FI Joint Venture Pty. Ltd.

Yogi - Magnetite Project - Environmental Materials characterisation assessment

May 2019

Executive summary

GHD were engaged by FI Joint Venture Pty Ltd to undertake a materials characterisation assessment in relation to leaching risks, radioactivity and air-borne hazards of the future waste rock and processing waste facilities (processed ore), at the proposed Yogi Magnetite Mine, Yalgoo, Western Australia

This desktop assessment of available information forms the basis for management requirements, understanding data gaps and requirements for further characterisation studies, of the waste rock and processed waste materials.

This report is subject to, and must be read in conjunction with, the limitations set out in Section 1.3 and the assumptions and qualifications contained throughout the Report.

Although information is absent from large parts of the footwall and hanging wall material (drilling and assay not completed), the following preliminary conclusions can be drawn:

Characterisation of leaching impacts (AMD)

The orebody and waste material exhibits relatively low concentrations of sulphur – assumed as sulphide (0.11% S). As a consequence, the risk that strong acidic conditions could develop is unlikely, however, further data/information is required to quantify the buffering capacity, and provide further confidence that acidic conditions will not prevail at concentrations that may cause secondary impacts.

Strongly elevated concentrations of dissolved metals in groundwater are not anticipated, given that the risk of acidic conditions persisting - which is conducive to metal mobilisation, is considered unlikely. However, further laboratory testing is required to quantify the number and concentration of metals of concern and potential for development of acidic conditions.

Although confirmation is required (e.g. salinity leaching data) the risk that adverse salinity impacts will leach from the waste rock and processed waste material is considered low, given that geological setting likely precludes the presence of readily dissolvable minerals (e.g. halite, gypsum, carbonate at elevated concentrations are not likely present).

Radioactivity:

Although data on radioactivity is absent, the geological setting of ore body and waste rock is commonly not associated with minerals and elements which exhibit elevated radioactivity (above that of background).

However, any radioactive minerals or elements, which are present may be subject to enrichment within the processed waste material as a consequence of ore processing and mineral separation processes.

The radioactivity exposure risk from the waste rock material should remain at background levels, (excluding possible dust exposure and leaching risks), given that the waste rock is not subject to processing.

Air-borne hazards:

While asbestos form minerals are not common to this geological setting, further confirmation is required through testing given the possibility that asbestos may be associated with the occurrence of sheared ultramafic rocks (i.e. talc-chlorite schist).

The mineralogy and lithological type of the of the BIF style orebody (e.g. 50% silica/chert) indicates that mining activities, waste rock dumps and processed waste storage facilities should be managed to prevent the generation of air-bore silica at concentrations which may cause adverse impacts to human health.

Recommendations:

The desktop review indicates that there is insufficient drilling information (mineralogical/ assay) within the hanging wall and some parts of the footwall material to understand the risks and management requires of these materials. To address this, drilling and laboratory analysis of the hanging and footwall wall material and other under-represented rock types is recommended.

While the available information indicates that the issues relating to the risk of acidic, metalliferous and saline drainage, radioactivity and asbestos appear to be low, there is insufficient data to sufficiently characterise the risk and likelihood of adverse impacts and management requirements.

Given the paucity of relevant data, and based on the recommendations with the DMP draft documentation (DMP 2016), specific laboratory testing is recommended within the waste rock and ore and processed material (when available).

Mining activities related to waste rock and processed waste dumps should be managed to prevent the generation of air-borne silica at concentrations which may cause adverse impacts to human health.

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1. Introduction

1.1 Scope and purpose of this report

GHD was engaged by FI Joint Venture Pty. Ltd. (FIJV) to undertake a Materials Characterisation Assessment to understand the health and environmental risks posed by mining and storage of subsurface materials at the Yogi Magnetite Project, Yalgoo, Western Australia.

The purpose of this desk-top assessment is to collate and present the available information in relation to leaching risks, radioactivity and air-borne hazards, of the planned waste rock and processed waste storage facilities (processed residual ore).

1.2 Site description and relevant mine features

The location and the layout of the Yogi Magnetite mine is presented in Figure 1.

The magnetite (iron mineralisation) is hosted within a mafic schist derived from volcanic rock, a part of Norie Group, comprising mineralised Banded Iron Formation (BIF) host rock.

Mining is to occur via open cut pit to an approximate maximum depth of 250 meters below ground level.

The waste rock is to be stored in a dedicated Waste Rock Facility, located adjacent to the open pit, and the ore is to be processed on-site and the dry processing waste stored with in the dedicated Dry Processing Waste Facility (Figure 1).

The processed Ore will be temporarily stockpiled on Site with subsequent transportation of the Ore in a slurry pipeline, proposed to be constructed between Yogi Mine and Geraldton Port.

1.3 Limitations

This report has been prepared by GHD for FI Joint Venture Pty. Ltd., and may only be used and relied on by FI Joint Venture Pty. Ltd. for the purpose agreed between GHD and the FI Joint Venture Pty. Ltd. as set out in Section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than FI Joint Venture Pty. Ltd. arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by FI Joint Venture Pty. Ltd. and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

1.4 Information sources

GHD are not aware of any former materials characterisation, testing and reporting of the Site.

In undertaking this desktop assessment, GHD's desktop study and assessment was based on the following information sources, made available by FIJV:

- ***Mineralogical, geological and assay database***, compiled by Snowden (circa 2018), which incorporated all drill-hole assay and lithological data available over the extent of the proposed open pit, including:
  - Approximately 30 drill holes (within the pit footprint) inclined at 60 degrees (to the east) to an approximate maximum depth of 290 meters. Drilling methods comprising predominantly RC, with 4 holes completed with Diamond drilling methods:
  - Mineralogical assays (%) comprising: Al, Co, Ti, Mn, Fe, Si, Pb, Cr, Ni ,Cu, S, and Zn, in the waste rock and ore (maximum assays numbers 5,500).
- *FIJV – **Yogi Mine Project Annual Report**, combined report group C47/1999, 1 January 2015 – 31 December 2016**.***
- *FI Joint Venture Pty Ltd, **Yogi Magnetite Deposit Mineral Estimate**, Yogi Mine, West Australia, Snowden, March 2018.*
- *FIJV, **Mineral Resource Estimate Update**, Yogi Mine, West Australia, Kusha Madan Consulting Eng, January 2018.*
- ***Geological Survey of Western Australia**, WA Sheet 22411:100 000 Geological Series, 2015, Yalgoo and notes.*
- *FST Australia**, Mine Dust Control**, Implementation of 5 MTPA Iron Ore Concentrate Plant in Yogi Mines, prepared for FIJV*, *February 2019.*

2. Site background and setting

2.1 Regional and local geological setting

Regional and local geology of the Yalgoo area has been summarised in the FIJV combined 2016 annual report C47/1999 (FIJV, 2017), compiled by site geologist Graeme Johnston.

The main greenstone sequence present in the Yalgoo Greenstone Belt comprises the Norie Group, which consists of laterally extensive (province-wide) lava plains, banded iron formations (BIF) and associated rocks.

The rock units within the Yogi area include a sedimentary succession of thrust-thickened quartz-magnetite BIF and medium grained epiclastics. These form a prominent north-south trending ridge line which dominates the topography of the Yogi Mine Project area.

Iron mineralisation at the Yogi deposit comprises secondary magnetite mineralisation hosted within the BIFs. The BIFs, which form ridges and low hills in the area, strike north-northwest to northwest in the tenements. The BIFs dip moderately steeply towards the west in the area of the tenements.

2.2 Mine geology

The localised geology is presented Figure 2, derived from a combined overlay of the surface geology from the 1:100,000 mapping (GWSA 2105), and the surface expression of the BIF at the surface based on the drilling information.

The GWSA mapping and drilling information indicates that within the confines of the pit area, the Banded Iron Formation strikes in north, north-west striking direction. Figure 2 shows that the drill holes are generally positioned over the location of the BIF orebody. Geological information is however not available on the composition of the hanging wall and the footwall material.

The geological cross-sections, presented in Appendix A, shows that the BIF material dips towards the west and within the limits of the pit outline it shows the following geological features and sequence:

- **Hanging wall**: The hanging wall geology is largely untested, but where tested comprises felsic, lesser amphibolite, un-minerslied BIFs and ultramafic and talc rocks.
- **Orebody:** The ore body comprises Fe - mineralised BIFs units (e.g. Fe> 22%) with subordinate un-mineralised BIFs, and lesser amphibolite and ultramafic units.
- **Foot wall**: comprises un-mineralised BIFs, talc chlorite/carbonate rocks and lesser amphibolite and felsic units, and significant portion of the footwall geology is untested.

2.1 Mining waste rock and ore tonnages

The geology types presented in the mineralogical data base have been consolidated into seven primary rock types (Table 1) recognising that the mineralogical database consists of varied nomenclature for describing similar lithological rock types.

"Mineralised" ore is based on a cut-off grade starting at 22% iron (Kusha Madan, 2017), and based on the information supplied by FIJV (FST, 2019), the mine ore and waste tonnages for the life of the mine are indicated as follows:

- Waste rock: 357 Million tonnes (Mt)
- Ore material: 388.5 Million tonnes (Mt)

The waste rock tonnages based on rock type are presented in Table 1. These waste tonnages and percentages are based on cross sectional area estimates (Appendix A), and extrapolation the rock types between cross sections (where appropriate). The approximations should not be used for any other purpose than the aims of this materials characterisation study, which is to understand the dominant rock types and the investigation focus.

The geological cross sections, presented in Appendix A and the information in Table 1 shows that approximately 33% of the total waste rock has not been characterised through drilling, geological and assay analysis ("Unsubstantiated"). Otherwise, the table shows that the known waste rock types are dominated by BIF (un-mineralised, e.g.: <22% Fe), amphibolite and felsic, talc rocks.

The geology of the unsubstantiated material is likely to similar in lithology to that of the tested material, and may comprise BIF, mafic, and felsic units with some alteration/shearing to talc materials.

