay data

Geology and Assay Data

The Northern Quarries (788) hematite deposit is a northeast striking, approximately 45°-70° southeast dipping, body of stratabound massive hematite+/-silica hosted in a sequence of Cambrian sediments. The deposit lies at the northeastern end of the Cuprona – Natone Iron Trend.

As modelled the deposit has a strike length of 430m (open ended along strike), vertical extent of 120m (open ended down dip) and a thickness that ranges from 10m to 30m.

The deposit was apparently discovered in ~1891 and prospected in the 1890's with some limited production (some small parcels of ore were also mined during the Second World War), and has been described by a number of government and industry geologists.

In 1919 the Commonwealth Government carried out systematic sampling with a view to purchasing the deposit (Boyd *et. al.*, 1919). They sampled the deposit in six surface trenches and the Upper Tunnel in the Northern Quarries (788) area, as well as the outcrop and workings on either side of the Blythe River, with their sampling considered of sufficient quality for inclusion in this estimation.

In the mid 1960's the Mines Department drilled three drill holes beneath the deposit with two considered worthy of sampling (BR1 and BR3).

In 1988/89 CW Davis carried out a 28 hole (for 252m) airtrack percussion drilling programme in the central portion of the deposit.

In 2015 Lottah Mining drilled four diamond and three reverse circulation drill holes into the deposit.

These four data sources constitute the assay sample data used in the estimation.

In this estimation dummy assay grades were assigned to 22 samples from Lottah drillholes 15CUN005DD and 15CUN008DD which were incompletely sampled. 7% Fe was utilised as it was determined to be adequately low enough.

Data Quality

The data used in the estimation is limited and of variable quality hence the Inferred status.

Early sampling by Boyd *et. al.* (1919) and Noldart (1966) has no laboratory QA/QC reported but appears to be of acceptable quality and has been used with caution. Lottah Mining Pty Ltd's sampling is of current industry standard.

However, the low positional accuracy of the trenches sampled by Boyd *et. al.* (1919) and similarly collar locations for government drill holes BR1 and BR3 and CW Davis airtrack holes means the orebody wireframe has a lower confidence level.

Further work to address this deficiency is detailed below but includes locating and surveying collars to Br1 and BR3, further assaying and field duplicating some of Boyd *et. al.*'s (1919) channel sampling and the CW Davis (Whitehead, 1989) drilling.

Estimation and Block Model

Modelling was done in SURPAC. A 045° oriented model with 10mY x 5mX x 10mZ blocks and sub-blocking to 2.5mY x 1.25mX x 2.5mZ was generated.

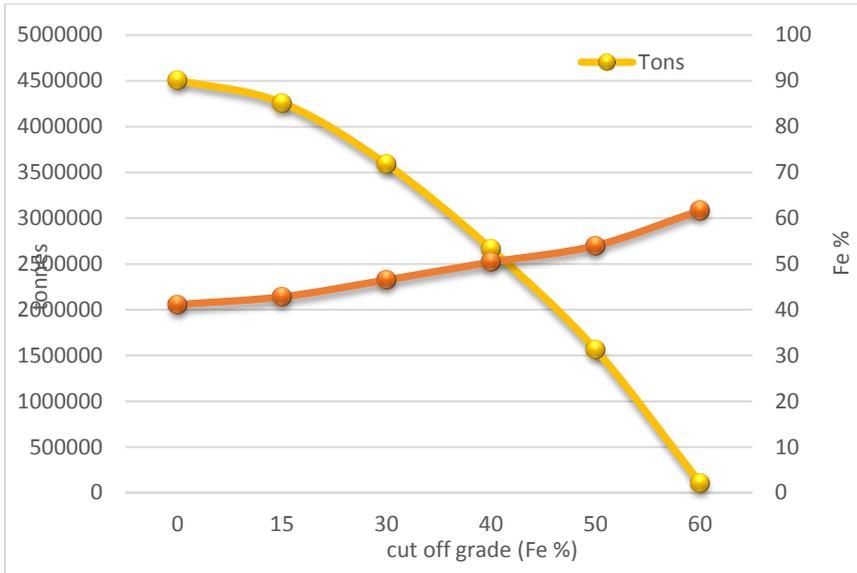
Due to recognised deficiencies in the data set estimation was by Inverse Distance Squared. Three passes were made with a 045° striking, -45° southeast dipping ellipse utilised with major/semi-major axis ratio of 2:1, major/minor axis ratio of 1:1, minimum 3 samples and maximum 15. Three passes were made, 100m x 50m x 50m, 50m x 25m x 25m and 20 x 10m x 10m.

Specific gravity used was determined by assuming the ore is a variable mix of silica or hematite alone and then using the estimated Fe block grade (and thus Fe₂O₃) and SiO₂ content to calculate a specific gravity for each block in the block model.

Discrete higher grade zones are recognisable in drill hole intersections and may be selectable in the mining process. Due to insufficient data and positional inaccuracies hard sub-domaining of these high grade zones was not attempted.

At various cut-off grades the block model reports the following tons and grades for the total resource.

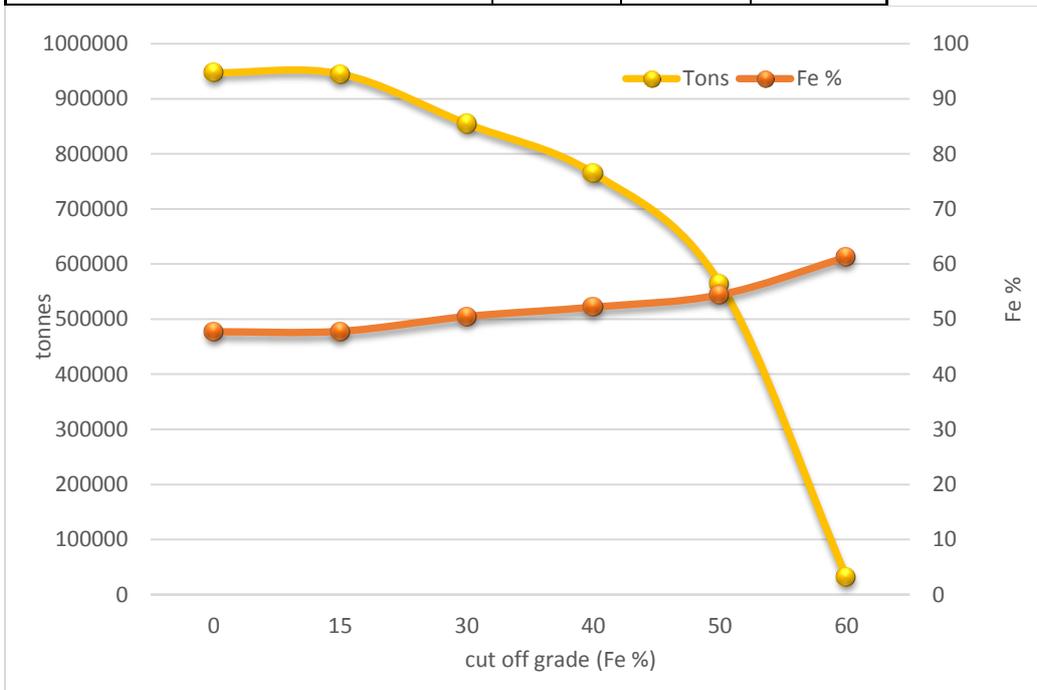
Cut Off Grade Fe %	Tons	Fe %	SiO ₂ %
0	4506180	41.13	34.15
15	4261362	42.81	33.1
30	3589741	46.51	30.09
40	2664424	50.39	25.51
50	1564495	54	20.72
60	106075	61.68	9.11



Total resource tons and grade chart

The expectation with current metal prices is that the resource will not be viable to the full depth as modelled. It is much more likely that only the shallower parts of the resource are viable. A 30m deep pit option has been modelled and queried and will form the basis for initial mine planning.

Cut Off Grade Fe % 30m pit option	Tons	Fe %	SiO2 %
0	947248	47.72	27.18
15	945172	47.8	27.02
30	854549	50.49	24.45
40	764913	52.18	22.99
50	564920	54.42	20.52
60	31607	61.25	9.89



Tons and grade – 30m pit option.

Potential for Extensions and Additions to Resource

The Northern Quarries (788) deposit lies towards the northern end of the Cuprona – Natone Iron trend with further hematite deposits known from both sides of the Blythe River (River Zone) and further southwest at Natone. Much of the trend remains obscured by a veneer of Tertiary aged basalt and so the trend has only been explored in a few places.

Limited historic sampling (Boyd *et. al.* 1919) in the River Zone has shown the hematite body to be up to 16.7m wide and assaying up to (all intervals true widths)

- 9.1m @ 54.3% Fe (Cut K),
- 7.6m @ 50.2% Fe (Cut J), and
- 16.7m @ 45.8% Fe (Cut N Yellow Crag).

The Purple Crag deposit has historically (Boyd *et. al.* 1919) assayed (all intervals true widths)

- 9.45m @ 64.4% Fe (Cut N) and
- 6.1m @ 67.1% Fe (Cut M).

At the Rutherfords (or Kiwis) deposit at Natone limited drilling in an area of 200m x 200m has intersected grades up to (all intervals down hole lengths)

- 29m @ 66.1% Fe (Natone 2),
- 20m @ 55.5% Fe (KWRC005), and
- 13m @ 58.5% Fe (R001).

There is excellent potential to add to the current hematite iron resource base in EL 6/2005.

Further, the recognition that the hematite bodies are likely to be of primary sedimentary origin, as opposed to some form of structural control, is highly encouraging as it expands greatly the area of potential

Recommendations

Northern Quarries (788) Resource - upgrade to Indicated status

- Detailed survey drill hole collars, outcrops, trenches.
- Field duplication of early trench sampling with extra trenching where possible.
- Re-log drill core and re-map outcrop to generate modern geological map.
- Sample missing intervals.
- Infill and step out drilling on 50m x 25m pattern with all holes oriented to the southwest.

Northern Quarries (788) extend resource (to north east)

- Step-out trenching and drilling to northeast particularly where iron scree mapped in historic mapping.

River Zone

- Detailed survey drill hole collars, outcrops, trenches and detailed geological mapping
- Further sampling with trenching and channel sampling where possible, drilling where required.
- Step out drilling to south west along strike from Yellow Crag, Purple Crag and Eastern Crag.

Basalt cover

- Determine thickness of basalt and model.
- Drill broad spaced fences of holes across favourable stratigraphic host.

Rutherfords (Natone) define resource

- Detailed survey drill hole collars, outcrops, trenches.
- Surface trenching on 25m sections (where possible) and infill drilling on 50m spaced sections as fences across the two parallel zones (with some fences also crossing the central zone).

- Geological remapping/relogging/reinterpretation of all drill holes to generate new geological map.

Rutherfords (Natone) define resource

- Step-out drilling to northeast and southwest along both parallel zones following stratigraphic host unit. Particularly southwest from drill hole Natone 2's intersection of 29.5m @ 66.1% Fe (down hole length) and R003's 13m @ 58.5% Fe (down hole length).
- Consider existing geophysical (gravity) and soil geochemical data (Cu, Sn and W) for ground to northeast and southwest and target relevant anomalies

Regionally

- Target the stratigraphic unit which hosts the hematite bodies, i.e. Cambrian siltstone beneath the Duncan Conglomerate, regionally.

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1.0 Introduction

This report, on behalf of Lottah Mining Pty Ltd, updates, revises and supercedes the previous modelling and estimation in MacDonald (2016).

In particular the new estimation details is based on

- re-wireframing of the orebody with the addition of new structural information removing previous ambiguities.
- including Whitehead (1989) airtrack drill samples
- adding dummy samples into Lottah drillholes 15CUN005DD and 15CUN008DD.

The Blythe River Iron deposits occur as a number of discrete hematite+silica bodies on either side of the Blythe River near Cuprona, 8km's inland from Burnie on Tasmania's northwest coast (see figure 1.1).

The deposits define a 2km long north-west striking linear trend of such hematite+silica bodies. The trend is obscured over a distance of $\sim\frac{1}{2}$ km in the middle by Tertiary basalt. The Northern Quarries (788) deposit is the northernmost of these bodies and has seen the most sampling and drilling (see figures 1.1 and 3.1).

South of the basalt the outcropping mineralised zone is called the River Zone which includes the River and Middle Tunnels on the northern slopes and the Yellow, Purple and Eastern Craggs on the southern banks of the Blythe River (see figures 1.1 and 3.2).

The hematite mineralised trend continues to the southwest beneath basalt cover before emerging with the Rutherfords iron deposits at Natone. The hematite mineralised trend is known as the Cuprona-Natone iron trend (see figure 1.1).

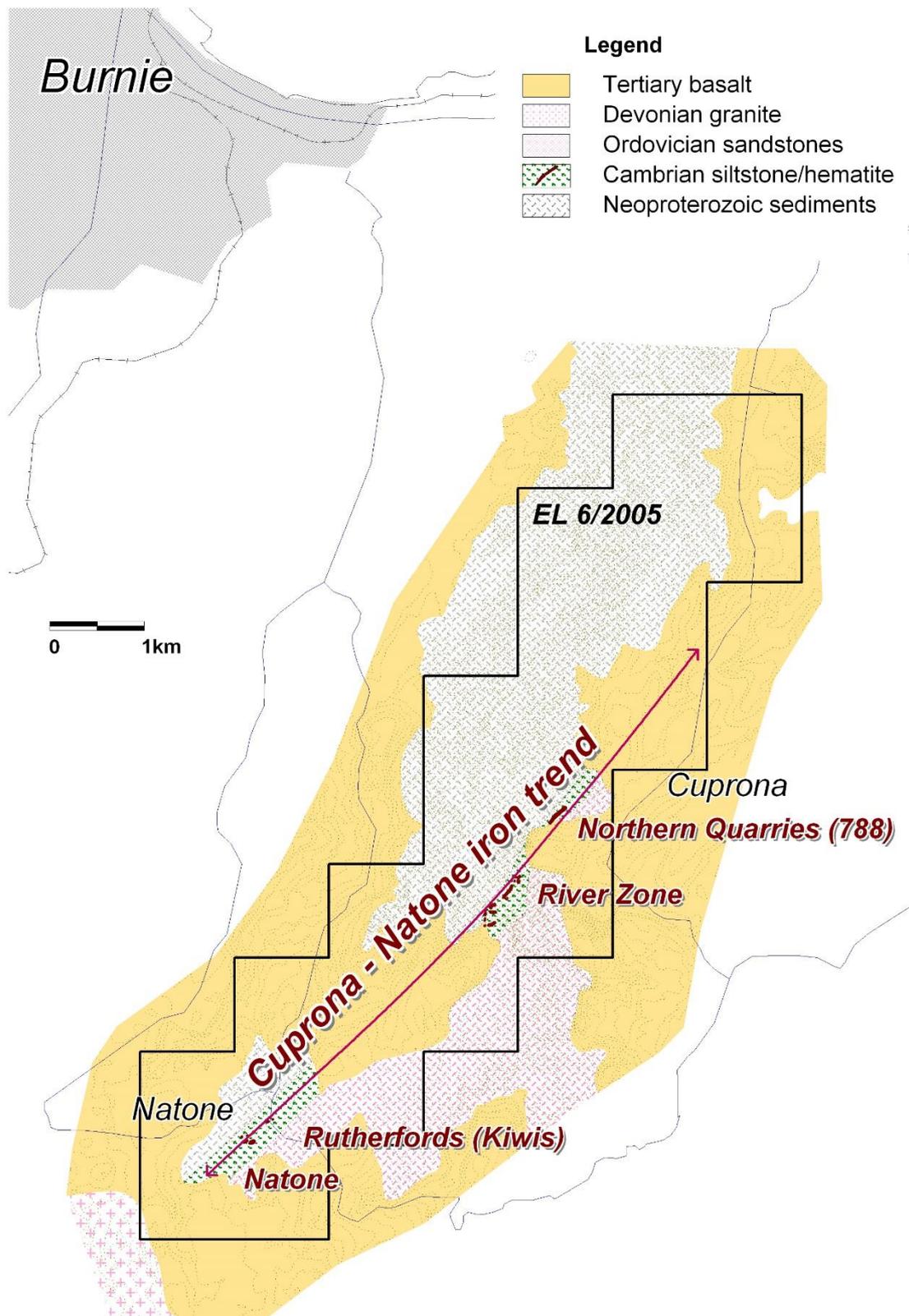


Figure 1.1: Cuprona-Natone iron trend, EL 6/2005, Northwest Tasmania.

2.0 Project background

2.1 Prospecting, Mining, Exploration History –

Outcropping hematite and limonite on the slopes of the Blythe River at Cuprona were apparently discovered sometime just prior to 1891 as the first mineral leases, in the names of R. Quiggin and W. Jones.

Government geologist A. Montgomery made a superficial examination of the deposit during his visit on 16th January, noting that at the time the deposit was “in no way opened up by cuttings or mining works of any sort” thus impeding his ability to fully appraise the deposit (Montgomery, 1894) but was impressed by the high quality (citing an assay by the government analyst Mr W.F. Ward at 66.5% Fe with 4.8% Si and only a trace of phosphoric acid), large volume (he estimated ~30 million tons) and potential vertical and lateral persistence.

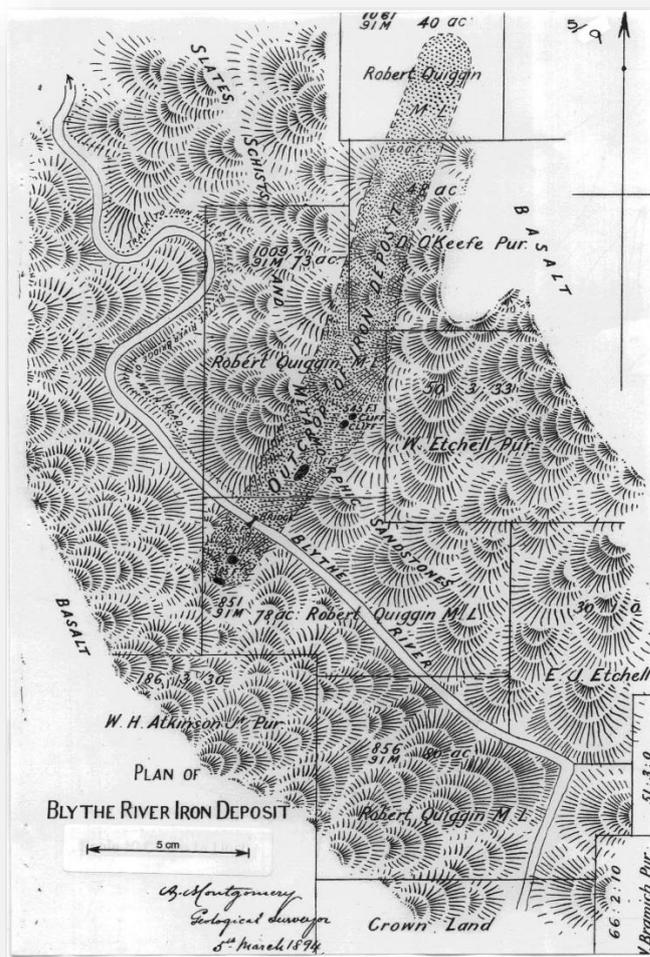


Figure 2.1 First geological map of the deposit, Montgomery (1894).

In the first few years of its existence this company carried out prospecting works in the form of an adit (Central adit) and trenches in an effort to prove the value of the deposits, and also reportedly quarried 1,000 tons of ore from the most northerly outcrop for testing (Blake, 1957). Other works consisted of the survey of a railway route, over a distance of six and a half miles, connecting the deposits with the Government railway line at the mouth of the Blythe River. A limited amount of grading construction was later commenced but the line was not completed.

Quiggins and Jones (and O'Keefe) sold their tenements to a newly formed mainland(?) company Blythe River Iron Mines Limited in 1900 who despatched Mr J.H. Darby who briefly described works at the time as consisting of the driving of two tunnels (Upper i.e. northern, and Lower i.e. southern) to cross-cut the orebody (Darby, 1900). Darby detailed the results of samples he collected with average Fe of 66.5%. Darby reported his rough estimate of total ore as 24.5 million tons using an s.g. of 3.0 tons per cubic yard and after removing 50% of the total volume of the deposit as internal waste.

Government geologist Twelvetrees (1901) visited the prospect in 15th June, 1900 and 9th and 10th January, 1901 at the point of near completion of the Upper and Lower (or River) Tunnels described by Darby (1900). Twelvetrees (1901) gives the first detailed description and interpretation of the deposit, produced a detailed geological map, and sampled Darby's Upper and Lower Tunnels and selected outcrops with an average assay of 63.9% in the Lower Tunnel and 64.1% in the Upper Tunnel and Quarry.

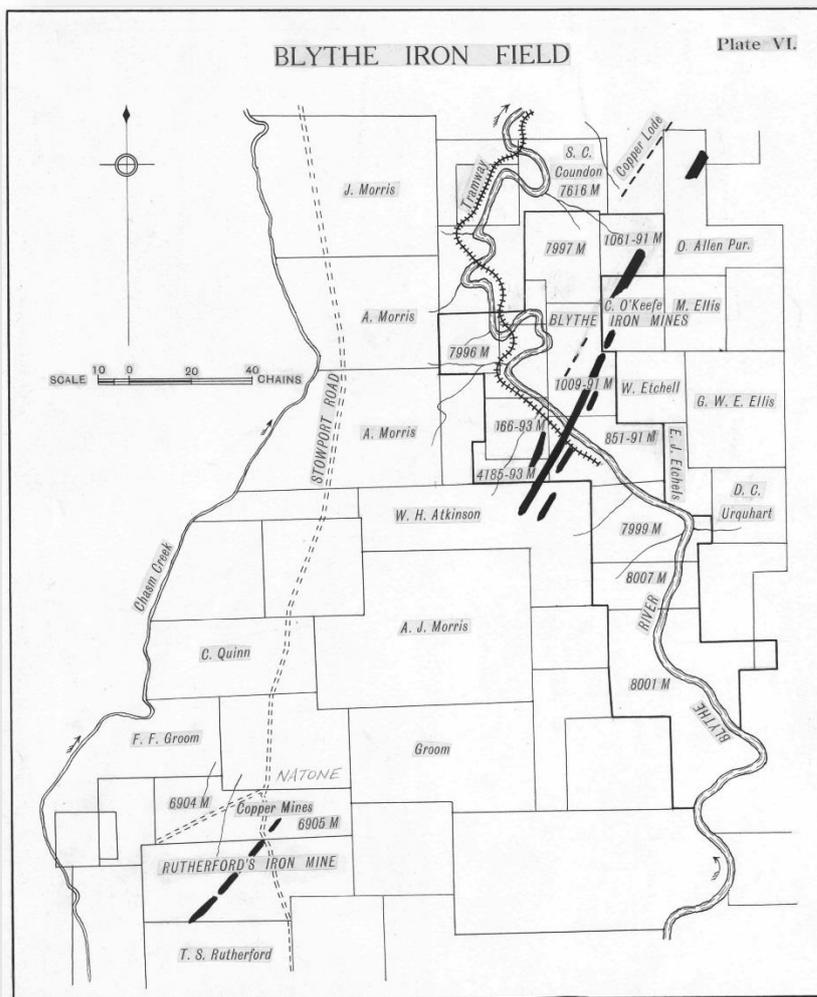


Figure 2.2: Twelvetrees (1919) plan.

Twelvetrees (1901) described the deposit as 'a huge outcrop of hematite iron ore, which runs N. 27° E., and S. 27° W. for an observed distance of over a mile ... conformable, both in strike and dip, with sedimentary rocks of the Cambro-Silurian system. Its strike is slightly sinuous, following the direction of the edges of the enclosing beds.' He too was impressed with the quality, size and potential persistence of the deposit estimating a resource of 2,791,000 tons, using an s.g. of 4.75 and assuming 50% internal waste (by volume).

It appears that little more was achieved and in 1919 Blythe River Irons Mines Limited offered the rights of purchase of the property to the Commonwealth Government who appointed Boyd, Gibson and Young to make an investigation of the deposit.

Boyd *et. al.* carried out a programme of systematically sampling essentially all exposed rock faces including the three tunnels. They also carried out detailed surveying of the workings and outcrops and sample locations generating a scaled long section and plan. Boyd *et. al.* concluded that ‘the bulk of the deposit is far too siliceous to be considered as an iron ore at the present day, and that the quantity of good ore is too small to be considered of any economic importance’. Boyd *et. al.* estimated that the deposit contained only 9,000,000 tons of iron bearing material and recommended that the Commonwealth Government not purchase the leases.

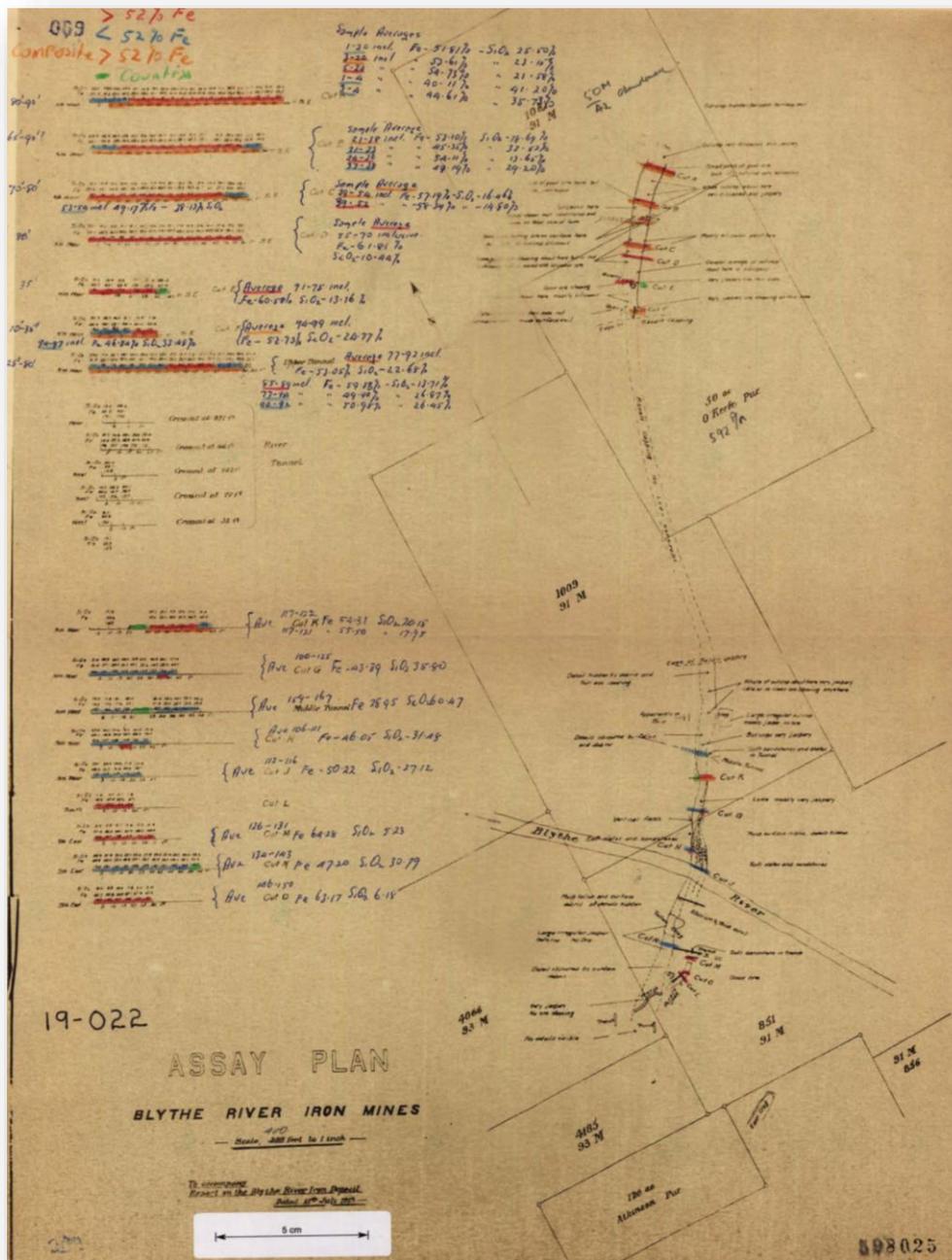


Figure 2.3: Boyd *et. al.* (1919) sampling plan with hand drawn notation.

