PECULIAR KNOB IRON ORE MINE

PROGRAM FOR ENVIRONMENT PROTECTION AND REHABILITATION (PEPR) UPDATE

Peculiar Knob Iron Ore Mine

Peak Iron Mines Pty Ltd

ML6314, ML6442, MPL125, MPL126, MPL127, MPL128, MPL129, MPL130, MPL131, MPL133, MPL134, MPL141, MPL147

Doc # P-2-REP-4-1001_2 (MPEPR 2020 / 017). August 2020

OVERVIEW

This document is the Program for Environment Protection and Rehabilitation (PEPR) for the Peculiar Knob (PK) Mine for Mining Leases ML6314 and ML6442 and Miscellaneous Purposes licences MPL125–MPL134, MPL141 and MPL147.

This PEPR updates and supersedes MPEPR 2019/030 which was approved by the Department for Energy and Mining (DEM) on 27 February 2020.

The approved PEPR has been prepared in accordance with the requirements of the Ministerial Determination 05 dated 12 July 2012, “Minimum information required to be provided in a program for environment protection and rehabilitation (PEPR) for a mineral lease and any associated miscellaneous purposes licence for metallic and industrial minerals (excluding extractive minerals, coal and uranium)”.

New information provided in this PEPR update has been prepared in accordance with the requirements of Ministerial Determination MD005, *Minimum information required to be provided in a program for environment protection and rehabilitation (PEPR) for a mineral lease (ML) and any associated miscellaneous purposes licence (MPL) for metallic and industrial minerals (excluding coal and uranium)* (amended 5 November 2015) and the *Minerals Regulatory Guideline MG2b: Preparation of a program for environmental protection and rehabilitation (PEPR) for metallic and industrial minerals (excluding coal and uranium) in South Australia, August 2018.*

The PEPR addresses the following:

- the existing environment
- the proposed mining operations, including design, construction, operation and care and maintenance
- stakeholder consultation
- environmental outcomes and measurement criteria
- mine closure and rehabilitation
- operator capability
- lease and licence conditions.

Peak Iron Mines Pty Ltd will operate the Peculiar Knob Iron Ore Mine, which is located approximately 60 km south east of Coober Pedy.

The Peculiar Knob mine commenced operations in December 2011 and the mine was then put into care and maintenance in January 2015 with the intention to recommence mining when ore prices improve. The mothballing components of this PEPR applied during the mine’s care and maintenance (mothball) phase. The mine was previously owned and operated by Southern Iron Pty Ltd, a wholly owned subsidiary of Arrium Limited and part of Arrium Limited’s mining business, Arrium Mining (now SIMEC Mining). Southern Iron Pty Ltd was subsequently sold to Peak Iron Mines Pty Ltd on 31 July 2019. This PEPR update is seeking approval for the relocation of the crushing, screening and separation plant from the Wirrida rail loop to the Peculiar Knob mine site. Additionally, further technical information is provided on PAF cell operation, waste dumping and mine closure conditions of the WRD.

Table of Contents

List of Tables

List of Figures

List of Appendices

Appendix E

Flora and Fauna Assessment

Appendix F

Defence Agreement

Appendix G

Consultation Comments on Mining Lease Proposal

Appendix H

EPBC Approval

Appendix I

PAF Cell Monitoring During Mothballed State – Independent Verification

Appendix J

Environmental Inspection Form

Appendix K

Mining Lease Conditions

DOCUMENT STATUS

Rev No.	Compiled by	Responsible Managers
Rev 4	Marnus Bothma Rob Morrow	Marnus Bothma - Director
		Rob Morrow – Project Director

In the event that a discrepancy exists between content in the body of the Program for Environment Protection and Rehabilitation and material in the appendices, the data in the body of the document is to be taken as the most current data.

environmental projects

This document has been reviewed and finalised with the assistance of Environmental Projects Pty Ltd, commissioned by Peak Iron Mines Pty Ltd.

REVISION HISTORY

Revision 0: as lodged for assessment 16 Dec 2014 by Arrium Mines

Revision 1: update incorporating 'mothballing plan' by Arrium Mines

Revision 2: update incorporating comments from DSD assessment by Arrium Mines

Revision 3: update reflecting new ownership by Peak Iron Mines Pty Ltd and addressing matters subsequent to MPEPR2016/043 approval

Revision 4: update reflecting relocation of crushing to the mine site and further technical issues regarding PAF cell management and WRD closure conditions.

Declaration of Accuracy:

The following declaration is made in accordance with regulation 30(4) and/or 49(4) *of the Mining Regulations 2011.*

We, Marnus Bothma (Director) and Gavin Argyle (Director), have taken the following steps to review information in this revised mining proposal to ensure its accuracy.

- completed an audit process against the ministerial determination to ensure the minimum requirements have been addressed
- completed an internal process of review and endorsement by the Responsible Managers
- completed a peer review by a suitably qualified consultant.

27 August 2020

Proponent Details	
Name of applicant	Peak Iron Mines Pty Ltd ABN 85 633 258 590
Address of applicants registered office	Level 11, BGC Centre 28 The Esplanade Perth WA 6000
Name of operator	Peak Iron Mines Pty Ltd
Responsible Person	Marnus Bothma 0408 198 749 marnus@peakiron.com
Postal address	Level 11, BGC Centre 28 The Esplanade Perth WA 6000
Tenement holder	Southern Iron Pty Ltd
Name of mining operation	Peculiar Knob Mine
Application date	27 August 2020

ABBREVIATIONS AND DEFINITIONS

Abbreviation	Definition
ABS	Australian Bureau of Statistics
ALA	Atlas of Living Australia
ALARP	as low as reasonably practicable
AMD	acid mine drainage
AMG	Australian Map Grid coordinate
AN/HANFO	ammonium nitrate/high ammonia nitrate fuel oil
ANFO	ammonium nitrate fuel oil
ANZECC	Australian and New Zealand Environment and Conservation Council
AS	Australian standard
BIF	banded iron formation
BHP	Broken Hill Proprietary
BoM	Bureau of Meteorology
DAWE	Department of Agriculture, Water and the Environment
DoD	Department of Defence
DD	diamond drilling
DDG	dust deposit gauge
DEW	Department for Environment and Water
DEM	Department for Energy and Mining
DoEE	Department of the Environment and Energy
DPTI	Department of Planning, Transport and Infrastructure
EL	Exploration Licence
EML	Extractive Mineral Lease
EMP	Environmental Management Plan
EMS	Environmental Management System
EPA	Environment Protection Authority
EPBC	Environment Protection and Biodiversity Conservation
Fe	Iron
FEL	front-end loader
FDR	Fugitive Dust Ranking
FY	financial year
GAB	Great Artesian Basin

GDP	Ground Disturbance Permit
HDPE	high density polyethylene
HE	high explosives
HGO	high grade ore
HV	heavy vehicle
IBRA	Interim Bio-geographical Regionalisation for Australia
ILUA	Indigenous Land Use Agreement
LFA	Landscape Function Analysis
LGO	low grade ore
LoM	life of mine
MARP	Mining and Rehabilitation Program
MC	Mineral Claim
MGO	medium grade ore
ML	Mineral Lease
MLA	Mineral Lease application
MMU	manned manoeuvring unit (i.e. an explosives truck)
MPL	Miscellaneous Purpose Licence
NGO	non-government organisations
NNTT	National Native Title Tribunal
NPW	National Parks and Wildlife
NRM	Natural Resource Management
NVC	Native Vegetation Council
OL	Licence to Occupy
PAF	Potential Acid Forming
PEPR	Program for Environmental Protection and Rehabilitation
PIRSA	Primary Industries and Regions of South Australia
PK	Peculiar Knob
RC	reverse circulation
ROM	run of mine
SA	South Australia or South Australian
SAAL	South Australian Arid Lands
SANTS	South Australian Native Title Services
SACOME	SA Chamber of Mines and Energy
SAGRN	SA Government Radio Network

SANTS	South Australian Native Title Services
SARIG	South Australian Resource Information Geoserver
SEB	significant environmental benefit
SES	SA State Emergency Services
TMP	Traffic Management Plan
U-Th	uranium-thorium
UHF	ultra-high frequency
WGS	World Geodetic System coordinate
WRD	waste rock dump
4WD	four-wheel drive

MEASUREMENTS AND SYMBOLS

Unit	Definition
B^{375}	a Habitat Significance Rating for a vegetation community, as compared with original vegetation
BCM	bank cubic metre(s)
Cfm	cubic feet per minute
dBL	decibels
FY	financial year
Ha	Hectares
kBCM	kilo bank cubic metre(s)
kL	kilolitre
kL/d	kilolitres per day
Km	kilometre
Kt	kilotonnes
kV	kilovolt
l	litre
L/t	litre per tonne
M	metre
m^3/h	cubic metres per hour
mBCM	million bank cubic metre
mBGL	metres below ground level
mg/L	milligrams per litre
ML	megalitre
Mm	millimetres
mm/s	millimetres per second
mRL	metres reduced level
Mt	million tonnes
Mtpa	million tonnes per annum
MVA	megavolt ampere
PN	pressure nominal
Psi	pounds per square inch
Q1, Q2, Q3, Q4	financial quarters 1, 2, 3 and 4

RL	reduced level
S/R	strip/ratio
TDA	total dissolved solids
SWL	standing water levels

1. CONTEXT AND PURPOSE OF THIS DOCUMENT

This document is an updated Program for Environment Protection and Rehabilitation (PEPR) which includes the existing operations of the Peculiar Knob Iron Ore Mine (the Project) and supersedes MPEPR 2019/030. The location of the project is indicated in Figure 1-1. The PEPR addresses activities associated with the Peculiar Knob mine including:

- open cut mining at the Peculiar Knob mine
- crushing, screening, separation and product stockpiling at Peculiar Knob mine
- truck loading and road haulage to Wirrida rail loop
- product stockpiling and rail loading operations at Wirrida rail loop
- stockpiling waste rock and low-grade material
- infrastructure components supporting the mining operations including, haul road, water supply borefields, power, accommodation village, access roads and communication system
- care and maintenance activities associated with the 'mothballing plan'
- rehabilitation and closure strategies.

Southern Iron Pty Ltd, (100% owned by Peak Iron Mines Pty Ltd) is the operator of the Project with the mine located approximately 60 km south east of Coober Pedy.

Mineral Lease ML6314 was granted by the Minister for Resources Development (Minister) on 25 June 2008. On 28 October 2010 the Minister also granted EMLs 6363–6382 and MPLs 125–131. On 29 June 2010 the Minister granted MPLs 133 and 134 for the water supply infrastructure. MPL141 for the Camp Water Borefield infrastructure was granted by the Acting Executive Director Mineral Resources (as delegate of the Minister) on 24 April 2013. Mineral lease ML6442 and MPL147 were granted by the Minister on 19 December 2014.

Arrium Mining, the previous owner and operator, announced the intent to put the Project into Care and Maintenance on 23 January 2015. The decision to suspend operations at Peculiar Knob mine was a result of high production costs and ongoing low iron ore prices and part of Arrium's overall business response to this business environment.

With the sale of Southern Iron Pty Ltd to Peak Iron Mines Pty Ltd, operations recommenced at Peculiar Knob Mine in February 2020 with recovery, crushing, screening and transport for export of low grade ore surface stockpiles.

This PEPR update is to address the recommencement of open pit mining. The most significant change to the operation from that undertaken previously is the relocation of the crushing and screening works from the Wirrida rail loop to the ROM pad at the mine site. Additionally, it is proposed to trial the introduction of dry magnetic separation for a portion of the crusher feed to achieve improved product grades. Further clarification is also included regarding PAF and potentially fibrous materials management and storage onsite, as well as addressing further works to be undertaken to finalise closure designs and confirmatory works related to the WRDs.

Figure 1-1 Project location

2. DESCRIPTION OF THE EXISTING ENVIRONMENT

A detailed description of the existing environment was included in the Peculiar Knob Iron Ore Mine Supplementary Tenements Proposal (reference WPC-104 (Rev 1) Arrium Mining 2014) and the previously approved PEPR 2013/013.

The key features of the existing environment are discussed in Section 7 as context for the risk assessments.

Section 7 also provides an update of any information or data relating to the existing environment in compliance with Section 2 of Ministerial Determination 005 (DSD 2012).

3. DESCRIPTION OF MINING OPERATIONS

3.1 General description and maps of operations

The operations include:

- open cut mining, at the Peculiar Knob mine
- crushing, screening, separation and product stockpiling at Peculiar Knob mine
- truck loading and road haulage to Wirrida rail loop
- product stockpiling and rail loading operations at Wirrida rail loop
- stockpiling waste rock and low grade material
- infrastructure components supporting the mining operations including, haul road, water supply borefields, power, accommodation village, access roads and communications system
- buffer around the mining and WRD areas
- care and maintenance activities associated with the 'mothballing plan'
- progressive rehabilitation.

The operations layout is in Figure 3-1 (and is also provided as Appendix A-1). Details of the current Mine Plan are outlined in Section 3.7. Mine closure and rehabilitation strategies are outlined in Section 5.

3.2 Tenements and land ownership

The tenements held by Southern Iron Pty Ltd include two Mineral Leases (MLs), 11 Miscellaneous Purposes Licences (MPLs) and 20 Extractive Minerals Leases (EMLs). The tenements and land ownership are detailed in Table 3-1 and shown on Figure 3-1, Figure 3-2 and Figure 3-3 (also provided as Appendix A-2).

Table 3-1: Peculiar Knob mining tenements and titles

Tenement	Title ID	Type of title	Landowner
ML6314	CL6211/153	Crown Leasehold	McDouall Peak Pty Ltd
ML6442	CL6211/153	Crown Leasehold	McDouall Peak Pty Ltd
MPL125	CL6211/153	Crown Leasehold	McDouall Peak Pty Ltd
MPL125	CL6180/992	Crown Leasehold	Ingomar Pastoral Co Pty Ltd
MPL126	CL6211/153	Crown Leasehold	McDouall Peak Pty Ltd
MPL126	CL6180/992	Crown Leasehold	Ingomar Pastoral Co Pty Ltd
MPL126	CL6181/743	Crown Leasehold	Ingomar Pastoral Co Pty Ltd
MPL127	CL6181/743	Crown Leasehold	Ingomar Pastoral Co Pty Ltd

MPL127	CL6180/992	Crown Leasehold	Ingomar Pastoral Co Pty Ltd
MPL128	CL6181/743	Crown Leasehold	Ingomar Pastoral Co Pty Ltd
MPL128	CL6180/992	Crown Leasehold	Ingomar Pastoral Co Pty Ltd
MPL129	CL6181/743	Crown Leasehold	Ingomar Pastoral Co Pty Ltd
MPL129	CL6180/864	Crown Leasehold	Ingomar Pastoral Co Pty Ltd
MPL130	CL6211/153	Crown Leasehold	McDouall Peak Pty Ltd
MPL131	CL6181/743	Crown Leasehold	Ingomar Pastoral Co Pty Ltd
MPL131	CT6136/25	Fee Simple	Australian Rail Track Corporation Ltd
MPL133	CL6181/743	Crown Leasehold	Ingomar Pastoral Co Pty Ltd
MPL134	CL6211/148	Crown Leasehold	McDouall Peak Pty Ltd
MPL134	CL6180/992	Crown Leasehold	Ingomar Pastoral Co Pty Ltd
MPL141	CL6181/743	Crown Leasehold	Ingomar Pastoral Co Pty Ltd
MPL147	CL6211/153	Crown Leasehold	McDouall Peak Pty Ltd
EML6366 EML6367 EML6368 EML6369	CL6211/153 CL6211/153 CL6211/153 CL6211/153	Crown Leasehold Crown Leasehold Crown Leasehold Crown Leasehold	McDouall Peak Pty Ltd McDouall Peak Pty Ltd McDouall Peak Pty Ltd McDouall Peak Pty Ltd
EML6363 EML6364 EML6365	CL6181/743 CL6181/743 CL6181/743	Crown Leasehold Crown Leasehold Crown Leasehold	Ingomar Pastoral Co Pty Ltd Ingomar Pastoral Co Pty Ltd Ingomar Pastoral Co Pty Ltd
EML6370 EML6371	CL6180/992 CL6180/992	Crown Leasehold Crown Leasehold	Ingomar Pastoral Co Pty Ltd Ingomar Pastoral Co Pty Ltd
EML6372 EML6373 EML6374 EML6375 EML6376	CL6181/743 CL6181/743 CL6181/743 CL6181/743 CL6181/743	Crown Leasehold Crown Leasehold Crown Leasehold Crown Leasehold Crown Leasehold	Ingomar Pastoral Co Pty Ltd Ingomar Pastoral Co Pty Ltd Ingomar Pastoral Co Pty Ltd Ingomar Pastoral Co Pty Ltd Ingomar Pastoral Co Pty Ltd
EML6377 EML6378	CL6181/743 CL6180/992	Crown Leasehold Crown Leasehold	Ingomar Pastoral Co Pty Ltd Ingomar Pastoral Co Pty Ltd
EML6379 EML6380 EML6381 EML6382	CL6181/743 CL6181/743 CL6181/743 CL6181/743	Crown Leasehold Crown Leasehold Crown Leasehold Crown Leasehold	Ingomar Pastoral Co Pty Ltd Ingomar Pastoral Co Pty Ltd Ingomar Pastoral Co Pty Ltd Ingomar Pastoral Co Pty Ltd

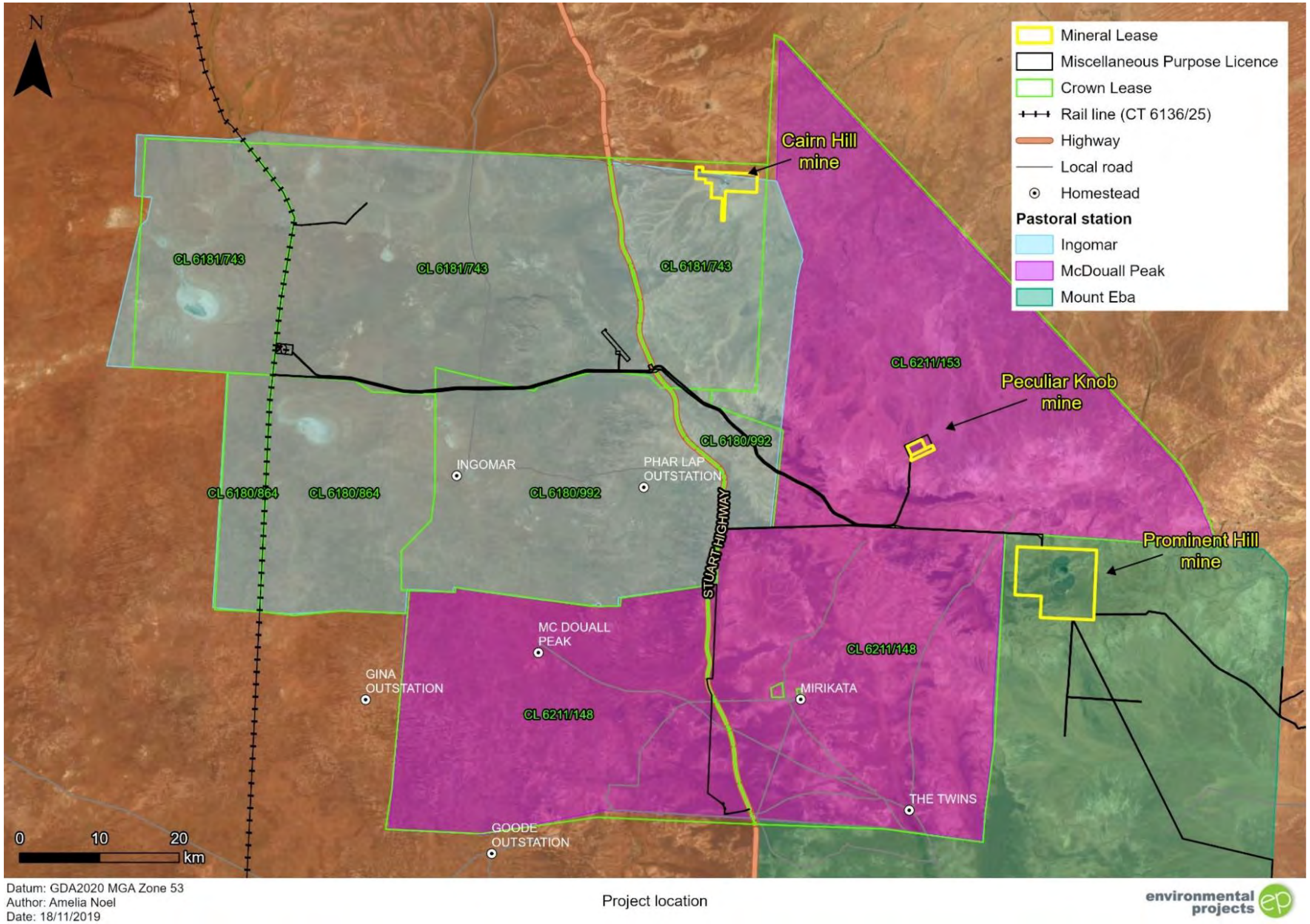


Figure 3-1: Land title references and pastoral station boundaries

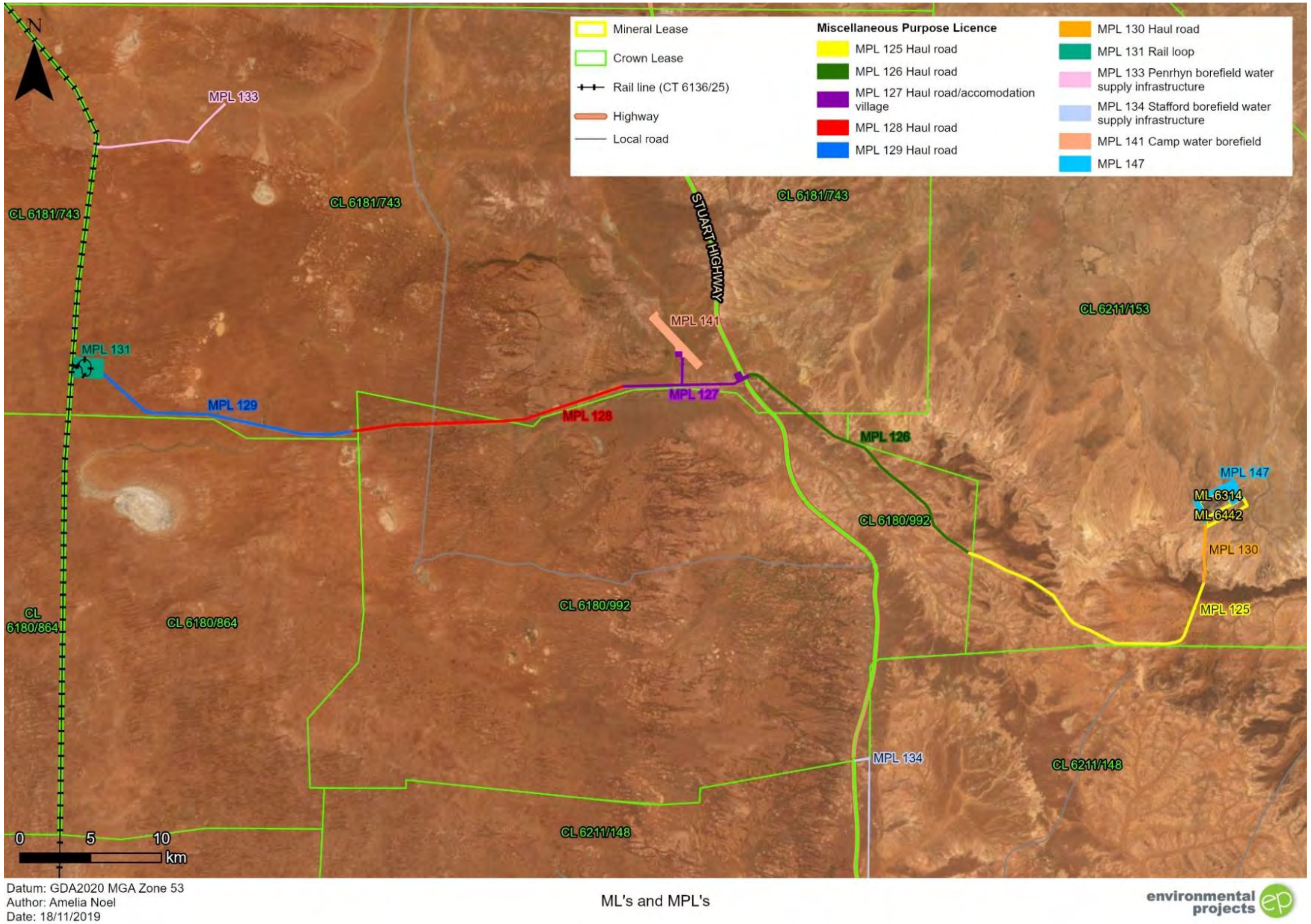


Figure 3-2: Mining tenements

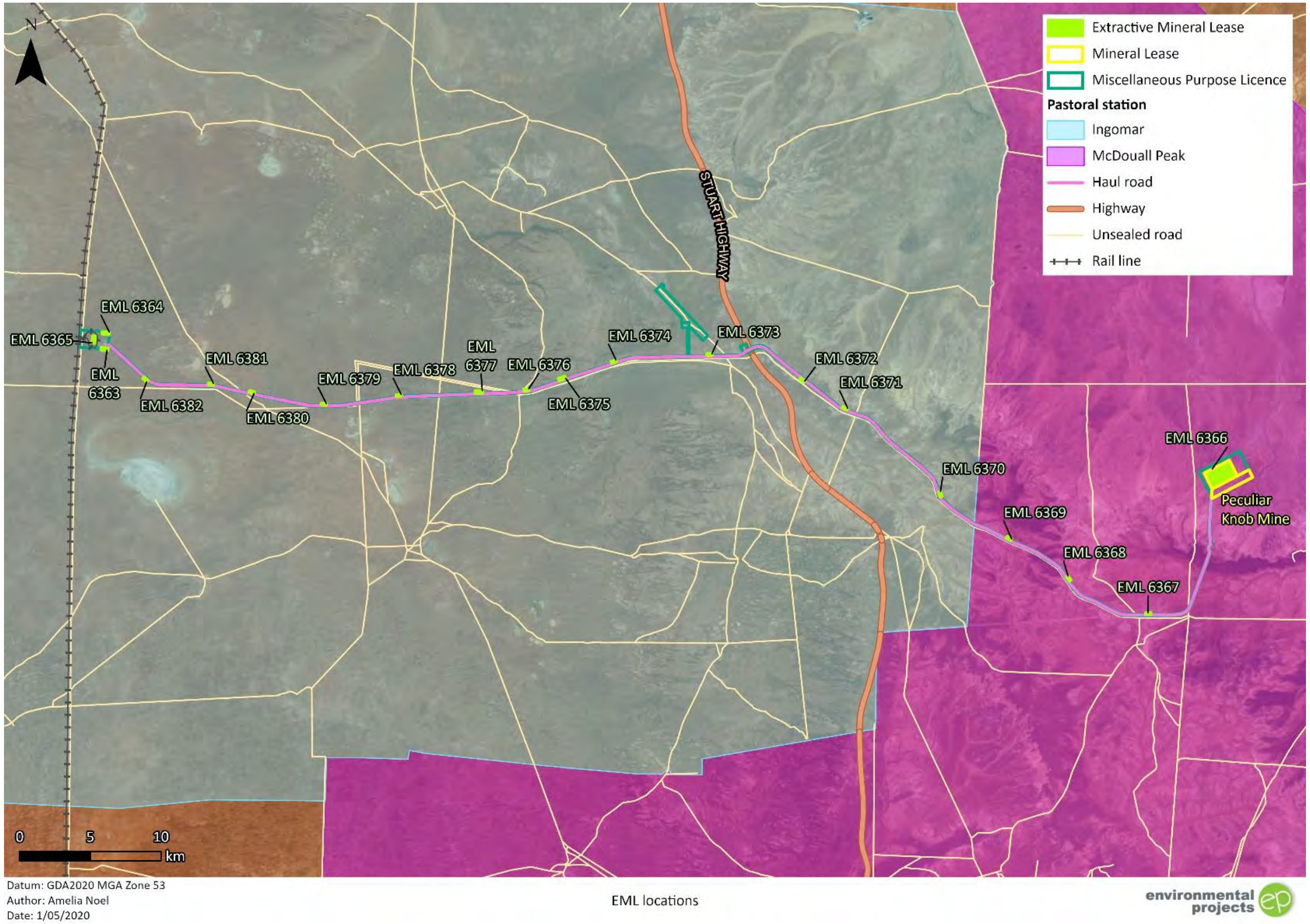


Figure 3-3: EML locations

3.3 Reserves, products and markets

3.3.1 Geological environment

Regional geology

The Peculiar Knob hematite deposit is located in the Mount Woods Inlier of the Gawler Craton (refer Figure 3-4). The Gawler Craton is a stable region of crystalline basement which ranges in age from Archaean to Mesoproterozoic (2,700 to 1,450 million years). Regional aeromagnetic surveys have shown that the Craton is host to separate deformed sedimentary sequences which contain magnetic, iron-rich sediments, known as banded iron formations (BIFs). These basement rocks are poorly exposed and are mostly overlain by thin soils and flat-lying sediments.

Peculiar Knob geology

At Peculiar Knob the Cretaceous Bulldog Shale is predominantly covered by Quaternary red-brown clay, sand and silt. This shale is highly to moderately weathered, pale brown to grey and contains minor gypsum. Some minor sandstone/conglomerate identified as Cadna-owie Formation may occur but generally Bulldog Shale directly overlies bedrock. Bedrock comprises a meta-sedimentary sequence of BIF, quartzite and quartz-microcline-sillimanite gneiss (Morris et al., 1998) with a metamorphic grade of upper amphibolite facies.

The zone of high grade iron mineralisation at Peculiar Knob is contained within two sub-parallel elongated lensoidal bodies of massive specular haematite. Both haematite lenses have a northeast to southwest trend and pinch and swell along a strike dimension of approximately 1,100 m. The mineralisation generally dips steeply to the northwest however dip reversals are evident in some places. The Peculiar Knob ore body is offset in three places by cross faulting and tapers out to narrow veins at the north eastern end of the deposit.

The local geology is shown in Figure 3-5 (and also provided as Appendix A-3) and interpretive typical cross section of the mine site in Figure 3-6.

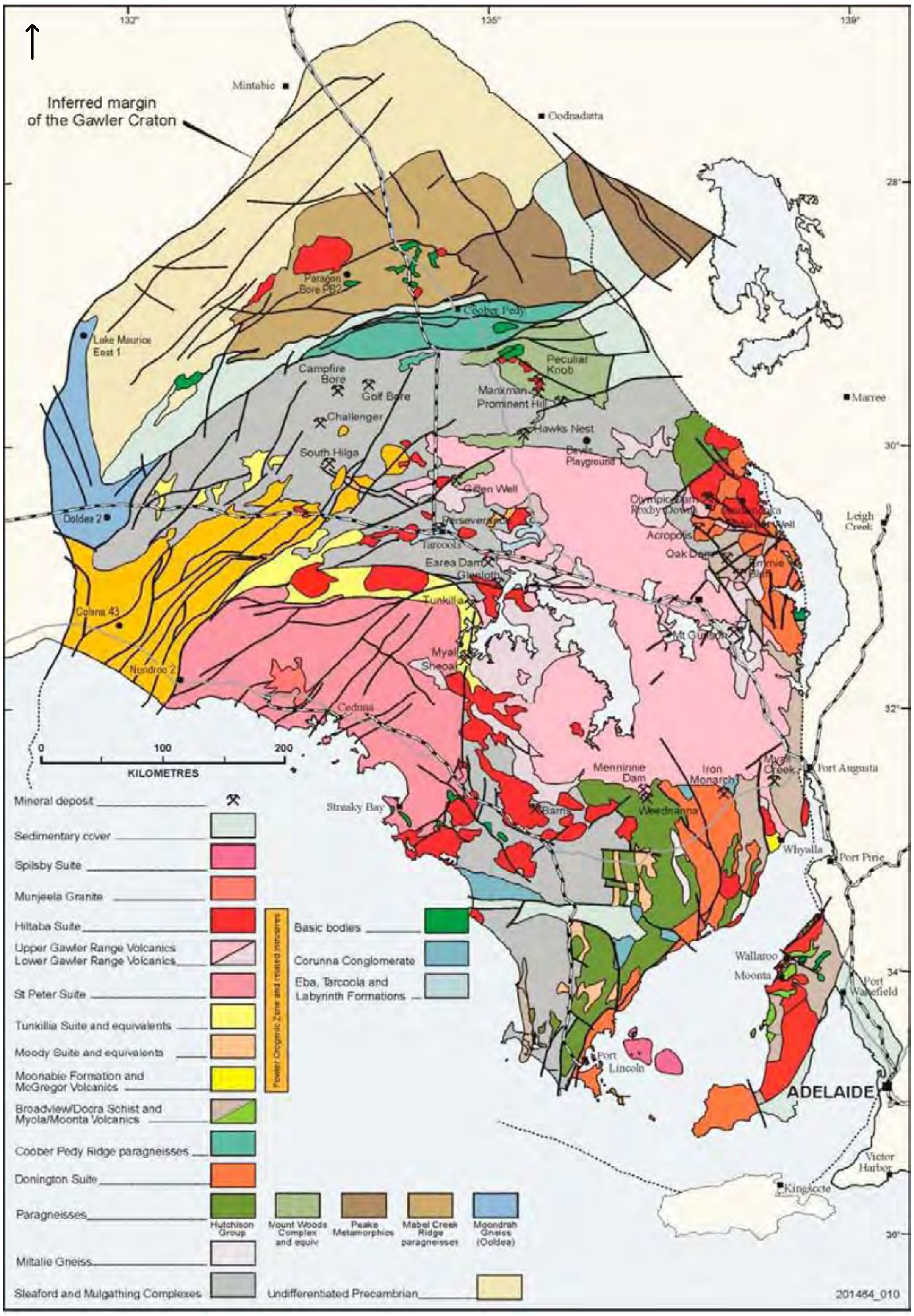


Figure 3-4: Regional geology

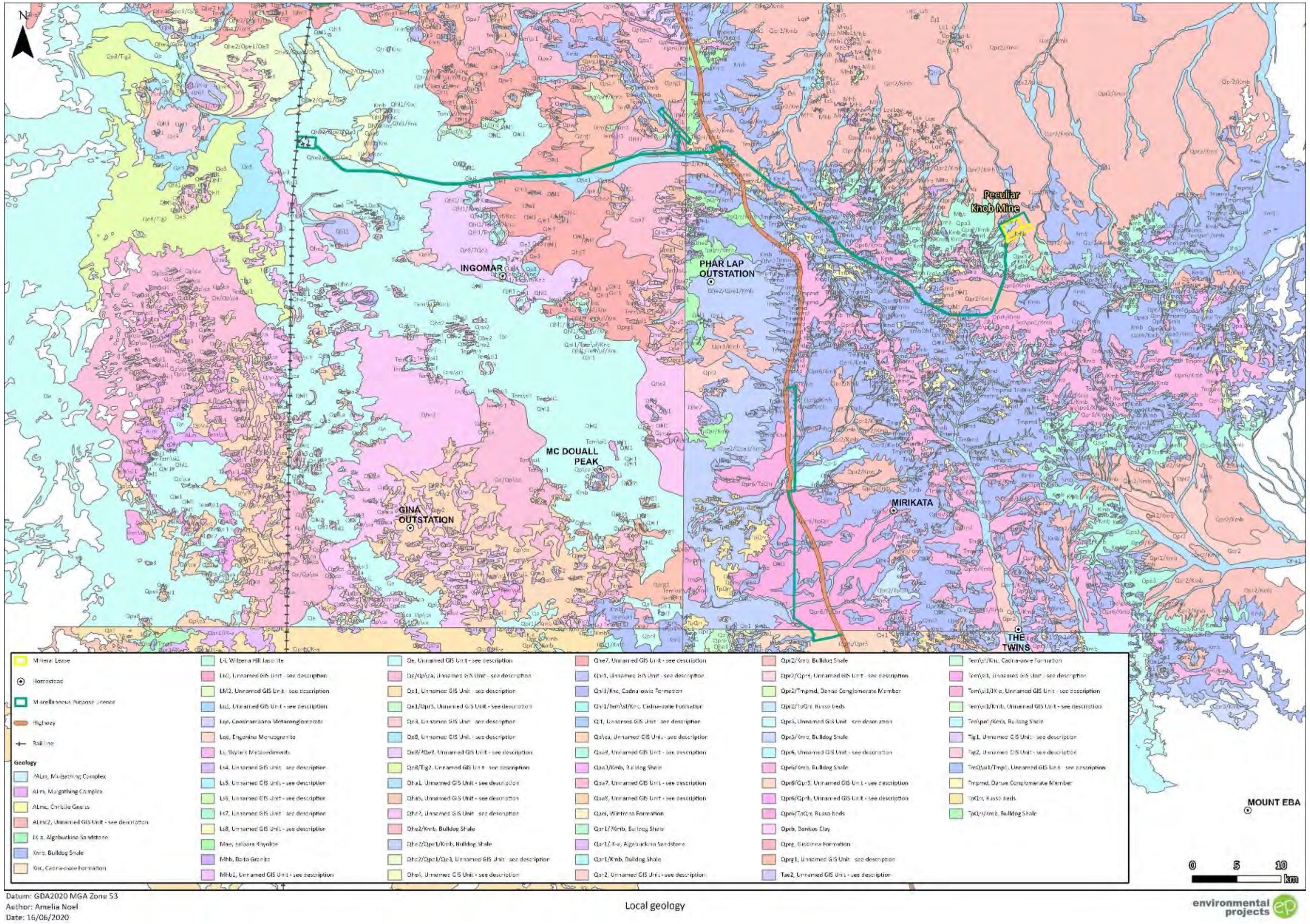


Figure 3-5: Local geology

Figure 3-6: Cross-section at 10,000

3.3.2 Reserves and resources

At the time of project acquisition by Arrium Mining Ltd from WPG Resources Ltd, the reported resource for Peculiar Knob from a 2011 estimate was 19 Mt@ 63.7% Fe and 7.45% SiO_2 (see Table 3-2). This estimate was from 89 drill holes (both RC and diamond), totalling 10,762 drill metres. The initial resource was reported from an Inverse distance squared estimation and reported as:

- Measured 13.4 Mt@ 63.7% Fe, 7.38% SiO_2
- Indicated 4.1 Mt @63.4% Fe, 8.20% SiO_2
- Inferred 1.5 Mt @64.5% Fe, 6.04% SiO_2

Additional infill and depth drilling by Arrium Mining improved resource definition. Changes in JORC reporting requirements in 2012 also adjusted resource classification parameters that meant future resource updates only reported resource classifications of indicated and inferred.

Table 3-2: Historical JORC compliant resource statements

Company	Year	Cut-off grade	Est method	Tonnes (Mt)	Fe %	SiO_2 %
WPG	2011	>55% Fe	ID2	19	63.7	7.45
Arrium	2012	>55% Fe	OK	17.2	63.2	8.32
Arrium	2013	>55% Fe	OK	21.3	63.06	8.42
Arrium	2014	>55% Fe	OK	20.9	62.95	8.34

The 2014 Peculiar Knob resource model update was based on a total of 217 drill holes for a total of 7251 chemical assays that were taken on 2 metre intervals. This resource updated included an additional six RC holes drilled within stages 3 and 4 that confirmed additional mineralisation outside of the 2012 resource update. The decrease in Fe grade and subsequent increase in SiO_2 grade that has occurred with each resource update can be attributed to:

- refined sub-blocking to reflect mining recoveries and minimum mining widths
- inclusion of Interpreted internal mafic veins
- inclusion of xenolith and narrow vein northern ore strings.

A 2015 reconciliation report assessing the remaining resource subsequent to the mine being placed into care and maintenance identified a remaining resource within the current pit design of 6.81 Mt @ 63.63% Fe, with an additional 3.35 Mt @ 62.4% Fe falling outside the current pit design (see Table 3-3 and Table 3-4).

Table 3-3: Remaining reserve in the current pit design following Peculiar Knob mine being placed in care and maintenance

Classification	Volume (Mm^3)	Tonnes (Mt)	Fe	SiO_2	Al_2O_3	P	LOI
Remaining reserve	1.47	6.81	63.63	8.00	0.26	0.02	0.41

Table 3-4: Remaining resource falling outside the current pit design

Classification	Volume (Mm^3)	Tonnes (Mt)	Fe	SiO_2	Al_2O_3	P	LOI
Indicated	0.4	1.85	62.95	8.52	0.26	0.01	0.44
Inferred	0.32	1.5	61.72	10.52	0.52	0.02	0.36
Total	0.72	3.35	62.4	9.4	0.38	0.02	0.41

A third-party consultancy (Mining Plus Pty Ltd) was engaged in October 2019 to review the existing final pit design for the Peculiar Knob Iron Ore deposit. The work entailed a site visit to investigate the current pit wall conditions and long-term performance of the rock mass followed by a revised pit design. An opportunity design (revised_pit_design_03_V3_with_goodbycut) to increase the minable ore resource was developed. The minable reserves of this design are shown in Table 3-5 and the pit design is detailed in Section 3.7.2.

Table 3-5 Minable in situ reserves – Design revised_pit_design_03_V3_with_goodbyecut

Material type	Volume (Mm³)	Mass (Mt)	Fe (%)	Al2O3 (%)	CaO (%)	TiO2 (%)
High Grade Ore	1.7	7.89	63.61	0.25	0.08	0.15
Low Grade Ore	0.02	0.08	53.40	0.33	0.19	0.18
Mineralised Waste	0.021	0.56	37.10	0.95	0.13	0.37
Waste	11.37	31.97	16.50	6.30	0.38	0.34

3.3.3 Production rate and products

Figure 3-7 provides a graph of the forecasted total Peculiar Knob pit material movements, from the recommencement of operations.

Prior to entering care and maintenance in January 2015, the Peculiar Knob pit was producing around 3.5 Mtpa of ore for export.

Details of the waste rock products are included in Sections 3.6 and 3.7.6.

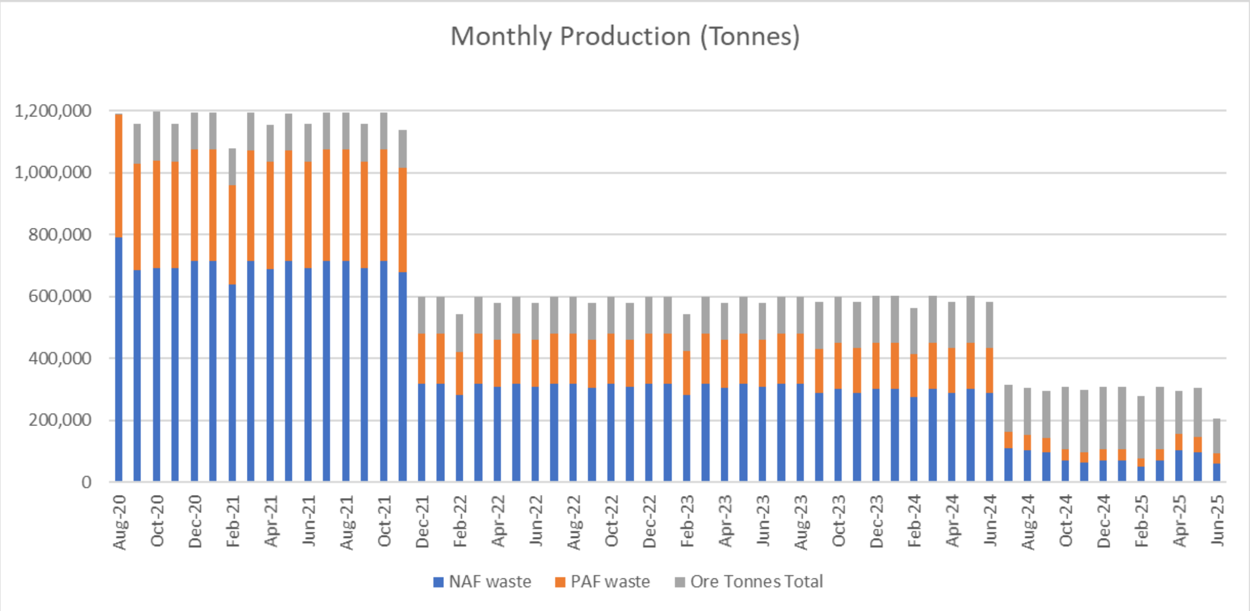


Figure 3-7: Forecast material movements at the recommencement of operations

At the commencement of FY2015, the mine was scheduled to be in production for a further two to three years. Due to the collapse in the ore price through FY2015, mining was suspended in June 2015 and the mine was placed under a care and maintenance plan.

The revised mine plan has the operations scheduled to recommence in Q3 2020, with completion expected by Q2 2025. A large portion of the waste material is scheduled to be mined between Q3 2020 and Q4 2021 (see Figure 3-8). The monthly ore target between Q3 2020 and Q3 2023 is 120,000 tonnes (1.44 Mt per annum), which then increases to 150,000 tonnes (1.8 Mt per annum) from Q3 2023 to Q3 2024. The production rate for the remaining of LOM is 200,000 tonne per month (2.4 Mt per annum).

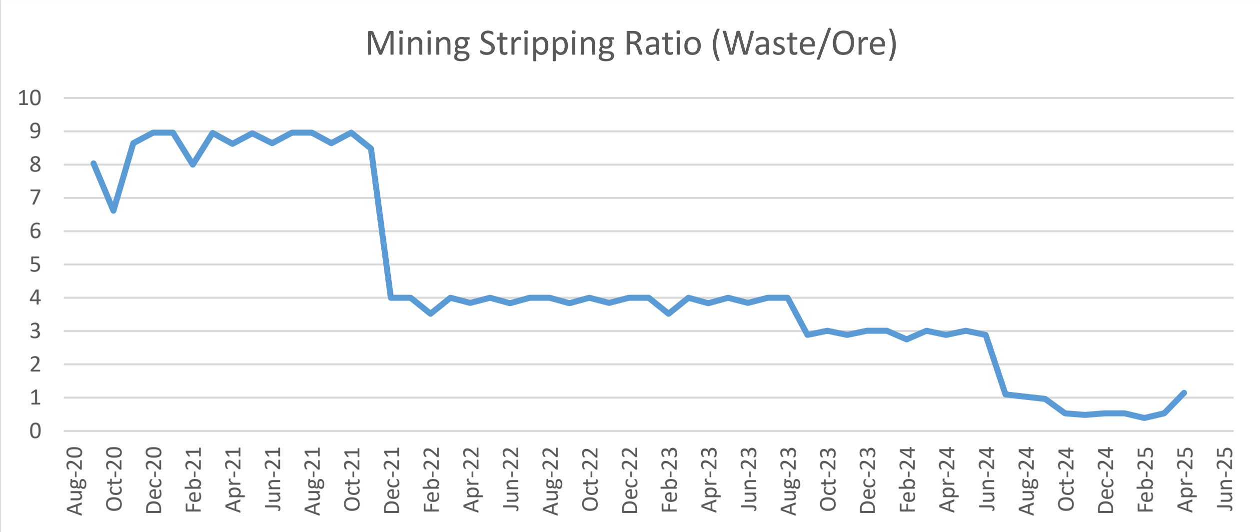


Figure 3-8: Forecast mining stripping ratio

3.4 Exploration and resource definition

There will be additional exploration activities undertaken within the MLs and MPLs. A further detailed program will be developed and submitted covering these activities.

3.5 Hydrogeological and geotechnical investigation

Hydrogeological investigations were undertaken between 2008 and 2011 (Rockwater 2008; Rockwater 2010; Rockwater 2011a; Rockwater 2011b). Information on the existing groundwater water supply sources is included in Section 3.12.7.

Hydrogeological assessments undertaken pre-mining by Parsons Brinkerhoff (2008) for the approved mining operations concluded that dewatering bores would not be required as there would be minimal groundwater flow into the pit.

This has been confirmed from the mining to date. The pit has been excavated to 120 metres below ground level and exhibits no seepage. This was also supported through the pre-mining exploration drilling program, where only two of the 83 exploration holes (PK56 and PK96) recorded water inflows with individual water yields of up to 5L/s (PB 2007).

Production blast hole drilling to date also has primarily been dry, confirming that groundwater inflow is not a significant issue for the Peculiar Knob open cut mining operation. Any inflow would evaporate due to the high natural evaporation rates. Rainfall that falls within the open pit area is directed to in-pit sumps for use in dust suppression.

A geotechnical review of the pit identified potential pit wall stability issues with the original pit design which if not addressed through the adoption of more conservative pit wall angles would have had the effect of making some 5.6 Mt of the targeted 10.8 Mt of hematite ore inaccessible. The pit was re-optimised and subsequent redesign resulted in nominal extensions to a length of 1,350 m (an increase of 50 m), a width of 465 m (an increase of 15 m) and a depth of 185 m (a nominal increase of the order of 10 m). The factors of safety (FOS) for dry and depressurised conditions and static loading were approximately 1.3 for both the north and south slopes. The FOS for worst case conditions (water pressure and a 0.06 seismic load) was 1.1 for both the north and south slopes. It was concluded that these FOSs were acceptable.

The slope stability and final shape for the existing WRD was assessed by Golder Associates Pty Ltd (2011) taking into consideration the overall slope angle of the WRD at 15°. The assessment of an overall batter slope based upon the conceptual WRD profile indicated an overall factor of safety of 1.5 when using a co-efficient of friction of 40° and zero cohesion.

The Eastern WRD is supplementary to the current northern WRD and contains the same rock in the same environment, at a comparable scale and using the same overall slope angle. Therefore the slope stability assessment previously undertaken by Golder Associates (2011) is also applicable to the Eastern WRD. The previous assessment indicated that the WRD will be stable. The Eastern WRD will be built in a series of batters and berms which results in a stepped profile. There is potential for the occurrence of shallow surface sloughing between tip edges and berms during construction, but this is common and not of concern to stability. Similarly, minor rilling is likely to occur, and is not considered to be a material issue.

A study by Dr A.G. Tony Meyers (Rocktest Consulting, 2014 – see Appendix B-1) looked at minimising the southern buffer between the dump toe and the pit crest. It was determined the current 100m buffer between the toe and crest could be reduced to a minimum of 50m, which enabled an increase in waste dump capacity. This was the subject of a minor change notification and DSD acceptance dated 20 June 2014.

3.6 Waste Rock Characterisation

This section provides a summary of the waste rock characteristics described in Jacobs 2020 (see Appendix B-2). Waste rock has been assessed following the MEND Manual (2001) and criteria defined in Section 5 of the Managing Acid and Metalliferous Drainage leading practice guidelines (DITR 2007) for waste rock characterisation.

3.6.1 Testing

Waste rock sampling and analysis has been documented in previous reports and summarised in Jacobs (2018) as part of the geochemical hazard assessment to assess potential for ARD generation from the WRD. The assessment collated available field and laboratory results collected since 2013.

A total of 315 samples have been collected for geochemical analysis between 2013 and 2017 and classified in accordance with criteria defined in Section 5 of the Managing Acid and Metalliferous Drainage (AMD) leading practice guidelines (DITR, 2007), which considers the GARD Guide (INAP 2009) and MEND (2004) guidelines for geochemical consideration.

In 2018, PSD and permeability tests were competed on the WRD cover for use in seepage modelling. Geotechnical testing for WRD slope stability and construction were undertaken as part of the feasibility study and are summarised in previous reports (PB 2007; PSM 2008, Golder 2008).

3.6.2 Geochemical characteristics

Previous test work undertaken by Golder Associates for WPG Resources Ltd has identified three samples from the Bulldog Shale and one from the Cadna-owie Formation as capable of generating acidic leachate (Arrium 2015).

The Bulldog Shale is comprised of bioturbated, fossiliferous, shaly, grey mudstones. The highly carbonaceous and chemically-reduced interlayers contain microscopic nodules of pyrite that readily oxidise upon exposure to the atmosphere (Arrium 2015). Given this, the Bulldog Shale has been identified as the unit with the greatest potential to generate acidic leachate at Peculiar Knob.

Acid sulphate rock characterisation

Due to the presence of potentially acid-generating lithologies noted during investigation of the mineral reserve, a programme of drilling and mineralogical analysis was designed to better refine and delineate the extent of the acid forming material. This was undertaken in March 2013. The programme comprised of 7 holes sampled at 2 m intervals. The location of these has been illustrated in Figure 3-9.

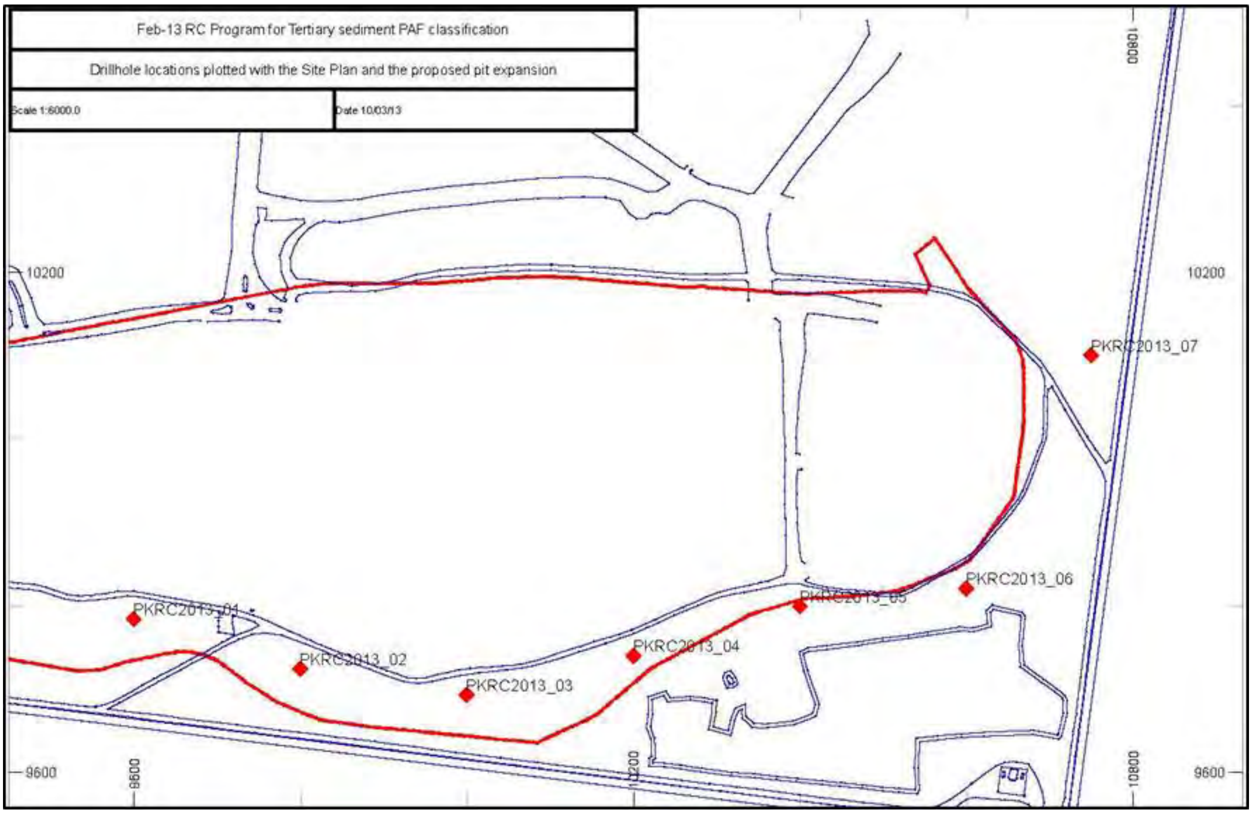


Figure 3-9: Location of RC cores drilled in March 2013

Further to initial drilling in May 2013, visible iron sulphides were identified within a metapellitic serpentine unit that was exposed on the footwall of the resource. In order to chemically confirm the acid-forming potential of this lithological unit, grab samples and an additional RC hole was drilled into the unit for further analysis.

The above samples were collected and distributed to laboratories for:

- Quantitative elemental and mineralogical analysis
- Net acid generating (NAG) potential analysis
- Storage as a reference sample.

A total of 262 samples across 7 litho-types were analysed for acid sulphate rock (ASR) characteristics during the March 2013 drilling program. A further 33 drill samples and 15 grab samples were analysed during May 2013. The lithologies sampled and analysed during these programs have been summarised in Table 3-6.

Table 3-6: Summary of Lithologies analysed for ASR at Peculiar Knob mine

Unit	March 2013	RC Drill Samples (May 2013)	Grab samples (May 2013)
Topsoil	11		
Bulldog Shale	125		
Cadna-owie Sandstone	69		2
Boorthanna	24		1
Serpentine	13		6
Quartzite	6		4
Granite	14		1
Rhyolite/Apalite		7	1
Metapelitic serpentine		26	
Total	**261**	**33**	**15**

Geochemical classification of the samples was conducted by Arrium (2015) according to the criteria defined in section 5 of the Managing Acid and Metalliferous Drainage (AMD) leading practice guidelines (DITR 2007), indicating that of the combined 309 samples collected:

- 54 samples were potentially acid forming (PAF)
- 7 samples had a low capacity to be potentially acid forming (PAF-LC)
- 104 samples were uncertain (UC)
- 117 samples were non-acid forming (NAF)
- 27 samples were acid consuming (ACM)

Using the same AMD guideline (DITR 2007), a review of the original classification completed by Arrium (2015) was conducted against the data supplied in Jacobs 2018. This comparison has been summarised in Table 3-7 and indicates that it is largely consistent with that conducted by Arrium (2015), and therefore the classification by Arrium (2015) is considered to be validated. It is noted that a single conflict occurred in the RC and grab samples, as indicated in Table 3-7.

Laboratory data for the RC drill holes PKRC2013_01 and PKRC2013_02 were not available for the comparison of lithological categorisations. Table 3-7 indicates that this resulted in a conflict in the number of samples reviewed, however the representation of each category within the data sets is comparable, and therefore the conflict is considered unlikely to have influenced any subsequent assertions made.

Table 3-7: Comparison between Jacobs 2017 and Arrium 2015

Category	March 2013				RC and Grab samples			
	Jacobs		Arrium		Jacobs		Arrium	
	Count	%	Count	%	Count	%	Count	%
PAF	35	17	43	16	11	23	11	23
PAF-LC	6	3	7	3	-	-	-	-
UC	69	34	97	37	6	13	7	15
NAF	75	37	98	37	20	42	19	40
ACM	16	8	16	6	11	23	11	23

The samples analysed and categorised as part of this study have been illustrated with respect to their ASR characteristics in Figure 3-10.

It was noted that a large number of samples were categorised as uncertain (UC) during the March program and as such, were re-analysed to determine the amount of sulphur present as sulphate. Arrium (2015) indicated that 98.3% of the sulphur was present as sulphate. A review of the data found that 90.1% of sulphur in UC samples was present as sulphate. This discrepancy is probably related to the absence of data from PKRC-2013_01 and PKRC-2013_02. In any case, the data indicate that the sulphur present in UC samples was overwhelmingly in the form of sulphate. Further, it was most commonly present in the upper, weathered horizon of the Bulldog Shale. This suggests that the upper horizons of the Bulldog Shale have been previously exposed to oxic conditions over geological timescales, resulting in the oxidation of sulphides and prior production/leaching of sulfuric acid.

Given the historic production of acidic leachate from the Bulldog Shale, it is likely that these samples are dominated by sulphate-sulphur minerals such as gypsum, which are non acid-generating (DITR 2007). Despite this, the exposure of such material still has the potential to generate metalliferous leachate and/or lead to sulphate-rich salinity issues. It is noted in the mineralogical analysis (Appendix B of Jacobs 2018) that the abundance of MgO in these samples was typically greater than CaO, suggesting that highly soluble $MgSO_4$ may be present and that sulphate-rich salinity present in leachate could be an issue.

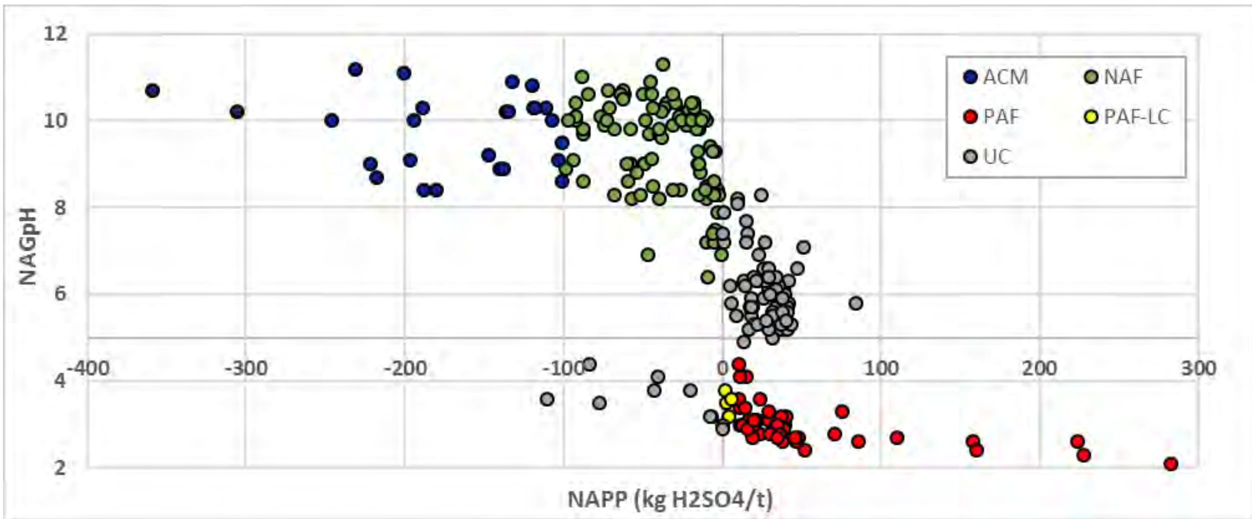


Figure 3-10: Acid sulphate rock characterisation in RC cores (note, samples from PKRC2013_01 and PKRC2013_02 not provided for analysis)

Waste Rock Dump

As part of the PAF cell reporting and monitoring process and standard material reporting processes, regular spatial surveys were completed for the Peculiar Knob pit and PAF cell on a monthly basis. Mineralogical analysis of production material was subsequently reconciled with waste material sent to Peculiar Knob PAF cell. This material analysis and reconciliation is wholly detailed in Appendix B of Jacobs 2018 (see Appendix B-3).

In order to reconcile the acid forming potential of the waste material which reported to the PAF Cell mine operations, the relationship between mineralogy and acid producing potential must be defined. As sulphur minerals at Peculiar Knob have been found to be acid generating, and Ca minerals such as carbonates are neutralising, the relationship between S and Ca minerals has been used to define the acid producing potential of the material distributed to the PAF Cell. The co-variance between the Net Acid Production Potential (NAPP) and S:CaO ratio is illustrated in Figure 3-11, and shows a positive logarithmic relationship between the two (i.e. the magnitude to which sulphur minerals exceed Ca minerals is an indicator of acid producing potential).

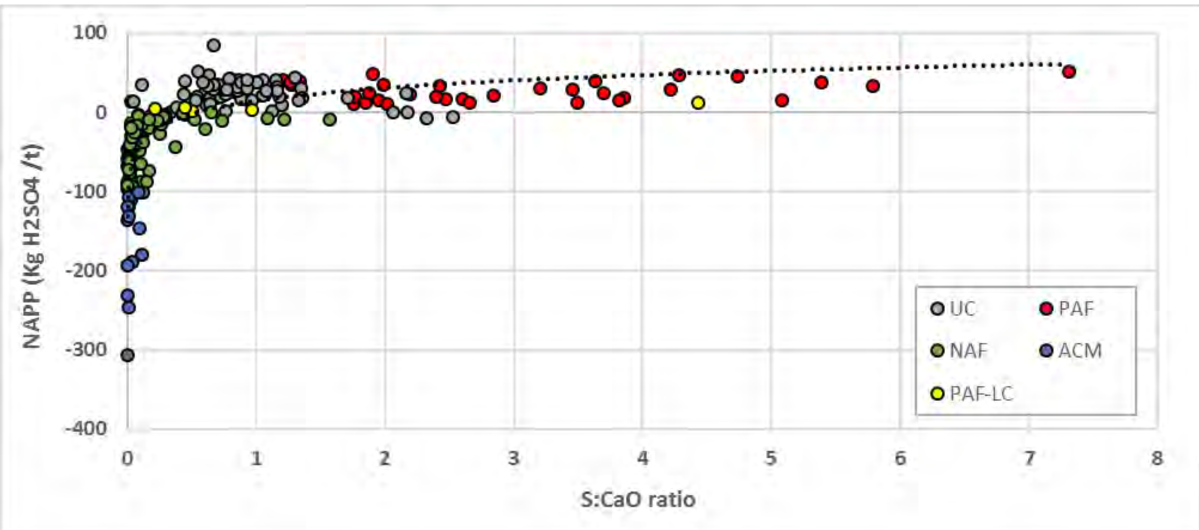


Figure 3-11: Co-variance between NAPP and S:CaO

Based on the S:CaO ratio mineralogical relationship described above, the areas most likely to contain PAF material were distributed to the WRD PAF cell during July 2012, June 2013, September 2013, and April-May 2014. Based on the mass of the material deposited at these times, the relative S:Ca ratio of these deposits and the trend identified in Figure 3-11, it is estimated that these areas contain a combined NAPP equivalent 36.8 tonnes of sulfuric acid.

The location of the PAF material identified has been illustrated in Figure 3-12, whilst Figure 3-13 illustrates historic encapsulation dump design of the batter slopes. All batter slopes have a minimum of 15 m encapsulation of NAF material with the top surface of the WRD capped with between 1 and 5 m NAF material. 1 m capping in the southern portion of the current tier is to allow for operational restart of the waste rock dump.

If left exposed to the atmosphere or covered by unsuitable material, these areas may potentially be at risk of oxidation and acid generation. Further to this, such acidification may mobilise metals present within the material. For example, there is a positive correlation between the S:CaO ratio (PAF material) and Al_2O_3 abundance in the WRD (see Figure 3-14), indicating the potential for Al mobilisation.

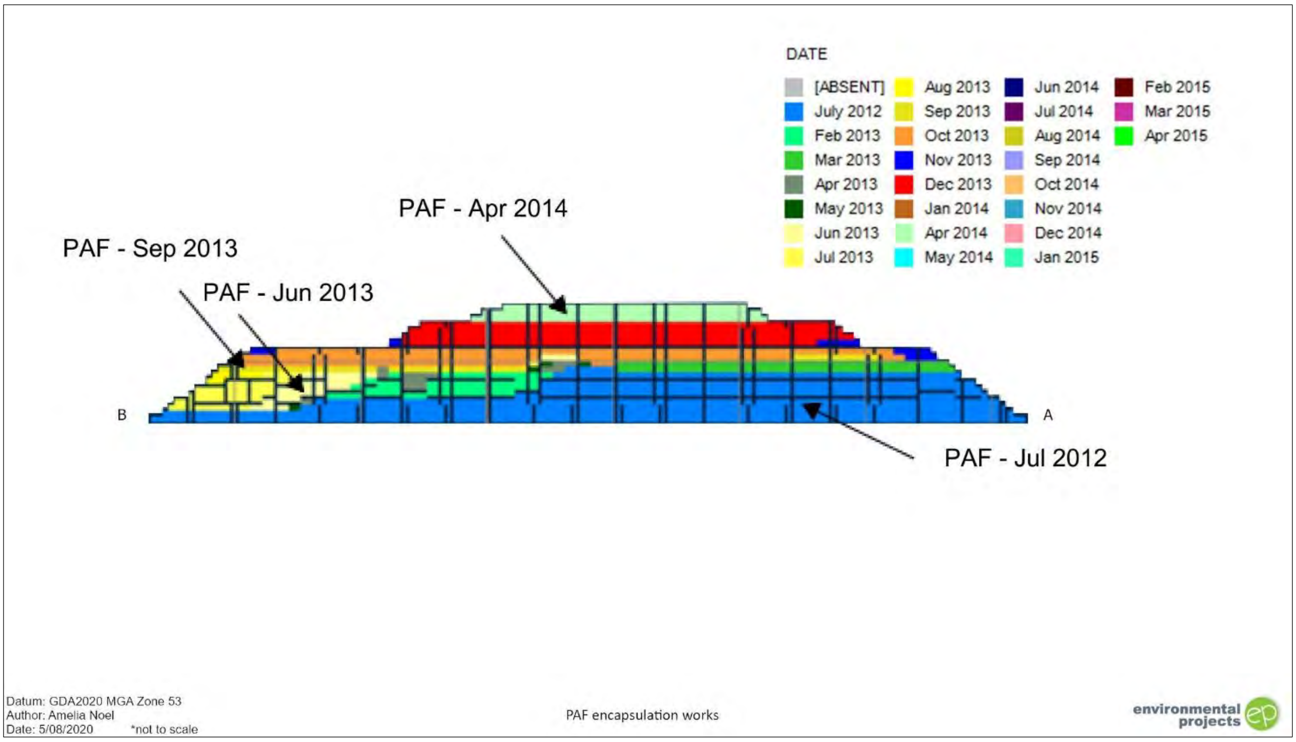


Figure 3-12: Timing of material deposited into Northern WRD PAF cell – looking west

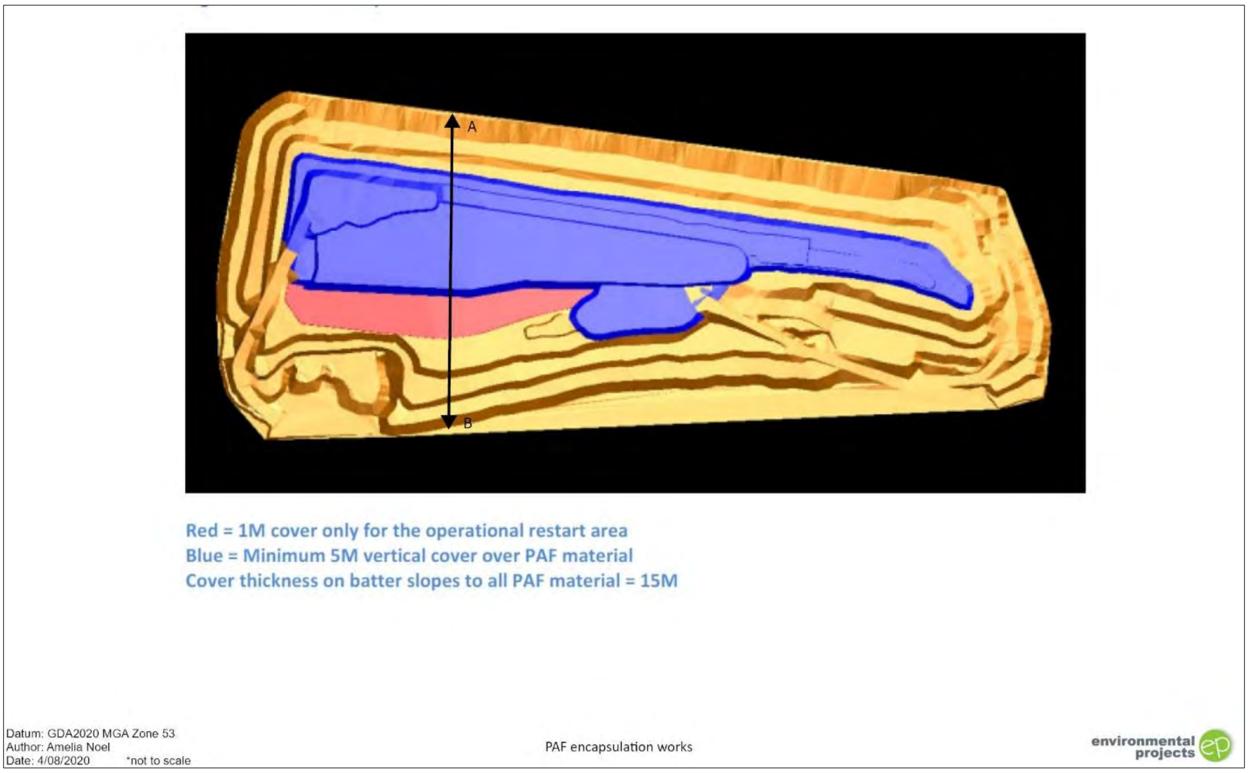


Figure 3-13: Historic PAF cell encapsulation (Northern WRD)

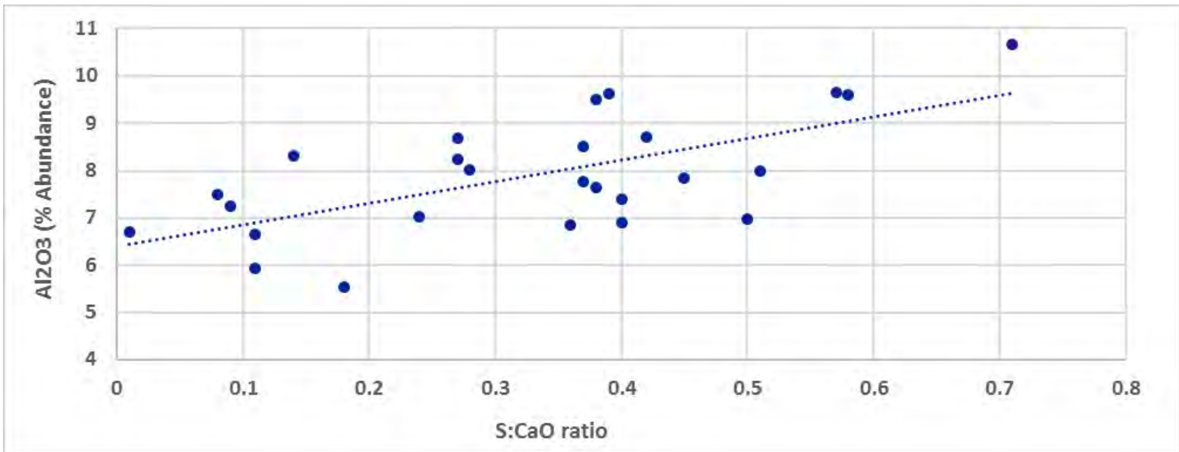


Figure 3-14: Co-variance between S:CaO ratio and Al_2O_3 abundance of production material reconciled with WRD

3.6.3 Physical characteristics

Geotechnical analysis pertaining to the WRD design and stability was completed prior to the commencement of mining and is detailed in full in the PSM (2008) and Golder (2008) reports.