Table 1 Waste rock type and approximated tonnages

Waste rock type	million tonnes (approximate)	Percentages of rock type (approximate)
Felsic	40	11%
Unsubstantiated	118	33%
BIF	100	28%
Talc	45	13%
Amphibolite	39	11%
Basalt (High mg)	8	2%
Komatiite/ultramafic	8	2%
Total	**357**	

3. Material characterisation risk assessment

3.1 Presentation of assay and geological information

This review indicates that the drilling and the limited elemental assay information is primarily focused on the characterisation of the BIF mineralised ore body, and that drilling and the elemental assay information is absent for large parts of the waste rock materials (e.g.: hanging wall and footwall materials)

In addition, specific rock testing data relating to materials characterisation is absent such as comprehensive elemental data, radioactivity data, acid production potential (sulphide/carbonate data).

Nevertheless, the available information, as presented in Section 1.4, has been assessed herein to develop an improved understanding of the site setting and risks posed by mining and storage of the materials.

The available geological information is summarised and presented as cross sections showing the drillhole traces and subsurface geology in Appendix A.

The available mineralogical assay information based on the rock types is summarised statistically and is presented in Table 3 (original assay data not presented herein).

3.2 Acidic leaching potential

3.2.1 Introduction

The generalised understanding of the risk associated with acidic drainage (and secondary metals mobilisation) is based on the following;

- the total concentration of *sulphide* the waste rock and mining void walls which may produce acid and,
- the acid neutralising capacity (e.g *carbonate*) of the waste rock and mining void walls.

Where sulphide (acid) is in excess to that of acid neutralising capacity (buffer), potential exists for the material to leach acid and metals, which may impact the groundwater and surface water environments.

3.2.2 Assessment of acid potential

The acid potential, based on the sulphur data is presented in Table 3. The sulfur data is also presented graphically as histograms to indicate the distribution of sulfur based on rock type in Appendix B. In the absence of confirmatory information (e.g. sulphur speciation), sulfur is assumed to indicate sulphide.

With respect to carbonate, Table 2 shows that there is no relevant data on the presence of carbonate (or other indicators of carbonate) within the waste rock or ore materials

The sulphur data, presented in Table 3 and as histograms in Appendix B indicates the following:

- The sulphur concentration of the waste rock and ore is considered sufficiently low (average 0.11%) to support the notion that the orebody is not subject to sulfide style alteration/mineralisation (Table 3).
- The average concentration of sulphur within the waste rock is similar to that of the ore at close to 0.11% sulphur (Table 3).

- The histograms in Appendix B indicate that a small number of samples exceed 0.5% sulphur within the waste rock and the ore material - at close to 2% of the assays/samples. The remainder of the samples (98%) are below 0.5% sulphur.

Table 2 Summary of metals assay data based on rock type

Rock Type	*Count of Al2O3*	*Min of Al2O3 (%)*	*Max of Al2O3 (%)*	*Average of Al2O3 (%)*	*Count of TiO2*	*Min of TiO2 (%)*	*Max of TiO2 (%)*	*Average of TiO2 (%)*
Felsic	431	1.63	33.01	***12.22***	431	0.05	1.76	0.49
Mafic	224	5.05	34.06	***16.12***	224	0.09	1.71	0.46
Misc	25	0.60	27.13	***14.07***	25	0.02	0.84	0.31
Pyroxenite	3	6.94	8.71	7.62	3	0.38	0.49	0.42
Regolith	40	7.53	33.39	***18.13***	40	0.08	3.39	***0.83***
Sedimentary	32	12.89	50.15	***23.13***	32	0.14	0.94	0.55
Talc-Chlorite	72	1.80	31.50	9.92	72	0.09	1.25	0.40
BIF<20%	1747	1.69	19.99	***15.29***	1747	0.06	3.03	0.43
BIF>20%	3949	20.00	47.49	***26.87***	3949	0.02	1.74	0.23
Global Abundance				***8.23***				***0.57***

Rock Type	*Count of Mn*	*Min of Mn (%)*	*Max of Mn (%)*	*Average of Mn (%)*	*Count of Zn*	*Min of Zn (%)*	*Max of Zn (%)*	*Average of Zn (%)*
Felsic	381	0.02	11.50	***0.16***	430	0.001	0.048	0.007
Mafic	110	0.02	0.34	0.08	223	0.000	0.041	0.006
Misc	22	0.01	0.15	0.08	25	0.000	0.012	0.006
Pyroxenite					3	0.005	0.012	0.007
Regolith	28	0.01	0.23	0.07	39	0.000	0.032	0.005
Sedimentary	20	0.02	0.16	0.06	32	0.001	0.008	0.005
Talc-Chlorite	50	0.01	2.43	***0.16***	65	0.000	0.025	0.007
BIF<20%	1420	0.01	10.15	0.10	1741	0.000	0.081	0.006
BIF>20%	3022	0.00	4.29	0.08	3847	0.000	0.045	0.005
Global Abundance				***0.095***				***0.008***

Rock Type	*Count of Fe*	*Min of Fe (%)*	*Max of Fe (%)*	*Average of Fe (%)*	*Count of SiO2*	*Min of SiO2 (%)*	*Max of SiO2 (%)*	*Average of SiO2 (%)*
Felsic	431	1.63	33.01	***12.22***	431	12.56	73.36	***57.12***
Mafic	224	5.05	34.06	***16.12***	224	38.37	67.15	***54.12***
Misc	25	0.60	27.13	***14.07***	25	50.23	78.53	***60.57***
Pyroxenite	3	6.94	8.71	***7.62***	3	49.86	53.36	***51.83***
Regolith	40	7.53	33.39	***18.13***	40	19.85	62.78	***51.68***
Sedimentary	32	12.89	50.15	***23.13***	32	11.81	59.00	***47.12***
Talc-Chlorite	72	1.80	31.50	***9.92***	72	39.10	78.78	***53.15***
BIF<20%	1747	1.69	19.99	***15.29***	1747	12.62	79.51	***55.92***
BIF>20%	3949	20.00	47.49	***26.87***	3949	5.39	61.47	***49.05***
Global Abundance				***5.21***				***27.66***

Rock Type	*Count of Pb*	*Min of Pb (%)*	*Max of Pb (%)*	*Average of Pb (%)*	*Count of Cu*	*Min of Cu (%)*	*Max of Cu (%)*	*Average of Cu (%)*
Felsic	431	0.00	0.025	***0.005***	431	0.00	0.08	0.0052
Mafic	222	0.00	0.011	***0.003***	222	0.00	0.03	0.0048
Misc	25	0.00	0.008	***0.004***	25	0.00	0.02	0.0046
Pyroxenite	3	0.00	0.000	***0.000***	3	0.00	0.01	0.0040
Regolith	40	0.00	0.010	***0.003***	40	0.00	0.02	0.0046
Sedimentary	32	0.00	0.009	***0.004***	32	0.00	0.01	0.0050
Talc-Chlorite	70	0.00	0.011	***0.003***	70	0.00	0.12	0.0051
BIF<20%	1732	0.00	0.012	***0.005***	1732	0.00	0.19	0.0054
BIF>20%	3825	0.00	0.041	***0.004***	3825	0.00	0.11	0.0045
Global Abundance				***0.001***				***0.007***

Rock Type	*Count of Cr*	*Min of Cr (%)*	*Max of Cr (%)*	*Average of Cr (%)*	*Count of Ni*	*Min of Ni (%)*	*Max of Ni (%)*	*Average of Ni (%)*
Felsic	127	0.001	0.16	***0.016***	431	0.000	0.04	0.006
Mafic	169	0.000	0.45	***0.032***	221	0.000	0.06	0.009
Misc	6	0.000	0.01	0.002	25	0.000	0.01	0.004
Pyroxenite	3	0.062	0.11	***0.088***	3	0.023	0.04	***0.030***
Regolith	13	0.000	0.01	0.002	39	0.000	0.03	0.006
Sedimentary	12	0.008	0.43	***0.209***	32	0.001	0.03	***0.011***
Talc-Chlorite	22	0.001	0.26	***0.150***	71	0.000	0.11	***0.032***
BIF<20%	409	0.000	0.30	***0.016***	1741	0.000	0.08	0.006
BIF>20%	1334	0.000	0.39	0.006	3760	0.000	0.10	0.004
Global Abundance				***0.016***				***0.011***

Rock Type	*Count of Co*	*Min of Co (%)*	*Max of Co (%)*	*Average of Co (%)*	*Count of S*	*Min of S (%)*	*Max of S (%)*	*Average of S (%)*
Felsic	82	0.0005	0.0050	0.0020	431	0.001	5.46	***0.15***
Mafic	59	0.0005	0.0060	0.0018	224	0.001	0.49	***0.08***
Misc	3	0.0005	0.0020	0.0012	25	0.001	0.52	***0.06***
Pyroxenite					3	0.002	0.02	0.01
Regolith	1	0.0010	0.0010	0.0010	40	0.001	0.41	0.03
Sedimentary					32	0.001	0.04	0.01
Talc-Chlorite	1	0.0010	0.0010	0.0010	72	0.001	0.61	***0.04***
BIF<20%	101	0.0005	0.0040	0.0016	1747	0.001	5.32	***0.11***
BIF>20%	545	0.0005	0.0030	0.0009	3950	0.001	5.01	***0.11***
Global Abundance				***0.003***				***0.041***

Notes: ***Bold*** *indicates concentration exceeds the global abundance*

Due to the absence of carbonate assay data, the concentrations of carbonate are for the purposes of this study deemed as zero, and as a consequence the neutralising capacity (ANC) is deemed as zero (see equation 1).

Based on the acid base accounting Equation 1, the occurrence of average concentrations of sulfur at 0.11% in the waste rock and ore indicates the calculated values of Maximum Potential Acid (MPA) is 3.36 kg H_2SO_4/ tonne. Based on the assumption of 'zero' carbonate contents the Net Acid Production Potential (NAPP) remains at 3.36 kg H_2SO_4/ tonne for both the waste rock and the ore.

The guidelines (DITR 2007) indicate that based on this value (3.36 kg H_2SO_4/ tonne) the waste rock and the ore material are classified as "Potentially Acid forming – Low Capacity".