J. D. Patterson purchased the leases in 1936.

In 1937 government geologist Mr P.B. Nye investigated the discrepancy between the descriptions of the quality and quantity of ore made by Montgomery (1894), Darby (1900) and Twelvetrees (1901), and those made by Boyd *et. al.* (1919) concluding that the former descriptions considered the total resource of the deposit whilst Boyd *et. al.* considered the probable mineable reserve of the deposit, a much harsher assessment. Nye comes up with 7 million tons using Boyd *et. al.*'s work but querying their conclusions in some areas.

In 1940 the Australian Commonwealth Carbide Co. Ltd. acquired Lease No. 322P 1M of 50 acres at the northern end of the deposits in the vicinity of Cuprona and in the early 1940's quarried and despatched 3.408 tons of iron ore for the production of ferrosilicon at its Electrona works at Snug (Thomas and Henderson, 1943). Whilst not detailed in any reporting it would appear that work had petered out by war's end.

In the 1950's renewed interest in iron ore exploration led to airborne magnetic surveys and ground follow-up. The Blythe River iron deposit was included in this ground follow-up work in 1957 with a grid established and magnetic survey conducted. Government geologist F. Blake mapped the grid and generated a plan and series of interpretative sections (Blake, 1958).

Atkinson (1958) also mapped the deposits in his investigation of the iron deposits in the Burnie-Penguin area.

Further Tasmanian government mapping was carried out by Gee in the early 1960's as part of his regional mapping of the Burnie quadrangle (Gee, 1967; Gee, 1977).

The Burnie quadrangle was geologically mapped in the years leading up to the publication of the map in 1967 (Gee, 1967) and explanatory notes in 1977 (Gee, 1977).

Detailed work at Cuprona due to the perceived potential regional significance of the deposits resulted in a three hole diamond drilling program at the Northern Quarries (788) deposit (Noldart, 1966) in 1965/66.

Intersections were made by the three drillholes. Drillhole BR1 intersected a (geologically determined) true width of mineralisation of approximately 24m assaying 45.3% Fe and 36.6% SiO₂ (from a depth of 38m); BR2 intersected a 20m true width of mineralisation (from a depth of 24m) but poor core recoveries meant it was not assayed; and BR3 intersected 27m of mineralisation at 26.6% Fe and 57.6% SiO₂ from 17m. Noldart concluded that the orebody in the northern part does not improve with depth and no further work was recommended there with work to be concentrated to the south of BR1 up to and below the Tertiary basalt cover.

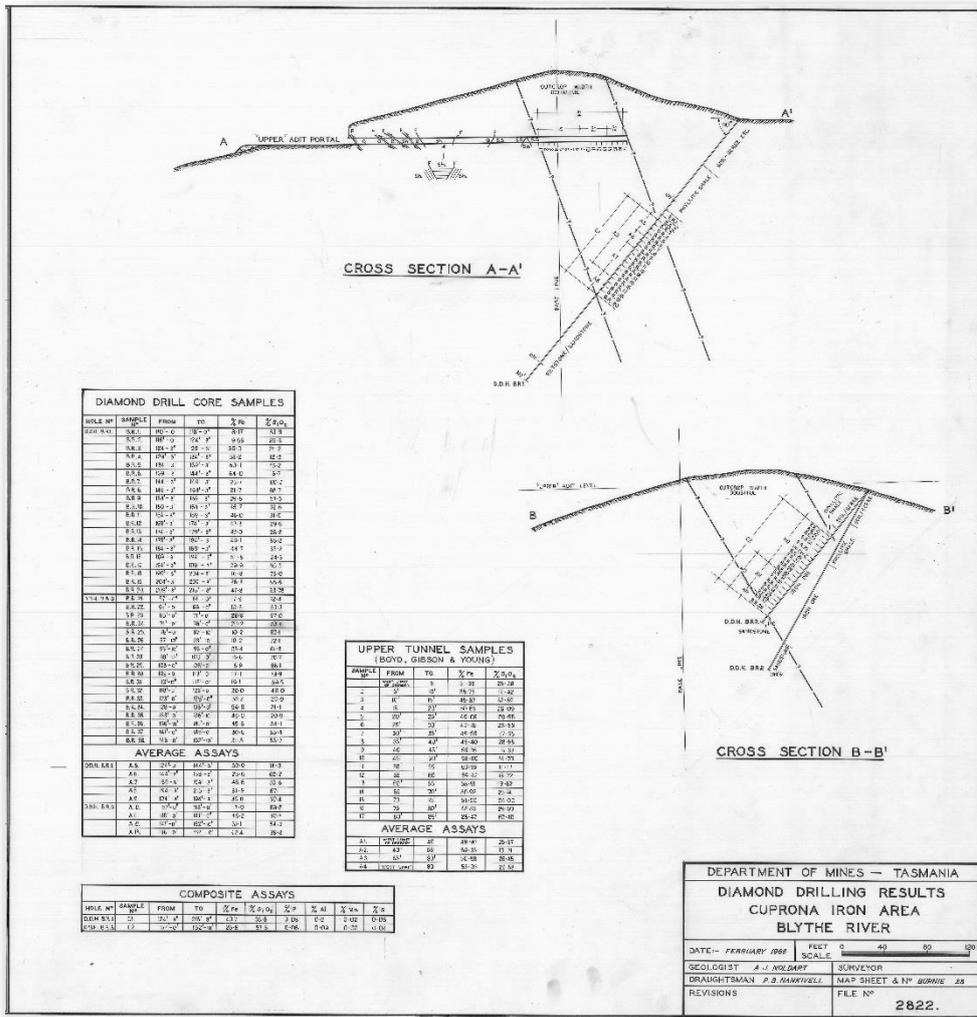


Figure 2.5: Drill section BR1/Upper Tunnel (section A-A') and BR2 and 3 (section B-B') at the Northern Quarries (788) deposit (after Noldart, 1966).

During the late 1960's through to the mid 1990's most exploration in the area switched from iron ore to base metal skarns that may have formed in favourable lithologies within the Onah Formation from fluids derived from the Housetop Granite.

From 1968 to 1972 the deposits were held by Minops under their EL's 13/68 and/or 14/68 in the Blythe River but their work focussed on the Natone area.

From 1969 to 1974 a Tasminex/ANZECO joint venture held the deposits under EL 1/69 but their work focussed on the Natone ironstone and Rutherford's copper prospect.

From 1977-1985 the deposits were held under EL 8/77 by a regionally focussed Comalco/Shell/CRA joint venture who carried out quite extensive regional work as well as focussed work looking for tungsten deposits.

In 1982 Shell followed up aeromagnetics anomaly 4414/1 (Banwell, 1981; Ruxton, 1982). Due to analogies with ironstones at Natone the anomaly at Cuprona was originally thought due to the ironstone bodies and a grid established accordingly, however, after final aeromagnetic data was

received it was found that the anomaly was not centred on the ironstones, but on two hills slightly to the south (Banwell, 1981).

The grid was soil sampling with 119 samples analysed for Cu, Pb, Zn, Ni, Fe, Mn, Sn and W, and a ground magnetics survey undertaken. Low order anomalous Sn, W and Cu in soils coincide with the ironstone outcrop (Banwell, 1981). The ground magnetic survey showed a poor response over the ironstones.

A single vertical percussion hole centred at approximately 2050mN 1675mE was drilled for 200m into the main magnetic anomaly (Banwell, 1981; Ruxton, 1982). The hole intersected Tertiary basalt from 0m to 132m, Tertiary alluvium from 132m to 146m and shales (Burnie Formation?) from 146m to end of hole at 200m.

In 1986 C.W. Davis pegged the deposits under EL 30/86. In 1988/89, the second year of the licence, a significant body of work was completed on the Northern Quarries (788) deposit at Cuprona with the drilling of 28 airtrack (i.e. "open" hole percussion) drill holes from 6m to 20m in depth to a total of 252m on a series of sections over a strike length of 180m (Whitehead, 1989).

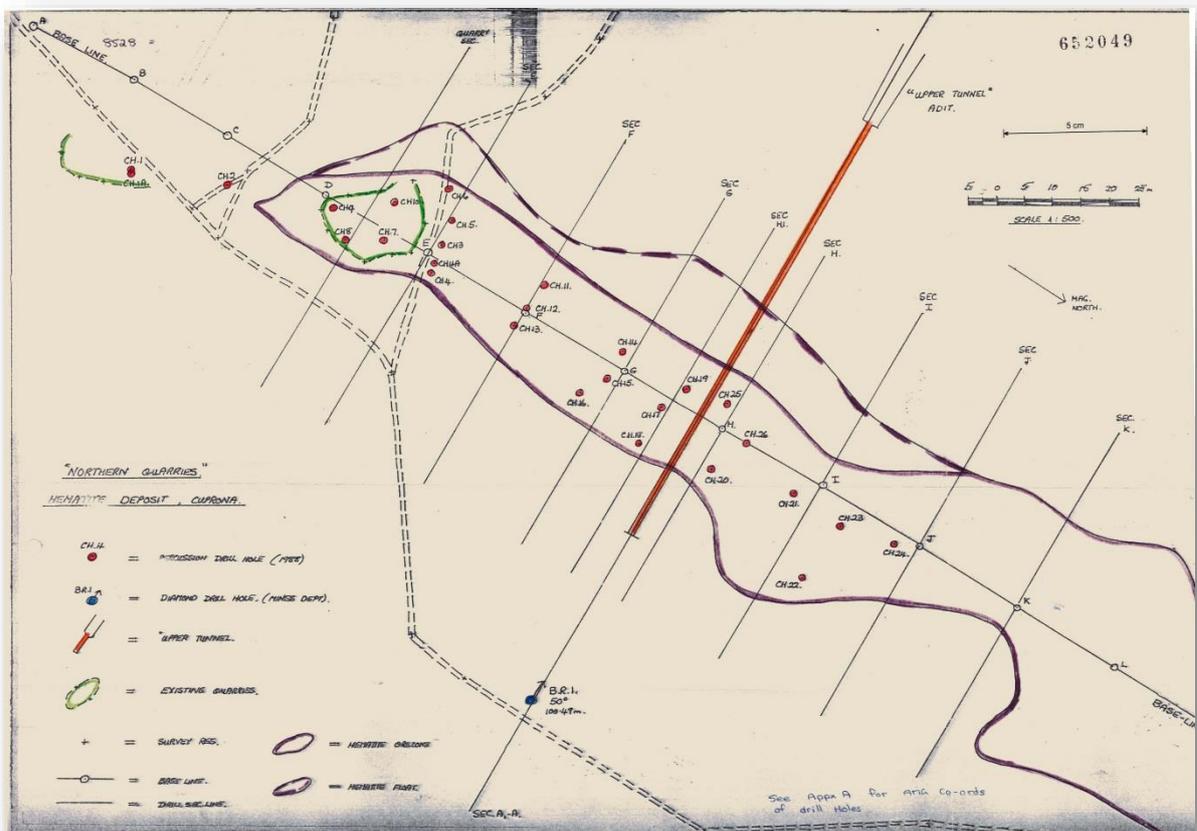


Figure 2.6: C.W. Davis airtrack drill locations – Northern Quarries (788) deposit (Whitehead, 1989). North (incorrectly oriented) as to the lower left.

‘Measured Mineable Reserves’ (as per the usage of Whitehead, 1989) of 74,989 tonnes at an average grade of 78.92% Fe₂O₃ (to a mining depth of 20 metres) were calculated (using a polygonal sectional method) over a 180m strike length, with additional ‘Indicated Geologic Reserves’ of 172.645 tonnes (to an approximate mining depth of 30 metres) and additional ‘Potential Geological Reserves’ (down to a drilled depth of 65m) of 1,170,000 tonnes (Whitehead, 1989).

Unable to attract investment capital they relinquished the ground.

From 1993 to 1995 the deposits were included in EL 9/92 by Pasminco who reviewed the regional geological setting, flew airborne magnetics/radiometrics, and collected and analysed rock chip samples from a large number of prospects.

In 2005 the deposits were pegged under EL 6/2005 by RedRiver Resources Limited under their Blythe Project (Karajas, 2006) with a principal aim to evaluate the mining potential of hematite/quartz bodies in the Blythe River valley at Cuprona with a similar potential inferred for hematite/limonite near Natone and for copper mineralisation within the permit area.

Work identified additional potential for magnetite iron ore as well as for IOCG (iron oxide-copper-gold) style mineralisation associated with aeromagnetic highs and attention shifted elsewhere (Karajas, 2007; Foster, 2007; and Mortimer, 2007, with Iron Mountain Mining Limited joint venturing into the project and managing it on 2nd November 2007 (anon. 2008; Kusnandar *et. al.* 2009; anon, 2010; and Kusnandar *et. al.* 2010).

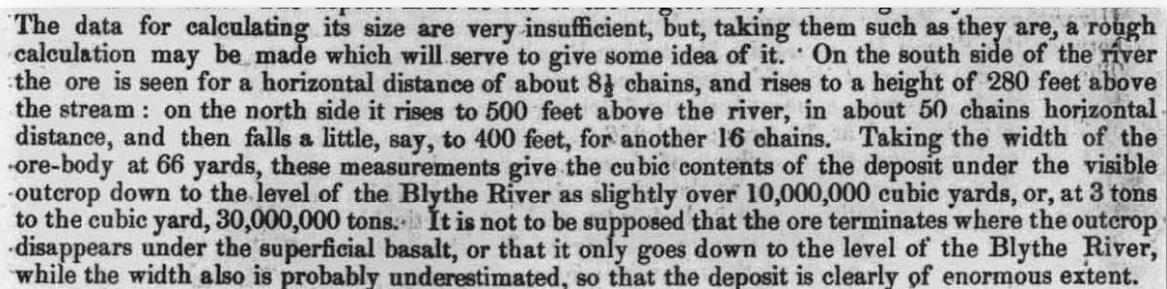
In 2012 Forward Mining Limited purchased the Blythe Project from the RedRiver Resources Limited/Iron Mountain Mining Limited joint venture.

In 2015 Forward Mining drilled 11 RC (for 1421m) and 5 diamond holes (for 454.8m) into the Northern Quarries (788), Eastern Crag and Purple Crag deposits as well as testing the trend between the Northern Quarries (788) deposit and the Central Tunnel Deposit.

2.2 Previous resource estimates

Essentially every geologist who has visited the deposit has attempted a rough calculation of the total resource. Early estimates (up until Whitehead, 1989) have considered both the Northern Quarries (788) and River Zone on both sides of the river. Whitehead (1989) estimates only the Northern Quarries (788) deposit.

Montgomery in 1894 reported the result of an early government sample of 95.2% Iron Peroxide (itself constituting 66.4% Fe i.e. 63.2% Fe, with 4.8% Si and a trace of phosphoric acid. He roughly estimated a total tonnage of 30 million tons using a density of 3.0 tons/cubic yard and using the following justification



The data for calculating its size are very insufficient, but, taking them such as they are, a rough calculation may be made which will serve to give some idea of it. On the south side of the river the ore is seen for a horizontal distance of about 8½ chains, and rises to a height of 280 feet above the stream: on the north side it rises to 500 feet above the river, in about 50 chains horizontal distance, and then falls a little, say, to 400 feet, for another 16 chains. Taking the width of the ore-body at 66 yards, these measurements give the cubic contents of the deposit under the visible outcrop down to the level of the Blythe River as slightly over 10,000,000 cubic yards, or, at 3 tons to the cubic yard, 30,000,000 tons. It is not to be supposed that the ore terminates where the outcrop disappears under the superficial basalt, or that it only goes down to the level of the Blythe River, while the width also is probably underestimated, so that the deposit is clearly of enormous extent.

(Montgomery, 1894)

In 1900 Mr J.H. Darby assessed the deposit between 12th and 28th September 1900 for a mainland company named Blythe River Iron Mines Limited and roughly estimated 24.5 million tons using a specific gravity of 3.0 tons per cubic yard, after removing 50% of the total volume of the deposit as internal waste.

Twelvetrees (1901) makes his calculation down to river level and over a strike length of 5940' and assuming 50% internal waste calculates 17,291,000 tons of marketable ore (no grade cited) but then qualifies this estimation by saying a 33% internal waste might be applied resulting in 23,000,000 tons.

Boyd *et. al.* (1919), acting as agents on behalf of the Commonwealth Government who were considering buying the deposit, made a more studied assessment determining a 8,834,000 tons at a

cut off grade of 12% SiO₂ and using a specific gravity of 12 cubic feet per long ton for low grade ore and 10 cubic feet for high grade ore.

They calculated 12,000 tons for the Purple Crag outcrop using 200' long x 30' wide x 20' thick i.e. as a float.

Nye (1937) did no new work during his brief visit and calculated 7 million tons essentially using Boyd *et. al.*'s work but querying their conclusions in some areas.

Atkinson (1958) remapped the area and commented that the "observations made by the author appear to substantiate the low estimate of Boyd, Gibson and Young."

MacDonald (1965) appraised the project for Kathleen Investments and cites two earlier references Dickenson, 1961 and Ridgway, 1964) with the latter estimating 1.9 million tons at 52% Fe. MacDonald (1965) bases his preliminary feasibility costings on a resource of 1,250,000 tons of 52% Fe material and uses a body of dimensions of 700' long, 88' wide and to a (nominal) depth of 200'. He notes that the success of the operation would depend on proving this resource with mapping, surface sampling and diamond drilling.

In 1989, following completion of the airtrack drilling programme for C.W. Davis, Whitehead (1989) made a pre-JORC 2012 polygonal estimate of the Northern Quarries (788) deposit as follows;

'Measured Mineable Reserves' (as per the usage of Whitehead, 1989) of 74,989 tonnes at an average grade of 78.92% Fe₂O₃ (to a mining depth of 20 metres); and

'Indicated Geologic Reserves' of 172.645 tonnes (to an approximate mining depth of 30 metres); and

'Potential Geological Reserves' (down to a drilled depth of 65m) of 1,170,000 tonnes (Whitehead, 1989).

As discussed later the data set of grades from the airtrack drilling are substantially positively skewed with respect to the other data sets and this resource estimate is also positively skewed and unreliable.

3.0 Geology

3.1 Regional Geology

Considerable geological work has been done over the last 125 years both by government and industry with a number of geological fact and interpretative maps, interpretative cross and long sections, drill hole geological logs and interpretative geological descriptions in reports produced during this time. In spite of this the geology and genesis of the hematite+silica bodies remains somewhat unclear though Gee's regional mapping of the Burnie quadrangle (Gee, 1968 and Gee, 1977) has provided the greatest insight.

Regionally the Blythe River Iron Deposits at Cuprona lie at the northeastern end of a +6km long hematite+silica mineralised trend which extends from Cuprona to Natone at the southwestern end.

The bodies range from 5m or less up to 30m in thickness, up to 430m long and apparently open at depth (except perhaps the Purple Crag outcrop).

The hematite+silica bodies are apparently stratiform within a ~100m thick unit of siliceous siltstone of Cambrian age and correlated with the Dundas Group. The siltstones form the basal unit of a regionally conformable Cambro-Ordovician sequence though locally unconformable contacts are noted (Gee, 1977), and are immediately overlain to the southeast by a quartz pebble conglomerate, the Duncan Conglomerate, containing siliceous and hematitic clasts.

Unconformably underlying the siltstones to the immediate northwest are polydeformed metasediments of the Proterozoic Burnie Formation.

Structurally the Cambro-Ordovician sequence at Cuprona and Natone lies on the western limb of a broad syncline with the sequence striking north easterly and dipping steeply to the southeast.

Similar hematite mineralisation is hosted in the same rocks at Penguin on the eastern limb of the syncline (Atkinson, 1958; Gee, 1977).

Hematite mineralisation occurs as massive earthy red hematite associated with silica in a massive to jointed and splintery rock. Silica occurs as splashes and blebs and appears to closely post-date the hematite.

Noldart (1966) describes the mineralisation intersected in Department of Mines drill holes BR1, BR2 and BR3 as follows. "The hematite generally is hard, compact, dark grey to reddish in colour with small vugs partly filled with crystalline hematite with occasional schistose and limonitic zones. Movement planes within the ore are faced with specular hematite. The silica is mainly dense and very fine grained, usually grading into iron giving a coarse mottled effect to the ore in the poorer sections, or occurring as smaller blebs and apparent vug fillings in the higher grade zones, giving a finely mottled appearance.

Brecciation zones are common in all intersections with the brecciation present in both higher and lower grade zones but more prominent in the siliceous sections of the ore body. Brecciation generally appears to have occurred after deposition of the iron but some post brecciation specular iron is present."

Within the individual ore lenses there does appear to be some internal zonation with high grade zones in the order of 3-8m thick, and commonly on the margins of the lense.

Whilst there are some structures described in the ore hematite mineralisation does not appear to be fault controlled. It is unclear as to whether this stratabound form reflects a primary sedimentary origin or a later preferential replacement of a favourable bed.

Gee (1977) discusses the genesis of the deposits remarking on the presence of clasts of hematite and limonite within the immediately overlying conglomerate.

Regionally the 1100m thick Duncan Conglomerate which overlies the siltstone is conformable with it. Gee (1977) notes that "In the Blythe River gorge at Cuprona, the base of the conglomerate is a poorly sorted breccia about 20 m thick, consisting of angular fragments of Proterozoic quartzite, siliceous siltstone, limonite and hematite, and rounded fragments of rare chert. Pebble size averages 3 cm, but ranges up to 15 cm. The matrix is a siliceous grit, and is replaced in part by limonite. Veins of specular hematite are present."

"The hematite ... (lenses) ... are probably replacement bodies in tectonic breccia zones within the Cambrian siltstone. Some of these bodies (*e.g.* Purple Crag) lie very close to the top of the siliceous siltstone and pass upward into a sedimentary breccia and conglomerate containing abundant clasts of hematite, limonite and Burnie Formation quartzite. This ferruginous rudite is the base of the Ordovician Conglomerate. The iron ore bodies were thus exposed prior to deposition of the Ordovician rocks, and the mixture of limonite and hematite, both *in situ* and as c last s , suggests a period of fossil gossanisation." (Gee, 1977)

This interpretation is highly significant as it suggests that the hematite "body" is much more regionally extensive than it might be if it was of more recent genesis.

The spatial relationship between hematite mineralisation and the parallel line of copper deposits offset just to the west is mentioned by a number of authors as suggesting a co-genesis, however, the copper lode at the Copper King mine is transgressing the strata making it post-sedimentary. It is more likely that that iron rich oxidised fluids, buffered by the nearby hematite bearing rocks, met and mixed with ascending reduced copper bearing fluids, precipitating copper iron sulphides, thus explaining the spatial association.

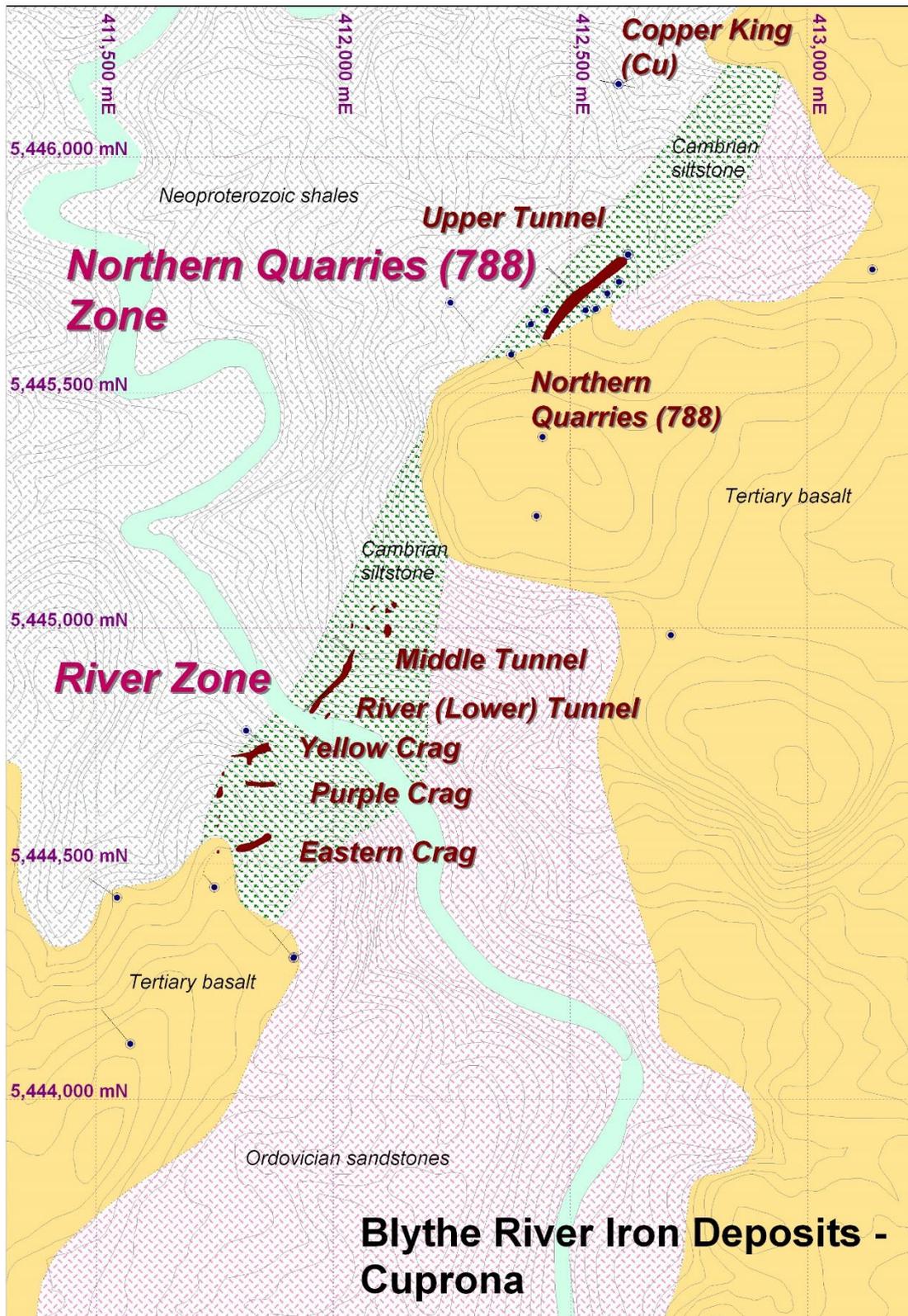


Figure 3.1: Blythe River Iron Deposits, Cuprona, summary geology and location plan. Maroon shapes are outcrops of hematite, black spots are drill hole collars and thin black lines drill traces.

3.2 Northern Quarries (788) Resource Geology

3.2.1 Introduction

There are a number of aspects of the geology of the Cuprona Iron Deposit which have significance in determining an accurate assessment of the total resource and the potential to extend and add to the resource base.