In November 2018, Golder completed a program of soil and waste rock sampling and geotechnical analyses (i.e. particle size distribution (PSD) and in-situ permeability testing) (Golder 2018) of the temporary WRD cover material. This testing was to determine the physical characteristics and the potential for seepage through the cover material.

PSD testing was completed on 14 waste rock samples and 8 soil samples, which were used for the seepage assessment. These data were selected as most representative of site conditions based on field observations. PSD results indicate that the topsoil can be generally characterised as a clayey, silty, gravely, fine to coarse grained sand. The results show that the soil profile is well graded and heterogenous in particle size.

PSD results indicate the inert waste rock layer can be characterised as a fine to coarse gravel with fine to coarse grained sand and some fines. The results show that the inert waste rock material is well graded and heterogenous in particle size (refer to Jacobs 2020 for details).

3.6.4 Potential for acid mine drainage

The assessment indicates that the previous assessment of ASR material conducted by Arrium (2015) is valid. The assessment indicates that according to (DITR 2007):

- Quaternary topsoil is typically NAF
- highly weathered Bulldog Shale is typically UC, however sulphur is typically present as sulphate and can be considered NAF
- slightly weathered Bulldog Shale is typically PAF or PAF-LC
- Metapelitic Serpentine unit is typically PAF
- Cadna-owie Sandstone is most commonly NAF, but can be PAF where it directly underlies the Bulldog Shale
- basement lithologies are typically NAF or ACM.

The geochemical hazards identified in the assessment include:

- sulphate salinity related to the mobilisation of sulphate from exposure of weathered Bulldog Shale
- PAF material with an estimated sulfuric acid content of 36.8 tonnes, a proportion of this in areas of temporary 1 metre capping
- metal mobilisation associated with the acidification of PAF material, particularly aluminium.

3.7 Mine plan

3.7.1 Type of mining operation to be carried out

Mining will be undertaken by traditional drilling and blasting with load and haul by backhoe excavator and dump trucks. Economic ore will be transported to the un-crushed stockpile as shown in Figure 3-15, whilst non-economic rock will be transported to the existing northern waste rock dump (WRD) and the new Eastern WRD. Mineralised material that can be characterised as ‘low grade’ will be separated and hauled to the Low Grade Stockpile located south west of the Northern WRD as indicated in Figure 3-15.

Currently, stockpiled low-grade material is being reclaimed/exported and is scheduled to be completed in January 2021. Figure 3-15 (also provided as Appendix A-4) shows the mine site tenements in relation to the Northern and Eastern WRDs, pit boundary, mine infrastructure and various stockpiles.

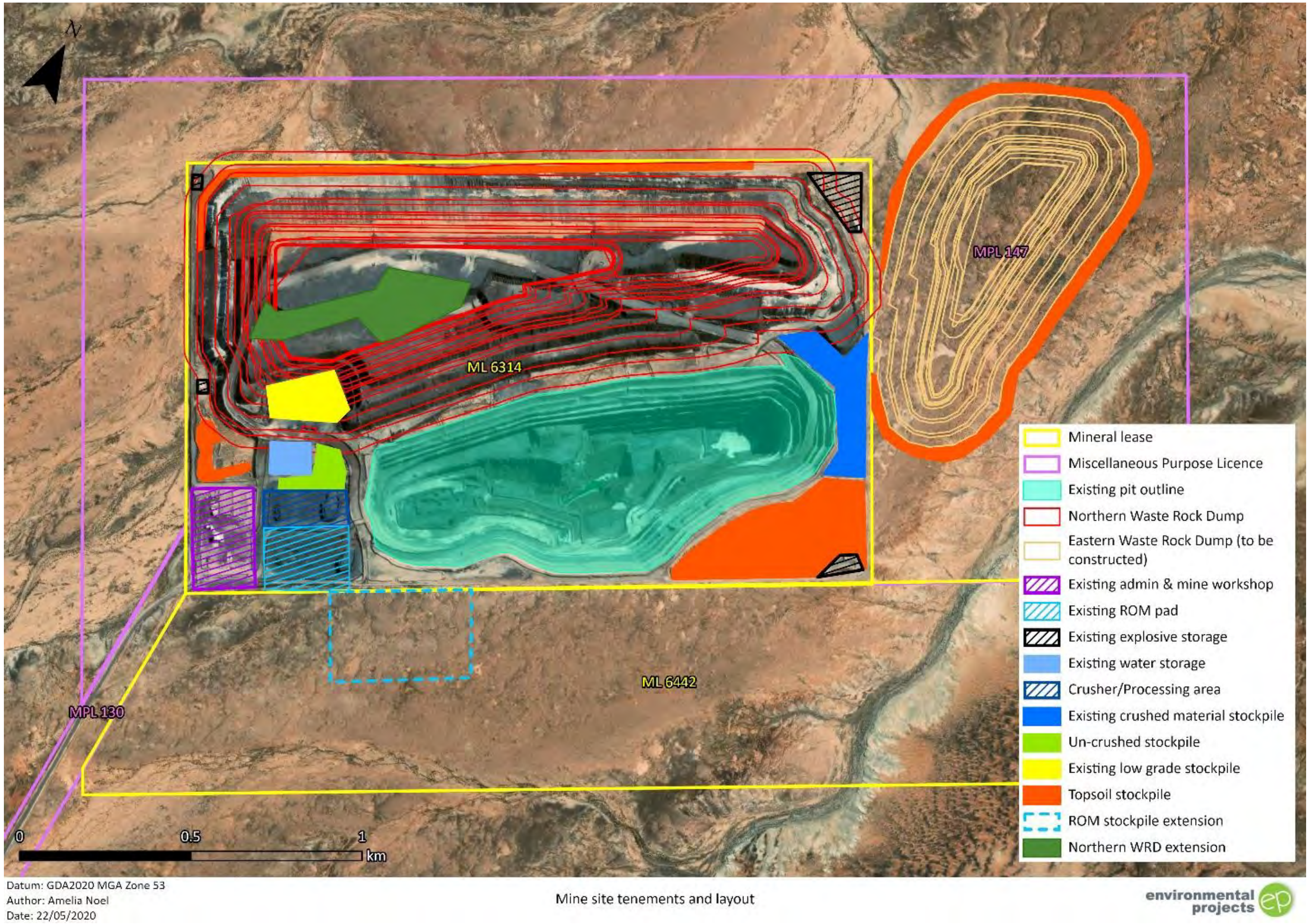


Figure 3-15: Mine site tenements and layout

3.7.2 Pit design

The pit design shown in Figure 3-16 and Figure 3-17 was developed by Mining Plus in October 2019. A site visit was undertaken to investigate the current pit wall conditions and long-term performance of the rock mass. An opportunity design to maximise the minable ore resource was developed with batter angles and catch berms consistent with geotechnical design criteria (see Figure 3-18) that were reviewed and confirmed by Peter O'Bryan & Associates in October 2019.

Either a Geotech bench or haul road is required at a vertical distance of no more than 96 metres. All other berms are designed with an 8 metre width. Wall batters above EL135 were designed to a 45-degree angle and batters below EL135 are designed at 73 degrees. Haul roads from the natural surface to EL7 are 28 metres wide allowing dual lane access. Below EL7, haul road widths are reduced to 18 metres with single lane access only. All ramps are designed with a 1:10 grade slope angle.

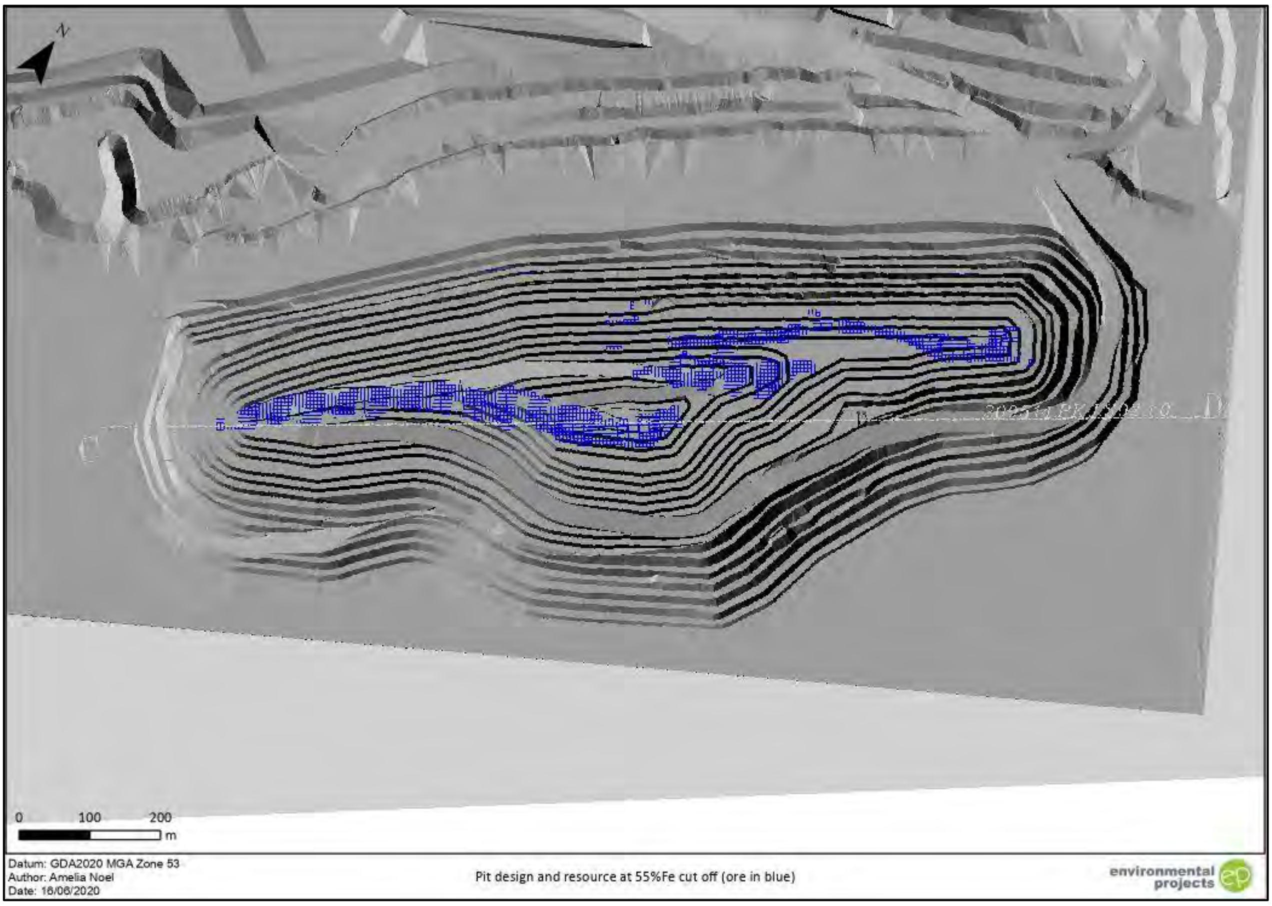


Figure 3-16: Pit design and resource at 55%Fe cut off (ore in blue)

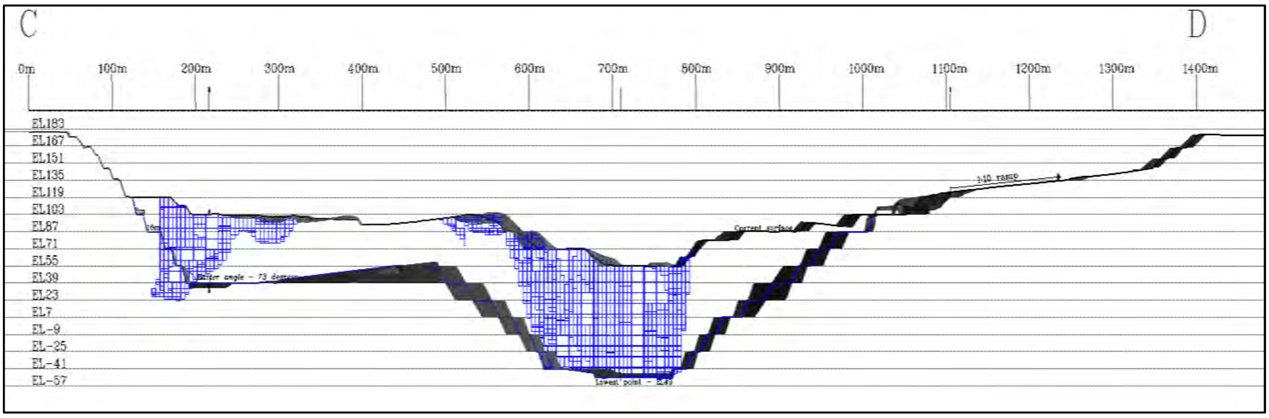


Figure 3-17: Pit Long-section C – D and resource at 55% cut off (Blue wireframe)

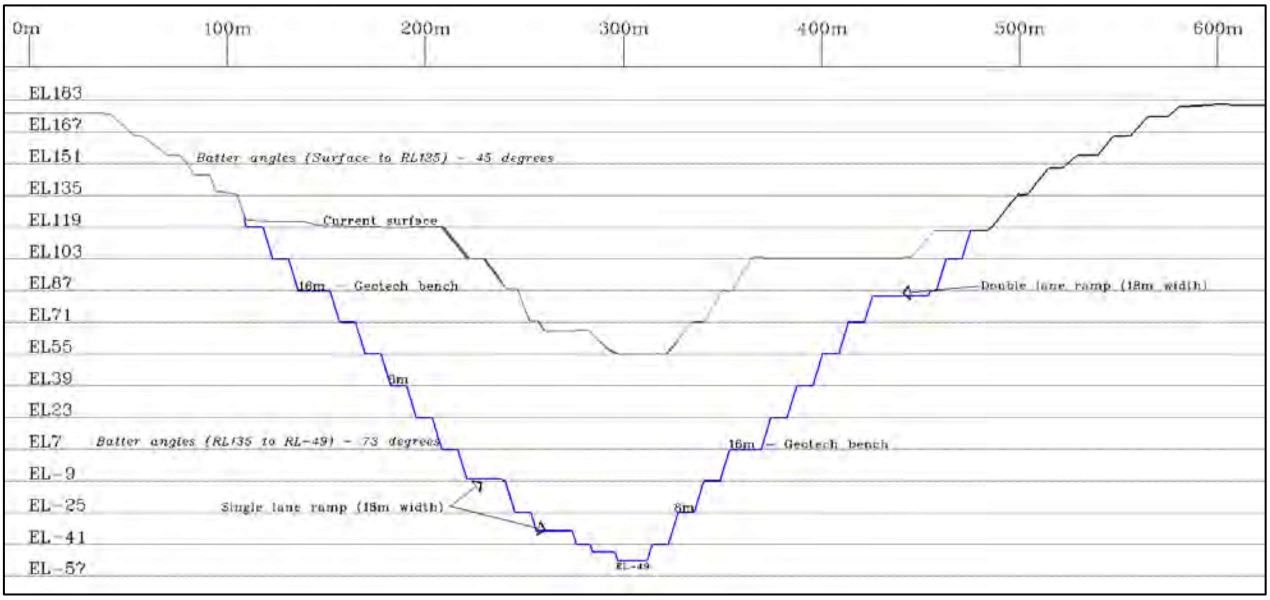


Figure 3-18: Pit geotechnical design criteria

The final pit will be approximately 1.4 km long, 560 metres wide, and approximately 216 metres deep. Figure 3-19 to Figure 3-23 (and also provided in Appendix C) show the cross sections and long sections of the pit design.

The pit is contained within ML 6314. ML 6442 to the south is provided as a contingency should the pit south wall conditions require further cut-back, and to also provide space for establishment of closure bunds and fencing.

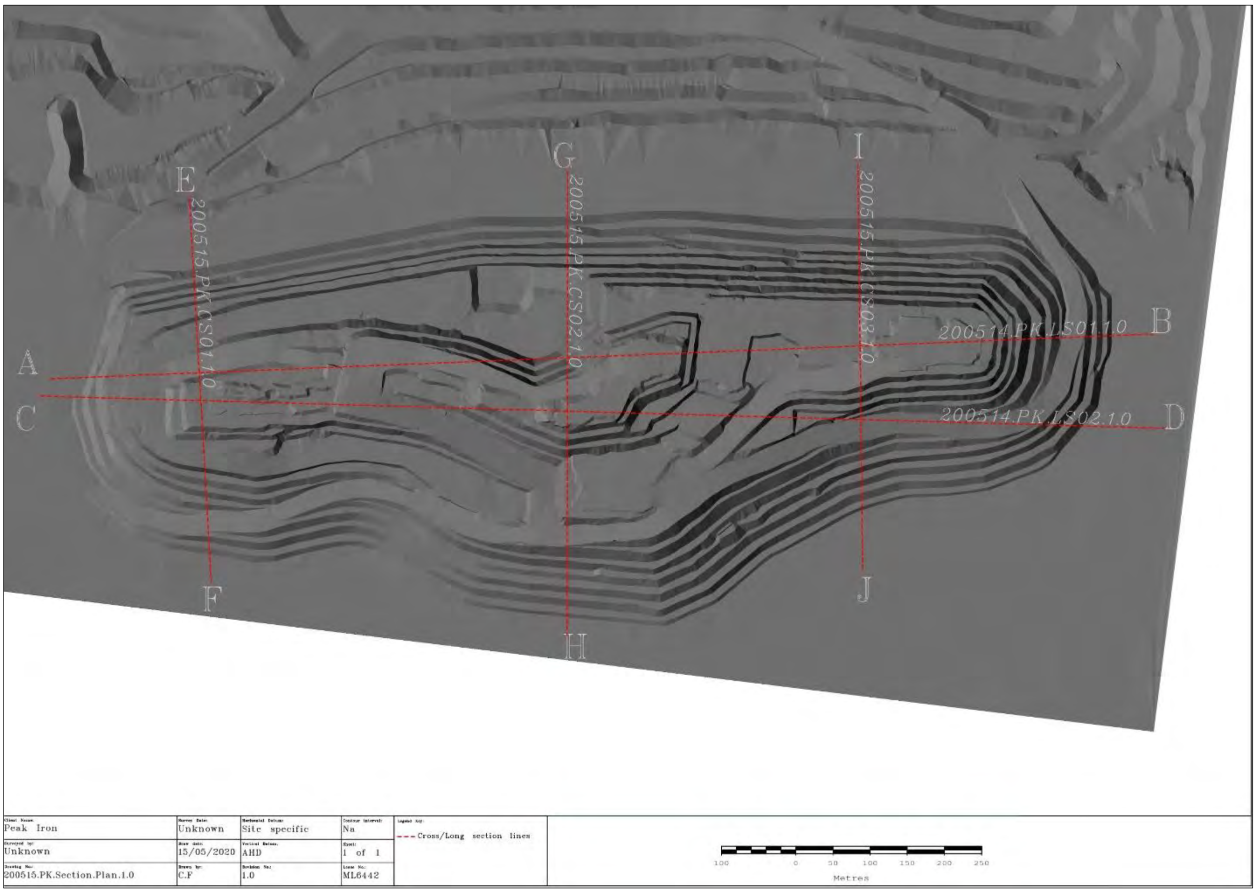


Figure 3-19: Pit section plan

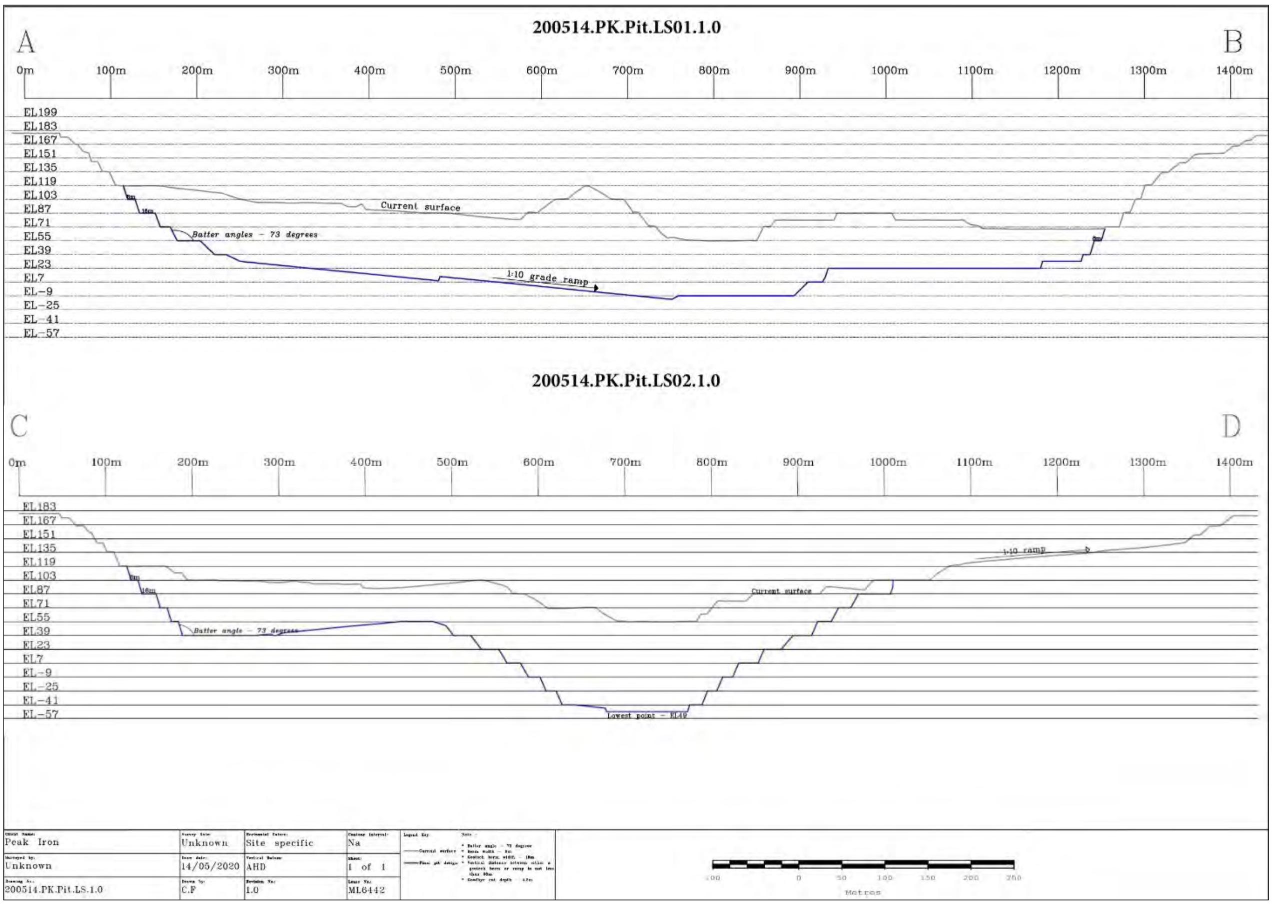


Figure 3-20: Pit long sections A – B and C - D

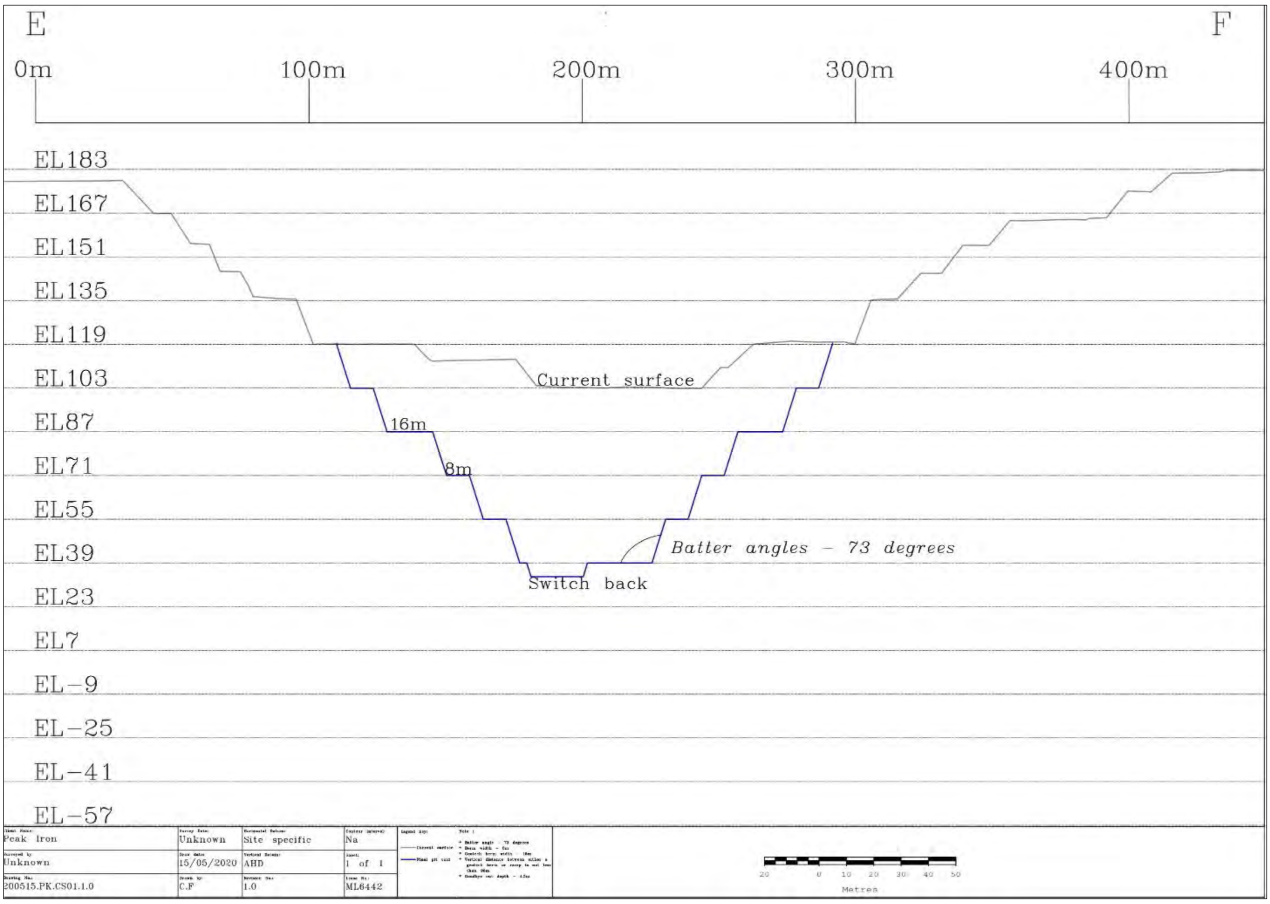


Figure 3-21: Pit cross section E - F

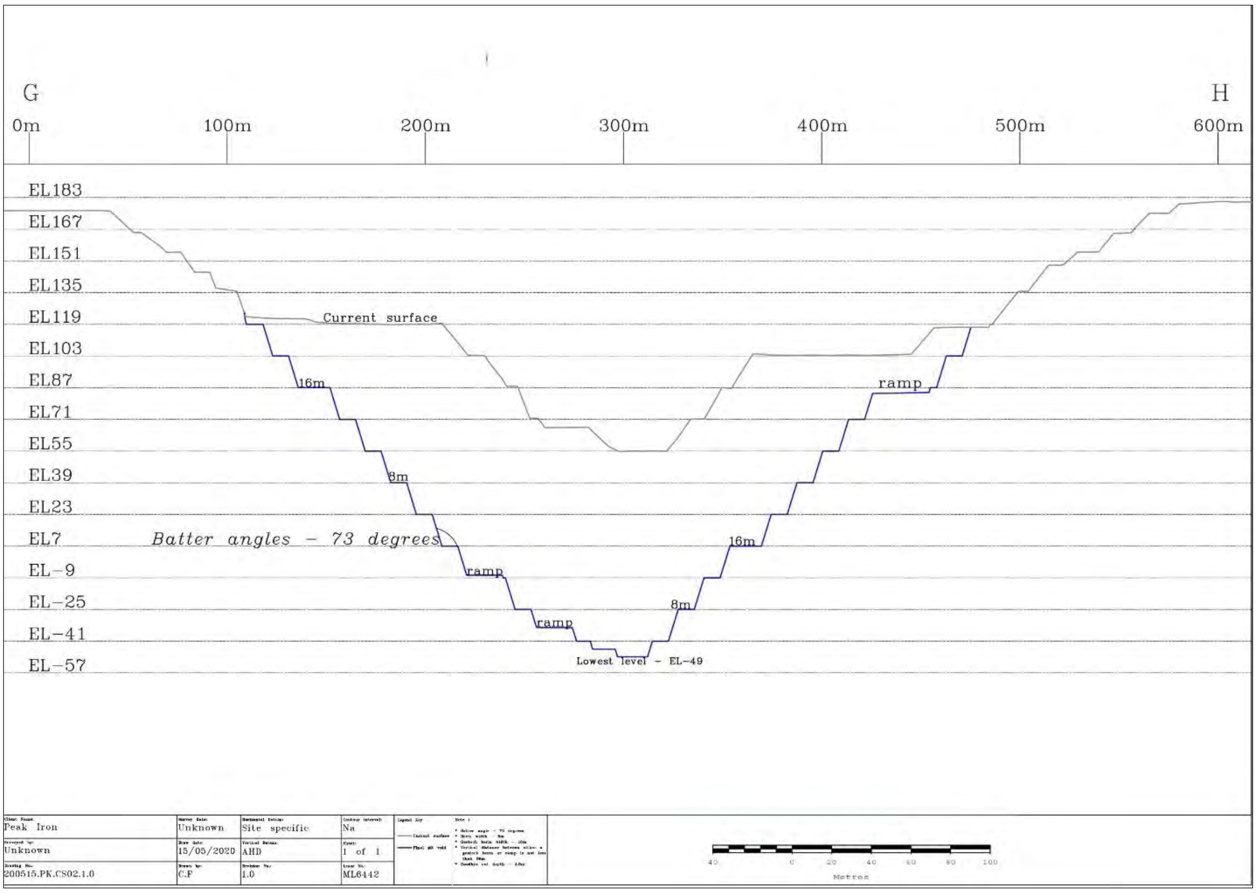


Figure 3-22: Pit cross section G - H

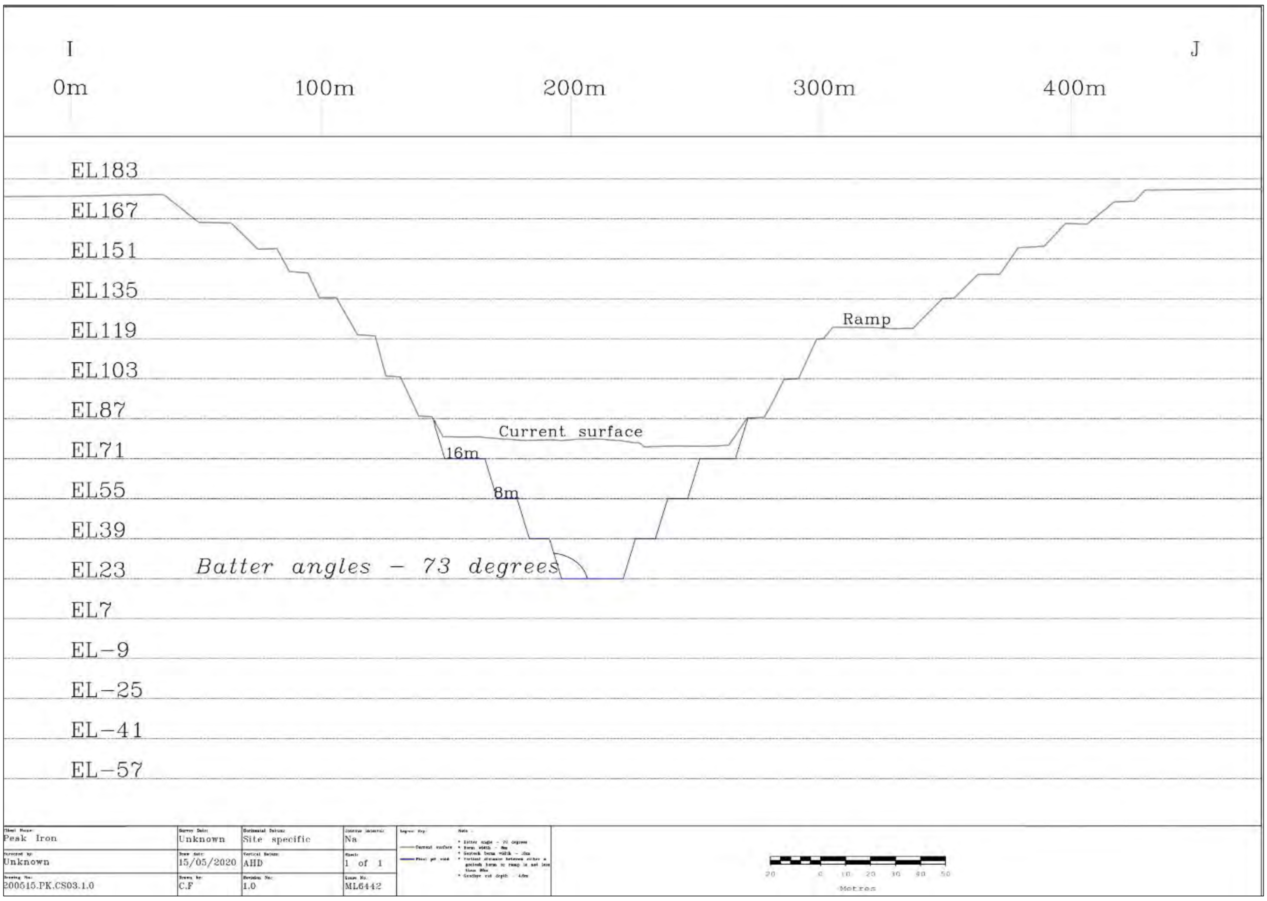


Figure 3-23: Pit cross section I - J

3.7.3 Sequence of mining

The mining sequence is based on the production rates described in Section 3.3.3 and is subject to variability due to market conditions, rail capacity and life of mine adjustments. Figure 3-24 to Figure 3-29 illustrate the proposed mining sequence on an annual basis. The mine scheduling blocks were cut into 20 m x 20 m x 8 m blocks and were coloured based on material classification.

The first year of mining will be concentrated on the eastern extent of the pit (see Figure 3-24). Due to the relatively low amount of waste in the area, ore will be available within the first two months of mining operations. Export of the high grade ore product is not expected until early 2021, therefore any ore mined between Q4 2020 and the commencement of exporting the ore will be crushed/processed and stockpiled.

Once the eastern section of the pit has been excavated to the final extents, the remaining pit will be excavated bench by bench from the top down and will not require any sub grading or boxcuts. As of Q4 2021, the remaining stripping ratio is low enough for two excavators to only work 12 hours in a 24 hour period and still achieve the required waste and ore target. During the final year of mining, as a result of further reduction in the stripping ratio, only one digging unit is required during dayshift only.

Figure 3-24: Approximate pit position – Q3 2021

Figure 3-25: Approximate pit position – Q3 2022

Figure 3-26: Approximate pit position – Q3 2023

Figure 3-27: Approximate pit position – Q3 2024

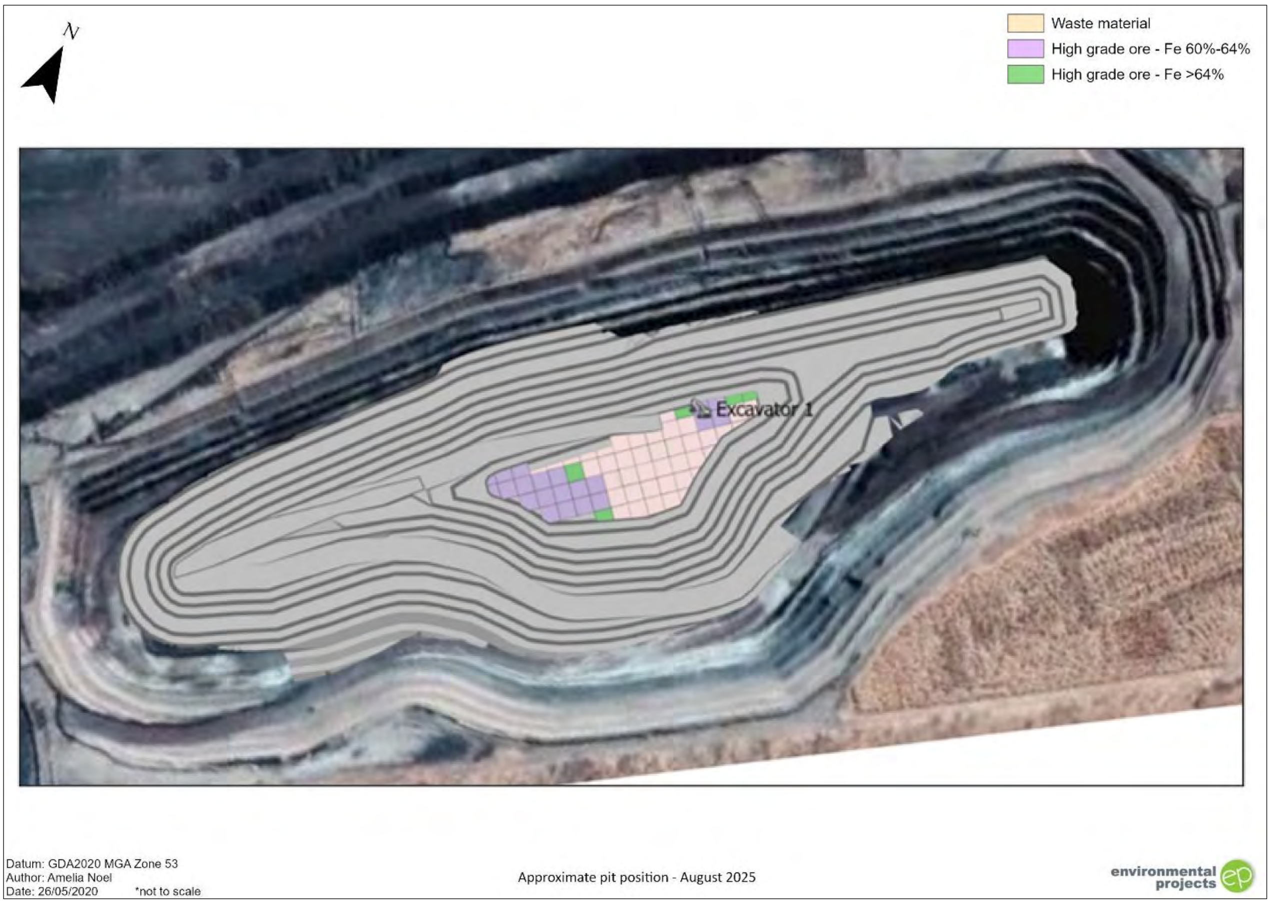


Figure 3-28: Approximate pit position – Q3 2025

Figure 3-29: Final void – Q3 2026

3.7.4 ROM pad and Process Area

The current ROM stockpile is located in the south west portion of ML 6314. The ROM pad will be extended to the south into ML 6442 as required to ensure adequate capacity (see Figure 3-30). This design allows for the elimination of heavy vehicle and road transport equipment interactions. The base of the extended ROM pad will be constructed from mineralised waste and low grade material. Drainage water runoff is managed through separation drains around the stockpile edges. These drains direct water runoff to sedimentation basins that enable filtration and percolation and avoid scouring from uncontrolled flows.

Ore mined from the pit will initially be stockpiled in the un-crushed stockpile and then loaded into the crushing, screening and separation plant (see Figure 3-30). The ROM stockpiles will have a combined storage capacity of approximately 1.4 Mt and will be used for stockpiling and blending high-, medium- and low-grade ores into the crushing plant. Any reject material from the proposed dry magnetic separation module will be disposed of directly into the WRD.

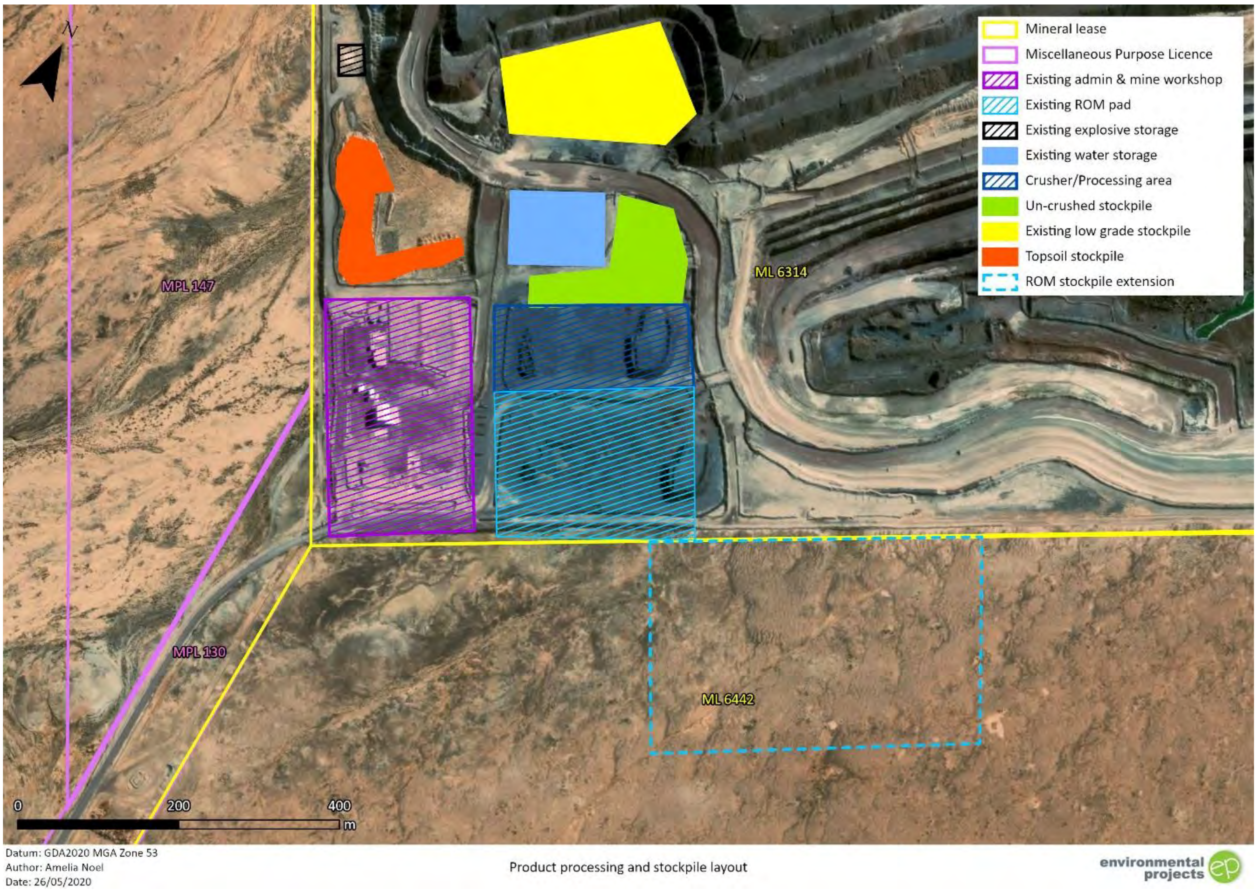


Figure 3-30: Product processing and stockpile layout

3.7.5 WRD design

The WRD designs are based on Pells Sullivan Meynink 2008 (see Appendix B-4), Golder 2011 (see Appendix C and D), Mining Plus 2013 and Mining Plus 2013a, and further described and updated in the figures included within this section.

The Eastern WRD is supplementary to the existing Northern WRD and contains the same rock in the same environment, at a comparable scale and using the same overall slope angle. The Eastern WRD has been designed using the same principles and specifications as the Northern WRD and therefore the slope stability assessment previously undertaken by Golder (2011) is also applicable to the Eastern WRD. Based on the stability modelling results, the conceptual landform design is acceptable (see Jacobs 2020, Appendix B-2).

Both WRD designs are within the original footprint that was established to be safe within the slope stability assessments.

The WRD design considers the final height and slope to construct a safe, stable structure that is not prone to significant erosion. The final landform design for the WRDs delivers a stable, safe and visually acceptable amenity beyond closure (see Sections 3.7.10 and 5.5.1 for further details).

Northern WRD design

The current Northern WRD comprises of 10 metre high batters with 28 metre berms between each lift. The batter angles are at natural repose (approximately 37°) excluding the northern face which has previously been re-profiled to a 1:4 grade.

The purpose of the Northern WRD extension is to provide additional NAF material cover over the most recently built PAF cell (circa 2015). The Northern WRD extension is approximately 607 metres long and a width ranging from 43 metres to 171 metres. NAF material will be placed over the previous PAF cell area up to 12.5 metres in the west to 7.5 metres in the east. Figure 3-31 and Figure 3-32 (and included in Appendix C-2) show the northern WRD design.

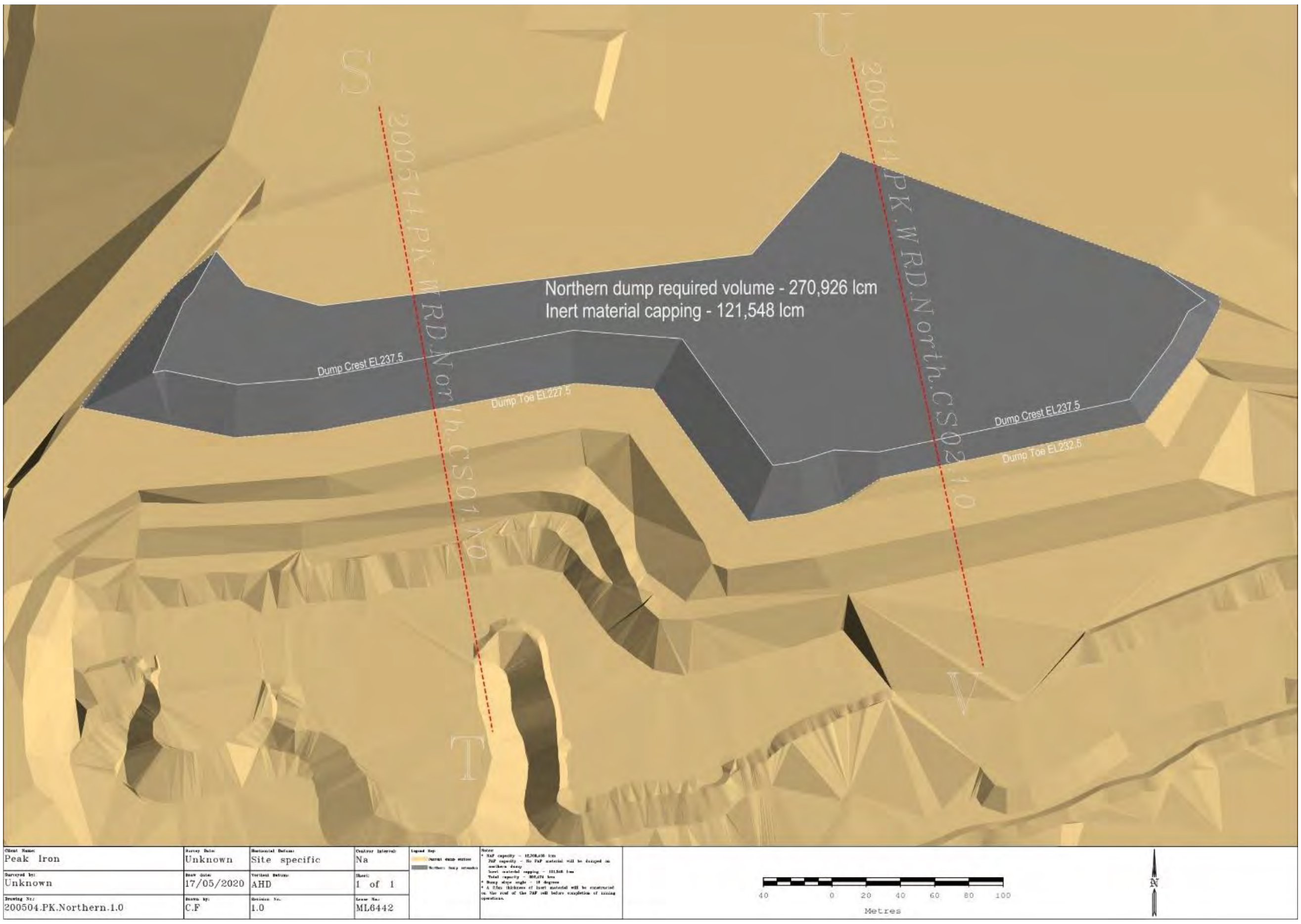


Figure 3-31: Northern WRD extension

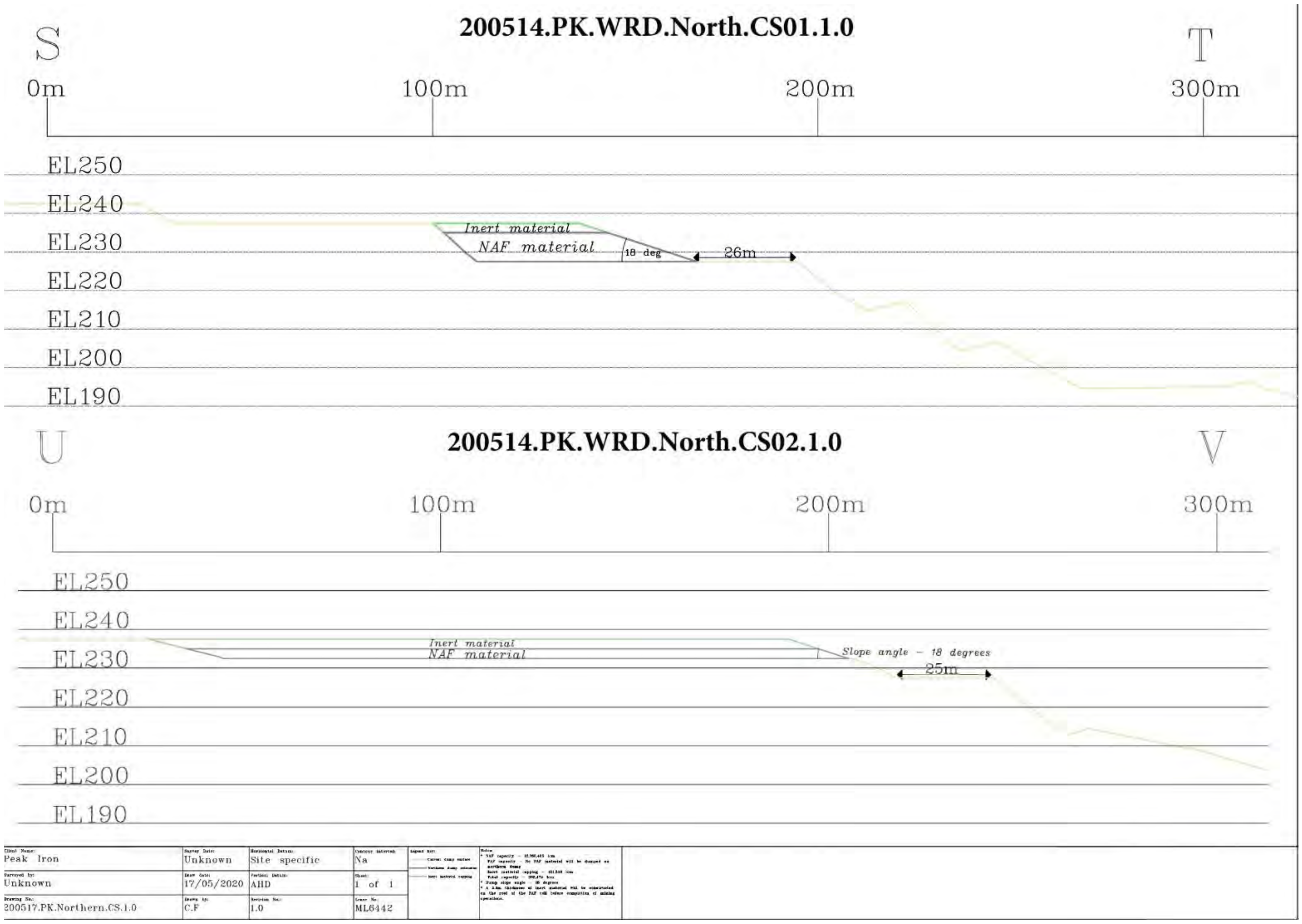


Figure 3-32: Northern WRD extension – cross sections S – T and U – V

Eastern WRD design

The design of the Eastern WRD has an outer slope that consists of a stepped rehabilitated slope of 18° with 10 metre high batters and 10 metre berms. The Eastern WRD is approximately 1112 metres long and 560 metres wide at its widest point. The dump is approximately 50 metres high with a maximum elevation of RL225. A dual lane ramp constructed at a 1:10 grade will provide access to each level of the dump. Figure 3-33 to Figure 3-35 (and included in Appendix C-2) show the Eastern WRD final landform design (see Section 3.7.9 for construction details). A 50 metre buffer between the WRD toe and the pit crest has been adopted for the eastern WRD.

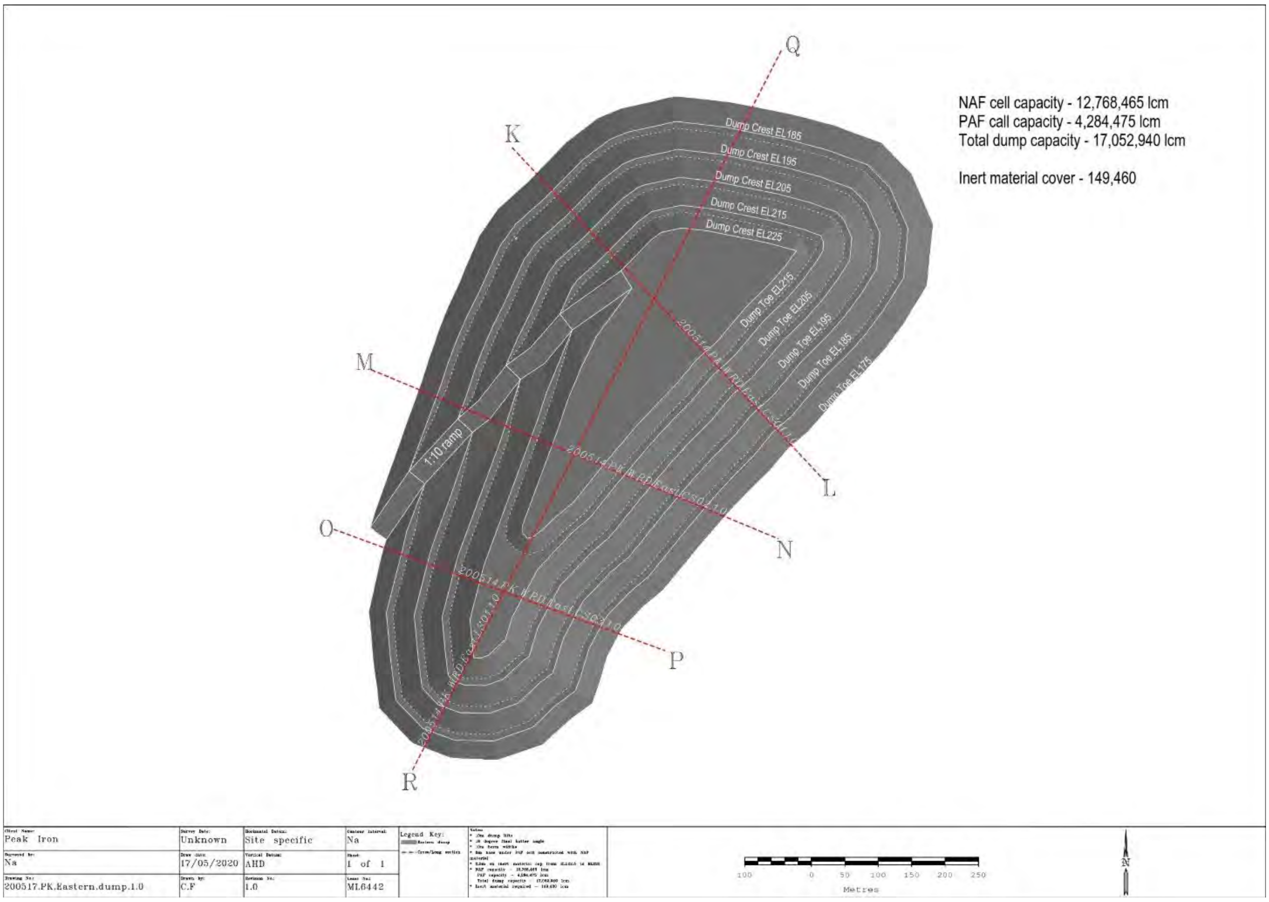


Figure 3-33 Eastern WRD section plan

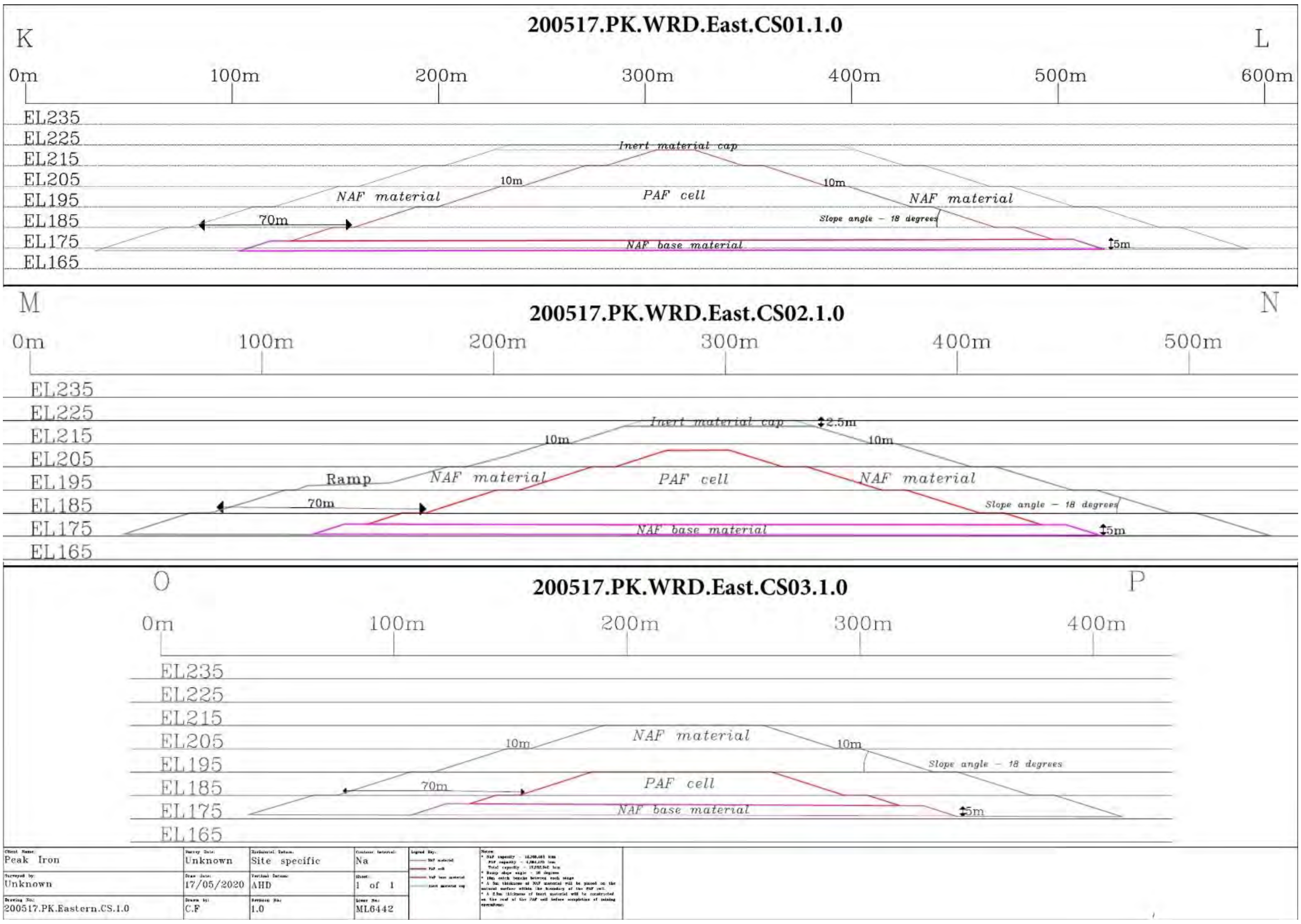


Figure 3-34 Eastern WRD cross-sections K – L, M – N and O – P

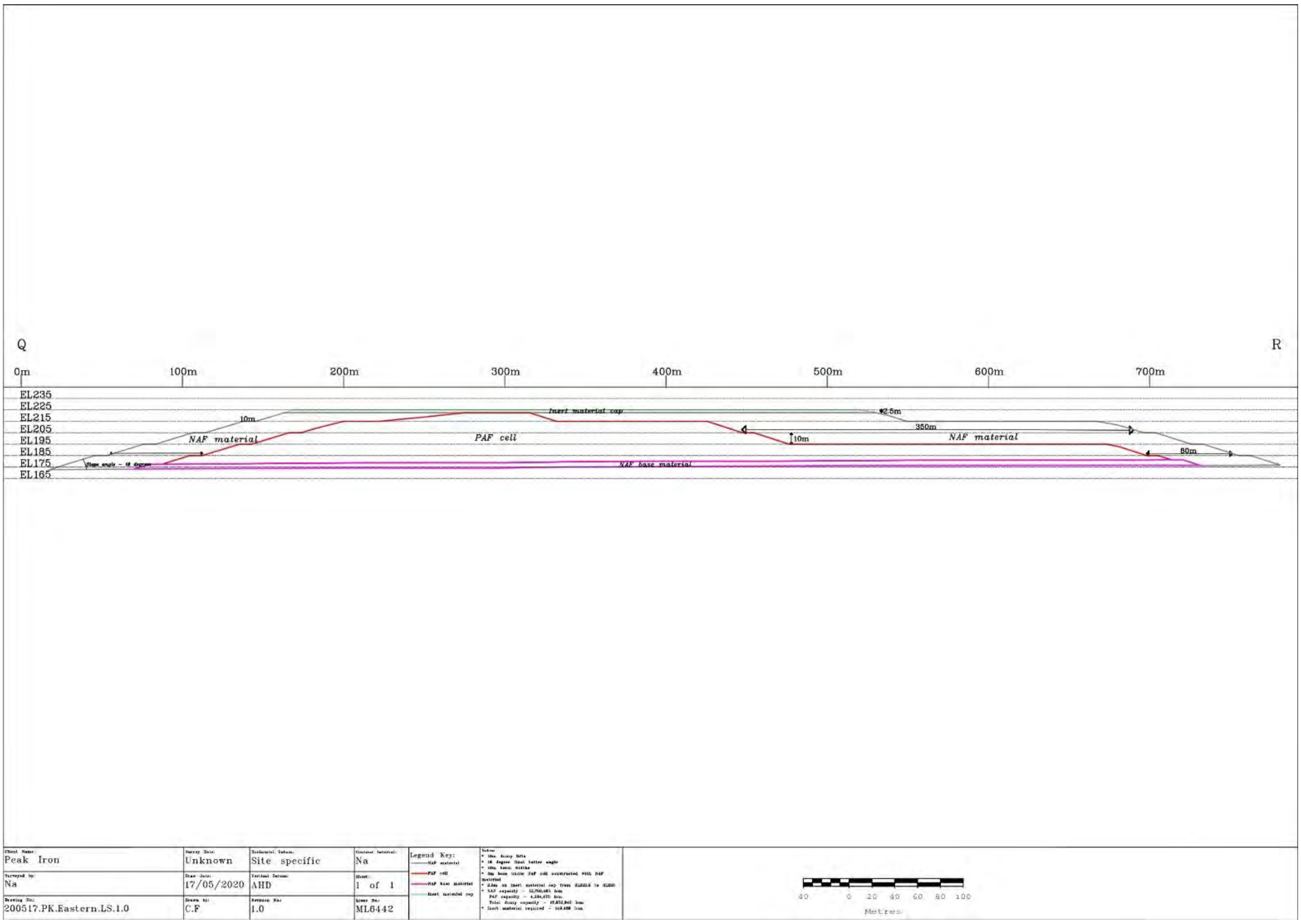


Figure 3-35 Eastern WRD long section Q – R

3.7.6 Waste rock volume estimate and material balance

The volumes of Serpentine unit material to be managed have been determined taking into consideration:

- interpretation of the site geology from drilling information and observations within the open pit
- sampling and laboratory analysis and assessment against chemical signatures
- mining block modelling.

The northern WRD remaining storage volume is approximately 270,926 loose cubic metres (LCMs) and is scheduled to be at full capacity within 12 months of the recommencement of mining. The Eastern WRD design provides a further 17.1 MLCM of storage capacity (see Table 3-8). The total scheduled waste to be mined is 11.4 M Bank Cubic Metres (BCMs), with a 10% swell applied the required WRD capacity is 12.4 MBCM (see Table 3-9).

All future PAF material mined (approximately 4.1 MLCMs) will be encapsulated within the Eastern WRD. The Eastern WRD has been designed to encapsulate an estimated 4.3 MLCM of PAF material which will be sufficient for the remainder of LOM (see Table 3-8). The contingency volume within the Eastern WRD design is 27%.

Table 3-8: Additional WRD capacity

Storage type	Location	Capacity (LCM)
NAF	Eastern WRD	12,768,465
PAF cell	Eastern WRD	4,284,475
NAF	Northern WRD	270,926
PAF cell	Northern WRD	0
Total		17,323,866

Table 3-9: Planned mined material

Material type	Volume (BCM)	Volume (LCM)
PAF	3,746,418	4,121,060
NAF	7,656,905	8,422,595
Total	11,403,323	12,543,655

3.7.7 PAF material management

Some waste materials from the Peculiar Knob mine will contain potential acid forming (PAF) material. All PAF materials are associated with a metapellitic Serpentine unit that will require encapsulating.

Materials from the Serpentine unit will be stockpiled within designated areas of the 'PAF' cell, known as PAF tip areas. Material loads shall be paddock dumped to minimise vertical infiltration of fluids.

The PAF cell in the Northern WRD is complete and is covered by NAF material varying in depth from two to five metres. No more PAF material will be placed in the Northern WRD. During the first stage of mining, further NAF material will be placed over the PAF cell prior to the construction of the final engineered closure cover (see Section 3.7.10 and 8.4).

The base of the Eastern WRD includes a minimum thickness of five metres of NAF material. The PAF material will be fully encapsulated on all sides by a minimum of 15 metres of NAF material (see Figure 3-36) on the batter slopes and a minimum 2.5 metre thick temporary cover during operations. As indicated in Section 3.7.6, PAF material is initially identified in the block model. A schedule for mining of the PAF material is allocated to a specific mining block and then allocated to a space in the WRD. Disposal of the PAF material is controlled by survey in terms of spatial location in order to maintain the previously agreed separation distances at the base, sides and top of final WRD. Inert material is then placed over the PAF Cells. A final engineered PAF cell closure capping will be applied in accordance with closure plans (see Section 3.7.10).

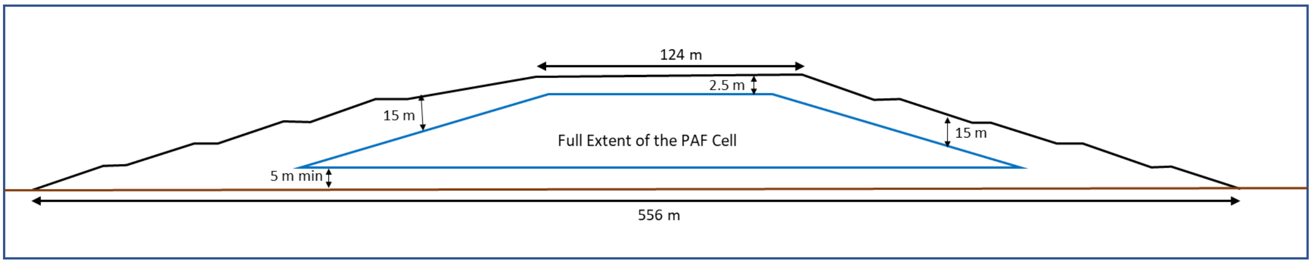


Figure 3-36: PAF cell section within Eastern WRD showing temporary cover during operations and prior to the application of the final engineered PAF cell closure capping

Fibrous mineral management

All fibrous minerals material will be managed in accordance with the Fibrous Mineral Management Plan (P-2-PLN-3-1005), which incorporates industry leading practice in environment and worker safety.

The Fibrous Minerals Management Plan details the protocols to minimise dust, movement and exposure of fibrous minerals during mining operations. A key component of the management of fibrous minerals is the sheeting of inert waste rock to a depth of 200 mm during the tipping operation. This nominal depth of sheeting is generally in line with the South Australian EPA Environmental Management of Landfill Facilities, Solid Waste Disposal guideline, that calls for a 150 mm daily cover of inert material atop of asbestos containing material. It is considered sufficient to prevent breaching and exposure of the underlying fibrous minerals as surface water management infrastructure will prevent possible erosion during rain events and sequencing of waste tipping campaigns will restrict mine vehicle traffic from the tip area. The sheeting is considered a separate interim cap, which will then be covered by the temporary operational cap of inert material to a depth of 2.5 metres, before the placement of the final engineered closure cap, as outlined in Section 3.7.10.

Critical elements of the Fibrous Minerals Management Plan include:

- all registers shall be established and maintained by the mining contractor and reviewed by Peak Iron Mines
- site wide Safe Operating Procedures (SOPs) shall be modified to incorporate the requirements detailed in this management plan
- regular monitoring of airborne fibre levels shall be undertaken
- all employees shall be actively informed of monitoring results, instructed and trained in the application of controls detailed in the document
- access to Designated Fibrous Mineral Areas shall be delineated, controlled and regulated
- where practicable, dust generation shall be contained, or suppressed at points of mineral occurrence
- all PPE, equipment, handling and disposing facilities shall be available and provided to employees.

In addition, the management plan includes details on:

- fibrous minerals management strategy:

  - identification of fibrous minerals, either when the exposure of serpentine mafic lithologies occurs or where previously undetected fibrous minerals are identified during mining activities
  - assessment of risk, undertaken with representatives from Geology, Engineering, Safety and Management and developed in consultation with workers
  - controls, documentation and implementation
  - review triggers.
- exposure monitoring
- sampling methodology
- in pit mining activities
  - plant requirements
  - drilling and blasting
  - post blasting inspections
- stockpiling and waste management
- Peculiar Knob General Induction requirements
- responsibilities.