This is an apparent classification, until such time as the carbonate concentrations and sulphur speciation (to confirm sulphide occurrence) are characterised within the waste rock and ore, at which point the material may be reclassified.

Equation 1:

NAPP (kg H_2SO_4 / tonne) = **MPA** [% Total S * 30.6] – **ANC** [(%CaO * 17.5) + (%MgO * 24.3)]

Table 3 Summary of sulphur (%) occurance based on rock type

Rock ID	Count	Minimum	Maximum	Average
Waste rock:				
Felsic	431	0.001	5.46	0.15
Mafic	224	0.001	0.49	0.08
Misc.	25	0.001	0.52	0.06
Pyroxenite	3	0.002	0.02	0.01
Regolith	40	0.001	0.41	0.03
Sedimentary	32	0.001	0.04	0.01
Talc-chlorite	72	0.001	0.61	0.04
BIF (<22% Fe)	1747	0.001	5.32	0.11
Ore:				
BIF (>22% Fe)	3950	0.001	5.01	0.11

3.3 Metalliferous leaching potential

3.3.1 Introduction

The current understanding of the risk associated with metalliferous drainage (which may impact groundwater or surface water environments) is based on the following;

- The concentration, or enrichment of metals in the waste rock or pit walls, compared against a reference rock/soil type the "Global Abundance" - an average concentration of the metals within the earth's crust.
- The occurrence of acidic conditions, which may promote the dissolution and mobilisation of metals from the waste rock and mine void walls in the presumed absence of buffering capacity.
- The released concentrations of metals/elements leached from the waste rock and processed waste over time.

3.3.2 Assessment of metal leaching potential

The available metals data from the mineralogical data base (Table 2) shows that a total of 12 metals and elements have been assayed within the ore and the waste rock.

The 12 metals and elemental average concentrations have been compared to the reference concentration (global abundance) to assess the relative enrichment, with the following results:

- Iron, silicon and aluminium and lead are relatively enriched in all waste rock types and ore material, at two to three times the reference concentrations.
- Chromium and nickel indicate relative enrichment in a few of the waste rock types associated with mafic composition (pyroxenite, talc-chlorite schist and BIF (< 22% Fe), and felsic units).
- Titanium enrichment is restricted to the regolith rock type, presumably as a consequence of deflationary style weathering.
- Zinc, copper and cobalt are not relatively enriched in all waste rock types and ore material.

Excluding the above 12 elements and metals, there is insufficient data/information with which to assess the occurrence of a number of other metals which may be of concern (e.g. arsenic, antimony, cadmium, barium, mercury, uranium etc).

Due to the '*Potentially Acid forming – Low Capacity'* conditions assessed at the site, the risk of strong acidic conditions persisting is considered unlikely, and high concentrations of dissolved metals in groundwater are not anticipated. However, identified dissolved metals can occur at concentrations that may be of concern to the human health and the environment under mild acid conditions, which until testing confirms, cannot be excluded from developing in the waste rock and processed waste material.

3.4 Saline drainage potential

3.4.1 Introduction

The generalised understanding of the risk associated with saline drainage is based on the mass of readily dissolvable minerals within the waste rock and processed waste material. Dissolved solids leaching from the rock mass may cause an adverse impact to the surrounding groundwater or surface water environments (if dissolved at elevated rates).

3.4.2 Assessment

Although the detailed mineralogy of the waste rock is not available, the dominant iron and silicic mineralogy of the BIF and the volcanic nature of the footwall and hanging wall lithology's may preclude the presence of readily dissolvable minerals (e.g. halite, gypsum, carbonate, sulphur).

Confirmatory testing is considered necessary to demonstrate that the risk of adverse saline impacts, derived from leaching from the waste rock and processed waste material is considered low.

3.5 Radioactivity

As GHD are not aware of measurements or testing of naturally occurring radioactive materials within the subsurface of the Yogi mining footprint.

The mineralogy and lithological type of this style of ore body and waste rock is commonly not associated with minerals and elements which exhibit elevated radioactivity (above that of background).

However, any radioactive minerals or elements which are present may be subject to concentration enrichment during processing of the ore material and deposition of the processed waste within the proposed on-site storage facilities.

Excluding dust and leaching risks, the exposure risk from the existing background levels of radioactivity within the waste rock should not be increased, given that the waste rock will not processed, and that the waste material will be relocated on the proposed waste rock landform.

3.6 Airborne hazards

Asbestos: GHD understand that the presence or absence of asbestos within the subsurface of the mining footprint has not been confirmed through testing, nor discussed within former reporting and geological descriptions.

The presence of asbestos form minerals may be associated with occurrence of talc-chlorite schist, noted predominately within the foot-wall waste rock materials. Otherwise, asbestos form minerals are not common occurrences within this geological setting.

Silica: The mineralogy and lithological type of the of the BIF style ore-body (e.g. 50% silica/chert) indicates that mining activities, waste rock dumps and processed waste storage facilities should be managed to prevent the generation of airborne silica at concentrations which may cause adverse impacts to human health.

4. Summary and recommendations

Although information is absent from large parts of the footwall and hanging wall material (in which drilling and assay data are incomplete or lacking), the following preliminary conclusions can be drawn:

Characterisation of leaching impacts (AMD):

The ore body and waste materials exhibit relatively low concentrations of sulphur – assumed as sulphide (0.11% S). Given the sulfur concentrations, the risk that strong acidic conditions could develop is considered unlikely. Further data/information is required to quantify the buffering capacity, and provide necessary confidence that acidic conditions will not prevail at concentrations that may cause secondary impacts.

Increased concentrations of dissolved metals over more than a magnitude are not anticipated, given that the low risk of strong acidic conditions persisting. However, further investigation is required to identify the metals of concerns and their concentrations as well as potential for development of acidic conditions.

While further confirmation is required (e.g. salinity leaching data) the risk that adverse salinity impacts will leach from the waste rock and processed waste material is considered low. The geological setting – as is currently understood - precludes the presence of readily dissolvable minerals (e.g. halite, gypsum, carbonate, sulphides).

Radioactivity:

The geological setting of ore body and waste rock is commonly not associated with minerals and elements which exhibit elevated radioactivity (above that of background). This needs to be confirmed by measurements of radioactivity.

Any radioactive minerals or elements, which are present may be subject to enrichment within the processed waste material as a consequence of ore processing and mineral separation processes.

The radioactivity exposure risk from the waste rock material is considered to remain at background levels, (excluding possible dust exposure and leaching risks), since the waste rock is not subject to processing.

Airborne hazards:

Asbestos form minerals are not common to this geological setting. Confirmation that this be case is required through testing due to the possibility that asbestos may be associated with the occurrence of sheared ultramafic rocks (i.e. talc-chlorite schist)

The mineralogy and lithological type of the BIF style orebody (e.g. 50% silica/chert) requires that mining activities, waste rock dumps and processed waste storage facilities be managed to prevent the generation of air-bore silica at concentrations which may cause adverse impacts to human health.

Recommendations:

This desktop assessment indicates that there is insufficient field-based information from the hanging wall and some footwall materials. They are likely to comprise approximately 33% of the total waste rock. Additional sample collection (mineralogical/assay) and laboratory analysis of the hanging wall and footwall materials and other under-represented rock types are recommended.

The scope of any additional drilling and testing should be developed following a collation of the existing rock chip/ core which may be available for testing purposes.

While the qualitative information indicates that the issues relating to the risks of acidic, metalliferous and saline drainage, radioactivity and asbestos appear to be low, additional data are necessary to sufficiently characterise the risk and likelihood of adverse impacts and management requirements.

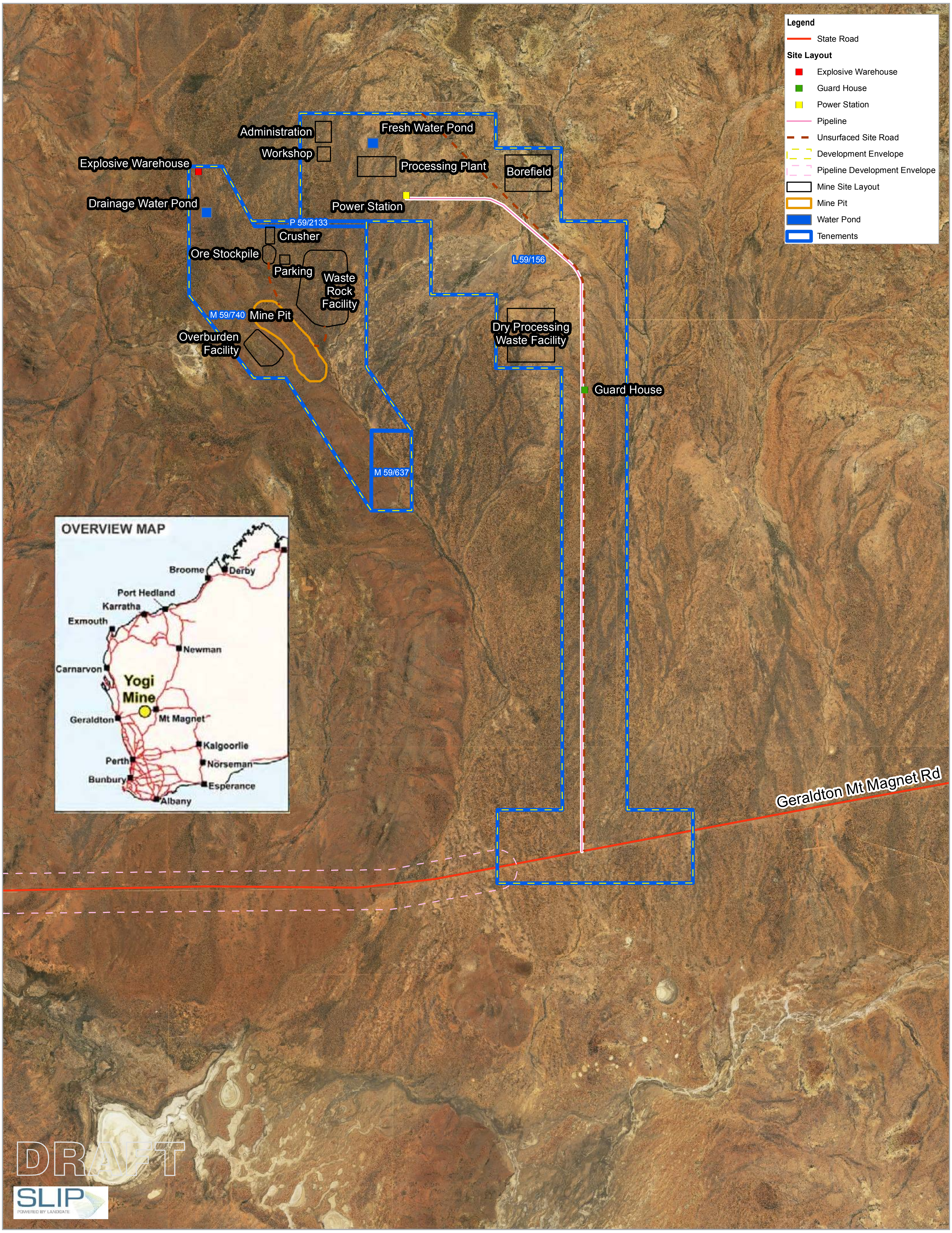
Due to the paucity of relevant data, and based on the recommendations with the DMP draft documentation (DMP 2016), specific laboratory testing is recommended within the waste rock and ore and processed material (when available), as follows:

- Acid neutralising capacity (ANC)
- Net acid generation (NAG)
- Sulfur speciation
- Metals comprehensive (up to 40 metals)
- Leach testing (major ions, pH, EC, metals)
- Radioactivity screen/gross alpha and beta
- Asbestos mineral fibres in selected rock types (e.g.: talc lithology)

Management of mining activities and waste rock dumps and processed waste should include preventative measures to minimise the generation of airborne silica at concentrations which may cause adverse impacts to human health.

Figure 1 Proposed Yogi magnatite mine location

Figure 2 Yogi drill hole plan and local geology



Paper Size ISO A3

0 0.5 1 1.5 2

Kilometers

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

FI Joint Venture Pty Ltd
Yogi-Magnetite Project

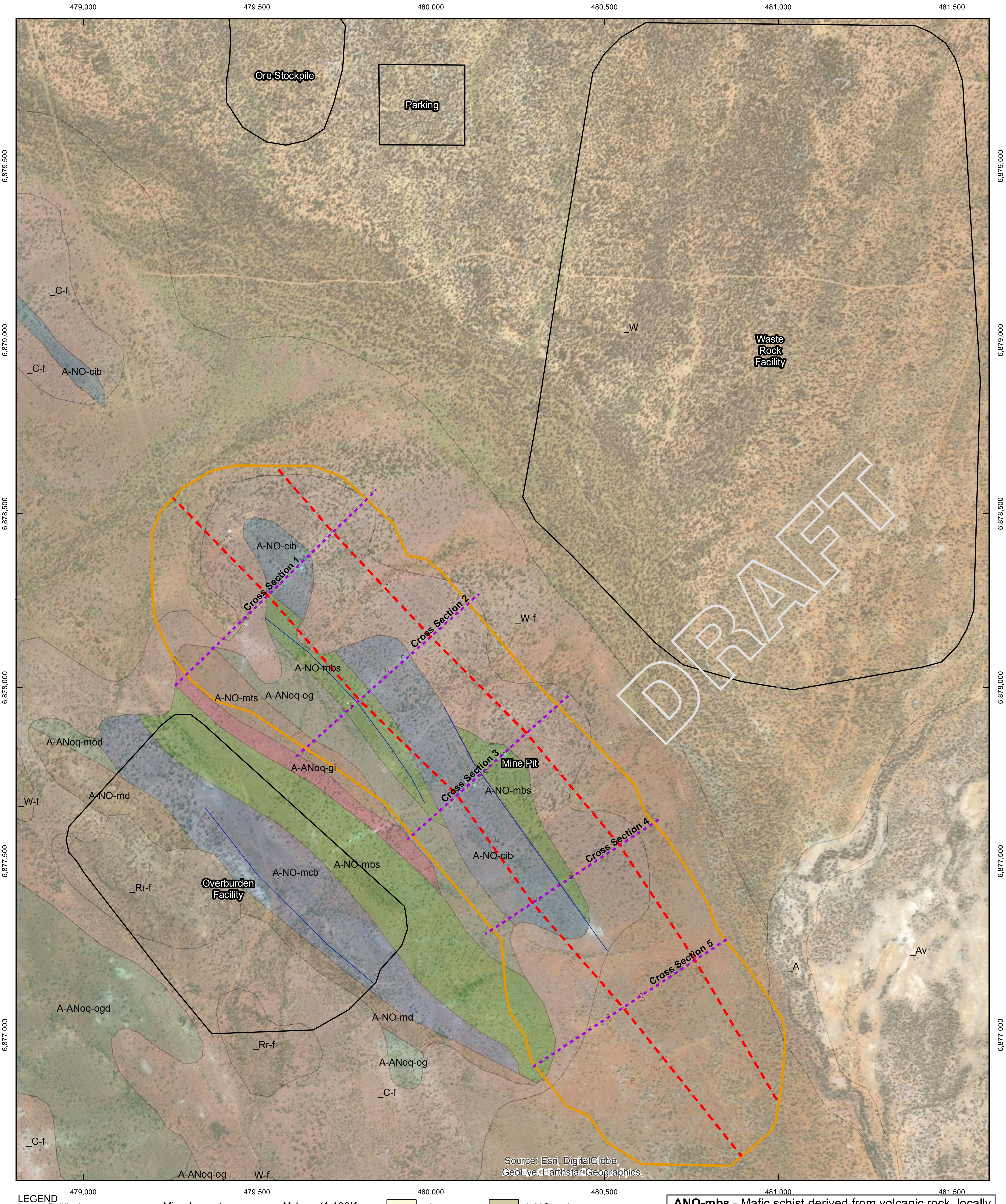
Proposed Yogi Magnetite Mine Location

Project No. 61-37117
Revision No. A
Date 18 Apr 2019

FIGURE 1

G:\61\37117\GIS\Maps\Working\Yogi Mine\6137117_001_MineSite_revA.mxd
Print date: 01 Aug 2018 - 17:20

Data source: MRWA: State Roads - 20171024; FIJV: Mine Tenements, Mine Site Layout, Development Envelope, Pipeline Development Envelope - 20171025; Landgate: Imagery. Created by: artermulo



LEGEND

- Drillholes
- Inferred BIF Orebody
- Cross Sections
- Dyke (1:100K Inferred)

Mine Layout

- Water Pond
- Mine Site Layout
- Mine Pit

Yalgoo (1:100K Geology)

- _C-f
- _W
- _W-f
- _A
- _Av
- _Rr-f
- A-ANoq-mod
- A-ANoq-gi
- A-ANoq-ogd
- A-ANoq-og
- A-NO-md
- A-NO-mts
- A-NO-mcb
- A-NO-mbs
- A-NO-cib

ANO-mbs - Mafic schist derived from volcanic rock, locally preserved relix pyroxene-spinifex texture

ANO-cib - Banded iron-formation and minor banded chert; metamorphosed

AANoq-og - Gabbro with 4-20mm grain size; includes layers of leucogabbro, quartz gabbro, pegmatitic gabbro, and dolerite; metamorphosed.

Paper Size A3

0 100 200 300

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 50

N

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CLIENTS | PEOPLE | PERFORMANCE

Client Logo

FIJV

Materials Characterisation Assessment

Yogi Drillhole Plan & Local Geology

Job Number 61-37117
Revision A
Date 10 Apr 2019

Figure 2

G:\61\37117\GIS\Maps\Working\AMD\6137117_AMDcrosssections_BLANK_A3P_RevA.mxd

999 Hay Street Perth WA 6000 Australia **T** 61 8 6222 8222 **F** 61 8 6222 8222 **E** permail@ghd.com **W** www.ghd.com

Data source: Data Custodian, Data Set Name/Title, Version/Date. Created by:dlbott

5. References

DITR 2007: National guidelines on Acid Metalliferous Drainage, Australian Government, Department of Industry Tourism and Resources, February 2007.

DMP 2016,: Materials Characterisation Baseline Data Requirements for Mining Proposals (Draft Guidance), Department of Mines and Petroleum, Western Australia, March 2016.

FIJV 2016: Yogi Mine Project Annual Report, combined report group C47/1999, 1 January 2015 – 31 December 2016***.***