These aspects are:

- Structure of the deposit
- Nature of the bounds to the deposit i.e. what controls the width, strike and down dip extents.
- Distribution of deleterious elements Si and P
- Controls on the genesis or formation of the deposit

3.2.2 Geometry

The Northern Quarries (788) hematite body is mapped as an elongate, steeply dipping.

The deposits lateral extents, i.e. width, are defined by a sharp reduction in iron content recognisably visually and through Fe and Si assays.

The dip of the deposit is defined by drillhole intersections, the Upper Tunnel and surface outcrop. At the northern end of the resource this dip is -45° to the southeast appearing to steepen to -65° at the southern end of the orebody. South of the river the intersection in 15CUS009DD and surface outcrop in the Yellow Crag indicates a dip more close to 80° to the southeast.

The width of the orebody is defined by complete lode intersections in Department of Mines drill holes BR1, 2 and 3 and Lottah Mining Pty Ltd's drill holes 15CUN007RC, 15CUN008DD and 15CUN010DD, and the trench sampling of Boyd *et. al.* (1919).

Boyd's sampling was carried out on the surface as well as the Upper Tunnel. Cuts A, B, C, D and F and the Upper Tunnel sampling are all described as being across the lode and perpendicular to strike. Cut E is taken across the full width of the lode but diagonally and the angle not given.

Widths are summarised in Table 3.1.

Table 3.1: Lode Width

Channel Sample ID	Width as Described (ft or m) either across lode or down hole	Horizontal Width assuming consistent 70° (m) lode dip
CUN008DD/CUN010DD	CUN008DD 15m & CUN010DD 51m	~14m
Cut A	100'	30.41m
BR2/3	BR3 27.9m	~26.5m
15CUN004RC	35m	~28.5m
Cut B	85'	25.85m
Upper Tunnel	85'	25.85m
BR1	28.1m	~26.5m
15CUN007RC	33m	~26.5m
Cut C	80'	24.33m
Cut D	80'	24.33m
15CUN009RC	93m	~13.0
Cut F	35'	10.64m
15CUN005DD*	16.5m	~5.0m

Nb* minimum width

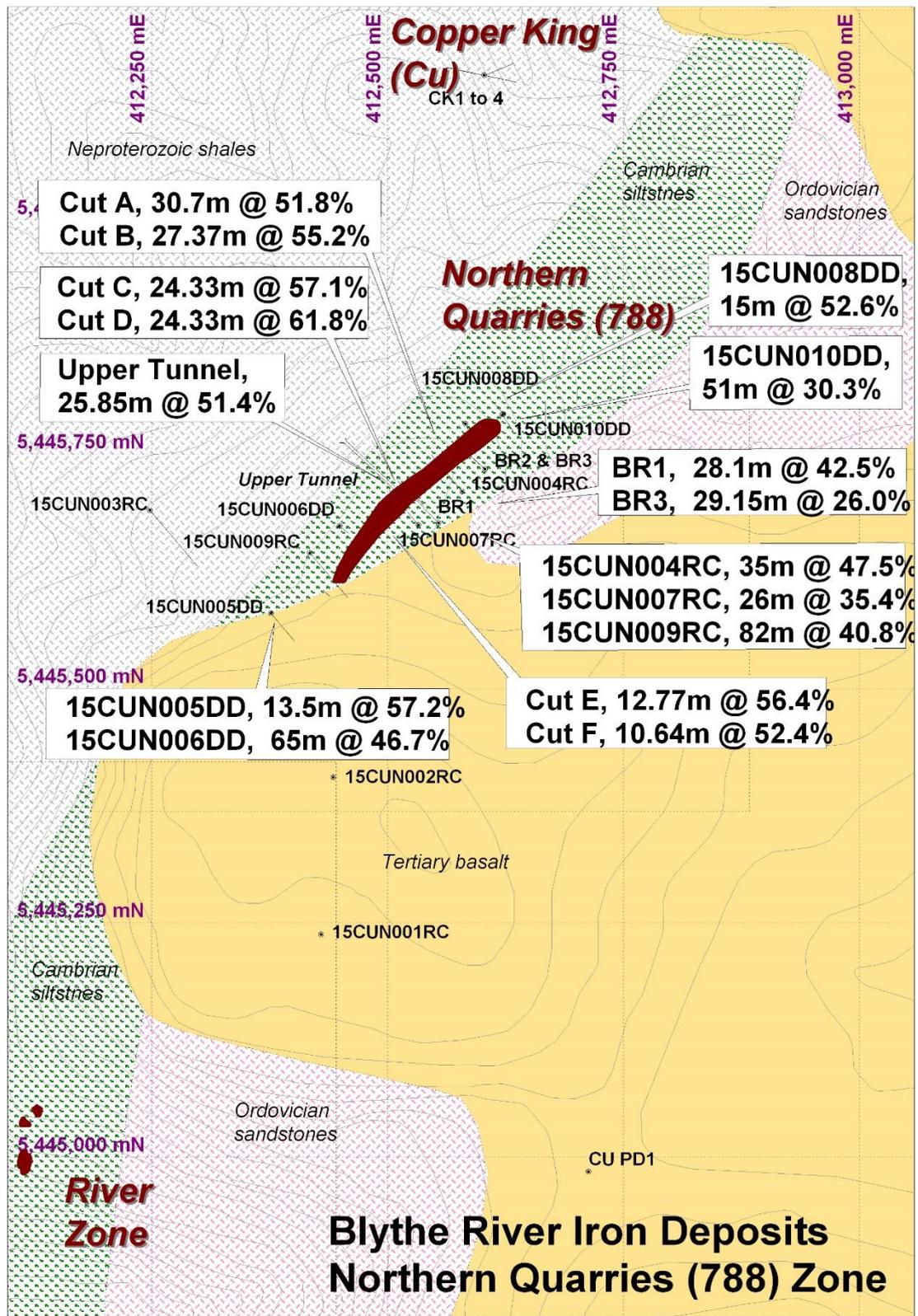


Figure 3.2: Northern Quarries (788) Zone samples used in estimation.

The extent of the deposit along strike to the northeast is only constrained by the lack of hematite outcrop and extent of drilling.

At the deposit's north eastern end drill holes 15CUN008DD and 15CUN010DD have both intersected massive hematite mineralisation. These are the northernmost sampling. The orebody has been modelled to 50m beyond this northing.

Approximately 500m northeast of this Twelvetreets (1905) map (figure 10.2) of the Blythe River mineral field shows an area of outcropping hematite mineralisation.

To the southwest the outcropping hematite disappears beneath basalt cover. Drill holes 15CUN001RC and 15CUN002RC both penetrated a thick body of basalt before passing in the Cambrian siltstones. Drill hole 15CUN002RC intersected 2m at 44.0% Fe.

Triangulation of the two intersections and the outcrop margin suggests the base of the basalt has a dip of 30° to the east. The basalt will truncate the orebody just south of Cut F.

The depth extent of the deposit is constrained by drilling. Geologically there is no compelling evidence for the lode to not continue at depth following the regional synclinal fold. Deepest intersections were made by drill hole 15CUN005DD.

4.0 Data

4.1 Introduction

The data used in this resource estimation consists of

- (1) the geological and topographical data used in the initial geological interpretation and ultimate 3D SURPAC orebody wireframing.
- (2) the sample assay and sample location data used in the estimation of the resource within the 3D orebody model.

Lottah Mining Pty Ltd have carried out an RC and diamond drilling programme in 2015 and requested the estimation of a resource from that data. The generation of a JORC compliant resource requires a thorough appraisal of all existing data and previous resource estimations and so time was spent compiling government and company reporting.

All relevant data pre-2011 is open file and available from Mineral Resources Tasmania's website database. Post 2011 data has been sourced from the client's own data files.

Data dating back as far as the initial mentioning of the deposit in 1891 has been considered with all relevant reports listed in the references.

Early reports provide information regarding early geological mapping, especially Blake (1958) as well as significant early sampling of now inaccessible workings, especially Boyd *et. al.* (1919) and Twelvetrees (1901). The drill hole results from the Department of Mines drilling in the mid-1960's (Noldart, 1966) and the shallow airtrack drilling of C.W. Davis in 1988/89 (Whitehead, 1989) are important sources of sample assays.

4.2 Geopositioning

The best geological mapping of the deposit are the fact maps of Blake (1958) and Atkinson (1958). Other geological maps are more schematic though illustrative.

Blake (1958) shows the positions and shapes outcropping geology, old tunnels, the river, surveyed railway line and cadastral boundaries. Geopositioning Blake (1958) also allows georeferencing of Boyd *et. al.* (1919). The sample assay data of Boyd *et. al.* (1919) is highly significant because the old adits sampled in this work are now collapsed and inaccessible.

Initially these plans were georeferenced using a creek junction on the south bank of the Blythe River, just upstream from the iron trend, as the datum (see figure 4.1).

The Upper Tunnel adit portal was used as the datum for georeferencing Boyd *et. al.* (1919) and the drill sections in Noldart (1966).

Subsequently high resolution LIDAR topographic data was modelled in 3D. Surface outcrops and salient features such as adit portals as mapped by Blake (1958) and Atkinson (1958) are recognisable and indicate some positional inaccuracies in both Blake (1958) and Atkinson (1958). Outcrop shapes and the location of salient features were digitised and then moved (generally only small distances) in order to fit more accurate positions as indicated by LIDAR.

The Upper Tunnel adit portal was clearly recognisable in the LIDAR generated DTM and used as a reference point for Boyd *et. al.* (1919) and Noldart (1966). Whilst this work was done to the best standard possible, inherent inaccuracies mean positioning drill hole collars, outcrops and samples in this way will have significant errors. The CW Davis collars were georeferenced using the positions of the dams with respect to LIDAR shapes (see figure 2.6).

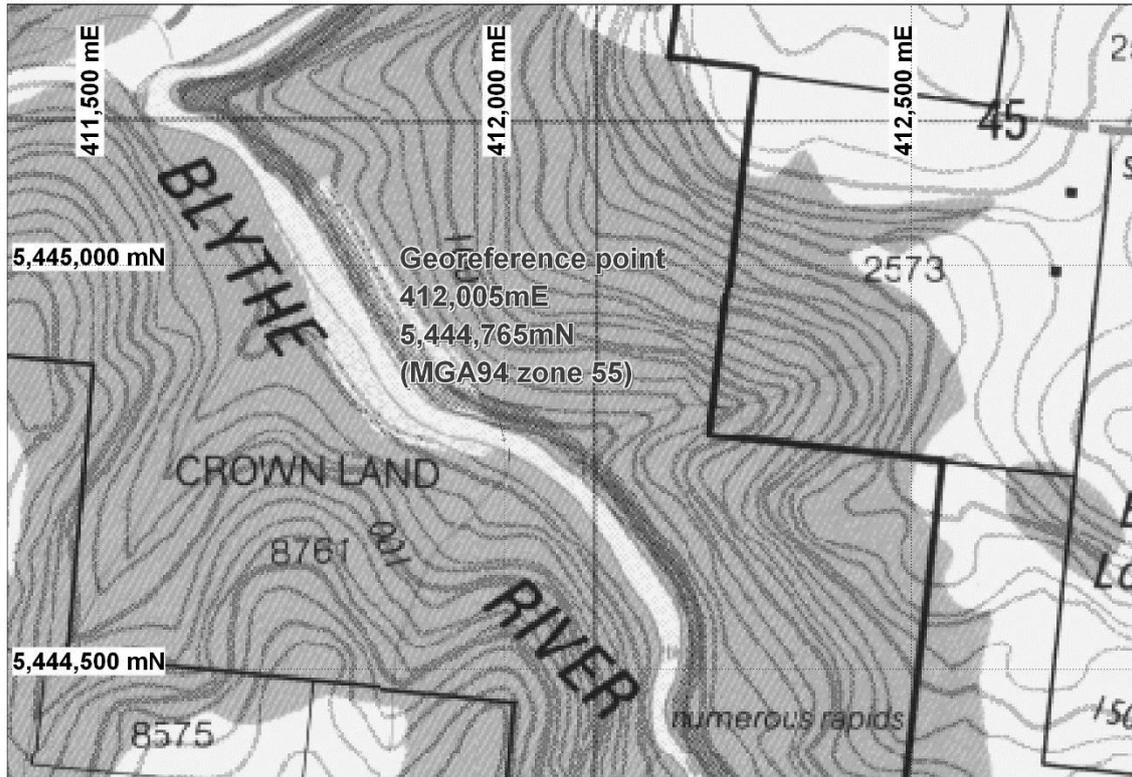


Figure 4.1: Location of point used in georeferencing Blake (1958) and Boyd *et.al.* (1919).

4.3 Sample Assays

4.3.1 Introduction

Samples have been collected and assayed from the earliest mentioning of the deposit in Montgomery (1894) who reported a single assay of 66.5% Fe with 4.8% Si and only a trace of phosphoric acid. This sample has not been included in the resource estimate due to lack of knowledge of its collection location.

Twelvetrees (1901) sampled the Central and Lower Tunnels, the Quarry and selected outcrops. Whilst these samples serve as field duplicates for subsequent sampling by Boyd *et. al.* (1919) their locations are a little too vague for serious consideration.

These samples, as was that of Montgomery (1894), were assayed by the government analytical laboratories.

	Iron.	Silica.	Phosphorus.	Copper.	Sulphur.
From Mr. Darby's low tunnel—	%	%	%		
Crosscut at 66 feet ...	46·0	34·2	...	Nil	...
" 77 feet ...	65·0	7·0	...	Nil	...
" 142 feet ...	67·2	3·8	...	Nil	...
" 167 feet ...	68·1	2·4	...	Nil	...
" 199 feet ...	68·5	2·0	...	Nil	...
" 225 feet ...	68·7	1·6	0·04	Nil	Traces
From Mr. Darby's upper tunnel	59·8	14·4
Upper quarry	68·4	2·2	0·04	...	Traces
Central tunnel.....	56·7	18·8
Lower South Crag	61·5	12·0
Purple Cliff.....	68·6	1·8	0·09	...	Traces

Figure 4.2: Twelvetimes (1901) assay data.

4.3.2 Commonwealth Government assessment (Boyd *et. al.*, 1919)

Boyd *et. al.* (1919) sampled all three tunnels, a series of cuts or trenches and relevant outcrop in a highly systematic manner.

A total of 192 samples were collected as contiguous channel samples commonly 5 feet in length but ranging from 2 feet to 7 feet.

All three adits were made re-accessed and sampled. A series of surface cuts or trenches were made across the deposits where possible and sampled with contiguous channel samples. Outcrops were sampled with similar contiguous channel samples.

In all 6 contiguous channels were sampled across the Northern Quarries (788) deposit, 3 on the north side of the river across the Middle and River Tunnel deposits, and 4 contiguous outcrop channel samples on the south side of the river across the Eastern Crag (1 channel) and Purple Crag (3 channels) deposits. Cuts were named alphabetically or after the tunnel or face.

192 samples were collected in all with 176 primary samples with 177 to 192 field duplicates were taken at 2 feet intervals across Cuts E and F.

Samples were collected in a very thorough and systematic manner detailed by Boyd *et. al.* (1919).

No mention is made of the sampling laboratory or assaying though it is almost certainly a government laboratory and likely the commonwealth given whom they were working for.

Samples were analysed for Fe and SiO₂. In addition a further 8 samples were also analysed for phosphoric acid and a further composite sample (of 23 samples) analysed for organic matter, moisture, hydration, Ferrous oxide, Ferric oxide, Magnetite, Phosphorous pentoxide, Sulphur trioxide, Lime, Silica, Alumina, Manganous oxide, Magnesia, Cupric acid, Chromic acid and Titanic acid.

These samples have been included in the database. They have been assigned the Cut name as *hole_id* in the database and distances converted to metres.

4.3.3 DDH's BR1, (2) and 3, Department of Mines (Noldart (1966))

In 1965/66 the Department of Mines drilled three holes into the Northern Quarries (788) deposit (Noldart, 1966).

Drill hole BR1 was drilled in a north westerly direction under the Upper Tunnel. Holes BR2 and BR3 were drilled in a similar orientation 75m along strike to the northwest

Excessive core loss in hole 2 meant that it wasn't sampled and was essentially redrilled by BR3.

Hole collars were surveyed with respect to the Upper Tunnel portal by tape and compass. BH1 was surveyed down hole at 150' and 300'. BR3 was not surveyed down hole.

Drill core in BR1 is NX from collar to 128' with BX to end of hole. Drill core in BR3 is BX from collar to 136'10" with AXT to end of hole.

Recoveries were good to average in BR1. BR2 was not sampled due to excessive core loss and was redrilled as BR3.

Samples were taken at intervals nominally 5' down hole with core split and half sampled.

It is not stated as to where and how the samples were assayed though this would have been at the government laboratories. Assays are reported for Fe and SiO₂ only.

4.3.4 CH1 to CH26 Open Hole Hammer holes, Northern Quarries (788) deposit (Whitehead, 1989)

The open hole hammer holes of C.W. Davis (Whitehead, 1989) into the Northern Quarries (788) deposit also provides detail on the variation of grade with depth. Holes were drilled with an Atlas Copco blasthole drill rig (no mention of hole diameter is made). Holes are names CH1 to CH26 (inc. CH1A and CH4A).

28 airtrack percussion holes were drilled to depths of 15m. Samples were collected at 3m intervals and riffle split. 83 samples in total were collected.

There is no mention of any drillhole recoveries nor QA/QC.

The nature of the drilling being open hole hammer lends itself to much more cross-sample contamination, particularly deeper samples and consideration needs to be given to sample precision and accuracy.

4.3.5 Lottah Mining Pty Ltd

In 2015 Lottah Mining Pty Ltd drilled 11 RC holes and 5 diamond drill holes in and around the more accessible deposits at the northern and southern ends of the trend.

Diamond drill holes 15CUN005DD, 15CUN006DD, 15CUN008DD and 15CUN010DD, and RC holes, 15CUN004 RC, 15CUN007 RC and 15CUN009RC were drilled into the Northern Quarries (788) deposit.

RC holes (15CUN00RC1 and 15CUN00RC2) targeted a magnetic anomaly just east of the hematite mineralised trend.

RC hole 15CUN00300RC was drilled just west of the main body testing for parallel mineralisation.

South of the river diamond drill hole 15CUS009DD tested the Purple Crag deposit, RC hole 15CUS003RC tested the Eastern Crag deposit and RC holes 15CUS001RC and 15CUS002RC tested south along the main trend with 15CUS004RC and 15CUS005RC off to the east of this main trend.

Diamond drillcore was HQ3 throughout. Recoveries were generally good. Samples were split with a diamond saw and assayed by the NATA accredited A.L.S. laboratory in Burnie.

Table 4.1: Drill holes and channels in database

hole_id	easting_mga94	northing_mga94	rl	hole_length	azi_true	dip	hole_type	company
15CUN001RC	412429.692	5445236.894	264.717	205	360	-90	RC	Lottah Mining Pty Ltd
15CUN002RC	412442.553	5445404.769	274.014	192	360	-90	RC	Lottah Mining Pty Ltd
15CUN003RC	412248.577	5445689.84	198.388	156	140	-60	RC	Lottah Mining Pty Ltd
15CUN004RC	412579.391	5445709.783	224.314	103	320	-60	diamond	Lottah Mining Pty Ltd
15CUN005DD	412376.7	5445579.715	232.671	170.1	140	-55	diamond	Lottah Mining Pty Ltd
15CUN006DD	412457.39	5445672.31	228.4	143.7	130	-85	diamond	Lottah Mining Pty Ltd
15CUN007RC	412533.154	5445674.023	230.45	100	320	-60	RC	Lottah Mining Pty Ltd
15CUN008DD	412622.968	5445792.373	212.175	32.8	320	-55	diamond	Lottah Mining Pty Ltd
15CUN009RC	412418	5445644	230.026	124	140	-60	RC	Lottah Mining Pty Ltd
15CUN010DD	412622.164	5445791.534	212.175	59.8	147	-70	diamond	Lottah Mining Pty Ltd
15CUS001RC	411572.711	5444116.412	226.992	171	320	-55	RC	Lottah Mining Pty Ltd
15CUS002RC	411545.21	5444427.4	164.541	129	305	-55	RC	Lottah Mining Pty Ltd
15CUS003RC	411749.947	5444449.042	184.813	61	320	-55	RC	Lottah Mining Pty Ltd
15CUS004RC	411917.882	5444300.366	195.218	40	60	-55	RC	Lottah Mining Pty Ltd
15CUS005RC	411917.345	5444299.24	194.961	140	320	-55	RC	Lottah Mining Pty Ltd
15CUS009DD	411817.625	5444781.464	59.3	150.5	130	-55	diamond	Lottah Mining Pty Ltd
BR1	412530.021	5445686.317	230.2	98.2	316	-50	diamond	Dept of Mines
BR2	412579.051	5445743.886	226.6	59.6	312	-60	diamond	Dept of Mines
BR3	412579.051	5445743.886	226.6	49	312	-50	diamond	Dept of Mines
CU PD1	412713	5444984	275	200	0	-90	RC	Shell
Water Bore	413138.166	5445760.189	220.675	100	320	-90	OHH	private
Cut A	412552.378	5445792.526	222.338	30.714	144.679	0	channel	Boyd et al
Cut B	412505.055	5445757.613	229.463	27.37	138.891	0	channel	Boyd et al
Upper Tunnel	412492.556	5445726.612	217.5	25.85	134.422	0	channel	Boyd et al
Cut C	412456.19	5445706.544	228.91	24.33	133.969	0	channel	Boyd et al
Cut D	412442.172	5445691.977	227.808	24.33	134.422	0	channel	Boyd et al
Cut E	412420.749	5445652.055	229.258	12.772	134.888	0	channel	Boyd et al
Cut F	412397.5	5445621	229	10.644	132.93	0	channel	Boyd et al
Middle Tunnel	412031.588	5444951.881	114	13.685	133.792	0	channel	Boyd et al
Cut K	412014.736	5444913.91	113.442	9.123	124.379	0	channel	Boyd et al
Cut G	411980.126	5444875.961	76.441	13.685	134.601	0	channel	Boyd et al
Cut H	411939.203	5444822.635	37	9.123	123.078	0	channel	Boyd et al
Cut J	411930.661	5444811.925	31.8	7.602	122.741	0	channel	Boyd et al
River Tunnel 32EftxcutNE	411945.819	5444829.677	37	1.52	136.976	0	channel	Boyd et al
River Tunnel 32EftxcutSW	411944.448	5444828.362	37	1.52	136.976	0	channel	Boyd et al
River Tunnel 77Eftxcut	411956.343	5444838.794	37	5.17	136.976	0	channel	Boyd et al
River Tunnel 142Eftxcut	411970.957	5444851.102	37	1.52	136.976	0	channel	Boyd et al
River Tunnel 166Eftxcut	411981.508	5444850.029	37	6.99	317.811	0	channel	Boyd et al
River Tunnel 221Eftxcut	411996.27	5444863.906	37	3.65	303.803	0	channel	Boyd et al
Cut L Purple Crag	411849.789	5444672.524	105.352	6.082	179.145	0	channel	Boyd et al
Cut M	411884.867	5444664.985	91.378	9.43	353.015	0	channel	Boyd et al
Cut N	411828.347	5444742.691	79.8	16.73	136.276	0	channel	Boyd et al
Cut O Purple Crag	411858.224	5444672.417	100.108	9.123	177.93	0	channel	Boyd et al
CH1	412433.462	5445634.311	233.17	6	0	-90	open hole percussion	CW Davis
CH10	412448.268	5445678.865	228.522	9	0	-90	open hole percussion	CW Davis
CH11	412466.679	5445701.1	231.282	9	0	-90	open hole percussion	CW Davis
CH12	412469.629	5445697.545	232.211	9	0	-90	open hole percussion	CW Davis

CH13	412472.239	5445694.51	232.805	9	0	-90	open hole percussion	CW Davis
CH14	412480.061	5445712.408	233.26	9	0	-90	open hole percussion	CW Davis
CH15	412483.58	5445708.485	234.557	12	0	-90	open hole percussion	CW Davis
CH16	412484.915	5445703.538	235.802	9	0	-90	open hole percussion	CW Davis
CH17	412489.957	5445717.243	234.985	9	0	-90	open hole percussion	CW Davis
CH18	412494.839	5445711.672	235.984	9	0	-90	open hole percussion	CW Davis
CH19	412488.391	5445721.939	234.023	9	0	-90	open hole percussion	CW Davis
CH1a	412434.37	5445634.063	233.376	12	0	-90	open hole percussion	CW Davis
CH2	412439.547	5445650.308	231.942	12	0	-90	open hole percussion	CW Davis
CH20	412501.582	5445723.23	236.355	9	0	-90	open hole percussion	CW Davis
CH21	412508.455	5445736.808	234.642	6	0	-90	open hole percussion	CW Davis
CH22	412522.195	5445735.18	236.217	6	0	-90	open hole percussion	CW Davis
CH23	412515.618	5445743.797	234.33	9	0	-90	open hole percussion	CW Davis
CH24	412520.28	5445752.433	232.809	9	0	-90	open hole percussion	CW Davis
CH25	412492.116	5445728.414	233.723	6	0	-90	open hole percussion	CW Davis
CH26	412499.007	5445730.324	234.747	6	0	-90	open hole percussion	CW Davis
CH3	412456.916	5445685.348	231.145	12	0	-90	open hole percussion	CW Davis
CH4	412460.673	5445682.314	231.904	12	0	-90	open hole percussion	CW Davis
CH4a	412459.303	5445683.072	231.878	3	0	-90	open hole percussion	CW Davis
CH5	412453.152	5445687.631	230.089	12	0	-90	open hole percussion	CW Davis
CH6	412448.236	5445688.633	229.336	15	0	-90	open hole percussion	CW Davis
CH7	412453.856	5445675.445	228.45	9	0	-90	open hole percussion	CW Davis
CH8	412452.423	5445668.594	228.584	9	0	-90	open hole percussion	CW Davis
CH9	412446.916	5445667.826	228.962	9	0	-90	open hole percussion	CW Davis

Table 4.2: Intersections Used In Modelling

Hole/Cut ID	From (m) to (m)	Length	Fe%
Cut A	0m to 30.7m	30.7	51.8
Cut B	0m to 27.37m	27.37	55.2
Upper Tunnel	0m to 25.85m	25.85	51.4
Cut C	0m to 24.33m	24.33	57.1
Cut D	0m to 24.33m	24.33	61.8
Cut E	0m to 12.77m	12.77	56.4
Cut F	0m to 10.64m	10.64	52.4
15CUN006DD	0m to 65.0m	65	46.7
15CUN010DD	0m to 51.0m	51	30.3
15CUN004RC	25.0m to 60.0m	35	47.5
15CUN007RC	34.0m to 67.0m	26	35.4
15CUN009RC	5.0m to 98.0m	82	40.8

15CUN008DD	0m to 15.0m	15	52.6
15CUN005DD	136.5m to 153.0m	13.5	57.2
BR1	37.78m to 65.89m	28.1	42.5
BR3	18.55m to 46.48m	29.15	26
CH1A	0.0m to 6.0m	6	48.62
CH21	0.0m to 6.0m	6	60.34
CH25	0.0m to 6.0m	6	56.45
CH26	0.0m to 6.0m	6	60.31
CH10	0.0m to 9.0m	9	50.66
CH11	0.0m to 9.0m	9	55.23
CH12	0.0m to 9.0m	9	57.17
CH13	0.0m to 9.0m	9	57.33
CH14	0.0m to 9.0m	9	37.23
CH16	0.0m to 9.0m	9	62.42
CH17	0.0m to 9.0m	9	65.01
CH18	0.0m to 9.0m	9	42.93
CH19	0.0m to 9.0m	9	58.43
CH20	0.0m to 9.0m	9	61.16
CH23	0.0m to 9.0m	9	55.07
CH24	0.0m to 9.0m	9	51.59
CH7	0.0m to 9.0m	9	57.82
CH8	0.0m to 9.0m	9	53.08
CH9	0.0m to 9.0m	9	42.54
CH15	0.0m to 12.0m	12	61.81
CH2	0.0m to 12.0m	12	18.11
CH3	0.0m to 12.0m	12	39.64
CH4	0.0m to 12.0m	12	34.34
CH5	0.0m to 12.0m	12	50.26
CH6	0.0m to 15.0m	15	44.1

5.0 Data Quality and Verification

5.1 Introduction

Assay data from the four main assay data sources is of variable quality and must be considered before use in any estimation. The precision, accuracy and bias of each data set must be considered on its own and in comparison with the other data sets. In addition the positional accuracy needs to be considered in determining whether data is used in the estimation.