Site activities will be governed by the Fibrous Minerals Management Plan and the strict protocols and controls will be implemented to minimise dust, movement and exposure of fibrous materials.

Figure 3-37 and Figure 3-38 show the typical tip head sequencing and associated encapsulation.

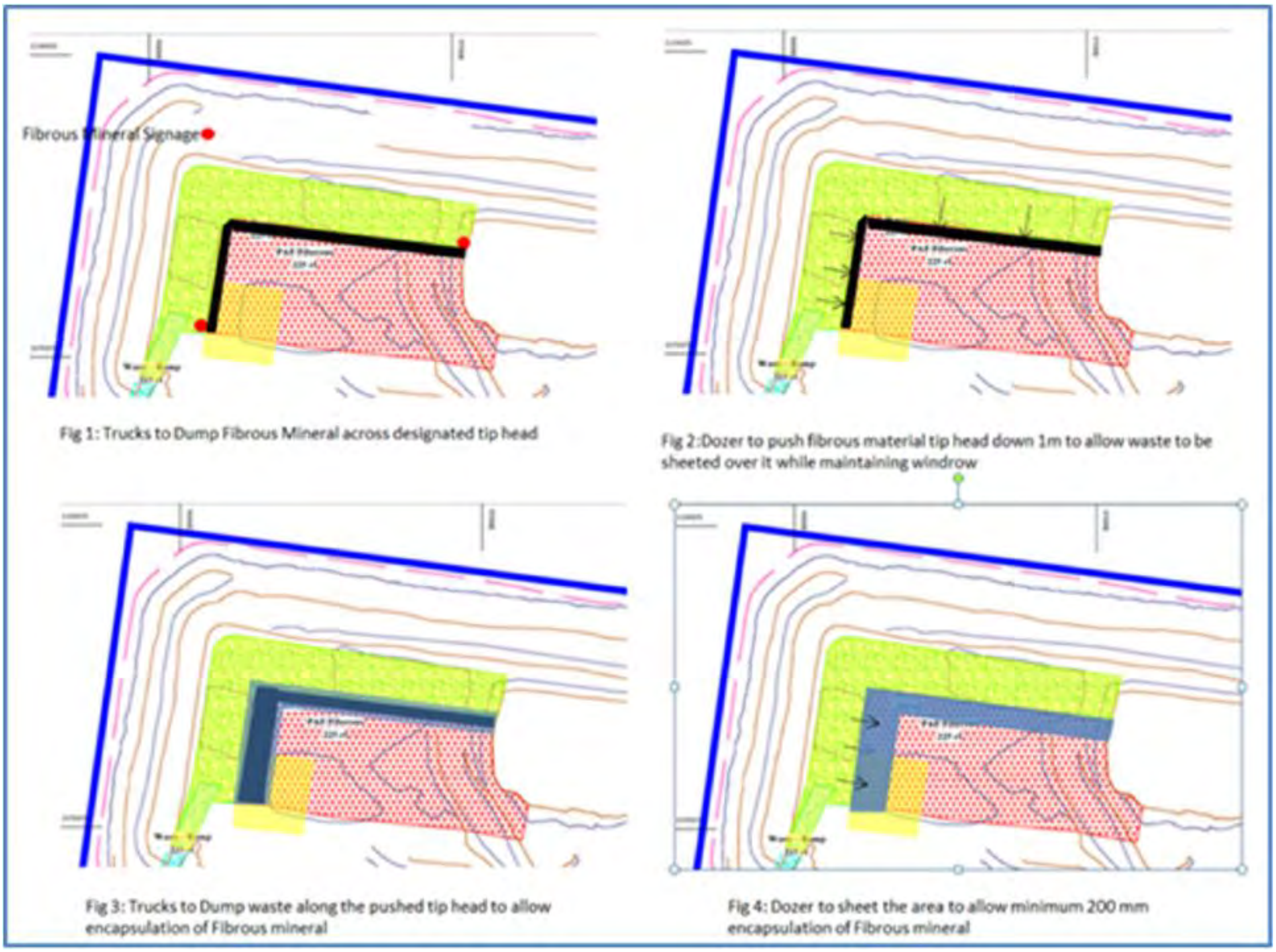


Figure 3-37: Typical tip head sequencing

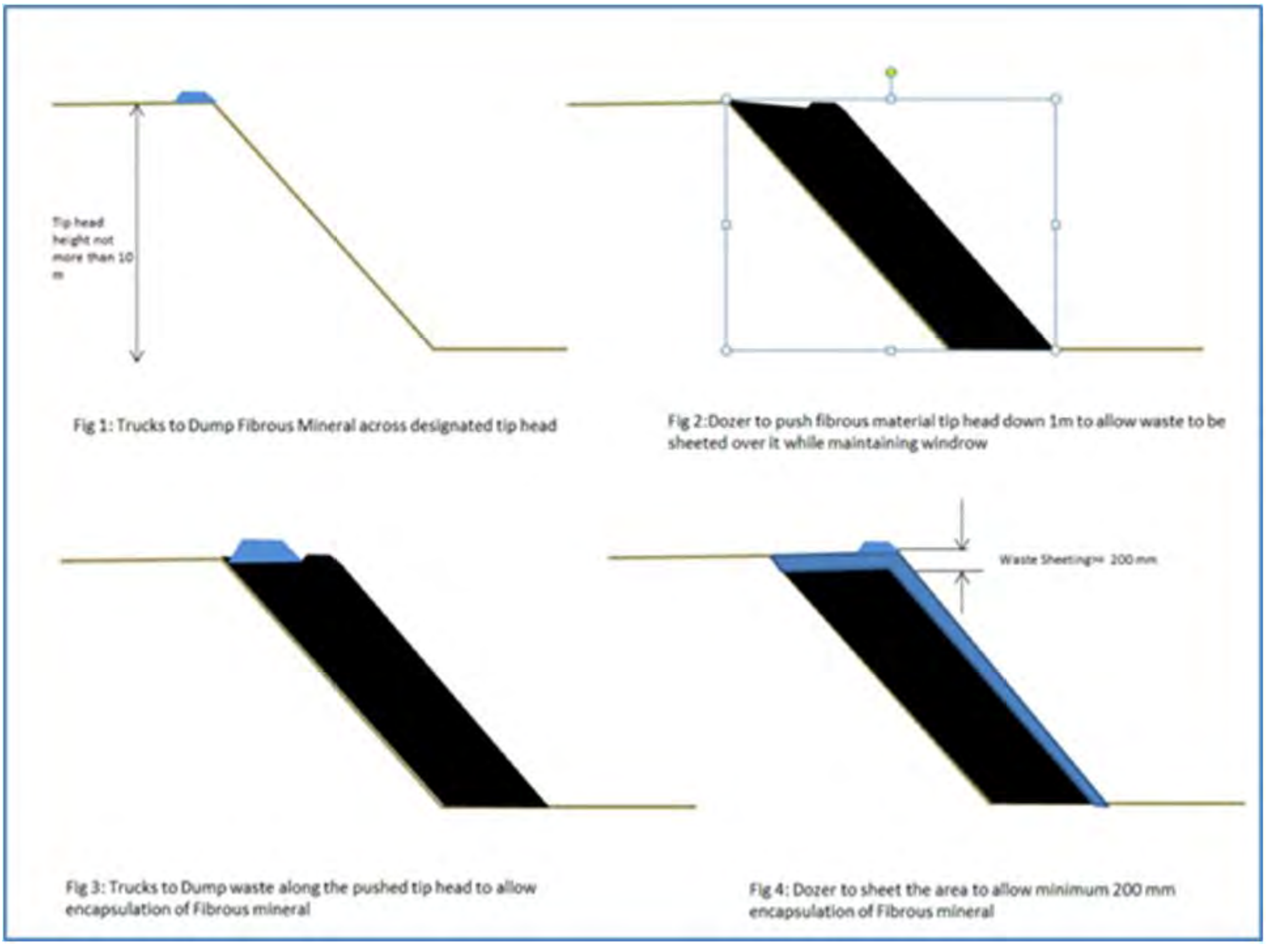


Figure 3-38: Cross-section view of the typical tip head sequence and associated encapsulation

Acid Rock Drainage (ARD) Management Plan

An Acid Rock Drainage (ARD) Management Plan will be implemented to manage materials from this Serpentine unit, not all of which is PAF material, but does contain potentially fibrous material and hence requiring similar management. Key aspects of the ARD Management Plan include:

- site procedures to incorporate requirements for managing materials from the Serpentine unit, including PAF management
- development of pit and mine plans to display locations and dimensions of the Serpentine unit, and hence PAF materials
- delineation of the Serpentine unit, and associated PAF materials, including validation sampling and analysis to confirm sulphur levels
- implementation of programs (including instructions and schedules) for the movement, placement and encapsulation of materials excavated from the Serpentine unit with compacted inert non-acid forming (NAF) non-fibrous materials
- delineated, controlled and regulated 'PAF' cell dumping locations

- strict stockpiling protocol for materials excavated from the Serpentine unit
- reconciliation of materials excavated from the Serpentine unit against remaining volumes in the containment cell
- ongoing awareness, inspection and assessment of Serpentine unit and PAF materials.
- the location and volume of material from the Serpentine unit requiring management will be communicated to site personnel through daily dig sheets and will be delineated and depicted on mine and dumping plans. Materials will be tracked and accounted for as the extent of 'PAF' cells and active dumping areas are clearly delineated
- areas of consumed 'PAF' cell space is monitored for cell availability
- truck loads are recorded for reconciling hauled volumes against forecast numbers
- WRD design changes and associated change management processes for WRD build requirements are communicated
- forecasts within mining schedules are assessed against remaining capacity in the 'PAF' cells.

3.7.8 WRD build methodology

The Eastern WRD design and construction sequence will consist of an initial placement of NAF material on the natural surface to create an impermeable base. No material classified as Serpentine or Bulldog Shale will be scheduled to be mined until enough NAF material has been placed at the base of the Eastern WRD. Once the NAF base for the Eastern WRD has been constructed, all NAF material will be diverted to the Northern WRD extension until capacity has been reached to finalise capping. Once the Northern WRD is complete all remaining waste material will be placed within the Eastern WRD. Further details of the WRD design are provided in Section 3.7.5 and details of the WRD construction sequence are shown in Section 3.7.9.

3.7.9 WRD staging and scheduling

Figure 3-39 to Figure 3-60 (and included in Appendix C-2) show the Eastern WRD stages. A detailed dumping sequence and schedule will be developed, reviewed and reconciled on a monthly basis during mining operations. A summary of the required volumes for each stage is shown in Table 3-10.

Table 3-10: WRD capacity required for each stage

Location	Stage number	NAF material volume (LCM)	PAF material volume (LCM)
Eastern WRD	Base	1,335,246	0
Eastern WRD	1	1,955,857	1,350,911
Northern WRD	1	270,926	0
Eastern WRD	2	1,775,242	1,686,367
Eastern WRD	3	1,645,510	819,312
Eastern WRD	4	1,205,229	373,008
Eastern WRD	5	566,906	54,877
Total		8,754,916	4,284,475

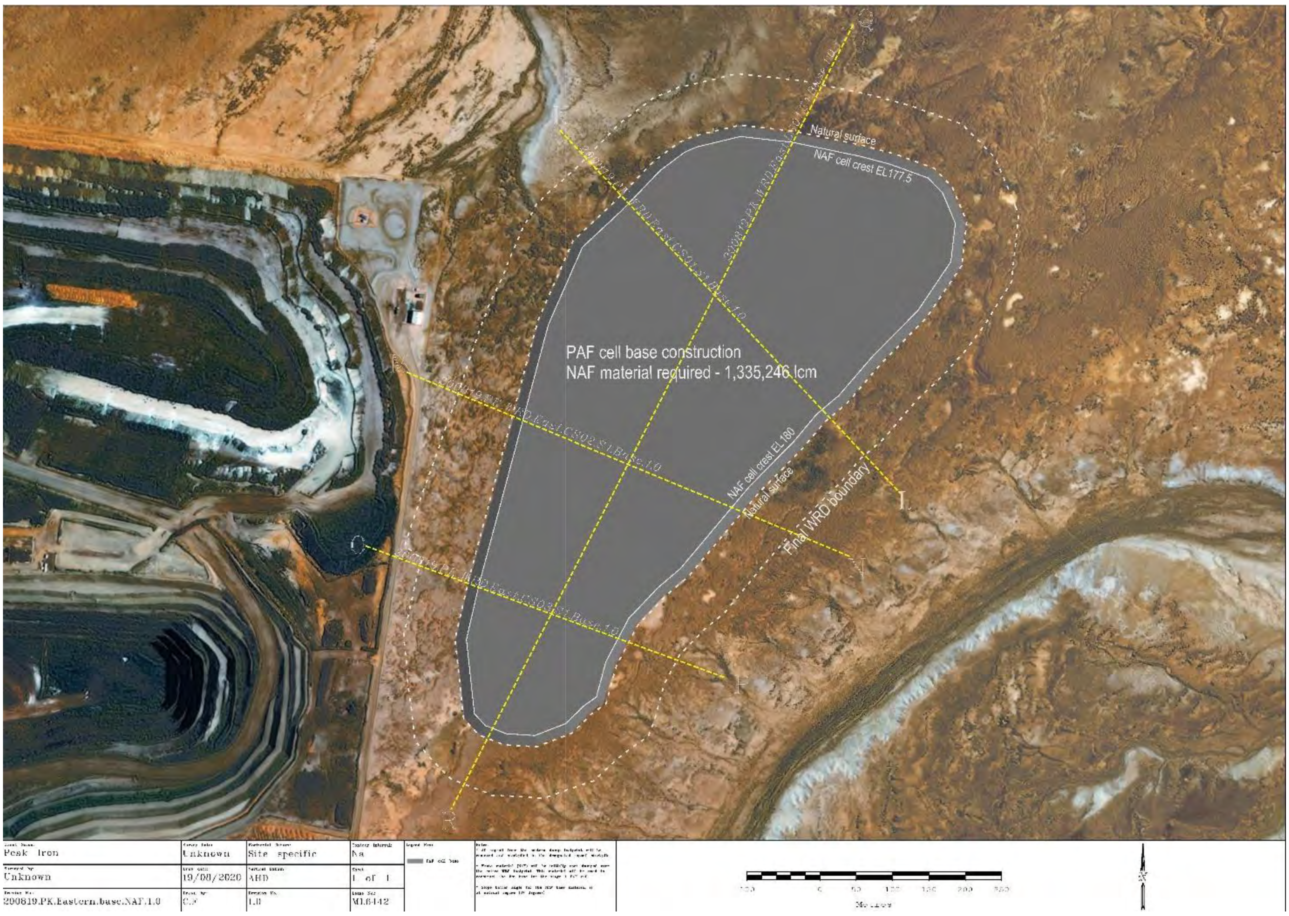


Figure 3-39: Eastern WRD once base is completed

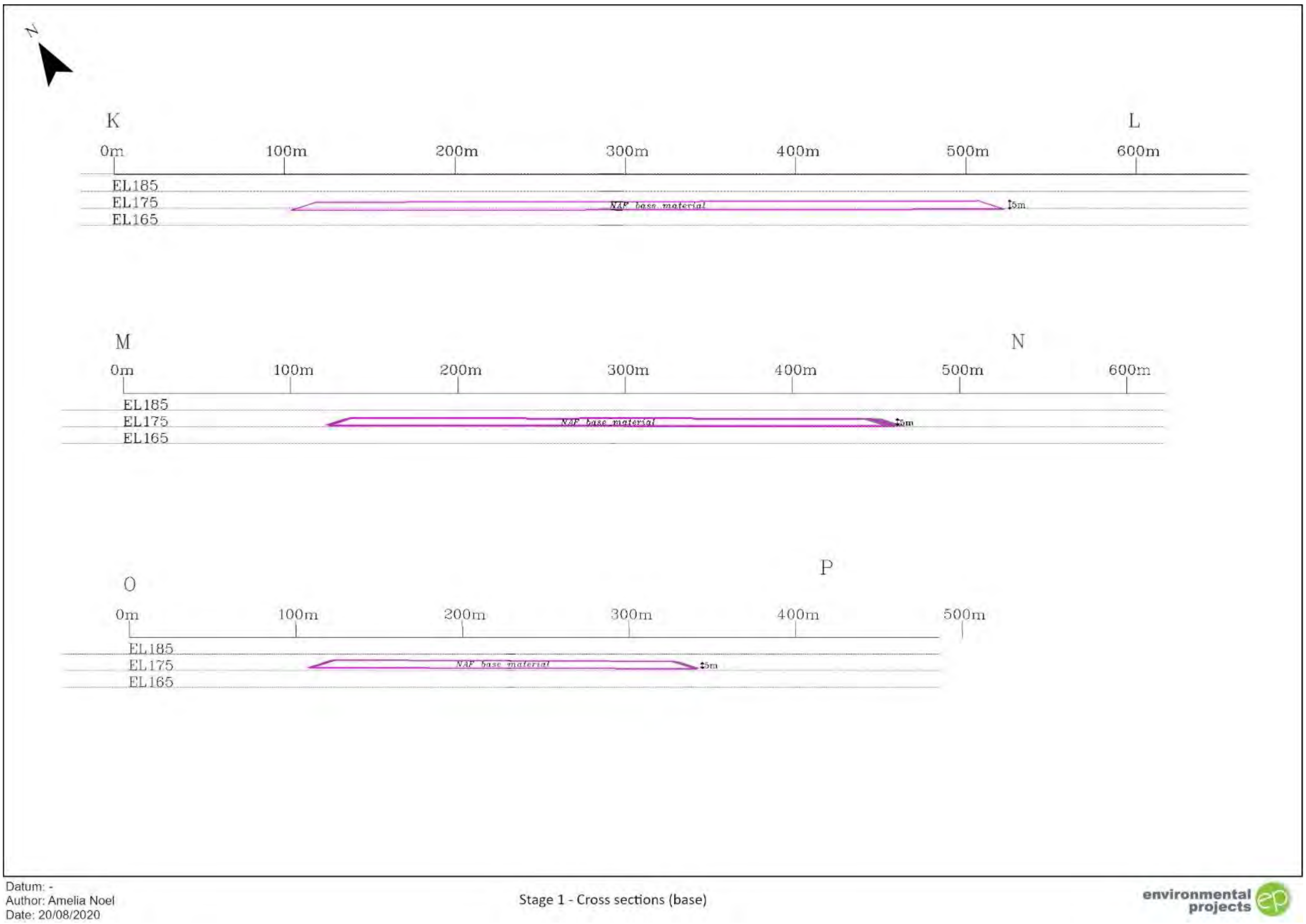


Figure 3-40: Eastern WRD base completed: cross-sections K – L, M – N and O –P

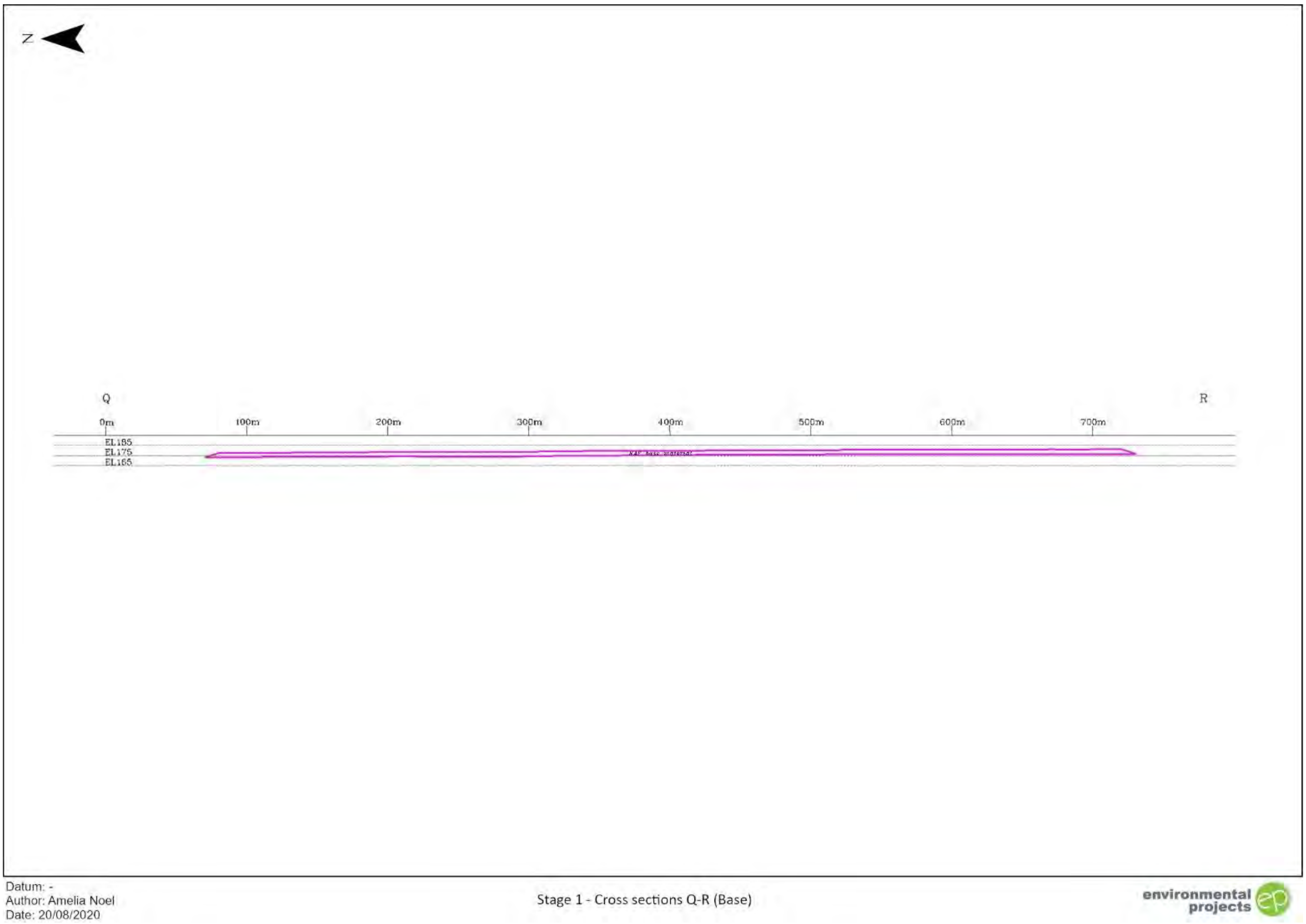


Figure 3-41: Eastern WRD base completed: long-section Q – R

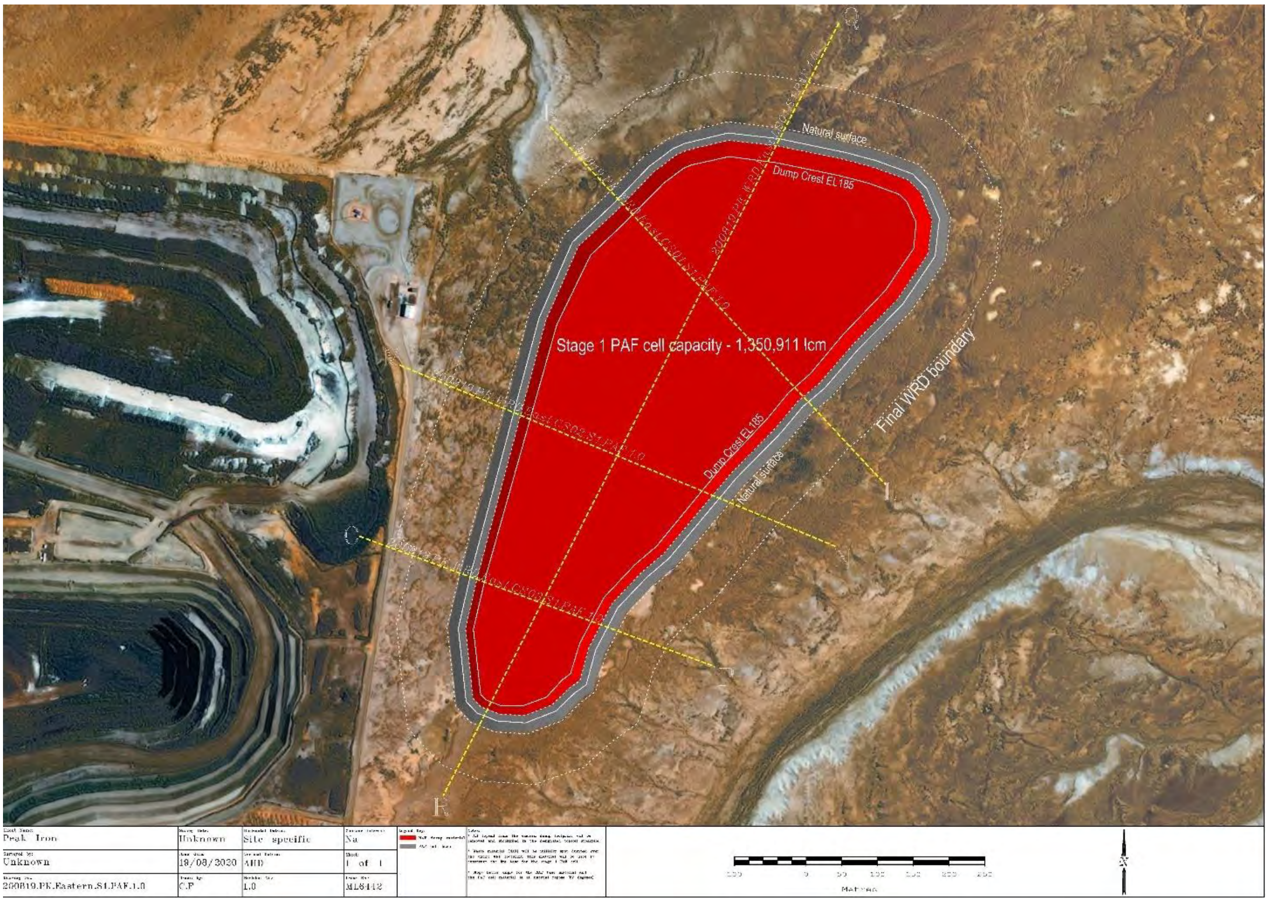


Figure 3-42: Eastern WRD status when Stage 1 PAF is completed

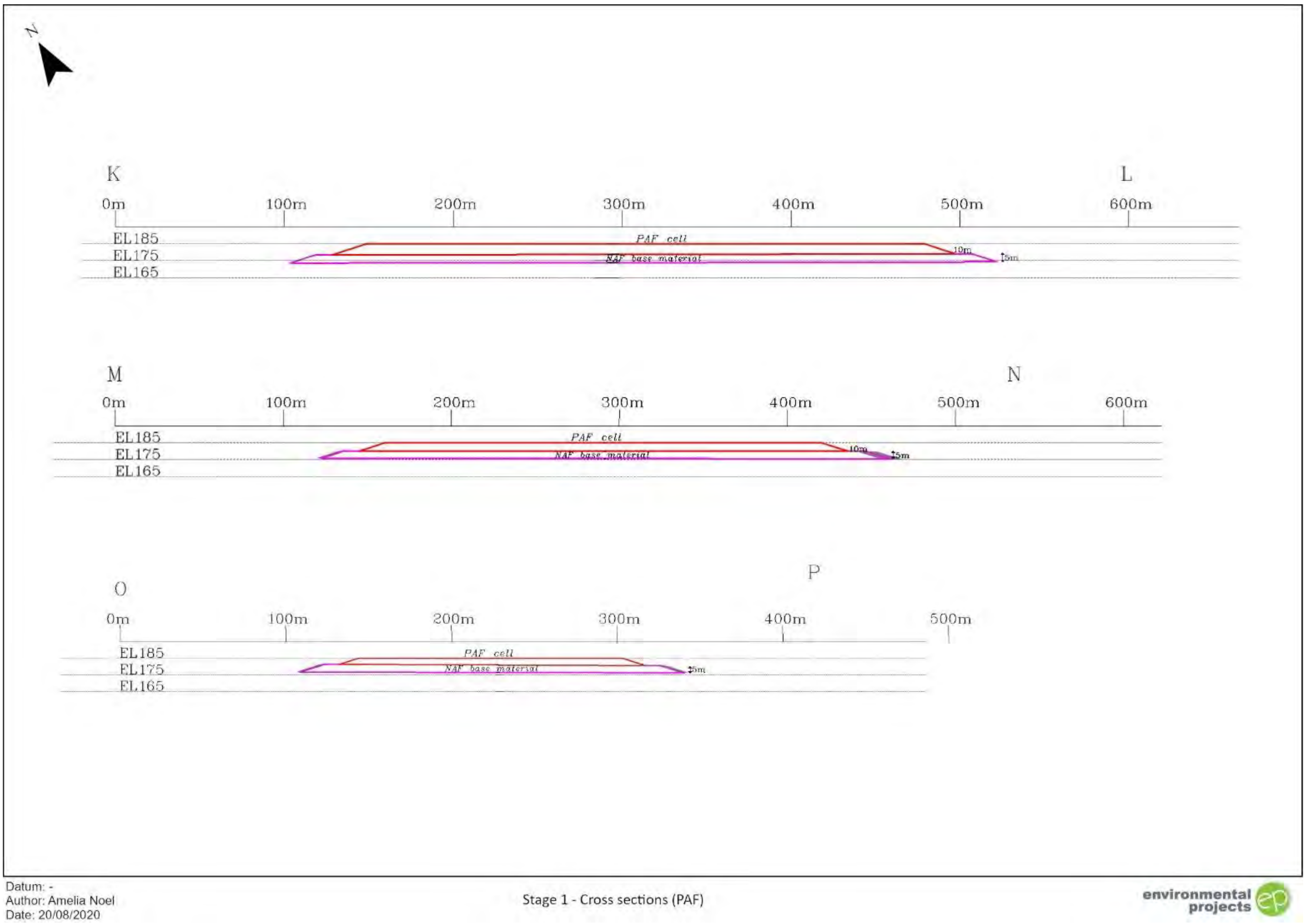
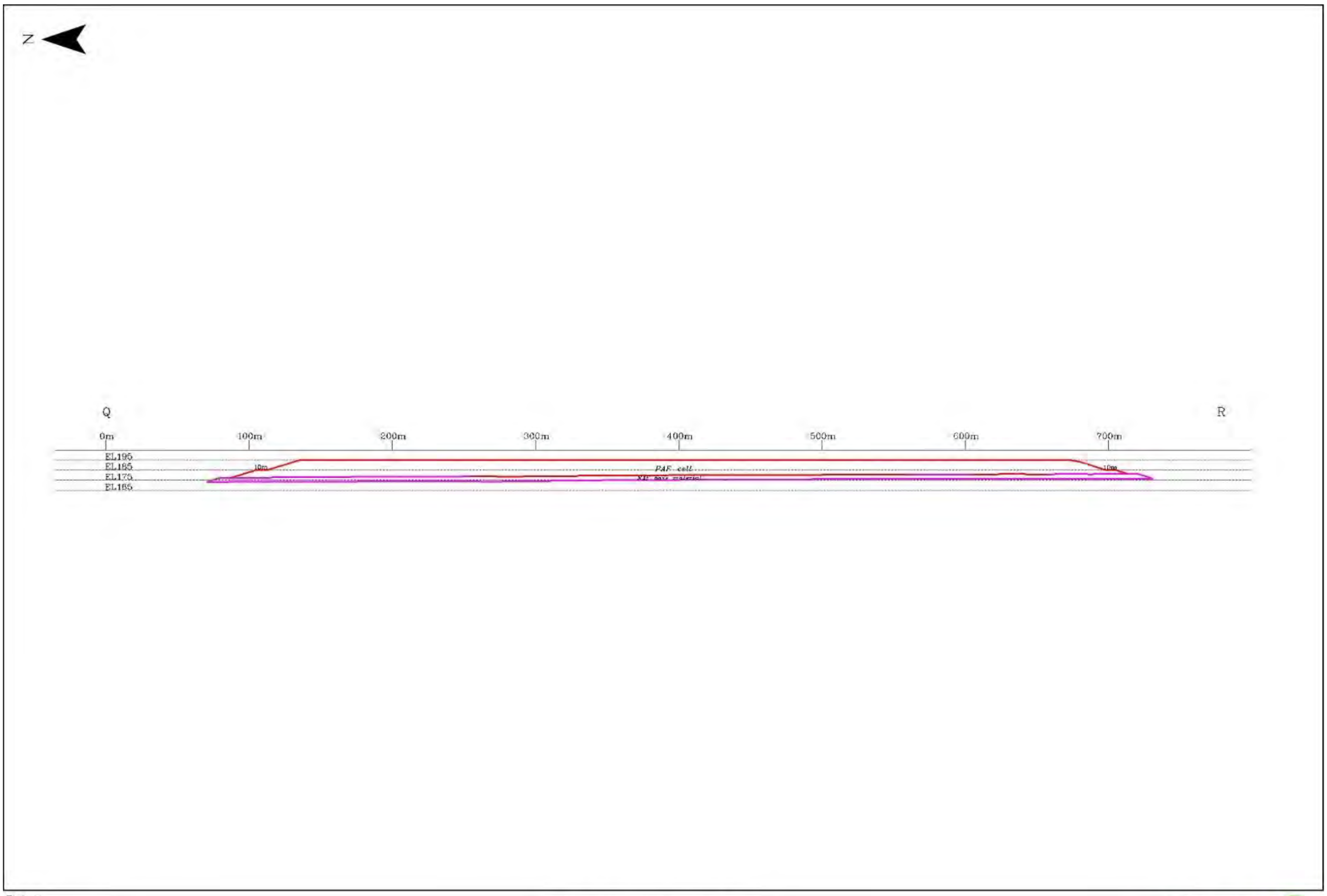


Figure 3-43: Eastern WRD status Stage 1 PAF completed – cross sections K – L, M – N and O –P



Datum: -
Author: Amelia Noel
Date: 20/08/2020

Stage 1 - Cross sections Q-R (PAF)

environmental projects

Figure 3-44: Eastern WRD status Stage 1 PAF completed – long section Q – R

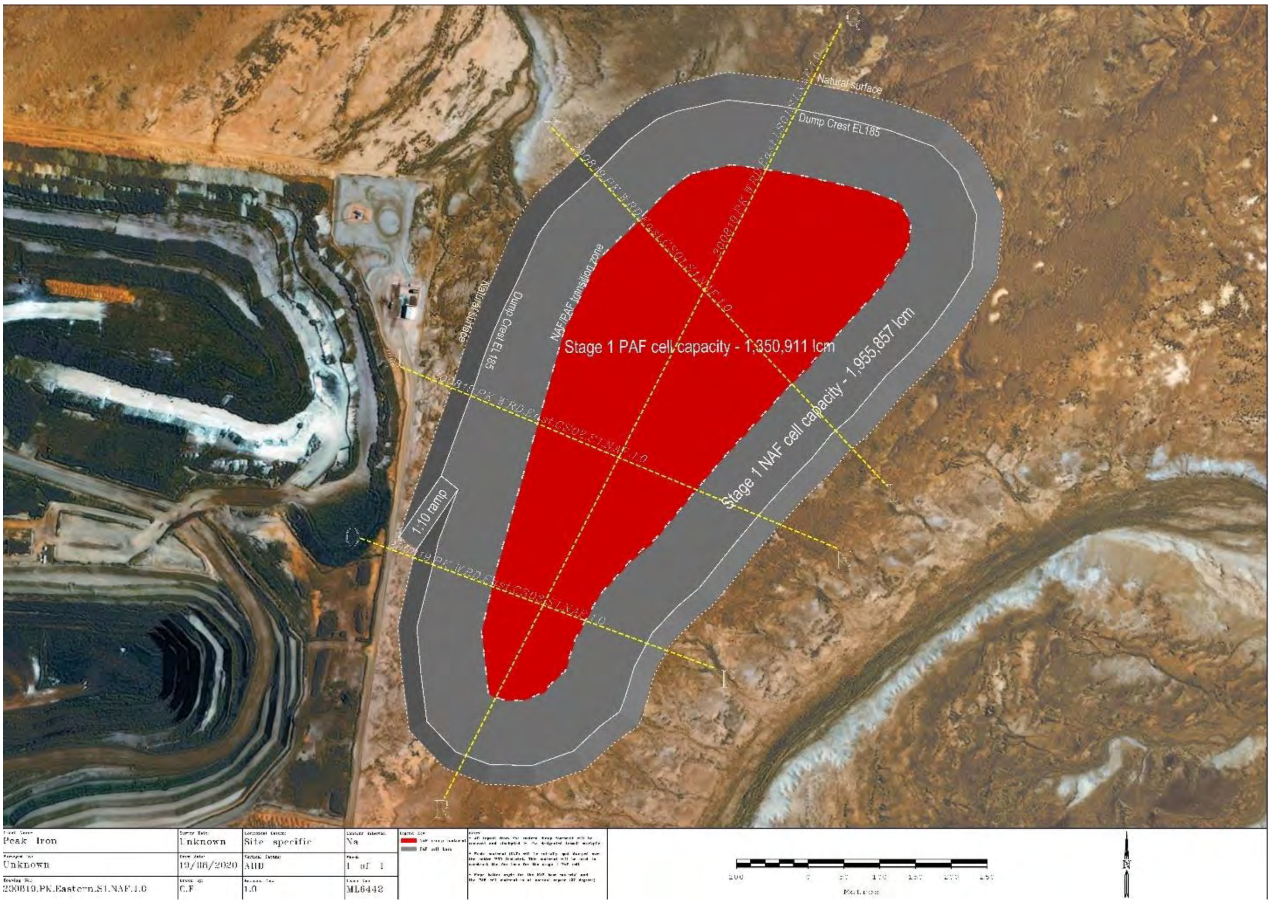


Figure 3-45: Eastern WRD status when Stage 1 NAF is completed

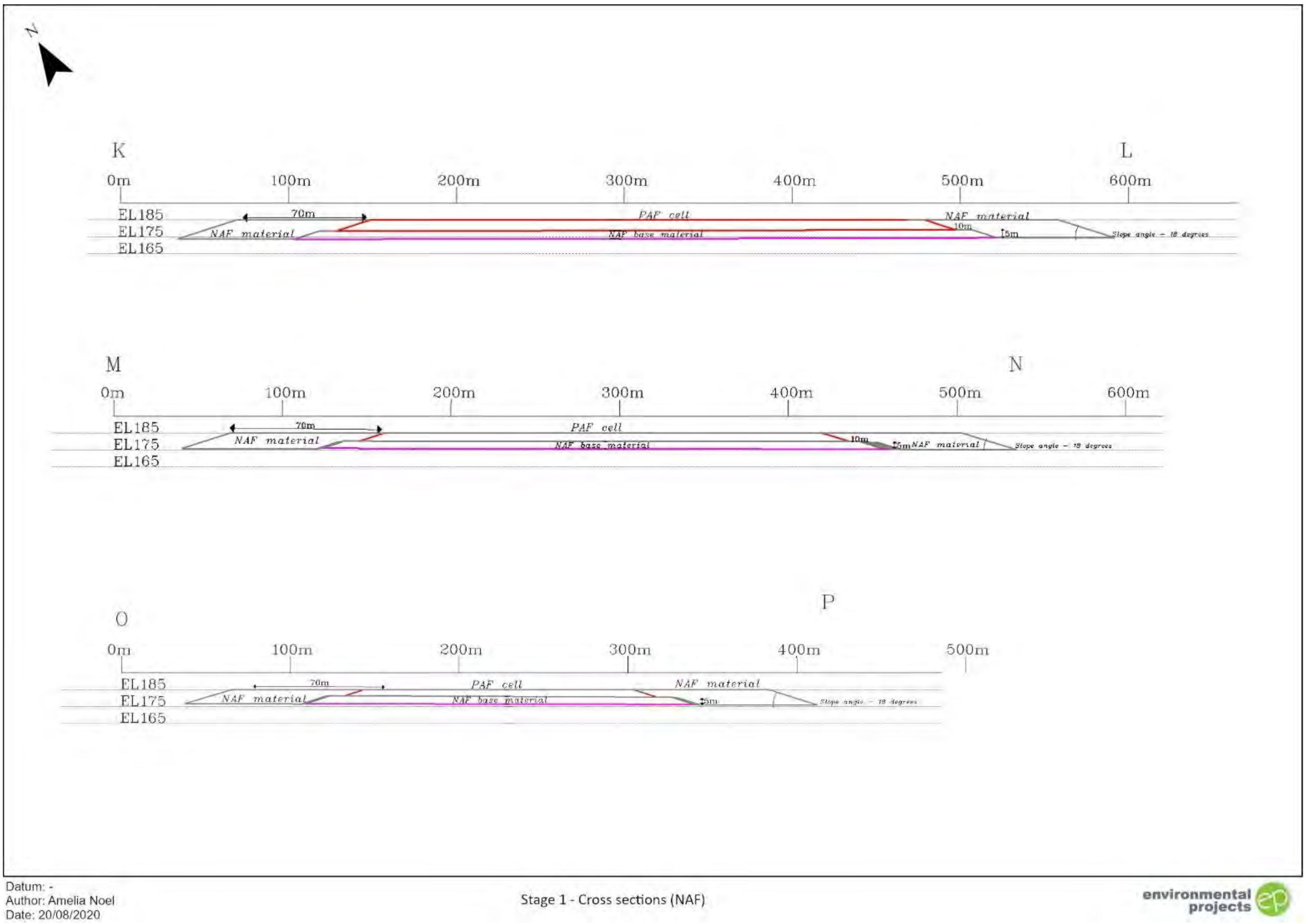


Figure 3-46: Eastern WRD Stage 1 NAF completed – cross sections K – L, M – N and O –P

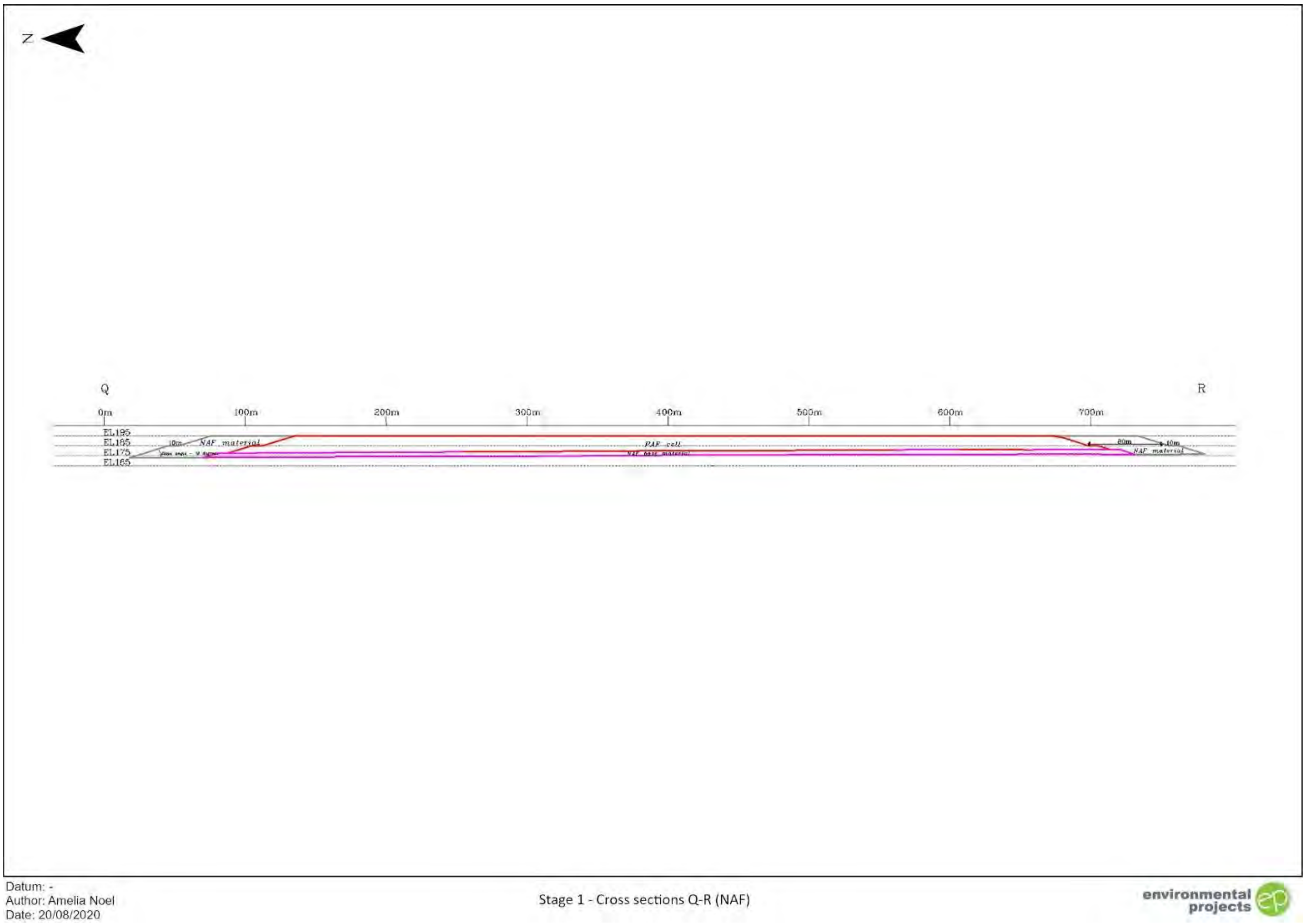


Figure 3-47: Eastern WRD Stage 1 NAF completed – long section Q – R

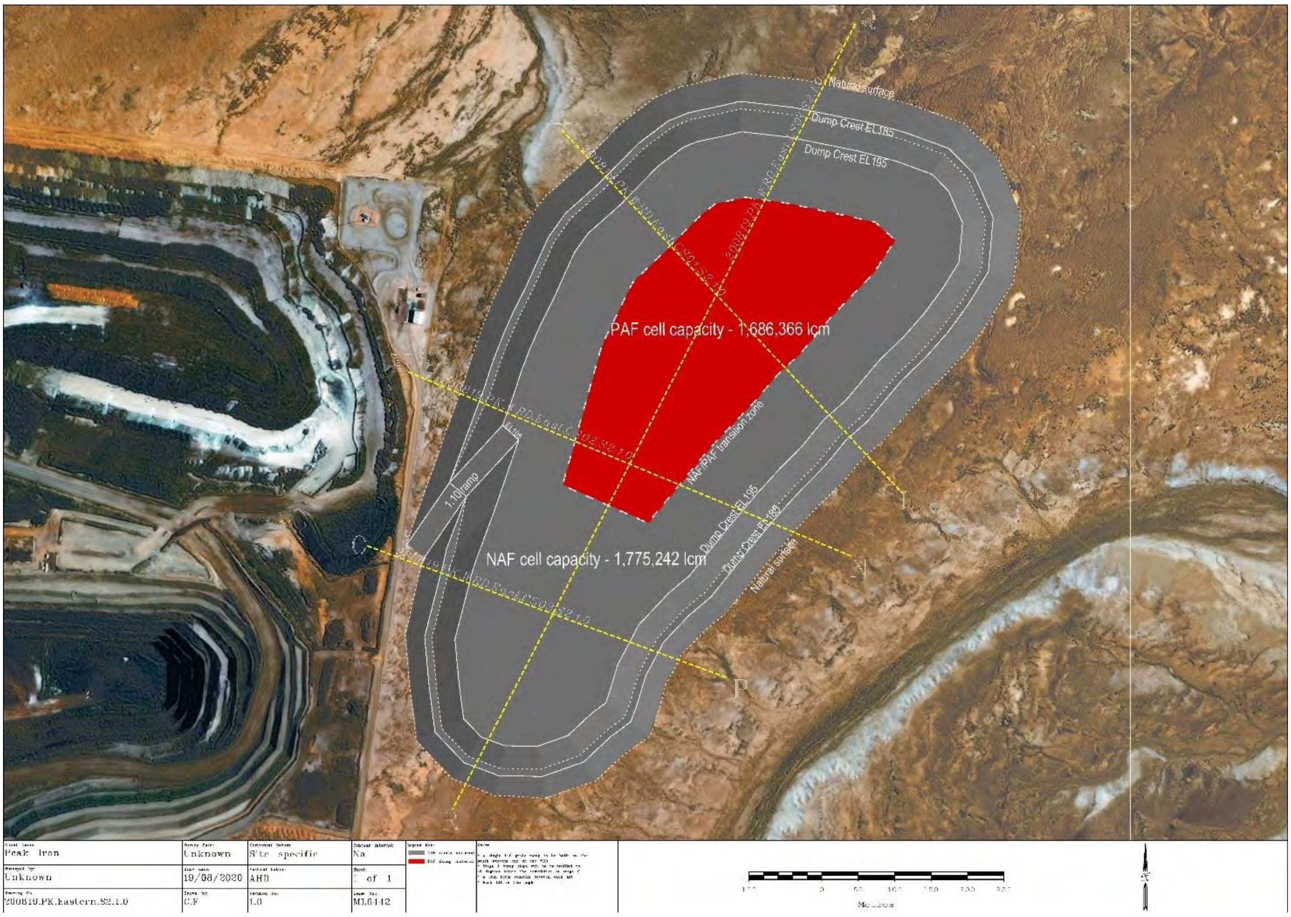


Figure 3-48: Eastern WRD status when Stage 2 is completed

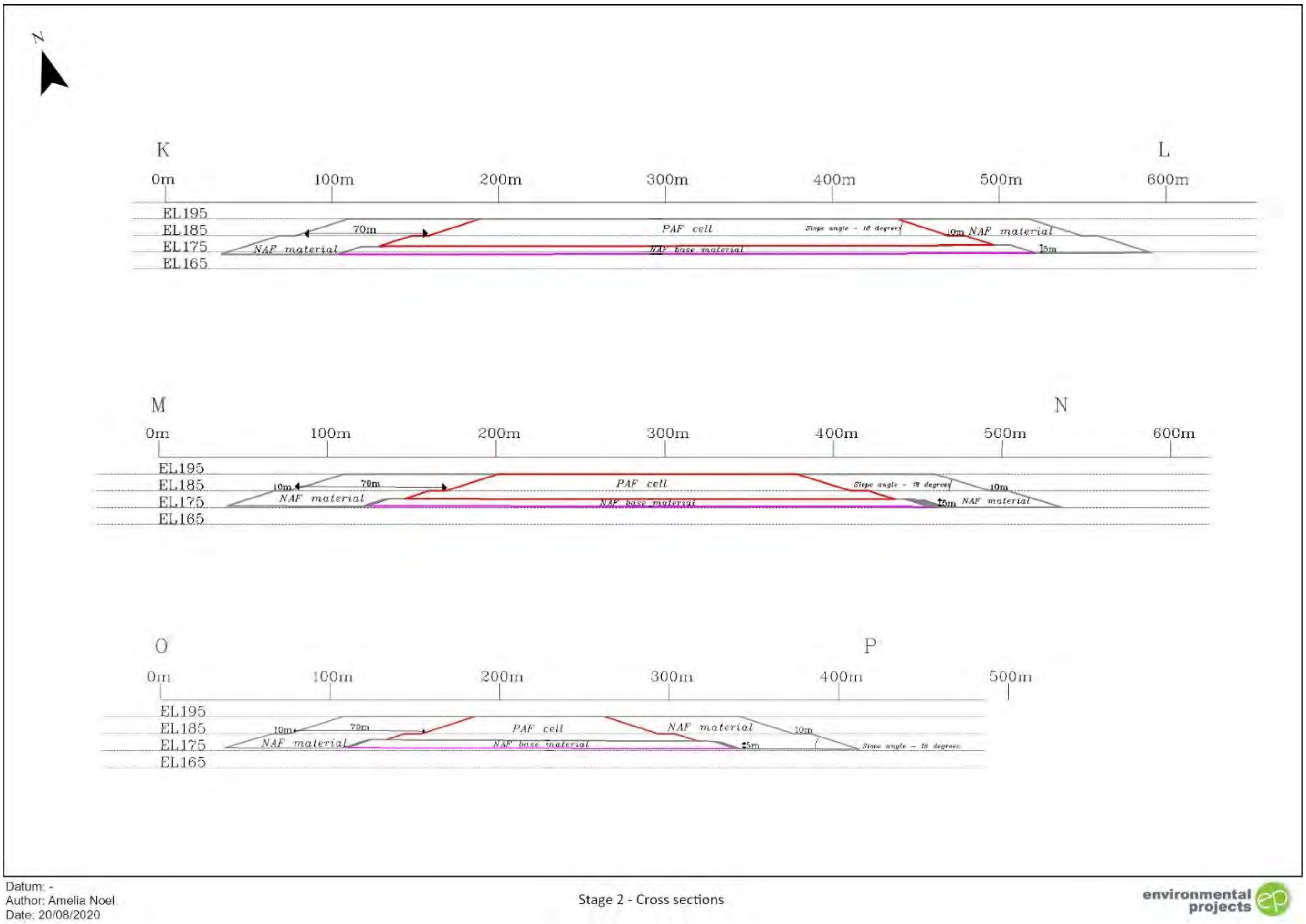


Figure 3-49: Eastern WRD Stage 2 completed – cross sections K – L, M – N and O –P

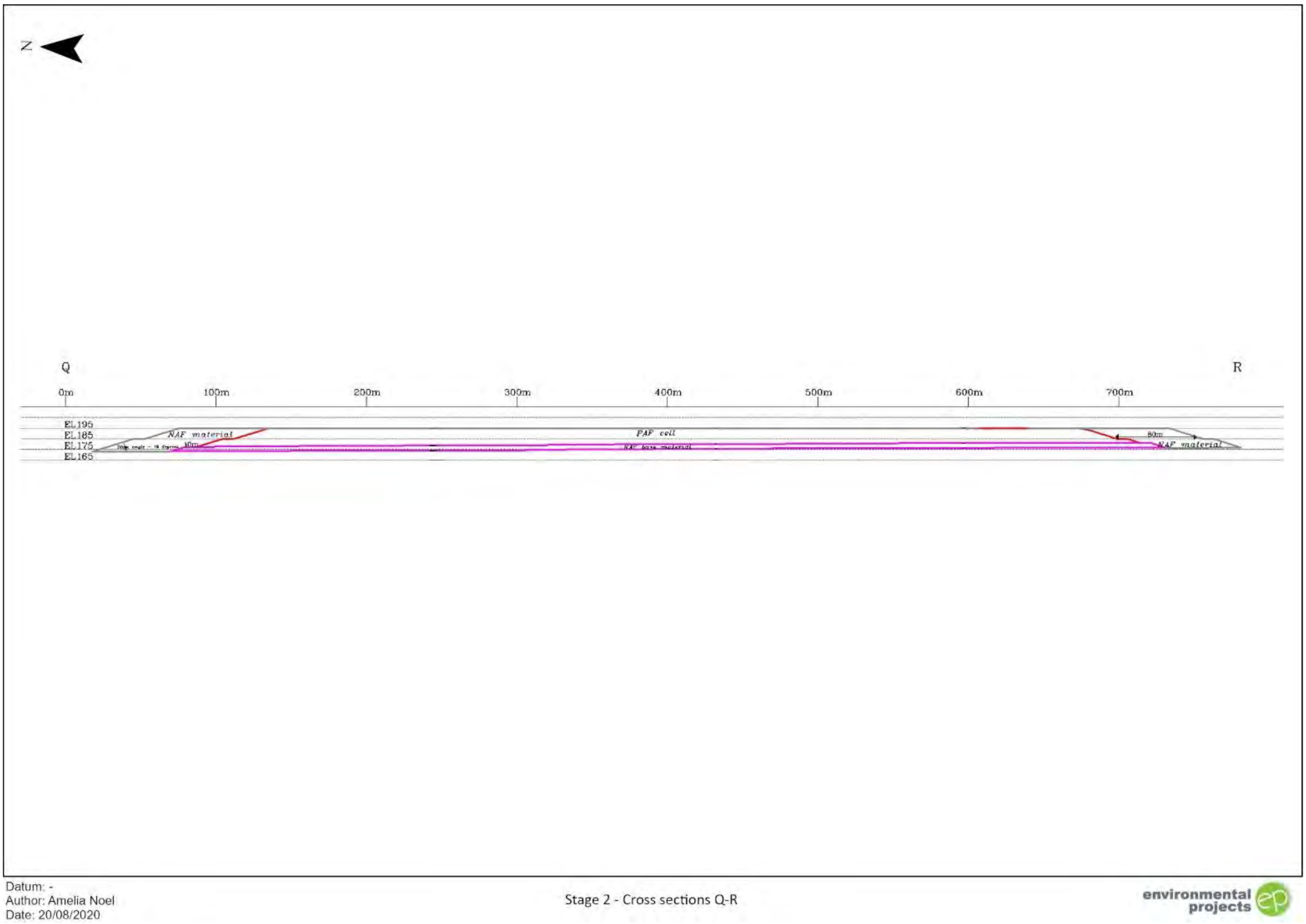


Figure 3-50: Eastern WRD Stage 2 completed – long section Q – R

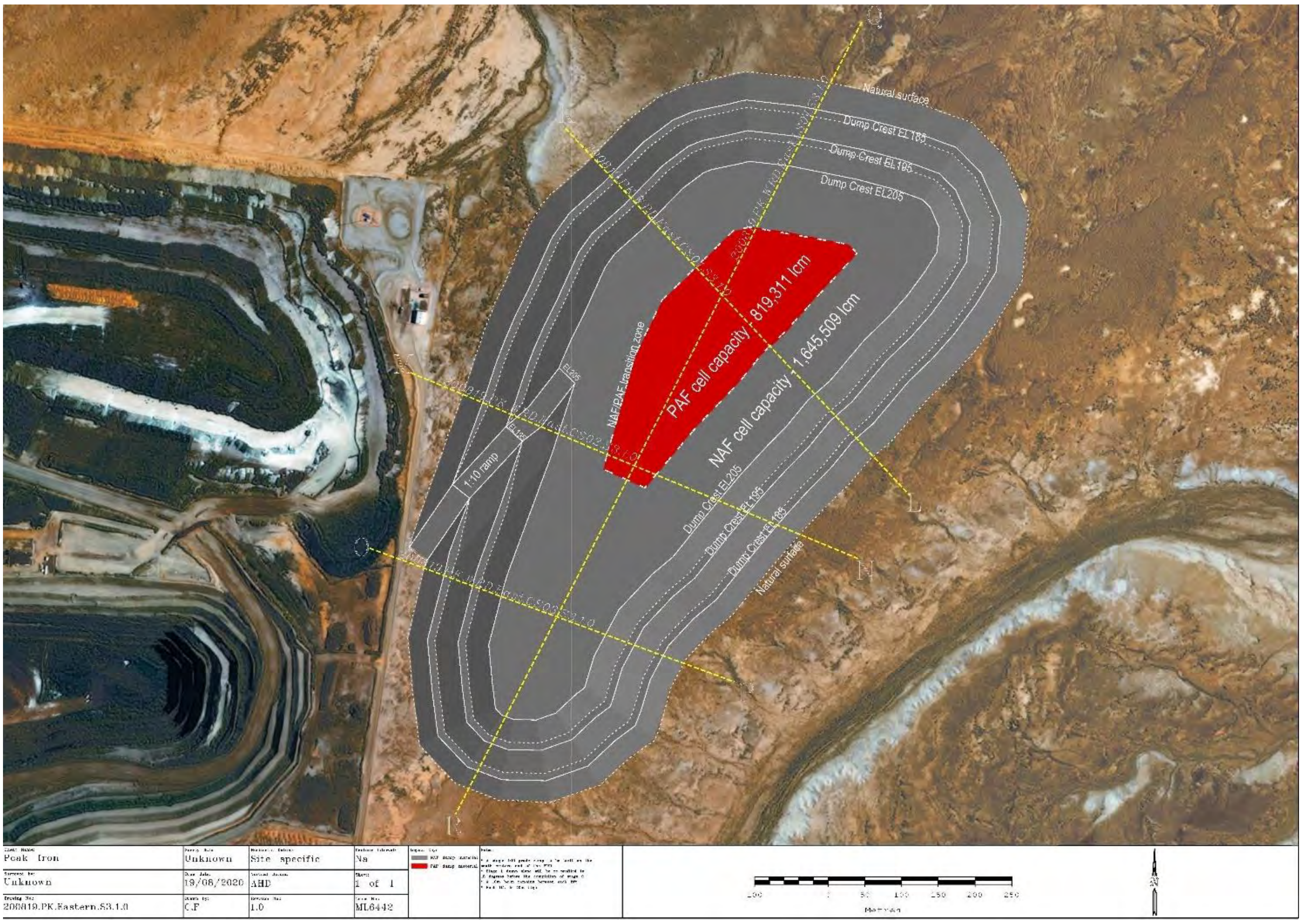
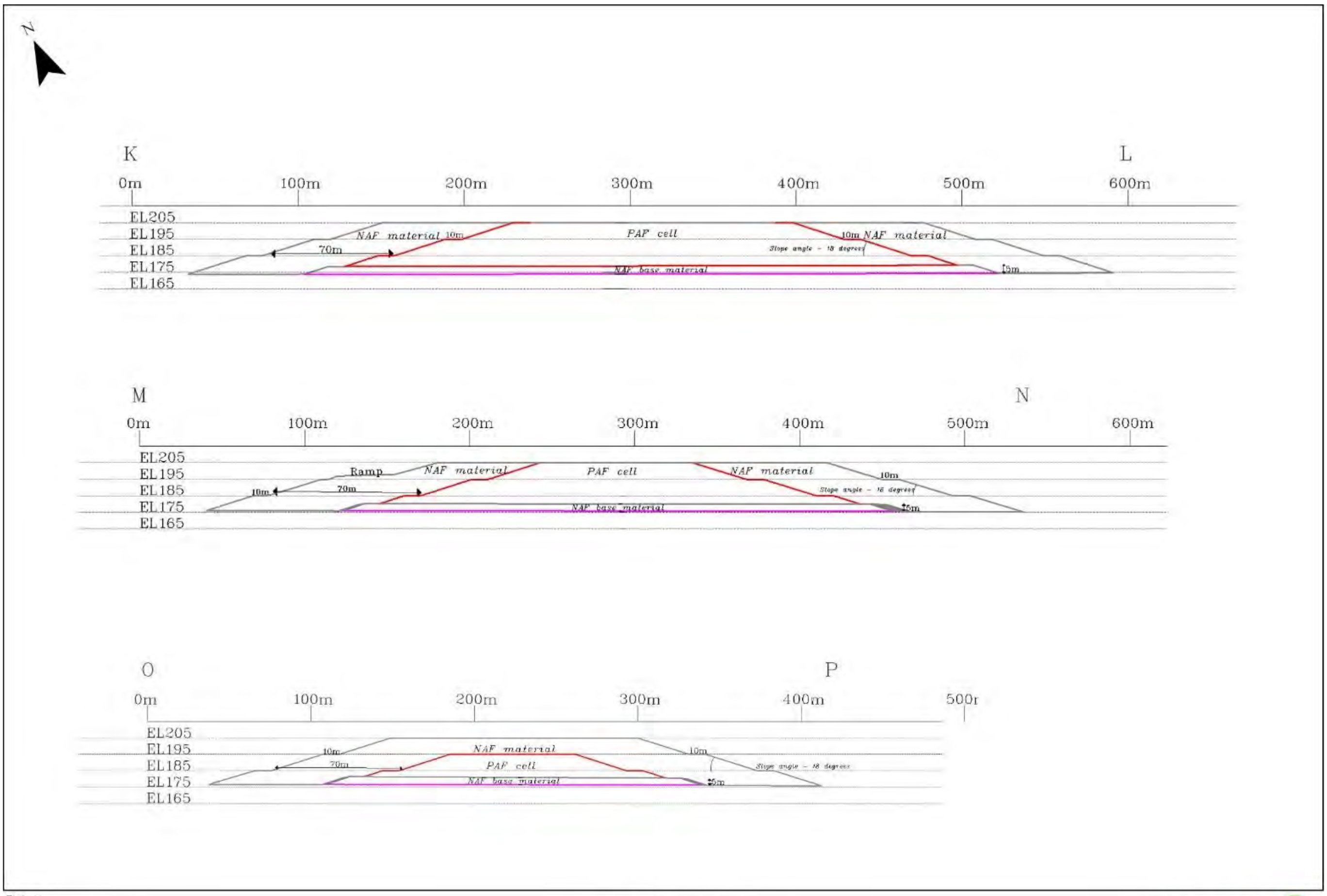


Figure 3-51: Eastern WRD status when Stage 3 is completed



Datum: -
Author: Amelia Noel
Date: 20/08/2020

Stage 3 - Cross sections

environmental projects

Figure 3-52: Eastern WRD Stage 3 completed – cross sections K – L, M – N and O –P

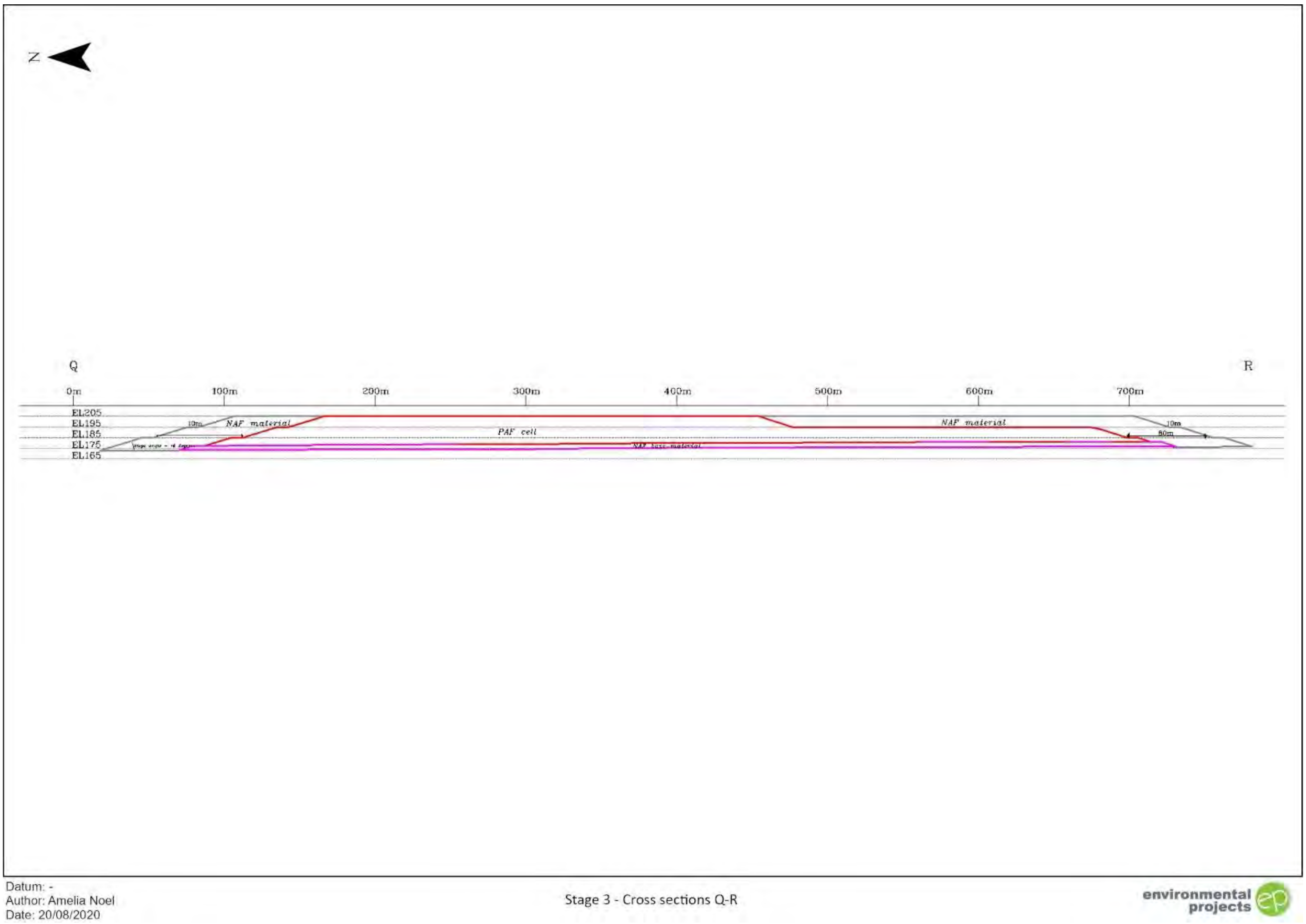


Figure 3-53: Eastern WRD Stage 3 completed – long section Q – R

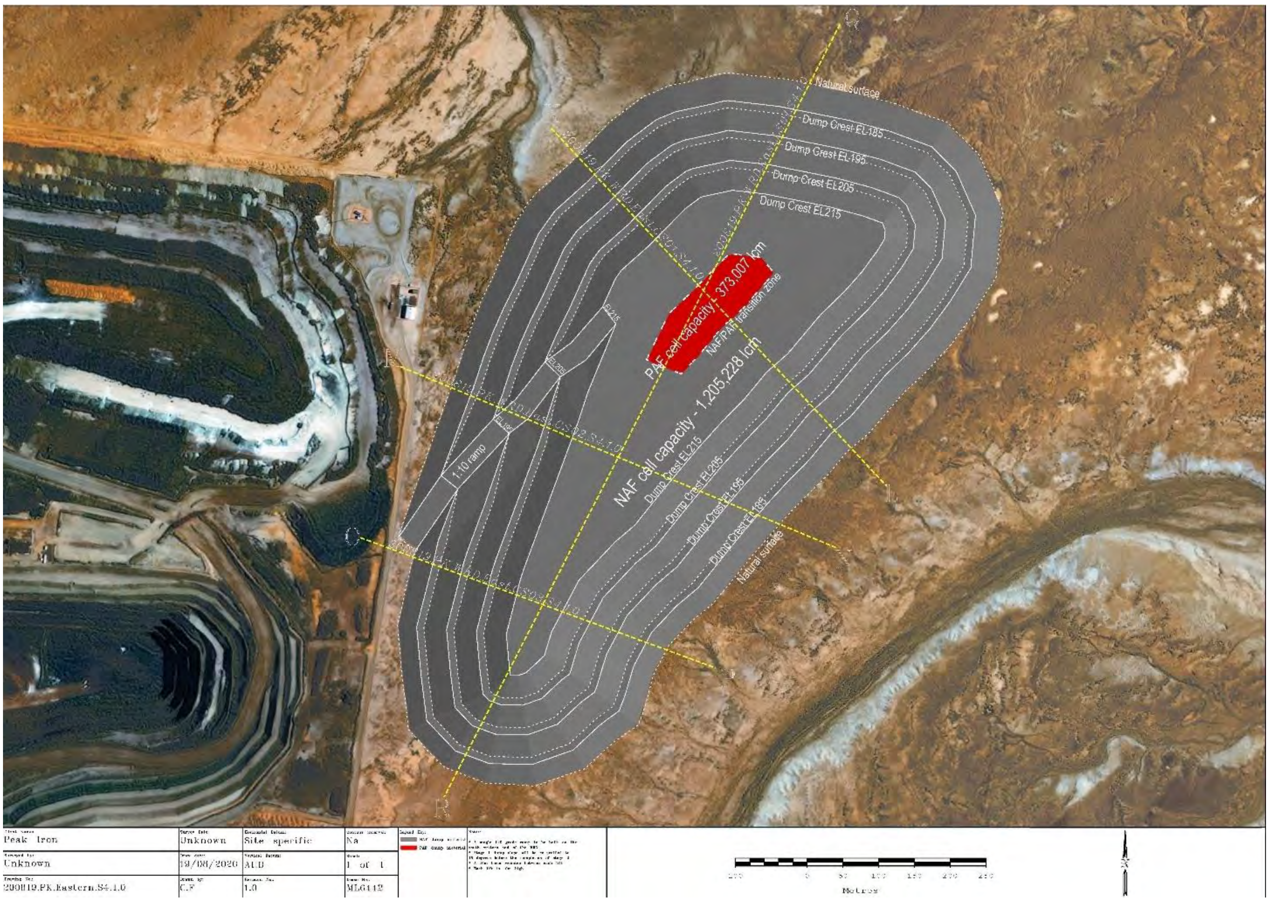


Figure 3-54: Eastern WRD status when Stage 4 is completed

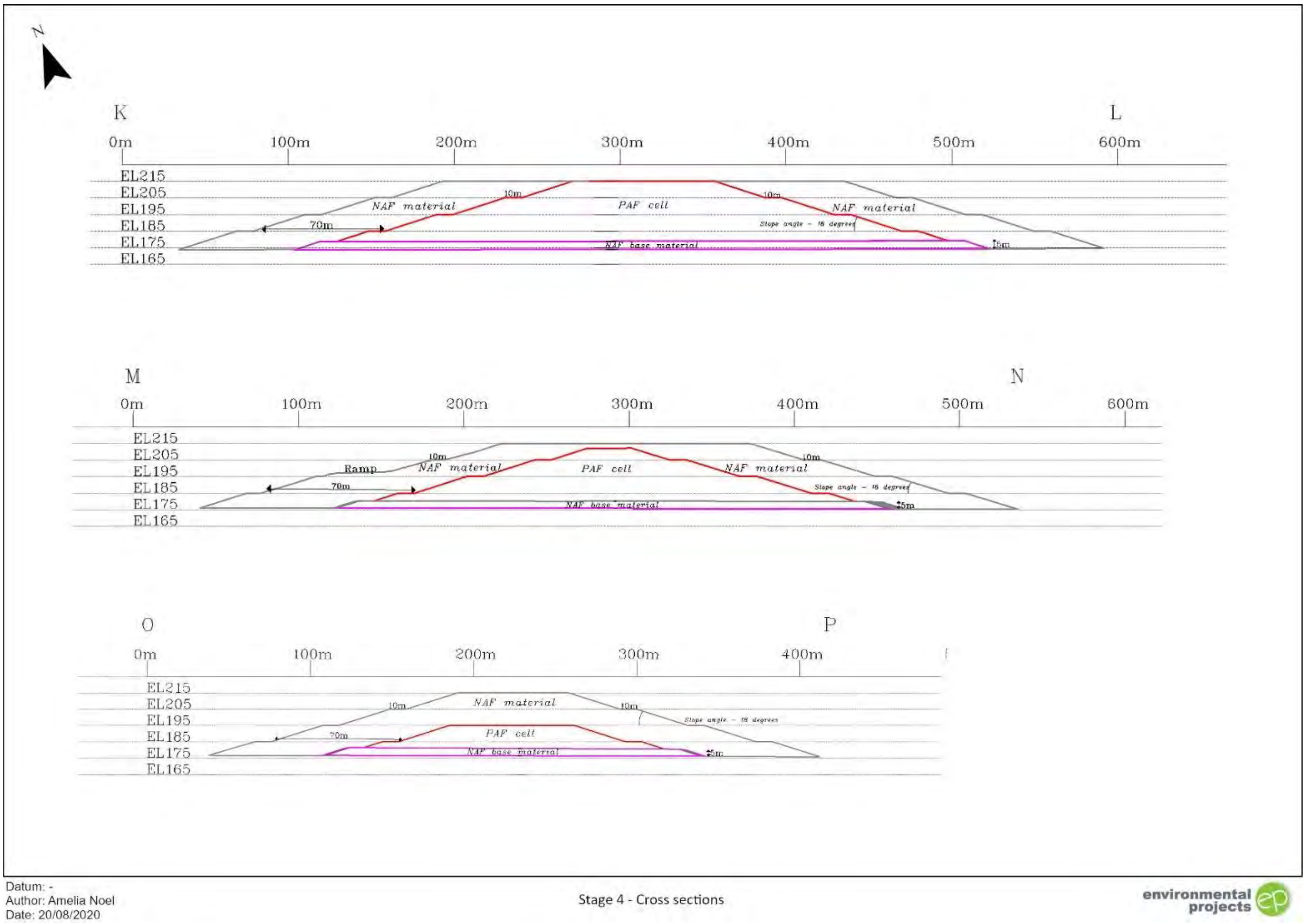
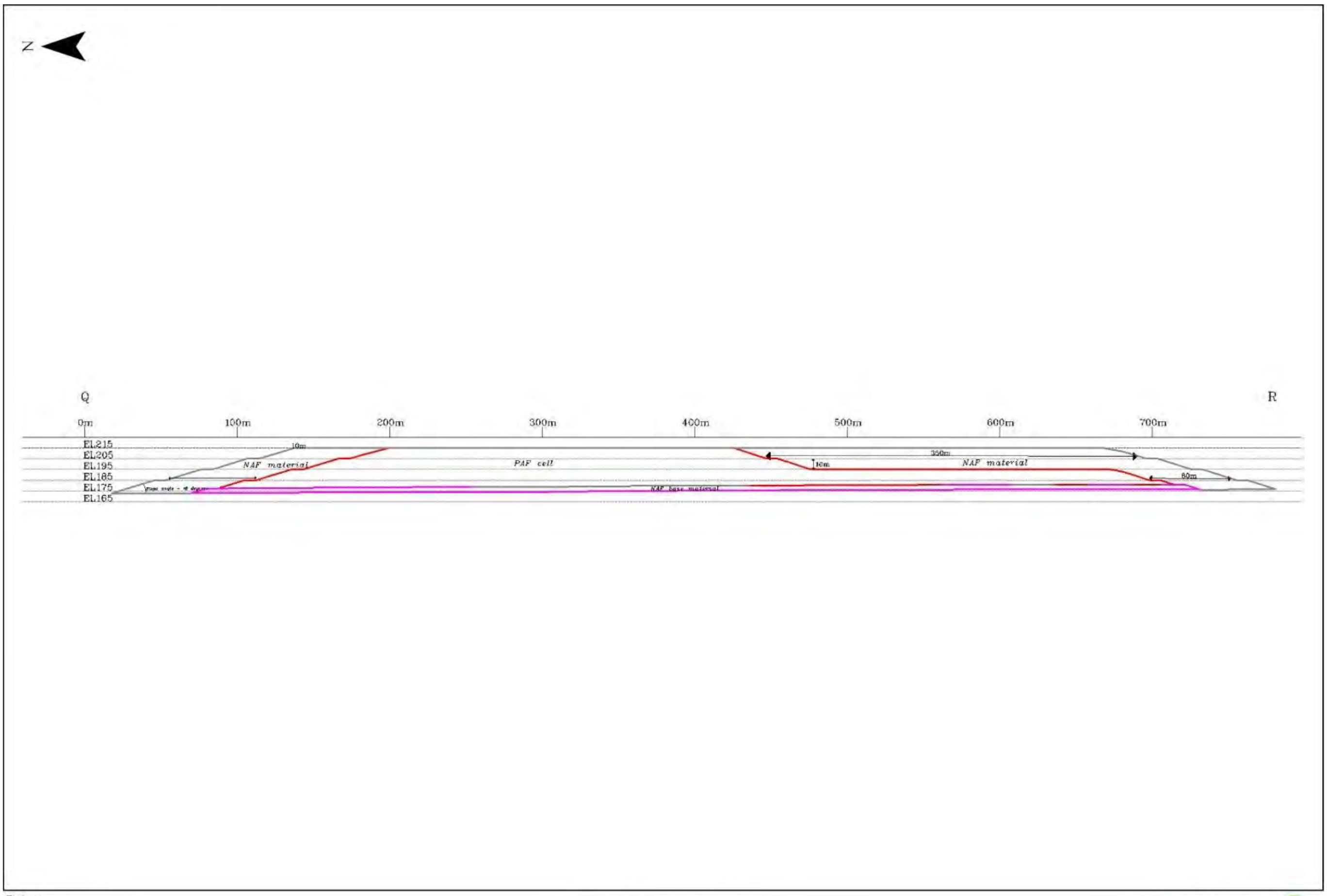