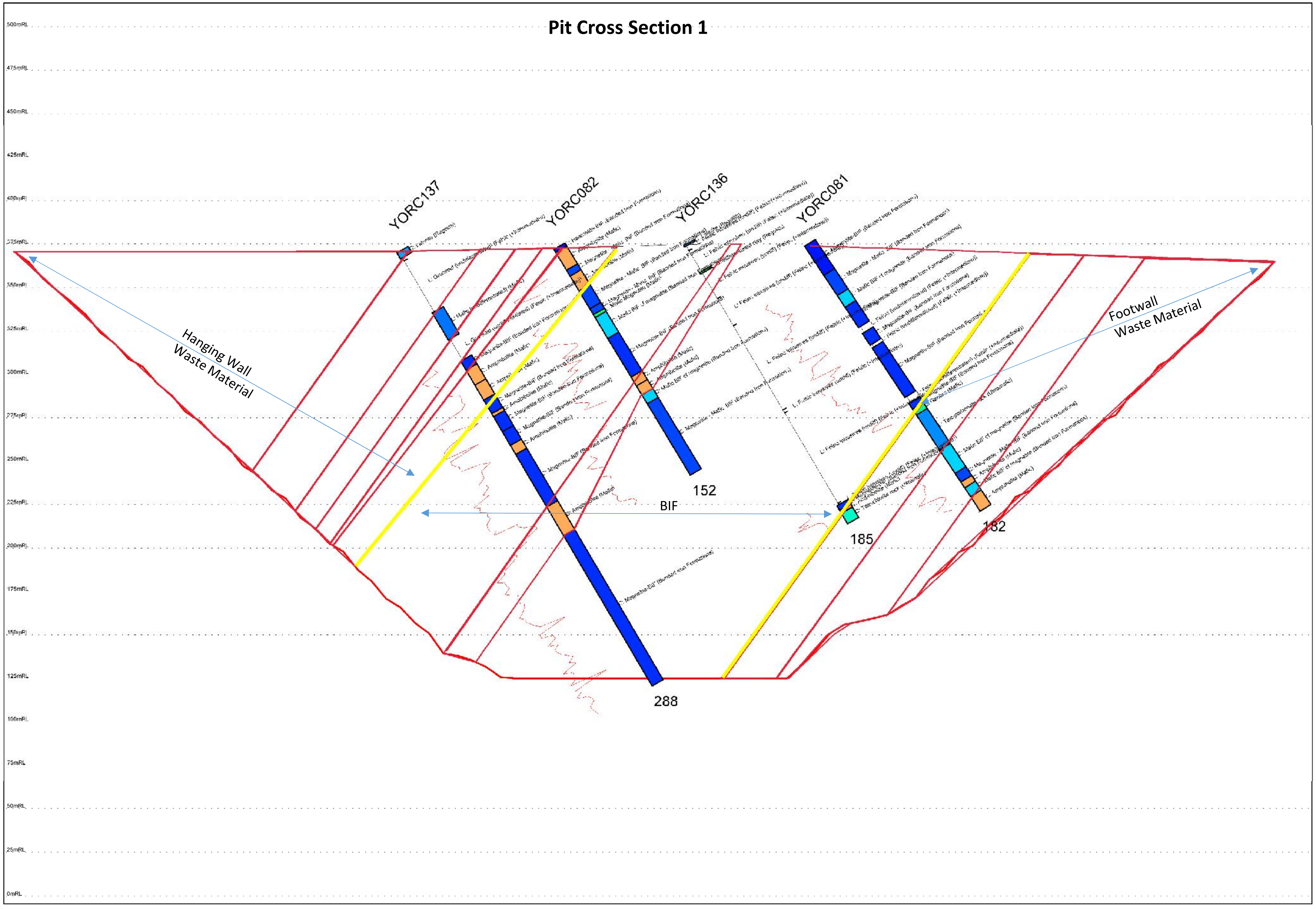
Kusha Madan, 2018: Consulting Eng, FIJV, Mineral Resource Estimate Update, Yogi Mine, West Australia, January 2018.

GSWA, 2015,: Geological Survey of Western Australia, WA Sheet 22411:100 000 Geological Series, 2015, Yalgoo and notes.

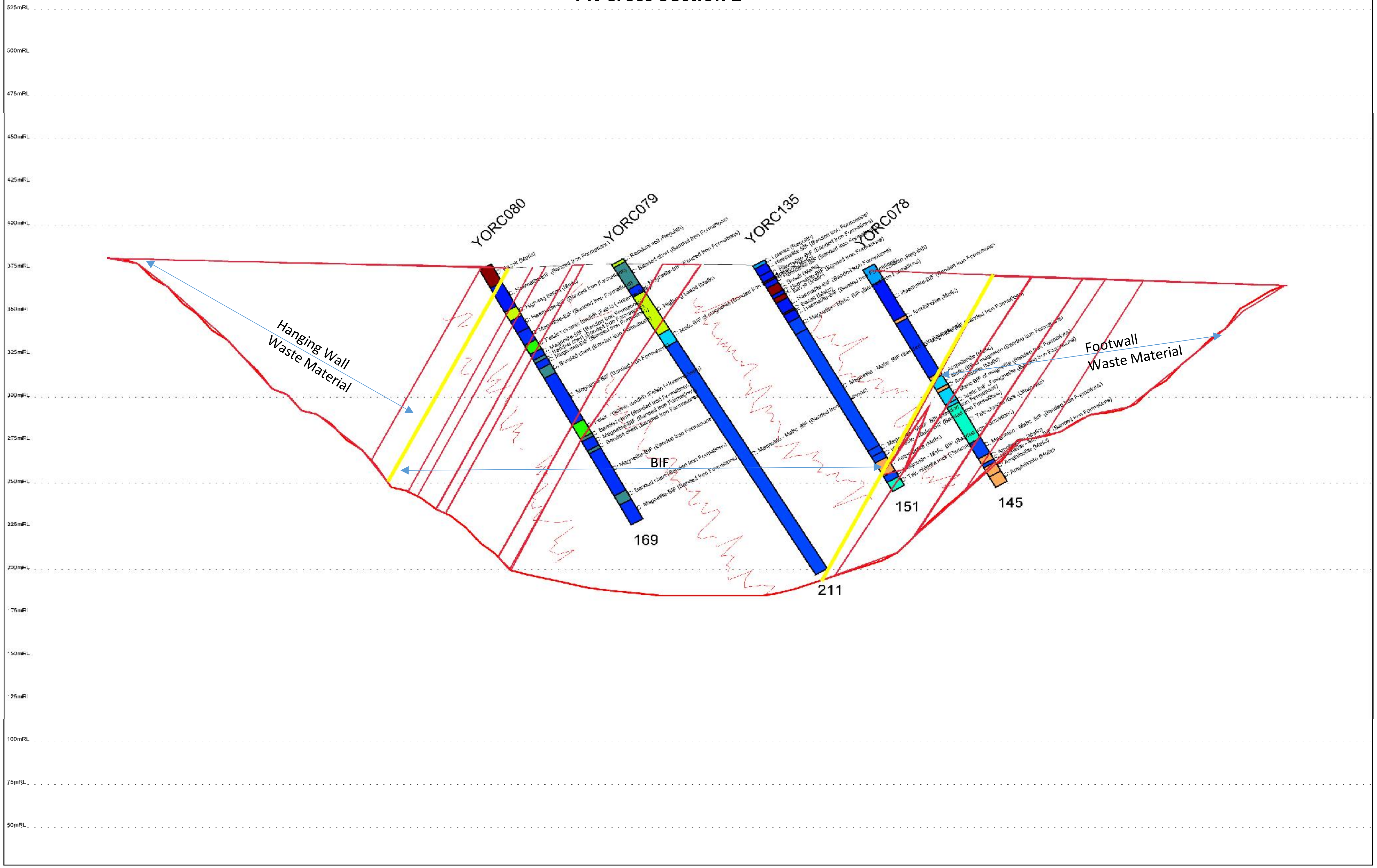
FST 2019, Australia, Mine Dust Control, Implementation of 5 MTPA Iron Ore Concentrate Plant in Yogi Mines, prepared for FIJV, February 2019.

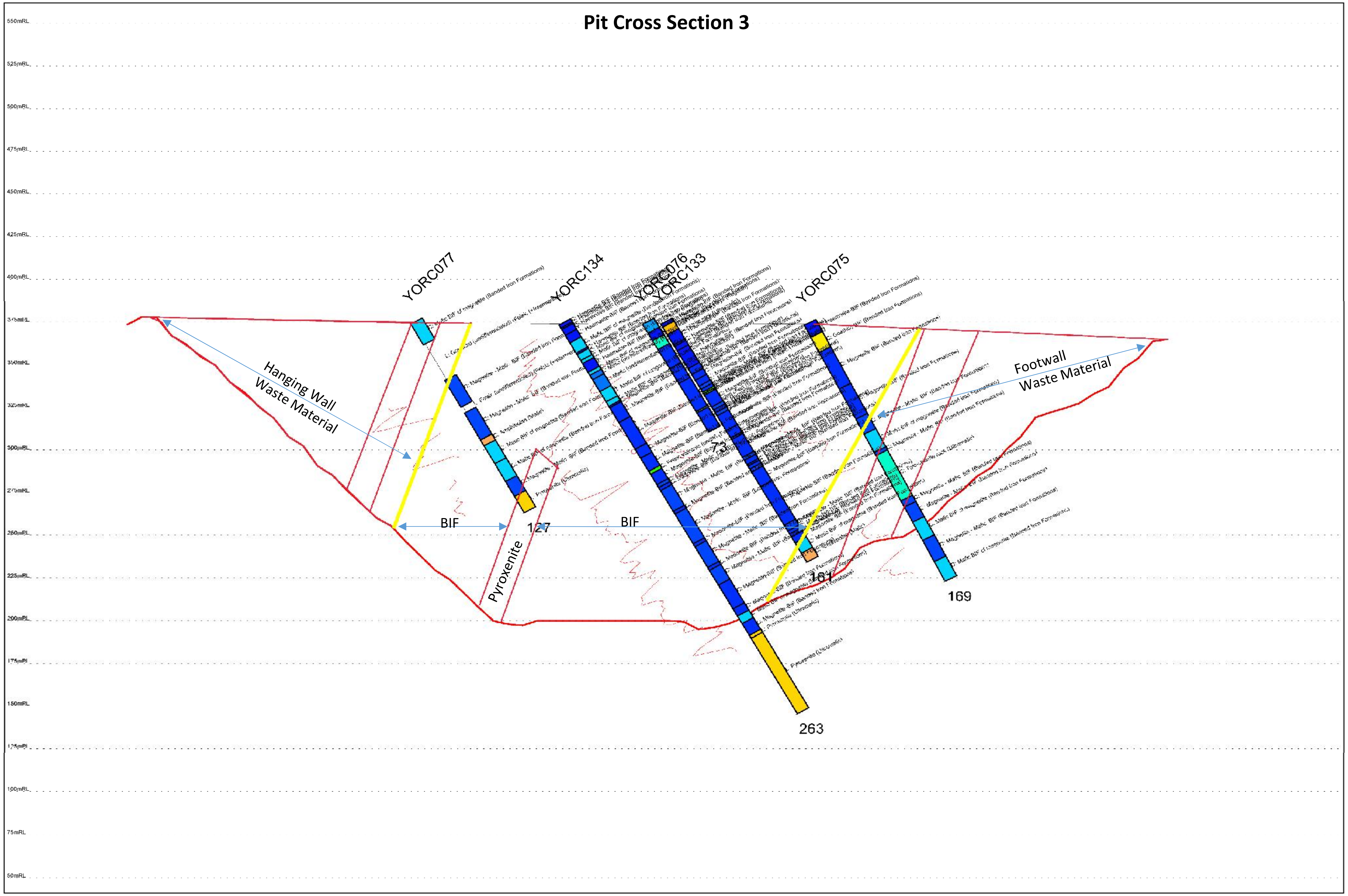
Snowden, 2018. FI Joint Venture Pty Ltd, Yogi Magnetite Deposit Mineral Estimate, Yogi Mine, West Australia, Snowden, March 2018.