5.2 Assessment of Sample Data Assay Quality

5.2.1 Comparison of Data Sets

All assay data from the four assay data sets is plotted as histograms in figures 5.1 to 5.4.

The Lottah and Department of Mines drilling data sets include both weathered and fresh samples. The CW Davis airtrack drilling is probably all in weathered material. Boyd *et. al.*'s sampling is probably mostly in weathered material with some fresh rocks in the adits. No effort has been made to distinguish weathered and fresh material as data is of insufficient quality.

The Lottah drilling data set includes external waste rock as well as ore and internal waste. The Department of Mines drilling, Boyd *et. al.* and CW Davis airtrack drilling data sets only include ore and internal waste.

Histograms of sample assay frequency show two populations in the Department of Mines and Lottah drilling data with both showing a background waste rock population and a discrete ore population (figures 5.1 and 5.2).

In the Department of Mines drilling the ore population (visually) ranges between 40% and 65% with a mean around 50-55%. The two populations are less well defined in the Lottah drilling data but visually the ore population ranges from 40% to 65% with a mean around 55%.

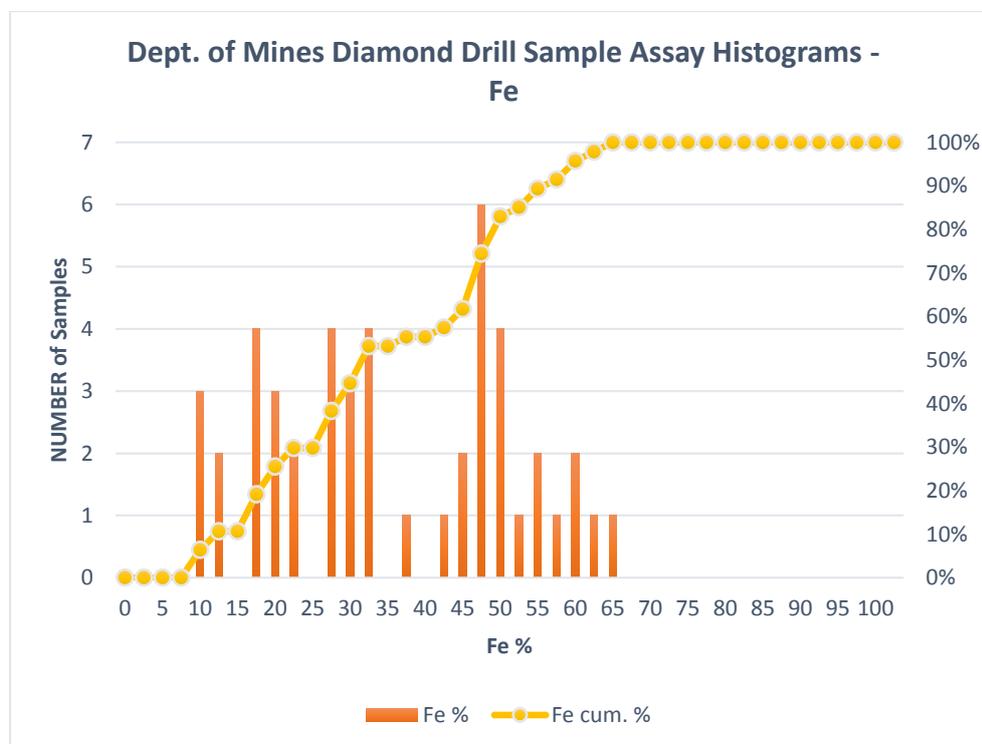


Figure 5.1: Department of Mines drillholes BR1, BR2 and BR3 (Noldart, 1919) diamond drill hole sample Fe assay histogram.

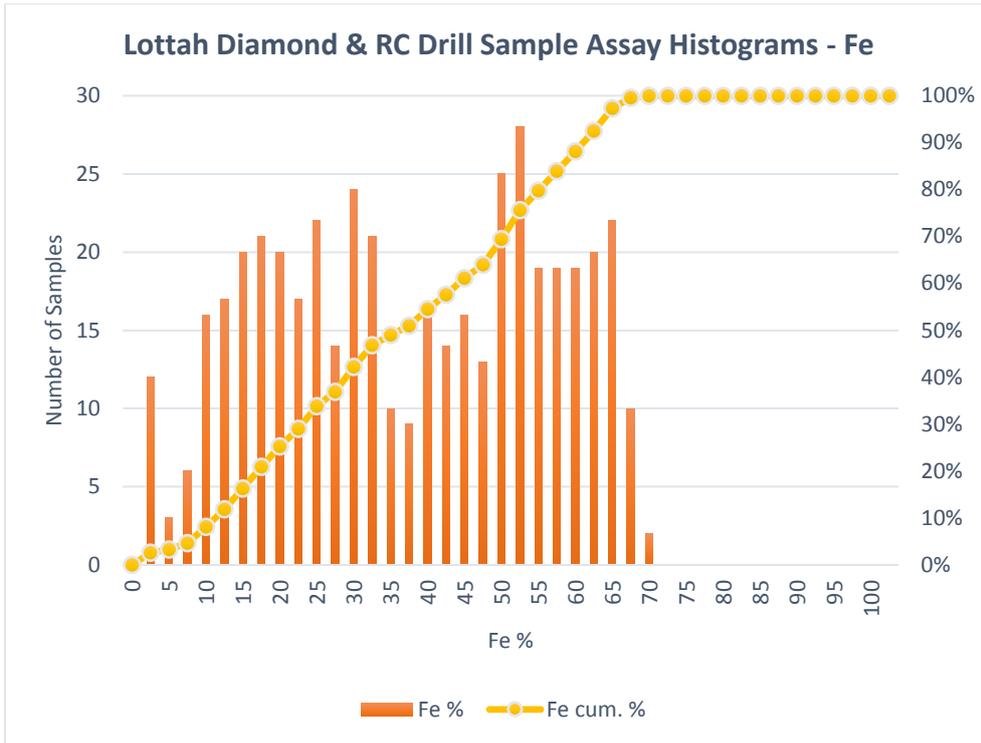


Figure 5.2: Lottah Mining Pty Ltd diamond and RC drill hole sample Fe assay histogram.

The Boyd channel data is all from within the orebody (figure 5.3). Its distribution is similar but slightly positively skewed to that of the Department of Mines drilling and the Lottah drilling data. This may be reflecting a primary surface enrichment or an enrichment in the sampling process.

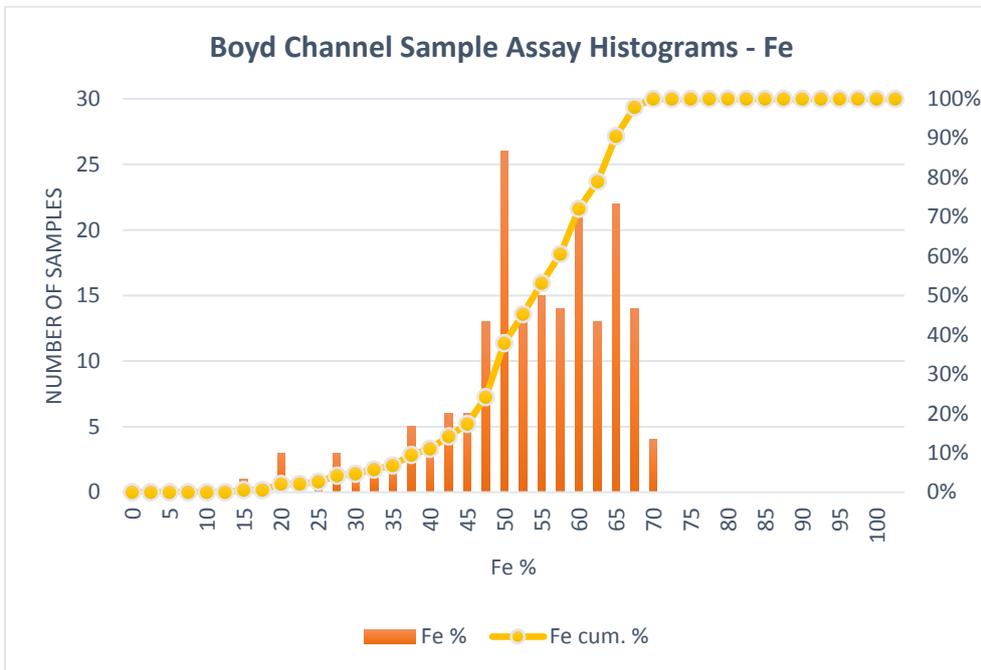


Figure 5.3: Boyd et. al. (1919) channel sample Fe assay histogram.

The C.W. Davis data was also taken from within the orebody. It ranges from 45% to 68% with a mean around 57% (figure 5.4) These samples were collected by open hole hammer drill from the surface. The bias may reflect biasing in the drilling and sampling stage or alternatively some near surface grade enhancement.

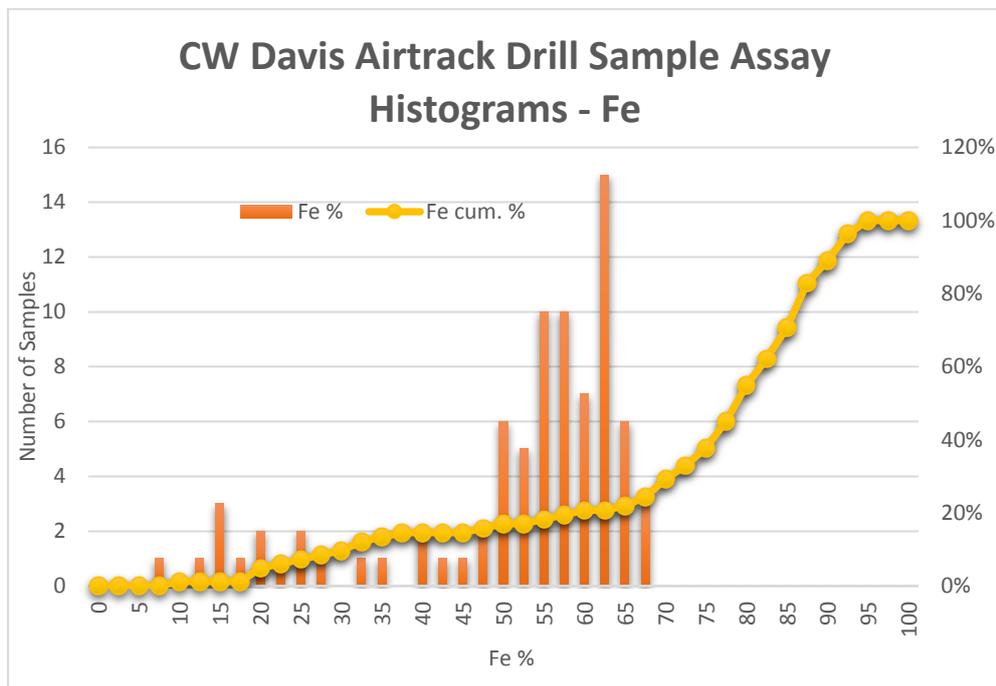


Figure 5.4: CW Davis (Whitehead, 1989) airtrack drill sample Fe assay histogram.

5.2.2 QA/QC

Boyd *et. al.* (1919) report no in-laboratory QA/QC procedures. They did carry out field duplicate sampling with 2' samples collected across parts of Cuts E and F. Sample intervals do not correspond and the only way to compare these samples is by composite.

2' samples 177 to 186 across part of Cut E composited as 62.07% Fe (10.08% SiO₂) compared with 63.12% Fe (9.12% SiO₂) from the original sampling.

2' samples 187 to 192 across part of Cut F composited as 47.5% Fe (31.2% SiO₂) compared with 49.6% Fe (29.6% SiO₂).

Similarly Noldart (1966) reports no in-laboratory QA/QC procedures. It is apparent that a split of the sample, presumably at the pulp stage, was composited over the whole of each drill holes intersection of the ore zone and assayed for other deleterious elements.

The composite assay from BR1 assayed 40.7% Fe (36.6% SiO₂) compared with a weighted average of the original samples of 38.2% Fe (42.7% SiO₂). BR3's composite assayed 26.6% Fe (57.6% SiO₂) compared with a weighted average of the composite samples of 26.0% Fe (46.5% SiO₂).

CW Davis report no QA/QC work on their sampling programme.

Lottah Mining carry out industry standard QA/QC with blanks and standards generally every 20 samples. They have also undertaken systematic resampling i.e. field duplicates. These field duplicates generally show good repeatability as expected though figure 5.5 shows 1 outlier.

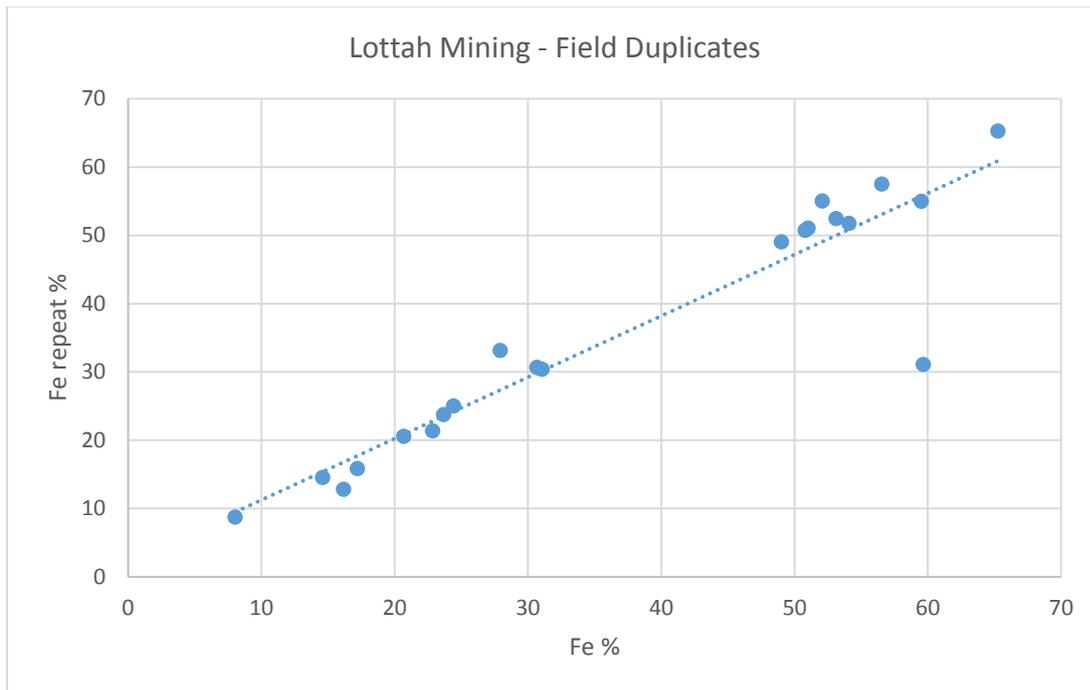


Figure 5.5: Lottah Mining Pty Ltd field duplicate assay comparison.

The assay data of Boyd *et. al.* (1919), Noldart (1965) and Whitehead (1989) are of variable and arguably questionable quality but has been included with the caution that further field duplicate sampling be carried out to confirm the reliability or otherwise of this data.

5.3 Assessment of Data Positional Accuracy

The positional accuracy of all three sample data sets is poor and may be +/- 10m. Early trenching and the drill collars to BR1 and BR3 were positioned from geo-referencing old plans.

Collars to Lottah Mining Pty Ltd drill holes have been surveyed by hand held GPS with positional accuracy of +/-5m.

6.0 Geological interpretation and modelling

One of the major revisions in this resource estimate with respect to MacDonald (2016) is the re-wireframing of the orebody. The new model is *nthnq_orebody_v8.mdl*.

MacDonald (2016) noted the apparent complexities of what was expected to be a simple tabular geology by assuming collar coordinates may be inaccurate and modelled the orebody as a -70° dipping body based on dips implied in Noldart (1966).

Access to drill core has allowed the measurement of bedding to core instances in a number of the Lottah diamond drill holes. These indicate that at the northern end at least the orebody dips as shallow as -45°. The southern end appears to steepen and has been modelled accordingly. An alternative possibility is a fault offset.

6.1 Methodology

Modelling was undertaken using SURPAC's 3D modelling software. Drill hole and trench sample data was stored in an ACCESS database. Wireframing was done by snapping to drillhole intersections in 3D.

6.2 Lithological boundaries and surface DTM

The presence of visible hematite and/or Fe assay was used to define the bounds to the orebody as there is a quite sharp drop in grade into the wallrocks.

The surface DTM used was generated from the LIDAR data with no field checking.

6.3 Mineralisation domain modelling

Mineralisation was modelled as a single domain.

As noted earlier in most drill hole intersections there is a recognisable zonation to mineralisation within the overall orebody with enriched hangingwall and footwall higher grade zones separated by a lower grade zone. e.g. BR1 on section 12300mN, 15CUN004RC on section 12350mN and 15CUN008DD and 15CUN010DD on section 12400mN. This zonation is particularly well expressed in 15CUN009DD on section 12150mN.

A similar zonation is suggested in hole 15CUN005DD on section 12100mN but incomplete sampling of the possible footwall zone has made the picture unclear.

Future work should have as one of its aims the resolution and domaining of these high grade zones.

6.4 Validation of geological interpretation and wireframe models

The wireframe models have been validated visually in 3D in SURPAC.

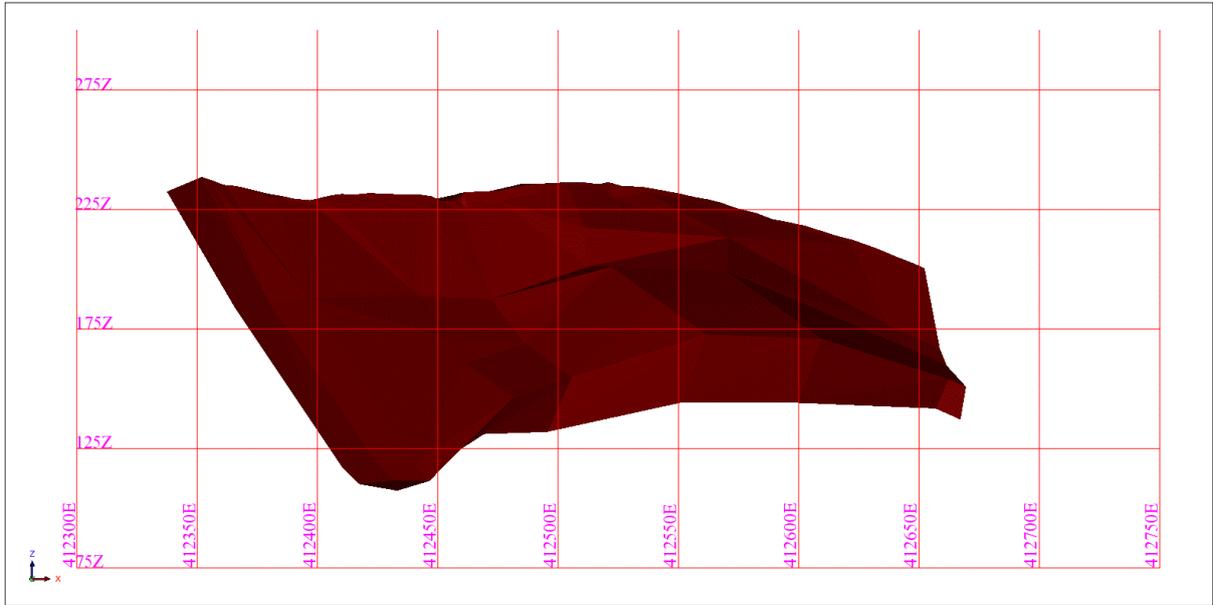


Figure 6.1: 3DM of Northern Quarries (788) orebody.

7.0 Statistical analysis

7.1 Introduction

Limited statistical analysis was performed on the data as there are clear deficiencies in the data set (collar positions, assaying QA/QC) which would make any results inconclusive.

Ore intersections are coded as *ore* in the ore table in *the Cuprona2016* database.

Around half of samples used in the estimation are from Lottah Mining's drilling which are 1m down hole samples. Sample lengths in both, drill holes BR1 and BR3, and the sampling by Boyd *et. al.* (1919), were predominantly at 5' (1.52m) intervals.

1m composites were chosen as the length for compositing.

Composite data is summarised in Table 7.1. Composite files are *comp_1mv3_ed* for Fe and *comp_1mv3_sio2_ed* for SiO₂ (there was no technical reason for using two composite files).

Table 7.1 Composite Statistics

Data Set	Number of Samples	Mean	Standard Deviation
Lottah	294	41.78	17.16
Boyd	159	55.07	7.82
CW Davis	219	52.30	14.48
Noldart	56	34.38	16.00
TOTAL	509	45.12	16.34

Histograms of 1m composite data are also shown in figures 7.1 to 7.3.

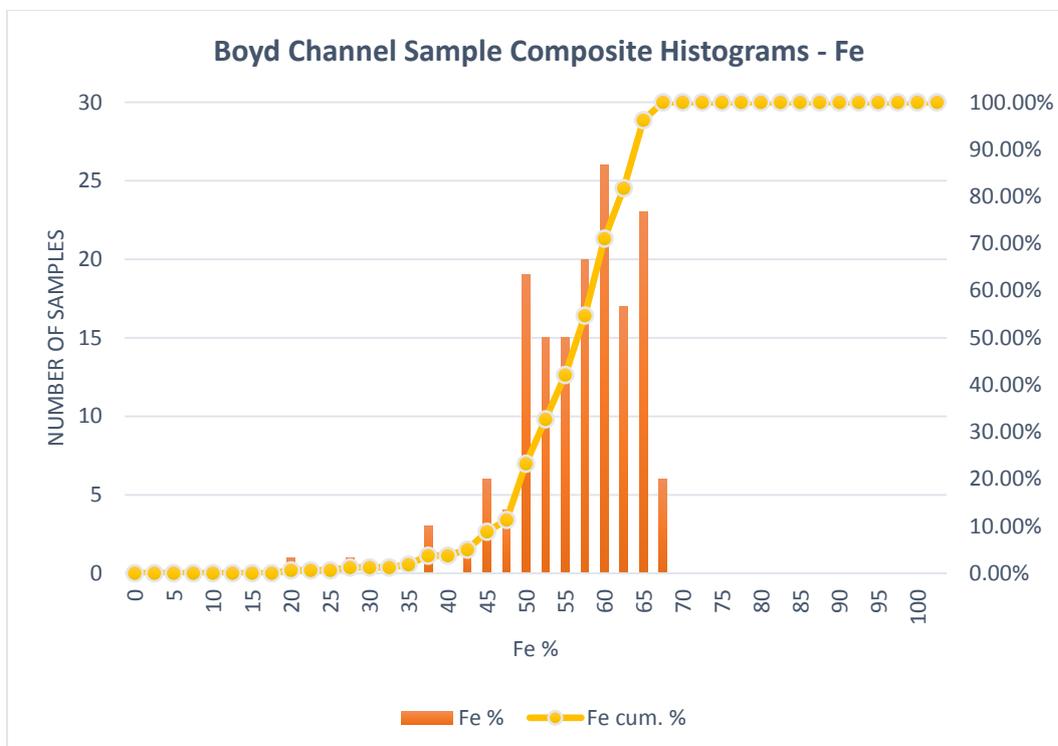


Figure 7.1: Boyd *et. al.* (1919) channel sample data composite histograms, Fe %.

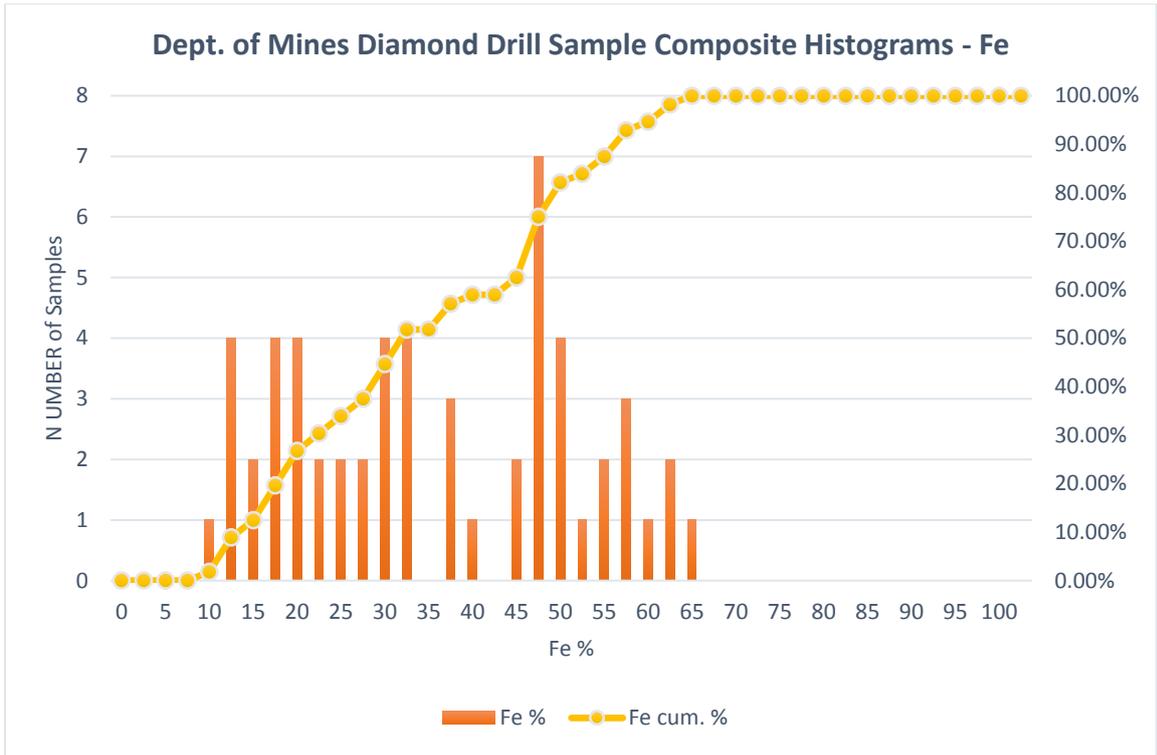


Figure 7.2: Department of Mines drill holes BR1 and BR3 sample data composite histograms, Fe %.