Figure 3-55: Eastern WRD Stage 4 completed – cross sections K – L, M – N and O –P



Datum: -
Author: Amelia Noel
Date: 20/08/2020

Stage 4 - Cross sections Q-R

environmental projects

Figure 3-56: Eastern WRD Stage 4 completed – long section Q – R

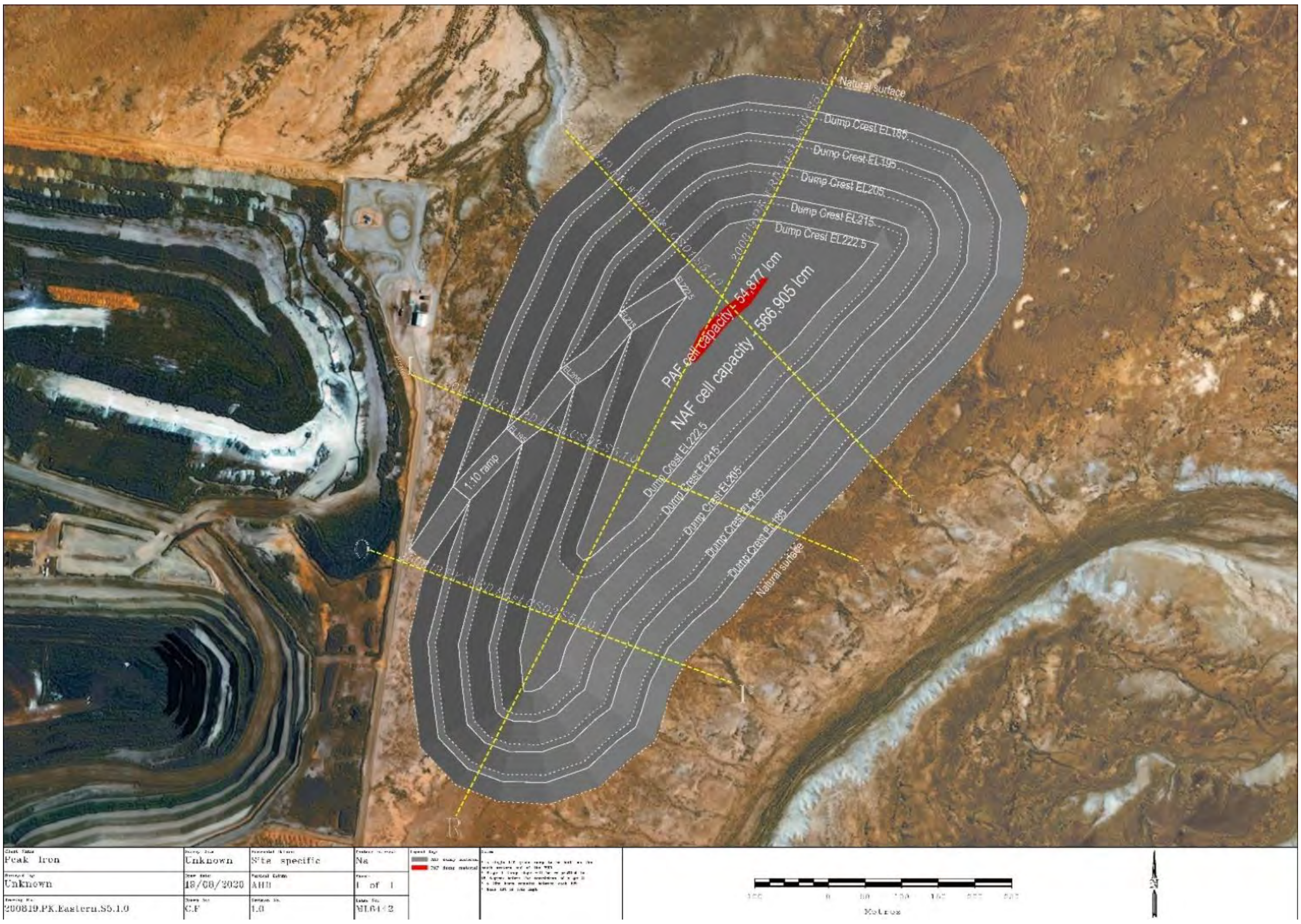


Figure 3-57: Eastern WRD status when Stage 5 is completed

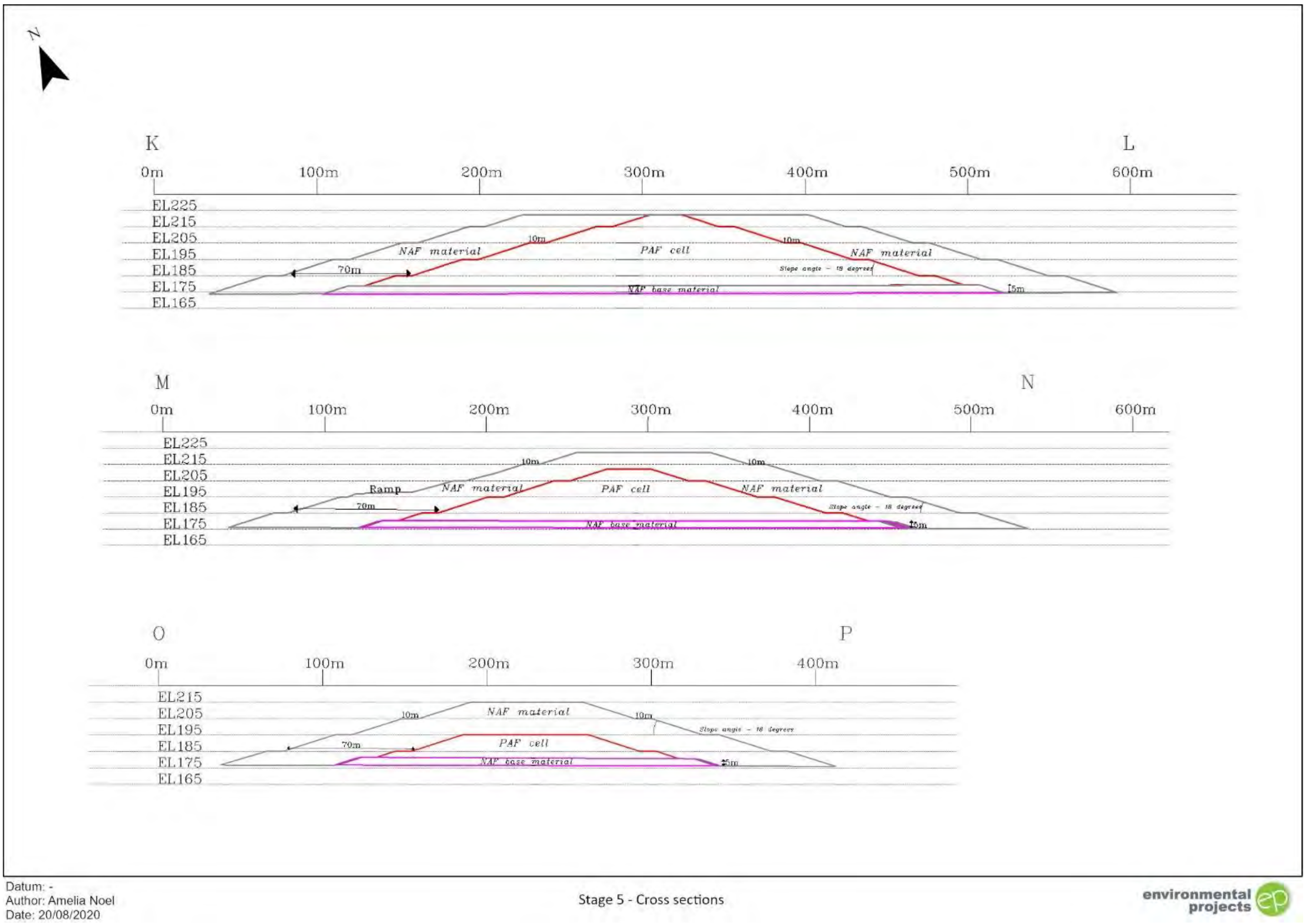


Figure 3-58: Eastern WRD Stage 5 completed – cross sections K – L, M – N and O –P

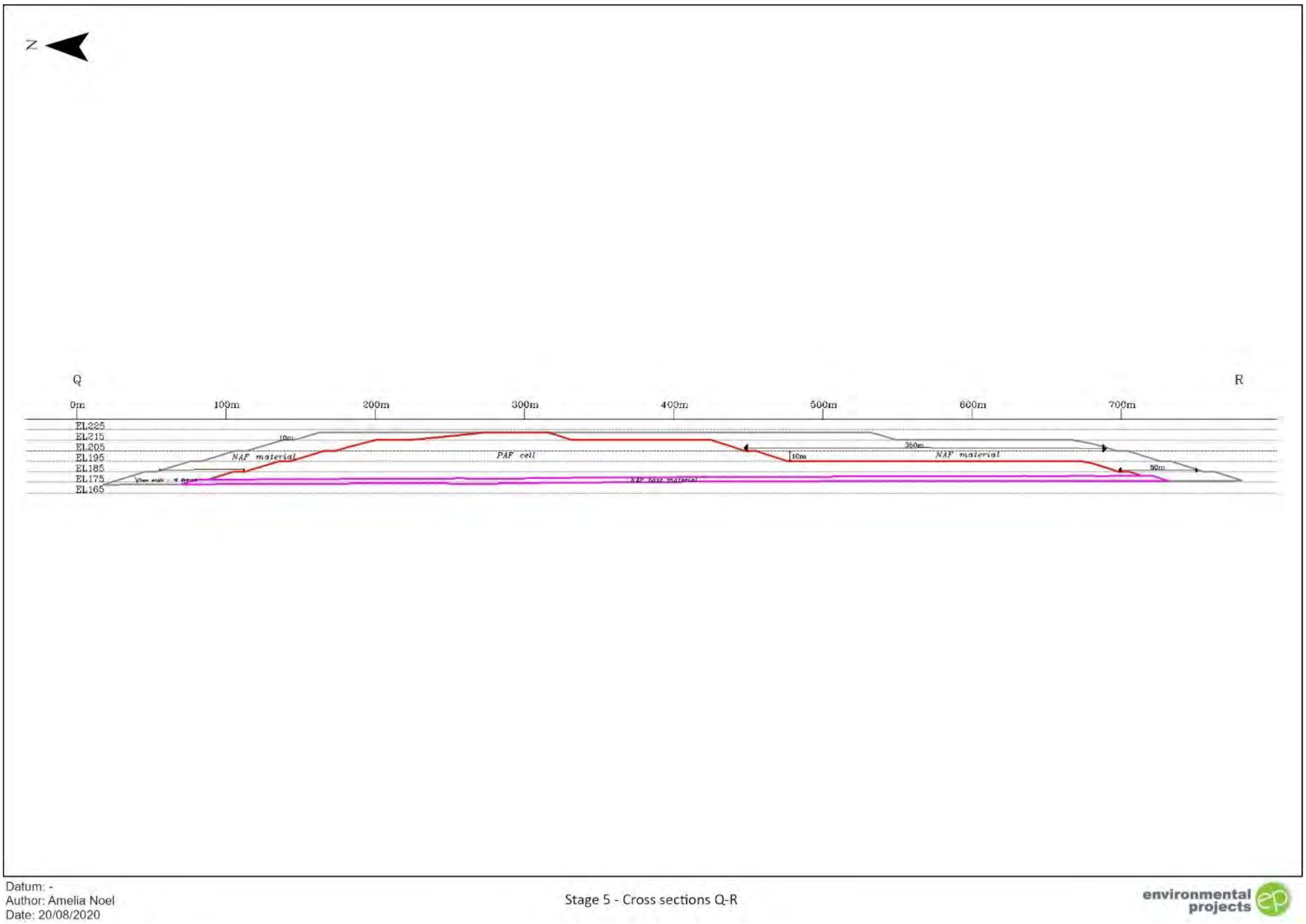


Figure 3-59: Eastern WRD Stage 5 completed – long section Q – R

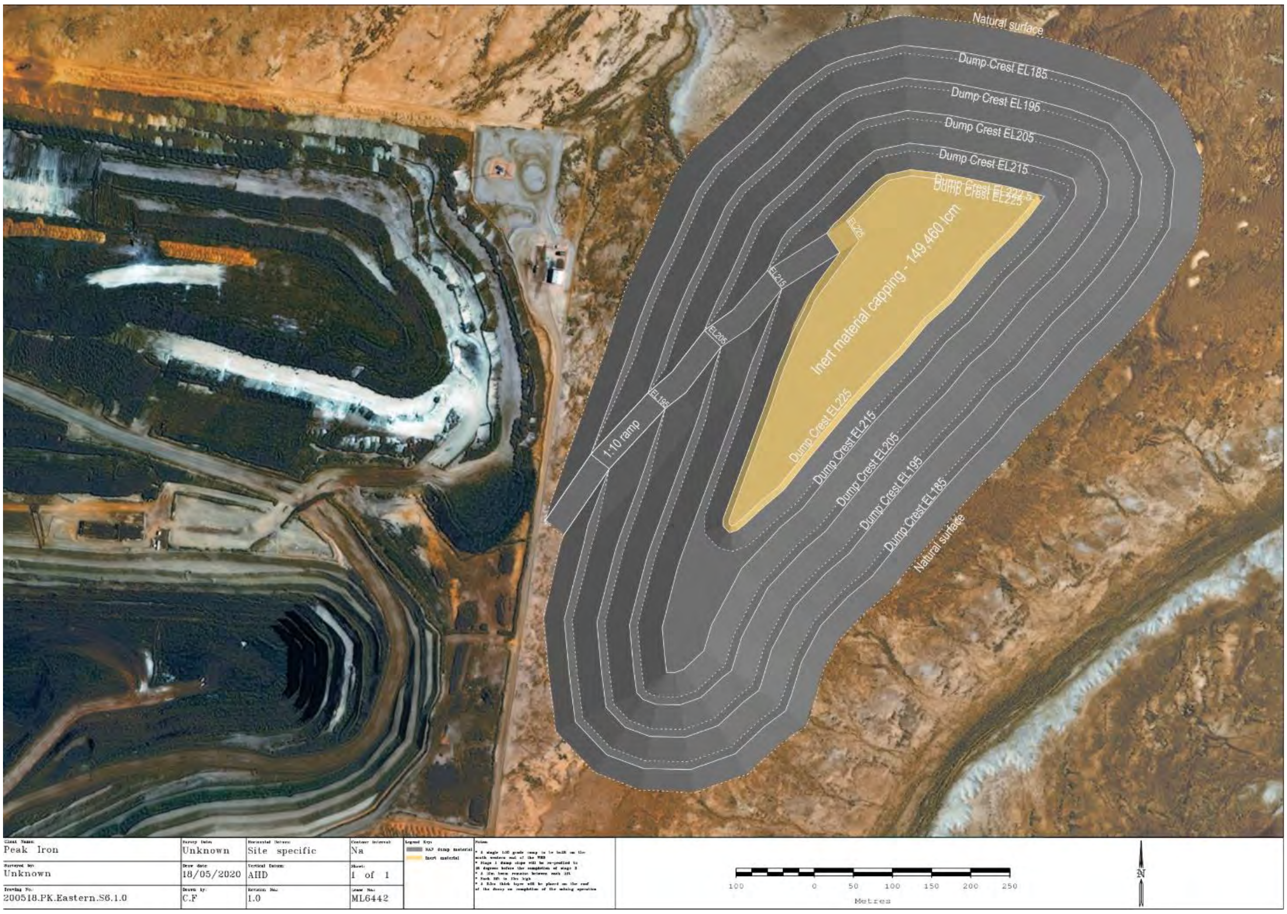


Figure 3-60: Eastern WRD status when Stage 6 is completed

Cross and long sections of the completed WRD landform (Stage 6) are provided in Section 3.7.5 (see Figure 3-34 and Figure 3-35).

3.7.10 WRD final cover design

A conceptual cover design for the Northern and Eastern WRDs has been developed (in accordance with the MEND Manual 2001) based on existing design information, stability modelling, geochemical characterisation (Jacobs 2018) and erosion and seepage modelling (Jacobs 2020 attached as Appendix B-2). This conceptual design will be tested and further refined as part of the detailed design process (see Section 8.4 Forward Work Plan).

The WRD cover is designed as a moisture store-and-release cover system that is appropriate for an arid environment. The cover is designed to prevent percolation of precipitation into the capped waste rock through construction of a topsoil layer with sufficiently low permeability which overlies a layer of inert waste rock. Rainfall will be 'stored' in the interstices of the topsoil and 'released' through evaporation back into the atmosphere before moisture infiltrates the waste rock underlayer. Rainfall stored within the cover will be retained until it is released through evaporation rather than shed as runoff, thus minimising erosion risk (Jacobs 2020).

The conceptual cover design is comprised of a two-layer system with the following minimum properties:

- topsoil cap – nominal 450 mm topsoil comprised of a minimum PSD of 22% silt and clay, 48% sand 30% gravel

- inert waste rock – nominal 1,000 mm capping layer comprised of a maximum of 80% gravel.

Seepage modelling results show that a WRD cover will prevent precipitation infiltration in all but rare rainfall events and will allow up to 27 mm of infiltration over a model period of 200 years (see Section 5.6 and Appendix B-2) for details of seepage modelling).

The conceptual final cover design is presented in Figure 3-61.

Sections 3.7.8 and 3.7.9 provide definition on the staging and scheduling of the WRD and associated PAF/NAF development and rehabilitation. Section 5 describes the rehabilitation and mine closure strategy.

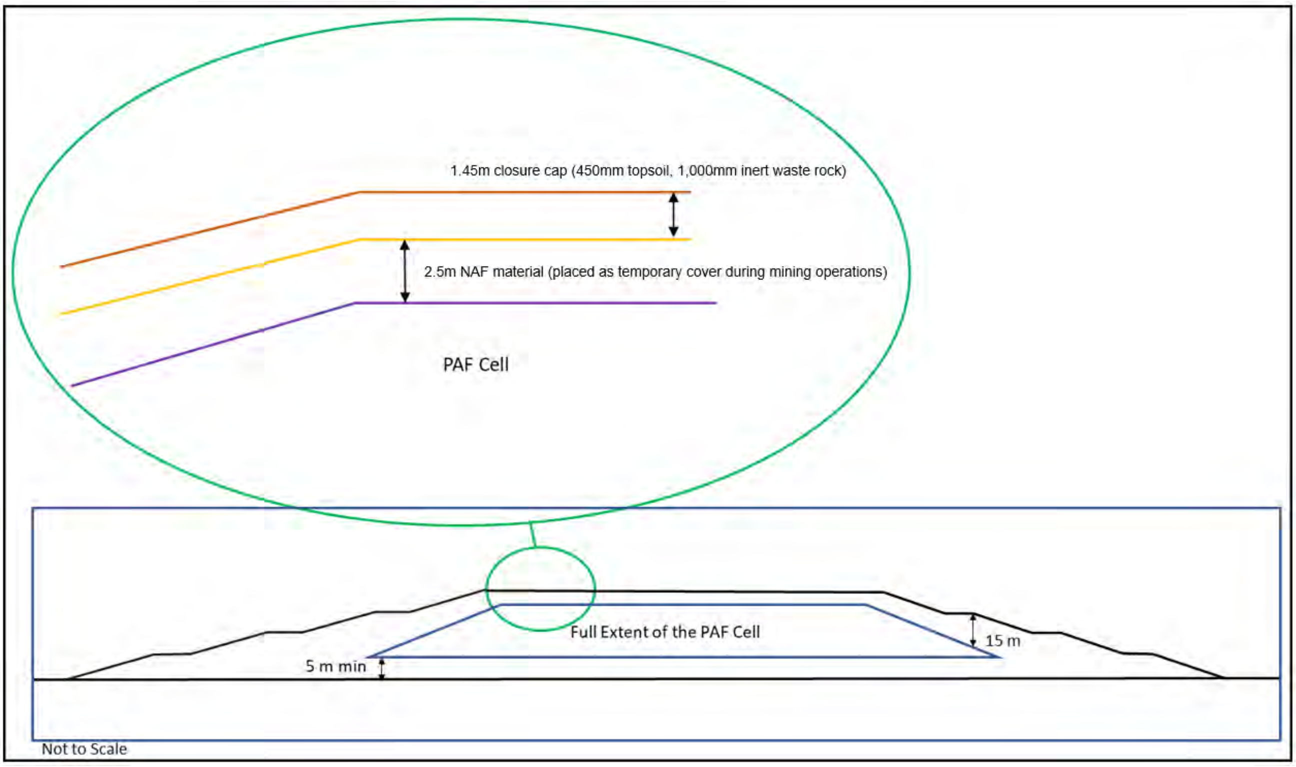


Figure 3-61: Conceptual PAF cell final cover

3.7.11 Stormwater and silt controls

The low rainfall in the area suggests the natural rill angle of dumped rock can be used as the batter slope in the building of the Eastern WRD as it is unlikely scouring and drainage will be a major issue. However, regardless of the arid climate, short duration, high intensity rainfall events occur in the region and require further assessment to manage intense rainfall events in the detailed design phase.

Runoff from the WRD has the potential to contain sediment. A minimum 50 m wide buffer has been retained between the toe of the dumps and the mining lease boundaries and pit crest to allow room for sediment traps and drainage channels to be installed. The sediment traps will be located at the northern boundary of the mining lease to capture diverted runoff from the WRD to settle out sediment prior to discharging to the downstream environment. The sizing of the traps and channels will be completed in the detailed design phase as part of FWP09 – Flood Study (see Section 8.4, Forward Work Plan). It is proposed that a design criteria for the capture and retainment of a 1 in 20 year rainfall event will be applied to stormwater controls. Indicative locations of these silt traps and drainage lines are shown in Figure 3-62.

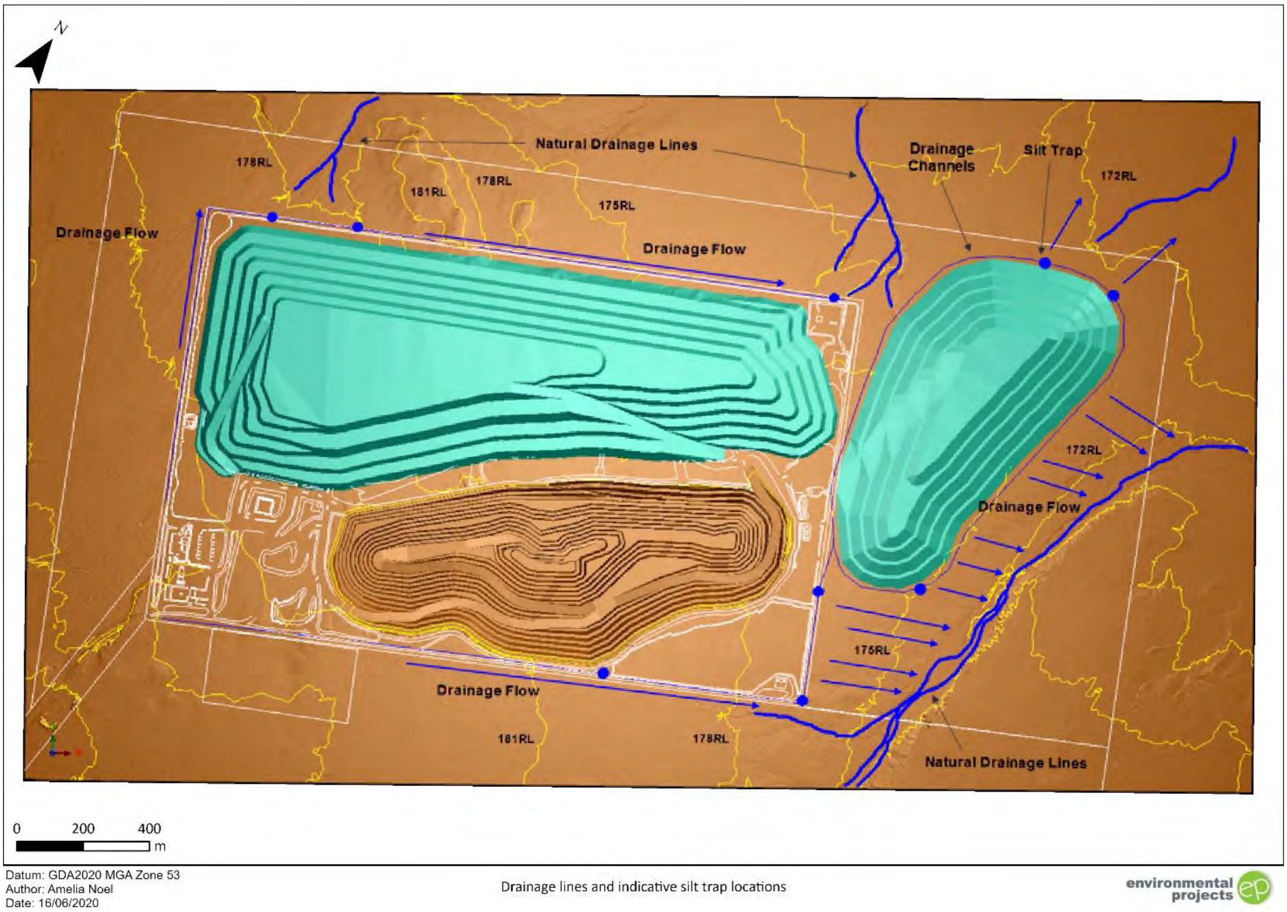


Figure 3-62: Drainage lines and indicative silt trap locations

The Eastern WRD will be bunded on the upstream southern side to prevent natural surface runoff mixing with runoff from the WRD. A small cut-off drain/diversion channel will be developed up catchment of the Eastern WRD to divert runoff from the WRD to a silt trap which will settle out sediment prior to discharging to the downstream environment (see Figure 3-62). Should a rainfall event greater than the 1 in 20 year design capacity result in discharge from the silt traps, a sample of the discharge water would be collected and analysed for pH and turbidity to demonstrate compliance with the Environment Protection (Water Quality) Policy 2015.

During mining operations the WRD cap will need a water shedding network to cater for high intensity design storm events. This will likely be lined trapezoidal channels or v-drains incorporated into the berms/access roads to transfer the water to ground level whilst minimising erosion and scour.

For closure, once the WRD is reprofiled, the capping will be assessed for erosion, scour and gullying profile over the longer-term, without intervention, for a duration to be confirmed. Further assessments will be undertaken to inform the detailed design and identify any required changes to the conceptual capping design (see Section 8.4, FWP).

Clean water runoff flowing from the southwest of the site along natural drainage lines will be intercepted by clean water diversion drains along the south and west boundaries of the mining extent and conveyed around the site where it will re-join the natural flow lines flowing to the north east at the northern boundary of the site.

Additionally, toe drains at the base of the WRDs will convey localised onsite runoff around the WRD to silt traps on the northern and mining boundary. These diversion drains will limit infiltration of water into the mining pit and WRD thereby reducing the risk of infiltration in PAF material from overland flow. diver

Drainage control measures will take into account the expected rainfall events in the region and are also designed to be water retaining (i.e. top surface, berms and batters are constructed to hold the maximum expected rainfall intensity event). The construction of suitably engineered impoundments on the flat surfaces and deep ripping at suitable intervals on the sloping surfaces will achieve the necessary control.

A range of average recurrence intervals (ARI) for the Peculiar Knob region are shown in Figure 3-63. The ARI data is applied to suit the risk profile that a particular structure presents to the environment over time. Drainage control measures have been designed for an ARI of 20 years.

Runoff from the extended ROM pad and stockpiles has the potential to contain sediment. These areas will be bunded on the upstream side to prevent natural surface runoff mixing with runoff sourced from the ROM pads and stockpiles. Cut-off drains/diversion channels will be implemented at suitable locations to divert runoff from the WRD to silt traps which will settle out sediment prior to discharging to the downstream environment.

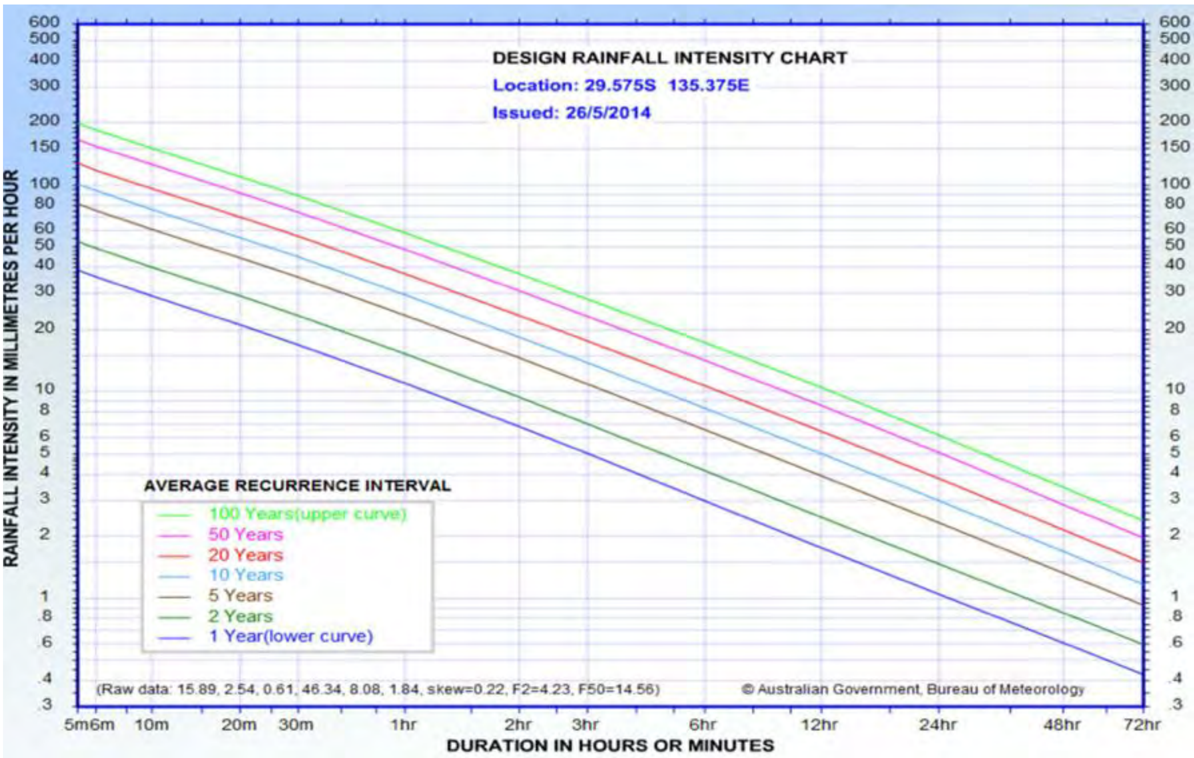


Figure 3-63: Rainfall averages and rainfall intensity chart

3.7.12 Rehabilitation

Open pit

The open pit will remain as a permanent feature. A two metre high bund will be established around the southern, western and eastern perimeter of the open pit and joined to the northern and eastern WRDs. The bund will be constructed with inert waste rock and rock armouring on the external slope to maintain integrity.

The proposed bund is located at least 60 m from the top of the final crest of the open pit and is beyond interpreted circular failure surfaces through the weathered rock and includes an addition margin of 10 m. The proposed design is consistent with the Safety Bund Walls Around Abandoned Open Pit Mines Guideline, (Department of Industry Resources, WA, 1997). Exit point(s) of the open pit will also be bunded to prevent vehicle access.

Where on-going public (and animal) safety may be at risk, a site fence with signage will supplement bunding around the pit.

WRD and PAF cell rehabilitation

Progressive rehabilitation is planned, including progressive placement of topsoil, for the Eastern WRD and associated PAF cell, as described in Section 3.7.9.

The initial stage of rehabilitation will involve re-shaping the WRD faces using dozers, for each lift, topsoil will then be placed and ripped into the profiled surface to the extent it is required to produce a stable and robust root zone for plants, noting that topsoil and seed stock is only to be placed on the lower faces to mimic the natural mesa formation in the Breakaways regional landscape. Topsoil harvesting in the mine site area typically averages depths of approximately 200 mm. The current topsoil stockpiles at the mine site contain approximately 310,000 LCM of material.

The Northern WRD will use approximately 190,000 LCM of that 310,000 LCM to dress the lower 30 to 45 m slopes of the profiled dump and provide skeletal topsoil cover on the upper surface.

Annual evaporation in the Peculiar Knob region is approximately 2,800 mm to 3,200 mm which is 18 to 20 times greater than the annual average rainfall.

Due to low rainfall and high evaporation rates it is not possible for the WRDs and PAF cell to become saturated. Priority is given to holding enough moisture in the available topsoil to anchor the growth of semi-arid zone vegetation.

The Eastern WRD will harvest an additional 120,000 LCM (approximate) of topsoil material which will be used to progressively dress 30 to 45 m of the lower slopes of the Eastern WRD and provide a minimum of 450 mm of soil cover on the upper surface (as per the closure cap design in Section 3.7.10), similar to the soil profile that exists naturally on the surrounding mesa landscape (see Figure 3-61).

The topsoil will be ripped into the lower WRD surface to produce a stable plant root zone of around 300-400 mm thickness. Progressive rehabilitation steps will include trials of the final landform profiles and topsoil application, including trialling of sub-structural batter slope features such as cross ripping to help achieve erosion control and successful revegetation.

Additional details of rehabilitation and closure of the WRD at the end of the life of the mine are discussed in Section 5.

3.7.13 Limits of disturbance

The limit of disturbance for the Eastern WRD is shown in Figure 3-64, in accordance with the Aboriginal heritage clearance survey conducted in December 2013.

Figure 3-64: Limit of disturbance

3.8 Description of operations

3.8.1 Modes and hours of operation

Normal operational hours are 24 hours per day, 7 days per week throughout the year. Although excavation during nightshift is not planned after November 2021, other mine support works such as blasthole drilling and maintenance is expected.

3.8.2 Workforce

The workforce during operations will vary during the life of the mine and is dependent on the level of mining and nearby exploration activity but may involve up to 180 people (including contractor employees).

The main workforce assignments for normal operations are in the order of:

- production, 55 people
- crushing, screening and separation of ore, 8 people
- machinery maintenance, 25 people
- haulage of ore to Wirrida loop, 30 people

- train loading, six people
- survey work, two people
- specialist mine support services, six people
- exploration activities,10 people
- administration, seven people
- environmental and safety services, four people.

3.8.3 Type of equipment

The type and number of equipment used at the Peculiar Knob mine will vary during life of mine. The planned number of equipment, and approximate noise emission levels (where available), for each type of equipment are provided in Table 3-11.

Table 3-11: Type of equipment and approximate noise emission

Quantity	Type	Make	Model	Size	Approximate noise emission
3	Drill rig	Gardner Denver	GD5000	GD5000	
3	Drill rig	Atlas Copco	D65	D65	
1	Excavator	Hitachi	EX1900	192 tonne	72 dB(A) in cab at maximum speed
1	Excavator	Hitachi	EX2500	250 tonne	89 dB(A) at 15 m operating mid gear and moving
2	Excavator	Komatsu	PC1250	110 tonne	89 dB(A) at 15 m operating mid gear and moving
4	Dump truck	Caterpillar	785	250 tonne	74 dB(A) at 50 m mid-range running
10	Dump truck	Komatsu	785	166 tonne	74 dB(A) at 50 m mid-range running
2	Bulldozer	Caterpillar	D10	D10	72 dB(A) in cab at maximum speed, no load
2	Grader	Caterpillar	16M		72 dB(A) in cab at maximum speed
1	Water cart	Caterpillar	740	740	
2	Mobile service truck				
1	Loader	Caterpillar	992	992	
1	Loader	Caterpillar	998	998	

10	Prime mover	Kenworth	C510		

Original Equipment Manufacturers (OEM) design their mining equipment to meet required industry standards to reduce or eliminate noise, vibration and heat sources to protect the environment and operators as far as practicable. All equipment used on site is required to meet statutory standards.

The sources of operational noise and vibration from the equipment used at the mine include, but are not limited to:

- engine operation
- operational alarms and warning systems including tramming or reversing alarms
- loading noise in truck bodies
- track noise from tramming tracked equipment
- hammer noise from drilling rigs.

Potential ignition sources include equipment engine exhaust systems, grading and dozing operations, railing operations, loading operations, electrical equipment and operating plant conveyors and screen.

3.8.4 Blast management

A blasting management plan will be implemented at the mine for all explosives handling and blasting activities and ensure that:

- there are no risks to public safety on or off the mining lease areas, as a result of blasting activities
- private and public property will not be adversely affected by blasting activities
- blasting techniques and protocols minimise dust generated during blast events
- blasting only occurs in daylight hours.

Blasting is undertaken using a range of compounds depending on ground conditions. For the 2012 2013 financial year (prior to care and maintenance) 79.45 tonnes of heavy emulsion product and 571.26 tonne of ANFO were used.

Blasting initiation is undertaken using nonel (non-electric) type blasting accessories. A blasting pattern and initiation sequence will be incorporated at the mine to ensure appropriate fragmentation of the rock mass, minimise unacceptable ground vibration and over-pressure and fly rock, that could result in impacts on other components of the project on MLs and MPLs and the adjacent Prominent Hill haul road. Blasting operations are undertaken at the end of day shift under normal operating conditions. Blast management procedure will address the potential impacts of vibration, overpressure, fly-rock, dust and noise on the environment, personnel, equipment and surrounding land and facilities. Blasts will be managed in accordance with industry best practice for explosives handling, blast design, initiation systems and impact controls. All blasts will be designed and supervised by qualified, trained and experienced personnel.

Specific controls within the blast management plan will include:

- an exclusion zone of at least 500 m from the blast for personnel
- an exclusion zone of at least 300 m from the blast for equipment
- notifications prior to blasting
- clearance activities before the blast
- an allocated blasting controller (i.e. responsible shot-firer)
- emergency preparedness during the blast
- standard communication methods during the blast
- post-blast checks
- clearance at the conclusion of blasting.

All potential risks and impacts are controlled and maintained below recommended levels in Australian Standard AS 2187.2: 2006.

To date no complaints relating to blasting operations have been received.

3.8.5 Mine pit dewatering

Refer to Section 3.5. Dewatering bores are not required as groundwater flow into the pit is nil. Previous reports by Parsons Brinckerhoff (2007) and Rocktest Consulting (2014) and subsequent excavation of the pit to 120 metres depth, confirm that little to no groundwater is likely to be present in the pit. Exploration drilling in the area was almost exclusively dry, with only minor water encountered in two of the 83 pre-mining exploration drillholes within the pit shell. Both these intercepts were detailed as minor inflows from the intersection of a structure at depths of 150 metres and 177 metres.

Due to the lack of any identified groundwater table or surface in and around the pit, no pit dewatering system is planned. Should the pit excavation intersect any of the minor structures at depth that may contain small volumes of water, this will be managed with in-bench sumps and the water used for dust suppression in and around the pit.

3.8.6 Topsoil and subsoil management

At the Peculiar Knob mine site topsoil and subsoil management will be undertaken in accordance with the Soil Management Plan (P-2-PLN-3-1006_0).

The location of the topsoil stockpile is indicated in Figure 3-65. An illustration of stockpile establishment is provided in Figure 3-66 and summarised as follows:

- demarcation of the area to be cleared will be undertaken
- any surface vegetation (grubbing material) will be collected and stockpiled to maximise additional seeds and organic matter addition to the soil

- topsoil to be cleared to a depth of between 100 mm and 300 mm and will be relocated to a long term topsoil stockpile or placed in windrows at the edge of the disturbed area, ensuring that excessive subsoil is not collected

- if available, up to 300 mm of subsoil may be harvested and stockpiled in windrows dependant on the quality and physical properties of the material which may impact on the suitability for use in rehabilitation. Subsoil and topsoil will be stored separately where possible

- where practicable, topsoil and subsoil will be applied and dispersed immediately on to a prepared rehabilitation area

- if immediate use is not practicable, long term stockpiles for topsoil and subsoil are developed in designated stockpile areas (refer to Figure 3-65)

- data on topsoil harvesting, storage location, topsoil stockpile inspections, stockpile relocations and dispersal onto rehabilitated areas is entered into the Topsoil Database

- reconciliation of topsoil and subsoil stockpiles will be undertaken annually

- stockpiles are actively monitored for weed control and erosion to ensure long term viability

- where practicable, reduce the area of exposed soil that could be eroded by stormwater by maintaining vegetative cover for as long as possible. Natural revegetation may need to be encouraged through the application of seeds to protect the topsoil from erosion and to maintain an active population of beneficial soil microbes

- the status of topsoil management is included in the annual compliance report.

Development of the Eastern WRD would generate approximately 120,000 LCM of topsoil material. There is currently 310,000 LCM of topsoil stored in the south eastern corner of ML6314. The topsoil from the Eastern WRD would be used directly for progressive rehabilitation where practicable, otherwise placed in windrows around the perimeter of the developing Eastern WRD. Details on the use of topsoil during rehabilitation are included in Section 3.7.12.

Topsoil and subsoil depths vary on ML6314 and there are Bulldog Shale outcrops naturally formed throughout the landscape. The topsoil depth in this area is on average around 200 mm.

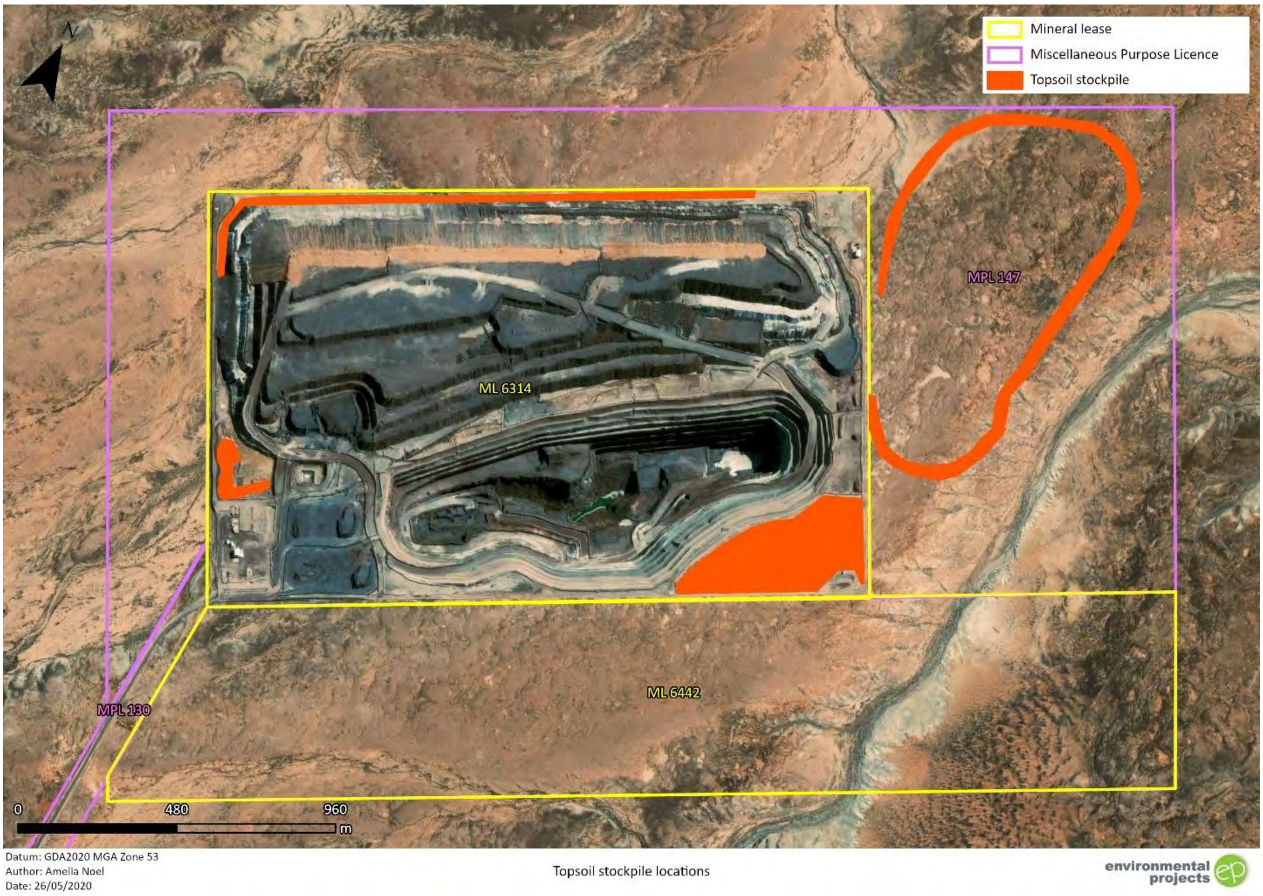


Figure 3-65: Topsoil and stockpile locations

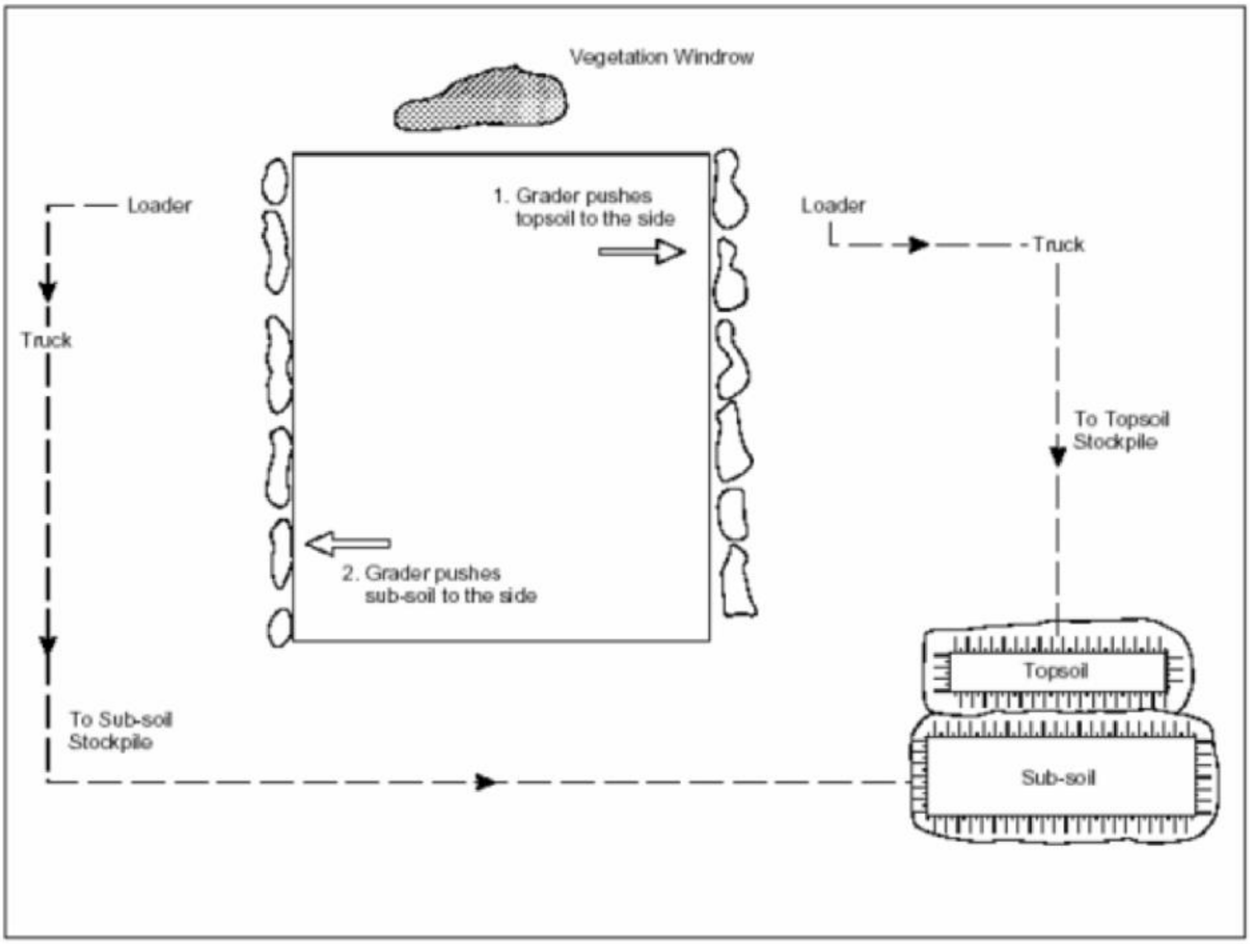


Figure 3-66: Recovery of topsoil and subsoil (Source DoIR 2006a)

In general post closure placement of topsoil and subsoil material, as applicable to the rehabilitation area, would be recovered from the stockpile areas and evenly spread over the subject area to a target depth of about 200 mm in order to minimise the potential for erosion and increase the success of revegetation works. The depth of topsoil used for rehabilitation will depend on the quantity available across the site, risks to erosion or instability, requirements for prompt revegetation, the final rehabilitation design and achieving final closure outcomes. No recovery of soil will be undertaken when the stockpiles are wet or during high winds.

In some situations it may be necessary to recover topsoil and subsoil together. In the event of this the topsoil and subsoil mix would be applied at a target depth of 200 mm. If insufficient topsoil/subsoil is available, placement would be undertaken in priority areas by placement in strips.

Details of topsoil application on the WRDs, including the capping system, are included in Section 3.7.10.

3.8.7 Stockpiles

A number of material stockpiles are required on site (refer to Figure 3-30). There is a low grade ore stockpile contained within the south-west area of the Northern WRD. This stockpile will either be depleted or relocated to the ROM pad for reclamation at a later date. Ore mined from the pit will be stockpiled in the un-crushed stockpile which covers an area of 14,043 m² to the north of the ore processing area. The ROM stockpile directly south of the ore processing plant is 42,020 m² in size and was the previous location of the ROM stockpile and requires minimal preparation works. The ROM stockpile extension will be used if required, which will be dictated by market demand, rail capacity constraints and the mining schedule. Before the ROM stockpile extension is utilised all topsoil will be removed and placed in the topsoil stockpiles as indicated in Section 3.8.6. A two metre thick base will be built comprising of mineralised waste or low grade ore. The approximate capacity of the ROM and low grade stockpiles are shown in Table 3-12.

Table 3-12: Material stockpile capacities

Stockpile	Capacity BCM
Current ROM pad	347,926
ROM pad extension	865,343
Un-crushed stockpile	174,414
Low grade stockpiles (within northern WRD)	500,000

In addition to the topsoil stockpiles at the mine, topsoil is stored in:

- windrows along the haul road
- two permanent stockpiles at the Wirrida rail loop
- one stockpile at the accommodation village
- one stockpile at the Stuart Highway underpass
- one permanent stockpile at the commencement of the haul road in the Breakaway area (CH1)
- in windrows along the accommodation village access road, Camp Borefield Road and Penrhyn Borefield Road.

Specific management measures for minimising the impact of stormwater include installing separation drains around the edges of the stockpile areas to direct water runoff to sedimentation basins which allow filtration and percolation and avoid scouring from uncontrolled flows.

3.8.8 Stockpile rehabilitation

Product stockpiles in the ROM pad area will be drawn down at the end of the LOM. In the interim, stockpiles will be managed and monitored to ensure topsoil remains available and viable for its final use.

Topsoil and subsoil stockpiles will be utilised in the progressive rehabilitation program, as described in Section 3.8.6. The remaining areas will be prepared for closure in accordance with the draft Closure and Rehabilitation Plan in Section 5.

3.9 Crushing and screening

The indicative location of the crushing and screening plant is shown on Figure 3-67. Ore from the un-crushed stockpile ranging in size 0 mm – 750 mm is fed into the crushing plant using an excavator or loader. The plant consists of one jaw crusher, one primary cone crusher, two secondary cones crushers and a series of vibrating screens to produce nominally -12.3 mm crushed ore product. The crushing plant footprint is approximately 70 metres by 65 metres and has a capacity of 500 t/hr. A schematic diagram of the crushing plant is provided in Figure 3-68.

Figure 3-67: Crushing and screening plant and DMS plant indicative location

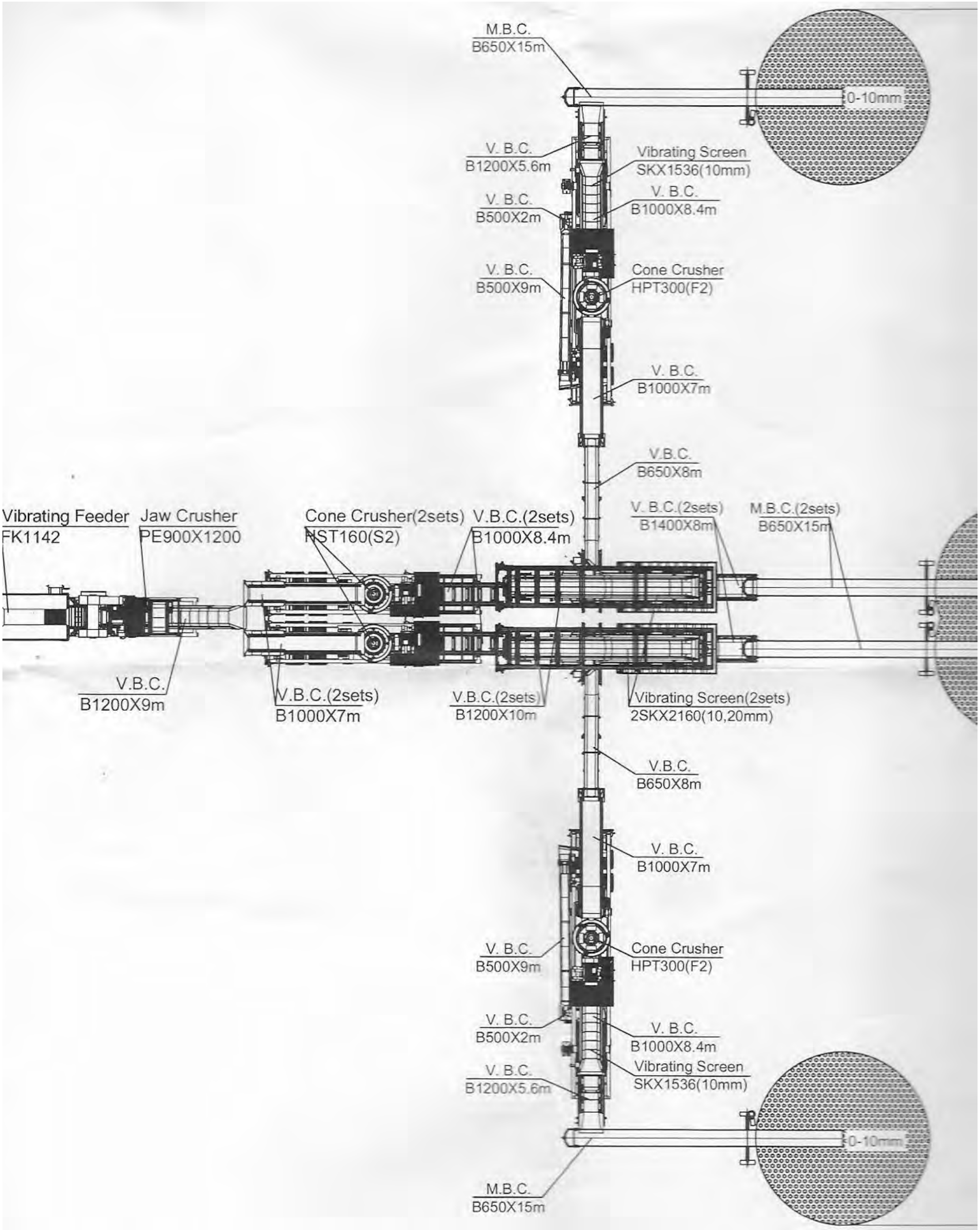


Figure 3-68: Crushing plant schematic

Once the ore has been crushed down to -12.3 mm (or to the customers specifications), the high grade product will be hauled to either the ROM Stockpile or the ROM Stockpile extension. The lower grade crushed ore will be fed into the Dry Magnetic Separation (DMS) plant to increase product grade. The approximate location of the DMS plant is shown on Figure 3-67. The plant consists of eight separate DMS units, with each unit having a processing capacity of 45 t/hr. Figure 3-69 to Figure 3-72 provide an example of the DMS plant.

Main noise sources include crushing, screening and magnetic separation operations. Operations to date have not given rise to any complaints and is not considered likely to in the future. Main dust sources include stockpiles, crushing, screening and magnetic separation operations. Details of dust and noise impacts and controls are provided in Section 7.

Figure 3-69: Example of the DMS unit

Figure 3-70: Rear view of DMS unit

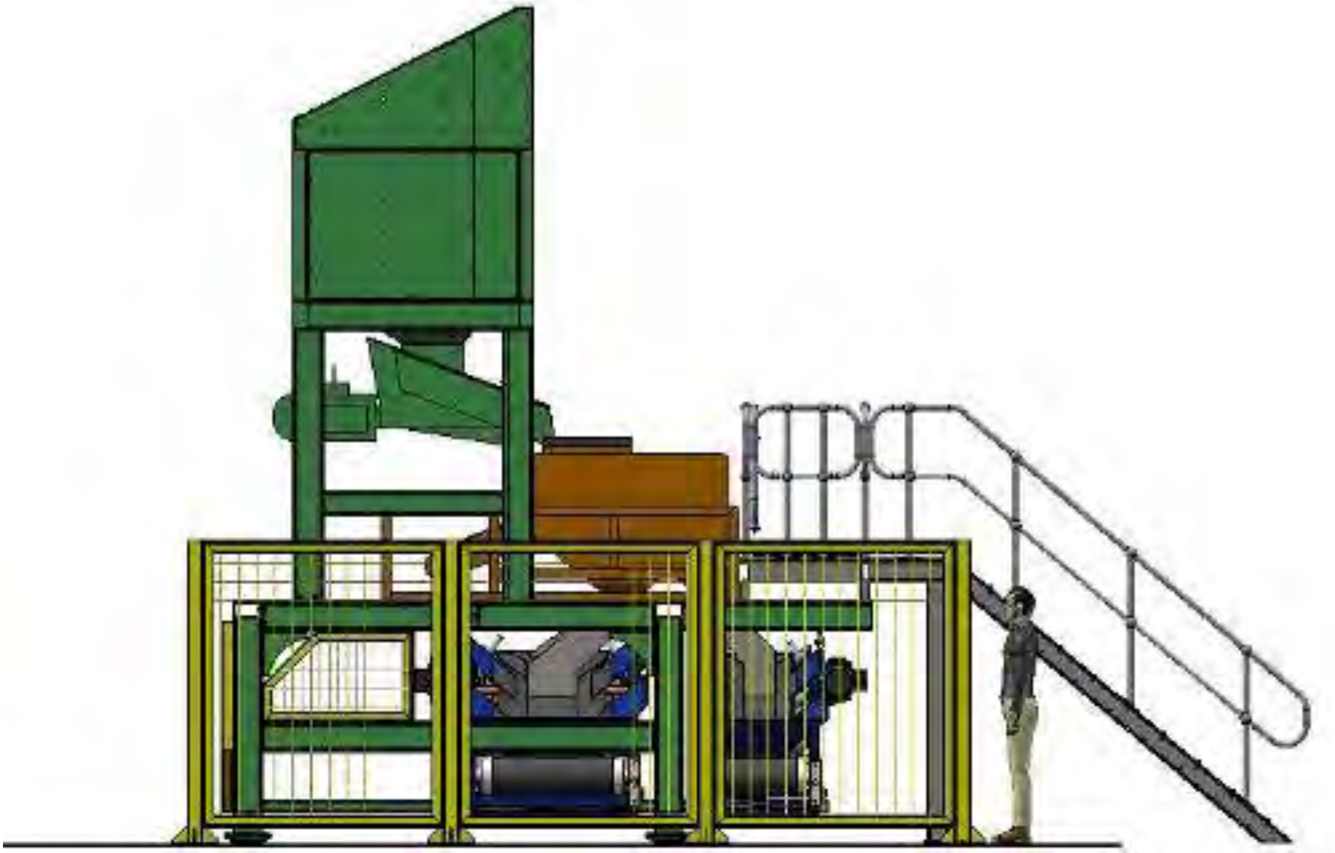


Figure 3-71: Side view of DMS unit

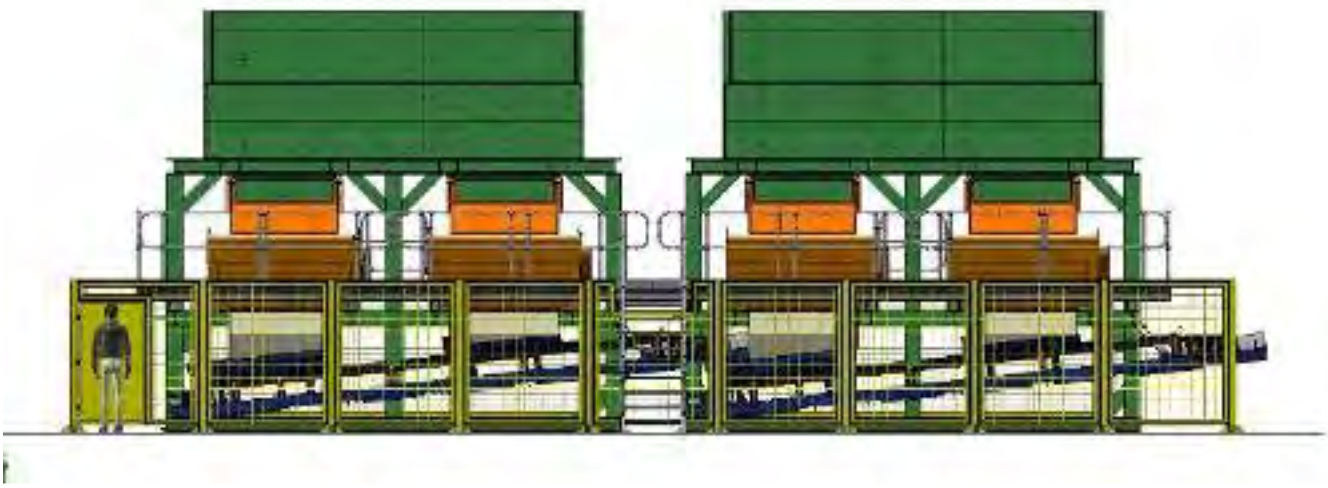


Figure 3-72: Front view of DMS unit

3.10 Product transport

3.10.1 Product road haulage (mine to rail loop)

Product is transported from the mine site to the Wirrida rail loop via the constructed haul road. The haul road has a total length of 96 km and for the majority of its route runs parallel to the existing Prominent Hill haul road located approximately 100 metres to the south.

Key characteristics of the haul road are detailed in Table 3-13.

Table 3-13: Key characteristics of the haul road

Item	Description
Tenement type	Miscellaneous Purposes Licence (MPL 125-131)
Road length	Approximately 96 km (from ML 6314 and ML 6442 to rail loop)
Road width	8 m haul road pavement
	23 m outside drain cut to outside drain cut (average)
No. of lanes	2 lane with additional widened passing lanes every 5 km

The existing sealed haul road crosses the Stuart Highway via a grade separated underpass.

Product haulage from the mine stockpile to the product stockyard at the Wirrida rail loop (see Figure 3-73) will be undertaken by multi trailer on highway style road trains up to approximately 75 m in length. Product haulage and stockpiling will be continuous, 24 hours per day, 7 days per week throughout the year. The haul road is a private road with restricted access as is necessary for the operating mine (and pastoral lease) management.

The road haulage operations will be managed under a traffic management plan to ensure safe and efficient operations.

Figure 3-73: Rail loop facility

3.10.2 Product rail transport

The Wirrida rail loop is approximately 0.5 km north of the Wirrida rail siding. The rail loop is a private facility owned by Peak Iron Mines. The rail loop has a length of 4.2 km. This allows one fully loaded train to be within the loop and one train awaiting loading. Both trains are completely clear of the main line rail traffic. Front End Loaders will be used to load product from the stockpile area onto the train wagons. An excavator may be used for final train wagon trimming in conjunction with the rail wagon weigh facility.

The rail haulage involves trains approximately 2.0 km in length hauling up to 12,500 tonnes per train in bottom dump or rotainer box wagons. A specialist rail operator will be contracted to operate and maintain the rail facilities.

3.10.3 Rehabilitation

The rail facilities will be decommissioned at mine completion and will be prepared for closure in accordance with the Closure and Rehabilitation Plan detailed in Section 5.

3.11 Wastes

3.11.1 Overburden

Information on the volumes and management of waste rock generated from the Peculiar Knob mining operations is provided in Sections 3.7.5 to 3.7.10.

3.11.2 Industrial and commercial waste

Commercial waste (food waste and packaging) from the service areas (and accommodation village if re-established), and industrial waste (waste oils, packaging, construction material and drums) are generated during operations.

Previous volumes of waste were calculated for the life of the project (three years) and assumed that each person generated 1.5 kg of waste per day. The expected breakdown of waste material is presented in Table 3-14.

Table 3-14: Waste type breakdown (indicative)

Waste category	%	Total (kg/day)	Mine life / tonne	Cubic metres / day	Mine life / m^3
Compostable/putrescibles	40	90	99	1.1	1,205
Paper	10	22.5	24	0.8	876
Cans	10	22.5	24	0.8	876
General waste	40	90	99	1.1	1,205
TOTAL	**100**	**225**	**246**	**3.8**	**4,162**

Note: real time volumes and kg/day provided by Australian Camp Services.