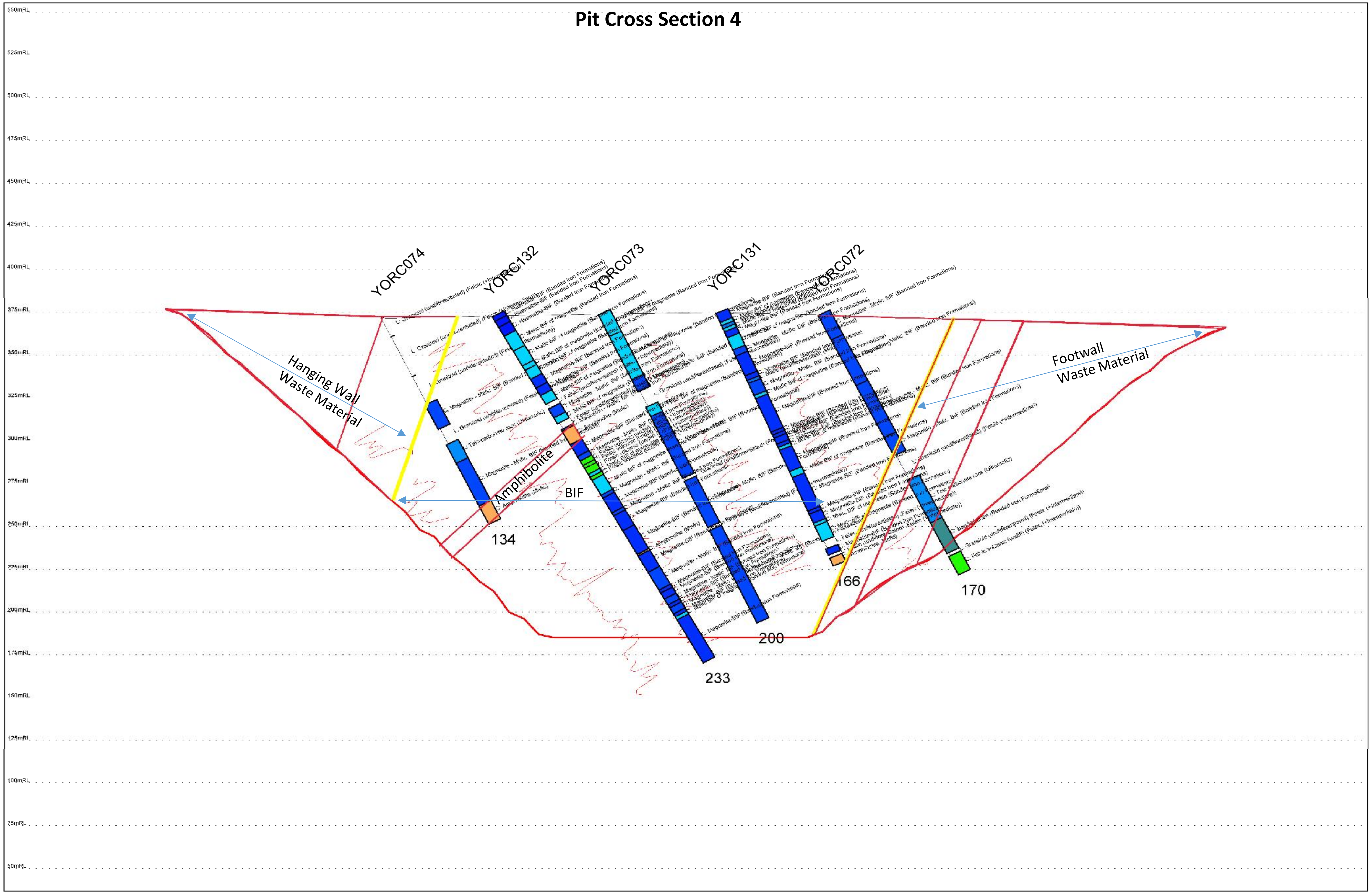
Appendix A – Geological cross sections


Pit Cross Section 1
500mRL
475mRL
450mRL
425mRL
400mRL
375mRL
350mRL
325mRL
300mRL
275mRL
250mRL
225mRL
200mRL
175mRL
150mRL
125mRL
100mRL
75mRL
50mRL
25mRL
0mRL
YORC137
YORC082
YORC136
YORC081
Hanging Wall
Waste Material
Footwall
Waste Material
BIF
152
288
185
182

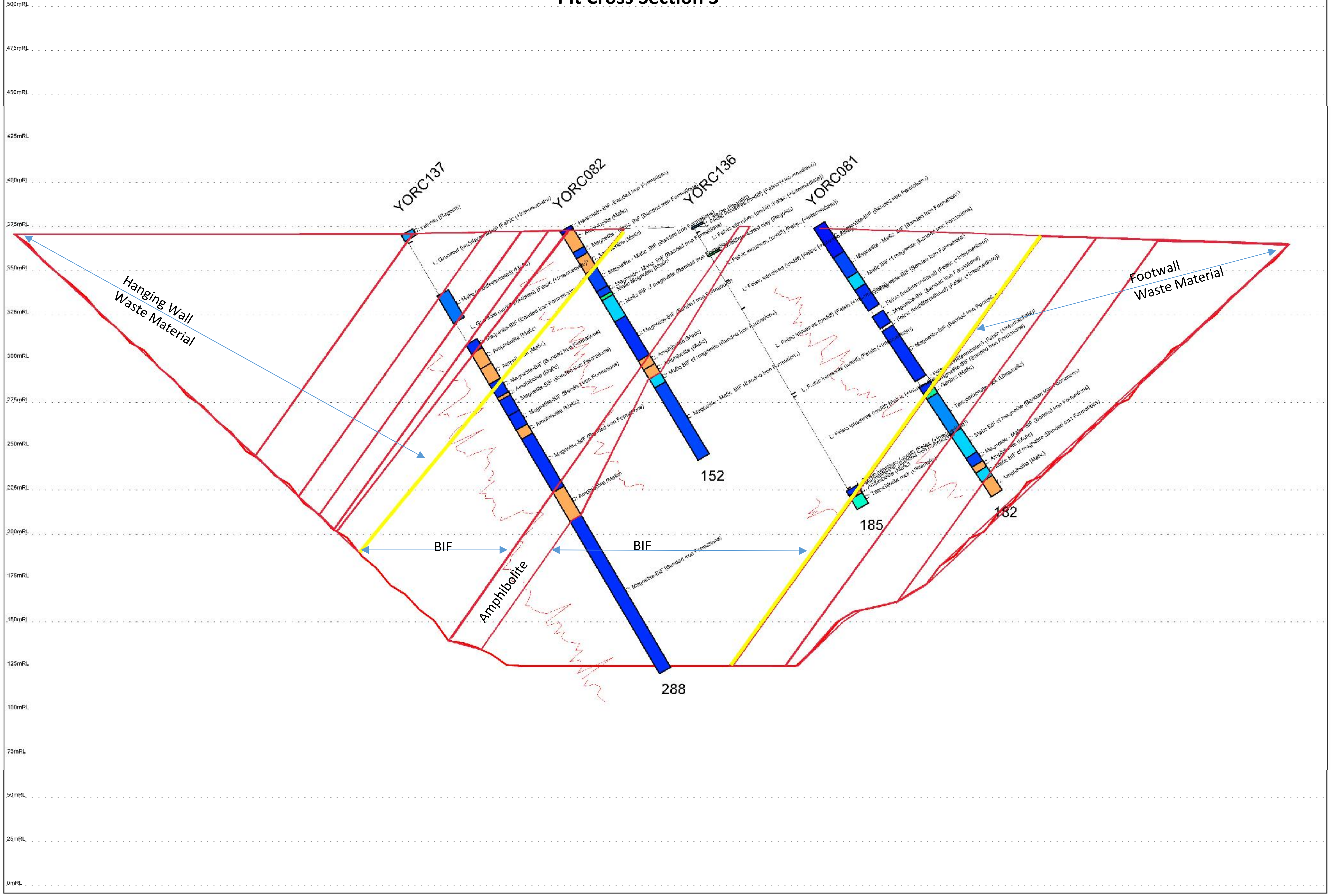
Pit Cross Section 2

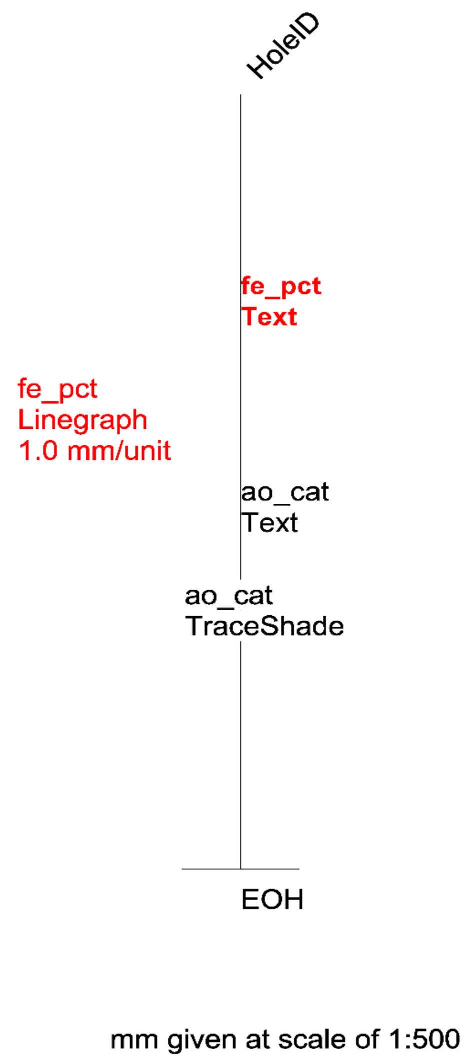



Pit Cross Section 3
YORC077
YORC134
YORC076
YORC133
YORC075
Hanging Wall
Waste Material
Footwall
Waste Material
BIF
BIF
Pyroxenite
127
73
161
169
263