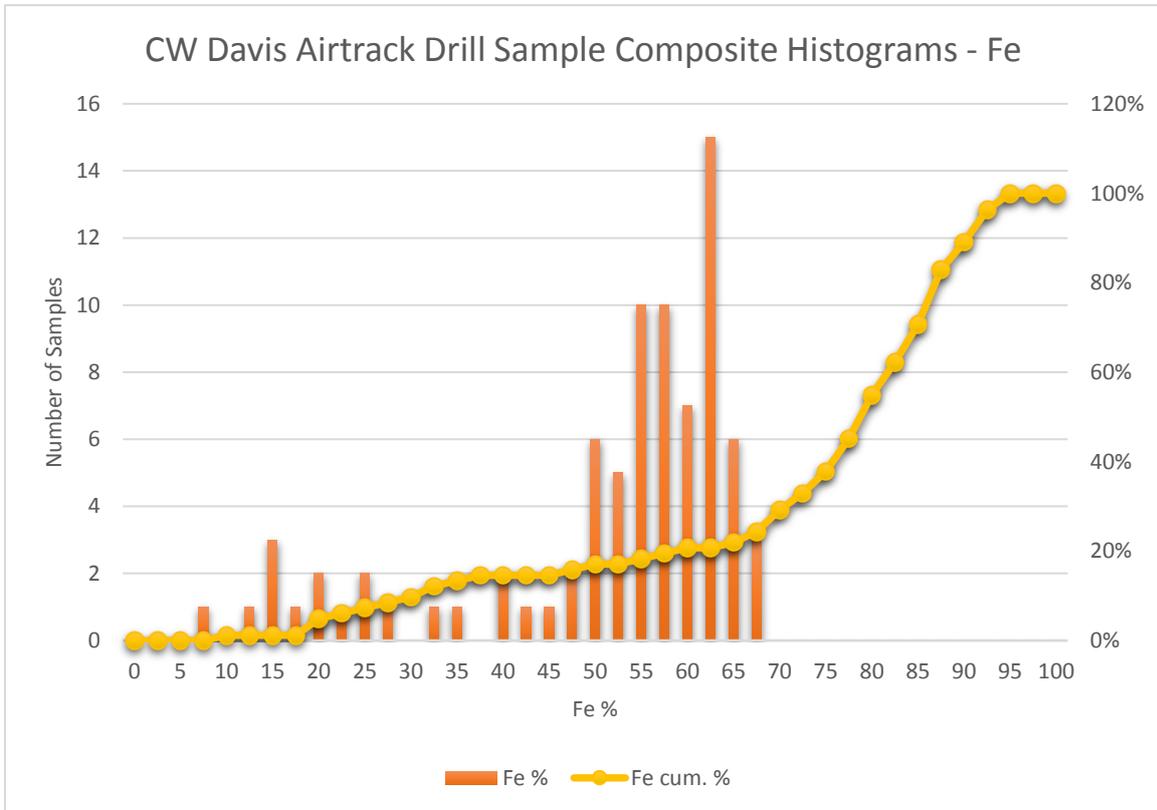


Figure 7.3: CW Davis blasthole percussion sample data composite histograms, Fe %.

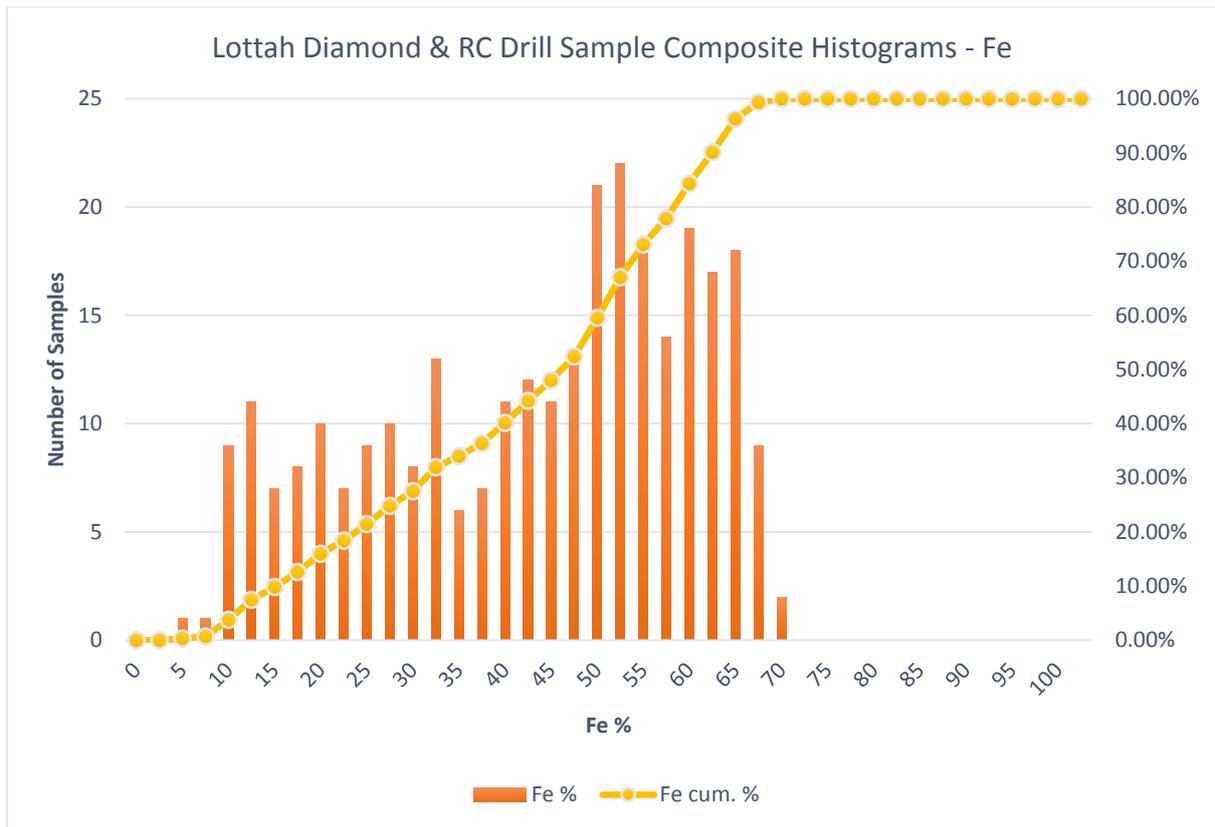


Figure 7.4: Lottah Mining drill hole sample data composite histograms, Fe %.

The histograms of both Lottah Mining's and the BR1 and BR3 data appears to show two populations, with the data of Boyd *et. al.* (1919) and Whitehead (1989) only showing the higher grade population. This may

- Accord with the selective sampling of Boyd *et. al.*
- Reflect higher surface grades due to some form of enrichment, or
- Indicate a serious skewness in the data.

The Boyd *et. al.* (1919) and Whitehead (1989) data data has been included in the estimation with a caution that it may be biasing the resource. Further field duplicate sampling of these surfaces is imperative for the inclusion of the Boyd *et. al.* (1919) data or alternatively for the addition of a new replacement surface data set of similar size i.e. a 6 trench trenching programme at a minimum.

7.2 Bulk Density

In MacDonald (2016) bulk density was calculated for the total resource using the mean of the 14 Lottah bulk density samples with 13 from 15CUN006DD and 4 from 15CUN005DD.

The mean of these 17 samples was 4.1g/cm³ with a standard deviation of 0.9 and range from 2.65 to 5.13.

In this re-estimation bulk density has been calculated from Fe assay based upon the observation that the ore is made up entirely of hematite or silica so the density can be calculated from the Fe assay. Bulk density values were calculated for each block from the Fe value already estimated into that block using the formula bulk density = 2.65 + (0.0373 x Fe%) [based on s.g.'s of 2.65g/cm³ for SiO₂ and 5.26g/cm³ for hematite]. (i.e. essentially assigning all non-iron material to an s.g. of 2.65).

8.0 Block modelling

Block modelling was done using SURPAC's block modelling function.

The block model's name is *nthnq_v2_plus_ed.mdl*

Blocks were designed as 10mY x 5mX x 10mZ with Y oriented at 045° true north. Blocks were sub-blocked to 2.5m x 1.25m x 2.5m.

Attributes assigned are:

- Rock_type rock_type 1= ore, rock_type2= all waste
- Fe Fe assay in %
- SiO2 SiO2 assay in %
- sg calculated from Fe in g/cm3 using $sg = 2.65 + (Fe\% \times 0.0373)$
- pit pit option 0 or 25
- RL slice 200, 210, 220, 230, 240

9.0 Grade estimation

9.1 Introduction

For data quality reasons estimation using a simple Inverse Distance Squared method is considered sufficient at this point.

9.2 Inverse Distance Squared

Three passes were used with a large search ellipse 100m x 100m x 50m, followed by 50m x 50m x 25m and then 20m x 10m x 10m.

The ellipse was rotated such that the major axis strikes 045° and the semi-major axis dips at -45° to the southeast.

The minimum number of informing samples was 3 with maximum number of informing samples used 15. Six discretisation points were used per block.

The estimation method was Inverse Distance to the power of 2.

9.3 Block model files

The resultant grade estimates are held in the model file *nthnq10.mdl*.

9.4 Validation

The block model has been validated visually in 3D in SURPAC and also through the generation of sections (see figures 9.1 to 9.9).

All sections show the surface outline, outline of 3DM at that northing, drill holes projected 12.5m onto the section plane showing Fe % and the .jpg image Fe % of the block model sliced at that northing.

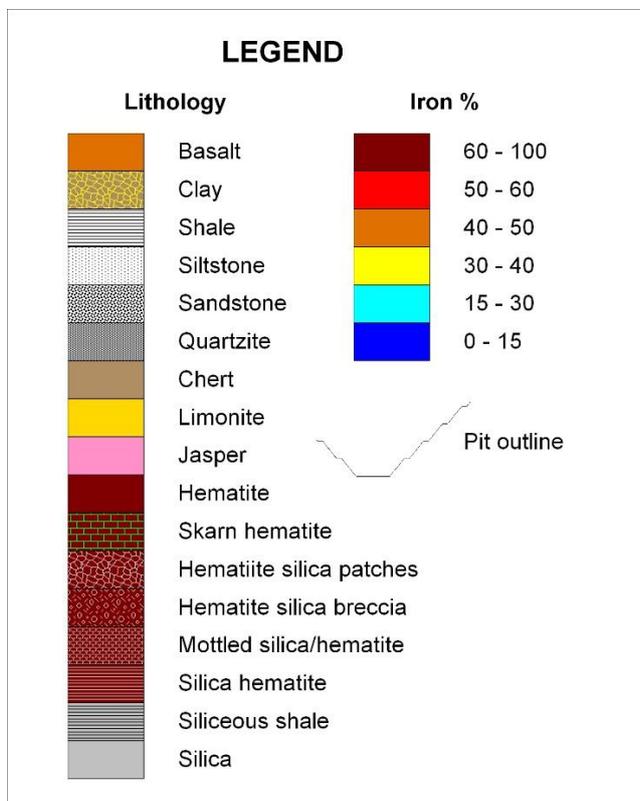


Figure 9.1: Legend Fe % for all sections and plans

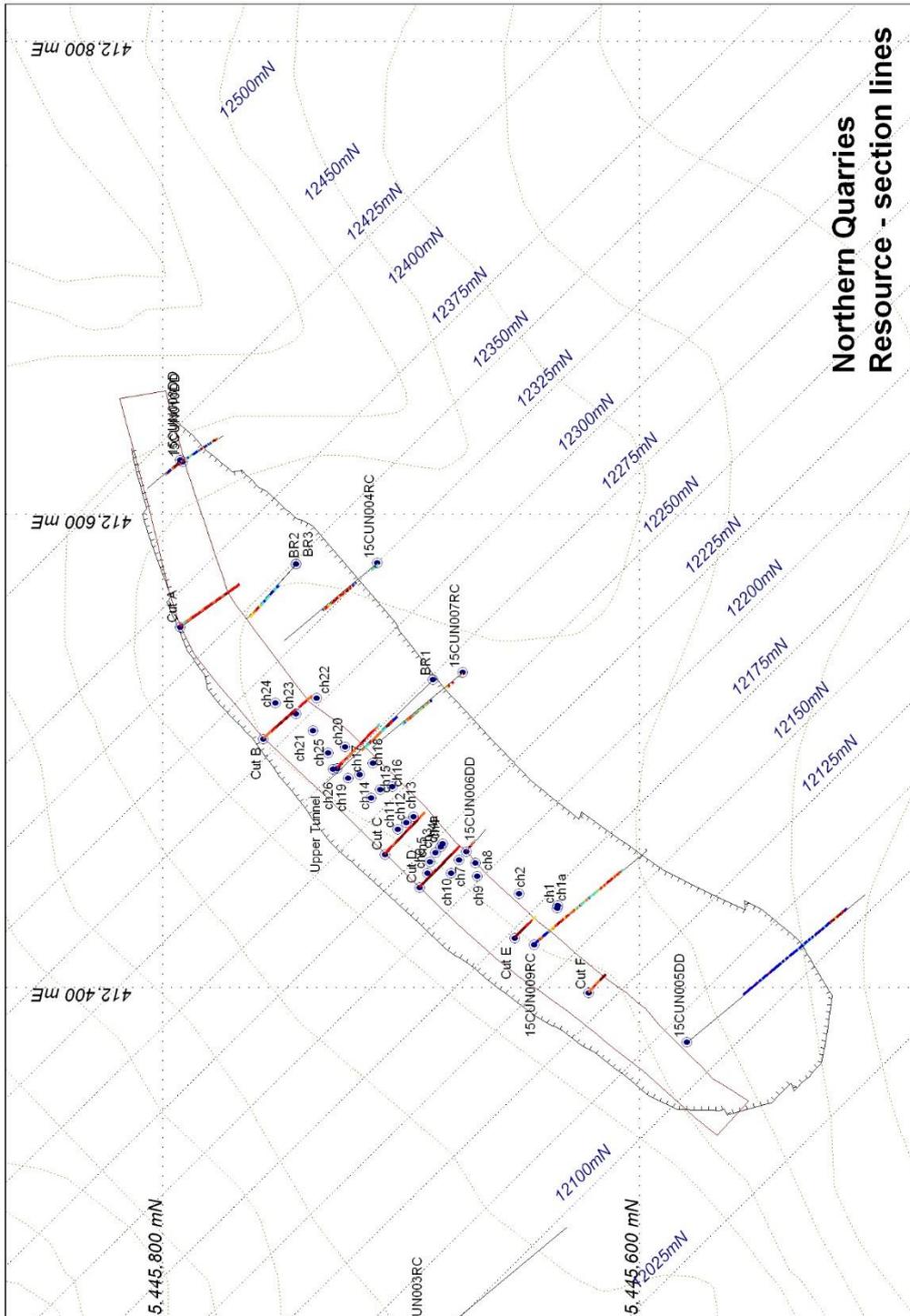


Figure 9.2: Northern Quarries (788) resource showing drillhole collars, 30m pit option bounds and Fe % (legend in figure 9.1).