3.11.3 Wastewater

Ablution facilities at the mine site and the Wirrida rail loop will be serviced with approved wastewater treatment or septic tank systems.

3.11.4 Rehabilitation

Rehabilitation and closure details are further detailed in Section 5 for LOM.

3.12 Description of supporting infrastructure

3.12.1 Mine site access

Access to the mine site from the Stuart Highway is via the haul/access road. Safety protocols have been developed for all vehicles travelling on the haul/access road to either the mine or the rail loop and includes communication through 2 way radio.

Visitors to the mine site are required to undertake a site induction upon arriving onsite. On arrival, visitors must check in at the Administration Office and undergo BAC testing. Visitors to site will be accompanied at all times by a nominated, inducted employee.

3.12.2 Office and administration facilities

The office and administration facilities will consist of demountable offices, store rooms, crib and ablution blocks to service the management team, pit mining operations and the road train haulage operations.

3.12.3 Accommodation village

The site workforce is planned to be accommodated at the Prominent Hill Mine Village under a life of mine agreement with OZ Minerals (the mine owner) utilising existing spare capacity.

As a contingency item, due to issues of sharing the OZ Minerals facility and COVID 19 risk management and social isolation requirements, Peak Iron are reviewing the need to re-establish their own accommodation village on MPL 127, similar to the previous facility at this location. If this option is required, Peak Iron will obtain other required licences and/or permits (such as EPA licence for wastewater treatment plant etc.) for the re-establishment of this facility.

The accommodation village location is approximately 3 km west of the Stuart Highway and covers an area of approximately 10.39 ha in size (see Figure 3-74).

If required, the accommodation village layout would fit within the existing disturbed site footprint to cater for up to 200 people. Initially a 180 person facility would be constructed.

The accommodation village would include kitchen/dining facilities and associated offices, wet mess, dry mess, recreational facilities, electricity generation, communications system, sewage treatment plant, RO plant waste evaporation pond and car parking.

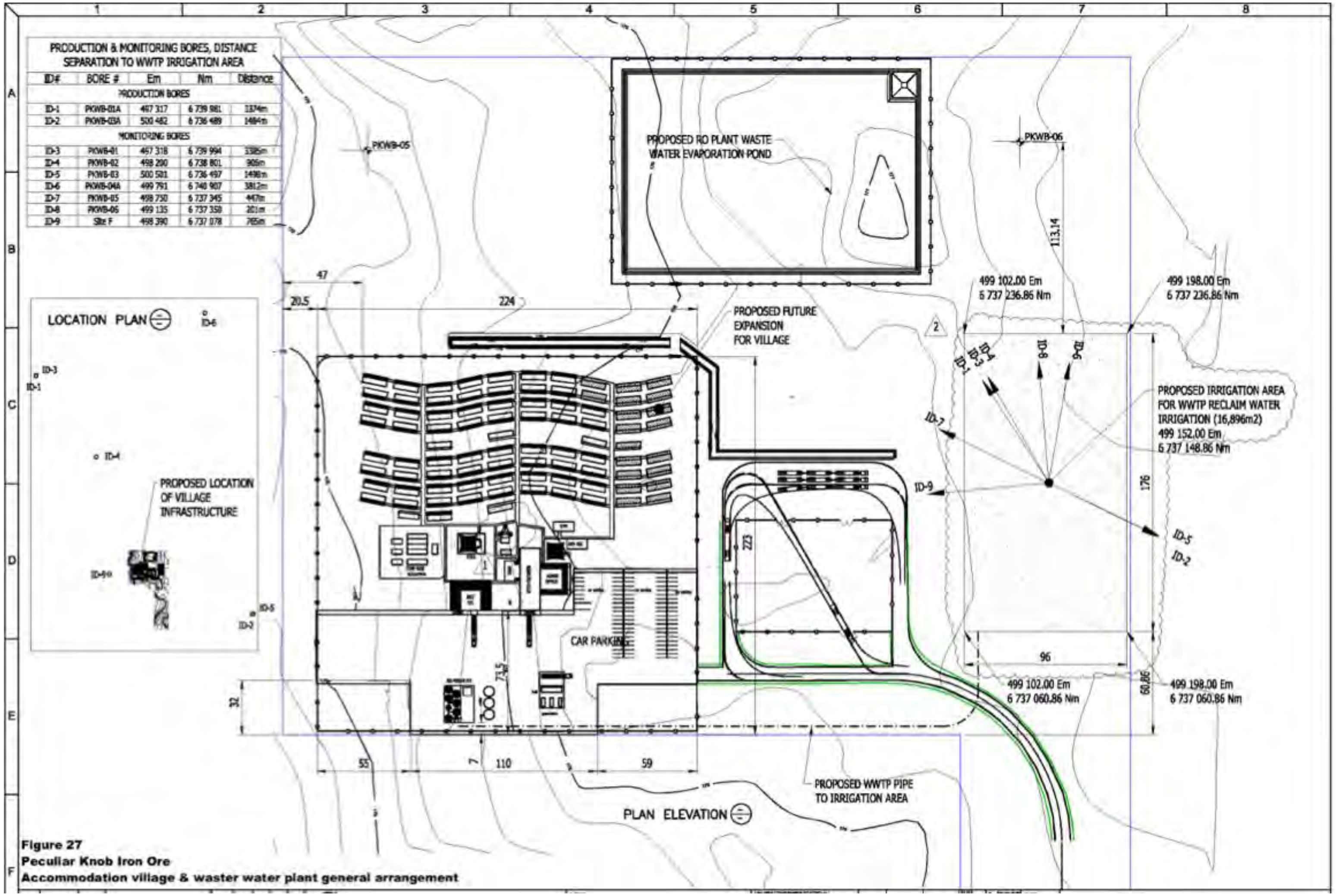


Figure 3-74: Indicative details of the optional accommodation village and wastewater plant layout

3.12.4 Maintenance workshop area

The maintenance facilities will consist of a demountable facility and the current high level shed / store. The facilities will include offices, daily service bay, repair bays, stores area, tyre change facility, light and heavy vehicle washdown with hydrocarbon recovery system, crib and ablution areas. There will be separate maintenance facilities for the train loading and road train haulage that may be located at the Wirrida rail loop.

3.12.5 Explosives and chemical storage

Blasting is undertaken using a range of explosive compounds depending on ground conditions. Approximately 80 tonnes of heavy emulsion product and 600 tonnes of ANFO are planned to be used per annum, depending on conditions and mining activity.

Blasting chemicals will be stored in the purpose built storage facility capable of storing 100 tonnes of this product as well as a tank for a smaller quantity of emulsion. Detonators and cartridge/package type explosives will be stored in conventional skid mounted 10 tonne magazines with appropriate fencing and earthing to comply with relevant Australian Standards and the Mines and Works Inspection Act 1920-1974 and Regulations 1998.

The magazine area is located northeast of the WRD and will be established in accordance with SafeWork SA requirements. The magazine will be capable of storing in the order of 80,000 detonator units and 10,000 kg of high explosives.

3.12.6 Fuel storage

Fuel storage at the mine site will be located adjacent to the mining plant maintenance area. There will also be a storage facility at the Wirrida rail loop adjacent to the road train maintenance facility. Each facility will have a nominal 300 kL capacity and will be constructed in accordance with Australian Standard AS 1940:2017, *The storage and handling of flammable and combustible liquids* and double skinned tanks will be in accordance with EPA Guidelines (EPA Guideline 080/04, 2007). The final configuration of the fuel storage facilities will be confirmed by the contractors operating that area. All facilities will be licenced as required. Only bulk diesel fuel is planned to be stored onsite.

Annual diesel usage during normal operations (including usage by all contractors) will be in the order of 12 - 15 ML.

Other hydrocarbons such as oils will be stored at approved facilities.

3.12.7 Water supply infrastructure

Water is needed for dust suppression in the mine, crusher, roadways and vehicle wash-down and as a source of potable water for the accommodation village should it need to be re-established.

The total non-potable water required for mining operations is between 0.75-1.25 ML/d.

Three borefields were identified for ML 6314 and ML 6442; Stafford Borefield, Penrhyn Borefield and Camp Water Borefield.

The Camp and Penrhyn Borefields are planned as the primary water supply with groundwater from the Stafford Borefield to be utilised only if required.

Water for the accommodation village (if re-established) will be obtained from the Camp Water Borefield. The locations of the Camp and Penrhyn borefields are indicated in Figure 3-75 and Figure 3-76 respectively.

Water licences have been obtained from DEW for the taking and use of underground water for Industrial purposes from the Camp and Penrhyn borefields. An application for a water licence for the Stafford borefield will be submitted in the future if required.

Penrhyn borefield

The Penrhyn Borefield will comprise two production bores and a 26.5 km underground transfer pipeline to a water transfer tank and turkey's nest dam on MPL131 at the Wirrida rail loop. From the water transfer tank and turkey's nest dam water is transferred via an underground/above ground pipeline adjacent to the Peculiar Knob haul road (MPL125–MPL130) to a turkey's nest dam on the mine site (ML6314). The infrastructure at each of the two bores includes a pump discharge piping, electrical control, diesel generating set and a self-bunded fuel tank.

Production is based on a maximum continuous flow rate of 17 l/s being pumped from the two bores.

Camp borefield

The Camp Water Borefield will comprise 2 production bores, 7 monitoring wells and approximately 6 km of above ground water supply pipeline (4 km for PKWB-01A and 2 km for PKWB-03A).

The pipeline from Bore PKWB-01A will comprise 200 mm PN6.3 butt-welded poly pipe and the bore is serviced by a submersible pump and a diesel Genset, producing a maximum of 11 litres/second flow rate.

The pipeline from Bore PKWB-03A will comprise 110 mm PN 12.5 compression fitting joined poly pipe and the bore is serviced with a submersible pump and a diesel Genset, producing a maximum of 5 litres/second flow rate.

Stafford borefield

The Stafford Borefield has not been developed to date and is being reserved as an emergency resource in the event that other water resources are compromised in some manner.

The Stafford Borefield water supply infrastructure comprise three production bores (Hawks Nest tenement) from which groundwater can be extracted and transferred via an underground pipeline approximately 30 km north to two water storage tanks located approximately one km east of the Stuart Highway. From the storage tanks water can be trucked via an access road and the Stuart Highway for use. Water can also be trucked to a turkey's nest dam located adjacent to the haul road and accommodation village access road on MPL127 and stored prior to use as required.

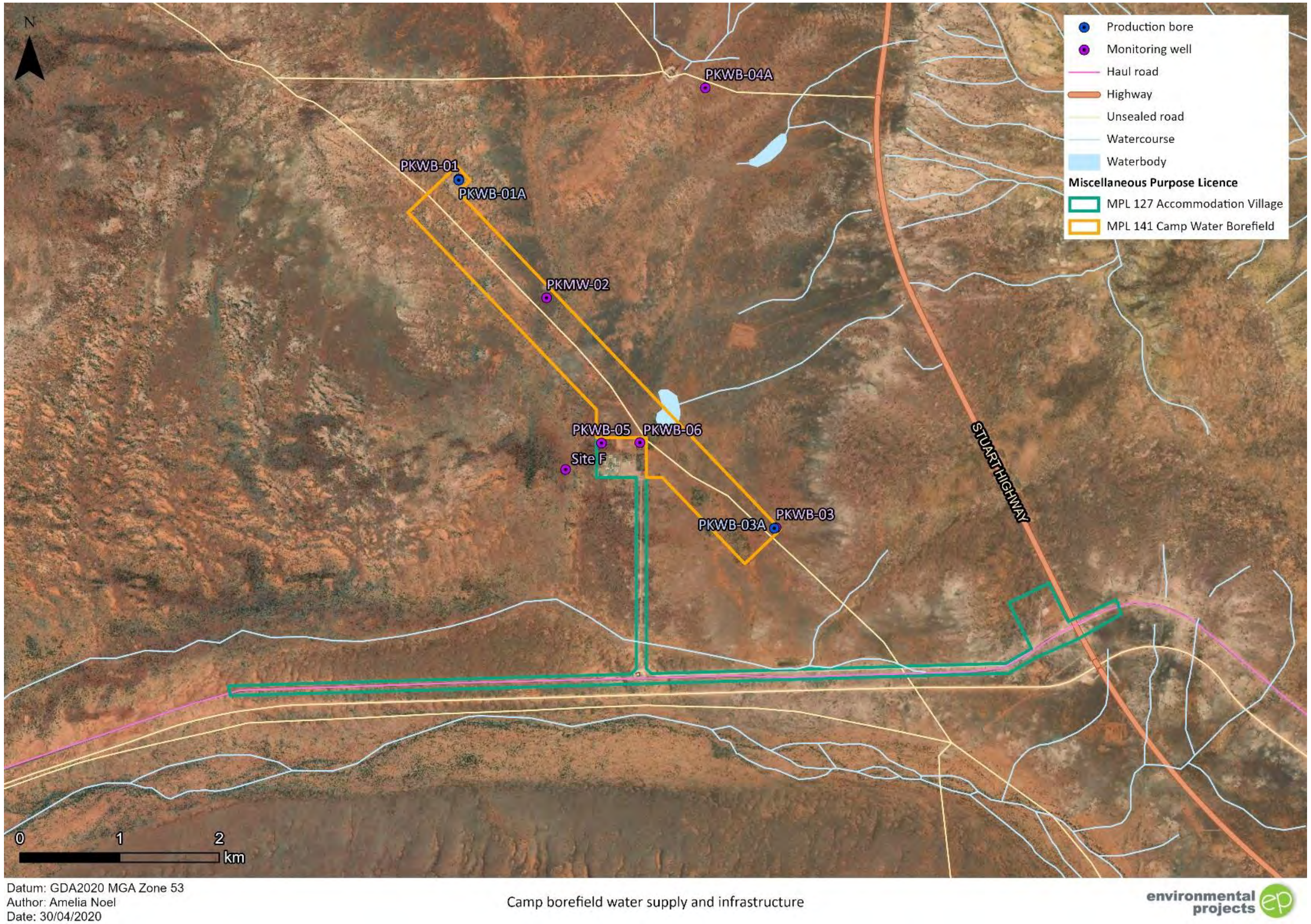


Figure 3-75: Camp borefield water supply and infrastructure

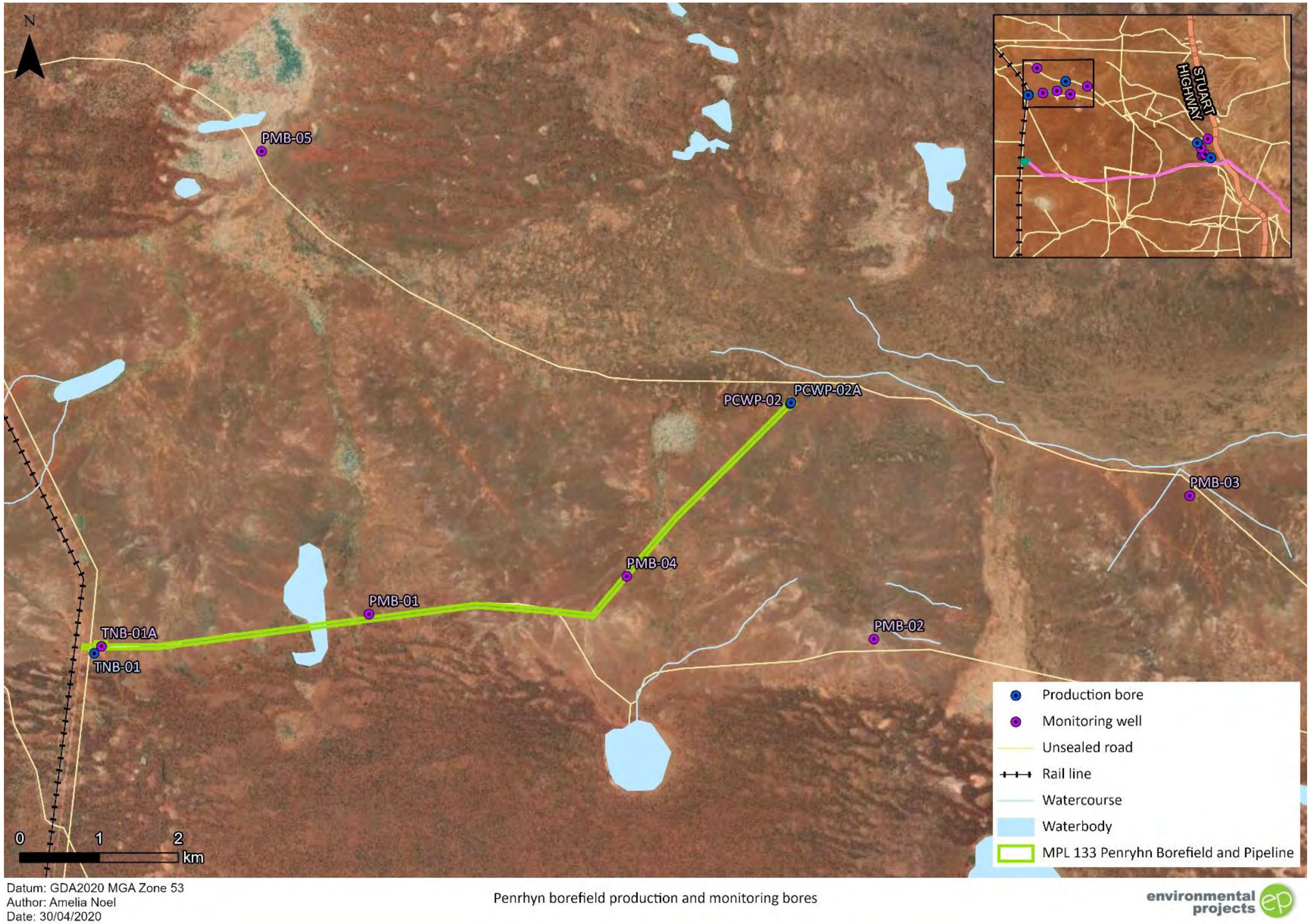


Figure 3-76: Penrhyn borefield production and monitoring bores

3.12.8 Rail infrastructure

Product will be transported via rail from the Wirrida rail loop to Port Adelaide, Whyalla or Port Augusta (future Port Playford). The rail haulage involves trains approximately 2.0 km in length hauling up to 12,500 tonnes per train in bottom dump or rotainer box wagons. A specialist rail operator will be contracted to operate and maintain the rail facilities.

The Wirrida rail loop is approximately 0.5 km north of the Wirrida rail siding. The rail loop is a private facility owned by Peak Iron Mines. The rail loop has a length of 4.2 km. This allows one fully loaded train to be within the loop and one train awaiting loading. Both trains are completely clear of the main line rail traffic.

3.12.9 Public roads, services and utilities used by the operation

The Stuart Highway is the closest main public road to the operations.

Product haulage vehicles access the mine site and the rail loop facilities via an underpass of the Stuart Highway. Light vehicles access the Stuart Highway for short durations when travelling between neighbouring locations such as Coober Pedy, Glendambo, Wirrida loop and the mine site.

Operations of the haul road and other mining infrastructure do not have any effect on the operation of the Stuart Highway.

There are no public services and utilities that are used for the mine or rail loop.

Table 3-15 is an estimate of light and heavy vehicle movements on public roads between the mine site and Coober Pedy on the Stuart Highway. Vehicle movements vary depending on the intensity of mining and special campaigns during life of mine.

Table 3-15: Estimated vehicle movements on public roads per week

Item	Description	Estimated Movements Per Week
Heavy Vehicles	General supplies, fuel, bulk explosives	30
Bus	Shift change to airport	20
Light Vehicle	Shift change, visitors, visiting contractors	60

3.12.10 Visual screening

Due to the location of infrastructure associated with the mining and their respective locations, the visual impacts are limited, and visual screening is not incorporated in designs or layout.

3.12.11 Site security and emergency services

Site security and emergency services requirements vary depending on activities during life of mine. There will be a site security access control point that will monitor and restrict site entry on a 24 hour basis, in accordance with Department of Defence WPA access requirements. Road signage prohibits unauthorised entry onto the access road and all authorised entry is directed to the mine office where visitors undergo induction.

The specific site security and access management plan will include the following measures:

- Emergency Command Team and Communications Officers
- Emergency Response and Crisis Management Plans
- operational staff trained in security and emergency procedures
- induction to be undertaken prior to being allowed on-site
- all personnel operating on site and visiting site will have security clearance in accordance with Department of Defence requirements
- all site visitors will be escorted at all times
- all authorised personnel will carry identification cards.

A trained Emergency Response Team and emergency services officer will be on site 24 hours, 7 days per week. Fire-fighting equipment will be installed and maintained in accordance with legislation and regulations. The Site Emergency Response Team will be trained and equipped to respond to all identified threats on site including but not limited to fires, road accidents, medical emergencies and confined space rescue.

3.12.12 Rehabilitation

At mine completion all facilities will be decommissioned and rehabilitated in accordance with Section 5.

3.13 Resource inputs

3.13.1 Workforce

The workforce requirements will vary during the life of the mine and is dependent on the level of mining activity, see Section 3.8.2.

3.13.2 Energy usage

The majority of operations will be conducted 24 hours per day, seven days per week and the total annual energy consumption is in the order of 2–2.5 MWh.

Each operational area will be supplied with individual power generators as estimated in Table 3-16. There are no overhead power lines between the individual areas of operation.

Table 3-16: Indicative power supply summary

Mine component	Power supply
Mine site	Four 100 kW generators
Crusher	Three 450 kW generators
Water infrastructure	Four 80 kW generators and four 100 kW generators
Wirrida rail loop	Two 200 kW generators

3.13.3 Fuel usage

Fuel usage will vary depending on mining activity and annual usage is in the order of 12–15 ML of diesel.

3.13.4 Water sources

Water is required for dust suppression in the mine, crusher, roadways (excluding the sealed haul road) and vehicle wash-down. Between 0.75 to 1.25 ML/d of non-potable water is required for operations.

Three borefields have been identified as a groundwater resource, namely Stafford Borefield, Penrhyn Borefield and Camp Borefield. The Camp and Penrhyn Borefields are the primary water supply for the Peculiar Knob project with groundwater from the Stafford Borefield only to be utilised if required. Water for the accommodation village (if re-established) would also be obtained from the Camp Water Borefield.

Section 3.12.7 provides a summary of the water infrastructure related to the water supply.

3.14 Mothballing - Care and Maintenance Management Plan

The Peculiar Knob operation was placed into care and maintenance in January 2015 by the previous owner (Arrrium Mining). The approved Peculiar Knob Mothballing Environmental Management Plan (mothballing plan) was integrated within the PEPR. The program of works to set up for the care and maintenance mode was completed in July 2015 and the site has since been in the monitoring phase. Peak Iron recommenced mining operations at Peculiar Knob during February 2020.

The Mothballing Plan would be triggered in the event that a suspension of mining operations is required in the future.

Key aspects of the mothballing plan included:

- 1 – 5 m vertical temporary capping of the PAF cell inside the northern WRD
- rehabilitation of specific areas including completed segments of the northern WRD, the area cleared for the proposed landfill site at the accommodation village, the underpass stockpile area, and the area inside of the truck loop at Wirrida
- installation of gates and signage at potential access points to ensure public safety
- review of temporary, progressive and final rehabilitation requirements
- implementation of on-going environmental management and monitoring programs during the care and maintenance period.

Further details of the mothballing plan are provided below.

3.14.1 Mine (ML6314 and EML6366)

Mining ceased in April 2015.

WRD profiling works were undertaken from February through to April 2015 and topsoil was spread on the upper levels of the profiled WRD (see Figure 3-77). Any further work on the WRD will be deferred until recommencement of mining, or closure.

Spoon drains and windrows were put in place at various points around the tenement boundary, pit crests and ROM areas. Drainage works for PAF management were also completed (see Figure 3-78).

Mothballing preparations at the mine site included:

- draining and modification of Turkey Nest 5 to prevent fauna entrapment
- works to ensure all remaining infrastructure was in a safe and steady state
- installation of drainage windrows and a barrier windrow for the mine pit and haul road to prevent water inflow. No fencing or abandonment bunds were constructed
- installation of windrows on the southern side of the ROM loop road to stop water drainage off the lease
- installation of gates and signage, as necessary, to prevent/deter public access (see Figure 3-79)
- removal of all general waste, LV/MV tyres (except those exempted for placement in the WRD, see Section 3.11), chemicals, hydrocarbons, explosives and septic/sewerage solids from site in accordance with EPA requirements
- reinstatement of the spoon drain along the northern boundary to prevent any impacts off lease
- construction of a spoon drain along the southern boundary to prevent any impacts off lease
- installation of drainage, where required, to prevent ponding in sections of the WRD not yet rehabilitated
- decommissioning of the RO Plant and relocation of the related plant and equipment off ML6314 for storage
- disposal of large earthmoving tyres to within the WRD (approval gained from EPA, see Section 3.11), in accordance with EPA requirements
- installation of a bund at access ramps into the pit and onto the WRD to prevent access (see Figure 3-79).

WRD rehabilitation efforts were inspected and photo point monitoring undertaken in November 2015 and again in April 2016. No rill or sheet erosion or other stability issues were observed on topsoiled or un-sheeted sections on either occasion. Topsoil placed on the upper slopes had remained where it was placed and there was no indication that it had started to migrate down slope. Minor revegetation through natural recruitment of Chenopod species had occurred on the Western corner of the WRD at ‘D’ in Figure 3-77. Ongoing monitoring is detailed in Section 8.2.

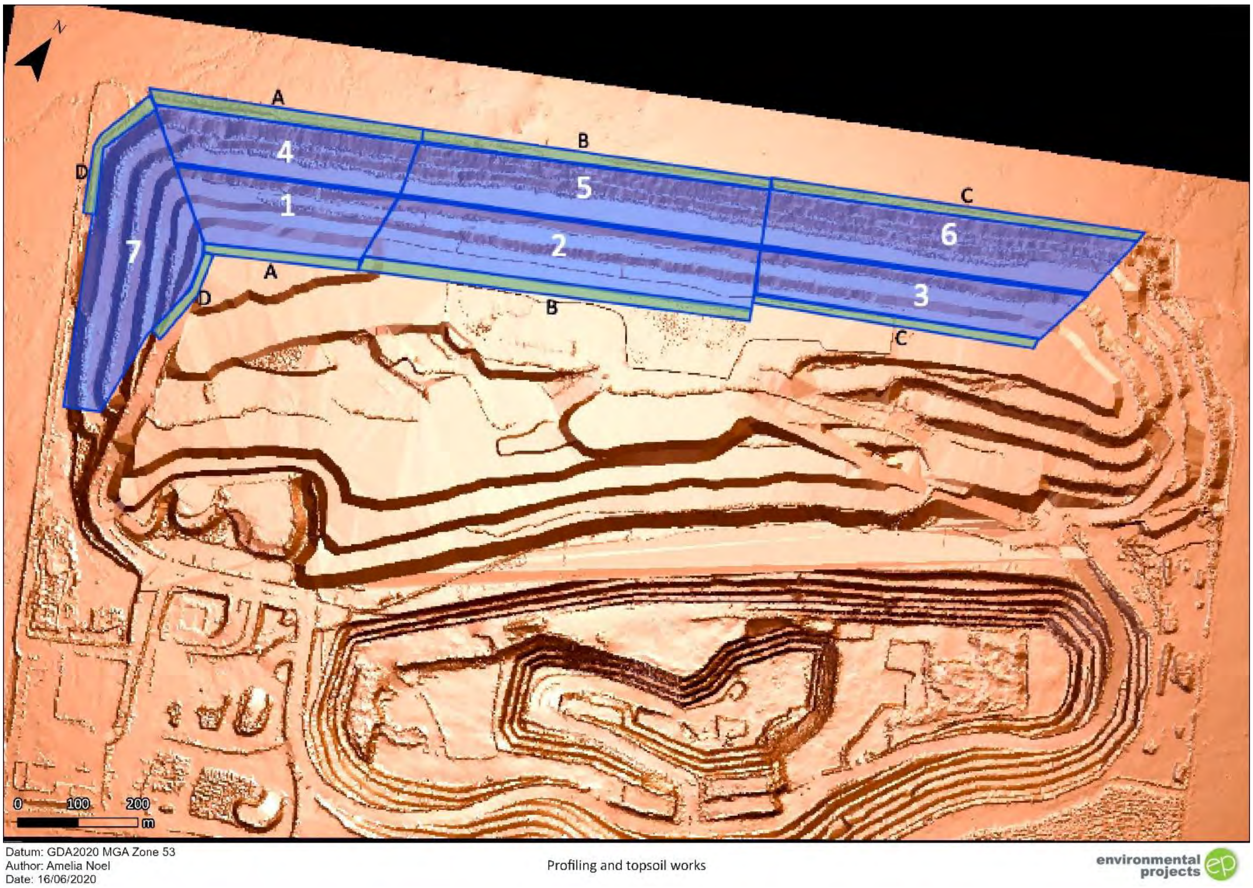


Figure 3-77: Profiling and topsoil works

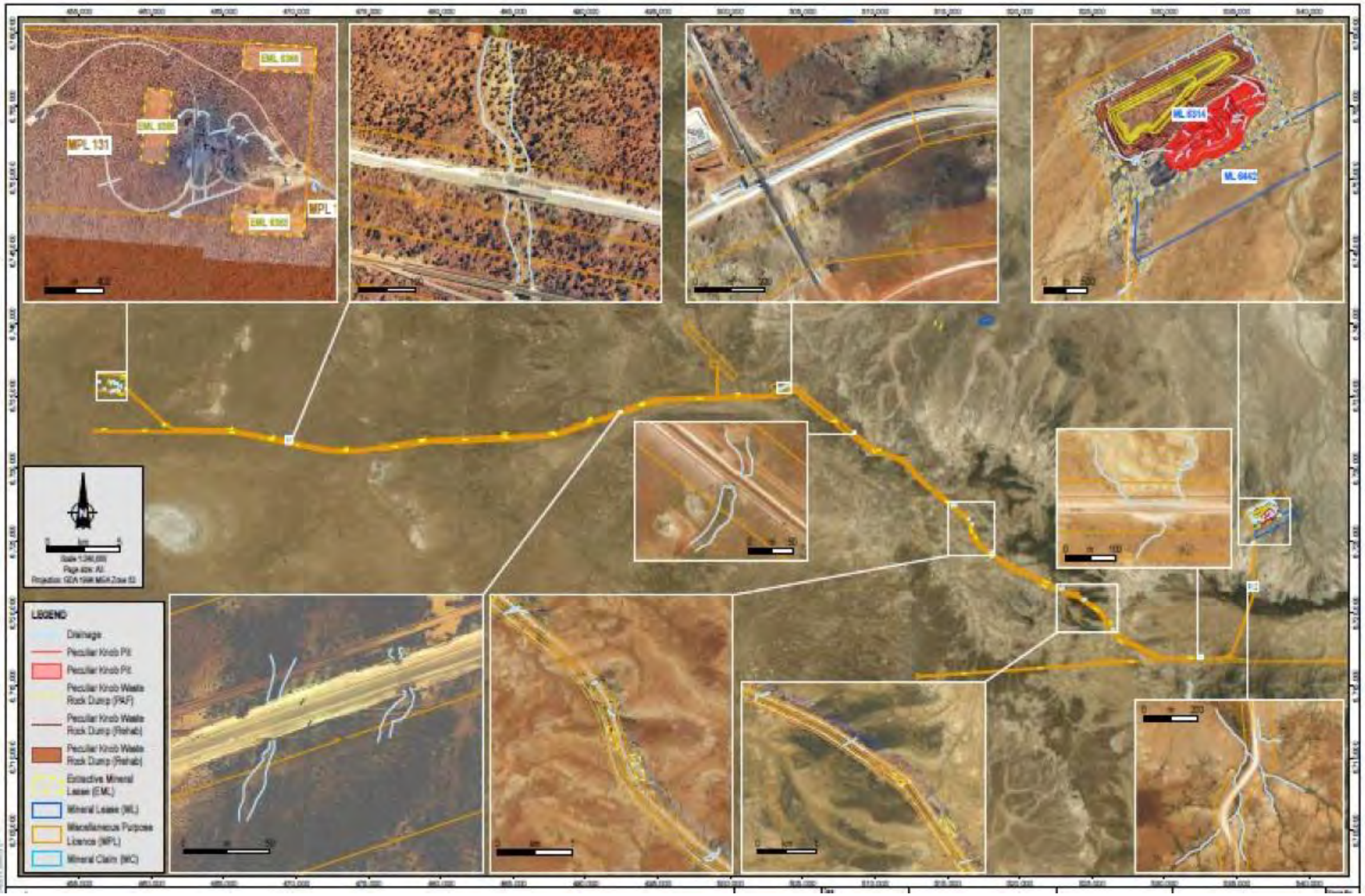


Figure 3-78: Drainage management

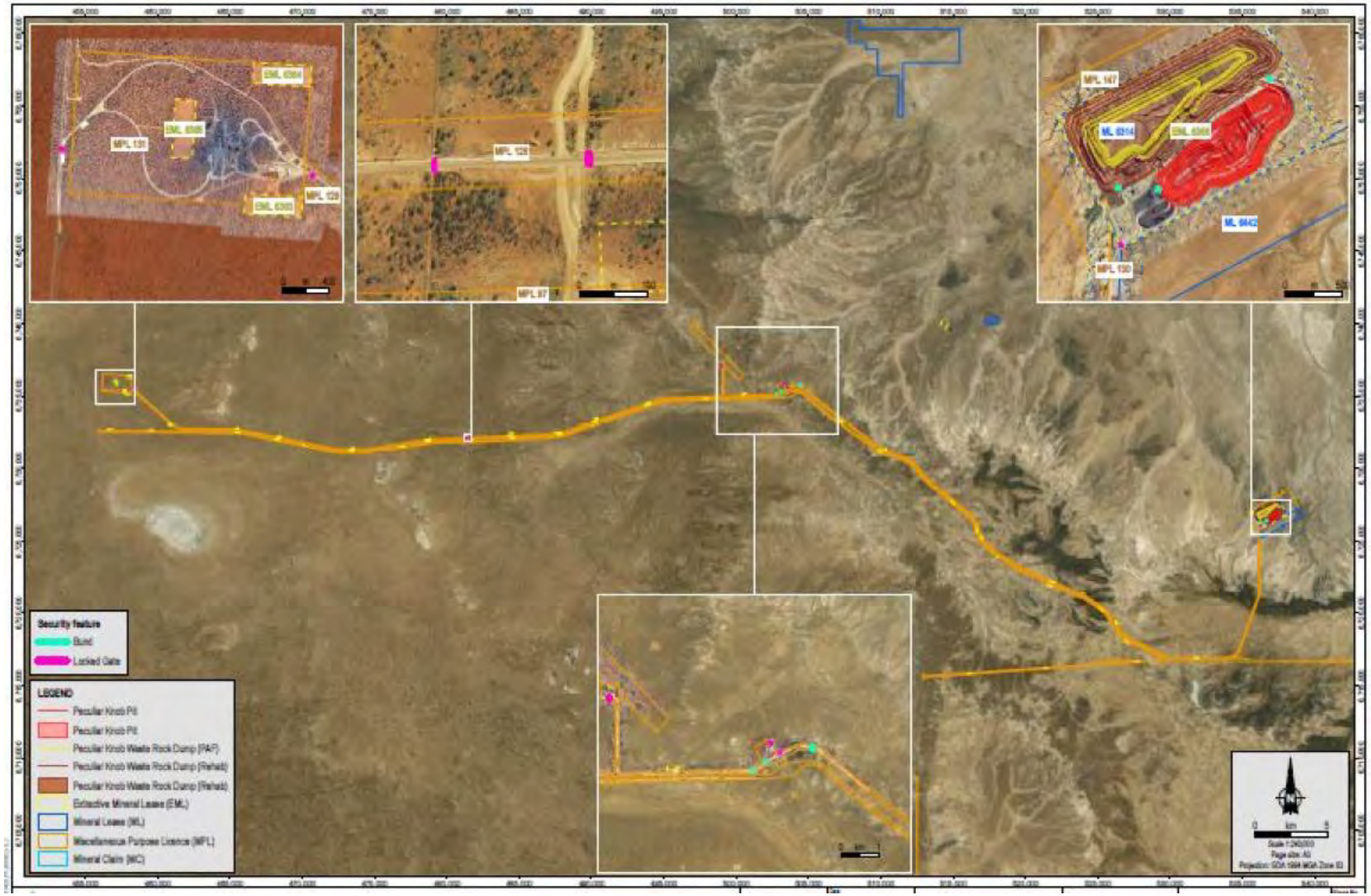


Figure 3-79: Site security features

Rehabilitation actions that formed part of the mothballing plan on ML6314 and EML 6366 included:

- part rehabilitation of the WRD
- encapsulation of PAF cells to prevent ARD formation whilst site is mothballed (see Figure 3-80)
- profiling of WRD to the approved design of a 15 degree slope with some topsoil placement on the upper slopes to facilitate revegetation (see Figure 3-81)
- installation of controls to manage drainage during rehabilitation works to prevent ponding on top of the WRD or on the berms
- monitoring and maintenance of rehabilitation works to ensure stabilisation of the WRD and encapsulation of PAF materials.

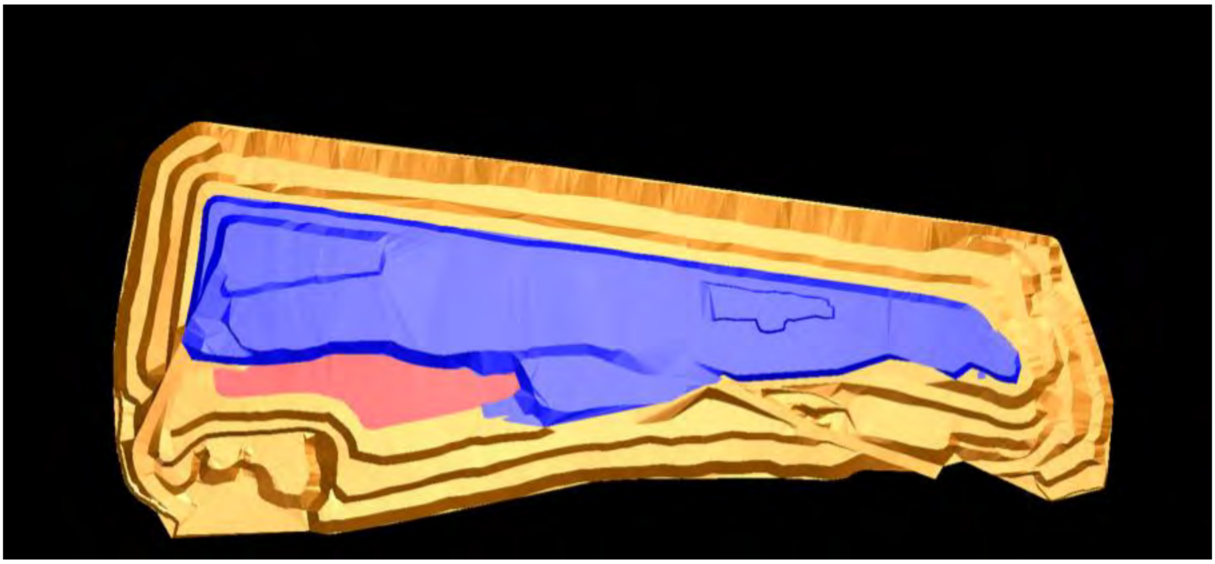


Figure 3-80: PAF encapsulation works (actual)

Red = 1M cover only for the operational restart area

Blue = Minimum 5M vertical cover over PAF material

Cover thickness on batter slopes to all PAF material = 15M

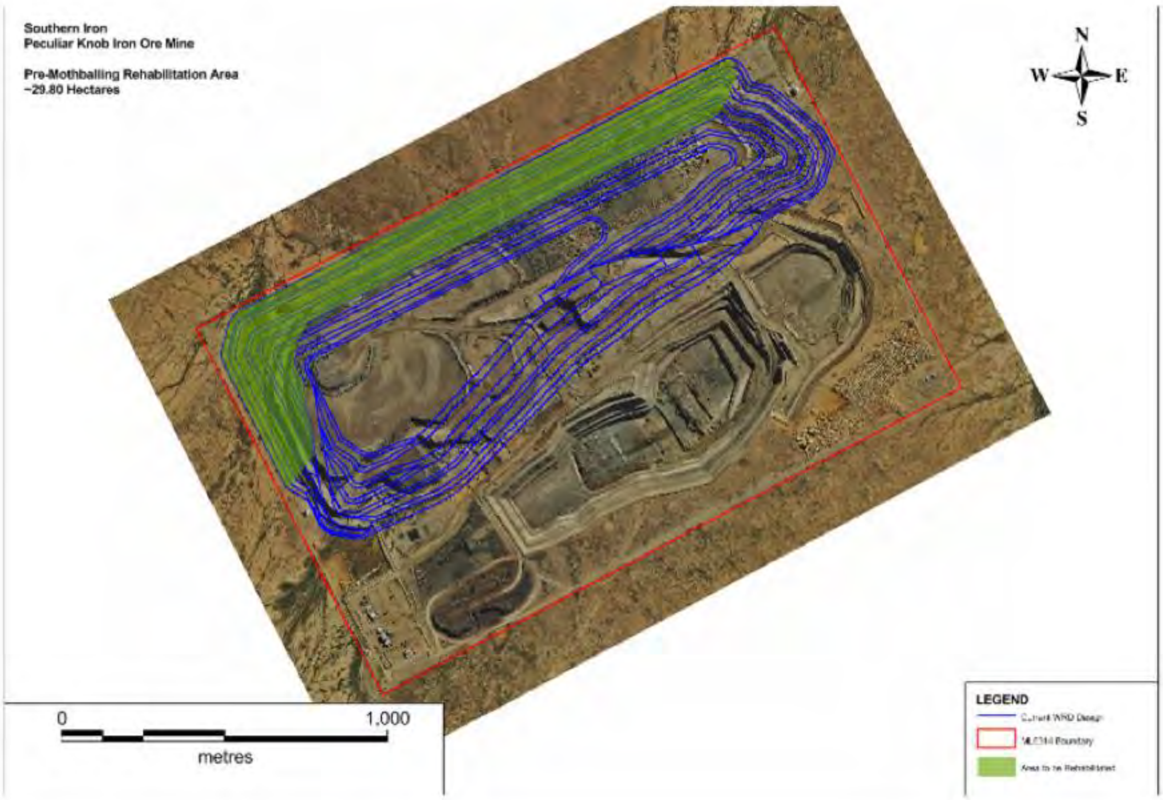


Figure 3-81: Mine WRD profiling works and rehabilitation

3.14.2 Wirrida rail loop (MPL131)

Ore haulage, crushing and screening, and train loading activities at Wirrida rail loop ceased in April 2015.

Mobile equipment, demountables, and removable items such as crushers, screens, stackers and gen-sets, plus consumables (such as hydrocarbons), were removed from site.

The rail loop siding, weighbridge deck and communications hut remained on site.

All remaining infrastructure was left in a safe and secure state, and monitored.

Other aspects of the Wirrida rail loop mothballing include:

- draining and modification of Turkey Nest 1 and the evaporation pond, to prevent fauna entrapment
- fines spillage and accumulations from crushing and screening activities collected, buried and stabilised under cover of mineralised waste
- communications equipment removed
- crusher support steelwork left in place

- inspection, monitoring and maintenance of all drainage channels and culverts around the rail loop to ensure that they are capable of performing as designed
- installation of gates and signage at the entrance to Wirrida from the Penrhyn Road to prevent/deter access
- decommission and removal of the RO Plant
- removal of all general waste, tyres, chemicals, hydrocarbons and septic systems from site in accordance with EPA requirements.

Rehabilitation works completed as part of the mothballing preparations at the Wirrida rail loop are shown on Figure 3-82, and involved the following actions:

- ripping of the surface using a grader
- respreading of topsoil over the area
- re-ripping of the topsoil treated area with a grader to aerate the soil and allow for water infiltration
- hand-broadcasting native seeds (sourced from the Wirrida area) following rain (if practical) for revegetation.

Figure 3-82: Wirrida rehabilitation area

3.14.3 Accommodation village (MPL127)

Activities associated with the accommodation village included:

- general removal of buildings, messing amenities and offices
- removal of the RO Plant
- removal of general waste, tyres, chemicals, hydrocarbons and septic/sewerage from the site in accordance with EPA requirements
- removal of the fuel tank and gas tanks
- closing and locking the Stuart Highway entrance gates and placement of signage to deter public access
- installation of a secure gate on the Village boundary fence across the access road into camp, to prevent/deter public access
- removing items in the heavy vehicle laydown yard.

The accommodation village area was rehabilitated. Figure 3-83 provides an overview of the site and the initial rehabilitation zone (un-used landfill zone). Once buildings and amenities were removed the site was prepared for rehabilitation. Rehabilitation works included the following:

- the use of a grader to rip the surface area
- respreading of topsoil
- re-ripping of topsoil treated areas by a grader to aerate the soil and allow for water infiltration
- hand-broadcasting of native seeds (sourced from the Camp area) following rain, if possible.

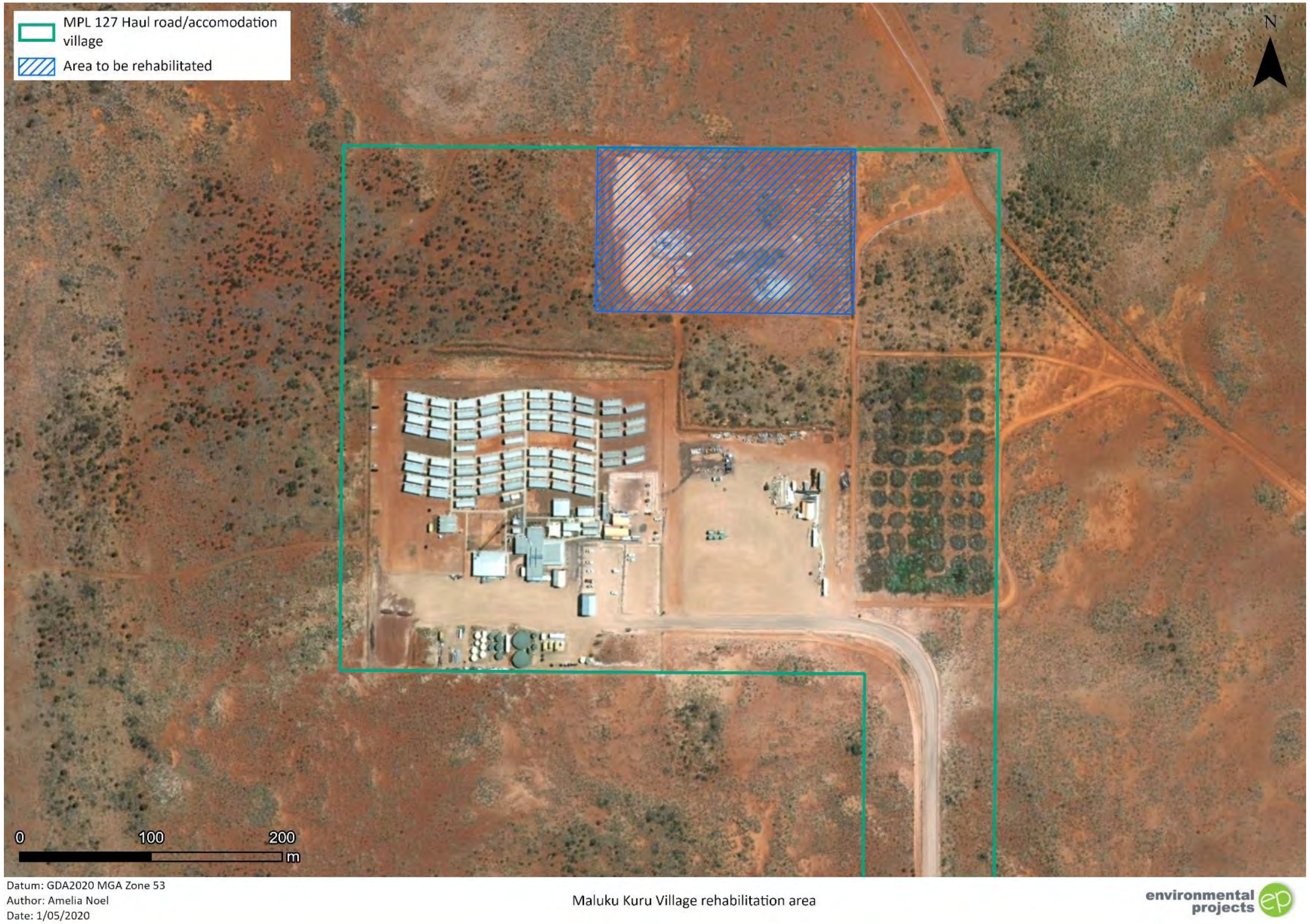


Figure 3-83: Maluku Kuru Village rehabilitation area

3.14.4 Haul roads (MPL125-130)

The haul roads remained with gates installed at agreed locations to prevent access. Access was allowed by adjacent landowners/pastoralists. The underpass was blocked off on either side with windrows. The water pipeline alongside the haul road remained depressurised. All pumps and bores were removed.

Activities associated with the haul roads also included

- installing gates and signage at the Stuart Highway entrance, and at the Old Stuart Highway entrance. Closed and locked gates and signage to deter public access
- draining and modifying Turkey Nests 2, 3 and 5 to prevent fauna entrapment
- inspecting culverts under the road at surface water intersections at completions of work. These culverts were added to the site's environmental inspection checklist for ongoing monitoring and assessment.

Rehabilitation of the Stuart Highway underpass is shown on Figure 3-84. Rehabilitation works included:

- the area previously used for storage of material excavated for the construction of the underpass, with one small area (approximately 10% of the total area) left for stockpiling sealing aggregates for haul road maintenance
- profiling the remaining aggregate stockpile to minimise the impact of visual amenity to highway users
- ripping the compacted surface around the base of the aggregate stockpile using a grader
- respreading topsoil and re-ripping using a grader to aerate the soil and allow for water infiltration
- broadcasting of native seeds (sourced from the underpass area) by hand, following rain if possible.

No rehabilitation of the haul road was proposed under the Mothballing Plan.

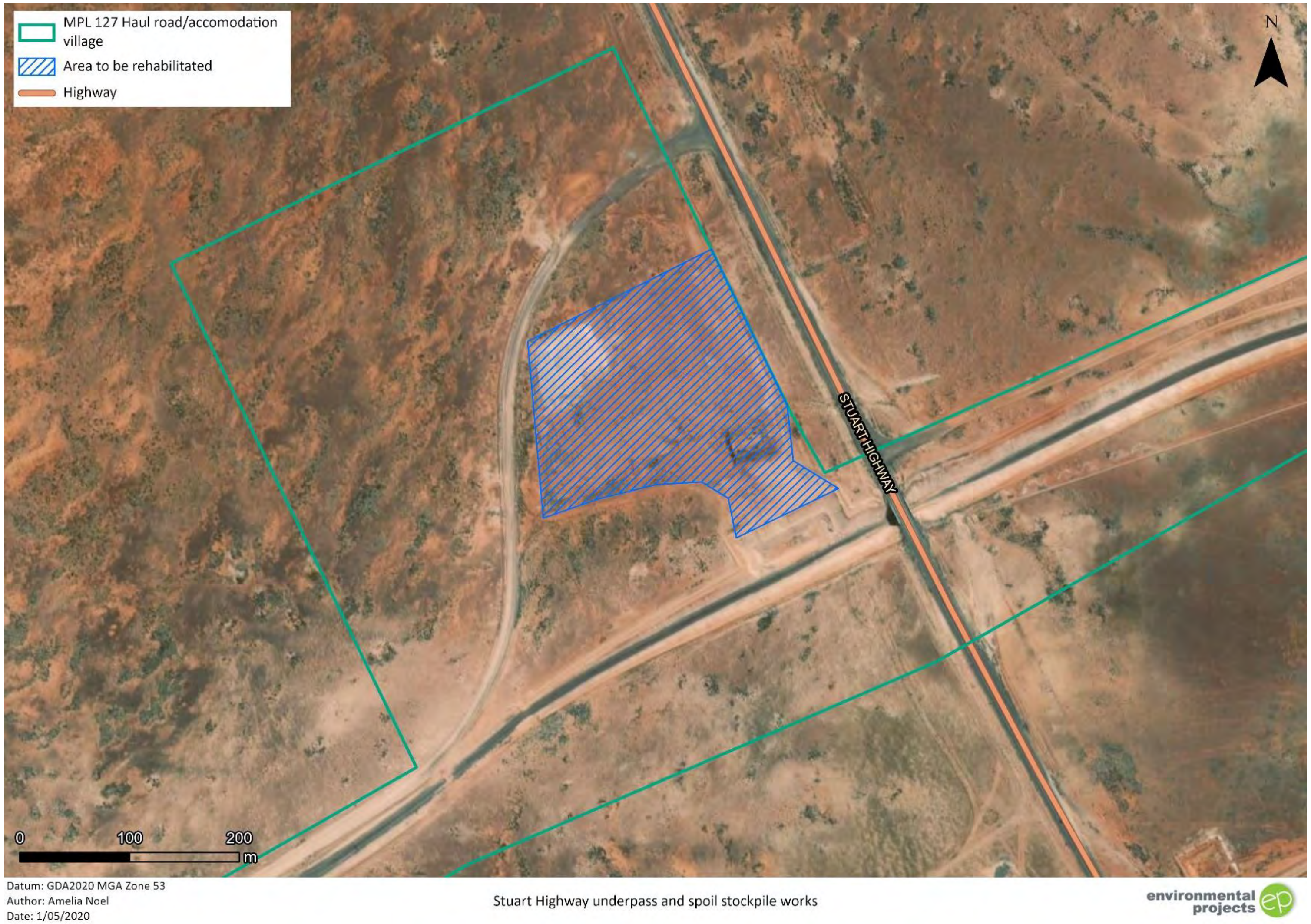


Figure 3-84: Stuart Highway underpass and spoil stockpile works

3.14.5 Water borefields (MPL133-134,141)

The mothballing plan for the water borefields included:

- removal of pumps from the four operational production bores (TNB-02, PCWP-02A, PKWB-01A, PKWB-03A) and capping and locking of bore casings
- removal of generators and control boxes from each production bore, for storage
- off-site removal, recycling or disposal of all other items at the production bores
- anchoring of all water tanks, (which remained in the current locations), with water
- disconnection of turkey nest pumps for removal and storage
- opening and draining breather valves for the pipeline (which remained in place). Breather valves were opened and water naturally drained onto the cleared pipeline track, and into haul road shoulder drain, all within the lease boundary and on cleared areas of ground.

DEW were notified of the actions undertaken in relation to mothballing production bores.

3.14.6 Borrow pits (EML6364-6382)

The mothballing plan for the borrow pits included:

- checking all lease pegs to ensure that they were compliant with DEM requirements
- ensuring borrow pits (EML6367, EML6370, EML6373 & EML6375) were adequately stabilised for the mothballed phase
- installation of bunds at the entrances of the open borrow pits to prevent fauna entrapment and ensure public safety.

Final rehabilitation of borrow pits will occur at closure.

3.14.7 Reporting

An annual compliance report as required under the *Mining Act 1971* will be submitted annually to DEM Mining Regulation Branch on the date agreed with DEM.

4. VEGETATION CLEARANCE

4.1 Introduction

In accordance with the requirement of the *Native Vegetation Act 1991,* environmental offsets associated with the project will be facilitated through the provision of a Significant Environmental Benefit (SEB).

The SEB was calculated on the basis of the process outlined in Guidelines for a Native Vegetation Significant Environmental Benefit Policy for the clearance of native vegetation associated with the minerals and petroleum industry (PIRSA 2005). The SEB was calculated based on EBS 2007 and COOE 2013 (see Appendix E). The mine closure program will see most areas, including the WRDs, rehabilitated to blend into the natural environment as described in Section 5. The most notable exclusion being the mine pit which will be made safe with bunding, fencing and signage and left as an open pit.

4.2 Areas to be cleared

The total vegetation clearance areas for the project are provided in Table 4-1.

Table 4-1: Vegetation clearance

Project area	Direct footprint (proposed) (ha)	SEB ratio	Approved native vegetation clearance area (ha)	SEB offset no restoration (ha)
ML6314 (Mineral Lease)	**250.00**	6:1	**250.00**	**1,500.00**
MPL147 (*) (Eastern WRD)	**51.71**	6:1	**51.71**	**310.26**
ML6442 (*) (Supplementary ROM Pad / southern buffer area)	**3.37**	6:1	**3.37**	**20.22**
MPL127 (Accommodation Village)	**10.39**	6:1	**10.39**	**62.34**
MPL131 (Rail loop / siding and crusher plant)	**60.00**	10:1	**60.00**	**600.00**
MPL125 (haul / access road)	**77.93**	2:1	35.89	71.79
		4:1	13.36	53.43
		6:1	5.18	31.07
		8:1	23.50	188.04
			77.93	**344.32**
MPL126 (haul / access road)	**75.54**	4:1	12.17	48.69
		6:1	15.26	91.57
		8:1	48.10	384.83
			75.54	**604.31**
MPL127 (haul / access road)	**33.60**	6:1	31.90	191.42
		8:1	1.70	13.58

			33.60	**205.01**
MPL127, TN3 Pipe and access track to camp	**3.24**	6:1	**3.24**	**19.44**
MPL128 (haul / access road)	**72.31**	4:1	53.19	**212.75**
		6:1	19.13	**114.75**
			72.31	**327.50**
MPL129 (haul / access road)	**70.04**	4:1	22.11	**88.43**
		6:1	18.77	**112.63**
		8:1	11.68	**93.47**
		10:1	17.47	**174.74**
			70.04	**469.27**
MPL130 (haul / access road)	**21.05**	2:1	1.67	**3.34**
		6:1	2.91	**17.43**
		8:1	1.91	**15.31**
		10:1	14.56	**145.60**
			21.05	**181.67**
Pipeline and access road from Wirrida to the mine	**75.36**	2:1	8.04	**16.09**
		4:1	21.76	**87.06**
		6:1	20.19	**121.14**
		8:1	18.86	**150.90**
		10:1	6.50	**65.00**
			75.36	**440.19**
MPL134 (Pipeline and access road from Stafford borefield)	**24.00**	10:1	24.00	**240.00**
TN1 (Wirrida)	0.72	10:1	0.72	**7.22**
TN2 (Wirrida / Camp)	0.72	4:1	0.72	**2.89**
TN3 (Camp)	0.72	6:1	0.72	**4.33**
TN4 (Camp / Mine)	0.72	6:1	0.72	**4.33**
TN5 (Mine)	0.72	6:1	0.72	**4.33**
Total TN1-5	**3.61**		3.61	**23.09**
MPL133 (Penrhyn borefield and pipeline access road)	6.00	10:1	6.00	**60.00**
EML1	4.51	2:1	4.51	**9.03**
EML2	5.14	2:1	5.14	**10.28**

EML3	4.50	8:1	4.50	**36.00**
EML4	4.50	6:1	4.50	**27.00**
EML5	4.50	8:1	4.50	**36.00**
EML6	4.50	8:1	4.50	**36.00**
EML7	4.50	6:1	4.50	**27.00**
EML8	4.50	6:1	4.50	**27.00**
EML9	8.75	4:1	8.75	**35.00**
EML10	4.50	4:1	4.50	**18.00**
EML11	8.75	4:1	8.75	**35.00**
EML12	4.50	4:1	4.50	**18.00**
EML13	4.50	6:1	4.50	**27.00**
EML14	4.50	4:1	4.50	**18.00**
EML15	4.50	6:1	4.50	**27.00**
EML16	4.50	10:1	4.50	**45.00**
EML17	8.75	10:1	8.75	**87.50**
EML18	8.75	10:1	8.75	**87.50**
EML19	8.75	10:1	8.75	**87.50**
Total EMLs	**107.40**		107.40	**693.81**
Sub-Total	**945.55**		**945.55**	**6,101.41**
Contingency for ML6442 & MPL147	**26.00**	6:1	**26.00**	**156.00**
Total	**971.55**		**971.55**	**6,257.41**

(*) = new supplementary tenements – not yet cleared

Note that MPL141 (Camp Water Borefield and access tracks) has negligible clearance requirements and is therefore not listed.

The previously approved vegetation clearance area (in superseded PEPR2013/013) was 890.47 ha, with a total off-set of 5,770.95 ha. The updated vegetation clearance table above provides for the expanded WRD and stockpiling footprints on ML6442 and MPL147, including contingency areas to enable minor variations to the mine footprint within tenements. The total approved clearance area is now 971.55 ha, with a total offset of 6,257.41 ha.

The vegetation to be cleared on the new supplementary tenements is in good condition with the majority of the vegetation classified as 6:1 SEB condition ratio. No flora species of state or national significance were found within the surveyed area.

The area required for clearance, including the contingency on the new supplementary tenements is 81.08 ha and is within vegetation association 1 (see Table 4-1). If restoration activities are undertaken onsite the SEB ratio is able to be reduced by 50%.

Vegetation clearance on ML 6442 and MPL 147 has not yet occurred on ground, at the time of this PEPR submission (June 2020). A permit to excavate or clear vegetation must be obtained prior to any native vegetation clearance. The permit application form (P-1-FRM-3-1001_0) is included in the Vegetation Management Plan.

4.3 SEB ratios and justification

The SEB ratios are indicated in Table 4.2. The SEB ratios are a function of the extent of degradation due to grazing.

The previously approved total project vegetation footprint impact area was 890.47 ha with a resultant SEB off-set of $827,798.57. The SEB calculations included an allowance for clearance of Stafford Borefield and pipeline route. At this stage the Stafford water supply option is being reserved as an emergency resource in the event that other water resources are compromised in some manner. It should also be noted that the Stafford production bores can be accessed via pastoral tracks without disturbing vegetation.

In addition, there was inbuilt conservatism in the amount of clearance for the haul road as an allowance had been made for potential dust impacts on vegetation and the complete clearance of ML6314. Subsequently, the gravel haul road has been bitumen sealed resulting in significantly reduced dust impacts along the haul route.

Table 4-2: SEB compensation

Project area	Direct footprint (proposed) (ha)	SEB ratio	Approved native vegetation clearance area (ha)	SEB offset no restoration (ha)	Total SEB payment to NVC fund ($)
ML6314 (Mineral Lease)	**250.00**	6:1	**250.00**	**1,500.00**	**230,000.00**
ML6442, MPL147 (WRD, ROM and associated areas including contingency)	**81.08**	6:1	**81.08**	**486.46**	**74,593.20**
MPL127 (Accommodation Village)	**10.39**	6:1	10.39	62.34	9,558.8
MPL131 (Rail loop / siding and crusher plant)	**60.00**	10:1	60.00	600.00	60,000.00
MPL125 (haul / access road)	**77.93**	2:1	35.89	71.79	30,150.92
		4:1	13.36	53.43	11,755.12
		6:1	5.18	31.07	4,763.44
		8:1	23.50	188.04	22,564.39
			77.93	**344.32**	**69,233.87**
MPL126 (haul / access road)	**75.54**	4:1	12.17	48.69	10,712.28
		6:1	15.26	91.57	14,040.63
		8:1	48.10	384.83	46,180.12
			75.54	**604.31**	**72,517.34**
MPL127 (haul / access road)	**33.60**	6:1	31.90	191.42	29,351.55
		8:1	1.70	13.58	1,629.85

			33.60	**205.01**	**30,981.40**
MPL127, TN3 Pipe and access track to camp	**3.24**	6:1	**3.24**	**19.44**	**2,980.80**
MPL128 (haul / access road)	**72.31**	4:1	53.19	**212.75**	46,805.08
		6:1	19.13	**114.75**	17,595.42
			72.31	**327.50**	**64,400.50**
MPL129 (haul / access road)	**70.04**	4:1	22.11	**88.43**	19,454.65
		6:1	18.77	**112.63**	17,269.49
		8:1	11.68	**93.47**	11,216.32
		10:1	17.47	**174.74**	17,474.00
			70.04	**469.27**	**65,414.46**
MPL130 (haul / access road)	**21.05**	2:1	1.67	**3.34**	1,401.72
		6:1	2.91	**17.43**	2,672.73
		8:1	1.91	**15.31**	1,836.69
		10:1	14.56	**145.60**	14,560.00
			21.05	**181.67**	**20,471.14**
Pipeline and access road from Wirrida to the mine	**75.36**	2:1	8.04	**16.09**	6,756.80
		4:1	21.76	**87.06**	19,153.00
		6:1	20.19	**121.14**	18,574.80
		8:1	18.86	**150.90**	18,107.96
		10:1	6.50	**65.00**	6,500.00
			75.36	**440.19**	**69,092.55**
MPL134 (Pipeline and access road from Stafford borefield)	**24.00**	10:1	24.00	**240.00**	**24,000.00**
TN1 (Wirrida)	0.72	10:1	0.72	**7.22**	721.50
TN2 (Wirrida / Camp)	0.72	4:1	0.72	**2.89**	634.92
TN3 (Camp)	0.72	6:1	0.72	**4.33**	663.78
TN4 (Camp / Mine)	0.72	6:1	0.72	**4.33**	663.78
TN5 (Mine)	0.72	6:1	0.72	**4.33**	663.78
Total TN1-5	3.61		3.61	**23.09**	**3,347.76**
MPL133 (Penrhyn borefield and pipeline access road)	6.00	10:1	6.00	**60.00**	**6,000.00**
EML1	4.51	2:1	4.51	**9.03**	3,792.10

EML2	5.14	2:1	5.14	**10.28**	4,317.84
EML3	4.50	8:1	4.50	**36.00**	4,320.00
EML4	4.50	6:1	4.50	**27.00**	4,140.00
EML5	4.50	8:1	4.50	**36.00**	4,320.00
EML6	4.50	8:1	4.50	**36.00**	4,320.00
EML7	4.50	6:1	4.50	**27.00**	4,140.00
EML8	4.50	6:1	4.50	**27.00**	4,140.00
EML9	8.75	4:1	8.75	**35.00**	7,700.00
EML10	4.50	4:1	4.50	**18.00**	3,960.00
EML11	8.75	4:1	8.75	**35.00**	7,700.00
EML12	4.50	4:1	4.50	**18.00**	3,960.00
EML13	4.50	6:1	4.50	**27.00**	4,140.00
EML14	4.50	4:1	4.50	**18.00**	3,960.00
EML15	4.50	6:1	4.50	**27.00**	4,140.00
EML16	4.50	10:1	4.50	**45.00**	4,500.00
EML17	8.75	10:1	8.75	**87.50**	8,750.00
EML18	8.75	10:1	8.75	**87.50**	8,750.00
EML19	8.75	10:1	8.75	**87.50**	8,750.00
Total EMLs	**107.40**		107.40	**693.81**	**99,799.95**
Total	**971.55**		**971.55**	**6,257.41**	**902,391.77**

4.4 SEB offset provisions

The previous owner (Arrium Mining) had previously agreed offset strategies for vegetation clearances preceding this PEPR update. That is, an SEB off-set strategy to the value of $827,798.57 that is in place for 890.47 ha, as calculated in Table 4-2.

The SEB for the 890.47 ha was established by way of a Biodiversity Offset Strategy with Nature Foundation SA to address the conservation of the Thick-billed Grasswren (Eastern subspecies) (*Amytornis textilis modestus*) (Nature Foundation SA, 2012). The agreement included a four-year research project and habitat management initiative at Witchelina Reserve to achieve the required SEB. The research project also complied with the EPBC Act approval requirements to offset the loss of Thick-billed Grasswren habitat. A combination of restoration works, reduction in predation and grazing impacts, and monitoring was put in place to improve the habitat and sustainability of the Thick-billed Grasswren. The SEB requirement for the 890.47 ha has been fulfilled through the completion of the research program.

The SEB offset for the new tenements (ML6442 and MPL147) is included in Table 4-2. A contingency has been included to cover incidental clearance associated with the new tenements. A monetary contribution to the NVC Fund will be implemented. The calculation of the SEB off-set value is in accordance with SEB guidelines as follows:

SEB payment to Native Vegetation Fund = (land value per ha x required SEB in ha) + (management fee per ha x area cleared) where:

- Land value = $20/ha of offset area
- Management fee = $800/ha of cleared area.

The calculated payment of $74,593.20 will be made into the NVC fund prior to the clearance of native vegetation on ML6442 and MPL147.

The EPBC approval for ML 6442 and MPL 147 required the preparation and implementation of a Feral Animal Control Programme to be applied to a minimum of 400 ha of Thick-billed Grasswren habitat within the *Baltana* sub-region. The Feral Animal Control Programme was approved by the Department of Agriculture, Water and the Environment (DAWE) in March 2020 and was implemented in May 2020.

4.5 Current SEB offset credit

A reconciliation of native vegetation clearance to date has been undertaken (see Table 4-3). Detailed records of previous vegetation clearance areas are not readily available and so the following methodology was employed to calculate the actual on-ground vegetation clearance:

- review of historical vegetation clearance mapping (August 2012)
- review of recent aerial photography to define current clearance areas
- review of clearance and rehabilitation data in previous compliance reports (where available).

The reconciliation provided in Table 4-3 will provide the basis for future reporting of vegetation clearance that is undertaken on the tenements. The reconciliation could not distinguish between the reported rehabilitated areas (in previous compliance reports) and existing native vegetation (uncleared) and so the rehabilitation areas have not been included in the credit areas calculation.

Table 4-3: Vegetation clearance reconciliation

Project area	Approved SEB clearance area (ha)	Clearance area (ha) (2020 reconciliation)	Rehabilitation area (ha) (reported)	Credit* (ha)
ML6314 (Mineral Lease)	250.0	242.43	8.0	7.57
MPL127 (Accommodation Village; haul / access road; TN3 Pipe and access track to camp)	47.23	58.46	4.01	-11.23
MPL131 (Rail loop / siding and crusher plant)	60.00	39.78	0.62	20.22
MPL125 (haul / access road)	77.93	73.06	None reported	4.87

Project area	Approved SEB clearance area (ha)	Clearance area (ha) (2020 reconciliation)	Rehabilitation area (ha) (reported)	Credit* (ha)
MPL126 (haul / access road)	75.54	65.94	None reported	9.6
MPL128 (haul / access road)	72.31	58.26	None reported	14.05
MPL129 (haul / access road)	70.04	50.58	None reported	19.46
MPL130 (haul / access road)	21.05	13.55	1.36	7.5
MPL141 Pipeline and access road from Wirrida to the mine	75.36	3.04	None reported	72.32
MPL134 (Pipeline and access road from Stafford borefield)	24.00	0	None reported	24.00
TN1 (Wirrida), TN2 (Wirrida / Camp), TN3 (Camp), TN4 (Camp / Mine), TN5 (Mine)	3.61	3.61	None reported	0
MPL133 (Penrhyn borefield and pipeline access road)	6.0	11.42	3.42	-5.42
EML6363 to EML6382	107.40	106.99	66.62	0.41
Sub-total	**890.47**	**727.12**	**84.03**	**163.35**
ML6442 (Eastern WRD)	51.71	0	0	51.71
MPL147 (Supplementary ROM pad / southern buffer area)	3.37	0	0	3.37
Contingency for ML6442 and MPL147	26.00	0	0	26.0
Sub-total (supplementary tenements)	**81.08**	**0**	**0**	**81.08**
Total (all tenements)	**971.55**	**727.12**	**84.03**	**244.43**

* does not include rehabilitated areas.

The total area calculated as cleared to date is 727.12 ha against the area approved for clearance of 971.55ha. Discrepancies between the calculated clearance area and reported clearance areas in previous compliance reports can be explained by inclusion of buffer areas not previously cleared or impacted, inconsistencies in reporting and the lack of detailed records available for review. It is noted that 414.75 ha of Thick-billed Grasswren (TBGW) habitat has been recorded as cleared compared to the maximum clearance allowance of 523 ha.

4.6 Proximity to conservation areas

National parks, regional reserves and conservation parks in the general area of the Peculiar Knob mine are shown in Figure 4-1 (and also provided as Appendix A-8) and include:

- The Breakaways Conservation Park – 101 km north-east of MPL 147
- Wabma Kadarbu Mound Springs Conservation Park – 150.5 km east of ML 6442 and MPL 147
- Tallaringa Conservation Park – 150.6 km west of ML 6442 and MPL 147

- Yellabinna Regional Reserve – 165.2 km south-west of ML 6442 and MPL 147
- Lake Eyre National Park – 173.6 km east of ML 6442 and MPL 147
- Lake Torrens National Park – 188.9 km south-east of ML 6442 and MPL 147
- Simpson Desert Regional Reserve – 263.7 km north-east of proposed ML 6442 and MPL 147.