Pit Cross Section 4
550mRL
525mRL
500mRL
475mRL
450mRL
425mRL
400mRL
375mRL
350mRL
325mRL
100mRL
75mRL
50mRL
YORC074
YORC132
YORC073
YORC131
YORC072
Hanging Wall
Waste Material
Footwall
Waste Material
Amphibolite
BIF
134
233
200
166
170

Pit Cross Section 5

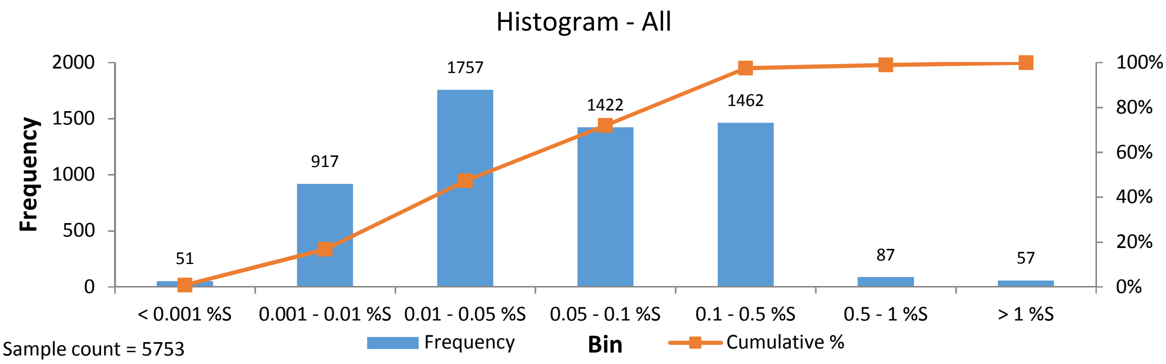




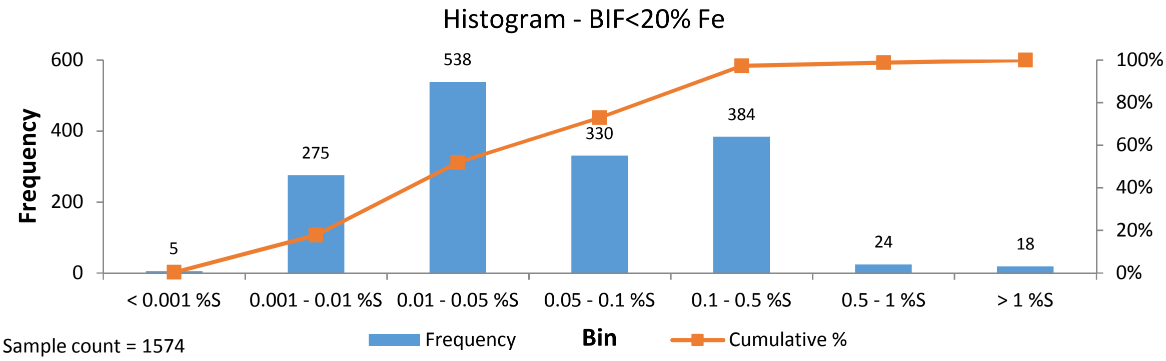
Legends
Geo_mi_ao_cat

- C: Alluvium (Transported)
- C: Haematite-BIF (Banded Iron Formations)
- C: Magnetite-BIF (Banded Iron Formations)
- C: Magnetite - Mafic BIF (Banded Iron Formations)
- C: Amphibolite (Mafic)
- L: Mafic (undifferentiated) (Mafic)
- L: Talc-carbonate rock (Ultramafic)
- C: Laterite (Regolith)
- C: Serpentinite (Ultramafic)
- C: Mafic BIF cf magnetite (Banded Iron Formations)
- L: Eluvial sediments (Transported)
- L: Saprolite after granitoid (Regolith)
- C: Basalt (Mafic)
- C: Talc-chlorite rock (Ultramafic)
- L: Felsic (undifferentiated) (Felsic (+Intermediat
- L: Gabbro (Mafic)
- L: Mafic Magnetite (Mafic)
- L: Felsic intrusives (undiff) (Felsic (+Intermedia
- L: Undifferentiated clay (Regolith)
- L: Granitoid (undifferentiated) (Felsic (+Intermed
- C: Saprolite (Regolith)
- C: No Sample (Miscellaneous)
- C: Banded chert (Banded Iron Formations)
- C: Felsic volcanic (undiff) (Felsic (+Intermediate
- C: Amphibole-silica-magnetite (Banded Iron Formati
- C: Dolerite (Assumed, no code)
- C: calcite or quartz? (Assumed, no code)
- C: Quartz vein (Miscellaneous)
- C: Ultramafic (undifferentiated) (Ultramafic)
- C: Residual soil (Regolith)
- C: High-mg basalt (Mafic)
- L: BIH Brecciated (Banded Iron Formations)
- C: Magnetite-amphibole (Banded Iron Formations)
- C: Goethite BIF (Banded Iron Formations)
- L: Pyroxenite (Ultramafic)
- C: Mottled zone clays (Regolith)
- C: Sand (Assumed, no code)
- C: Breccia (Miscellaneous)
- C: Pegmatite (Assumed, no code)
- C: Quartz dolerite (Mafic)
- C: Banded Iron Formation (undiff) (Banded Iron Fo
- L: Komatiite (Ultramafic)
- C: Colluvium (Transported)
- L: Sheetwash sedim ents (Transported)

Appendix B Histograms for sulfur concentrations



Sample count = 5753



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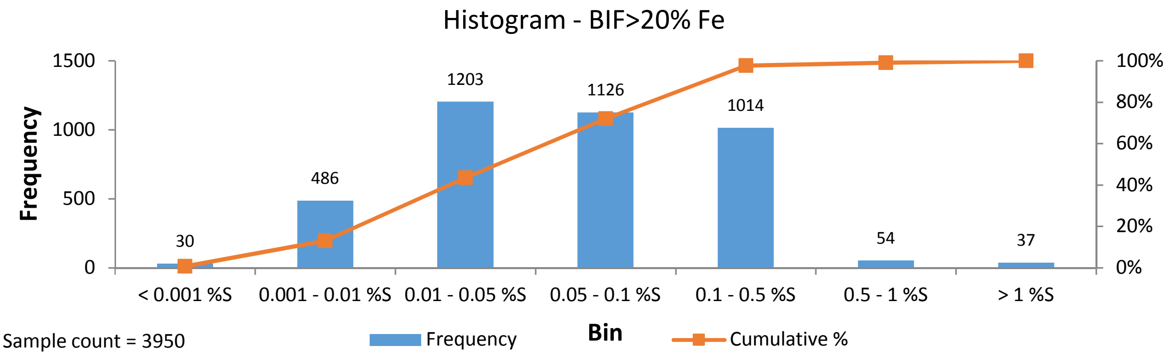
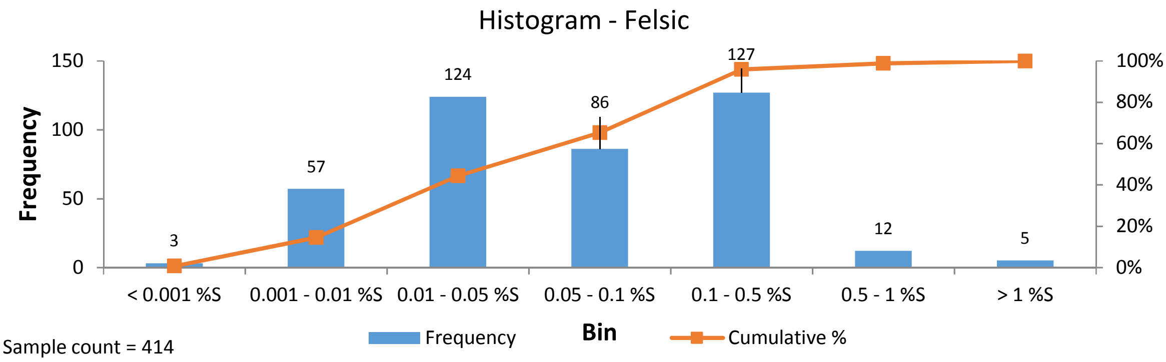
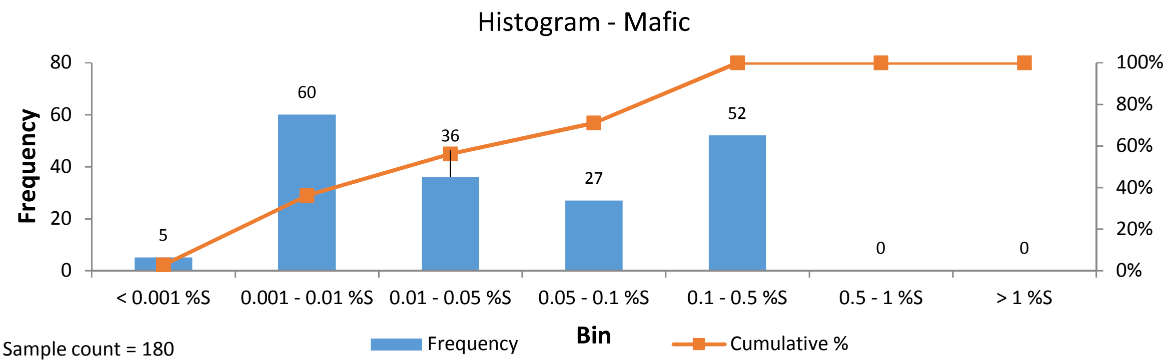