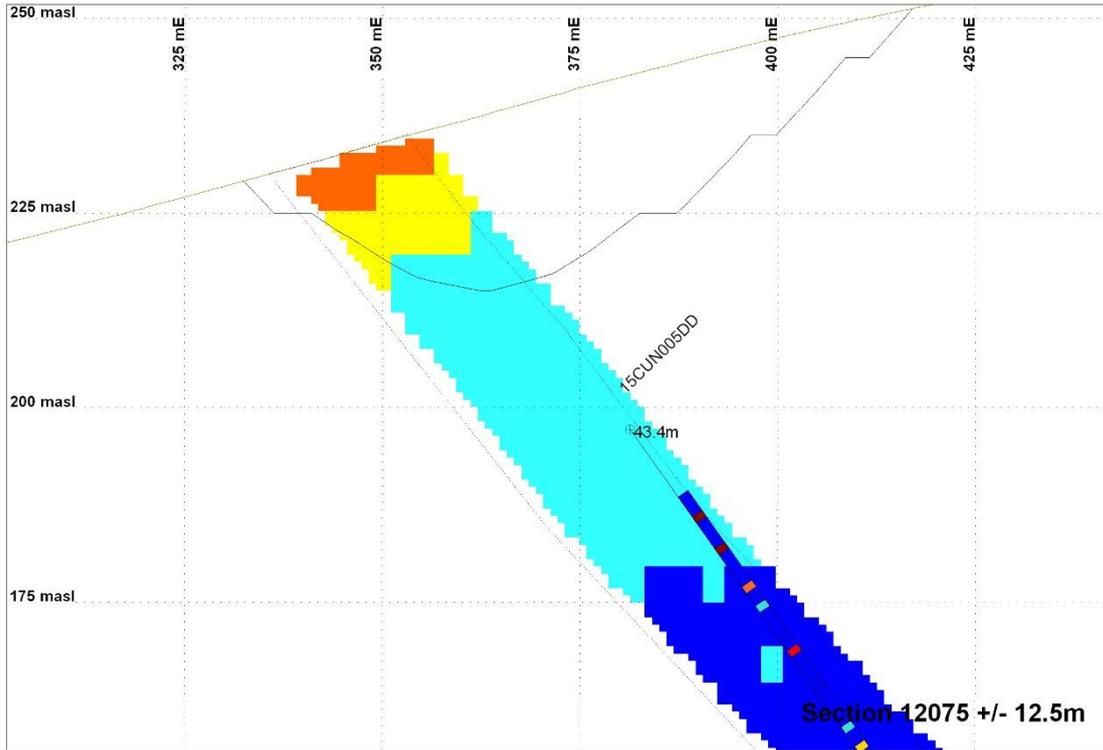


Figure 9.3: Section 12075m

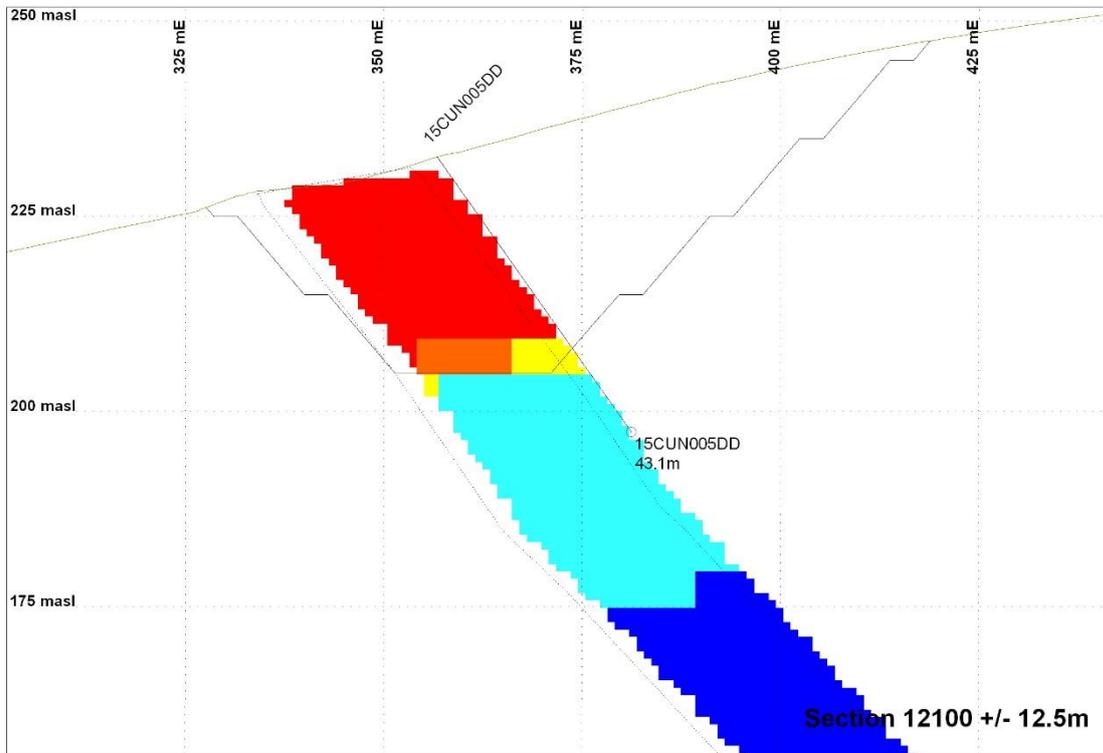


Figure 9.4: Section 12100mN

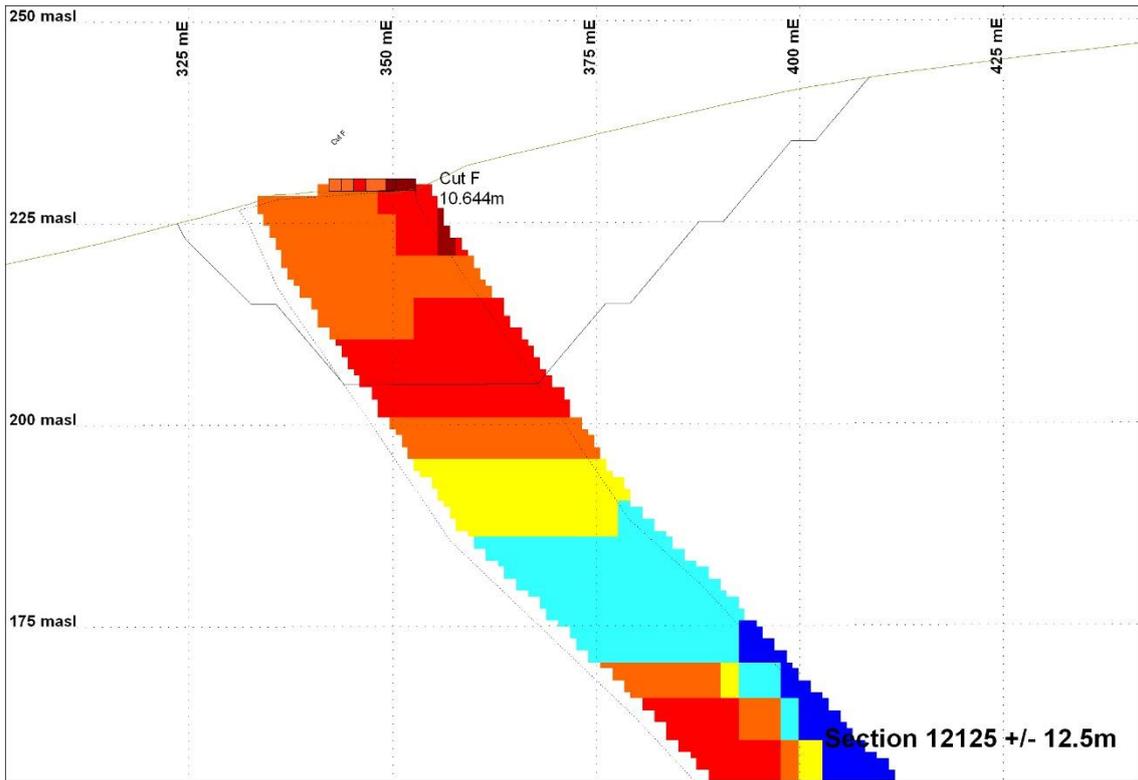


Figure 9.5: Section 12125mN

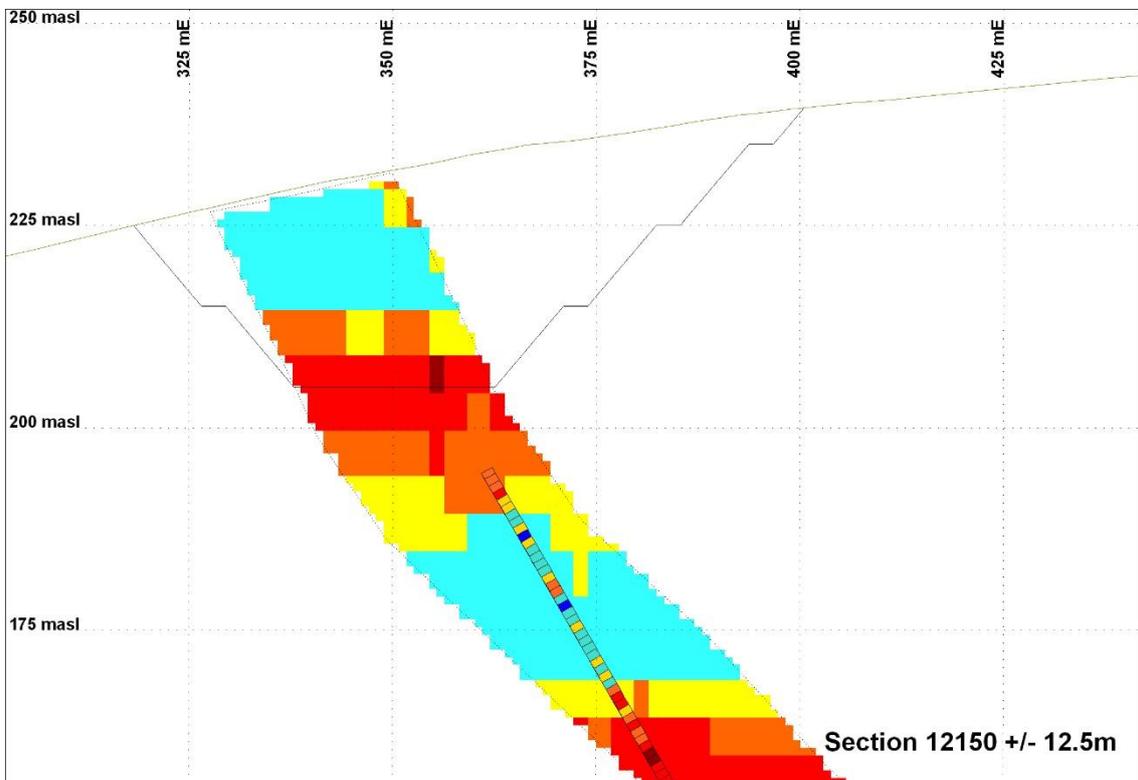


Figure 9.6: Section 12150mN

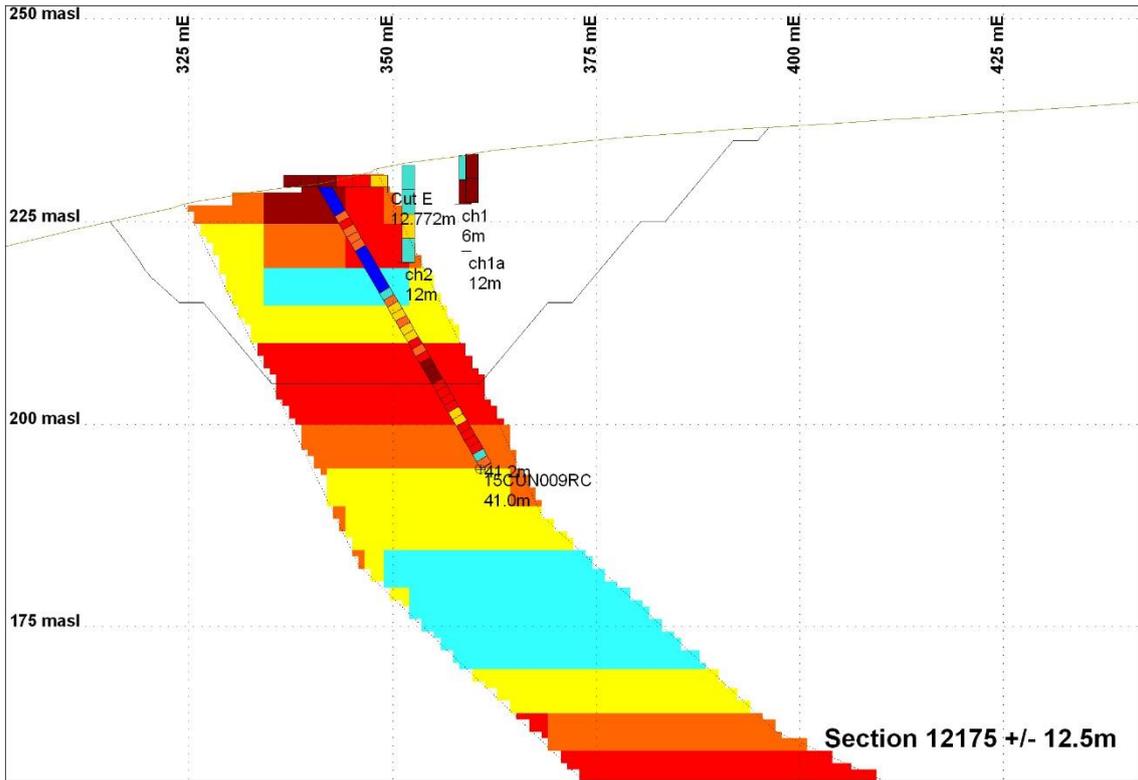


Figure 9.7: Section 12175mN

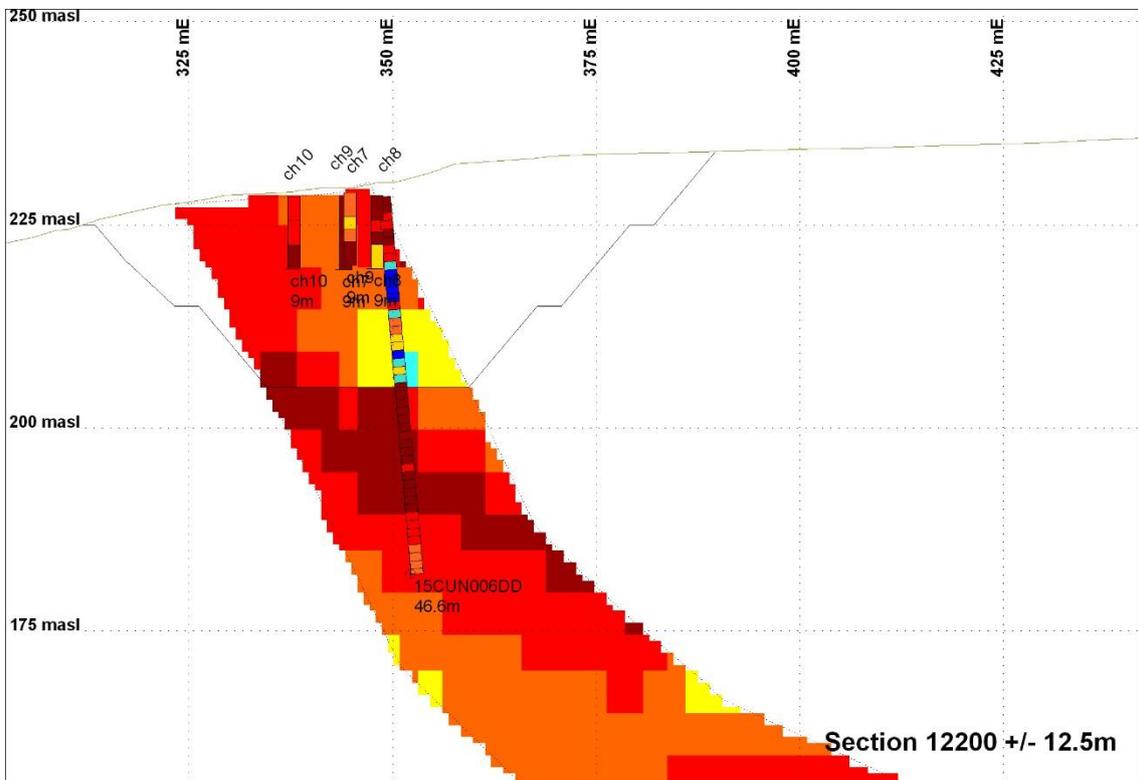


Figure 9.8: Section 12200mN

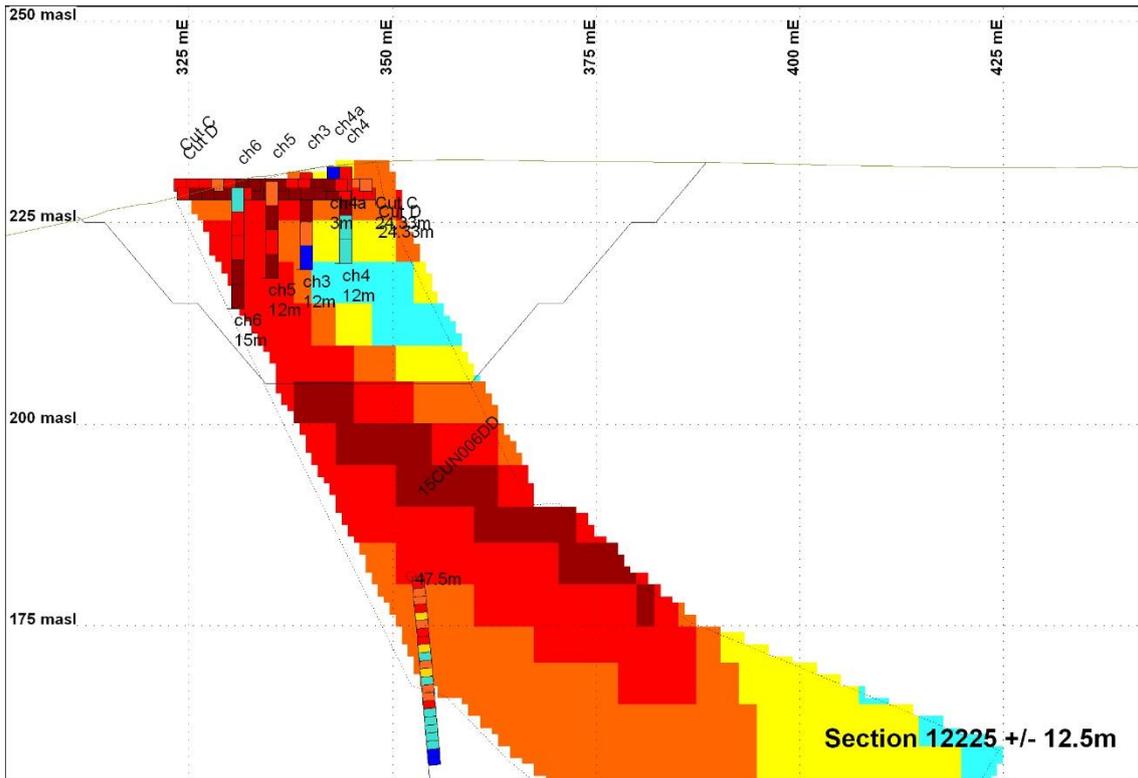


Figure 9.9: Section 12225mN

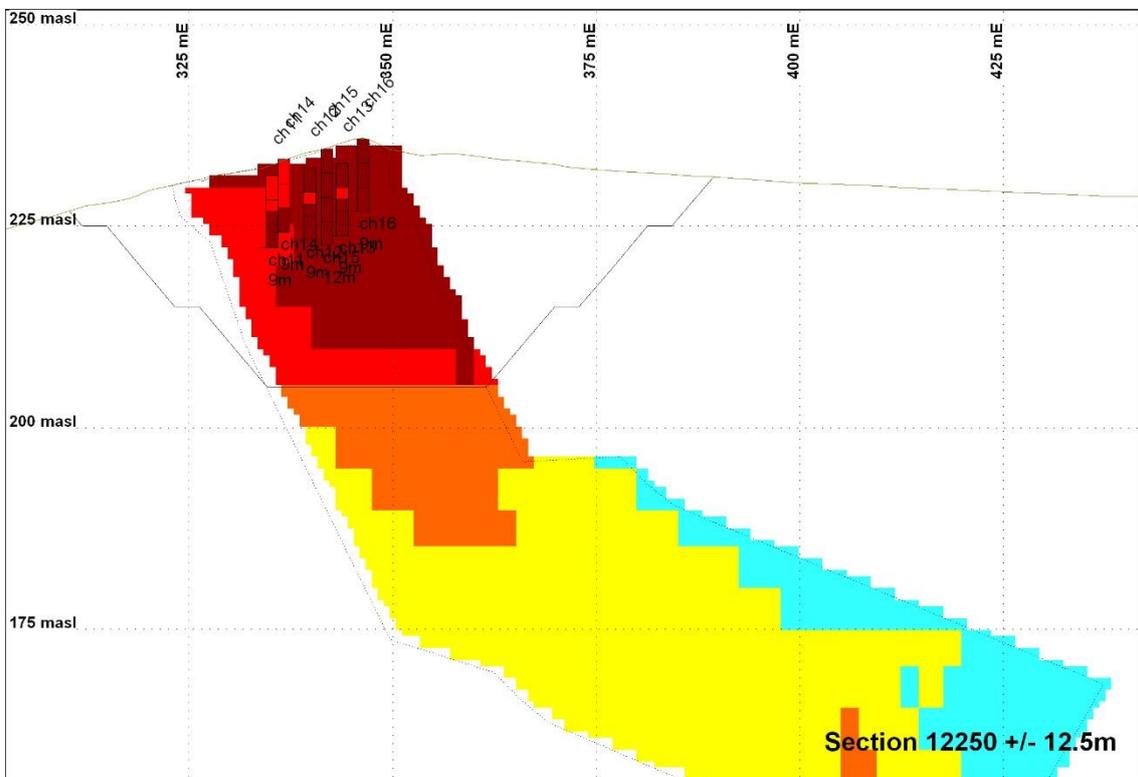


Figure 9.10: Section 12250mN

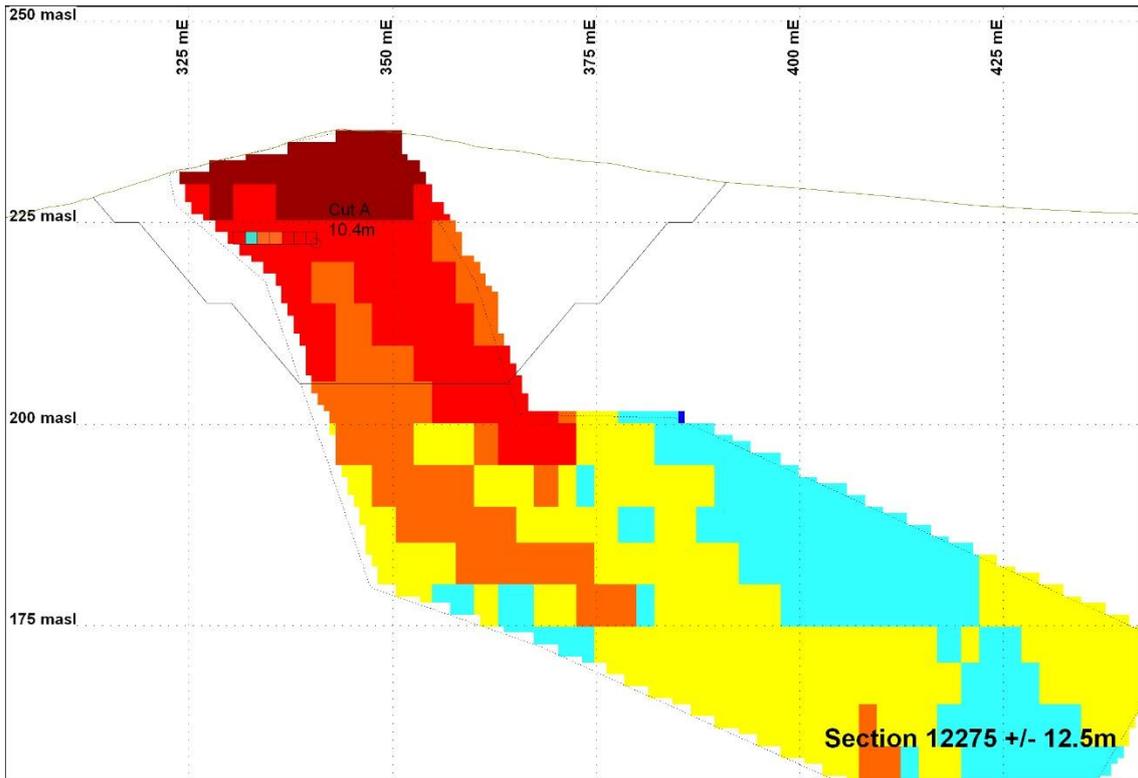


Figure 9.11: Section 12275mN

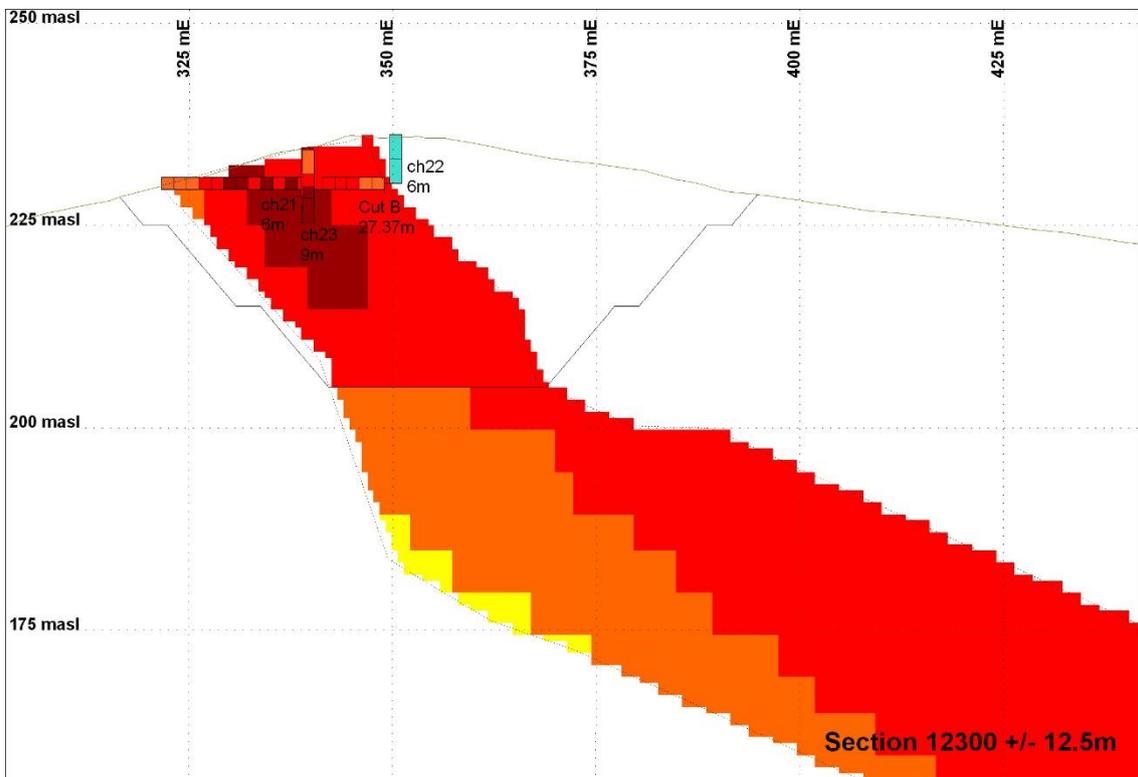


Figure 9.12: Section 12300mN

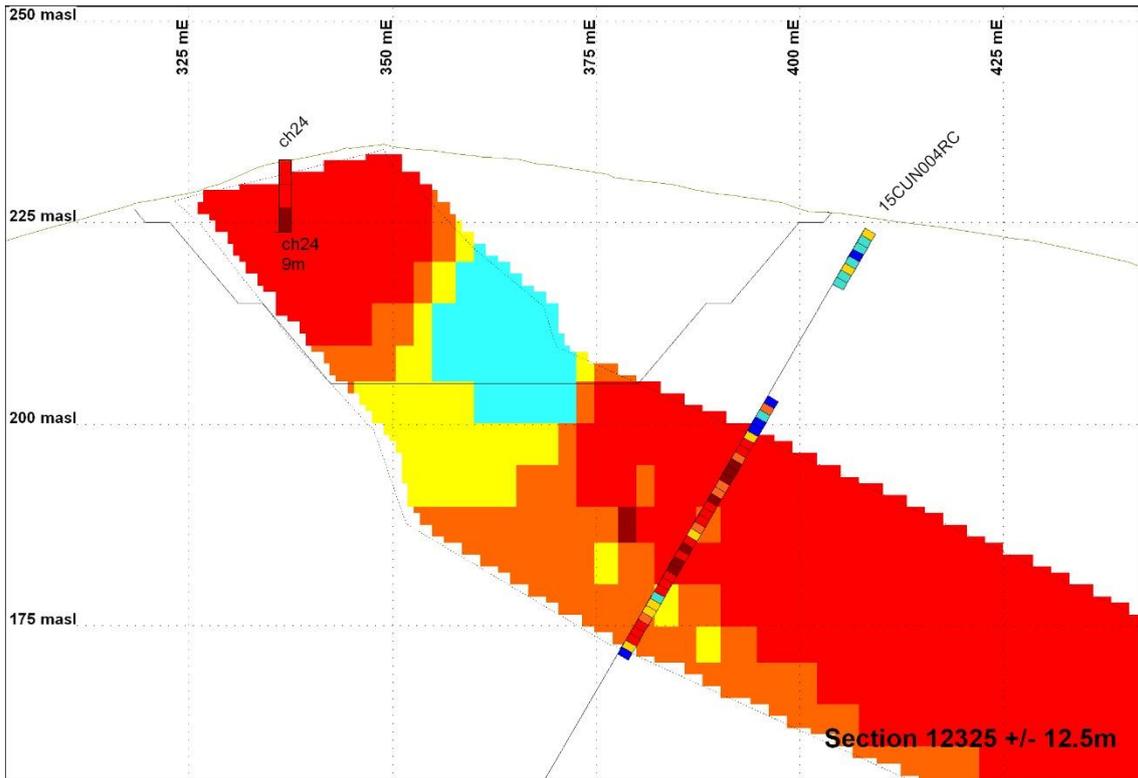


Figure 9.13: Section 12325mN

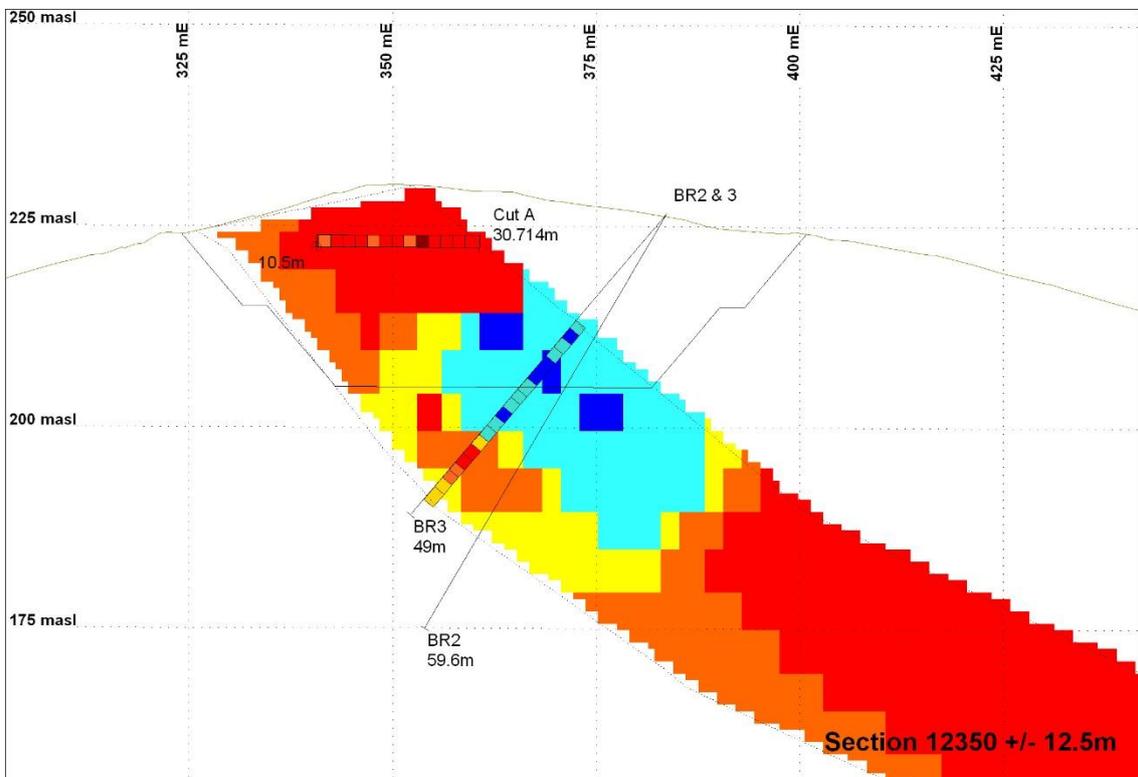


Figure 9.14: Section 12350mN

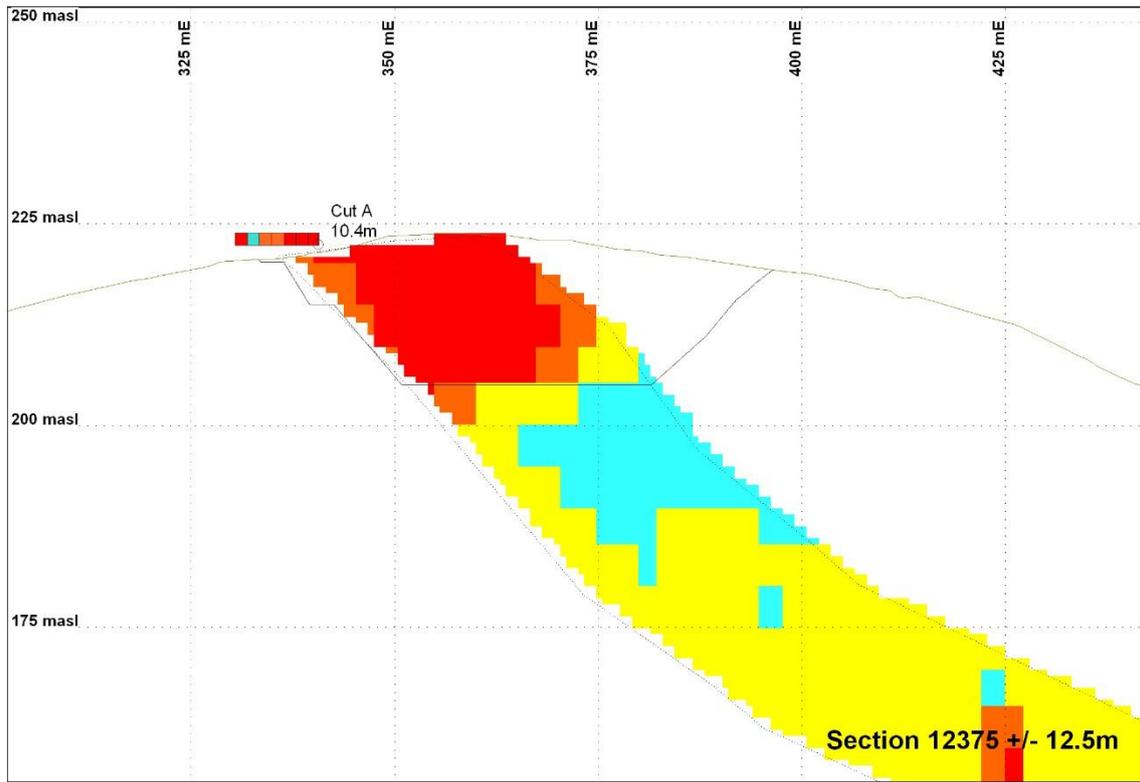


Figure 9.15: Section 12375mN

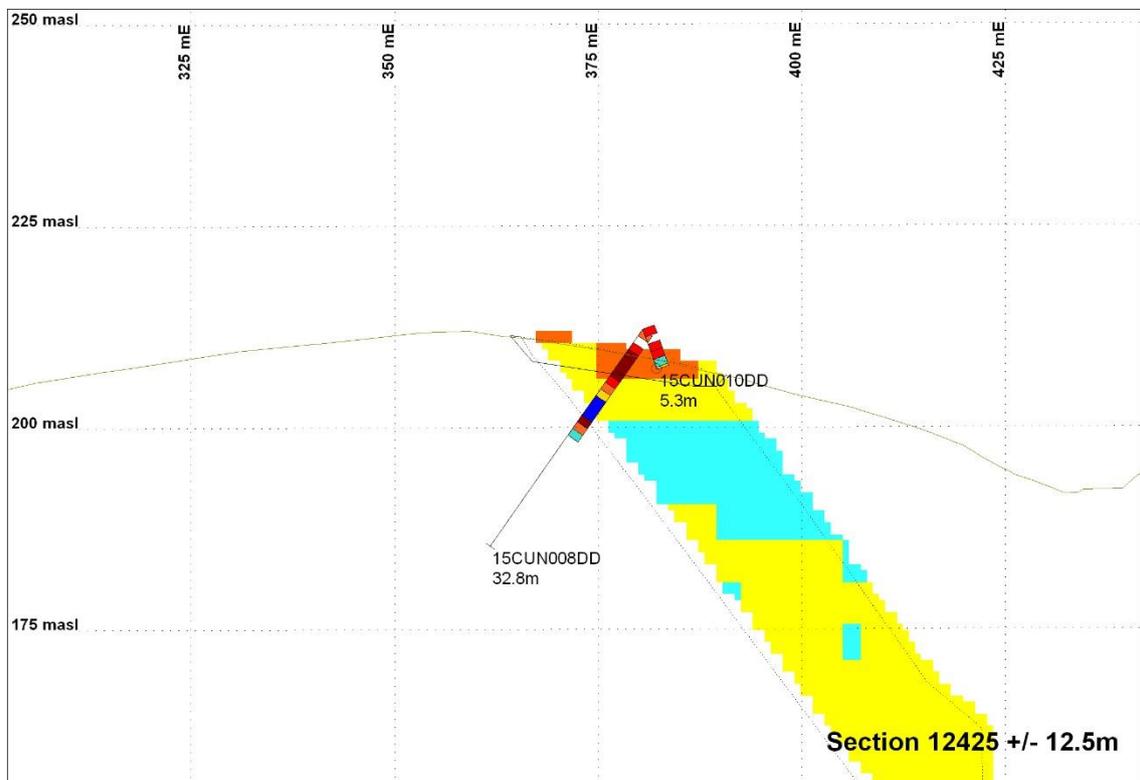


Figure 9.16: Section 12425mN

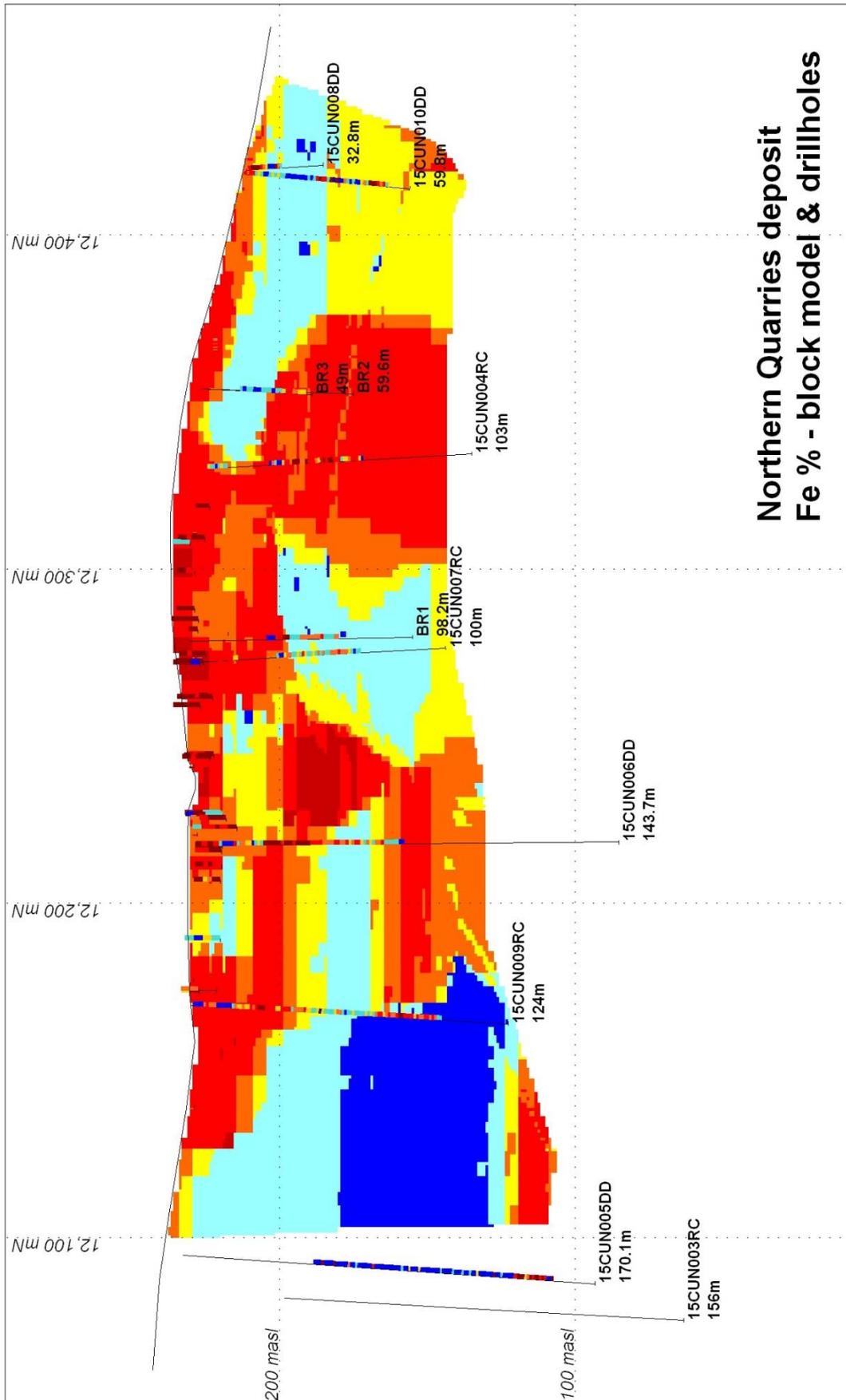


Figure 9.17: Long section looking northwest

9.5 Resource reporting

Table 9.1 Total Resource Tons and Grade

Cut Off Grade Fe %	Tons	Fe %	SiO2 %
0	4506180	41.13	34.15
15	4261362	42.81	33.1
30	3589741	46.51	30.09
40	2664424	50.39	25.51
50	1564495	54	20.72
60	106075	61.68	9.11