Figure 4-1: Location of regional reserves and conservation parks

5. MINE CLOSURE AND REHABILITATION

5.1 Closure objectives and overall strategy

The primary objective of the Peculiar Knob Mine Closure and Rehabilitation Plan is to ensure:

- the external visual amenity of the site is harmonious with the surrounding area to the extent that is reasonably practicable
- the area is left in a safe and stable condition that supports a resilient, self-sustaining natural ecosystem suitable for the post-mining land use identified in consultation with closure stakeholders
- risks to public health and safety and to fauna are as low as reasonably practicable
- surface water quality is not adversely impacted post closure
- groundwater quality and quantity for existing third-party users and environmental receptors is not impacted.

The closure and rehabilitation scope of work covers the existing operations which commenced in 2011 and the approved new tenements.

There is potential for some of the existing infrastructure to be required post-closure for other projects or third parties. The Wirrida rail loop, the western part of the haul road and water supply borefields could be useful to other mining projects. In addition, the haul road could be used by the pastoralists for access to parts of their stations. These issues have been taken into consideration in the development of the closure strategy.

Development of the access road, accommodation village and the Wirrida rail loop has not resulted in a significant change to the natural topography. Therefore, post-closure contours are not likely to be significantly different from pre mining development. In relation to the haul road, which is about 90 km long, establishment of post-closure contours would require the development of an excessive number of figures/plans. On this basis post-closure contour plans have been developed for those areas where there was a significant change to the pre-mining topography, namely the open pit and WRD.

Prior to rehabilitation activities being undertaken a weed assessment will be undertaken to determine if any weed destruction and control will be needed.

All sites will be assessed for areas that have been subjected to dust suppression using saline water and if necessary, soil testing would be undertaken.

Areas of potential soil contamination would be identified and rehabilitated as necessary to the agreed standard.

In general, topsoil and subsoil material as applicable to the rehabilitation area would be recovered from the stockpile areas and evenly spread over the area to a target depth of about 200 mm in order to enable revegetation and minimise the potential for erosion, making sure that disturbed areas (such as decommissioned operational areas) are covered with a layer of topsoil.

The topsoil and the subsoil will be recovered separately to avoid mixing prior to application to the rehabilitation area and no recovery of soil would be undertaken when the stockpiles are wet or during high winds.

In some situations, it may be necessary to recover topsoil and subsoil together. In the event of this the topsoil and subsoil mix would be applied at a depth of 200 mm. If insufficient topsoil/subsoil is available, placement would be undertaken in priority areas by placement in strips.

WRDs containing PAF material would have priority when applying topsoil. Rehabilitation details for the WRDs are included in Section 3.7.10. Any stored windrows of vegetation would be spread evenly over the topsoil in advance of revegetation. The entire rehabilitation site will be ripped in rows to break up vegetation on the top of the soil and prepare the topsoil for seed growth.

5.2 Description of closure domains

As part of the approach to closure and rehabilitation, closure and rehabilitation domains (Table 5-1) have been developed as follows:

- Domain 1 – Mine pit, crushing, screening and separation plant and ancillary areas
- Domain 2 – WRD
- Domain 3 – Previous crushing and screening plant and rail loop
- Domain 4 – Accommodation village
- Domain 5 – All roads
- Domain 6 – Extractive pits
- Domain 7 – Water supply bores and associated infrastructure.

Table 5-1: Rehabilitation and closure domains

Rehabilitation and closure domains	Earliest potential rehabilitation start date	Earliest potential rehabilitation completion date
Domain 1	Completion of mining operations	Completion of mining operations
Domain 2	Progressive during operational Mining	1–2 years post completion of mining activities
Domain 3	Completion of mining operations	1 year post completion of mining activities
Domain 4	Completion of mining operations	Completion of rehabilitation operations
Domain 5	Completion of mining operations	Completion of rehabilitation operations
Domain 6	Following construction activities	Completion of mining operations
Domain 7	Completion of mining operations	Completion of rehabilitation operations

The following closure and rehabilitation strategies for the identified domains are planned as part of the rehabilitation and closure activities. These activities are considered preliminary and will be finalised during operations and prior to closure. The estimated timing of completion of rehabilitation for the domains is indicated in Table 5-1.

5.2.1 Domain 1: Mine pit and ancillary areas

The following activities will be undertaken to decommission and rehabilitate the mine pit area and ROM pad:

- pit bunded for safety
- remove crushing, screening and separation plant
- scrape and remove ROM pad
- trim and reshape site after re-spreading of topsoil to suitable contours
- re-spread stockpiled topsoil
- drainage directed to natural drainage channels where reasonably practicable.

Where on-going public and animal safety may be at risk, a site fence with signage will supplement bunding around the pit.

This domain also covers removal and remediation of:

- all buildings, concrete pads and similar foundation structures and above ground structures
- electrical installations (including all overhead and buried cabling), fixed lighting towers and power generators
- explosives magazine facility
- all hardstand areas and pads
- water storage and reticulation infrastructure
- pit dewatering pumps, cabling and pipelines
- all miscellaneous structures, civils and trenches.

Remediating these sites generally involves ripping and sheeting with topsoil to establish a suitably revegetated landscape that blends with the natural environment.

The open pit may accumulate water as a result of incident rainfall, localised runoff and groundwater seepage. During operation there has been limited seepage into the open pit due to the measured groundwater table level being below the pit and high evaporation rates. It is expected that the final groundwater level will not fully recover to the pre-mining level due to the high evaporation rates. The open pit will continue to be a groundwater sink and over time the regional groundwater will equilibrate to the new groundwater level. Given the significant distance between the open pit and the mound springs located to the east and northeast it is expected that there will be no impact on groundwater levels at the springs and the water dependent ecosystems. Groundwater that accumulates at the base of the pit will be highly saline due to the concentration of salts resulting from evaporation.

5.2.2 Domain 2: WRD

The following activities will be undertaken to decommission Domain 2:

- establish the Northern WRD with 15° slopes from crest to toe and the Eastern WRD with 18° slopes with 10 m berms resulting in an overall final slope of 15°
- review stability analysis of WRD to ensure long term safety and stability
- cap the WRD as per the cover design (see Section 3.7.10 for details)
- undertake periodic testing for any acid rock drainage and take remedial action as appropriate during monitoring period
- drainage from southern part of final landform redirected into mine pit
- provide rocky drop structures where appropriate for each major external drainage line
- construct a road around the edge of the dump, to allow vehicle access. This road would also include a drain to provide storm water drainage around the lower edges of the dump and to direct dirty water run-off to sedimentation ponds before it enters the natural drainage channels.
- removal of all equipment, buildings, concrete pads and similar foundation structures and above ground structures
- scrape surface area to remove residual ore or contamination and dispose in WRD
- remediate soil compaction by ripping along contour
- re-spread stockpiled topsoil to blend with local adjacent landforms
- revegetation of ripped areas.

5.2.3 Domain 3: Rail loop and stockpile facilities

If the facilities are not required for other projects or third parties the following activities will be undertaken to decommission and rehabilitate Domain 3:

- removal of all equipment, buildings, concrete pads and similar foundation structures and above ground structures
- scrape surface area to remove residual ore or contamination and dispose in WRD
- remediate soil compaction areas by ripping along contour
- re-spread stockpiled topsoil to blend with local adjacent landforms
- revegetation of ripped areas.

Approval from the relevant regulatory authorities and the pastoral lessee would be required if the infrastructure in this domain was to be retained for other projects or third parties.

5.2.4 Domain 4: Accommodation village

The accommodation village was dismantled during the mothballing phase and the area rehabilitated (see Section 3.14.3). Should the accommodation village be re-established in the future, and the facilities are not required for other projects or third parties, the following activities will be undertaken to decommission and rehabilitate Domain 4:

- removal of all buildings and above ground structures, e.g. accommodation village, RO plant wastewater evaporation pond, WWTP
- remove concrete pads and similar foundation structures
- Rehabilitate WWTP irrigation area
- scrape surface area to remove residual ore or contamination and dispose in WRD
- remediate soil compaction areas by ripping along contour
- re-spread stockpiled topsoil to blend with local adjacent landforms
- revegetation of ripped areas.

Approval from the relevant regulatory authorities and the pastoral lessee would be required if the infrastructure in this domain was to be retained for other projects or third parties.

5.2.5 Domain 5: All roads

Allowances have been made in the rehabilitation and closure cost estimate to fully remove and remediate all access tracks and haul roads, however, this will be subject to consideration of potential on-going usage of the infrastructure by other projects and/or interested stakeholders. The sealed haul road will be a key infrastructure item of interest to other regional projects, including Department of Defence.

The on-going usage and potential transfer of liabilities will be a matter for negotiation with the Mining Regulator, the pastoral lessee and the potentially interested stakeholders, including the Pastoral Board, as we approach closure of the Peculiar Knob.

If the facilities are not required for other projects or third parties the following activities will be undertaken to decommission and rehabilitate Domain 5:

- remove concrete structures, e.g. culverts, headwalls
- scrape mine surface area to remove residual ore or contamination and dispose in WRD
- scrape spray seal from haul road and dispose in borrow pits that have not been rehabilitated (Borrow pit 1-EML6367, Borrow pit 4-EML6370, Borrow pit 7-EML6373, Borrow pit 9-EML6375). Disposal of spray seal material will be undertaken in accordance with relevant legislation.
- remediate soil compaction areas by ripping along contour
- re-spread stockpiled topsoil to blend with local adjacent landforms

- revegetation of ripped areas.

Approval from the relevant regulatory authorities and the pastoral lessee would be required if the infrastructure in this domain was to be retained for other projects or third parties.

5.2.6 Domain 6: Extractive pits

The following activities will be undertaken to decommission and rehabilitate Domain 6:

- scrape surface area to remove residual ore or contamination and dispose in WRD
- remediate soil compaction areas by ripping along contour
- re-spread stockpiled topsoil to blend with local adjacent landforms
- revegetation of ripped areas.

Approval from the relevant regulatory authorities and the pastoral lessee would be required if the infrastructure in this domain was to be retained for other projects or third parties.

5.2.7 Domain 7: Water supply bores and associated infrastructure

If the facilities are not required for other projects or third parties the following activities will be undertaken to decommission and rehabilitate Domain 7:

- removal of all above ground structures, e.g. tanks, pipes, turkey's nest dams, pumps, fences (unless negotiated with landowner to remain)
- decommission water bores (unless negotiated with landowner to remain) in accordance with the Minimum Construction Requirements for Water Bores in Australia (4^{th} edition) and/or other DEM and DEW requirements
- remediate soil compaction by ripping along contour, e.g. tracks
- re-compaction and making good of existing roadways/access tracks
- revegetation of ripped areas
- remove concrete pads and similar foundation structures.

Approval from the relevant regulatory authorities and the pastoral lessee would be required if the infrastructure in this domain was to be retained for other projects or third parties. If water wells are to be transferred to a landowner, then a deed of transfer between the 2 parties will be required.

5.3 Closure cost estimate

An initial estimate of the cost of closure relating to the cessation and rehabilitation of mining activities on Peculiar Knob was developed using the NSW Department of Primary Industries DPI-MR Rehabilitation Cost Calculation Tool (ESB26/V1.7) and provided in the previously approved PEPR 2013/013 ($7,632,174).

A review of the surety was undertaken following re-assessment of the areas of native vegetation clearance and land disturbance associated with the new ML and MPL. In addition a review of the costs included allowance for the rehabilitation of the sealed haul road surface. The revised rehabilitation cost estimate utilised the South Australian Mine Rehabilitation Liability Calculator Tool (Version 5.21) from the South Australian Department for Energy and Mining. The revised full cost of rehabilitation liability was undertaken by Korda Mentha in October 2016, and updated by Peak Iron Mines in June 2020. Table 5-2 provides a breakdown of the closure cost estimate with the Bond recommendation being $7,700,000.

Table 5-2: Closure cost estimate

Operations area/domain	Amount ($)
Open pit	$241,733
WRDs (including LG stockpiles)	$1,297,145
Processing facilities (including ROM stockpiles)	$339,026
Rail facilities	$357,220
Haul roads and access roads	$1,601,865
Administration and accommodation	$79,920
Ancillary areas (equipment depots, workshops, laydown areas)	$617,043
Services infrastructure (water, sewage, power, water borefields)	$433,888
Water management (dams, watercourse, diversions)	$18,198
Subtotal (of direct costs)	**$4,986,038**
Monitoring, maintenance and other in-direct costs	$2,717,851
Total Peculiar Knob project cost estimate/bond	**$7,703,889**

5.4 Rehabilitation of exploration sites

The rehabilitation of exploration sites where further mine development is unlikely to occur will be undertaken separately, and include the following management measures:

- all non-development sites will be closed in accordance with DEM Guideline M21 – General Specifications for the Construction and Abandonment of Mineral Exploration Drill Holes
- all drill holes will be capped immediately after completion
- all drill hole PVC casing will be removed or cut off below the ground. Should casing need to be left above ground temporarily (e.g. for down-hole survey, monitoring water levels etc.), they will be capped immediately, and cutting and rehabilitation will be completed when they are no longer required.
- on completion of the exploration program, all drill cuttings will be backfilled, buried or removed from the site
- tracks will be rehabilitated by re-spreading stockpiled topsoil to the original contour profile and scarifying to promote regrowth. The sites will be left in a neat and tidy condition.

Since exploration is exempt from significant SEB offset requirements for native vegetation clearance (in accordance with Part 2, Section 5 of the Native Vegetation Regulations 2003), these minor disturbances are not included in the SEB calculations.

5.5 Final landform

5.5.1 Mine site

WRD

The design of the WRD has taken into consideration the final height and slope to ensure that the structure is safe, stable and not prone to significant erosion.

The design of the rehabilitated Eastern WRD incorporates 10 m high batters at 18° and 10 m berms resulting in a final overall slope angle of about 15° and a final height of 30 m above existing land surface (refer Figure 5-1).

The rehabilitated Northern WRD will have a continuous 15° battered face from dump crest to toe.

The slope stability and final shape for the Northern WRD was assessed taking into consideration the overall slope angle of the WRD at 15°. The assessment of an overall batter slope based upon the conceptual WRD profile indicated an overall factor of safety above 1.5 when using a coefficient of friction of 40° and zero cohesion. As the Eastern WRD contains the same rock in the same environment, at a comparable scale and using the same overall slope angle as the Northern WRD, the slope stability assessment is also applicable to the Eastern WRD. Based on the stability modelling results, the conceptual landform design is acceptable (see Jacobs 2020, Appendix B-2).

Rehabilitation of the WRDs will be undertaken progressively and final PAF rehabilitation cover will be as described in Section 3.7.7, 3.7.9, 3.7.10 and 3.7.12.

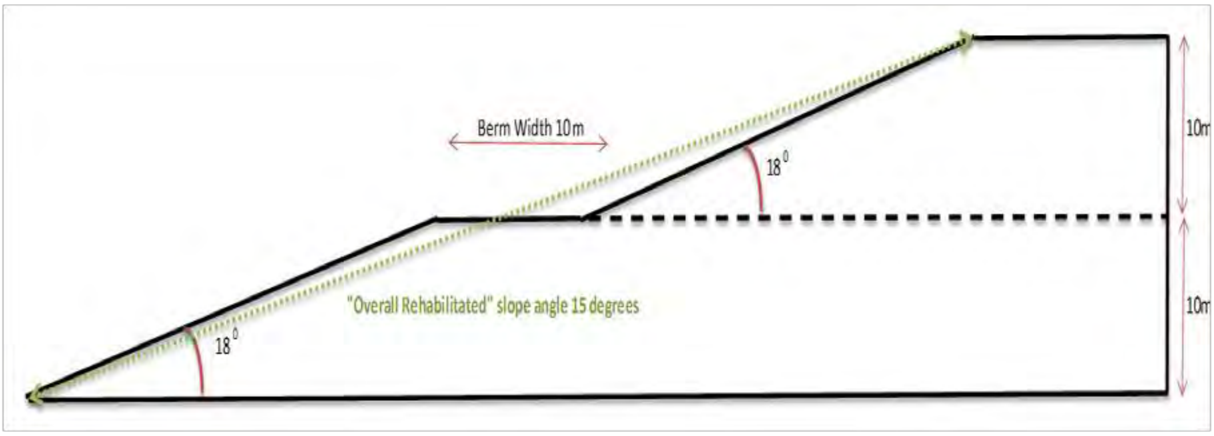


Figure 5-1: Typical section of rehabilitated WRD

Open pit

The open pit will remain as a permanent feature. A 2 m high bund will be established around the southern, western and eastern perimeter of the open pit and joined to the northern and Eastern WRDs. The bund will be constructed with inert waste rock and rock armouring on the external slope to maintain integrity.

The proposed bund is located at least 60 m from the top of the final slope of the open pit and is beyond interpreted circular failure surfaces through the weathered rock and includes an addition margin of 10 m. The proposed design is consistent with the Safety Bund Walls Around Abandoned Open Pit Mines Guideline, (Department of Industry Resources, 1997). The inside toe of the abandonment bund must be located at least 10 metres outside the boundary defined by the intersection of the projected plane with the surface (see Figure 5-2).

The potential for slope failures to impact the proposed bund is considered to be negligible. Exit point(s) of the open pit will also be bunded to prevent vehicle access. A fence may be installed in areas if required to minimise the potential of public access.

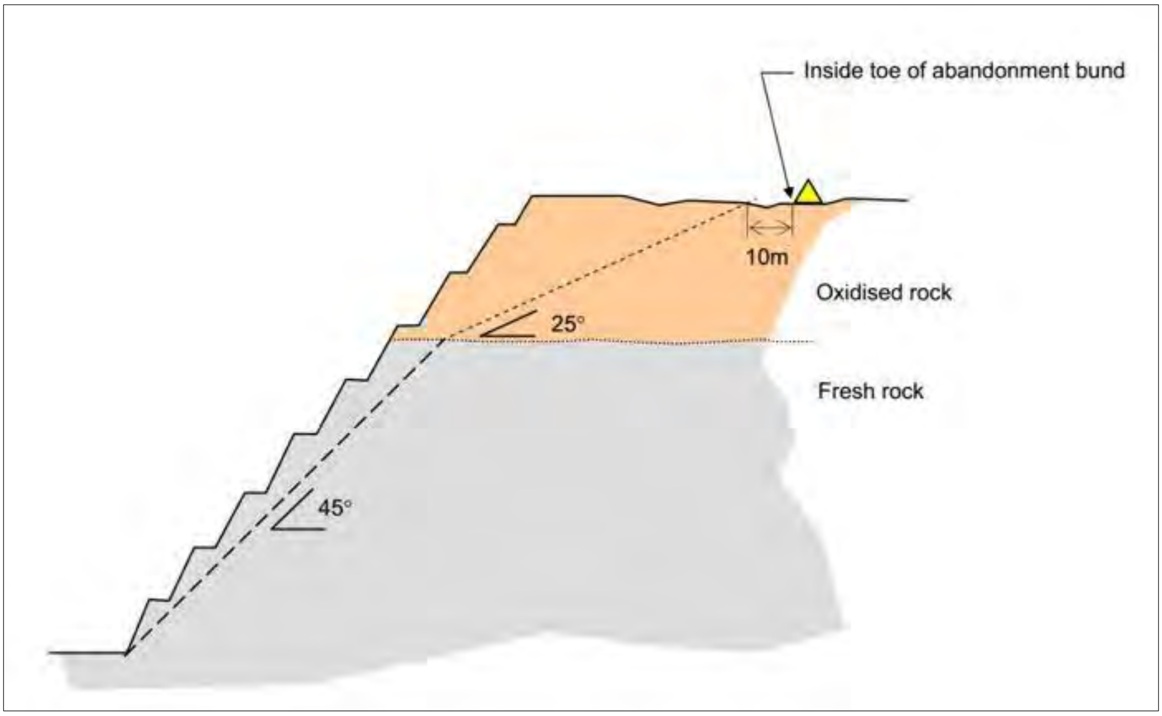


Figure 5-2: Generic zone of long term instability

A review of the proximity of the Northern WRD to the north wall crest was undertaken by Peter O'Bryan & Associates in May 2020. Wall conditions along the northern wall, adjacent to the existing and proposed WRD are generally fair to good. Figure 5-3 shows a plan view of the proposed open pit and WRD. The critical cross-sections for the western, central and eastern sectors are shown on Figure 5-4, Figure 5-5 and Figure 5-6 respectively.

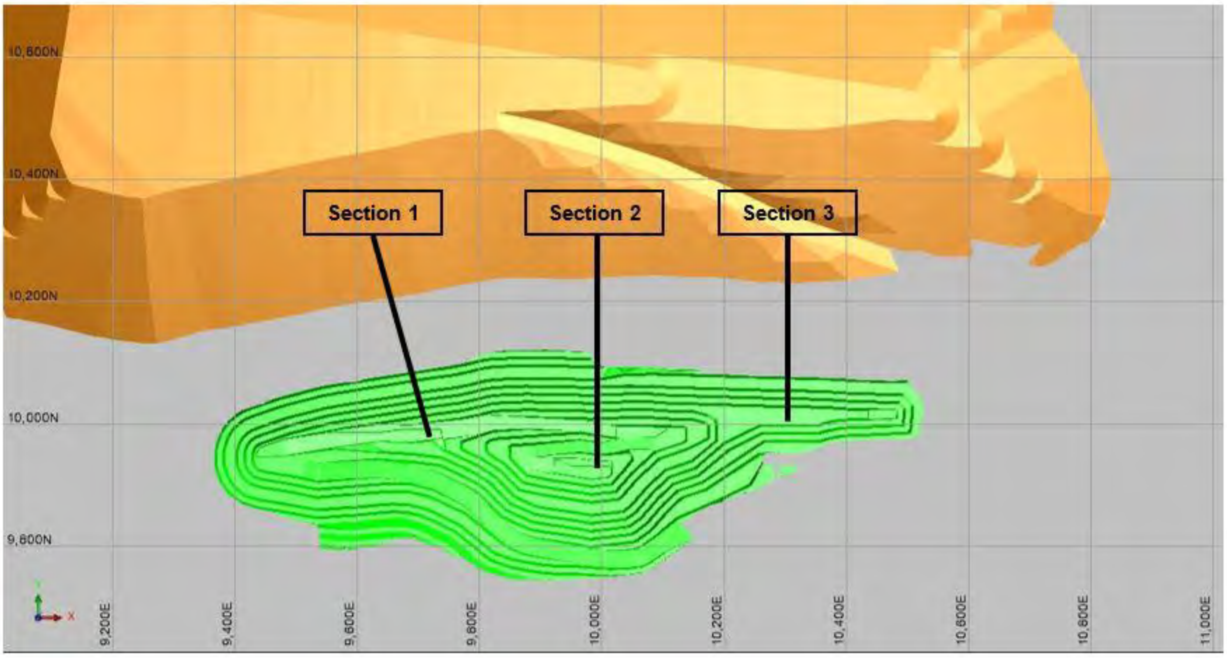


Figure 5-3: Plan view of proposed open pit and WRD

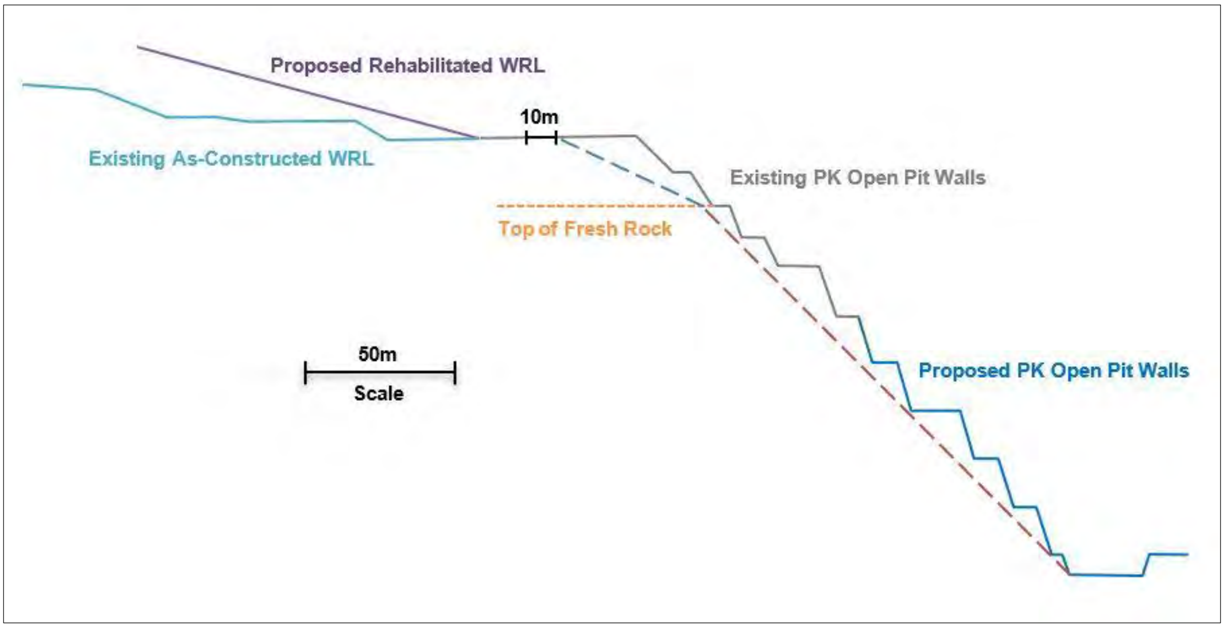


Figure 5-4: Western sector critical cross-section (1)

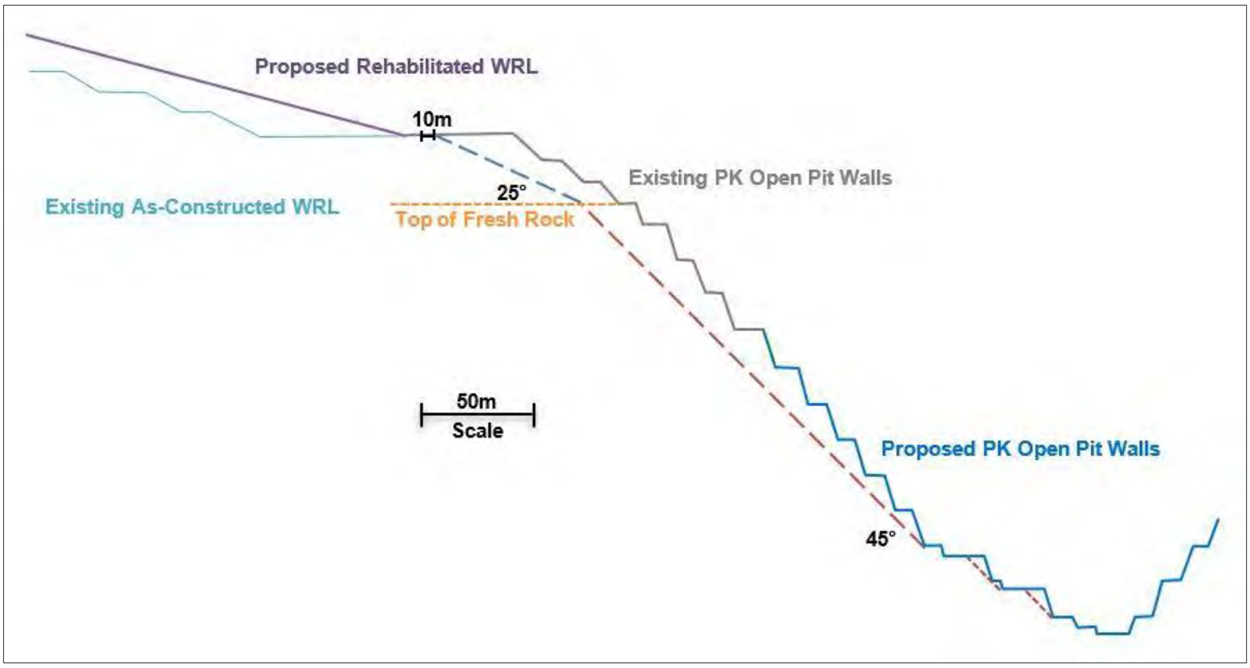


Figure 5-5: Central sector critical cross-section (2)

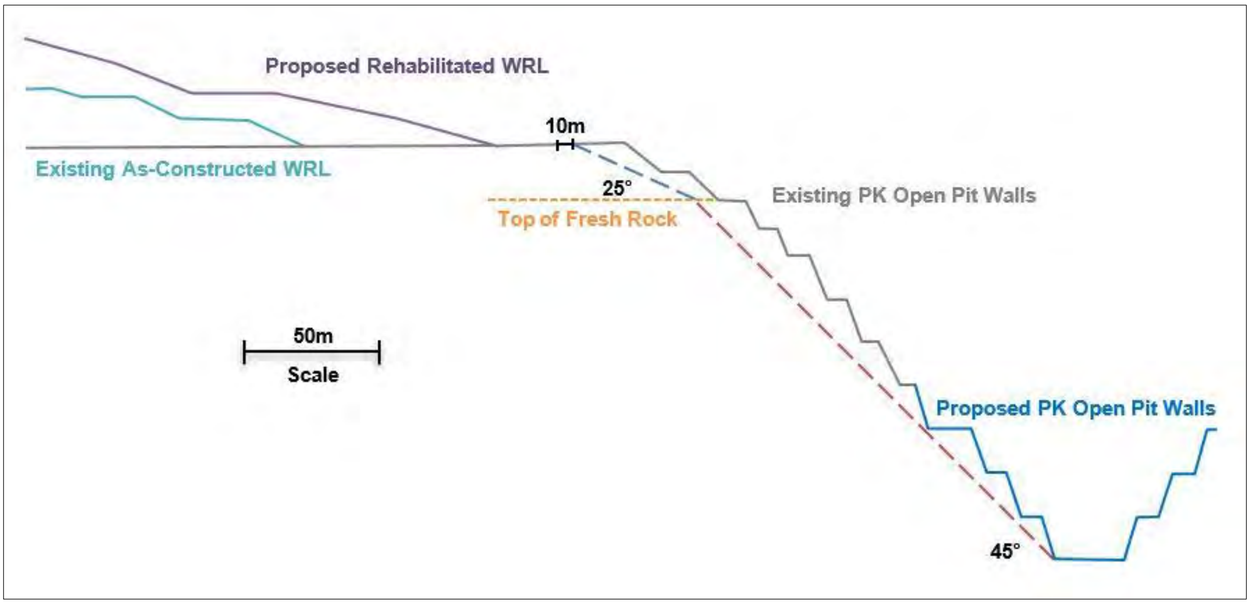


Figure 5-6: Eastern sector critical cross-section (3)

The location of the WRD meets generically-defined requirements, being outside the potential very long zone of influence (ZOI), and is considered to be acceptable. Given the proposed distance between the open pit north wall crest and the WRD southern toe exceeding the minimum requirement, a geotechnical assessment close to the end of mining (see Section 8.4) would assist in determining if the WRD could be part of the abandonment barrier, or if an abandonment bund needs to be constructed between the pit and the WRD (as is currently proposed).

Landform

The final landform design for the open pit and WRDs delivers a stable, safe and visually acceptable amenity beyond closure. Revegetation will be undertaken in accordance with species found in the flora surveys of the mining areas.

The post closure landform profile and cross sections are indicated in Figure 5-7 to Figure 5-12and post closure contours in Figure 5-13.

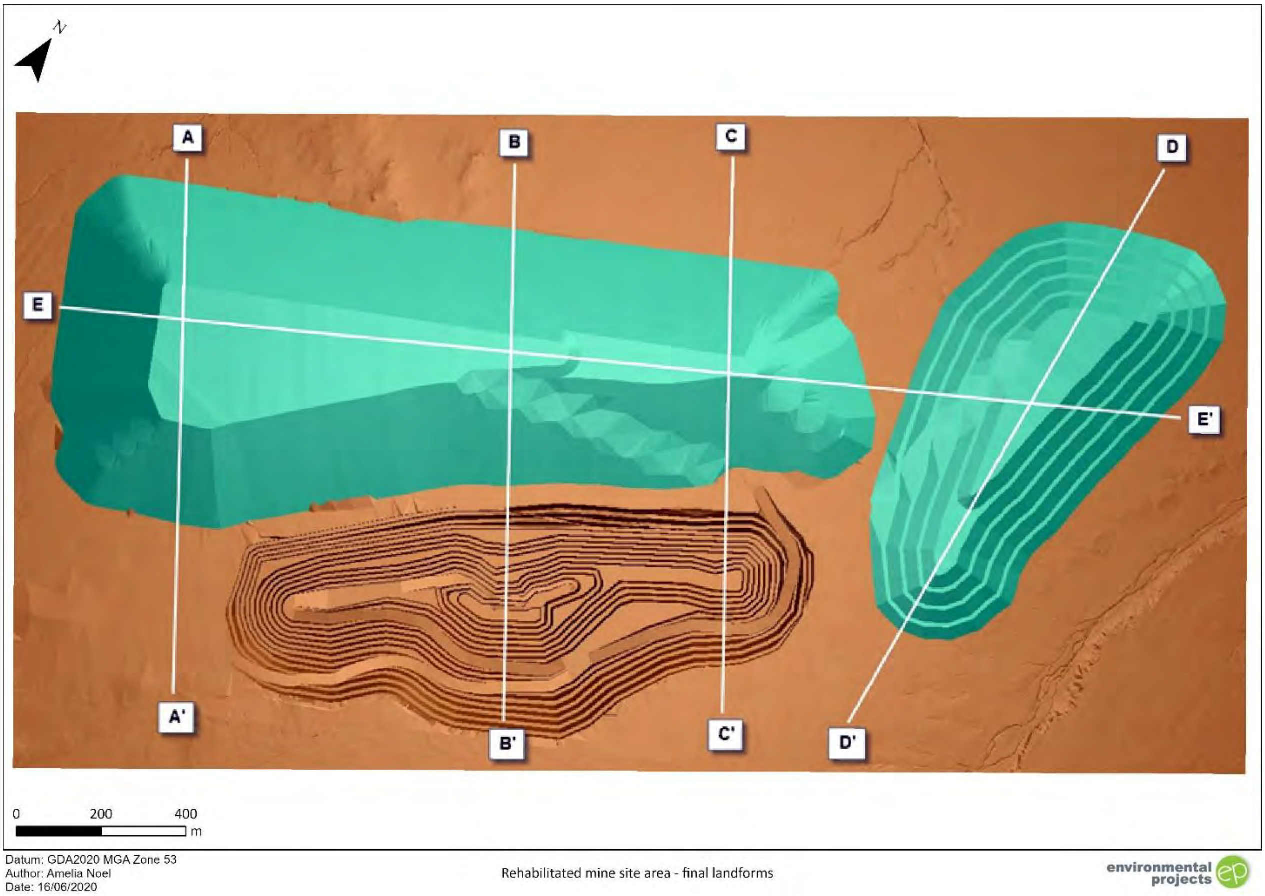


Figure 5-7: Rehabilitated mine site area- final landforms

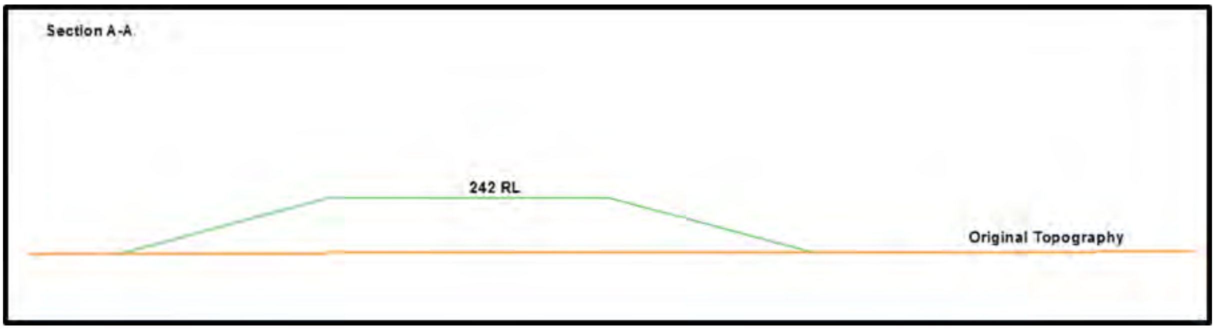


Figure 5-8: Final landform cross-section A-A

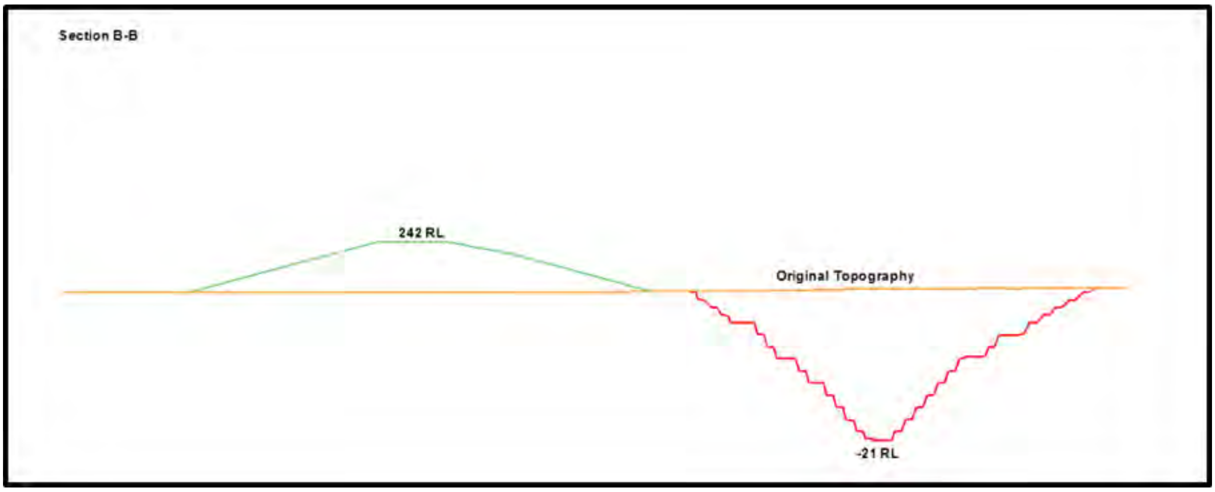


Figure 5-9: Final landform cross-section B-B

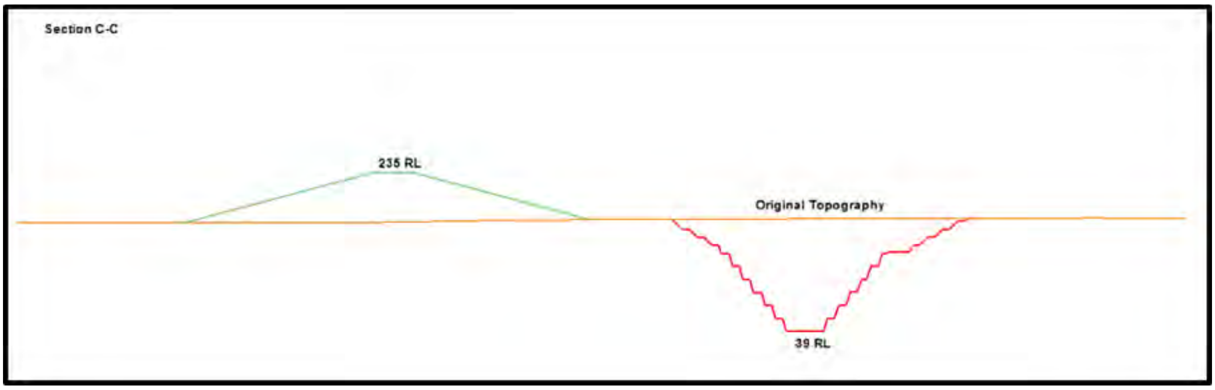


Figure 5-10: Final landform cross-section C-C

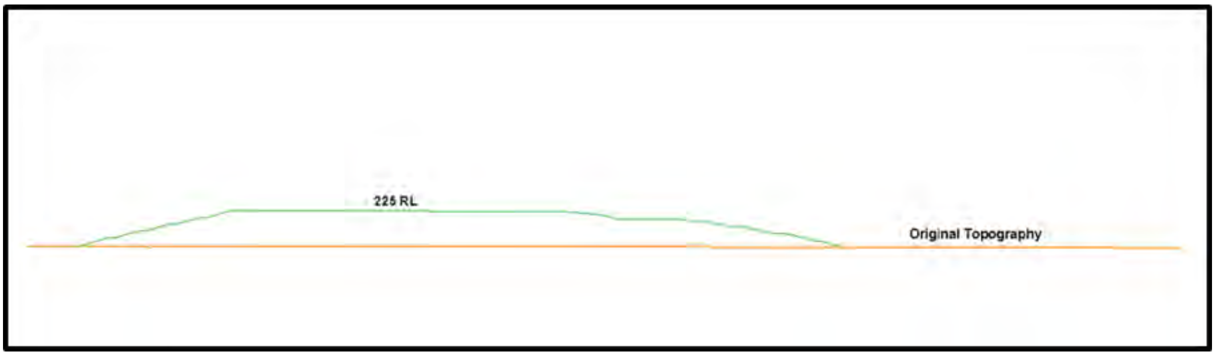


Figure 5-11: Final landform cross-section D-D

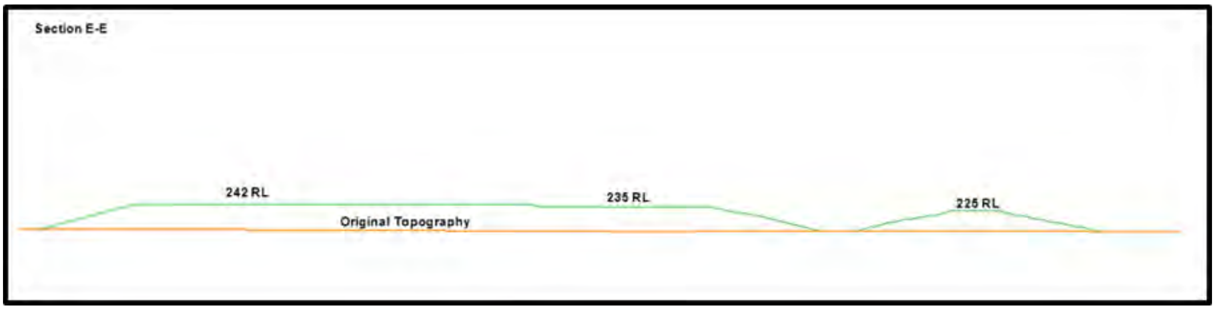


Figure 5-12: Final landform cross-section E-E

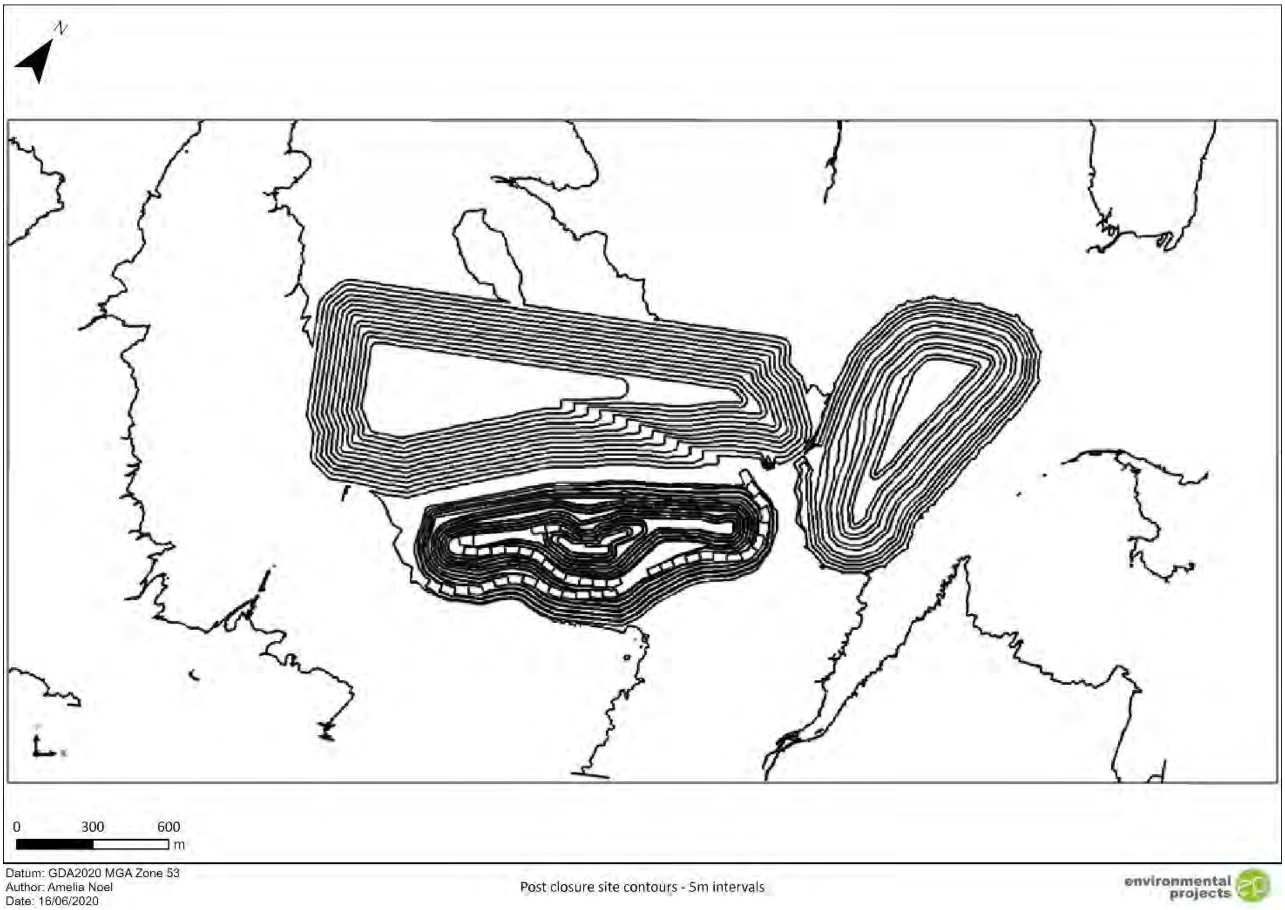


Figure 5-13: Post closure site contours-5 m intervals

5.5.2 Accommodation village

If the accommodation village is re-established in the future, the rehabilitation aspects are included in Section 5.2.4, assuming that the facility is not required to be retained for other projects or third parties. If rehabilitated, the completed revegetated surface will be integrated with the natural land surface. Final contours of the rehabilitated surface have not been included as there is not a significant variation in levels from the pre-development levels.

5.5.3 Wirrida rail loop

The rehabilitation aspects of the rail loop are included in Section 5.2.3, assuming that the facilities are not required for other projects or third parties. If rehabilitated, the completed revegetated surface will be integrated with the adjacent natural land surface. Final contours of the rehabilitated surface have not been included as there is not a significant variation in levels from the pre-development levels.

5.5.4 Haul road

The rehabilitation aspects of the haul road are included in Section 5.2.5, assuming that the road is not required for other projects, third parties or the pastoralist. If rehabilitated, the revegetated surface will be integrated with the adjacent natural land surface. Final contours of the rehabilitated surface have not been included as there is not a significant variation in levels from the pre-development levels.

5.5.5 WRD cover design

The conceptual rehabilitation cover design of the PAF cell is presented in Figure 3-61 (see Section 3.7.10). This will be refined and confirmed in accordance with the future works plan as detailed in Section 8.4 to provide the final rehabilitation cover design for the PAF cell.

Section 3.7.5 and Section 3.7.9 provides descriptions of the staging and scheduling of the WRD and associated PAF/NAF development and rehabilitation.

5.6 WRD cover seepage assessment

The geochemical hazard assessment identifies the potential for PAF material to be oxidised on the surface and sides of the WRD despite the presence of a temporary cap. Oxidised PAF material represents a risk to environmental receptors. For impacts to occur, acid from the PAF source needs to be mobilised into flow pathways by water. The purpose of the seepage assessment is to determine the potential magnitude and rates of rainwater infiltration into the WRD that may create the flow pathway to mobilise acid.

It is likely that infiltration of water into the WRD can be substantially reduced, or effectively stopped, by an engineered cap. The purpose of a WRD cap is:

- to exclude air and reduce oxidation of PAF material
- to prevent infiltration of rainfall into the WRD.

5.6.1 Climatic influence on seepage

The Scientific Information for Land Owners (SILO) database was used to provide an analysis of climatic data for Peculiar Knob (see Jacobs 2020). Based on the assessment of the climate data, the following conclusions can be drawn:

- precipitation, when it occurs, is generally low (<20 mm/day) and variable across the year
- on an average, there are less than 2 days per year with more than 20 mm of rainfall
- potential evaporation exceeds precipitation during the entire year.

This analysis illustrates that with low rainfall, and high evaporative potential, a correctly designed WRD cap should be able to capture, store and release all rainfall back into the atmosphere, and therefore substantially reduce risks of infiltration through the WRD and subsequent acid seepage.

5.6.2 Seepage analysis and modelling

The arid environment experienced at Peculiar Knob, with low rainfall and very high evaporative potential, equates to a low risk of rainfall infiltration leading to the generation of acidic seepage. The likelihood of rainwater infiltration into the WRD was assessed using a simplified infiltration capacity modelling approach built around site climate data (rainfall and potential evaporation) and including a cap layer. The model assessed the frequency and magnitude of infiltration through the cap into the waste rock, using daily historical climate data from SILO. Full results of the model are provided in Jacobs 2020 (see Appendix B-2).

A multilayer cap was modelled, consisting of 0.45 m of topsoil underlain by 1.0 m of inert waste rock (the current temporary cap in place). Site personnel have indicated that sufficient topsoil is available on site to construct a 0.45 m layer across the WRD.

The soil moisture balance seepage analysis method adopted for the initial seepage assessment (Jacobs 2018, Appendix B-3) was updated using the PSD data collected by Golder (2018) to reflect site-specific conditions. The PSD data reported the proportion of clay/silt, sand and gravel material.

Two different groups of soil and inert rock samples were used when determining a representative material distribution. The adopted parameters for each material type are shown in Table 5-3.

Table 5-3: Seepage Model Parameters

Samples used in Analysis	Material Type	% of Topsoil Material	Representative Particle Size (mm)	Specific Retention (%)	Effective Retention Depth (mm)
Topsoil Layer					
SOIL_02, SOIL_09, WRD_03, WRD_07, WRD_12	Fines/Silt	20.0	0.01	32.2	29.0
	Sand	47.4	0.5	9.5	20.3
	Gravel	32.6	10	0	0
Inert waste rock					
WRD_03, WRD_07, WRD_12	Fines/Silt	21.7	0.01	32.2	69.9
	Sand	48.7	0.5	9.5	46.2
	Gravel	30.0	10	0	0

It was assumed that the inert waste rock layer would retain 100 mm. This was a conservative estimate based on the calculation of specific retention whilst allowing a margin of uncertainty of the characteristics of the inert waste rock layer.

Model Description

The simplified infiltration capacity modelling approach is not a seepage model, rather, it simulates the passage of water down through the cover layers as each layer becomes wetted, and then allows downwards percolation to the next layer of the cap. Each layer is represented as a simple 'bucket' with retention capacity represented by the number of millimetres of infiltration that can be retained before tipping into the next layer. Vegetation and evapotranspiration is not considered in this initial stage modelling, however, will be included in more detailed modelling to be undertaken as outlined in the Forward Work Plan, detailed in section 8.4.

The GoldSim model considers only the relative capacities of material in each layer in the conceptual design and factors such hydraulic conductivity and sub-daily rainfall and evaporation intensity are not considered. A simple volumetric balance of the primary fluxes (rainfall, evaporation and any downwards percolation from one layer to the next) is performed each timestep (daily). The daily timestep model is run through the 117 years of available historic SILO potential evaporation and rainfall data extended to make a 200-year series.

The two-layer model comprises topsoil capping and inert waste rock. In each daily timestep, the topsoil layer is subject to addition and subtraction of rainfall (after runoff is accounted for) and evaporation respectively. The updated PSD data (Table 5-3) enabled the GoldSim model to be adapted to represent the three main material types within the topsoil layer as three discreet storages. Figure 5-14 below shows a graphical representation of the conceptual GoldSim model relationships. The effective retention depth of each layer was calculated based on the specific retention capacity and relative proportion of each material type (fines/silts, sand and gravel).

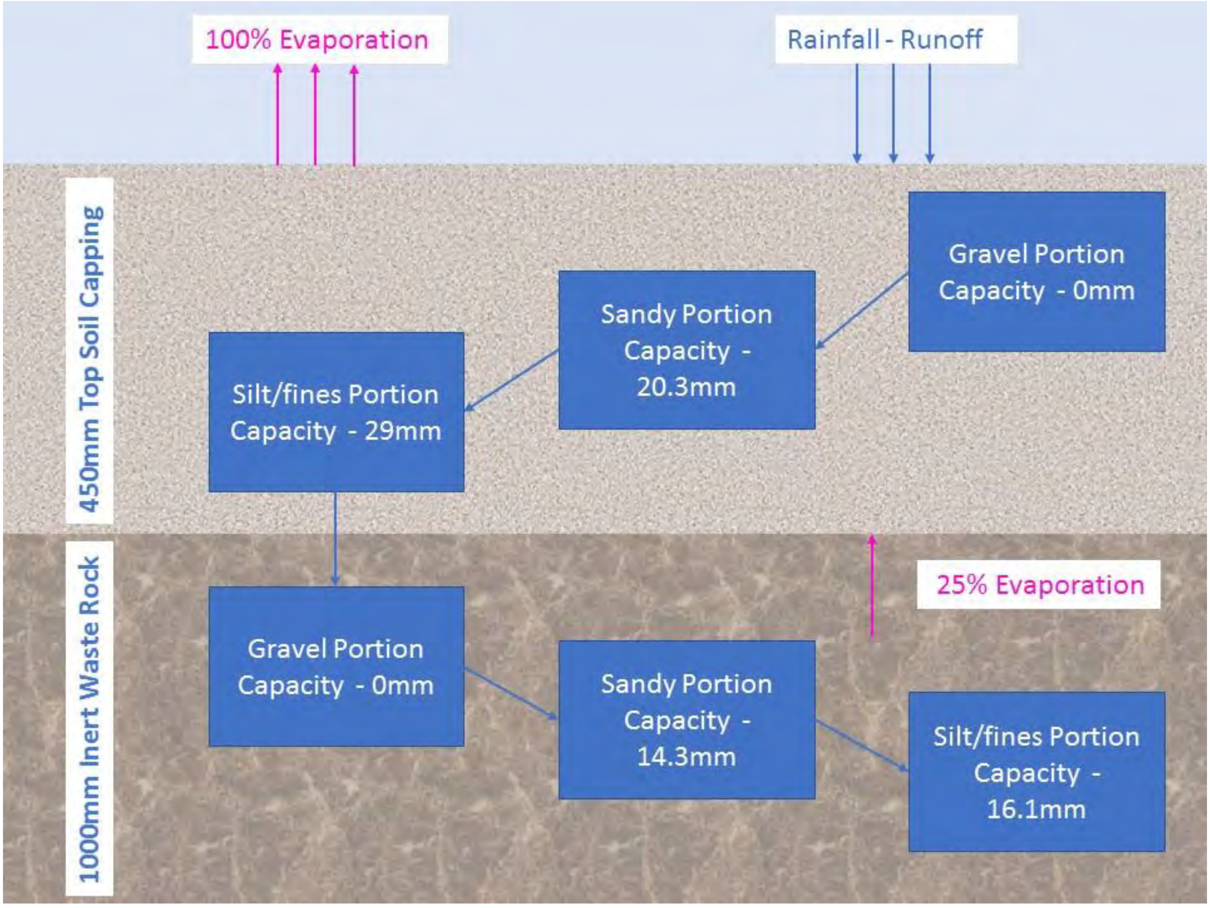


Figure 5-14: Conceptual Model of Topsoil and Cap Layer

Rainfall infiltrating the gravel layer (within the topsoil cap) is not retained and drains into the sand layer. Water draining into the sand layer is contained within the sand storage and is subject to evaporation. When the capacity of the sand storage is exceeded, water then drains to the silt/clay and retained, where it is subject to evaporation. If the capacity of the silt/clay store is exceeded, water will then drain through the topsoil layer and into the 1 m inert waste rock layer. The 1 m-thick capping layer of inert waste rock is assumed to provide an additional 100 mm of water retention and was assumed to be subject to 25% of the pan evaporation rate. It is expected that all water exceeding the capacity of the inert waste rock will reach the WRD.

In the event that daily rainfall exceeds daily evaporation the estimated depth of moisture retention within each layer will increase. Conversely, whenever daily evaporation exceeds daily rainfall (the dominant condition), the estimated depth of water retained in the layer will reduce. (due to evaporative losses).

5.6.3 Seepage modelling results

The modelling results show that:

- the cap as modelled (0.45 m of topsoil) stops the vast majority of the seepage across the 200-year period
- 123 mm of water cumulatively infiltrates through the topsoil layer into the temporary cap of inert waste rock over a period of 200 years

- the underlying 1 m inert waste rock layer retains all excess water that seeps into it where the capacity of the topsoil layer is exceeded across the modelled 200-year period.

- The GoldSim modelling indicates that the preliminary design provides sufficient effective water retention capacity to prevent seepage into the underlying PAF material. It is noted that there is some percolation of water into the inert waste rock layer however it does not reach a depth sufficient to exceed the effective retention capacity of this layer. This is as a result of the strongly negative water balance whereby daily evaporation greatly exceeds rainfall except for infrequent larger rainfall events or the cumulative effect of consecutive days of rainfall in excess of daily evaporation.

- The depth of moisture contained in the topsoil layer is therefore typically low due to the relatively arid conditions. However, large but infrequent daily rainfall events or smaller but occurring over consecutive days, may occur. Under these conditions the effective retention capacity of the topsoil layer may be exceeded as the rate of infiltration exceeds the rate of evaporative loss. In this case water the topsoil layer is 'surcharged' and excess water enters the waste rock layer (but not as far as the PAF material).

The sensitivity of the cap performance to the runoff coefficient applied was assessed for runoff coefficient values between 10% and 20%. The results of the sensitivity analysis show no seepage to the WRD resulted from the three modelled run-off coefficients.

Sensitivity of the performance of the conceptual cap design to reduced rates of evaporation was also conducted. This comprised of systemically reducing the assumed rates of evaporation from both the upper topsoil and WRD layers from 100 and 25% of pan evaporation respectively. The analysis revealed that:

- the conceptual capping design was capable of preventing infiltration into the PAF material with an 80% reduction in the adopted evaporation rates

- under these conditions the upper topsoil layer and lower WRD layers were subject to 20 and 5% of pan evaporation respectively.

As the Project design progresses, more detailed modelling using SEEP/W or VADOSE will be employed and will consider and simulate unsaturated flow through the cap design. This will provide some further description of the likely soil moisture behaviour and vertical infiltration behaviour. Further updates to the seepage model, including vegetation and evapotranspiration impacts will be undertaken as part of the Forward Work Plan detailed in Section 8.4.

6. CONSULTATION

6.1 Objectives of the community and stakeholder engagement framework

The assessment process for the original ML application (2008) original PEPR (2011) and supplementary ML application (2014) provided the public with the opportunity to comment on the Project during previous approval phases.

Details of consultation activities have been provided to DEM throughout the aforementioned project phases.

Peak Iron Mines recognises that establishing constructive and sustained relationships with all stakeholders is a key aspect of sustainable business practice. Peak Iron Mines embraces a socially responsible approach to mining, which is reflected in its efforts to engage, promote, respect, and invest in the people and communities associated with the company's business.

Peak Iron Mines is committed to implementing good-practice principles of engagement with stakeholders. Peak Iron Mines has adopted the foundation principles for effective engagement summarised below:

- **Inclusive:** engagement processes identify and include participants who represent all stakeholder groups.
- **Transparent and accountable:** engagement processes are open and transparent, with clear accountabilities.
- **Clear and informed:** engagement processes provide timely, balanced and objective information
- **Accessible and timely:** engagement processes are accessible to all stakeholder groups and allow sufficient time for deliberation and informed opinion.
- **Meaningful:** engagement processes and outcomes are considered by decision-makers and can influence the decisions made.

The primary objective is to establish a framework for developing positive, sustainable relationships with stakeholders likely to be affected by the proposed development. The processes used to engage with the community and stakeholders, disseminate information, gather feedback and explore ways to satisfactorily address issues of concern, will evolve as a consequence of this engagement process.

The specific goals of the framework are to:

- accurately identify, and consult with, stakeholders likely to be directly impacted by the project
- clearly describe the operations, risks, benefits and potential impacts of all proposed activities to stakeholders
- consistently provide timely, accurate and relevant information to stakeholders from project inception to completion
- establish an agreed 'two-way' communication process for exchanging information and feedback that is easily understood and culturally appropriate
- provide regular opportunities for stakeholders to obtain information, seek clarification and make comment on the project

- establish realistic expectations regarding the outcomes of the consultation process, including the extent to which stakeholder input will influence the decision-making process
- acknowledge and respond to all feedback, issues and concerns expressed by stakeholders in a respectful and timely manner
- work collaboratively to facilitate mutually beneficial outcomes for stakeholders wherever possible
- establish an agreed process for dispute resolution

6.2 Sustainability Principles

Peak Iron Mines has adopted the following principles as part of their operation.

- *Value for stakeholders: We operate our businesses in an efficient and financially sustainable way in order to provide value to our stakeholders.*
- *Environmental protection: We optimise the eco-efficiency of our products through the product life cycle, including increased resource and energy efficiency.*
- *Safety and health: We foster the wellbeing of our employees and provide them with a safe and healthy working environment.*
- *Local Communities: We demonstrate social responsibility by promoting values and initiatives that show respect for the people and communities that are affected by our business.*
- *Ethical Standards: We conduct our business with high ethical standards in our dealings with employees, customers, suppliers and stakeholders.*
- *Stakeholder Engagement: We engage our stakeholders and independent third parties in a constructive dialogue to help fulfil our sustainable development commitments.*

6.3 Planned approach to community engagement

A range of tools and techniques will be used to engage effectively with community and stakeholder groups. These tools and techniques, and details of the engagement activities undertaken to date are summarised in Table 6-1.

It is an objective to keep stakeholders well informed regarding operations that can impact on pastoral activities or neighbouring mining activities.

As part of ongoing consultation, Project Factsheets will be developed to provide information for consultation with key stakeholders regarding current and proposed developments.

The following agreements are in place with stakeholders:

- A Deed of Consent (dated 3 March 2014) between 2014 OZ Minerals Prominent Hill Operations Pty Ltd (the holder of EL 4283) and Southern Iron Pty Ltd which provided consent for the pegging out and granting of new tenements. A copy of the Consent Deed was registered with DEM (previously DMITRE).

- A Deed of Access between Southern Iron Pty Ltd and Department of Defence relating to the coexistence of the Peculiar Knob Iron Ore Project the WPA (Appendix F) – this Deed (or Permit) is to be updated By Department of Defence and provided to Peak Iron Mines for review and agreement.
- An Access and Compensation Agreement between Peak Iron Mines and McDouall Peak.
- An Access and Compensation Agreement between Peak Iron Mines and Ingomar.
- A Native Title Mining Agreement for Mineral Production – Peculiar Knob between Peak Iron Mines and AMYAC.

Table 6-1: Key stakeholder engagement activities

Stakeholder	Engagement mechanism	Purpose/Frequency
Directly affected landholders	Formal (written) correspondence Face-to-face meetings Telephone call/email	Formal correspondence including official letters and statutory forms to be issued as required in accordance with relevant legislation (i.e. Notice of Entry, Use of Declared Equipment etc.) Face-to-face meetings to be held as agreed with individual landholders directly affected Periodic telephone call/email to actively solicit feedback regarding impact of operations, efficacy of impact mitigation strategies, answer questions and provide update on project progress, as required. Various written/verbal communications as required to: • respond to ad hoc comments, questions or requests for information (verbal or written) • acknowledge/respond to complaints and issues of concern (written) • request access to land
Other landholders	Formal correspondence Face to face meetings Telephone call/email Printed material	Formal correspondence including official letters and statutory forms to be issued as required in accordance with relevant legislation (i.e. Notice of Entry, Use of Declared Equipment etc.) Face to face meetings as required to: • discuss current project plans and proposed new developments • provide regular project updates • report action taken in response to issues/items raised previously • identify any new issues of interest or concern • identify opportunities to facilitate mutually beneficial outcomes for Peak Iron Mines and the wider community • gauge community attitudes to the project • seek input to closure and rehabilitation plans Telephone call/email correspondence as required to: • solicit feedback regarding impact of operations, efficacy of impact mitigation strategies Occasional distribution of printed material to: • provide project updates to the wider community • respond to issues of community interest/concern
Indigenous groups	Face-to-face meetings	Regular face-to-face meetings to:

	Site visits Formal correspondence Statutory notices Telephone/email correspondence	• establish and maintain stakeholder relationships • discuss current project plans and proposed future developments • provide regular project and progress updates • report action taken in response to issues/items raised • identify any new issues of interest or concern and gauge attitudes to the project • identify opportunities to facilitate mutually beneficial outcomes for Peak Iron Mines and Indigenous stakeholders Site visits as required to identify sites of cultural heritage significance Formal correspondence in relation to Native Title Mining Agreements Statutory notices issued in accordance with relevant legislation Ad hoc telephone and email correspondence as required
Federal Government	Face-to-face meetings Formal correspondence Statutory notices Telephone/email correspondence	Regular meetings with Department of Defence representatives to: • comply with the requirements of the Deed of Access between Peak Iron Mines and The Commonwealth • arrange Access Approvals where required • provide operational updates and discuss current project plans and proposed new developments Statutory notices to be submitted in accordance with relevant legislation including referral under EPBC Act Telephone/email briefings to government stakeholders regarding development plans, project schedules, and other issues of interest/concern, as required
Regulatory bodies and State Government agencies	Face-to-face meetings Formal (written) correspondence Statutory notices and application forms Telephone calls/email correspondence	Formal written correspondence including letters, reports, statutory notices and application forms to be submitted in accordance with relevant legislation Ad hoc telephone and email correspondence to clarify statutory requirements etc. Regular project update meetings held with DEM as required to: • discuss proposed projects and further development of existing operations • present project schedules and updates on existing operations clarify regulatory requirements
Local government	Face-to-face meetings Formal correspondence Telephone calls/email correspondence	Briefing to Local Council as required to: • inform members and/or Administrator of current and future development plans • provide relevant regular project progress updates and status of statutory applications • discuss emergent issues and gauge community attitudes to the project

6.4 Issues management

A process to manage key issues has been incorporated into the Stakeholder Engagement Framework.

Stakeholders are encouraged to contact Peak Iron Mines, ask questions and discuss any issues of interest or concern throughout all phases of the project. All questions and feedback will be recorded in a Stakeholder Communications Register and will be reported against in annual PEPR compliance reports. All feedback will be acknowledged within one month of receipt. Wherever possible information will be provided if requested, together with any proposed follow-up action and the expected response times for resolving issues. Notes will be made of all one-to-one discussions with stakeholders.

Any issues of concern raised by stakeholders through the consultation process will be addressed.

6.5 Complaints management

Peak Iron Mines will strive to have a positive impact on our community, economy and environment by openly engaging with our employees and stakeholders on key issues and delivering on our commitments. Complaints will be recorded, investigated and responded to within one month of the complaint being received.

We will aim to operate with:

- *transparency, engagement and accountability*
- *meaningful engagement and community empowerment*
- *accountability to stakeholders*
- *establishing cordial and respectful relations with stakeholders, communities and government agencies.*

6.6 Key stakeholder list

This plan adopts the definition of stakeholders used at the 2002 World Summit on Sustainable Development. Stakeholders are defined as 'those who have an interest in a particular decision, either as individuals or representatives of a group. This includes people who influence a decision, or can influence it, as well as those affected by it' (MCMPR 2005, p6).

The key stakeholders for the project are shown in Table 6-2.

Table 6-2: Key stakeholders

Stakeholder group	Specific stakeholders
Directly affected landholders	McDouall Peak Station (W & S Rankin) Ingomar Station (S Harrison)
Indigenous groups	Antakirinja Matu-Yankunytjatjara Aboriginal Corporation (AMYAC)
Neighbouring Mining Operations	Prominent Hill Operations Pty Ltd/OZ Minerals Breadknife Hill Stone Quarry/McCormack Construction
State Government	Department for Energy and Mining (DEM) SafeWork SA Primary Industries and Regional Development (PIRSA) (including the-Pastoral Board & Unit) Department of Planning, Transport, and Infrastructure (DPTI) South Australian Planning Commission Department of the Premier and Cabinet (DPC) Department for Environment and Water (DEW) (including the Native Vegetation Council) Environmental Protection Agency – SA (EPA) SA Health
Local government and councils	District Council of Coober Pedy Outback Communities Authority
Federal Government	Department of Defence / Woomera Prohibited Area Coordination Office (WPACO) Department Agriculture, Water, and the Environment (DAWE)
Non-government organisations	Regional Development Australia - Far North South Australian Arid Lands Landscape Board (SAAL Landscape Board) Coober Pedy Miners Association Inc. Coober Pedy Retail Business & Tourism Association Inc.

6.7 Results of stakeholder consultation

Peak Iron Mines will keep records of all community consultation activities. A summary of the outcomes of meetings undertaken by the previous owner (Arrium Mining), and recent meetings held by Peak Iron Mines are provided in Table 6-3 and Table 6-4 respectively and includes a record of issues raised and responses offered.

Table 6-3: Previous stakeholder engagement undertaken by Arrium Mining

Stakeholder	Date	Matters discussed	Issues raised	Response
W & S Rankin – McDouall Peak Pastoral Lease	27/11/2013	Proposed ML and MPL and extent of WRD and Notice of Entry for Aboriginal Heritage Clearance Survey.	No issues raised	NA
	27/02/2014	Provided a copy of the Stakeholder Consultation Information Pack and a general update on preparations for the pegging of the new ML and MPL and development of the Mining Lease Proposal	It was noted that the existing Access & Compensation Agreement will require amendment on grant of the new tenements. No other issues were raised.	An updated version of the access agreement has been negotiated and signed off.
Department of Defence (Commonwealth of Australia)	25/01/2012	Initial discussions regarding the intent to expand tenement area around ML6314.	No issues raised	NA
	27/11/2013 (and again for subsequent visits in Jan'14 and Fe'14)	Access Approvals for the Aboriginal Heritage Clearance Survey.	No issues raised	NA
	21/02/2014	Discussed the status of preparations for the proposed ML and MPL, and followed up by forwarding a copy of the Stakeholder Consultation Information Pack.	No issues raised	NA
	16/04/2014	Arrium Mining provided written notification to the Commonwealth on 16/04/14 2014 of its intention to make application for the two new tenements, and subject to the required approvals to undertake "Proposed Additional Mining Activities" as defined in the Deed of Access.	Awaiting response from the Commonwealth (response required within 3 months).	NA
	26/05/2014	Defence confirmed agreement to the mine extension and the "Proposed Additional Mining Activities".	No issues raised	NA
	13/10/2014	The process to amend the current access deed to include the new leases	No issues raised	Amendment drafted

AMYAC	4/12/2013 Jan/Feb 2014	Proposed ML and MPL and extent of WRD and ROM pad. Heritage clearance survey undertaken. Two further site clearance visits were undertaken by AMYAC and discussions with Arrium resulted in a mutually agreed "in principle" position being determined on 12/02/14 which meets the operational requirements of the Peculiar Knob Iron Ore Project whilst respecting the concerns of AMYAC and minimising heritage impacts.	Survey indicated amendment of WRD and ROM pad footprints required due to sensitive features. Some landscape features sensitive to Aboriginal women were identified in addition to those identified on 4/12/14 Southern Iron presented alternative WRD footprint options to minimised impact on sensitive areas to the extent possible.	Further consultation to be undertaken on revised footprints of WRD and ROM pad adjusted. The in principle agreement reached on 12/02/14 is in the process of being formalised. It is intended to make application to the Minister under Section 23 of the Aboriginal Heritage Act in relation to disturbance of areas of significance (with the support of AMYAC)
OZ Minerals Prominent Hill Operations Pty Ltd	Various meetings on • 21/02/2012 • 7/09/2012 • 13/05/2013 • 25/09/2013 • 3/03/2014	Discussed options for Southern Iron to peg and make application for additional tenement area around ML6314. These discussions ultimately resulted in an "in principle" agreement enabling SI to peg a new ML and new MPL on OZ's EL 4283. Formal agreement enabling SI to peg a new ML and new MPL on OZ's EL 4283. A copy of the Consent Deed has been registered with DMITRE.	The key issue dealt with was to ensure that Southern Iron's proposed new tenements and activities on those tenements did not sterilise mineralisation of interest to OZ Minerals. No issues	On 3/03/14 OZ Minerals Prominent Hill Operations Pty Ltd and Southern Iron Pty Ltd executed a Deed of Consent which provides consent for the pegging out and granting of these new tenements. NA
Minister for Environment & Conservation (Crown Lands Pastoral Unit)	21/02/2014	Meeting with Chris Turner to present the Stakeholder Consultation Information Pack and discuss the proposed new ML and new MPL. Also discussed engagement status with the relevant pastoral leaseholder.	NA	NA
Department of the Environment (DoE)	12/03/2014 31/03/2014 14/04/2014	EPBC Referral submitted. Clarification request received from DoE Decision Notice received from DoE: • advising that the proposed action is a "controlled action," and that the proposed action will be assessed by "preliminary documentation"		 Response to clarification request provided Requested additional information was provided on 17/04/14.