Sample count = 3950

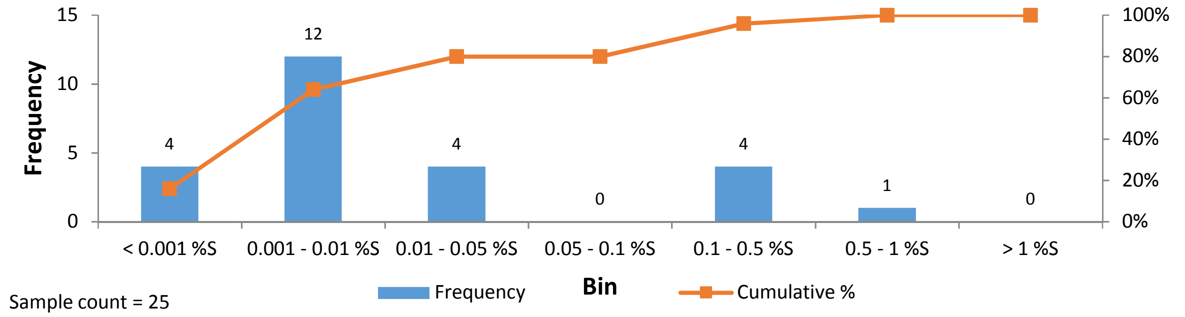


Sample count = 414

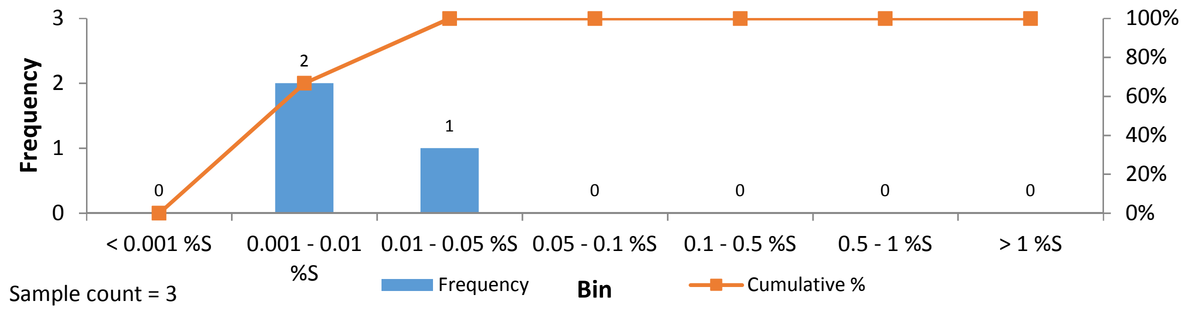


Sample count = 180

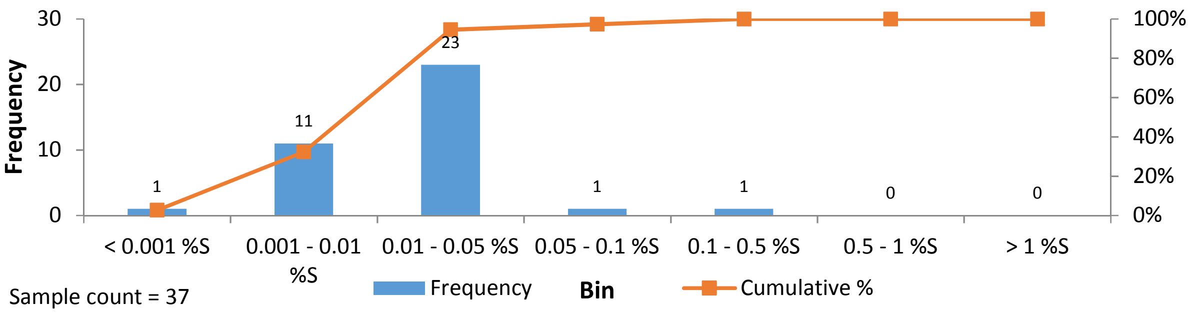
Histogram - Misc



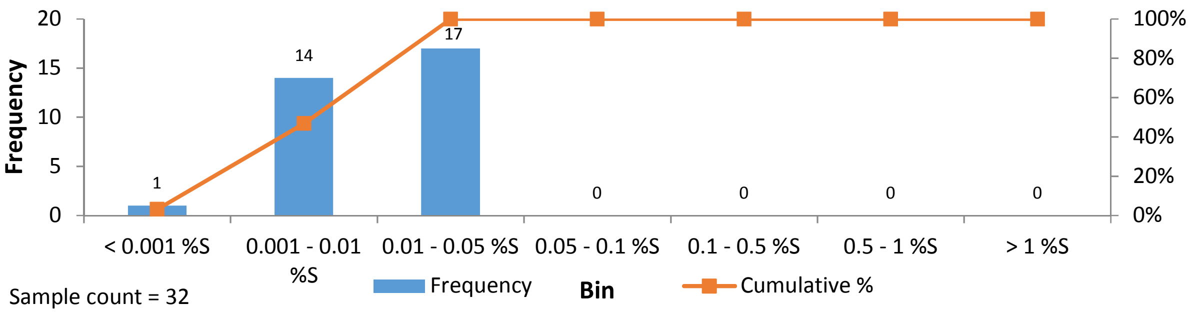
Histogram - Pyroxenite



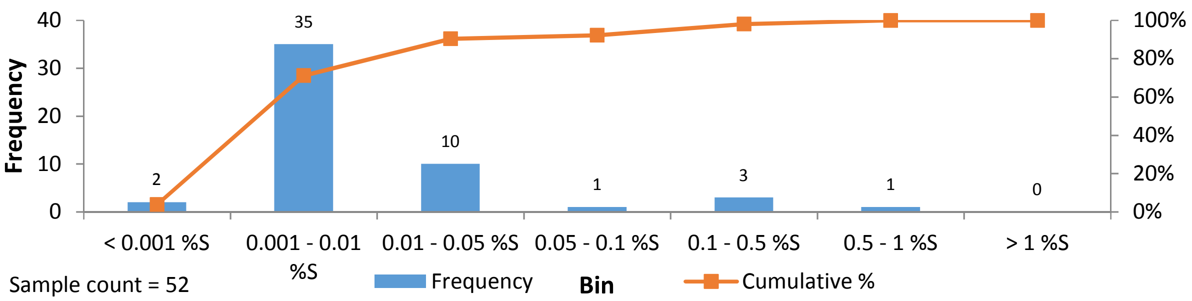
Histogram - Regolith

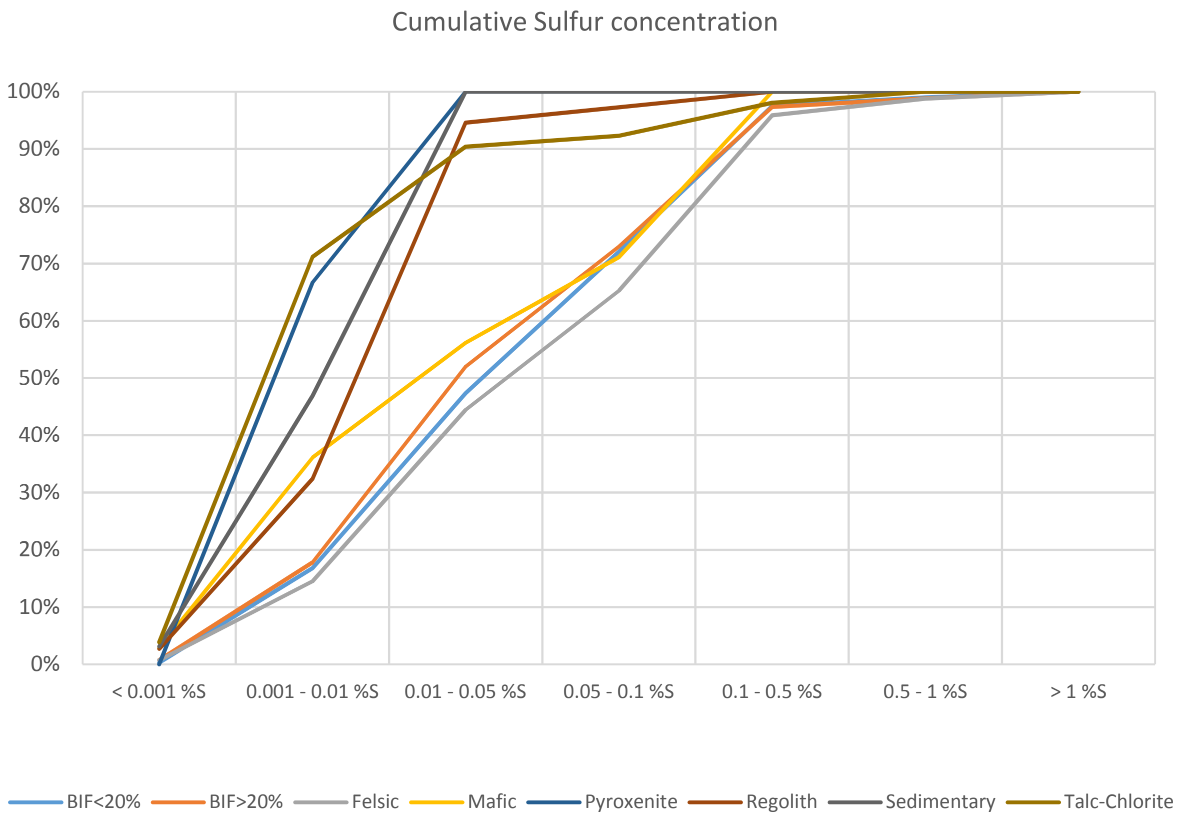


Histogram - Sedimentary



Histogram - Talc Chlorite




Cumulative Sulfur concentration
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
< 0.001 %S
0.001 - 0.01 %S
0.01 - 0.05 %S
0.05 - 0.1 %S
0.1 - 0.5 %S
0.5 - 1 %S
> 1 %S
BIF<20%
BIF>20%
Felsic
Mafic
Pyroxenite
Regolith
Sedimentary
Talc-Chlorite

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6137117-74171/https://projects.ghd.com/oc/WesternAustralia1/yogimagnetiteproject/Delivery/Documents/Materials characterisation assessment.docx

Document Status

Revision	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Rev 0	Paul Hamer	Milo Simonic	pp.	Paul Hamer		14/5/2019

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