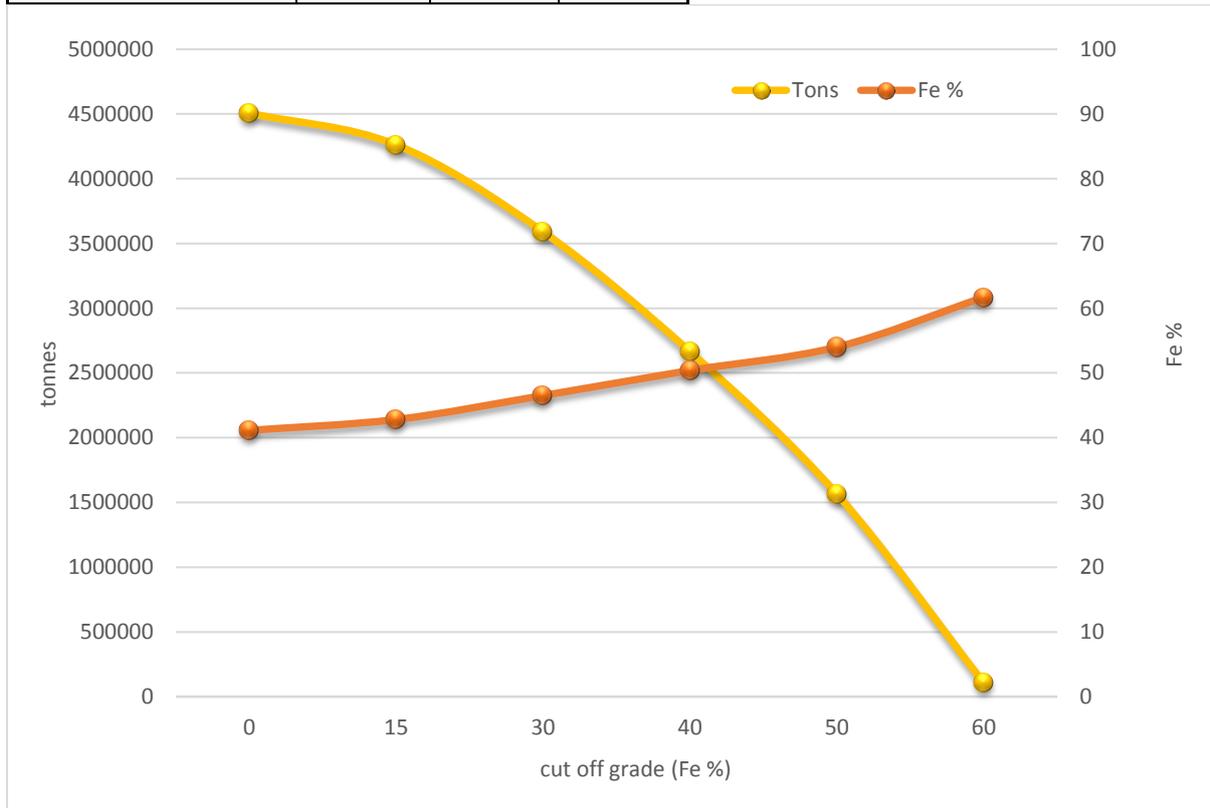


Figure 9.18 Tons and grade curve for total resource.

A nominal pit option has been assessed throughout. Tons and grades for the 30m pit option are detailed below.

Table 9.2 Total Resource 30m pit option - Tons and Grade

Cut Off Grade Fe % 30m pit option	Tons	Fe %	SiO2 %
0	947248	47.72	27.18
15	945172	47.8	27.02
30	854549	50.49	24.45
40	764913	52.18	22.99
50	564920	54.42	20.52
60	31607	61.25	9.89

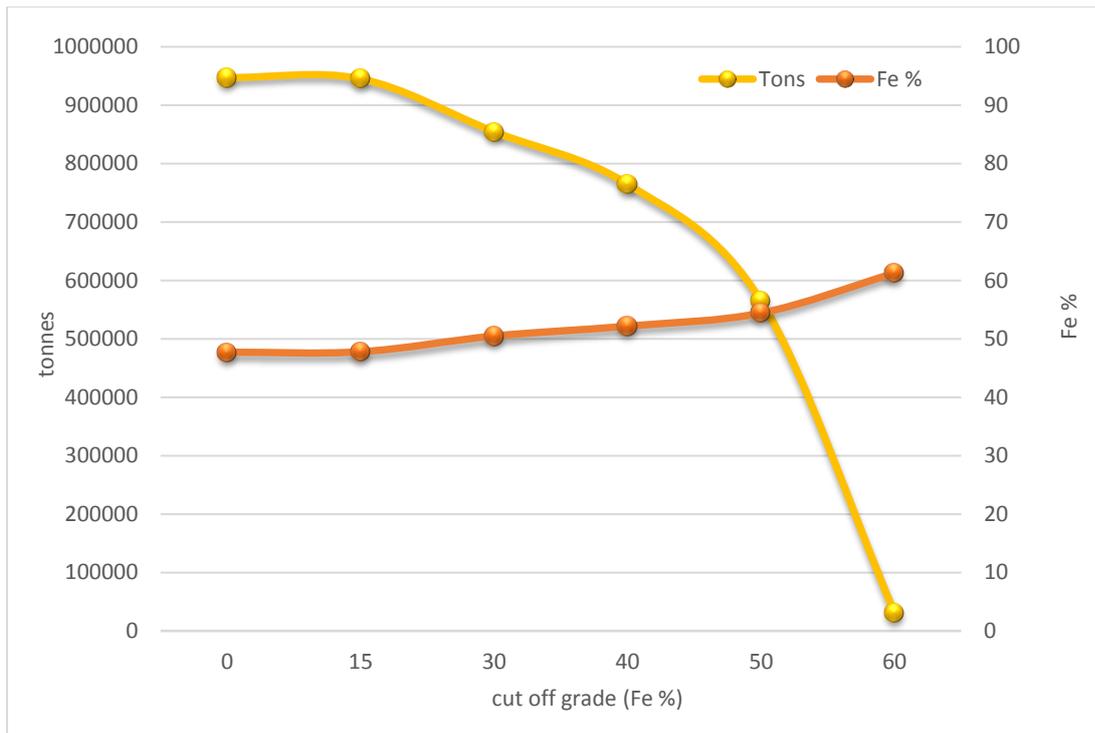


Figure 9.19 Tons and grade 30m pit option.

10.0 Potential to Extend or Add to Resource Base

10.1 Introduction

There is considerable potential to extend the hematite iron resource to the southwest and southeast from the Northern Quarries (788) deposit along the Cuprona-Natone Iron Trend with systematic drilling, trenching and sampling.

10.2 Northeast

There is 500m of strike of the trend to the north east of the Northern Quarries (788) deposit before the trend disappears beneath basalt cover. Early mapping by Twelvetrees (1905) (figure 10.2) suggests the possibility of further hematite mineralisation just beneath the basalt about 500m northeast.

Work here should initially consist of shallow excavator trenching and step-out drilling initially on 100m sections.

10.3 River Zone

10.3.1 Introduction

Immediately to the southwest of the Northern Quarries (788) body on Sushames Hill the mineralised zone is truncated by what drilling has shown to be a relatively thick basalt cover.

The hematite mineralized trend reappears from beneath this cover with massive hematite outcrops on the ridge down to the Blythe River and up the slopes on the south side of the river before (see figures 2.4, 10.3 and 10.4).

This part of the Cuprona – Natone trend is called herein the River Zone and has been mapped and described by Noldart (1958) and sampled and geologically described by Boyd *et. al.* (1919).

10.3.2 Mining and Exploration History

Boyd *et. al.* (1919) sampled the lode in the two tunnels, the River or Lower Tunnel (sampling 5 cross-cuts into the ore), and the Middle Tunnel. On the ridge between the two tunnels trenches were dug and Cuts G and K sampled. Contiguous channel samples were also cut across the lode at the mouth of the River Tunnel (Cut H) and across the lode on the north bank of the river (Cut J)

In the Middle Tunnel the lode as sampled is 12.7m (45') wide, described as "very hard, jointed and jaspery with no clean ore" and assayed 13.7m @ 25.95% Fe, however, Boyd *et. al.* state that the ore only constitutes 5' of the drive.

In Cut K, 35m south-southwest of the Middle Tunnel the sampling did not quite extend the full width of the lode with 9.73m (32') sampled and a further 1.22m (4") not sampled i.e. a total width of 11.0m (36') assaying approximately (assuming last 4' assays similarly to the previous sample) 9.1m @ 53.3% Fe. The rock here is described as hard dense and siliceous ore with some samples also described as being foliated. This cut is reportedly the best mineralised in the River Quarries zone.

Cut G was taken 50m further away again and sits above the 221' cross-cut in the River Tunnel. Cut G did not extend quite to the east wall of the lode (unstated amount) but 13.7m (45') was sampled with the rock described as reddish ore in the western part and more jaspery in the eastern. Cut G assayed 13.7m @ 13.7m @ 43.4% Fe.

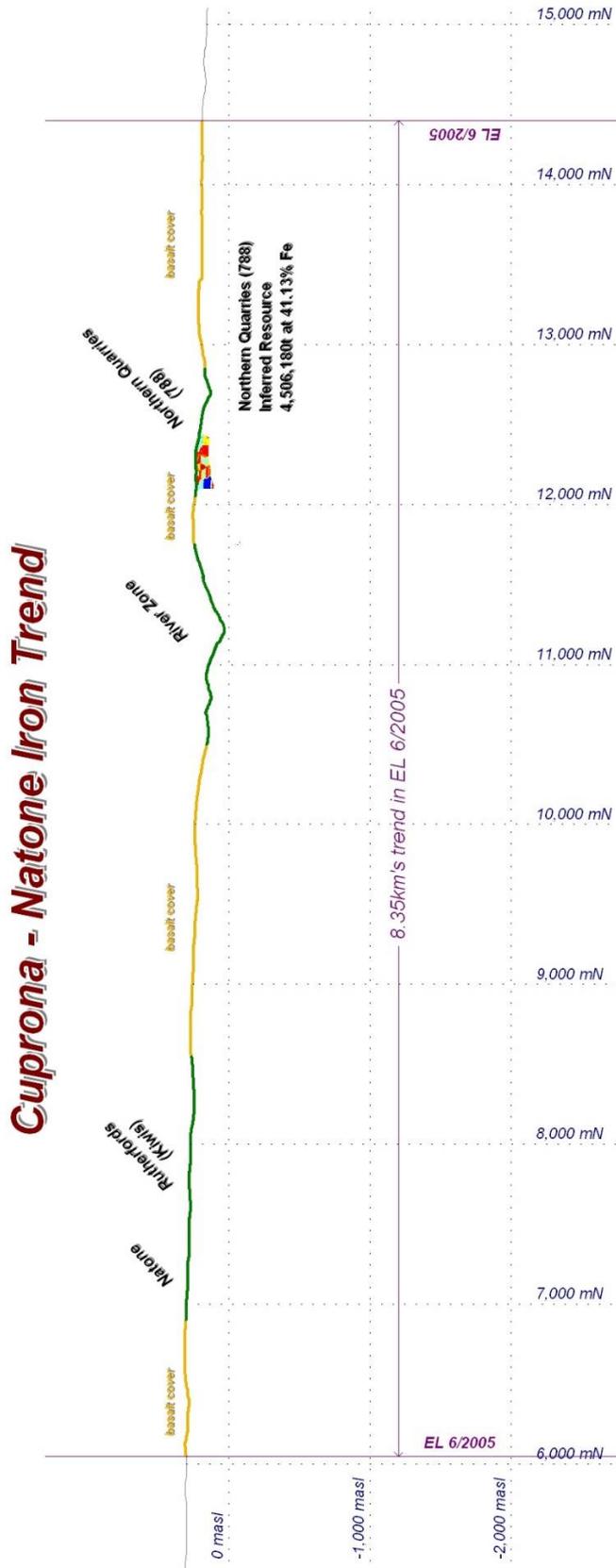


Figure 10.1: Cuprona-Natone Iron Trend long section looking towards 315° i.e. north west. Green and brown line is surface along the iron trend with brown basalt cover and green exposed Cambrian siltstones, host to the hematite bodies.

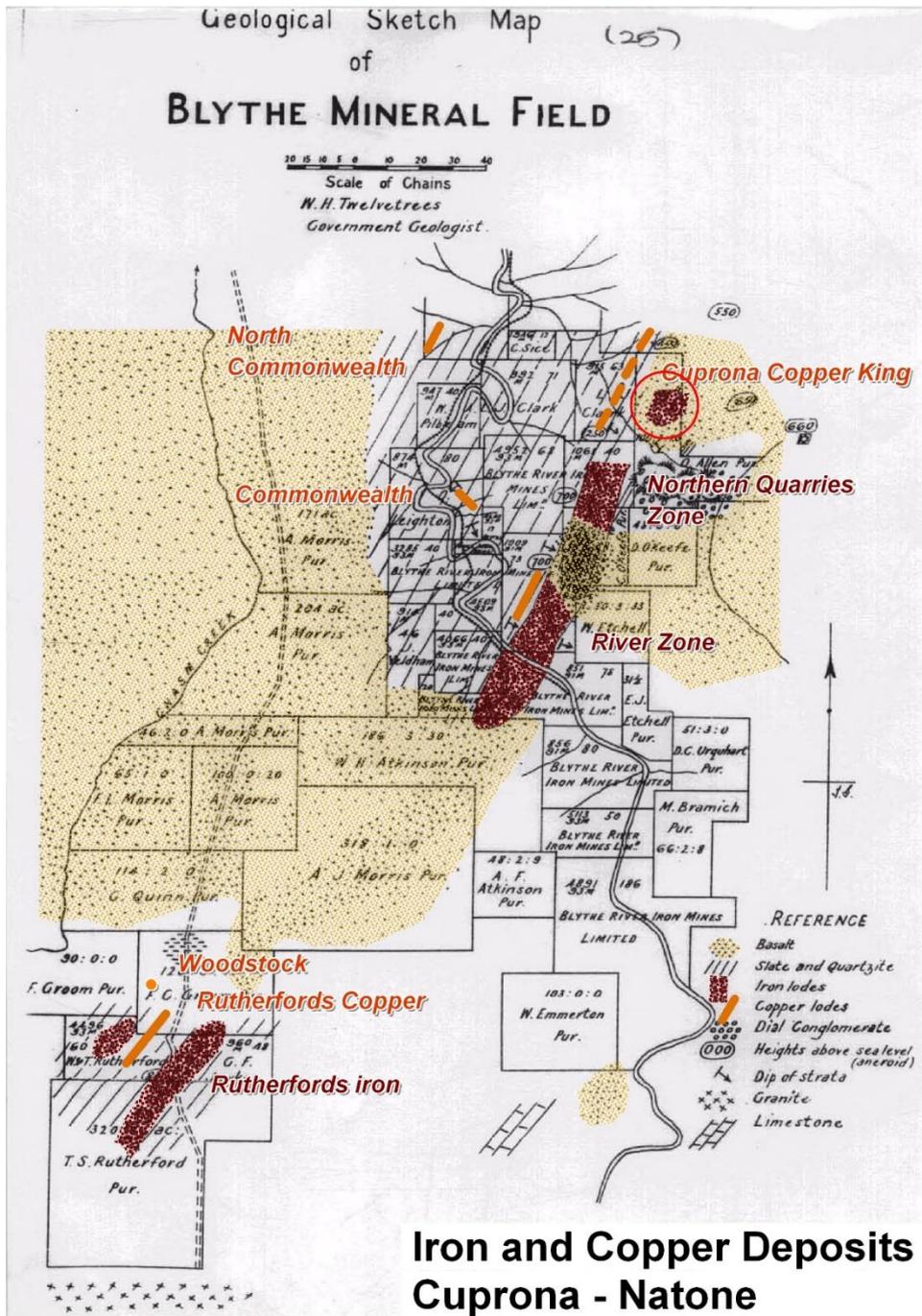


Figure 10.2: Location of iron mapped by Twelvetrees (1905) in area of red circle.

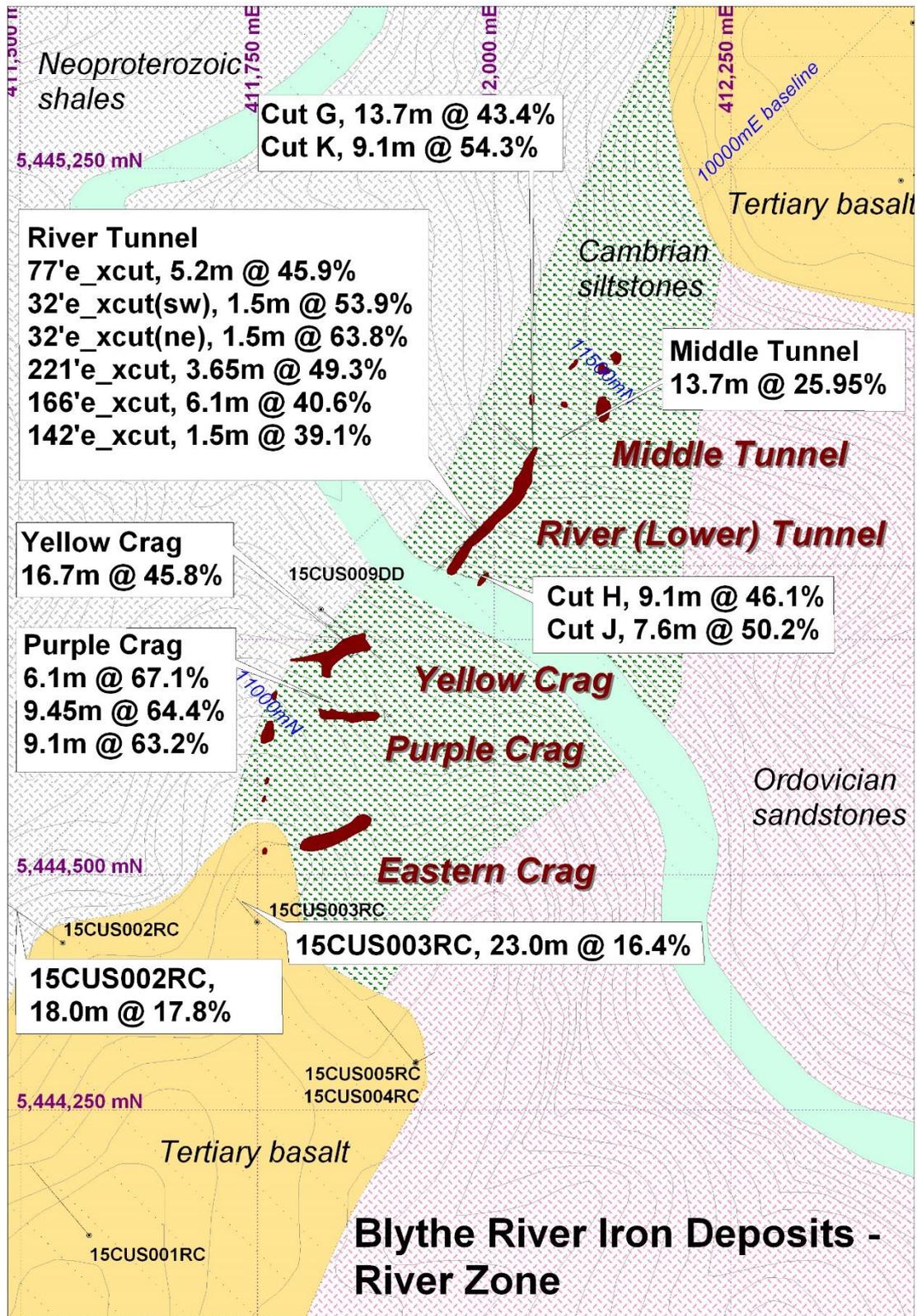


Figure 10.3: Blythe River Iron Deposits River Zone geology and sample results. Maroon shapes are hematite outcrops. Sample results all from Boyd et. al (1919).

The River Tunnel was sampled with a series of channel samples across 5 of the cross-cuts (32', 77', 142', 166' and 221'). Boyd's map shows the River Tunnel cutting across the lode diagonally starting from its western footwall at the mouth but with the deepest cross-cut (221') at the eastern margin of the lode. Samples in these cross-cuts give no indication of lode widths but the ore is generally described as siliceous, jaspery and jointed with good ore in narrow patches. Grades here range from 39.1% Fe to 63.8% Fe.

Cut H sampled the outcrop to the immediate east of the tunnel mouth with a sampled width of (30') but lode width of 10.04m (33'). Cut H assayed 9.1m @ 46.1% Fe.

Cut J was taken across the outcrop of the lode in the north bank of the river giving a full width of 7.6m (25'). The rock here is described as hard and dense with blebs of silica. Outcrop just upslope and across the river as described as being more jaspery. Cut J assayed 7.1m @ 50.2% Fe.

The hematite trend continues on the southern slopes of the Blythe River outcropping as a series of crags. The Yellow Crag lies directly on the trend as defined on the north side of the river. The other two crags, the Purple Crag, and Eastern Crag, are offset to the east from this trend.

Cut N across the Yellow Crag is described as "siliceous and jaspery throughout" with an outcrop width of 16.73m (55") sampled and a further 3.04m (10') width beyond sample #144 of jasper similar to that in #144 i.e. a total outcrop width of 19.77m (65'), i.e. 16.73m @ 45.8% Fe.

This outcrop was tested at depth by drill hole 15CUS005DD which intersected 27.0m at 30.0% Fe and along strike by 15CUS002RC which intersected 18.0m @ 17.8% Fe. including 1m @ 42.6% Fe.

The Purple Crag is described as fragmental or agglomeratic ore and has been considered to be potentially a large float with a more recent history suggested. It has been sampled across its outcrop width in Cuts L 6.08m (20'), M 9.12m (30'), and O 9.12m (30'). These assayed 6.1m @ 67.1% Fe, 9.45m @ 64.4% Fe and 9.1m @ 63.2 % Fe.

The geological relationship between these three outcrops needs resolution. In particular the Eastern Crag's position is problematic. It may represent a parallel trend.

The Eastern Crag was not sampled by Boyd *et. al.* (1919) but has been drill tested at its southwestern end by drill hole 15CUS003RC which intersected 23.0m @ 16.4% Fe.z

Lottah Mining have also drilled holes 15CUS001RC, 15CUS004RC and 15CUS005RC to look for the continuation of the main mineralised trend with no significant intersections.

10.3.3 Mineralisation and Potential

The surface and underground sampling to date has shown mineralisation to be of a lower tenor than the Northern Quarries (788) area, however, higher grades have been intersected in parts.

Cut K assayed 9.1m @ 54.3% Fe. There is a 300m section between it and the edge of the basalt with no trenching or drilling. Whilst Blake (1958) did not map hematite in this area (figure 2.4), Atkinson (1958) does (figure 10.4). This section should be more thoroughly assessed given its proximity to the operation on the other side of the hill.

On the south side of the river the geological picture is unclear with the suggestion of three parallel zones. The Purple Crag may be a red herring as adits into barren rock immediately beneath it suggest that it is a large float and has been considered so by most visitors.