		• requesting some additional information for assessment purposes		

Table 6-4 Recent stakeholder engagement undertaken by Peak Iron Mines

Stakeholder	Date	Matters discussed	Issues raised	Response
W & S Rankin – McDouall Peak Pastoral Lease	31/10/2019	Introductory meeting	Update McDouall Peak of Peak Iron Mines intentions and timing Potential for Peak Iron Mines and OZ Minerals to share accommodation village infrastructure Previous non reporting of livestock collisions during operations	Peak Iron Mines to provide detail to McDouall regarding access track requirements in the vicinity of Bluebird Track to allow LV and bus access between Peculiar Knob Mine and Prominent Hill. McDouall will review detail but in principal have no objections to an access track Peak Iron Mines to ensure future livestock collisions are reported.
	02/04/2020	Update of activities at PK and proposed roadworks	Management of livestock interactions with PK haul road Request for additional road signs	PK Roadkill Procedure drafted and sent for comment Road signs ordered and installed
	22/04/2020	Bore monitoring activities notification	None	N/A
Ingomar Pastoral Company (IPC)	12/08/2019	Introductory meeting held. Introduced Peak Iron Mines and the intended restart strategy	Certificate of currency requested for Peak Iron Mines Southern Iron licences	N/A
	03/09/2019	Provided certificate of currency and discussed future access notification requirements	IPC requested notification be provided of Peak Iron Mines access activities.	Peak Iron Mines agreed to provide email advice of activity within the mothball period
	02/04/2020	Update of activities at Peculiar Knob	None	N/A
	18/05/2020	Notification of proposed Feral Animal Control Programme	None	N/A
AMYAC	18/10/2019 (AMY Nominees)	Introductory meeting	Update AMY Nominees with Peak Iron Mines intention and timing.	Peak Iron Mines to advise as opportunities arise.

	18/11/2019 (AMYAC)	Introductory meeting and general review of agreement	AMY Nominees interested in contracting and employment opportunities. Possible resource sharing with waste recycling at Prominent Hill Update AMYAC with Peak Iron Mines intention and timing. Review of mutual obligations under the agreement. Possible Traditional Owner meeting timing	Peak Iron Mines will discuss once mobilised to site. AMYAC to advise possible dates and details for Peak Iron Mines review after COVID-19 no longer considered a threat to elders/board members
	19/03/2020 AMY Nominees	Introductory meeting, project update and potential employment and business opportunities	None	N/A
	31/03/2020 AMY Nominees and OZ Minerals	Potential business opportunities for AMY Nominees	None	N/A
OZ Minerals Prominent Hill Operations Pty Ltd	14/08/2019	Introductory Meeting, discussion of infrastructure requirements and potential sharing arrangements	Peak Iron Mines intended operations restarts timeline.	Scheduled follow up meetings and site visit
	16/10/2019	Site visit conducted, OZ Minerals inspected Peak Iron Mines haul road and Peak Iron Mines inspected OZ Minerals' camp and associated infrastructure	Peak Iron Mines intention to share accommodation infrastructure	N/A
	23/10/2019	Teleconference held to discuss camp facilities sharing and discussed outcomes of site visit	Requirement for landholder agreement on track access	Further discussions to be held following internal OZ Minerals discussions
	04/02/2020	Agreement reached re Peculiar Knob personnel occupying Prominent Hill accommodation village and utilisation of Prominent Hill charter services	None Forward manning projections	Projections to be provided to OZ Minerals once confirmed
	23/01/2020	Accommodation requirements WPA access requirements Prominent Hill vs Peculiar Knob, OZ Minerals booking system	N/A	N/A
	18/03/2020			

		Introductory meeting to members of SHEC team	Potential of stakeholder complications	Regular cross company communication to reduce the risk of stakeholder complications
CFS, SES/Mines Rescue & SAAS	22/05/2020	PK Mine site visit/familiarisation and Emergency Management Plan	Emergency drill	Emergency Management Plan to be distributed once finalised. Emergency drill scheduled for July 2020.

6.8 Government agency consultation

Peak Iron Mines has undertaken briefings and consultation with various government agencies and other stakeholders in relation to the Peculiar Knob Project and this PEPR update. Table 6-4 below provides a list of stakeholder consultations undertaken to date however the list is not exhaustive. Regular communication occurs on a daily/weekly/monthly basis with various stakeholders commensurate with their needs and the requirements of the project.

Table 6-5: Results of government agency consultations

Stakeholder	Date	Matters discussed	Issues raised	Response
DEM	07/06/2019	Introductory call to discuss Peak Iron Mines intentions and acquisition of the assets	NA	NA
	30/07/2019	Peak Iron Mines restart requirements. Historical correspondence and requirements between DEM and Arrium 'administrators appointed' (Korda Mentha)	DEM requested amendments made to the PEPR from Korda Mentha which were not addressed	Peak Iron Mines to provide updated waste rock dump cover design. Update PEPR as required
DEM, DEW, EPA	07/11/2019	Multi departmental meeting held with DEM, EPA, DEW, Native Vegetation Branch Licence requirements	Introductory discussion on Peak Iron Mines approach to mining and stockpile reclaiming operations	Peak Iron Mines to provide outline of operations to DEM
Department of Defence (Commonwealth of Australia)	14/10/2019	The process to amend the current access deed to include the new leases	Department of Defence (Commonwealth of Australia)	14/10/2019
Woomera Prohibited Area Coordination Office (WPACO)	19/12/2019	Project update and forward plan	N/A	N/A
DEM	21/01/2020	Project update, PEPR revision, bond, water license, Feral Animal Control Programme	Encapsulation of any PAF rock detected during mining operations	PEPR revision to be provided to DEM to address Matters Subsequent
DPTI	24/01/2020	Rail and port options and access	N/A	N/A
DEM	24/01/2020	Expected production, supply chain, expected job creation, project schedule, project pipeline	None	N/A
WPACO	30/01/2020	Proposed site access management framework	WPA requirements for GWA train drivers on Peak Iron Mines owned Wirrida rail loop	For the purposes of the Peculiar Knob project and applying only to train drivers, the Wirrida rail loop

				to be considered part of the rail corridor
WPACO	18/02/2020	Exclusion periods	Interruption of activities in amber zone #2	Exploration rehabilitation activities delayed
SafeWork SA	07/05/2020	Introductory meeting to Peak Iron Mines and the Peculiar Knob Project	SafeWork SA requires a variety of Peak Iron Mines/Peculiar Knob WHS documents to ensure regulatory compliance	Documents sent; feedback received and subsequently incorporated into documents.
CFS, SES/Mines Rescue and SAAS	22/05/2020	Peculiar Knob Mine site visit/familiarisation and Emergency Management Plan	Emergency drill	Emergency Management Plan to be distributed once finalised. Emergency drill scheduled for July 2020.
DEM	04/06/2020	Peculiar Knob Project update, update on exploration rehabilitation activities and summary of project pipeline	None	N/A
DPTI	17/06/2020	Update on Peculiar Knob Project. introduction and discussion on project pipeline.	None	N/A
DEW – Native Vegetation Branch	11/08/2020 – phone discussion 25/08/2020 – email follow up	Lack of detailed records of previous vegetation clearance and proposed reconciliation of native vegetation clearance Proposed clearance of vegetation (approximately 0.4 ha) at Wirrida rail loop	Suitability of proposed methodology Clearance of vegetation	Agreement that proposed methodology was sound Clearance of vegetation at Wirrida siding is okay provided it is within existing approved clearance area

7. RISK ASSESSMENT

7.1 Overview and process

7.1.1 Impact assessment

The potential environmental, social and economic impacts have been identified for the Project (Table 7-1, Table 7-2 and Table 7-3).

Table 7-1: Natural environment impacts

Aspects (impact events)	Impact receptors	Potential and likely consequences
Vegetation clearance	Flora	• Reduced flora diversity and abundance • Adverse effects on threatened species • Establishment of weeds in cleared areas
	Fauna	• Reduced native fauna diversity and abundance • Adverse effects on threatened fauna species
Mining activities (including rehabilitation and closure)	Flora Fauna Soil Surface water Groundwater Air quality Noise, vibration & light Visual amenity	• Reduced flora diversity and abundance • Reduced native fauna diversity and abundance • Loss of soil quality and quantity (erosion) • Salinization of soil • Decrease in groundwater quantity and quality due to extraction • Contamination of soil, surface water and groundwater • Increased dust generation • Inappropriate disposal of waste leading to loss of amenity • Change to visual amenity • Increased noise, vibration and light
Changes in land use following closure	Flora	• Re-establishment of ecosystem function
	Fauna	• Maintenance of fauna species diversity and abundance
	Visual amenity	• Visual amenity changes due to altered landscape

Table 7-2: Social impacts

Aspects (impact events)	Impact receptors	Potential and likely consequences
Mining activities (including rehabilitation and closure)	Coober Pedy community and pastoral lease holders	• Community complaints relating to dust, noise, vibration, light, waste • Loss of income due to decrease in grazing land, loss of stock due to truck and vehicle collision • Positive impact of income to community and jobs • Reduced visual amenity
	Aboriginal community	• Disturbance of sites
Changes in land use following closure	Coober Pedy community, pastoral lease holders and general community	• Reduce access to areas of interest and recreational value

Table 7-3: Economic impacts

Aspects (impact events)	Impact receptors	Potential and likely consequences
Change in land use	Local community Pastoral lease holder	• Increased employment • Reduced pastoral opportunities • Increased training • Opportunity for new local business ventures

The impact events identified for activities associated with the development have been compiled and assessed in terms of the receptor or receiving environment which is potentially affected. This may include:

- native vegetation and fauna
- weeds, pest animals and pathogens
- soil
- surface water
- groundwater
- air quality
- visual amenity, nuisance noise and light
- public safety and unauthorised access
- heritage
- adjacent land use and third-party property
- traffic.

The impact assessments for the following activities, however, are provided separately:

- waste disposal
- blasting (and vibration)
- care and maintenance
- closure and post closure.

7.1.2 Control and management strategies

The incorporation of control and management strategies includes both design control measures (to reduce the impact before it occurs) and management measures undertaken as part of the activity.

These controls and management strategies have been developed in accordance with recognised industry standards. Where the primary risk is ranked higher than 'Low', controls and/or management strategies will be implemented to reduce that risk. These include any necessary changes to design.

Refer to Section 9.1 for further information on over-arching management systems.

7.1.3 Completion of risk assessment

A risk assessment is undertaken prior to controls and/or management strategies being applied in order to establish an inherent (or primary) risk ranking. A second risk assessment is undertaken with the controls and/or management measures applied to provide a residual risk ranking. Peak Iron Mines considers these residual risks to be appropriate and acceptable project risks, providing the relevant controls and/or management strategies are implemented.

The following risk assessment matrix (consistent with AS/NZS ISO 31000:2009 Risk management and DEM MG2 guidelines) forms part of Peak Iron Mines business risk management systems, and is used to determine the risk of identified impacts presented in the following sections (Figure 7-1).

LIKELIHOOD / CONSEQUENCE	1 Negligible	2 Minor	3 Medium	4 Major	5 Extreme
5 Almost certain	High	High	Very High	Very High	Very High
4 Likely	Moderate	High	High	Very High	Very High
3 Possible	Low	Moderate	High	Very High	Very High
2 Unlikely	Low	Low	Moderate	High	Very High
1 Rare	Low	Low	Moderate	High	High

Figure 7-1: Peak Iron Mines risk assessment matrix

The qualitative measures of likelihood are:

- Almost certain: The event is expected to occur in most circumstances. Not surprised if it happens.
- Likely: The events will probably occur in most circumstances. Not surprised if it happens.
- **Possible:** The event might occur at some time. Would not be surprised either way, whether it happens or not.

- **Unlikely:** The event could occur at some time. Surprised if it happens.
- **Rare:** The event may occur only in exceptional circumstances. May happen, but it would be a shock.

The qualitative measures of social, environmental and legal consequences are:

- **Negligible:** No lasting effect. Low-level impacts on biological or physical environment. Limited damage to minimal area of low significance. Public concern limited to local complaints. Ongoing scrutiny/attention from regulator. Low-level legal issue. On the spot fine. Technical non-compliance, prosecution unlikely.
- **Minor:** Minor effects on biological or physical environment. Minor short-medium term damage to small area of limited significance. Minor adverse local public or media attention and complaints. Significant hardship from the Regulator. Reputation is adversely affected with a small number of site-focused people. Minor legal issues, non-compliances and breach of regulation. Minor prosecution or litigation possible.
- **Medium:** Moderate effects on biological or physical environment but not affecting ecosystem function. Moderate short-medium term widespread impacts. Attention from media and heightened concern from local community. Criticism by the NGOs, significant difficulties in gaining approvals. Environmental credentials moderately affected. Serious breach of regulation with investigation or report to authority with prosecution and/or moderate fine possible.
- **Major:** Serious environmental effects with some impairment of ecosystem function (e.g. displacement of a species). Relatively widespread medium-long term impacts. Significant national media attention. May lose license to operate or not gain approval. Environmental/management credentials tarnished. Major breach of regulation with potential major fine and/or investigation and prosecution by authority. Major litigation.
- **Extreme:** Very serious environmental effects with impairment of ecosystem function. Long term, widespread effects on significant environment (e.g. unique habitat, national park). Serious public or media outcry (international coverage). Damaging NGO campaign. Licence to operate threatened. Reputation severely tarnished. Share price may be affected. Investigation by authority with significant prosecution and fines. Very serious litigation, including class actions.

7.1.4 Leading indicator measurement criteria

Where appropriate (i.e. where the management of a risk relies heavily on a management strategy to reduce the risk) leading indicator criteria have been developed and are detailed in internal operational plans and programs. These have been designed to provide an early warning that the control or management strategy is not adequate and the outcome is at risk of not being achieved.

7.1.5 Outcome and measurement criteria

Outcomes and measurement criteria have been developed and are included in this PEPR. Outcomes and measurement criteria will monitor the effectiveness of the controls and/or management strategies specifically implemented by Peak Iron Mines for primary risks ranked higher than ‘Low’. The process in which required outcomes and measurement criteria for this PEPR have been determined is outlined in Figure 7-2.

7.1.6 New environment risks

There are no new environmental risks for the Project. If new risks are identified during operations or there are modifications to the Mine Plan a review will be undertaken of potential impacts through the risk assessment process and the PEPR updated accordingly.

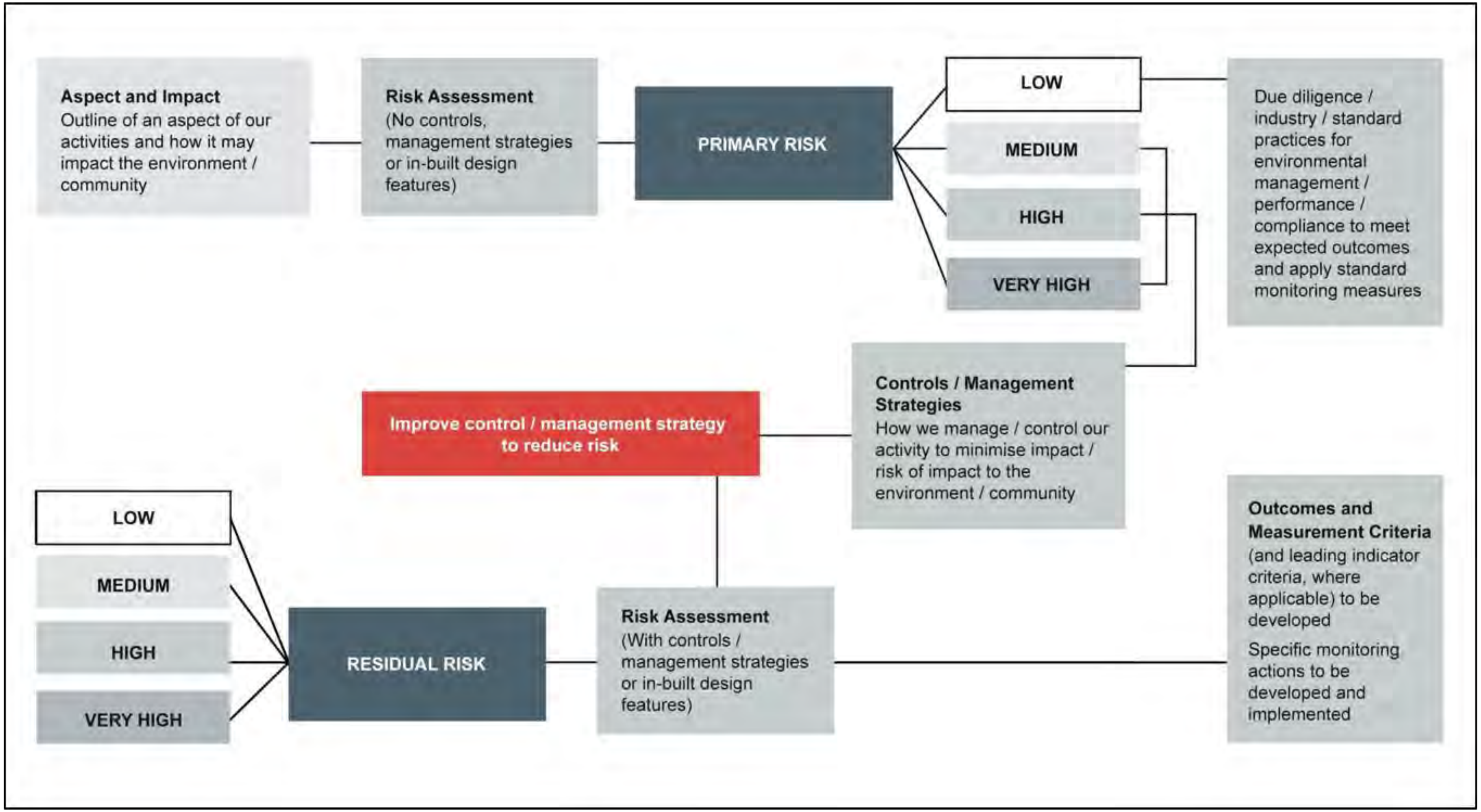


Figure 7-2: The risk assessment process converging on outcomes and measurement criteria

7.2 Applicable legislation

A matrix of legislation, regulations and policy currently applicable for the various aspects assessed for Peculiar Knob mine is provided in Table 7-4.

7.3 Stakeholders

A matrix of stakeholders currently applicable to the various aspects assessed for Peculiar Knob mine is provided in Table 7-5. Refer to Section 6 for details of Peak Iron Mines community and stakeholder engagement plan.

Table 7-4: Applicable legislation to Peculiar Knob operations

	Native Vegetation and Fauna	Weeds, pests and pathogens	Soil	Stormwater	Groundwater	Air quality	Radiation and asbestiform materials	Visual amenity, nuisance noise and light	Blasting and vibration	Waste Management	Public Safety	Adjacent land use and third party property	Heritage	Traffic	Post-closure
Commonwealth															
Environment Protection and Biodiversity Conservation Act 1999	x			x	x	x									x
South Australian															
Aboriginal Heritage Act 1988													x		x
Crown Land Management Act 2009											x	x			
Environment Protection Act 1993	x		x	x	x	x	x	x	x	x					x
Environment Protection (Air Quality) Policy 2016	x					x									x
Environment Protection (Noise) Policy 2007								x	x						x
Environment Protection Regulations 2009					x										x
Environment Protection (Waste to Resources) Policy 2010										x					x
Environment Protection (Water Quality) Policy 2015				x	x										x
Explosives Act 1936									x						

Heritage Places Act 1993													x		x
Mining Act 1971	x		x	x	x	x	x	x	x	x	x	x	x	x	x
National Parks and Wildlife Act 1972	x	x													x
Native Title (South Australia) Act 1994													x		x
Native Vegetation Act 1991	x			x	x	x						x			x
Landscape South Australia Act 2019	x	x	x	x		x						x			x
Radiation Protection and Control Act 1982							x								
Road Traffic Act 1961														x	
Work Health and Safety Act 2012							x		x		x	x			x
Work Health and Safety Regulations 2012									x		x	x			x

Table 7-5: Stakeholders potentially affected by Peculiar Knob operations

	Native Vegetation and Fauna	Weeds, pests and pathogens	Soil	Stormwater	Groundwater	Air quality	Visual amenity, nuisance noise and light	Blasting and vibration	Waste Management	Public Safety	Adjacent land use and third party property	Heritage	Traffic	Post-closure
Commonwealth government														
Department of Agriculture, Water and the Environment (DAWE)	x													
Department of Defence										x	x			
National Native Title Tribunal (NNTT)												x		
South Australian government														
DPC - Aboriginal Affairs and Reconciliation												x		
Department for Environment and Water (DEW) – SA Arid Lands Landscape Board	x	x	x	x		x					x			x
(DEW) – Parks and Wilderness Council	x	x	x											
PIRSA – Pastoral Board											x			
Department for Energy and Mining (DEM)	x	x	x	x	x	x	x	x	x	x	x	x	x	x
Department Planning, Transport and Infrastructure (DPTI)								x					x	
Environment Protection Authority (EPA)														

Native Vegetation Council (NVC)					x	x	x		x				x	x
Safework SA	x			x	x						x			x
South Australian Native Title Service (SANTS)										x				
Other												x		
Peak Iron Mines site personnel, contractors and visitors														
Antakirinja Matu-Yankunytatjara Aboriginal Corporation (AMYAC)								x		x			x	
OZ Minerals	x											x		x
Copper Pedy Council								x						
landholders										x	x		x	
local community						x	x	x		x	x			x
neighbouring landholders									x	x			x	x
public road users	x	x	x	x	x	x	x	x	x	x	x		x	x
regional community							x		x	x				
visitors									x	x				x

7.4 Native vegetation and fauna

7.4.1 Context

Extensive surveys were undertaken as part of the original approval for ML6314 and through monitoring of potential impacts from operations as required by the current approved PEPR 2019/030 and reported in the Southern Iron annual compliance report.

The development on ML6442 and MPL147 will result in clearance of native vegetation, which could reduce flora density and diversity and habitat for fauna. Dust generation could result in an impact on vegetation. A series of controls and management strategies will be used to ensure these impacts are minimised, and are as low as reasonably practicable (ALARP).

The maximum approved clearance area (previously approved PEPR 2013/013) was 890.47 ha (see Section 4.2). A total area of 81.08 ha of native vegetation has been approved for clearance associated with ML6442 and MPL147 (previously approved PEPR2016/043). The details of the area to be cleared and the associated vegetation communities are provided in Section 4. The SEB was amended to allow for a maximum potential vegetation clearance area of 971.55 ha or alternative arrangements, such as payment to the NVC Fund.

No flora species of state or national conservation rating were identified during the survey.

The *Amytornis textilis modestus* (thick-billed grasswren) has a national rating of 'vulnerable' and a State rating of 'rare'. This species and its habitat were identified in the EPBC Act Protected Matters Report as likely to occur within the nominated area and was subsequently detected on site during the 2007 EBS survey. As part of the 2007 assessment conducted by EBS (see Appendix E-1), it was identified that mining activities (drilling and operational works) could impact the population of the thick-billed grasswren within ML6314, however at a regional level these impacts will not be ecologically significant.

The Thick-billed Grasswren was observed during the July 2013 and September 2013 surveys around the site in the chenopod low shrubland with open gibber association (vegetation association 2) and within an area of dense Blue Bush (*Maireana astrotricha*).

The Peculiar Knob Project was deemed to be a controlled action on date 6th September 2010 and subsequently approved with conditions on 9th June 2011. On 30th October 2012 Southern Iron Pty Ltd obtained a variation to the EPBC approval. The new tenements granted in December 2014 were the subject of a new EPBC Referral (EPBC 2014/7154). The Commonwealth Department of Environment determined on 11th April 2014 that the proposed action was a "controlled action" which requires assessment and approval under the EPBC Act before it can proceed. On 29th July 2014 Southern Iron Pty Ltd received approval from the Assistant Secretary West Assessment Branch of the Department of Environment (delegate of the Commonwealth Minister administering the EPBC Act) for the WRD expansion and other components included in the ML and MPL application (Appendix H).

Southern Iron with The Nature Foundation and Flinders University are currently running a research program to better understand habitat preferences, breeding and gene flow of the Thick-billed Grasswren. The research program has been amended to take into consideration the minor additions to habitat clearing for the proposed new tenements (15% extra clearing matched with 15% additional funds). The preferred habitat of the Thick-billed Grasswren is Chenopod Shrubland, which is well-represented throughout the region. With research currently underway to better understand this species it is likely that the minor removal of the preferred habitat of the Thick-billed Grasswren and habitat restoration at Witchelina Reserve will result in a net benefit for the species.

A Feral Animal Control Programme was approved by the Department of Agriculture, Water and the Environment (DAWE) in March 2020 and was implemented in May 2020. The programme was implemented over a minimum of 400 ha of Thick-billed Grasswren habitat within the *Baltana* sub-region to offset the vegetation clearance associated with ML 6442 and MPL147, as per the EPBC Decision Notice (dated 29/07/2014).

7.4.2 Potential impacts

The potential impacts to native vegetation and fauna from the project activities may result from:

- unauthorised vegetation clearance
- loss of density and diversity of vegetation
- loss of habitat
- fugitive dust from clearance, moving vehicles, machinery and equipment
- collision with fauna
- blasting activities
- uncontrolled surface runoff and changes to drainage
- use of saline water for dust suppression.

Standard management controls and monitoring protocols will be implemented to minimise impacts where they cannot be prevented.

The potential impacts on native vegetation and fauna are summarised in Table 7-6.

Table 7-6: Impact event analyses- Native vegetation and fauna

Source	Pathway	Barrier	Environmental receptor	Consequences
Authorised and unauthorised vegetation clearance	Over clearing	Environmental awareness training Clearance protocols and approval system Compliance with the *Native Vegetation Act 1991*	Native vegetation Fauna	Impact on vegetation species diversity and abundance Adverse effect on threatened species Loss of habitat (unapproved clearance)
Mine related dust generating activities	Airborne dust	Dust mitigation and management strategies	Native vegetation Fauna	Impact on vegetation species diversity and abundance Adverse effect on threatened species Loss of habitat

Crushing and screening operations at the mine site	Airborne dust	Operational procedures and controls Dust control measures on crushing and screening operations	Vegetation	Impact on vegetation species diversity and abundance
Vehicle traffic, machinery and equipment	Vehicle traffic on haul roads and access roads	Driver awareness Speed restrictions Existing road infrastructure will be used, minimising the need to create new transport corridors	Native vegetation Fauna	Interaction with vehicles and equipment causing damage to vegetation and injury/fatality of fauna
Sedimentation	Drainage lines along preferential pathways	Sedimentation controls and monitoring protocols	Native vegetation Fauna	Changes to local drainage Reduced health of vegetation with sedimentation Loss of habitat
Entrapment of fauna	Voids, holes, enclosures	Awareness Inspection protocols	Fauna	Injury, fatality Reduced health and wellbeing
Night time operations	Light	Lighting design and orientation to minimise spillage of light outside of work areas	Fauna	Reduced health and wellbeing of fauna

7.4.3 Control and management strategies

Native vegetation

There is no practical way of avoiding the impacts of clearing vegetation. However, the extent, severity and likelihood of the consequences will be reduced by implementing the management measures set out below. These impacts will be limited to the designated area approved for vegetation clearance. Flora monitoring sites are indicated in Figure 7-3 (and also provided as Appendix A-9).

The controls and management strategies that will be implemented to minimise impacts to native vegetation include:

- awareness training
- planning, design and operational clearance permits and dust management procedures
- implementing procedures and checks which require approval in accordance with clearance protocols before vegetation is cleared

- planning, design and operational procedures to minimise impacts on native vegetation, particularly vegetation providing habitat for native fauna
- construction and operations management plans to ensure impact areas are surveyed for native vegetation, and controlled to comply with design parameters and approvals conditions
- setting aside a SEB offset to compensate for native vegetation clearances for the proposed activities. The SEB offset areas for various clearance areas of the operation will be set aside in accordance with Section 4
- commissioning botanists recognised under the Native Vegetation Act to undertake native vegetation surveys and assessment with comparisons to baseline monitoring data.

Fauna

The controls and management strategies that will be implemented to minimise impacts to fauna include:

- awareness training
- planning, design and operational procedures to protect fauna
- undertaking annual spring time surveys to record the occurrence of listed species such as the Thick-billed Grasswren and compare statistical changes to baseline project data
- commissioning experts to undertake fauna surveys and assessments, to complement in-house surveys and assessments.

Table 7-7 and Table 7-8 provide details of the risk assessment for the identified impact events, the control and management strategies to be implemented, and the associated outcomes and measurement criteria for native vegetation and fauna. Fauna monitoring sites are indicated in Figure 7-3 (and also provided as Appendix A-9).

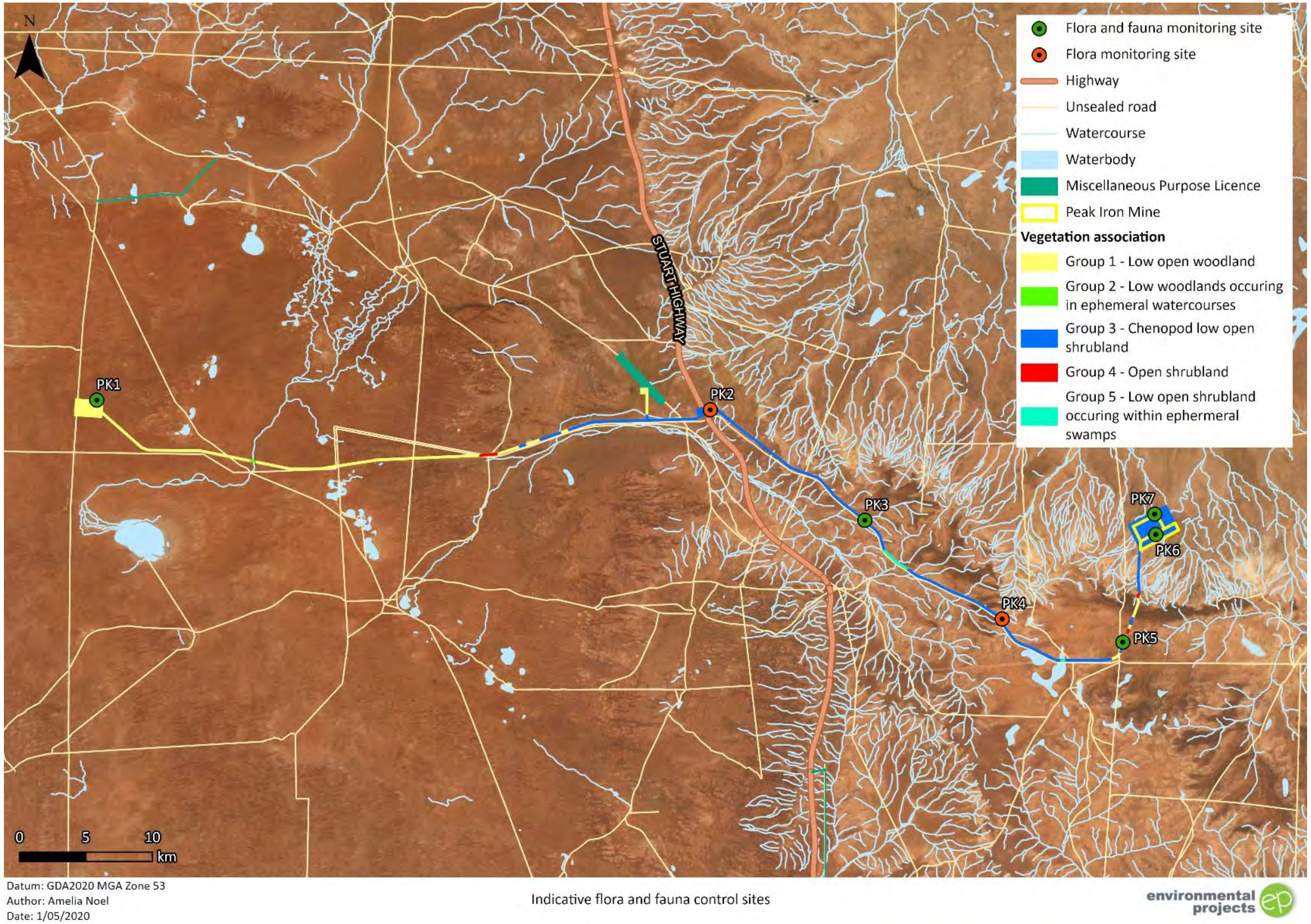


Figure 7-3: Indicative flora and fauna control sites

7.4.4 Evaluation of residual risk

Monitoring of the impact of operations on vegetation (including dust) has been undertaken at the mine site and reported in previous Annual Compliance reports. It was noted that cattle grazing and trampling of perennial shrubs has been the most significant impact. The 2013 flora monitoring indicates that dust impacts from mining activities have not had negative impacts on vegetation health.

The monitoring has also indicated that fugitive emissions from the haul road are minimal and observations of heavy vehicle movements suggest that the dust suppression program is effective.

In relation to native vegetation and fauna, the impact assessment has concluded the primary risk to regional species and communities of significance will be 'High' if appropriate planning, design and operational management measures are not implemented.

Risks will be reduced as far as practicable by the design, minimising the areas of vegetation clearance and avoiding clearance in areas of high habitat value and continuing with the successful management measures.

Providing SEB offsets beyond the regulatory minimum obligations and other mitigation strategies will assist by preserving habitat for the Thick-billed Grasswren.

There is a 'Moderate' primary risk of dust affecting flora and there is a possibility of impact to fauna during operation. Further assessment of potential dust impacts on native vegetation associated with the relocation of the crushing and screening plant to the mine site, and road transport of crushed product to the rail loop, is provided in Section 7.9.

The net impact to native vegetation and fauna, as a result of the project activities is considered to be of low significance to the area and the region given:

- the predominant vegetation associations to be cleared are well represented throughout the region
- conservation significant native vegetation and fauna are well represented within the region
- the SEB provides for the clearance area
- the strict controls and monitoring imposed by the operator for clearance of vegetation.

The monitoring program during 2013/14 included a comparison of impact sites adjacent to operational area control sites unaffected by mining activities. This comparison showed no statistical or physical impact on native vegetation from dust. Similarly fauna monitoring surveys from 2013/14 indicate no measurable negative impacts to fauna living adjacent to mining areas when compared to the control site several kilometres from operations.

The residual risk will be maintained as predominantly 'Low' with the implementation of due diligence, standard industry practices, and specific controls and management measures.

Table 7-7: Risk assessment- Native vegetation

Aspect and impact	Level of risk (inherent) LHD/CON/IRL			Controls/ Management strategies	Level of risk (residual) LHD/CON/RRL			Outcome measurement requirement
Reduced native vegetation species diversity and abundance as a result of unauthorised vegetation clearing	Possible	Minor	Moderate	Mining operations designed to reduce clearing requirements and impacts. Implement measures in Sections 4 and 5 which address: • Rehabilitation requirements (schedule, species, monitoring and management etc) • Vegetation clearance boundaries • Weed management (within the rehabilitation areas) • Site access and traffic movements Implement Significant Environmental Benefit (SEB)	Unlikely	Minor	Low	Yes-see Section 8.1.1
Adverse effects on threatened flora as a result of vegetation clearing	Unlikely	Minor	Low	Mining operations designed to reduce clearing requirements and impacts. Implement measures in Sections 4 and 5 which address: • Rehabilitation requirements (schedule, species, monitoring and management etc) • Vegetation clearance boundaries • Weed management (within the rehabilitation areas) • Site access and traffic movements Implement Significant Environmental Benefit (SEB)	Unlikely	Minor	Low	No
Permanent loss of abundance or diversity of native vegetation in areas adjacent to mining operations due to dust	Possible	Minor	Moderate	Grade/compact high-traffic areas around the site with road base. Site induction and training to include requirements to keep to established tracks and roads. Staged clearing and progressive rehabilitation (as per Sections 4 and 5) Implementation of Dust Management Plan An appropriately qualified and experienced specialist will assess whether there is a demonstrated impact associated with saline water use for dust suppression.	Unlikely	Minor	Low	Yes-see Section 8.1.8

Impacts to vegetation from saline water used for dust suppression	Likely	Medium	High	Use of drip sprayer rather than boom spray as appropriate for dust suppression activities. Staged clearing (as per Sections 4 and 5). Cleared and compacted areas such as roads to be ripped at the end of the project to assist vegetation establishment in areas where saline water was applied. Soil monitoring to establish salinity parameters and possible removal of saline soil during rehabilitation, to promote re-vegetation in affected areas. An appropriately qualified and experienced specialist will assess whether there is a demonstrated impact associated with saline water use for dust suppression.	Unlikely	Minor	Low	Yes-see Section 8.1.1
Loss or reduction in quality of downstream riparian habitats due to altered flow regimes through diversion of local watercourses	Possible	Medium	High	Any water diversion will be designed to avoid soil disturbance in flows that may cause deterioration of water quality. Water will not be diverted out of the catchment so that the volume of water to downstream pools will be maintained. Water diversions will be inspected during and after flows to ensure stability of any constructed sections.	Unlikely	Minor	Low	Yes-see Section 8.1.1
Loss of vegetation from fires due to mining operations	Unlikely	Minor	Low	Compliance with AS 5062-2006 Fire protection of mobile and transportable equipment. Provide emergency response capability at mine. Liaise with local emergency services and nearby mining operations. Undertake training and mock incidents.	Unlikely	Minor	Low	No

Table 7-8: Risk assessment- Fauna

Aspect and impact	Level of risk (inherent) LHD/CON/IRL			Controls/ Management strategies	Level of risk (residual) LHD/CON/RRL			Outcome measurement requirement
Reduced native fauna species diversity and abundance due to reduction in vegetation habitat	Possible	Minor	Moderate	Mining operations designed to reduce clearing requirements and impacts	Unlikely	Minor	Low	Yes-see Section 8.1.2
Reduction of threatened species abundance across the project area	Possible	Minor	Moderate	Mining operations designed to reduce clearing requirements and impacts. Implementation of best practice progressive rehabilitation programs and subsequent protection and monitoring of rehabilitated areas. Significant Environmental Benefit (SEB) Offset. Threatened species monitoring during operations. An appropriately qualified and experienced specialist will assess whether there have been any net adverse impacts on native fauna species	Unlikely	Minor	Low	Yes-see Section 8.1.2
Reduction in native fauna species diversity and abundance during operations due to dust, noise, vibration or light.	Possible	Minor	Moderate	Implementation of dust management plan Include noise abatement design measures on site infrastructure e.g. generators, material handling machinery. Use of mobile mine machinery with noise abatement devices e.g. mufflers that meet standards and current best design capability. Maintain noise abatement devices on mine infrastructure and mobile machinery / vehicles (mufflers). Service machinery regularly in accordance with manufacturing requirements. Use of directional lighting consistent with safety requirements. An appropriately qualified and experienced specialist will assess whether there have been any net adverse impacts on native fauna species.	Possible	Minor	Moderate	Yes-see Section 8.1.2
Vehicle collisions with significant fauna causing death or injury.	Unlikely	Minor	Low	Include fencing where appropriate to minimise potential access by fauna to site operational areas. Speed restrictions on roads. Employee and contractor fauna awareness training during inductions.	Possible	Minor	Moderate	Yes-see Section 8.1.1

				Site induction to include requirements for compliance with Section 13 of the *Animal Welfare Act and Animal Welfare Regulations 2008*				
Loss or reduction in diversity and abundance of ephemeral fauna ecosystems.	Possible	Minor	Moderate	Any water diversion will be designed to avoid soil disturbance in flows that may cause deterioration of water quality. Water will not be diverted out of the catchment so that the volume of water to downstream pools will be maintained. Water diversions will be inspected during and after flows to ensure stability of any constructed sections. An appropriately qualified and experienced specialist will assess whether there have been any net adverse impacts on ephemeral ecosystems.	Unlikely	Minor	Low	Yes-see Section 8.1.1
Loss of fauna from fires due to mining operations	Unlikely	Minor	Low	Compliance with AS 5062-2006 Fire protection of mobile and transportable equipment. Provide emergency response capability at mine. Liaise with local emergency services and nearby mining operations. Undertake training and mock incidents.	Unlikely	Minor	Low	Yes-see Section 8.1.2

7.5 Weeds, pests and plant pathogens

7.5.1 Context

Three exotic species including rosy dock (*Acetosa vesicaria*), colocynth (*Citrullus colocynthis*) and burr-medic (*Medicago polymorpha var. polymorpha*) were identified during previous flora investigations for ML6314, MPLs 126-129, MPL131, MPL133 and MPL134 (EBS 2007 and 2009).

During the current mining operations the weed species paddy melon (*Cucumis myriocarpus*) was found adjacent to the haul road. The plants were completely removed including seed matter adjacent to the plants. The locations were recorded in a site register to enable future follow up inspections. buffel grass (*Cenchrus ciliaris*) was found in areas adjacent to the Adelaide to Darwin railway and was subsequently poisoned by a qualified contractor. To date no buffel grass has been recorded at Peculiar Knob operations. Infestations of caltrop (*Tribulus terrestris*) and Mediterranean turnip (*Brassica tournefortii*) occurred around the accommodation camp and were subsequently controlled.

Three weed species were identified as part of investigations for the expanded WRD. *Malvastrum americanum* and *Sonchus oleraceus* (sowthistle) were located north of ML6314 in very small numbers and *Sonchus oleraceus* was also observed at the major drainage line located east of ML6314 where a dense population occurred due to an accumulation of water over a prolonged period.

Cattle and rabbits were the two exotic fauna species recorded during the 2007 and 2009 surveys by EBS.

7.5.2 Potential impacts

The potential impacts relating to pests, weeds and plant pathogens are detailed in Table 7-9.

Table 7-9: Impact event analysis- Weeds, pests and plant pathogens

Source	Pathway	Barrier	Environmental receptor	Consequences
New weeds and increased abundance of existing weed species	Vehicle traffic Cleared areas	Vehicle washdown Weed Management Plan Continuous weed mapping	Native vegetation	Impacts to native vegetation communities Breach of the Landscape SA Act
New pest animal species Increase in abundance of existing pest animal species	Migration onto site from surrounding land	Active pest management through terrestrial weed and Pest control procedures	Native vegetation Fauna	Predation on native fauna Depletion of native vegetation and reduction in abundance
Plant pathogens	Imported onto site via vehicle traffic	Vehicle washdown Hygiene procedures and protocols	Native vegetation	Decreased health of local native vegetation

7.5.3 Control and management strategies

Peak Iron Mines will implement a site specific pest and weed management program for the mining operations.

Table 7-10 details the risk assessment, the control and management strategies to be implemented, and the associated outcomes and measurement criteria for pests, weeds and plant pathogens. Weed monitoring sites are indicated in Figure 7-3.

7.5.4 Evaluation of residual risk

The risk assessment indicated that the primary risk of introducing weeds was 'Moderate to High' if appropriate planning, design and operational management measures are not implemented. The risks of introducing pathogens are 'Low', and will be managed in accordance with standard operational protocols.

During the previous mining operations, the weed species paddy melon (*Cucumis myriocarpus*) was found adjacent to the haul road. The plants were completely removed including seed matter adjacent to the plants. The locations were recorded in a site register to enable future follow up inspections. Buffel grass (*Cenchrus ciliaris*) was found in areas adjacent to the Adelaide to Darwin railway and was subsequently poisoned by a qualified contractor. To date no buffel grass has been recorded at Peculiar Knob operations. High risk areas will be monitored. Specific monitoring of weeds and pests will continue as part of the existing program for weed and pest control.

As pest animals already exist in the area on a landscape scale, the primary risk of introducing a new pest animal or increasing the abundance of existing pest animals is 'Low' to 'Moderate'.

A feral animal control program will be implemented upon recommencement of mining.

The currently adopted control and management measures lead to a residual risk level of 'Low to Moderate'.

Table 7-10: Risk assessment- Weeds, pests and plant pathogens

Aspect and impact	Level of risk (inherent) LHD/CON/IRL			Controls/ Management strategies	Level of risk (residual) LHD/CON/RRL			Outcome measurement requirement
Establishment of weeds in disturbed areas	Possible	Minor	Moderate	Seed and soil inspection permits on all vehicles entering site Mining operations designed to reduce clearing requirements and impacts. Minimise open areas of disturbance through staged clearing program, weed eradication programs on site, maintenance of rehabilitated areas. Topsoil stockpile management and progressive rehabilitation. An appropriately qualified and experienced ecologist will assess whether there is a demonstrated increase in weeds.	Unlikely	Minor	Low	Yes-see Section 8.1.3
Weed establishment in artificially wet areas during operations.	Possible	Minor	Moderate	Seed and soil inspection permits on all vehicles entering site. Design site surface water management to minimise water ponding. Implement weed management plan during operations, and monitor for weed establishment in areas of disturbance during mine life Environmental awareness training for all staff and contractors Prohibition of off-road driving. An appropriately qualified and experienced ecologist will assess whether there is a demonstrated increase in weeds.	Unlikely	Negligible	Low	Yes-see Section 8.1.3
Reduction in native fauna species density and diversity due to introduced (feral) species	Possible	Minor	Moderate	Include fencing where appropriate to deter animals from water and waste sources. Waste stored on site to be contained to isolate from pests. Implement strict waste management procedures (including containment, segregation etc) to minimise food sources. Monitor and implement pest trapping and management as required. An appropriately qualified and experienced specialist will assess whether there is a demonstrated increase in pest animals. Pets not to be kept and no animal to be fed on site.	Unlikely	Minor	Low	Yes-see Section 8.1.3 Stakeholder communication notes demonstrate that ad-hoc pest control programs have been discussed and undertaken as required with Ingomar Station and McDouall Peak Station.

Increased abundance of feral animals and weeds due to long term water body in borrow pit associated with EML 6373	Unlikely	Minor	Low	This is a low risk area for feral goats. Feral goats not recorded in previous fauna or flora surveys or annual monitoring. Fox and rabbit abundance will be monitored and ad hoc pest control programs will be undertaken as required following consultation with the managers of Ingomar Station.	Unlikely	Minor	Low	Stakeholder communication notes demonstrate that ad-hoc pest control programs have been discussed and undertaken as required with Ingomar Station
Introduction of plant pathogens from machinery entering site from infested areas	Rare	Minor	Low	Vehicle brush down stations at entrances to mine site. Minimise clearing through staged clearing and progressive rehabilitation. Implementation of weed management plan, progressive rehabilitation, restrict traffic movements across the operation, stock management and access on site, weed education during induction process for contractors and site staff.	Rare	Minor	Low	No

7.6 Soil

7.6.1 Context

Soil is considered in this section in the context of impacts to undisturbed soil and stripped topsoil.

The project area occurs within the Stony Plains and Gawler Interim Biogeographic Regionalisation for Australia (IBRA version 7). These Bioregions have been subdivided into sub-regions (IBRA version 7) and Associations (IBRA version 6.1). Table 7-11 provides a summary of the relevant IBRA information for the MLs and MPLs and the distribution indicated in Figure 7-4 (and also provided as Appendix A-10).

Table 7-11: Biogeographic distribution of project components

Tenement	Project Component	IBRA Region	IBRA Sub-region	IBRA Association
ML6314	Existing open pit, WRD, site offices, ROM pad, magazine, telecommunications tower, and other relevant mining infrastructure	Stony Plains	Baltana	Breakaway
ML6442	Additional ROM pad, crushing plant, stockpiles	Stony Plains	Baltana	
MPL125	Haul road	Stony Plains	Breakaway	Breakaway
MPL126	Haul road	Stony Plains	Breakaway	Breakaway
MPL127	Haul road, accommodation village	Stony Plains	Breakaway & Oodnadatta	Warrida, Mabel Creek & Breakaway
MPL128	Haul road	Stony Plains	Oodnadatta	Warrida, Mabel Creek & Lake Phillipson
MPL129	Haul road	Gawler	Oodnadatta	Lake Phillipson
MPL130	Haul road	Stony Plains	Baltana & Breakaway	Breakaway
MPL131	Rail loop	Gawler	Oodnadatta	Lake Phillipson
MPL133	Penrhyn borefield and pipeline	Stony Plains	Oodnadatta	Lake Phillipson
MPL134	Stafford borefield and pipeline	Stony Plains	Breakaway & Oodnadatta	Breakaway & Warrida
MPL141	Camp borefield	Stony Plains	Oodnadatta	Mabel Creek
MPL147	WRD	Stony Plains	Baltana	Breakaway

The Breakaway is characterised by a dissected silcrete tableland, mesas and extensive gibber-covered footslopes on deeply weathered shales.

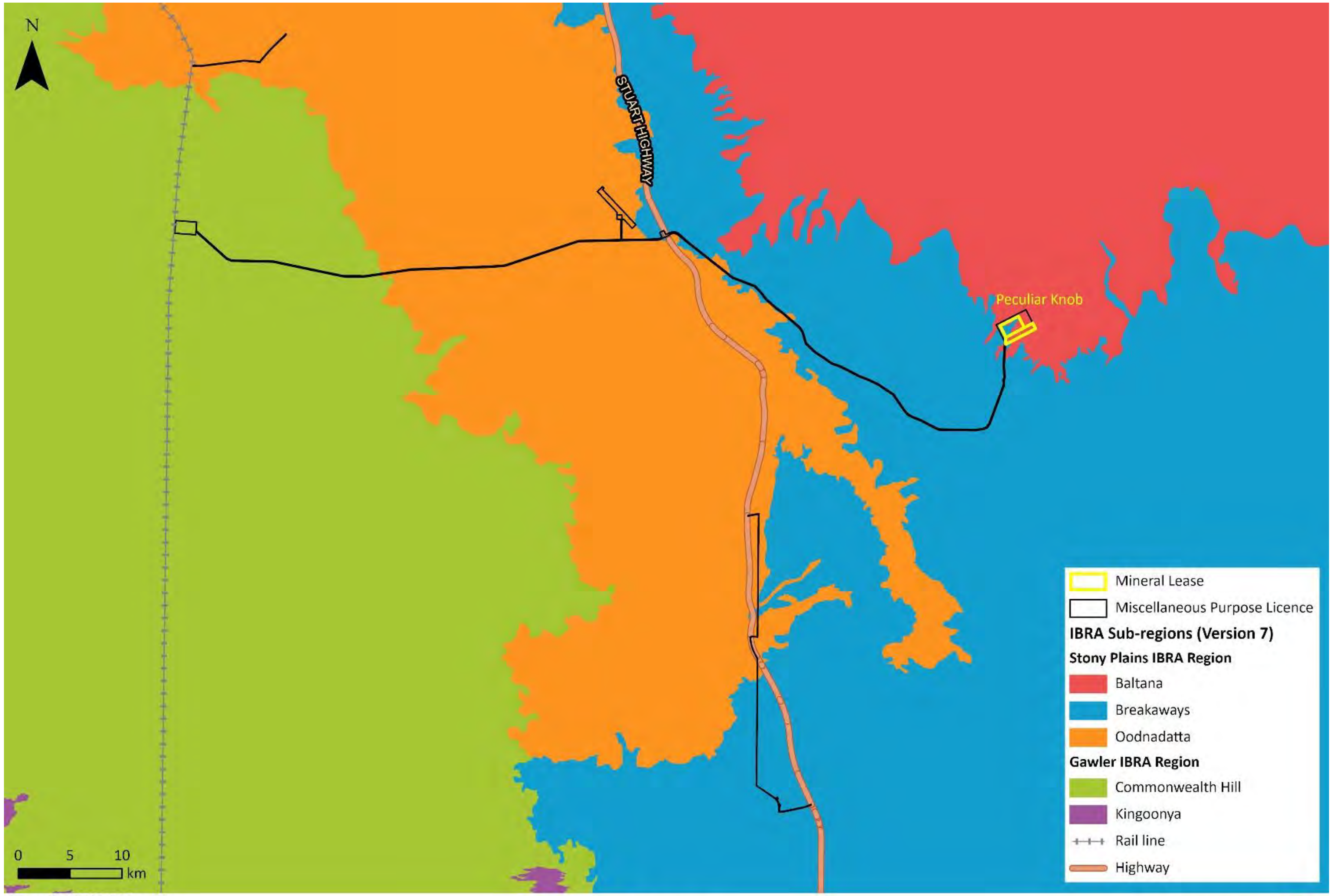
The soils of the Peculiar Knob area are of the broad shallow calcareous loamy soil type. Gibbers (pebble size rocks generally quartz rich) commonly occur on the soil surface and form a partial protection from erosion. Gilgais (a hummocky micro-relief pattern of small depressions or raised areas) with cracking clays also occur, and soils developed on alluvium may be sandier.

Where developed on Bulldog Shale the soil profiles are up to 0.5 m deep. The soils are typically of low biological activity and low in nutrients.

The accommodation village, rail loop and the western portion of the haul road traverse soils that consist of dominant moderately deep red duplex soils with sub-dominant moderately deep sands.

Topsoil is removed from operating areas and stockpiled for later reuse for onsite rehabilitation and revegetation programs. Appropriate topsoil management is required to ensure it remains viable for reuse (refer to Section 3.7.6).

The mining operations have the potential to result in soil contamination if appropriate management measures and controls are not implemented.



Datum: GDA2020 MGA Zone 53
Author: Amelia Noel
Date: 30/04/2020

IBRA regions

environmental projects ep

Figure 7-4: IBRA regions

7.6.2 Potential impacts

The potential impacts relating to soil are detailed in Table 7-12.

Table 7-12: Impact event analysis- Soil

Source	Pathway	Barrier	Environmental receptor	Consequences
Land clearance (including inadvertent clearance)	Site preparation works and mining activities	Topsoil management procedures Stormwater control infrastructure Staged clearance Progressive rehabilitation where feasible	Soil	Loss of soil quantity resulting in poor rehabilitation outcomes
Use of saline water for dust suppression	Mining activities	Application rate and post mining management	Soil	Loss of soil quality
Hazardous substance, raw water and chemical spills	Mining activities	Operating procedures Storage of hazardous substances in accordance with AS 1940 and EPA bunding guidelines	Soil	Loss of soil quality Impacts to vegetation
Acid Rock Drainage	Mining activities	Design of WRD	Soil	Loss of soil quality

7.6.3 Control and management strategies

Table 7-13 provides details of the risk assessment for soil, the control and management strategies to be implemented, and the associated outcomes and measurement criteria.

7.6.4 Evaluation of residual risk

A 'High' primary risk has been identified for erosion, salinity and acid rock drainage impacts for soil. Therefore, strategies to protect soil viability and ensure losses are minimised as much as reasonably practicable.

Monitoring of soil pH and soil salinity was undertaken in 2013/2014, in accordance with the requirements of the PEPR 2013/013. The results were documented in the 2013-2014 Compliance Report and indicated that concentrations were within the range of what would be expected with natural seasonal variability. Erosion and sedimentation was also monitored and the results indicate no major changes when compared to baseline monitoring.

Implementation of the proposed control and management measures is expected to reduce the residual risks of impacts as far as practicable to 'Low to Moderate' risk. Monitoring locations are indicated in Figure 7-5 (and also provided as Appendix A-11).

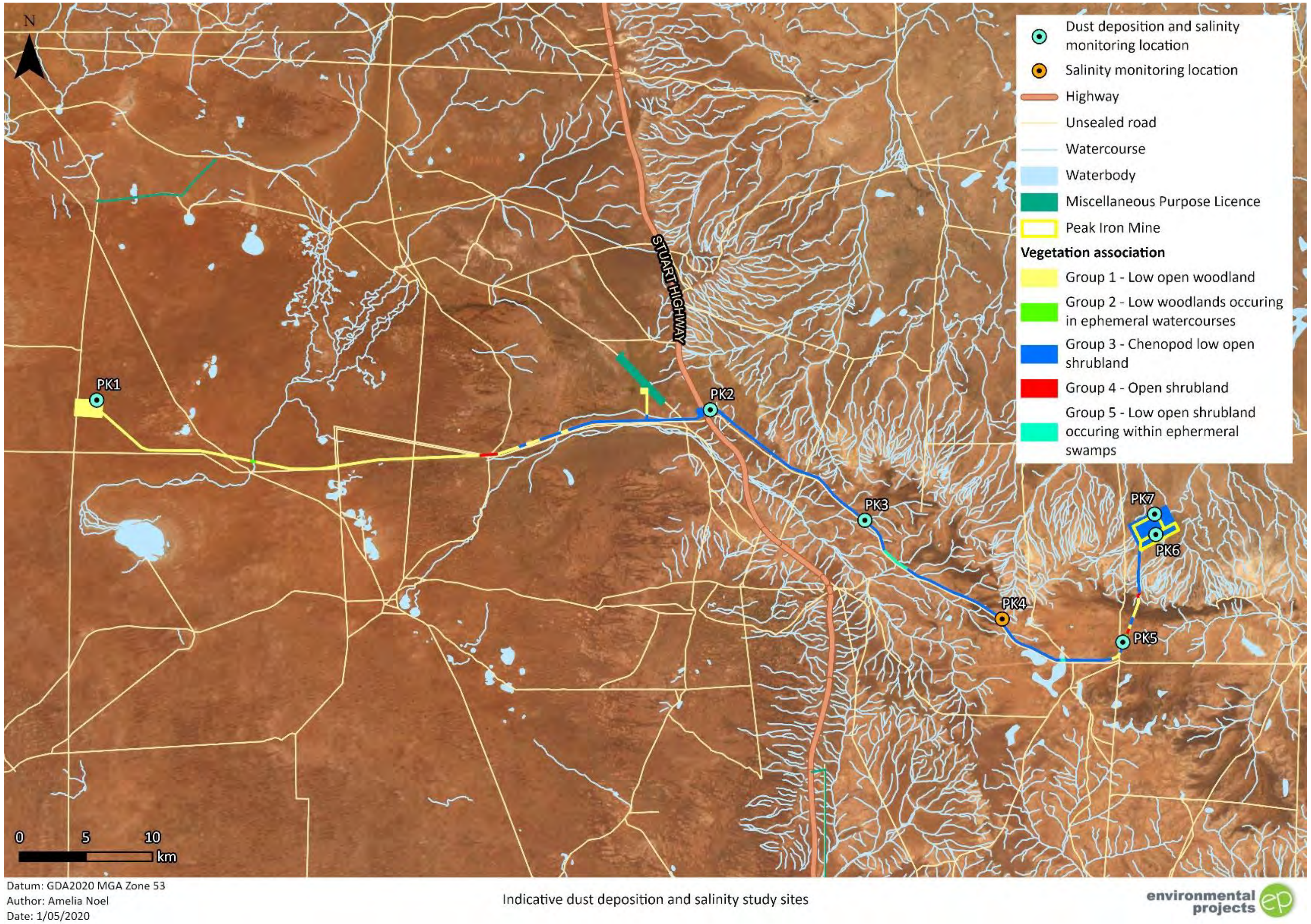


Figure 7-5: Dust deposition and salinity study sites

Table 7-13: Risk assessment- Soils

Aspect and impact	Level of risk (inherent) LHD/CON/IRL			Controls/ Management strategies	Level of risk (residual) LHD/CON/RRL			Outcome measurement requirement
Erosion of topsoil in cleared and disturbed areas across the project area.	Likely	Minor	High	Minimise potential erosion impacts through staged clearing and progressive rehabilitation where possible. Design to consider drainage where possible and include contour banks, formed drainage and permanent and temporary erosion control measures as appropriate. Regular inspections and maintenance of sediment and erosion control devices during operations. Operational vehicles will be required to keep to established and designated tracks and work zones. High-traffic areas to be sealed with road base.	Possible	Minor	Moderate	Yes-see Section 8.1.5
Increased level of salt in topsoil due to saline water use for dust suppression activities	Unlikely	Minor	Low	Minimise overspray through use of drip sprayer rather than boom spray for dust suppression. Haul road has been sealed. Implementation of a dust management plan. Grading of trafficable areas to address potential issues with salt build up in soils. Sample soil salt concentrations in areas required for dust suppression and remove contaminated soils (to the WRD) prior to rehabilitation. An appropriately qualified and experienced specialist will assess whether there is a demonstrated impact associated with saline water use for dust suppression	Rare	Minor	Low	No
Reduction in topsoil quality due to acid rock drainage	Unlikely	Minor	Low	Design of WRD facility to include encapsulation cell for potential acid forming (PAF) material. Implement a program of periodic checking of potentially acid forming material during mining activities. Certification by a suitable independent professional to demonstrate that WRD has been constructed in accordance with approved design.	Unlikely	Minor	Low	No

Trigger reportable site contamination provisions contained within the *Environment Protection Act 1993* from hazardous substances spills	Unlikely	Minor	Low	Design fuel, oil and chemical storage in accordance with Australian Standards and EPA Bunding and spill management guideline EPA 080/07 is standard practice. Maintain fuel, oil and chemical storage areas during operations. Undertake regular inspections of operational area for signs of leaks or spills. Implement chemical and fuel management procedures including emergency response, spill containment and clean up procedures.	Unlikely	Minor	Low	No
Loss or degradation of stockpiled topsoil	Possible	Minor	Moderate	Topsoil stockpiles to be placed uncompacted in designated areas with signage to prevent accidental removal, disturbance or degradation of the resource.	Unlikely	Minor	Low	Yes-see Section 8.1.5

7.7 Stormwater

7.7.1 Context

The project is in the upper catchment of Balta Baltana Creek, which drains to Lake Cadibarrawirracanna approximately 75 km to the north. The catchment boundary in the south is along the ridgeline of the Stuart Range. South of the deposit in the Stuart Range (Breakaway) creeks are incised with some creek side vegetation present. However, on the ML6314, ML6442 and MPL147, creek beds are ill-defined. The catchment upstream (south) of ML6314 is small (approximately 1,500 ha).

The haul/access road traverses between two catchments with the catchment boundary occurring along the ridgeline of the Stuart Range. The haul road traverses the Breakaways and a tributary of Brumby Creek and Carringallana Creek which flows into Lake Wirrida.

The Stafford Borefield and associated infrastructure is located within the vicinity of Stafford Swamp, Horse Shoe Swamp and Four Mile Swamp whilst the Penrhyn Borefield and associated infrastructure is located approximately 8 km east of Lake Phillipson and Lake Warrida approximately 20 km to the south.

As for most parts of the arid zone of South Australia, the lakes and creeks in the region are normally dry. Runoff is ephemeral, occurring only after significant and intense rainfall events, which may be either localised or regional.

The mine site area is located on a gently undulating, elevated, broad plateau. Surface water drainage areas are poorly defined and primarily occur as broad depressions and braided channels.

Site observations indicate that creek flows last one or two days in the Breakaway area and not at all on the Peculiar Knob mine site during rainfall events of up to 40 mm (as recorded at Coober Pedy). However, during prolonged rainfall surface water collects in the prominent drainage line located on the east and south east of the ML and proposed WRD extension.

The existing WRD is located to the northwest of, and adjacent to, the open pit. A small ephemeral creek bed is located on the northern and western side of the existing WRD and the northern part of MPL147.

7.7.2 Potential impacts

The potential impacts relating to stormwater are detailed in Table 7-14. Increased soil gully erosion, increased sedimentation, loss of topsoil and mobilisation of contaminants are likely to occur if adequate management measures and controls are not implemented.

Table 7-14: Impact event analyses-Stormwater

Source	Pathway	Barrier	Environmental receptor	Consequences
Alteration of natural drainage lines	Stormwater drainage Earthworks	Project designs and layout Stormwater management and controls Closure designs to incorporate long-term controls	Natural vegetation and topography Natural drainage lines Third-party property	Increased flows causing erosion, reduced health of native vegetation Reduction of flows to surface water dependent ecosystems Flooding
Raw water, chemical and fuel spills	Earthworks	Appropriate infrastructure for storage of hazardous materials Procedures for hazardous materials storage, use and spills response	Surface water Groundwater Soil	Surface water contamination Soil contamination Loss of abundance of vegetation
Acid rock drainage from the WRD	Stormwater drainage	WRD design, operation and management. Closure designs to incorporate long-term controls.	Natural drainage channels	Stormwater contamination

7.7.3 Control and management strategies

Table 7-15 provides details of the risk assessment for stormwater, the control and management strategies to be implemented, and the associated outcomes and measurement criteria.

The current mining activities are undertaken with appropriate management measures and controls put in place to ensure that stormwater is protected from contamination sources and that erosion and sedimentation is minimised through the installation of silt traps and diversions where required.

Management measures including; encapsulation of PAF material, bunding standards and controls for hazardous materials handling, use and storage, and for storing, reusing, recycling and disposing of waste will minimise the risk of contamination to stormwater.

7.7.4 Evaluation of residual risk

The primary risk associated with surface water is considered to be 'Moderate' to 'High'.

With implementation of the proposed control and management measures, the residual risk has been determined to be 'Low' to 'Moderate'. Surface water and erosion photo point monitoring locations are indicated in Figure 7-6 (and also provided as Appendix A-12). Acid rock drainage sampling locations are shown in Figure 7-7.

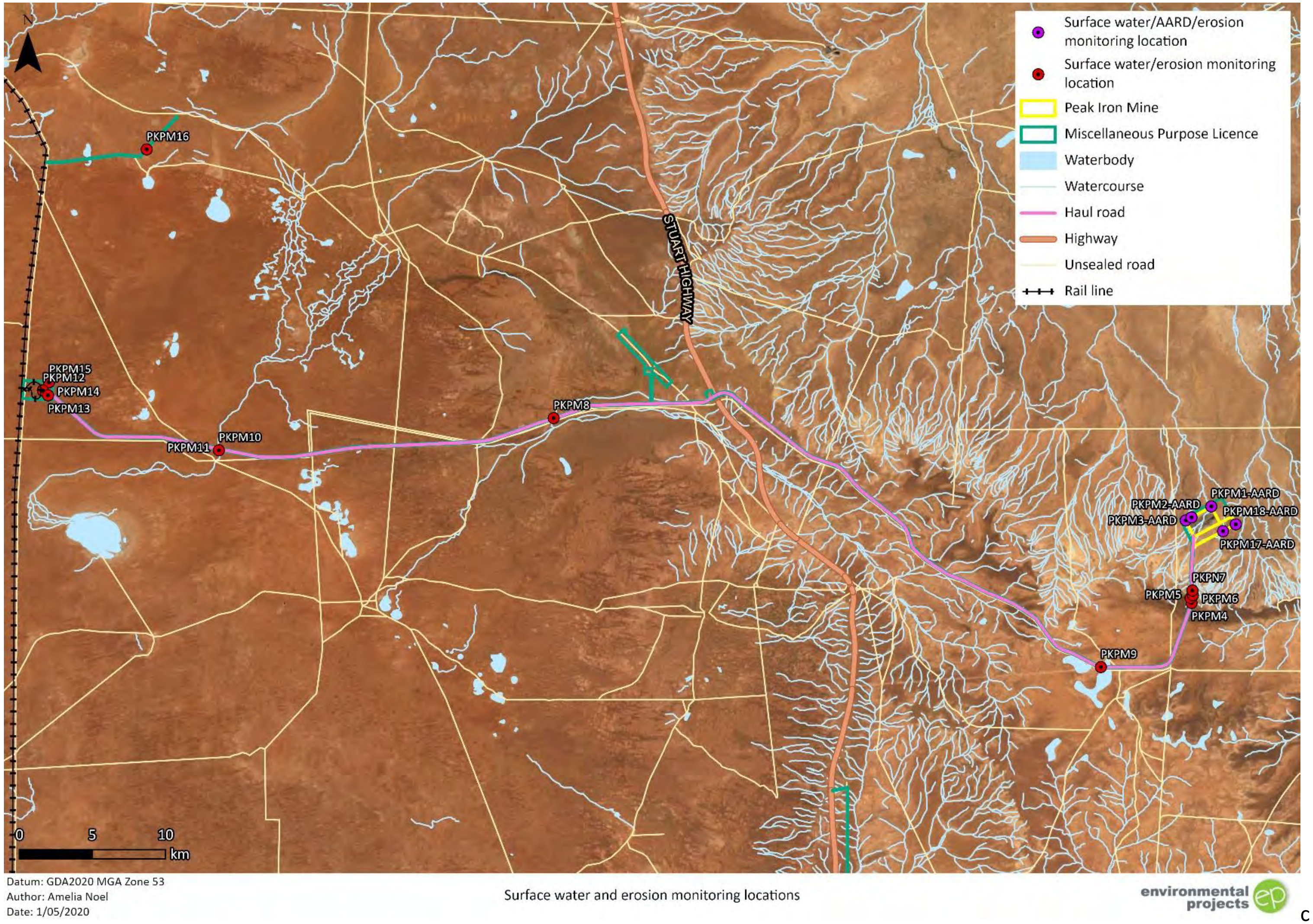


Figure 7-6: Surface water and erosion monitoring locations

Figure 7-7: Acid rock drainage soil sampling location

Table 7-15: Risk assessment- Stormwater

Aspect and impact	Level of risk (inherent) LHD/CON/IRL			Controls/ Management strategies	Level of risk (residual) LHD/CON/RRL			Outcome measurement requirement
Erosion of soils due to altered flow volumes, frequency and velocities.	Possible	Medium	High	Hydrologically design surface water diversion channels to accommodate natural flow regimes. Implementation of regular inspections and maintenance of hydrological design elements and site surface water diversions during operations particularly after >10mm of rainfall in one day.	Possible	Minor	Moderate	Yes- see Section 8.1.6
Reduction in surface water quality through increased sediment load in local watercourses.	Possible	Medium	High	Run off from site to be collected in diversion channels and directed through sediment traps prior to discharge to the environment. Design of operations to include opportunistic use of this water and water caught in pit back through operations e.g. dust suppression to minimise the need for off-site release. Regular inspections and maintenance of sediment and erosion control devices during operations. Disposal of collected material to be facilitated within mine WRD. Development and implementation of surface water quality monitoring program during operations (note: monitoring program will be opportunistic due to nature of flows in the area). As a minimum, inspections will occur after >10mm of rainfall in one day.	Possible	Minor	Moderate	Yes-see Section 8.1.6
Reduction in surface water quality due to raw water, fuel or chemical contamination.	Possible	Minor	Moderate	Design fuel, oil and chemical storage in accordance with Australian Standards and EPA Bunding and spill management guideline EPA 080/07. Maintain fuel, oil and chemical storage areas during operations. Undertake regular inspections of operational area for signs of leaks or spills. Implement chemical and fuel management procedures including emergency response, spill containment and clean up procedures.	Unlikely	Minor	Low	Yes-see Section 8.1.6
Reduction in surface water quality due to acidic leakage from the WRD	Possibly	Medium	High	Design of WRD to include encapsulation cell for potential acid forming (PAF) material. Implement a program to undertake periodic checking of potentially acid forming material during mining activities. Certification by a suitable independent professional to demonstrate that WRD has been constructed in accordance with approved design.	Unlikely	Minor	Low	Yes- see Section 8.1.6

7.8 Groundwater

7.8.1 Context

At Peculiar Knob and its immediate vicinity, groundwater has only been identified to date in occasional water bearing fractures in bedrock. At the Stafford Borefield, Proterozoic bedrock of the Wilgena Hill Formation is covered by Cainozoic sandy superficial deposits and Cretaceous Bulldog Shale. Groundwater in the Penrhyn Borefield area occurs in the Mount Anna Sandstone Member of the Cadna-Owie Formation (Cretaceous) and the underlying Algebuckina Sandstone (Jurassic).