As to which of these two (or three) trends is the likely one to continue to the south opinions amongst geologists differ with Blake (1958) favouring the Eastern Crag (figure 10.2), Atkinson (1958) favouring the Purple Crag (in spite of my comments above) and Boyd *et.al.* (1919) favouring the Yellow Crag

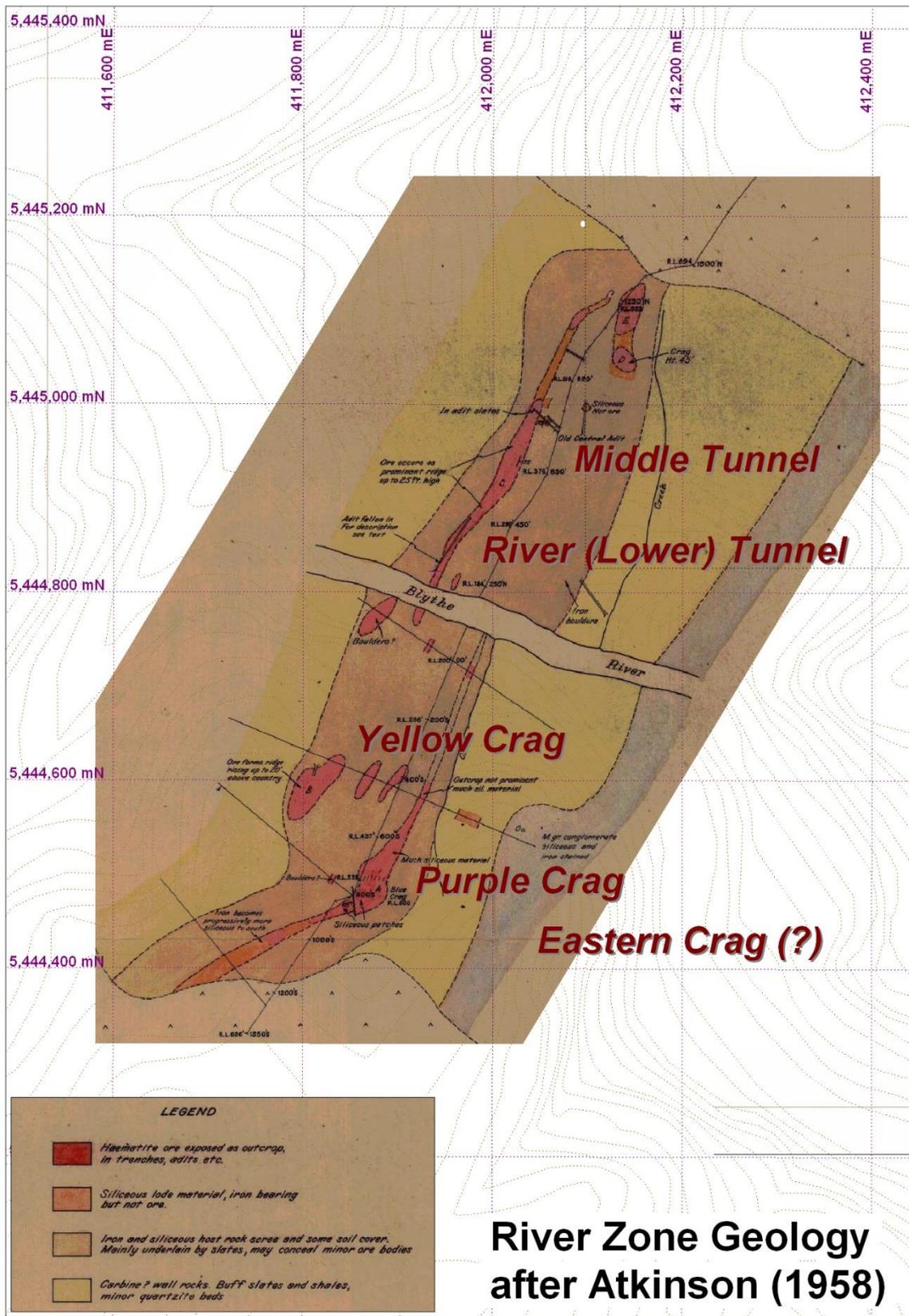


Figure 10.4: Blythe River Iron Deposits River Zone geology after Atkinson (1958).

trend. All show the rock becoming more siliceous towards the basalt margin under which the zone disappears.

The result in 15CUS002RC of 18m (down hole) at 17.8% Fe is significant as this lies on the margin of the basalt cover making mineralisation in this area more readily exploitable.

10.4 Natone/Rutherfords area

10.4.1 Introduction

Further southwest long strike the hematite trend reappears at Natone with outcropping hematite at Rutherfords (Kiwis).

10.4.2 Mining and Exploration History

The ironstone at Natone was first mined by the owner of the property Mr T Rutherford on or about 1919. Workings consisted of two shallow shafts.

In 1938, J. Linell Cook (Holdings Pty. Ltd.) reportedly further prospected the area by shaft sinking and trenching and contracted the Department of Mines to drill two diamond drill holes.

Thomas and Henderson (1943) describe extensive work recently completed and ongoing by a company Ferrico Proprietary Limited who had sunk 4 shallow shafts (3 with cross-cut drives at their base) and cut numerous trenches. Intriguingly their mining work stopped when ore was reached as they were unable to successfully break the very hard siliceous hematitic ore.

Minops investigated the Natone area from 1968 to 1972 following on from the BMR regional magnetics survey. Their work included magnetics, IP, auger drilling and the drilling of 3 diamond drill holes (Natone 1, 2 and 3) by the Department of Mines drill rig totalling 506m.

Hole 1 targeted the main magnetic anomaly to the west as did hole 3 intersecting weathered sediments grading into quartzite hornfels with minor tremolite/actinolite rock and calc-silicate skarn with pyrrhotite likely responsible for the magnetic anomaly.

Hole 2 (Natone 2) targeted the easterly weaker magnetic anomaly and intersected a 125' (horizontal width assuming vertical dip) zone of 53% Fe in massive hematite (Jack, 1969).

During 1969-1974, within EL 1/69, the Tasminex/ANZECO J/V investigated the Natone ironstone and Rutherford's copper prospect, to the north, with soil and rock geochemistry, mapping, magnetics and costeaming and the drilling of 5 shallow percussion totalling 106m at Rutherfords copper prospect.

During 1977-1985, EL 8/77 was investigated by the Comalco-Shell-CRA J/V. Extensive exploration focussed towards the discovery of tin-tungsten deposits included mapping, stream, rock and soil geochemistry: aeromagnetic and INPUT EM surveys, SP, IP max-min EM, SIROTEM, gravity and the drilling of three diamond drill holes NT1, NT2 and NT3. Drill hole NT3 encountered significant magnetite mineralisation.

The Natone-Rutherfords area was also held under EL 6/2005 by RedRiver Resources Limited under their Blythe Project (Karajas, 2006). RedRiver Resources drilled 5 holes (RRN1 to RRN5) for 721.7m. Their first hole RRN1 attempted to twin Shell hole NT3's magnetite intersection. The other 4 holes targeted soil (copper mainly but also gold, silver, palladium) +/- gravity anomalies. Holes were assayed for Cu, Pb, Zn, Ag, Au and Sn but not Fe. Hole RRN5 intersected bands of hematite in clay from 0 to 48.2m. The other holes intersected sediments with some calc-silicate skarn development.

Upon joint venturing into the project Iron Mountain Mining Limited drilled 5 RC holes (KWRC1 to KWRC5) for 254m (anon. 2008) into Rutherfords workings. These holes all intersected varying quantities of hematite mineralisation with better results 8m @ 57.6% Fe and 3m @ 55.5% Fe.

In 2003 Tasmania Mines Ltd drilled three diamond drill holes R001, R002 and R003 into the Rutherfords prospect. All holes were angled to the southwest and all intersected hematite mineralisation with R001 intersecting 66m @ 45.5% Fe including 13m @ 58.5%.

10.4.3 Mineralisation and Potential

Hematite mineralisation at Rutherfords (Kiwis) appears to occur in two parallel zones, striking ~045°, which outcrop on a small hill.

The larger eastern zone's outcrop was described by Atkinson (1958) as being 90' (27.5m) wide and exposed along strike for 210' (64m). The eastern zone has been drilled to its south over a strike length of 150m in four holes;

- RRN2, not assayed for Fe
- KWRC004, 4m @ 48.4% Fe
- R003, 4m @ 56.6% Fe and 5m @ 45.5% Fe
- R001, 66m @ 45.5% Fe including 13m @ 58.5% Fe

The smaller eastern zone's outcrop was described as having exposed dimensions of 60' (18.3m) wide and 130' (39.7m) long. The western zone has been drilled over a strike length of 200m with four holes;

- KWRC002, 8m @ 57.6% Fe
- KWRC005, 20m @ 55.5% Fe
- Natone 2, 29.5m @ 66.1% Fe
- R002, 3m @ 44.8% Fe

The two parallel zones are separated by about 30m of low grade material exposed in trenches on the hill though there are suggestions from Thomas and Henderson (1943) of thin high grade zones within this.

Internal zonation within the orebodies is apparent in drillholes e.g. R001 with three high grade zones, and R003 with two high grade zones.

Whilst these drill results are encouraging there is currently insufficient data to generate a resource with further drilling and surface trenching required.

In particular in order to facilitate modelling and estimating a resource, drill holes and surface trenches should be designed to complete continuous fences across each of the two zones on 50m spaced sections (with some fences extending across the low grade centre). This will allow definition of orebody bounds and provide sufficient assay data for the generation of an Inferred resource at least.

Both mineralised zones remain open to the south west and north east. Extending the resource will require similar fences of drilling and trenching on 100m spaced sections initially closing in to 50m sections. The intersection in R001 argues for prioritisation of step out drilling to the south west on this the eastern zone.

Prioritisation of sections for drilling might also utilise soil sampling data with Sn, Cu and W weakly anomalous in the hematite orebodies.

11.0 Conclusions and Recommendations

The massive hematite+/-silica body at the Northern Quarries (788), Cuprona has been modelled and a resource estimated.

Poor sample positional accuracies combined with low sample density and have led to the resource being classified as an Inferred Resource.

All future drill hole collars and other surface sampling should be DGPS or conventionally surveyed. All holes should be down hole surveyed. All holes should be collared to the northeast of the orebody and drilled to the southwest to provide accurate assessment of orebody shape.

The resource is reported at a range of cut-off grades. These higher grades will only be achievable with successful delineation of higher grade zones. Such delineation will require closer spaced drilling in the first instance and grade control pit mapping and sampling.

Work required to elevate the resource status from Inferred to Indicated will necessarily consist of

- Detailed survey drill hole collars, outcrops, trenches.
- Field duplication of early trench sampling with extra trenching where possible.
- Re-log drill core and re-map outcrop to generate modern geological map.
- Sample missing intervals.
- Infill and step out drilling on 50m x 25m pattern with all holes oriented to the southwest.

In order to extend the resource it is preferable to follow it along strike to the northeast and southwest than target at depth.

Northern Quarries (788) extend resource (to north east)

- Step-out trenching and drilling to northeast particularly where iron scree mapped in historic mapping.

To add to the resource base work should focus on:

River Zone

- Detailed survey drill hole collars, outcrops, trenches and detailed geological mapping
- Further sampling with trenching and channel sampling where possible, drilling where required particularly between Cut K and the basalt margin.
- Step out drilling to south west along strike from Yellow Crag, Purple Crag and Eastern Crag.

beneath basalt cover

- Determine thickness of basalt and model.
- Drill broad spaced fences of holes across favourable stratigraphic host.

Rutherfords (Natone) define resource

- Detailed survey drill hole collars, outcrops, trenches.
- Surface trenching on 25m sections (where possible) and infill drilling on 50m spaced sections as fences across the two parallel zones (with some fences also crossing the central zone).
- Geological remapping/relogging/reinterpretation of all drill holes to generate new geological map.

Rutherfords (Natone) define resource

- Step-out drilling to northeast and southwest along both parallel zones following stratigraphic host unit. Particularly southwest from drill hole Natone 2's intersection of 29.5m @ 66.1% Fe (down hole length) and R003's 13m @ 58.5% Fe (down hole length).
- Consider existing geophysical (gravity) and soil geochemical data (Cu, Sn and W) for ground to northeast and southwest and target relevant anomalies

Regionally

- Target the stratigraphic unit which hosts the hematite bodies, i.e. Cambrian siltstone beneath the Duncan Conglomerate, regionally.

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JORC Code, 2012 Edition – Table 1

Section 1 Sampling Techniques and Data

(Criteria in this section apply to all succeeding sections.)

Criteria	JORC Code explanation	Commentary
Sampling techniques	<ul style="list-style-type: none"> Nature and quality of sampling (eg cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as down hole gamma sondes, or handheld XRF instruments, etc). These examples should not be taken as limiting the broad meaning of sampling. Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used. Aspects of the determination of mineralisation that are Material to the Public Report. In cases where 'industry standard' work has been done this would be relatively simple (eg 'reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay'). In other cases more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (eg submarine nodules) may warrant disclosure of detailed information. 	<ul style="list-style-type: none"> 3 historic data sets, Boyd <i>et. al.</i> (1919) and Noldart (1966), both reports included as appendices and Whitehead (1989). Boyd <i>et. al.</i> (1919) channel sampling trenches and adits. Sampling and assaying to industry standard of the day. Noldart (1966) Department of Mines diamond drill holes BR1 and BR3. Sampling and assaying to industry standard of the day. 1 new data set Lottah Minint Pty Ltd done to industry standard.
Drilling techniques	<ul style="list-style-type: none"> Drill type (eg core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic, etc) and details (eg core diameter, triple or standard tube, depth of diamond tails, face-sampling bit or other type, whether core is oriented and if so, by what method, etc). 	<ul style="list-style-type: none"> Boyd (1919) channel samples, Noldart (1966) diamond core, Whitehead (1989) open hole percussion, Lottah mixture diamond core and reverse circulation percussion
Drill sample recovery	<ul style="list-style-type: none"> Method of recording and assessing core and chip sample recoveries and results assessed. Measures taken to maximise sample recovery and ensure representative nature of the samples. Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material. 	<ul style="list-style-type: none"> Boyd (1919) recoveries not recorded. Noldart (1966) poor recoveries BR2 – redrilled as BR3. CW Davis (1989) no mention recoveries. Perhaps some bias with open hole percussion samples from Whitehead (1989)
Logging	<ul style="list-style-type: none"> Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies. Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc) photography. The total length and percentage of the relevant intersections logged. 	<ul style="list-style-type: none"> All channel samples and drillholes logged to industry standard by different geologists. Logging to sufficient standard for purposes of resource estimation.
Sub-sampling techniques and sample preparation	<ul style="list-style-type: none"> If core, whether cut or sawn and whether quarter, half or all core taken. If non-core, whether riffled, tube sampled, rotary split, etc and whether sampled wet or dry. For all sample types, the nature, quality and appropriateness of the sample preparation technique. Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples. Measures taken to ensure that the sampling is representative of the in situ material collected, including for instance results for field duplicate/second-half sampling. Whether sample sizes are appropriate to the grain size of the material being sampled. 	<ul style="list-style-type: none"> Boyd (1919) channel samples onto mat. Noldart (1966) half core. Whitehead (1989) riffle split. Lottah half core diamond and riffle split RC. Sampling methodology and size adequate for the orebody type being bulk commodity.
Quality of assay data and laboratory tests	<ul style="list-style-type: none"> The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total. For geophysical tools, spectrometers, handheld XRF instruments, etc, the parameters used in determining the analysis including instrument make and model, 	<ul style="list-style-type: none"> No QA/QC for Boyd (1919). Noldart (1966) and Whitehead (1989). Industry standard QA/QC Lottah – standards and blanks and repeats every 25.

Criteria	JORC Code explanation	Commentary
	<p>reading times, calibrations factors applied and their derivation, etc.</p> <ul style="list-style-type: none"> Nature of quality control procedures adopted (eg standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (ie lack of bias) and precision have been established. 	
Verification of sampling and assaying	<ul style="list-style-type: none"> The verification of significant intersections by either independent or alternative company personnel. The use of twinned holes. Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols. Discuss any adjustment to assay data. 	<ul style="list-style-type: none"> No field duplicates. Boyd (1919), Noldart (1966), Whitehead (1989) data taken from old reports and hand entered. Lottah data from primary source. Dummy data (7% Fe) added for unsampled intervals (22 in total) for holes 15CUN005DD & 15CUN008DD
Location of data points	<ul style="list-style-type: none"> Accuracy and quality of surveys used to locate drill holes (collar and down-hole surveys), trenches, mine workings and other locations used in Mineral Resource estimation. Specification of the grid system used. Quality and adequacy of topographic control. 	<ul style="list-style-type: none"> Boyd (1919) channels georeferenced from old plans, Noldart (1966) collar location georeferenced from old plans, Whitehead (1989) georeferenced from old plans, Lottah primary source – DGPS for earlier holes, handheld GPS for hole 6 onwards. GDA94 datum with local grid generated for drill sections. Local grid is 045° true LIDAR topographic data used for surface topography.
Data spacing and distribution	<ul style="list-style-type: none"> Data spacing for reporting of Exploration Results. Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied. Whether sample compositing has been applied. 	<ul style="list-style-type: none"> Boyd (1919) channel samples on 20m-40m spaced sections, Whitehead (1989) holes 5m spacings on 15m-20m spaced sections, Lottah drilling on nominally 25m spaced sections. All samples composited to 1m downhole.
Orientation of data in relation to geological structure	<ul style="list-style-type: none"> Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type. If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material. 	<ul style="list-style-type: none"> All sampling conducted across strike, some holes drilled down dip.
Sample security	<ul style="list-style-type: none"> The measures taken to ensure sample security. 	<ul style="list-style-type: none">
Audits or reviews	<ul style="list-style-type: none"> The results of any audits or reviews of sampling techniques and data. 	<ul style="list-style-type: none"> There has been no audit of the data.

Section 2 Reporting of Exploration Results

(Criteria listed in the preceding section also apply to this section.)

Criteria	JORC Code explanation	Commentary
Mineral tenement and land tenure status	<ul style="list-style-type: none"> Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings. The security of the tenure held at the time of reporting along with any known impediments to obtaining a licence to operate in the area. 	<ul style="list-style-type: none"> EL 6/2005 current at time of reporting. Title held in name by Blythe River Iron Pty Ltd, managed by parent company Lottah Mining Pty Ltd.
Exploration done by other parties	<ul style="list-style-type: none"> Acknowledgment and appraisal of exploration by other parties. 	<ul style="list-style-type: none"> All previous exploration data has been incorporated.
Geology	<ul style="list-style-type: none"> Deposit type, geological setting and style of mineralisation. 	<ul style="list-style-type: none"> Stratabound/stratiform bedded hematite+-silica hosted in folded Cambrian-Ordovician sequence,
Drill hole Information	<ul style="list-style-type: none"> A summary of all information material to the understanding of the exploration results including a tabulation of the following information for all Material drill holes: <ul style="list-style-type: none"> easting and northing of the drill hole collar elevation or RL (Reduced Level – elevation above sea level in metres) of the drill hole collar dip and azimuth of the hole down hole length and interception depth 	<ul style="list-style-type: none"> All data is provided in the report in Tables 4.1 and 4.2

Criteria	JORC Code explanation	Commentary
	<ul style="list-style-type: none"> ○ hole length. ● If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case. 	
Data aggregation methods	<ul style="list-style-type: none"> ● In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (eg cutting of high grades) and cut-off grades are usually Material and should be stated. ● Where aggregate intercepts incorporate short lengths of high grade results and longer lengths of low grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail. ● The assumptions used for any reporting of metal equivalent values should be clearly stated. 	<ul style="list-style-type: none"> ● Data composited to 1m downhole lengths.
Relationship between mineralisation widths and intercept lengths	<ul style="list-style-type: none"> ● These relationships are particularly important in the reporting of Exploration Results. ● If the geometry of the mineralisation with respect to the drill hole angle is known, its nature should be reported. ● If it is not known and only the down hole lengths are reported, there should be a clear statement to this effect (eg 'down hole length, true width not known'). 	<ul style="list-style-type: none"> ● All intersections in report are downhole intersections. Approximate horizontal widths in Table 3.1
Diagrams	<ul style="list-style-type: none"> ● Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported. These should include, but not be limited to a plan view of drill hole collar locations and appropriate sectional views. 	<ul style="list-style-type: none"> ● Plan and sections in report
Balanced reporting	<ul style="list-style-type: none"> ● Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high grades and/or widths should be practiced to avoid misleading reporting of Exploration Results. 	<ul style="list-style-type: none"> ●
Other substantive exploration data	<ul style="list-style-type: none"> ● Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples – size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances. 	<ul style="list-style-type: none"> ●
Further work	<ul style="list-style-type: none"> ● The nature and scale of planned further work (eg tests for lateral extensions or depth extensions or large-scale step-out drilling). ● Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive. 	<ul style="list-style-type: none"> ● Potential for extensions included in report

Section 3 Estimation and Reporting of Mineral Resources

(Criteria listed in section 1, and where relevant in section 2, also apply to this section.)

Criteria	JORC Code explanation	Commentary
Database integrity	<ul style="list-style-type: none"> ● Measures taken to ensure that data has not been corrupted by, for example, transcription or keying errors, between its initial collection and its use for Mineral Resource estimation purposes. ● Data validation procedures used. 	<ul style="list-style-type: none"> ● Database has not been audited. Data entry undertaken with care. Potential error margins not considered high due to bulk nature of commodity.
Site visits	<ul style="list-style-type: none"> ● Comment on any site visits undertaken by the Competent Person and the outcome of those visits. ● If no site visits have been undertaken indicate why this is the case. 	<ul style="list-style-type: none"> ● A number of site visits made, primary assessment of historical reported data, visual assessment of Lottah diamond core
Geological interpretation	<ul style="list-style-type: none"> ● Confidence in (or conversely, the uncertainty of) the geological interpretation of the mineral deposit. ● Nature of the data used and of any assumptions made. ● The effect, if any, of alternative interpretations on Mineral Resource estimation. ● The use of geology in guiding and controlling Mineral Resource estimation. ● The factors affecting continuity both of grade and geology. 	<ul style="list-style-type: none"> ● Geological interpretation confident apart from steepening of dip at southern end which may be due to faulting.
Dimensions	<ul style="list-style-type: none"> ● The extent and variability of the Mineral Resource expressed 	<ul style="list-style-type: none"> ● Total resource 400m long x 20-25m

Criteria	JORC Code explanation	Commentary
	as length (along strike or otherwise), plan width, and depth below surface to the upper and lower limits of the Mineral Resource.	<ul style="list-style-type: none"> wide x120m vertical 30m pit option 400m long x 20-25m wide x 30m vertical
Estimation and modelling techniques	<ul style="list-style-type: none"> The nature and appropriateness of the estimation technique(s) applied and key assumptions, including treatment of extreme grade values, domaining, interpolation parameters and maximum distance of extrapolation from data points. If a computer assisted estimation method was chosen include a description of computer software and parameters used. The availability of check estimates, previous estimates and/or mine production records and whether the Mineral Resource estimate takes appropriate account of such data. The assumptions made regarding recovery of by-products. Estimation of deleterious elements or other non-grade variables of economic significance (eg sulphur for acid mine drainage characterisation). In the case of block model interpolation, the block size in relation to the average sample spacing and the search employed. Any assumptions behind modelling of selective mining units. Any assumptions about correlation between variables. Description of how the geological interpretation was used to control the resource estimates. Discussion of basis for using or not using grade cutting or capping. The process of validation, the checking process used, the comparison of model data to drill hole data, and use of reconciliation data if available. 	<ul style="list-style-type: none"> Single hard modelled domain with quite sharp lithological and assay bounds. Internal waste zones not hard domained. SURPAC software utilized. Previous resource estimations were more back of the envelope rough estimations. Inverse distance squared estimation. Three passes 100m x 50m x 50m, 50m x 25m x 25m and 20m x 10m x 10m. Major/semi-major axis ratio of 2:1, major/minor axis ratio of 1:1, minimum 3 samples and maximum 15 Blocks 10mY x 5mX x 10mZ sub-blocked to 2.5m x 1.25m x 2.5m oriented 045°. Mining units expected to be determined by excavator bucket i.e. 2-2.5m wide. Model validated visually on sections in figure 9.3 to 9.16 in report.4 Deleterious elements not considered in estimation though SiO₂ is deleterious in iron ore. No byproducts except for hangingwall waste.
Moisture	<ul style="list-style-type: none"> Whether the tonnages are estimated on a dry basis or with natural moisture, and the method of determination of the moisture content. 	<ul style="list-style-type: none"> Dry tons. No determination of moisture content to date.
Cut-off parameters	<ul style="list-style-type: none"> The basis of the adopted cut-off grade(s) or quality parameters applied. 	<ul style="list-style-type: none"> Quite sharp grade change coincident with lithological change – essentially no cut-off applied.
Mining factors or assumptions	<ul style="list-style-type: none"> Assumptions made regarding possible mining methods, minimum mining dimensions and internal (or, if applicable, external) mining dilution. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential mining methods, but the assumptions made regarding mining methods and parameters when estimating Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the mining assumptions made. 	<ul style="list-style-type: none"> Assumed to be mined via open cut.
Metallurgical factors or assumptions	<ul style="list-style-type: none"> The basis for assumptions or predictions regarding metallurgical amenability. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential metallurgical methods, but the assumptions regarding metallurgical treatment processes and parameters made when reporting Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the metallurgical assumptions made. 	<ul style="list-style-type: none"> No consideration given to metallurgical factors.
Environmental factors or assumptions	<ul style="list-style-type: none"> Assumptions made regarding possible waste and process residue disposal options. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider the potential environmental impacts of the mining and processing operation. While at this stage the determination of potential environmental impacts, particularly for a greenfields project, may not always be well advanced, the status of early consideration of these potential environmental impacts should be reported. Where these aspects have not been considered this should be reported with an explanation of the environmental assumptions made. 	<ul style="list-style-type: none"> Not considered in this actual resource estimate but considered and highly relevant to the successful extraction of resource in that it lies in part beneath private land.

Criteria	JORC Code explanation	Commentary
Bulk density	<ul style="list-style-type: none"> Whether assumed or determined. If assumed, the basis for the assumptions. If determined, the method used, whether wet or dry, the frequency of the measurements, the nature, size and representativeness of the samples. The bulk density for bulk material must have been measured by methods that adequately account for void spaces (vugs, porosity, etc), moisture and differences between rock and alteration zones within the deposit. Discuss assumptions for bulk density estimates used in the evaluation process of the different materials. 	<ul style="list-style-type: none"> Bulk density was calculated from Fe% assays based on the recognition that the orebody consists entirely of a mixture of hematite and silica such that $s.g. ore = s.g. SiO_2 + (s.g. Fe_2O_3 \times \text{percentage } Fe_2O_3)$ i.e. $s.g. ore = 2.65 + (Fe\% \times 0.0373)$ Waste has been assigned an s.g. of 2.65
Classification	<ul style="list-style-type: none"> The basis for the classification of the Mineral Resources into varying confidence categories. Whether appropriate account has been taken of all relevant factors (ie relative confidence in tonnage/grade estimations, reliability of input data, confidence in continuity of geology and metal values, quality, quantity and distribution of the data). Whether the result appropriately reflects the Competent Person's view of the deposit. 	<ul style="list-style-type: none"> Resource is classified as Inferred due to: <ul style="list-style-type: none"> inadequacies of sample quality inaccuracies in sample location merging four data sets use of dummy data resource is almost at Indicated status for top 30m.
Audits or reviews	<ul style="list-style-type: none"> The results of any audits or reviews of Mineral Resource estimates. 	<ul style="list-style-type: none"> This estimate is a remodeled/re-estimated version
Discussion of relative accuracy/ confidence	<ul style="list-style-type: none"> Where appropriate a statement of the relative accuracy and confidence level in the Mineral Resource estimate using an approach or procedure deemed appropriate by the Competent Person. For example, the application of statistical or geostatistical procedures to quantify the relative accuracy of the resource within stated confidence limits, or, if such an approach is not deemed appropriate, a qualitative discussion of the factors that could affect the relative accuracy and confidence of the estimate. The statement should specify whether it relates to global or local estimates, and, if local, state the relevant tonnages, which should be relevant to technical and economic evaluation. Documentation should include assumptions made and the procedures used. These statements of relative accuracy and confidence of the estimate should be compared with production data, where available. 	<ul style="list-style-type: none"> The resource is quite robust within the error bounds of the sampling/assaying particularly due to the bulk nature of the commodity type. Better QA/QC procedures would allow classification to Indicated status for the top 30m and at tonnages and grades very similar to those modelled.