A number of registered bores and wells occur within a distance of 30 km of MPL141 Camp borefield and 30 km from MPL133 Penrhyn Borefield (see Figure 7-8 and Figure 7-9 also provided as Appendix A-13 and A-14).

7.8.2 Potential impacts

The potential impacts to groundwater may result from; pit development and dewatering (although this is unlikely as no significant groundwater has been noted in exploration boreholes to the base of the proposed open pit); activities involving hazardous substances (such as fuels, chemicals); acid rock drainage; and decrease in availability through increased use of groundwater for water supply and dust suppression. The potential impacts relating to groundwater are summarised in Table 7-16.

Table 7-16: Impact event analysis- Groundwater

Source	Pathway	Barrier	Environmental receptor	Consequences
Water supply bores	Mining activities	Groundwater located below base of open pit Water extraction in accordance with DEW water license Water supply areas located significant distance from GAB springs	GAB springs and West Springs Zone Existing groundwater users	Decrease in groundwater levels impacting GAB springs and West Springs Zone
Dewatering	Mining activities	Groundwater located below base of open pit. Water extraction in accordance with DEW water license	Existing groundwater users	Decrease in groundwater availability and quality to pastoralists
Spills of chemicals and fuels	Via seepage to groundwater Incorrect storage and handling, refuelling activities of vehicles	Fuel, oil and chemical storage in accordance with Australian Standards and EPA guideline Refuelling in designated areas Implementation of spill management measures	Existing groundwater users GAB springs and West Springs Zone	Contamination of groundwater

Acid rock drainage	Via seepage to groundwater	Appropriate encapsulation of PAF material	Existing groundwater users GAB springs and West Springs Zone	Contamination of groundwater

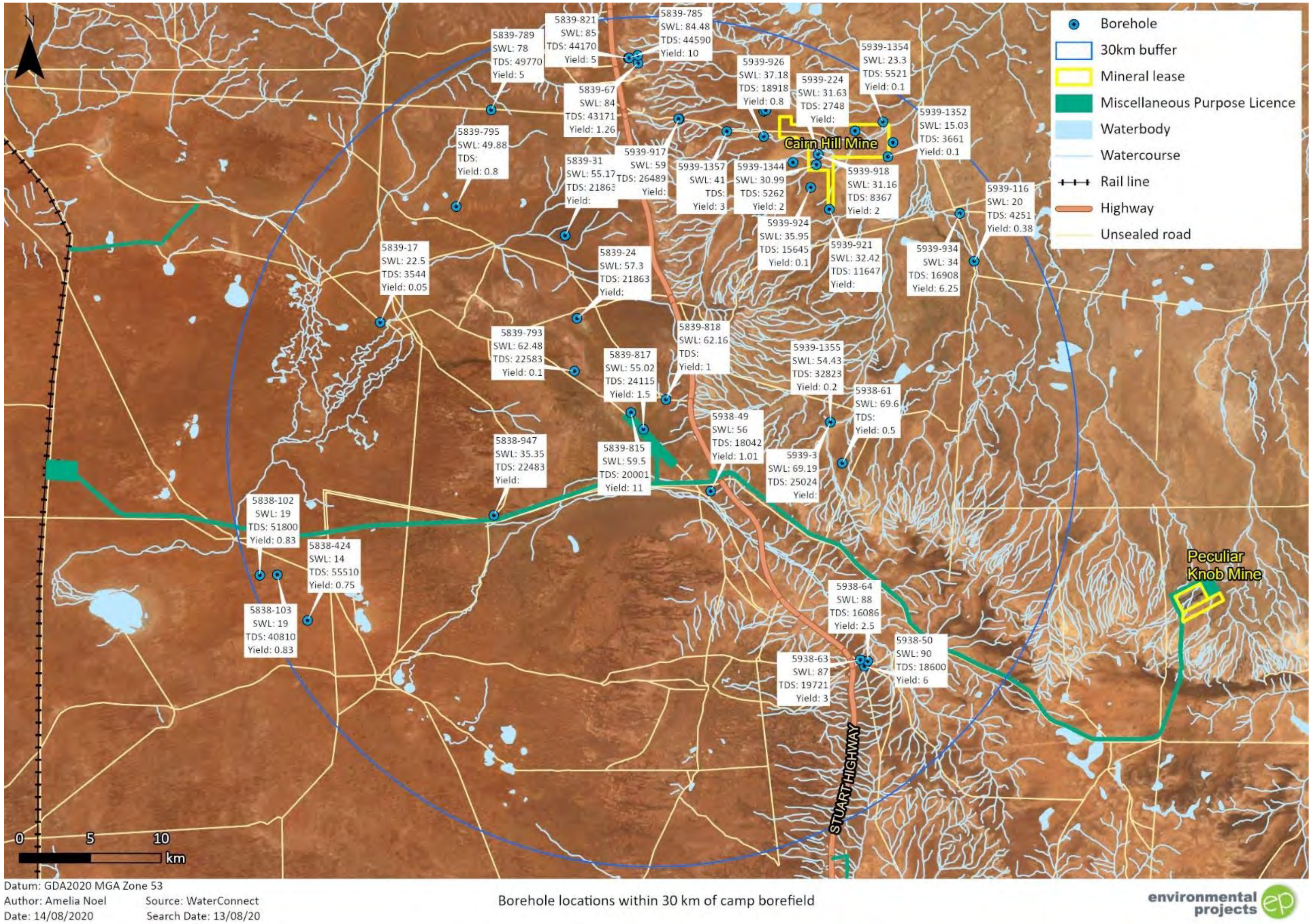


Figure 7-8: Borehole locations within 30 km of Camp borefield

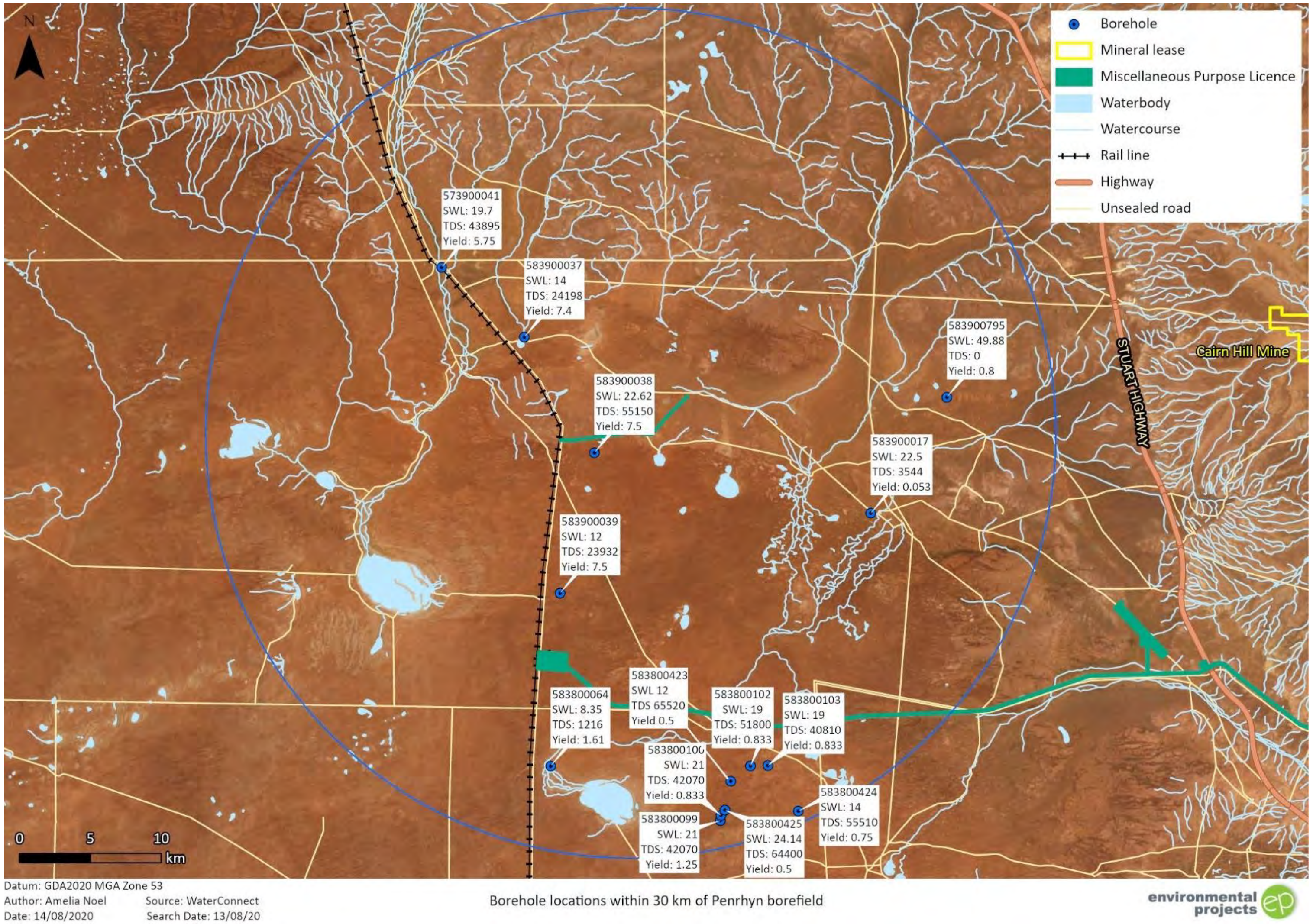


Figure 7-9: Borehole locations within 30 km of Penrhyn borefield

7.8.3 Control and management strategies

Table 7-17 provides details for the risk assessment for groundwater, any control and management strategies to be implemented, and the associated outcomes and measurement criteria.

7.8.4 Evaluation of residual risk

Groundwater monitoring as part of the current Peculiar Knob operations has included measurement of groundwater levels, electrical conductivity, pH, metals and nutrient analysis and water usage (extraction rates versus licence allowance).

Table 7-17: Risk assessment- Groundwater

Aspect and impact	Level of risk (inherent) LHD/CON/IRL			Controls/ Management strategies	Level of risk (residual) LHD/CON/RRL			Outcome measurement requirement
Reduction in regional groundwater levels impacting the Greater Artesian Basin springs and South West Springs Zone, pastoralists and third-party users	Unlikely	Medium	Moderate	Mine water supply areas are located at a significant distance from the site and should have minimal impact on regional GW levels within the Peculiar Knob region. Implement groundwater monitoring program during operations to monitor potential impacts from water abstraction activities.	Unlikely	Minor	Low	Yes-see Section 8.1.7
Adverse impacts on groundwater quality and consequent reduction in available groundwater resources due to fuel and chemicals spills.	Unlikely	Minor	Low	Storage of fuels and other hazardous materials will be done in accordance with EPA guidelines and Australian Standards. Maintain fuel, oil and chemical storage areas during operations. Undertake regular inspections of operational area for signs of leaks or spills. Implement chemical and fuel management procedures including emergency response, spill containment and clean up procedures.	Rare	Minor	Low	No
Reduction in groundwater availability and quality in regional bores due to reduction in groundwater levels and increase in salinity of available water	Possible	Medium	High	Multiple water supply areas will be developed to minimise reliance and impacts associated with one supply location. The development and operations of these supply areas will be staged to address required volumes based on construction and operations schedules. Implement groundwater monitoring program during operations to monitor potential impacts on water levels and groundwater quality. Implement alternative water supply options for impacted groundwater uses as required.	Possible	Minor	Moderate	Yes- see Section 8.1.7
Adverse effects on ground water quality and consequent reduction in available groundwater resources due to ARD.	Unlikely	Minor	Low	Implement groundwater monitoring program, including nearby pastoral bores and mine bore field. Implement program of periodic checking of acid rock drainage potential during mining activities.	Unlikely	Minor	Low	No

To date the existing operation has not exceeded water allocations:

- Camp Water borefield - 333,312 kL (66% of the allocation)
- Penrhyn borefield – 316,135 kL (59% of the allocation)
- Stafford borefield has not been commissioned

Groundwater threshold levels at the borefields have not been exceeded during the production period (refer to Table 7-18) and salinity levels are within acceptable seasonal variation levels.

Table 7-18: Groundwater drawdown and threshold levels

Borefield	Bore	Drawdown Threshold (m)	Baseline static water level (m below top of collar)	Water Level Change (m) May 2017
Penrhyn Borefield	PMB-01	0.6	25.4	-0.17
	PMB-02	0.6	42.6	-0.23
	PMB-03	0.6	36.0	-0.22
	PMB-04	0.6	31.6	-0.15
	PMB-05	0.6	19.6	0.87*
Camp Water Borefield	PKWB-02	1.5	54.9	-0.22
	PKWB-04A	1.0	62.0	-0.27
	PKWB-05	1.5	53.2	-0.18
	PKWB-06	1.5	54.3	-0.25
	SITE F	1.0	51.5	-0.18

* PMB-05 – water level currently 0.87m above initial level measured in 2011

The primary risk associated with groundwater is considered to be predominantly ‘Low to Moderate’ if there are no controls and management measures.

The implementation of specific controls and management measures required for the existing mining operations (and the results indicated above) indicates an acceptable residual risk level of predominantly ‘Low’. Groundwater monitoring locations are indicated in Figure 7-10 (and also provided as Appendix A-15).

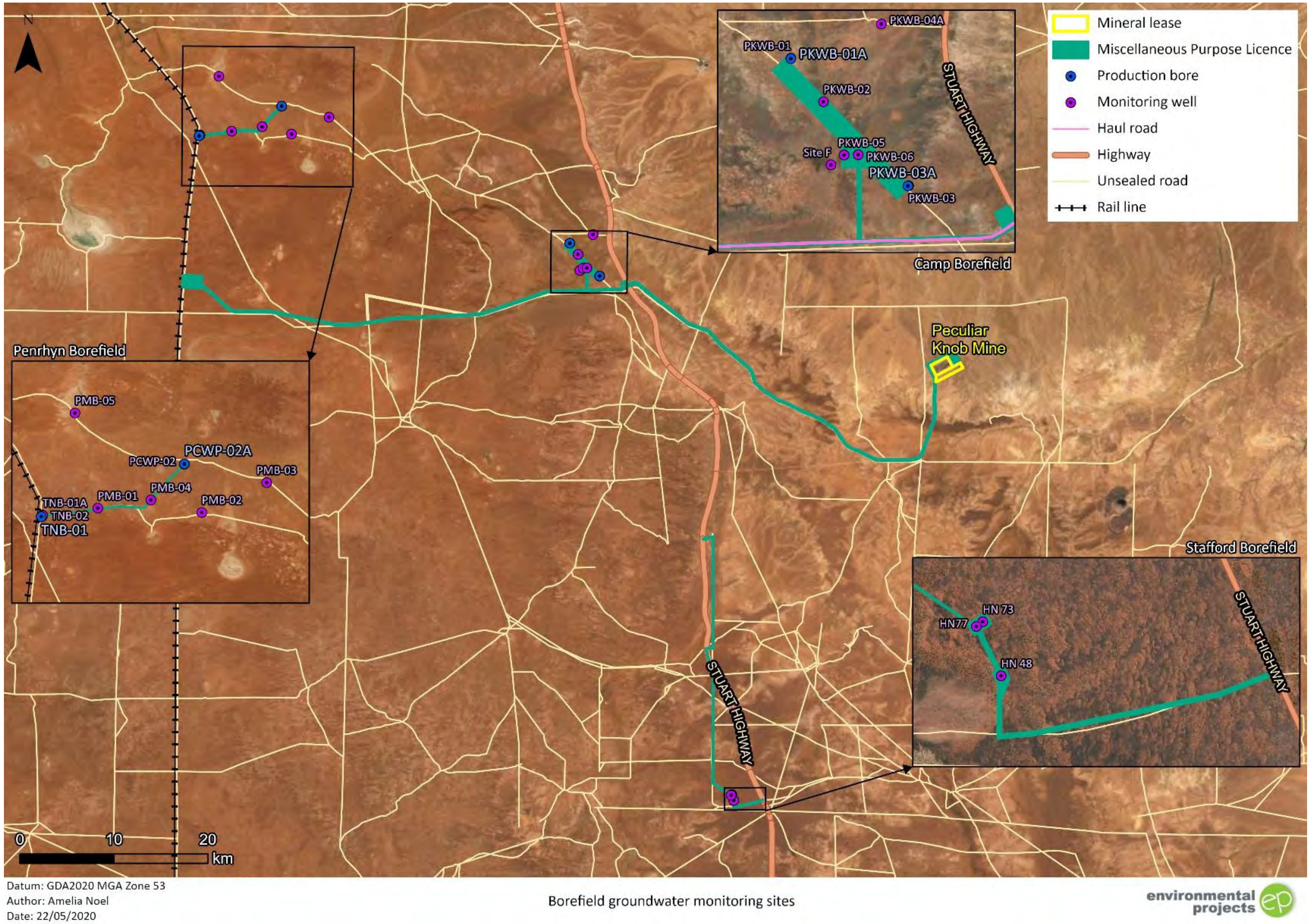


Figure 7-10: Borefield groundwater monitoring sites

7.9 Air quality

7.9.1 Context

Air quality impacts may arise from fugitive and point source emissions of dust. Activities such as blasting, loading and hauling ore, crushing and train loading, WRD construction, and open areas all have the potential to generate dust that could reduce amenity. Emissions from vehicles, machinery and equipment are of much lesser concern due to operation and maintenance requirements.

The closest significant industrial development is Prominent Hill mine which is located approximately 25 km southeast of the mine site (refer to Figure 3-1). The nearest major population centre is Coober Pedy (90 km northwest) which had a total population of 1,695 in 2011 (ABS 2011). The second closest major population centre is at Roxby Downs (180 km southeast) with a total population of 4,702 in 2011 (ABS 2011).

There are also a number of houses on pastoral leases at some distance surrounding the mine site:

- McDouall Peak – 54 km
- Ingomar – 57 km
- Mt Eba – 70 km.

The nearest residence to the haul/access road alignment are Ingomar Station homestead, located approximately 10 km south, followed by McDouall Peak homestead (35 km).

The nearest residences to the Wirrida rail loop are:

- Ingomar Station homestead – 27 km
- Gina Outstation– 45 km
- McDouall Peak homestead – 48 km.

Dust levels have not been monitored specifically at the Peculiar Knob mine site other than depositional dust. The background dust level is expected to be consistent with dust levels generated from local pastoral leasehold lands. Dust levels are highest in summer, particularly in times of drought, and under the influence of hot and dry northerly winds. Apart from the Stuart Highway and roads in Coober Pedy most pastoral access tracks and the Prominent Hill haul road are unsealed.

The PEPR 2019/030 for the Peculiar Knob mine requires monitoring of dust complaints by the public, pastoral lease holders or third-party mining operations and remedial action to be undertaken within 72 hours. To date there have been no complaints relating to air quality and dust from mining activities undertaken in the current ML.

Relocation of crushing and screening plant to mine site

Historically, the crushing and screening of ore material has occurred at the Wirrida rail siding, prior to loading onto rail carriages for transport. On the recommencement of mining operations for extraction of high-grade ore, it is proposed to relocate the crushing and screening operations to the existing ROM pad at the mine site (within existing tenements) as described in Section 3.9 and shown on Figure 3-15 and Figure 3-67.

Crushed product will be transported via road trains from the mine site to the Wirrida rail loop via the sealed haul road (see Section 3.10.1). It is proposed to haul product (crushed ore to -12.3 mm) from the mine to the rail loop on a double shift operation. The road trains would travel to the Wirrida rail loop using the bituminised haul road.

Dust Characterisation

In order to quantify the potential dust impacts, dust characterisation testing was undertaken on a pre-crush ore sample to determine the potential fines component of the material that could be mobilised during the crushing, screening and separation process.

According to the International Standardisation Organisation (ISO 4225-ISO, 1994) dust is considered to be small solid particles, conventionally taken as those particles below 75 µm in diameter, which settle out under their own weight, but which may remain suspended for some time (WHO 1999). The World Health Organisation (WHO) states that in aerosol science, particles with an aerodynamic diameter of less than 50 µm do not remain airborne very long and that particles greater than 100 µm may (depending on conditions) become (but hardly remain) airborne (WHO 1999).

Ore material of approximately 50 mm diameter was provided to Bureau Veritas in Adelaide, for dust characterisation analysis. Pre-crushing was undertaken by the lab, with the ore material crushed and screened to 12.3 mm. Laser sizing analysis was performed on the crushed ore material and the particle size distribution (see Figure 7-11) results indicate that the volumetric distribution of the ore material is:

- D10-47.455 µm maximum particle diameter below which 10% of the sample volume exists
- D50-166.434 µm maximum particle diameter below which 50% of the sample volume exists (median particle size)
- D90-356.367 µm maximum particle diameter below which 90% of the sample volume exists.

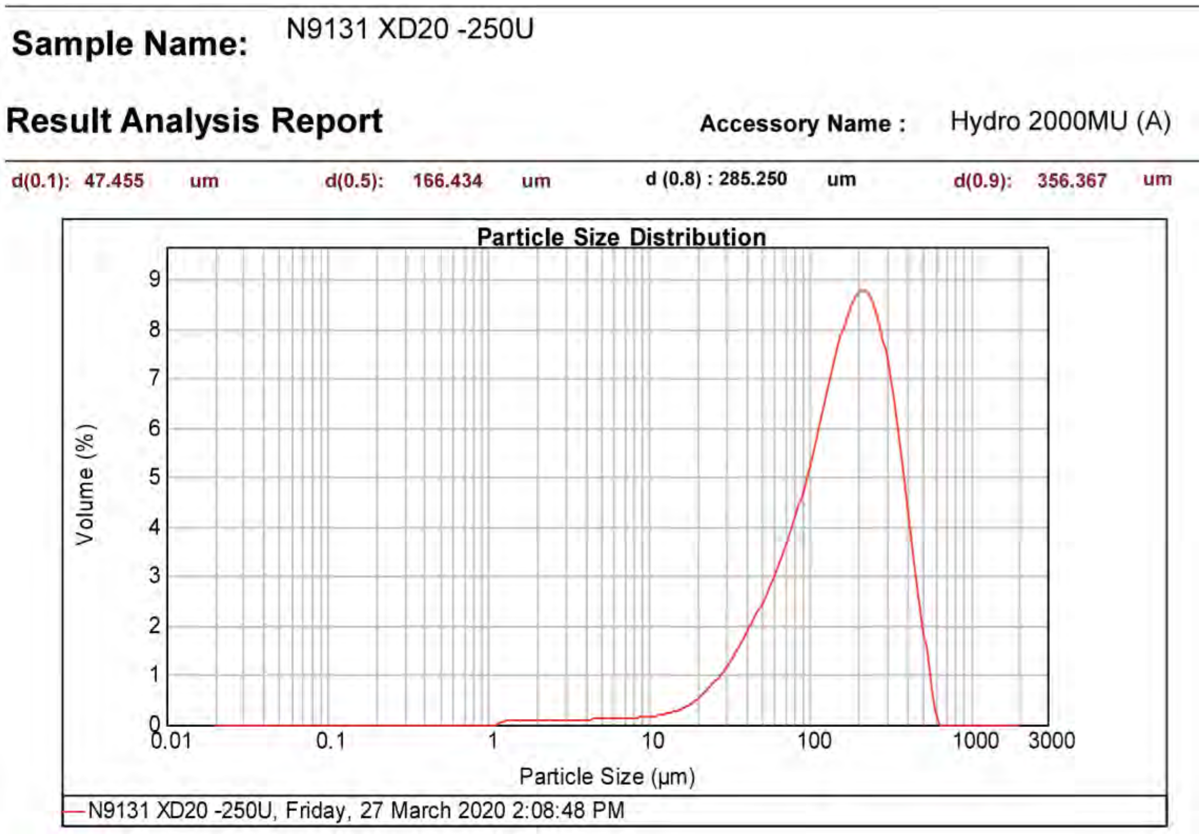


Figure 7-11 Particle Size Distribution

The data indicates that 80 per cent of the sample ranges in size from 47.55 µm to 356.376 µm (D10-D90) with the volume weighted mean (D4,3) size being 186.454 µm. This indicates that particles of 186.5 µm constitute the bulk of the sample size. Figure 7-12 shows that approximately 20 per cent of the sample volume consisted of particles less than 79.433 µm in size, however the results indicate a bias towards the larger end of the 1-75 µm size range, with only 4.99 per cent of the entire sample falling at or below 30.2 µm.

Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %	Size (µm)	Vol Under %
0.010	0.00	0.105	0.00	1.096	0.00	11.482	1.69	120.226	34.48	1258.925	100.00
0.011	0.00	0.120	0.00	1.259	0.02	13.183	1.87	138.038	40.58	1445.440	100.00
0.013	0.00	0.138	0.00	1.445	0.11	15.136	2.11	158.489	47.42	1659.587	100.00
0.015	0.00	0.158	0.00	1.660	0.19	17.378	2.41	181.970	54.87	1905.461	100.00
0.017	0.00	0.182	0.00	1.905	0.28	19.953	2.81	208.930	62.72	2187.762	100.00
0.020	0.00	0.209	0.00	2.188	0.37	22.909	3.34	239.883	70.62	2511.886	100.00
0.023	0.00	0.240	0.00	2.512	0.46	26.303	4.06	275.423	78.18	2884.032	100.00
0.026	0.00	0.275	0.00	2.884	0.55	30.200	4.99	316.228	85.00	3311.311	100.00
0.030	0.00	0.316	0.00	3.311	0.64	34.674	6.17	363.078	90.70	3801.894	100.00
0.035	0.00	0.363	0.00	3.802	0.73	39.811	7.65	416.869	95.07	4365.158	100.00
0.040	0.00	0.417	0.00	4.365	0.83	45.709	9.45	478.630	98.01	5011.872	100.00
0.046	0.00	0.479	0.00	5.012	0.93	52.481	11.60	549.541	99.67	5754.399	100.00
0.052	0.00	0.550	0.00	5.754	1.04	60.256	14.13	630.957	100.00	6606.934	100.00
0.060	0.00	0.631	0.00	6.607	1.15	69.183	17.08	724.436	100.00	7585.776	100.00
0.069	0.00	0.724	0.00	7.586	1.27	79.433	20.51	831.764	100.00	8709.636	100.00
0.079	0.00	0.832	0.00	8.710	1.39	91.201	24.50	954.993	100.00	10000.000	100.00
0.091	0.00	0.955	0.00	10.000	1.53	104.713	29.13	1096.478	100.00		

Figure 7-12 Particle Size Distribution as a Percentage

Potential dust generation

The dust characterisation testing (see Figure 7-11 and Figure 7-12) shows that the PSD of crush material (when crushed to -12.3 mm) is such that it is likely to have very little dust generative capacity, as less than 20 per cent of the material is sized below 79 µm, with inhalable particulate matter ($pm_{2.5}$ and pm_{10}) comprising of 0.46 per cent ($pm_{2.5}$) and 1.53 percent (pm_{10}). The volumetric mean of the sample is 186 µm, indicating that the majority of the material is coarse in nature and, if mobilised, is expected to deposit within a short distance, likely to be confined to the environment directly around the crushing, screening and separation plant.

This is supported by observations of the existing crushing and screening process onsite, for which significant dust generation has not been noted during operations. Likewise, transport of the crushed product from the mine site to the Wirrida rail siding is unlikely to generate significant dust emissions and dust emissions have not been previously observed during transport of crushed product in uncovered rail wagons.

Morning (9 am) and afternoon (3 pm) wind speed and direction data was obtained from the Woomera and Oodnadatta meteorological stations operated by BoM (see Figure 7-13 to Figure 7-16). Wind rose data indicates predominant wind directions from the south and south east along with morning winds from the south west. This is consistent with the data presented in Appendix E, Figure 6 of the 2013 MARP.

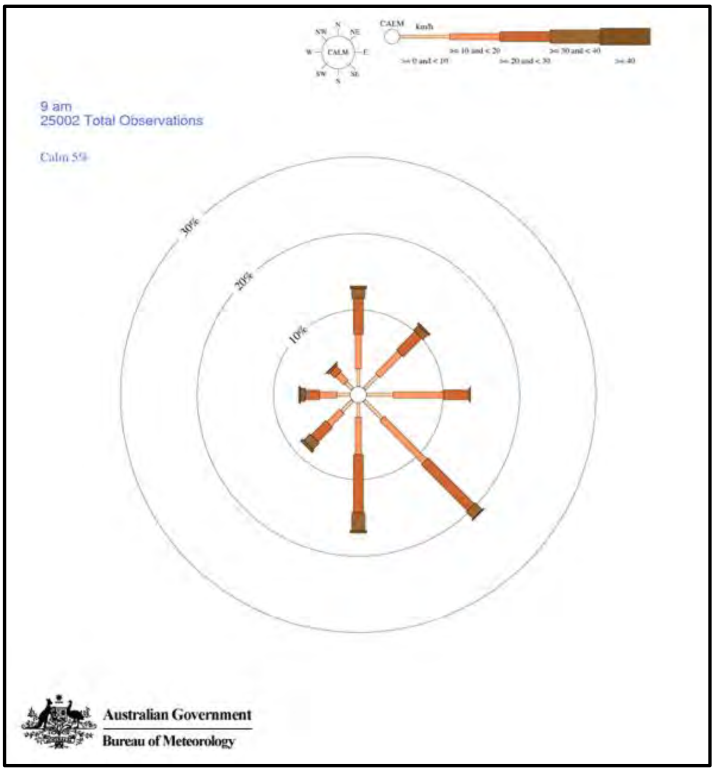


Figure 7-13 Woomera 9am Wind Rose (1954-2016)

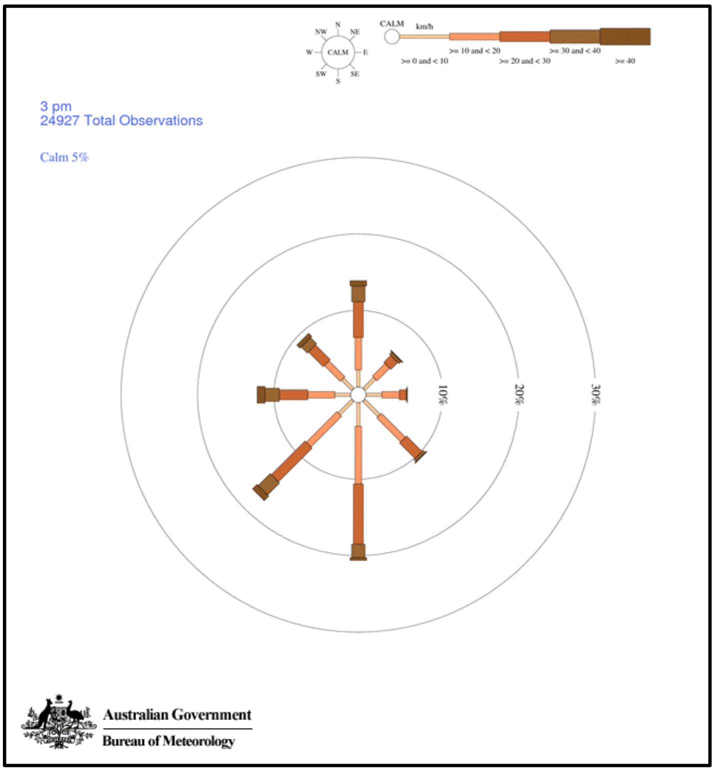


Figure 7-14: Woomera 3pm Wind Rose (1954-2016)

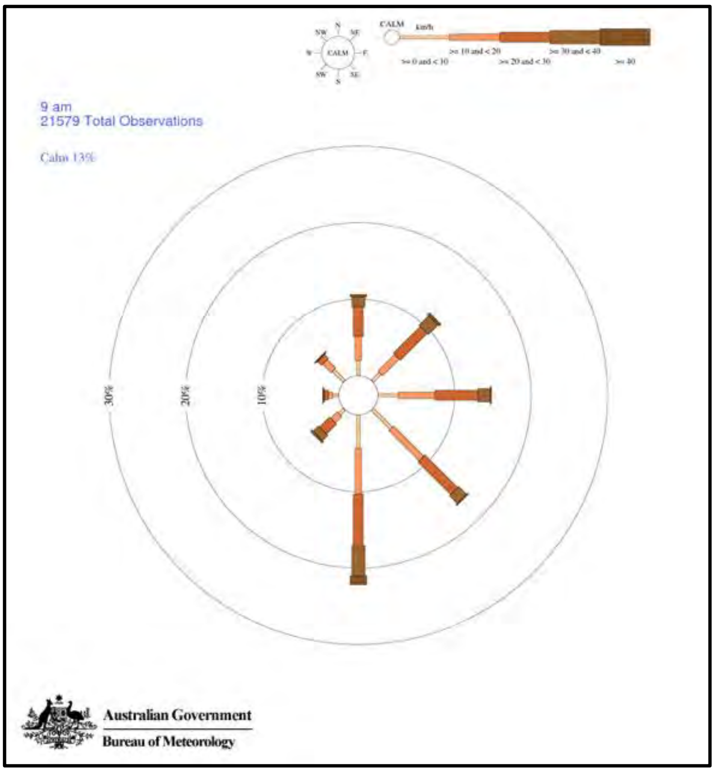


Figure 7-15 Oodnadatta 9am Wind Rose (1942-2016)

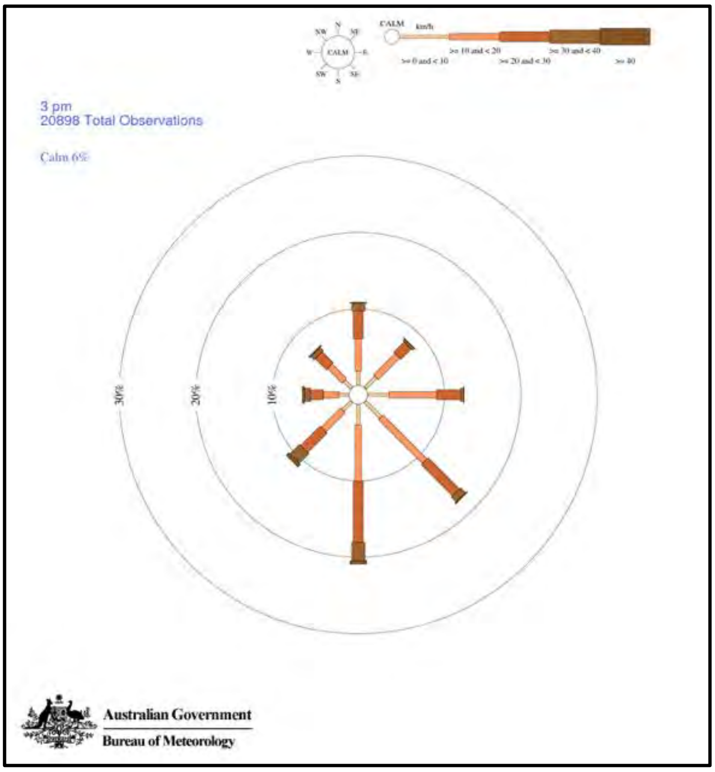


Figure 7-16 Oodnadatta 3pm Wind Rose (1946-2016)

Modelling undertaken for the crushing and screening operation at the Wirrida rail loop (Holmes Air Sciences, 2008) has been used to inform the dust impact assessment for the proposed crushing plant within the mine lease. This was achieved by overlaying the previously generated Wirrida contours over the proposed location of the mine site crushing operations. This is considered a valid approach to assessment with consideration to the similarities of the two operations (e.g. throughput, material specifications and the nature of the process and equipment).

Holmes Air Sciences (2008) air quality modelling consisted of a computer-generated dispersion model (AUSPLUME-version 6, VEPA 1986), to predict ground level dust concentrations and deposition levels in the vicinity of the crushing and screening operation. The model is a Gaussian dispersion model, which requires data on wind speed, wind direction, atmospheric stability class and mixing height. In order to quantify this data, The Air Pollution Model (TAPM-version 2), developed by the CSIRO was used to create a synthetic data set, with the synoptic information determined from the six-hourly Limited Area Prediction System (LAPS). The atmospheric stability classes were assigned to each hour of the TAPM data based on sigma-theta (Holmes Air Sciences 2008, US EPA 1986). The mean annual wind speed was determined to be 3.5 metres per second and moisture content was assumed to be high at >4 per cent. The dispersion modelling was based on three particle size categories:

- 0-2.5 µm-(fine) (4.7 % of TSP)
- 2.5-10 µm (coarse) (34.4 % of TSP)
- 10-30 µm (rest) (60.9 % of TSP)

Full TSP emission rates were assumed from three source groups (corresponding to a particle size category), with deposition to occur appropriate for particles with an aerodynamic diameter equal to the geometric mean of the limits of the particle size range, except $pm_{2.5}$, which assumed a particle size of 1 µm.

The air quality modelling considered a range of dust emitting source activities and the intensity (see Table 7-19).

The planned annual production rate between August 2020 and June 2025 varies between 1.44 Mt (2020-2023) and up to a maximum of 2.4 Mt per annum for the final nine months (September 2024-June 2025), which is less than the modelled production rate of 3 Mt per annum. This will result in less dust being generated per year and over the entire life of mine. Table 7-19 provides the updated intensity for crushing activities at Peculiar Knob.

Table 7-19 Dust generating activity

Activity	Units	Intensity (Wirrida)	Intensity (Peculiar Knob)
Dumping Rom to crusher hopper	t/y	3,000,000	2,000,000
Primary crushing	t/y	3,000,000	2,000,000
Secondary crushing	t/y	1,500,000	1,000,000
Screening	t/y	3,000,000	2,000,000
Loading product to stockpiles	t/y	3,000,000	2,000,000
FELs loading conveyors	t/y	3,000,000	2,000,000 (trucks)
Conveyer loading reclaim stockpile	t/y	3,000,000	Not Applicable
Loading trains	t/y	3,000,000	Not Applicable
Wind erosion from product stockpile	ha	1.25	No Change
Wind erosion from reclaim stockpile	ha	0.3	No Change

In addition to the reduction in intensity of mining activity and therefore annual dust generation, additional testing that was undertaken on ore samples in 2020, has provided detailed particle size distribution information that is significantly less than that which was modelled.

The Wirrida dispersion modelling was based on three particle size categories and industry standard assumptions for an Iron Ore project, however testing has confirmed lower percentages of particle sizes in the 0 to 2.5 µm and 2.5 to 10 µm range, which results in an increase in the percentage of material in the 10-30 µm category, as shown below:

- 0-2.5 µm -(fine) (0.46 %of TSP)
- 2.5-10 µm (coarse) (1.07 % of TSP)
- 10-30 µm (rest) (98.47 % of TSP)

The dispersion modelling indicates all particles under the 30 µm would be mobilised into the atmosphere and deposited as dust at varying distances from the crushing operations. The particle size distribution data (see Figure 7-12) indicates that the ore, when crushed to 12.3 mm in size will generate approximately 4.99 % of its TSP volume as dust particles smaller than 30 µm in size.

The Wirrida modelling, which used a higher intensity rate for dust generating activities and higher percentages of particles in the finer size categories, can be considered to provide a conservative indication of the potential dust plume and ground level deposition rates that can be expected from crushing operations at the mine site. Figure 7-17 (and provided as Appendix A-16), shows the Wirrida modelling output (g/m^2/month), overlaid over the proposed mine site crushing location and indicates that all potential depositional dust impacts are contained to within the ML and MPL. No offsite impacts are modelled or expected, however onsite visual monitoring of dust plumes will be periodically undertaken to confirm the expected results.

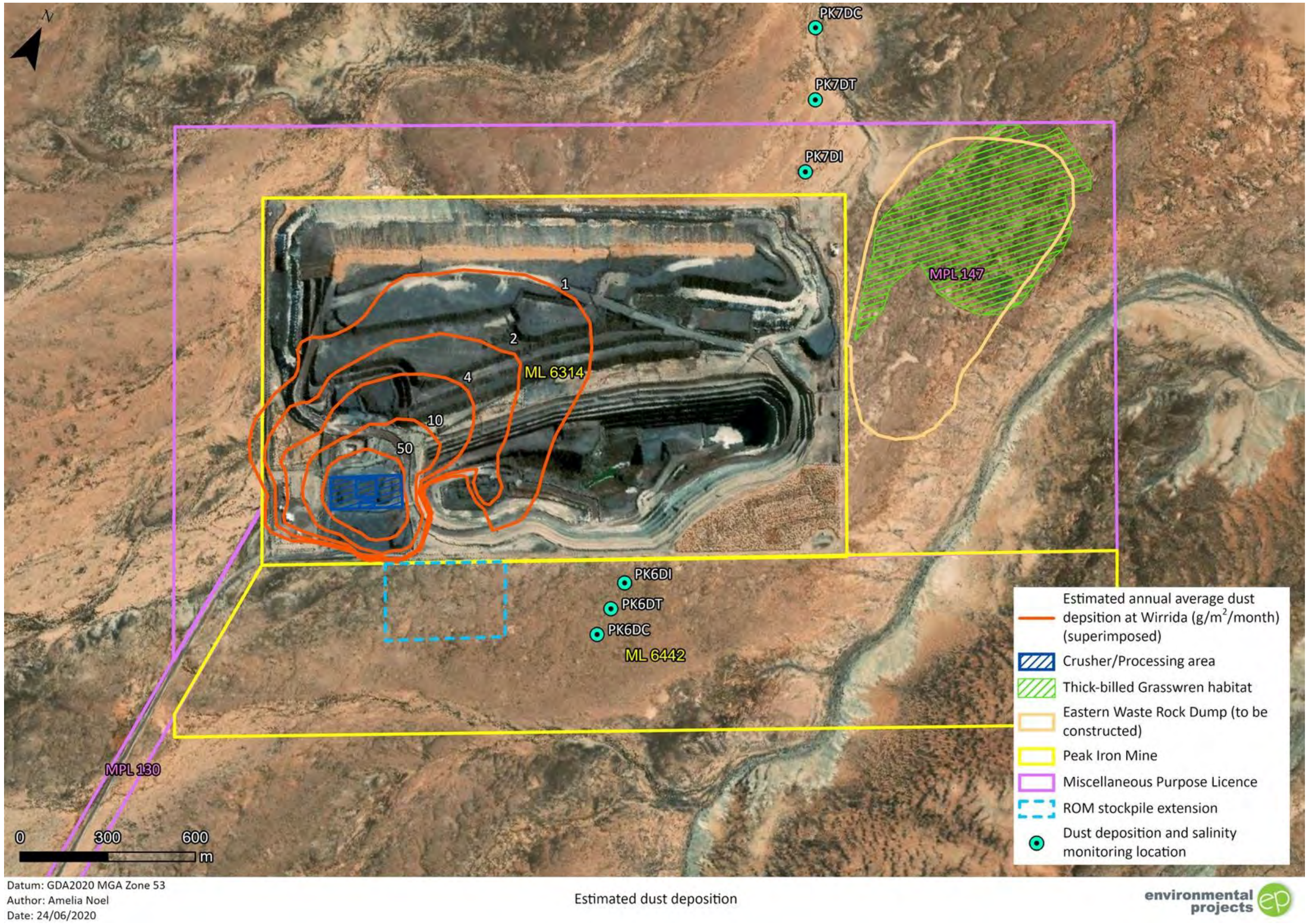


Figure 7-17 Estimated dust deposition

Depositional dust monitoring results

In October 2013, four dust deposition gauges were installed around the Wirrida crusher and rail siding to assess dust levels. The results were used to track performance of dust reduction projects at this location. Data evidence from the deposition gauges indicated that the control of dust emissions from the Wirrida crusher and rail siding were successful.

Six dust deposition monitoring locations were re-established during February 2020 at the Peculiar Knob (PK) monitoring locations (vegetation monitoring locations) shown on Figure 7-5, with dust deposition data to be collected and analysed on a monthly basis. Each dust monitoring location was re-established with an impact, transition and control site depositional dust gauge (DDG).

Historic dust levels have been consistently below the site objective of $4g/m^2$/month with seven exceedances in total over three years monitoring. One exceedance was identified at the Wirrida rail siding (PK1) in February 2013, four exceedances at the haul road at the Stuart Highway (PK2) and two exceedances along the haul road (PK3) between the monitoring period February 2012 to March 2015 (see Table 7-20). An analysis of historic data indicates that only a small portion of the total dust (i.e. the ash content) could be attributable to mining activities.

Table 7-21 presents the current depositional dust data and indicates significantly lower levels of collected dust, attributable to mining activities, as crushing activities restart at the site and transport of crushed material along the sealed haul road is undertaken.

A review of the dust monitoring program will be undertaken in six months.

Table 7-20 Historic depositional dust (February 2012 to March 2015)

Date	Content	Unit	23/2/12	21/5/12	22/8/12	22/11/12	21/2/13	20/5/13	21/8/13	23/11/13	4/3/14	22/5/14	4/12/14	30/3/15
PK DUST SITE 1	Ash Content	g/m²/month	1	0.6	0.3	1.7	14.1	2	1.4	2.5	3.4	1.1	1.3	2.7
	Total Insoluble Matter	g/m²/month	1	0.8	0.3	2	15.1	2.2	1.5	2.6	3.6	1.2	1.4	2.9
	Total Solids	g/m²/month	1.1	1.3	0.5	2.6	16.7	2.6	1.9	2.8	3.7	1.6	2.1	3
PK DUST SITE 2	Ash Content	g/m²/month	1.9	4.9	4.3	2.9	12.8	2.8	1.2	2	5.4	5.8	2.7	2.4
	Total Insoluble Matter	g/m²/month	2.3	5.1	4.9	3.2	13.6	3.1	1.5	2.2	6.1	6.2	3	2.7
	Total Solids	g/m²/month	3.6	5.5	6.3	4.1	14.9	4.1	2.7	2.8	6.7	7.2	4	3.7
PK DUST SITE 3	Ash Content	g/m²/month	10.3	0.9	0.9	1.3	ALS not able to analyse due to faecal matter	3.8	1.3	1.9	2.7	7.1	1	
	Total Insoluble Matter	g/m²/month	14.6	1.1	1.2	1.4		5	1.4	2.5	3.5	8.1	1.1	
	Total Solids	g/m²/month	23.5	1.1	2.1	1.5		6.4	2	3.1	5.6	8.2	1.6	
PK DUST SITE 5	Ash Content	g/m²/month	1.9	1.4	1	1.5	9.8	2.2	1.7	1.7	2	2.2	1.7	

Date	Content	Unit	23/2/12	21/5/12	22/8/12	22/11/12	21/2/13	20/5/13	21/8/13	23/11/13	4/3/14	22/5/14	4/12/14	30/3/15
	Total Insoluble Matter	g/m²/month	2.4	1.5	1.2	2	10.9	2.5	1.9	1.9	2.4	2.5	2.1	
	Total Solids	g/m²/month	4.1	2	1.9	2.6	13.4	3.9	2.8	2.6	3	3.4	2.4	
PK DUST SITE 7	Ash Content	g/m²/month	1	1.3	1	2.3	4.9	3.1	0.6	1.8	3.4	4.1	3.5	
	Total Insoluble Matter	g/m²/month	1.1	1.5	1.3	2.8	5.7	3.9	0.7	2.1	3.8	5.1	4.3	
	Total Solids	g/m²/month	1.4	2	2.5	3.8	8.5	6.6	3	2.2	4.7	14.2	5.4	

* Exceedances above the site objective of 4g/m²/month are highlighted

Table 7-21 Depositional Dust (April and May 2020)

Field ID		PK1DI		PK2DI		PK3DI		PK5DI		PK6DI		PK7DI	
Date	**Unit**	**April 2020**	**May 2020**	**April 2020**	**May 2020**	**April 2020**	**May 2020**	**April 2020**	**May 2020**	**April 2020**	**May 2020**	**April 2020**	**May 2020**
Ash content	g/m²/month	0.8	0.8	0.2	Not analysed – jar broken during transit	0.6	1.3	0.4	0.7	0.2	1.7	1.8	Not analysed – jar broken during transit
Insoluble solids	g/m²/month	0.9	1	0.3		1.8	3.6	0.6	1	0.3	2.1	2.6	
Total solids	g/m²/month	3.4	1.2	2.6		7.5	7	3.6	1.8	2.3	2.1	4.1	

7.9.2 Potential impacts

The Project has the potential to have air quality impacts on pastoral lease holders and Prominent Hill mining operations through dust emissions. The relocation of the crushing and screening plant to the mine site, and the transport of crushed product from the mine site to the rail loop, will not result in any additional air quality impacts on existing or new environmental receptors. The depositional dust data presented in Table 7-20 and Table 7-21 indicate that mining operations do not contribute to elevated dust levels in the surrounding environment.

In addition, there is also potential for generation of greenhouse gas (GHG) due to combustion emissions from mining, crushing equipment, vehicles and diesel generators. The potential impacts relating to air quality are detailed in Table 7-22:.

Table 7-22: Impact event analysis- Air quality

Source	Pathway	Barrier	Environmental receptor	Consequences
Dust generation from operations	Atmosphere	Operational procedures and controls Water carts on unsealed access tracks, in-pit roads, WRD and open areas Dust control measures on crushing operations Sealing of main haul road Staged vegetation clearance	Pastoral lease holder and Prominent Hill operations	Nuisance impacts and reduced amenity for pastoral lease holder, Prominent Hill accommodation village Complaints
Crushing and screening operations at the mine site	Atmosphere	Operational procedures and controls Dust control measures on crushing and screening operations	Pastoral lease holder and Prominent Hill operations Vegetation Fauna	Nuisance impacts and reduced amenity for pastoral lease holder, Prominent Hill accommodation village Complaints Impact on vegetation species diversity and abundance
Dust generation from road transport of crushed ore from mine site to rail loop	Atmosphere	Operational procedures and controls Dust mitigation and management strategies Driver awareness	Pastoral lease holder Vegetation	Nuisance impacts and reduced amenity for pastoral lease holder Impact on vegetation species diversity and abundance
Emissions from combustion from mining plant and equipment exceeding regulatory criteria	Atmosphere	Maintenance of equipment and vehicles	Pastoral lease holder and Prominent Hill operations	Increase in regional greenhouse gas emissions

7.9.3 Control and management strategies

The proposed design and operational control and management measures will ensure dust is minimised as far as is practicable. Table 7-20 provides details of the risk assessment, control and management strategies to be implemented, and the associated outcomes and measurement criteria for air quality.

7.9.4 Evaluation of residual risk

The primary risk associated with air quality is considered to be potential dust impacts on pastoral lease holders and the Prominent Hill accommodation village (located 25 km southeast of the Peculiar Knob mine).

There are also a number of residences on pastoral leases ranging from 54 km to 70 km from the mining and crushing operations. Historically there have been no complaints relating to air emissions from the existing mining operations.

Dust mitigation and management measures would be implemented as per the Dust Management Plan.

The primary risks of dust impact have been assessed as ‘Low’ with implementation of the specific controls and management measures.

Similarly, the primary risks of significant greenhouse gas emissions are considered to be ‘Low’.

Table 7-23: Risk assessment- Air quality

Aspect and impact	Level of risk (inherent) LHD/CON/IRL			Controls/ Management strategies	Level of risk (residual) LHD/CON/RRL			Outcome measurement requirement
Increase in dust levels due to operations leads to impacts on pastoral lease holder and third-party mining operations	Rare	Negligible	Low	Design trafficable and working areas on site to incorporate sealing with compacted material (as appropriate for design specification) to minimise dust generation Implement a dust management plan to address dust and general air quality issues on site during operation Operations protocols with leaseholders and Prominent Hill mining operations	Rare	Negligible	Low	No
Increase in dust levels due to crushing and screening at the mine site has an impact on adjacent vegetation and fauna habitat	Possible	Minor	Low	Implement a dust management plan to address dust and general air quality issues on site during operation	Unlikely	Minor	Low	No
Increase in dust levels due to road transport of crushed ore (from mine site to rail loop) leads to impacts on pastoral lease holder and vegetation	Unlikely	Minor	Low	PSD and dust emission characteristic testing to be undertaken prior to initial product transport Site induction and training to include requirements to keep to established tracks and roads Truck drivers to observe any significant dust emissions during product transport Implementation of Dust Management Plan	Rare	Negligible	Low	No
Emissions from combustion from mining plant and equipment exceeding regulatory criteria	Unlikely	Negligible	Low	Preventative maintenance of mining plant, equipment and vehicles in accordance with manufacturer's requirements	Rare	Negligible	Low	No

7.9.1 Environmental impact assessment

An impact assessment for the relocation of the crushing and screening plant to the mine site has been undertaken in accordance with Minerals Regulatory Guideline MG2b (DEM 2020). The potential impact events associated with the relocation of the crushing and screening plant to the mine site, and the transport of crushed product along the haul road to the rail loop (as identified in Table 7-22:) have been assessed according to the Source-Pathway-Receptor model (see Table 7-24:). Where a Source-Pathway-Receptor has been confirmed, an environmental outcome and measurement criteria is provided (see Table 7-25:).

Table 7-24: Environmental impact assessment – crushing and screening plant

Environmental element	Mine life phase	Impact ID	Potential impact event	Source	Pathway	Receptor	Uncertainties and assumptions	Sensitivity to change (in assumptions)	S-P-R (Yes/Uncertain/No)	Justification for the confirmation/non-confirmation (an environmental outcome is required where the S-P-R is confirmed)	Description of the likely impact
Air quality	Operation	PK-01	Increase in dust levels due to crushing and screening plant located on mine site leads to impacts on pastoral lease holder and/or Prominent Hill operations	Fugitive dust from crushing and screening plant	Atmosphere	Pastoral lease holder Prominent Hill operations	Crushed product from the mine site has been tested for dust characterisation (see Section 7.9.1) – dust generation capacity is low Observations from previous crushing campaigns have not noted excessive dust generation	Historical depositional dust data indicate crushing and screening activities have not contributed to excessive nuisance dust (see Section 7.9.1). Composition of product will not change.	No	Dust characterisation testing indicates crushed product has very little dust generative capacity with long term mobilisation unlikely to occur and dust likely to be deposited locally, in the environment directly around the crushing and screening plant (refer to detailed discussion in Section 7.9.1) Receptors are located greater than 25 km from the mine site	No impact predicted
Air quality	Operation	PK-02	Increase in dust generation from road transport of crushed product from mine site to rail loop leads to impacts on pastoral lease holder	Fugitive dust from road transport of crushed product	Atmosphere	Pastoral lease holder	Crushed product from the mine site has been tested for dust characterisation (see Section 7.9.1) – dust generation capacity is low Observations from previous transport of crushed product have not noted excessive dust generation	Historical depositional dust data indicate transport along haul road has not contributed to excessive nuisance dust (see Section 7.9.1). Composition of product will not change.	No	Dust characterisation testing indicates crushed product has very little dust generative capacity with long term mobilisation unlikely to occur and dust likely to be deposited locally No previous observation of dust generation from transport of crushed product Receptors are located greater than 10 km from the haul road	No impact predicted
Native vegetation	Operation	PK-03	Reduced native vegetation health, abundance and appearance	Fugitive dust from crushing and screening plant and transport of product along haul road	Atmosphere	Native vegetation	Limited evidence of extensive or long term damage to vegetation from dust Assumed that impact is not long term or permanent, vegetation health will recover quickly once emissions cease Observation from previous crushing and screening activities at Wirrida demonstrates that fugitive dust falls out within 960 m from the source	Low sensitivity to change. Composition of product will not change. Haul road will remain sealed.	Yes	Native vegetation is within the area surrounding the mine site and haul road	Some level of vegetation health impact or staining may occur, but unlikely to be long term

Environmental element	Mine life phase	Impact ID	Potential impact event	Source	Pathway	Receptor	Uncertainties and assumptions	Sensitivity to change (in assumptions)	S-P-R (Yes/Uncertain/No)	Justification for the confirmation/non-confirmation (an environmental outcome is required where the S-P-R is confirmed)	Description of the likely impact
Fauna (Thick-billed Grasswren)	Operation	PK-04	Reduced Thick-billed Grasswren habitat health and abundance	Fugitive dust emissions from crushing and screening at the mine site	Atmosphere	Fauna (Thick-billed Grasswren)	Observations from previous crushing and screening at Wirrida demonstrates that fugitive dust falls out within 960 m. See Figure 7-17 in section 7.9.1 that shows the predicted dust plume based on evidence from the previous operation Observation from previous crushing and screening at Wirrida demonstrated that there is no evidence of vegetation health impacts and that staining is short term Vegetation at Wirrida is tall shrubland with foliage of a viscose nature, whereas the vegetation near the mine site that is of importance as habitat to the Thick-billed Grasswren is in the Chenopodiaceae family and may be affected differently Modelling is representative and indicates Thick-billed Grasswren habitat will not be impacted by depositional dust from crushing and screening activities Annual fauna survey (Ecological Horizons, 2015) data indicates that there are no identified impacts to Thick-billed Grasswren as a result of decreased habitat health, as a result of mining activities	Low sensitivity to change. Composition of product will not change. Annual activity intensity is lower than originally modelled for Wirrida	Yes	Thick-billed Grasswren habitat is within the area surrounding the mine site Dust characterisation testing indicates crushed product has very little dust generative capacity with long term mobilisation unlikely to occur and dust likely to be deposited locally	No impact predicted

Table 7-25: Environmental outcomes, control measures and criteria – crushing and screening plant

Mine life phase	Impact event ID	Impact event (confirmed in previous tables)	Control measures	Certainty of control measure effectiveness	Sensitivity of control measures to change of assumptions	Outcome (appropriate level of impact/consequence) Developed in conjunction with stakeholders	Measurement criteria	Leading indicator criteria
Operation	PK-03	Reduced native vegetation health, abundance and appearance through dust emissions from crushing and screening plant at mine site and the transport of crushed product along the haul road	Dust controls implemented in accordance with the Dust Management Plan (P-2-PLN-3-1003) Dust suppression using water and/or agents will be utilised on crushing and screening plant Truck drivers to observe any significant dust emissions during product transport An appropriately qualified and experienced specialist will assess whether there is a demonstrated impact associated with dust deposition on vegetation.	Control measures have been implemented in the past and are known to be effective Some level of vegetation health impact or staining may occur Assumed that impact is not long term or permanent, vegetation health will recover quickly once emissions cease.	Dust emissions combined with extended drought may cause longer term damage	No permanent loss of abundance or diversity of native vegetation in areas adjacent to mining operations due to dust, unless a significant environmental benefit has been approved in accordance with relevant legislation	Annual vegetation survey shows no demonstrated vegetation health impacts associated with mine-derived dust compared with control sites at the locations shown on Figure 7-3	N/A

7.10 Radiation and asbestiform materials

7.10.1 Context

All naturally occurring soils, rocks and minerals contain small amounts of radioactive elements. Testing of a selection of rock types from the Peculiar Knob mine for uranium was undertaken as part of the Mineral Lease proposal.

The results indicated that uranium concentrations were within background levels and below the 80 mg/kg trigger value for further investigation.

A mafic intrusion containing serpentine has been identified on the footwall of the Peculiar Knob ore body. Serpentine can occur in two forms, as fibrous chrysotile (an asbestiform mineral) or as the non-fibrous antigorite.

7.10.2 Potential impacts

The potential impacts relating to radiation and asbestiform minerals are detailed in Table 7-26: and include:

- prolonged exposure to radiation exceeding health limits for workers
- radiation impacts to soil, groundwater, surface water, fauna and the community
- human or fauna health impacts from asbestiform minerals.

Table 7-26: Impact event analysis-radiation and asbestiform minerals

Source	Pathway	Barrier	Environmental receptor	Consequences
WRD development	Earthworks	PK Fibrous Minerals Management Plan Rehabilitation Plan Progressive rehabilitation	Mine site personnel Prominent Hill operations Surrounding pastoral leaseholders Local community and public	Impact to human health
Mining operations	Blasting, excavation and loading	Fibrous Minerals Management Plan Rehabilitation Plan	Mine site personnel Prominent Hill operations Surrounding pastoral leaseholders Local community and public	Impact to human health

7.10.3 Control and management strategies

Table 7-22 provides details for the risk assessment, control and management strategies to be implemented, and the associated outcomes and measurement criteria for radiation and asbestiform minerals.

7.10.4 Evaluation of residual risk

The primary risk associated with radiation was identified to be ‘Low’ because testing of representative rock samples had indicated that radioactive minerals were within background levels.

The primary risk level associated with asbestiform minerals was assessed as ‘High’ and following implementation of control and management measures as “Moderate” because the main operational areas are a significant distance from potential receptors (nearest pastoral lease residence, Prominent Hill accommodation village and local community and general public).

Table 7-27: Risk assessment- Radiation and asbestiform minerals

Aspect and impact	Level of risk (inherent) LHD/CON/IRL			Controls/ Management strategies	Level of risk (residual) LHD/CON/RRL			Outcome measurement requirement
Excavation of materials containing radioactive elements leads to radiation impacts to humans and fauna, soil and water	Unlikely	Minor	Low	No uranium minerals have been identified at Peculiar Knob and on this basis no specific design control measures have been incorporated. Geologists will regularly check for uraniferous minerals in the ore. In the event that uraniferous minerals are observed the risk will be reassessed and appropriate control measures developed.	Rare	Minor	Low	No
Excavation and disposal of materials containing asbestiform minerals leads to detrimental effects to human and fauna health	Likely	Medium	High	Design control measures to deal with fibrous and asbestiform minerals includes the provision of mobile plant with sealed cabins and appropriate filtered air conditioning systems. The Fibrous Minerals Management Plan (will be implemented in relation to fibrous and asbestiform minerals. Any fibrous or asbestiform minerals and contaminated Personal Protection Equipment (PPE), vehicle air-conditioning filters or other protective air filtration systems from equipment operating in designated restricted areas would be double bagged and disposed with the raw asbestiform material within the WRD. The asbestiform disposal area will be located in a central area of the WRD and covered immediately with 200 mm of non-hazardous material and subsequently covered by at least 2 m of non-hazardous material.	Unlikely	Medium	Moderate	Yes-see Section 8.1.9

7.11 Visual amenity, nuisance noise and light

7.11.1 Context

Noise levels are related to mining and processing operations, and visual impacts would primarily be related to the WRD and lighting at night.

The Prominent Hill accommodation village is located approximately 25 km from the Peculiar Knob mine site and is the closest sensitive noise receptor.

The nearest residences are variably located between 27 km and 70 km from the Project operations.

The WRD will be extended to the east and will result in an increased footprint, potentially creating additional visual impact.

Lighting is necessary for safety and security during night time operations and may result in impact to pastoral residences.

7.11.2 Potential impacts

The potential impacts relating to visual amenity, nuisance noise and light are detailed in Table 7-23.

Table 7-28: Impact event analysis- Visual amenity, nuisance noise and light

Source	Pathway	Barrier	Environmental receptor	Consequences
Mining operations	Mining activities Altered landscape landform	Mining operation development plans incorporating appropriate considerations. Rehabilitation in accordance with Closure and Rehabilitation Plan. Progressive rehabilitation	Prominent Hill operations Surrounding pastoral leaseholders General public	Reduced visual amenity
Mining and processing operations **Equipment noise** **Increased lighting**	Altered landscape Noise Night time lighting	Planning and design to incorporate appropriate considerations Community consultation Rehabilitation in accordance with Closure and Rehabilitation Plan Progressive rehabilitation	Prominent Hill operations Surrounding pastoral leaseholders	Reduced amenity Nuisance noise/light

7.11.3 Control and management strategies

Table 7-24 provides details for the risk assessment, any control and management strategies to be implemented, and the associated outcomes and measurement criteria for visual amenity, nuisance noise and light.

Table 7-29: Risk assessment- Visual amenity, nuisance noise and light

Aspect and impact	Level of risk (inherent) LHD/CON/IRL			Controls/ Management strategies	Level of risk (residual) LHD/CON/RRL			Outcome measurement requirement
Disturbance to neighbours due to an increase in ambient noise levels from construction and operational activities	Unlikely	Minor	Low	Include noise abatement design measures on site infrastructure e.g. generators, material handling machinery. Use of mobile mine machinery with noise abatement devices that meet standards and current best design capability. Maintain noise abatement devices on mine infrastructure and mobile machinery / vehicles. Service machinery regularly in accordance with manufacturing requirements. In the event noise and vibration does become an operational issue (based on complaints received or another indicator) a Noise and Vibration Management Plan will be developed for implementation.	Rare	Negligible	Low	No
Reduced visual amenity in project area (local and regional area including Breakaways area)	Possible	Minor	Moderate	WRD and topsoil storage area and haul roads designed to reduce clearing requirements and impacts. Waste dump design to reflect surrounding topography. Progressive rehabilitation of WRD and other areas of site as appropriate. Sections 4 and 5 outline the approach for progressive and final rehabilitation.	Unlikely	Minor	Low	Yes-see Section 8.1.10
Loss of amenity due to lighting	Possible	Negligible	Low	Use of directional lights targeted to work areas and for safety management.	Unlikely	Negligible	Low	No

7.11.4 Evaluation of residual risk

The WRD has the potential to result in a visual impact on the existing landscape. The primary risk associated with visual amenity was identified to be ‘Moderate’ with a residual risk level of ‘Low’.

The risks associated with noise and nuisance lighting were assessed as ‘Low’ because the main operational areas are a significant distance from potential receptors (nearest pastoral lease residence and Prominent Hill accommodation village). To date there have been no complaints relating to current operations.

7.12 Traffic

7.12.1 Content

Iron ore product is transported from the Peculiar Knob Mine via the haul road through pastoral leases and under the highway to the Wirrida rail loop for subsequent loading onto trains and transportation to Adelaide, Port Augusta or Whyalla for export.

7.12.2 Potential impacts

The potential impacts relating to traffic are summarised in Table 7-25. Proposed operations will not generate additional traffic on haul roads and public roads.

Table 7-30: Impact event analysis- Traffic

Source	Pathway	Barrier	Environmental receptor	Consequences
Vehicle movements	Transport of ore to Wirrida and waste rock to WRD and ROM pad	Driver awareness, speed, site road rules	Pastoral lessees and employees Public road users Livestock Fauna Prominent Hill operations	Injury or fatality to pastoral lease personnel Injury or fatality of public Injury or fatality of fauna Injury or fatality of livestock Increased public road maintenance Interference with Prominent Hill operations

7.12.3 Control and management strategies

Table 7-26 provides details of the risk assessment for traffic, control and management strategies to be implemented, and the associated outcomes and measurement criteria.

7.12.4 Evaluation of residual risk

The primary risks associated with traffic were identified as ‘Moderate to Extreme’ due to the risk of harm to pastoral lease personnel, native fauna and cattle.

With implementation of the proposed control and management measures the residual risk is ‘Low to High’ should an impact event occur. The ML6442 and MPL147 will not generate additional traffic on the Wirrida Haul road or other public roads, resulting in a ‘Low’ residual risk.

Table 7-31: Risk assessment- Traffic

Aspect and impact	Level of risk (inherent) LHD/CON/IRL			Controls/ Management strategies	Level of risk (residual) LHD/CON/RRL			Outcome measurement requirement
Increased safety issues from increased traffic on local and regional roads.	Possible	Medium	High	Implementation of Traffic Management Plan	Unlikely	Minor	Low	Yes – see Section 8.1.11
Increased road maintenance requirements due to increased heavy vehicle traffic from mining activities.	Possible	Minor	Moderate	Reach an agreement with DPTI (if required) regarding maintenance requirements. Implementation of Traffic Management Plan (including speed restrictions, road inspections).	Unlikely	Minor	Low	Yes – see Section 8.1.11
Vehicle collisions with significant native fauna causing death or injury.	Unlikely	Minor	Low	Include fencing where appropriate to minimise fauna potential access to site operational areas. Speed restrictions on roads. Employee and contractor fauna awareness training during inductions.	Unlikely	Negligible	Low	No
Vehicle collisions with cattle causing death or injury.	Possible	Minor	Moderate	Locate watering points at appropriate distance from the access road in consultation with the pastoralist. Include fencing, grids and gates in site design to minimise potential stock access to site operational areas. Restrictions on on-site haulage and access road speeds to minimise potential collisions with livestock. Access and compensation agreements include clause on management of livestock injuries and fatalities.	Unlikely	Minor	Low	Yes-see Section 8.1.11
Vehicle collisions with pastoral lease personnel causing death or injury.	Possible	Extreme	Very High	Property access agreements Traffic management plan Reduced haul road crossing access Traffic control signage requiring pastoral lease personnel to stop and proceed when clear.	Rare	Extreme	High	Yes- see Section 8.1.11

7.13 Public safety

7.13.1 Context

The Peculiar Knob mine site is not fenced, and access is restricted to one entry point, which is controlled through signage. As the mine operates on a continuous basis, access by any individual not authorised to be on site will be identified and promptly dealt with by authorised mine site personnel as part of the mining operations.

7.13.2 Potential impacts

The potential impacts relating to public safety are summarised in Table 7-27.

Table 7-32: Impact event analysis- Public safety

Source	Pathway	Barrier	Environmental receptor	Consequences
Unauthorised site access to operational areas	Site security failures	Existing site security Traffic management Signage	Member of the public	Injury or fatality to members of the public

.

7.13.3 Control and management strategies

Peak Iron Mines will implement comprehensive site access control measures to reduce impacts associated with public safety due to unauthorised access.

Table 7-28 provides details for the risk assessment, any control and management strategies to be implemented, and the associated outcomes and measurement criteria for public safety.

7.13.4 Evaluation of residual risk

The primary risk to public safety was assessed as 'Very High' due to the potential for harm to people should they enter the haul road or mining operations.

With the implementation of specific controls and management measures, the residual risk has been determined to be 'High'.

Table 7-33: Risk assessment- Public safety

Aspect and impact	Level of risk (inherent) LHD/CON/IRL			Controls/ Management strategies	Level of risk (residual) LHD/CON/RRL			Outcome measurement requirement
Injury or death to members of the public as a result of unauthorised access to operational areas	Possible	Major	Very High	Adopt practices to protect the health and safety of pastoral leaseholders and the public from mining activities Maintain warning signage, implementation of site induction, visitor sign in and site access protocols Control entry and exit points to the site	Unlikely	Major	High	Yes – see Section 8.1.12

7.14 Adjacent land use and third-party property

7.14.1 Context

Mining operations have the potential to affect third-party property as a consequence of unintended and unexpected aspects of the operation.

Land adjacent to the Peculiar Knob mining activities is used for pastoral activities, Department of Defence operations and activities by OZ Minerals.

Third-party infrastructure close to the tenements that may be affected includes the Prominent Hill haul road.

7.14.2 Potential impacts

The potential impacts relating to adjacent land use and third-party property have been considered as part of the existing operations and are summarised in Table 7-29.

Table 7-34: Impact event analysis- Adjacent land use and third-party property

Source	Pathway	Barrier	Environmental receptor	Consequences
Mining operations adjacent to pastoral activities and third-party property	Air-borne dust Unauthorised land clearance Fire	Stakeholder Engagement and Communications Management Process	Adjacent pastoral landholder OZ Minerals Prominent Hill operations Commonwealth Defence land	Damage to property Claims of damage to third-party and livelihood Potential for lawsuit and prosecution

7.14.3 Control and management strategies

Table 7-30 provides details of the risk assessment for adjacent land use and third-party property, any control and management strategies to be implemented, and the associated outcomes and measurement criteria.

7.14.4 Evaluation of residual risk

The primary risk associated with adjacent land use and third-party property were generally assessed as High' given the proximity of the OZ Minerals haul road to the Peak Iron Mines haul road.

With ongoing community engagement, ongoing consultation with stakeholders and ensuring compliance with tenement conditions and the outcomes developed for the project, the residual risk is still considered to be "High".

Table 7-35: Risk assessment- Adjacent land use and third-party property

Aspect and impact	Level of risk (inherent) LHD/CON/IRL			Controls/ Management strategies	Level of risk (residual) LHD/CON/RRL			Outcome measurement requirement
Effects on Department of Defence operations	Unlikely	Minor	Low	Appropriate agreements in place with Department of Defence Implement protocols in place with Department of Defence	Unlikely	Negligible	Low	No
Decrease in pastoral income due to a decrease in grazing area associated with mining operations	Unlikely	Minor	Low	Mining operations, haul roads and processing areas designed to reduce clearing requirements and impacts. Design rehabilitation program to facilitate low-intensity grazing as final land use. Implementation of a communications and operating protocol with pastoralist Access and compensation agreement in place covering losses Stakeholder Engagement Plan	Unlikely	Minor	Low	No
Claims of damage to third-party property natural resources, livelihood, enjoyment or infrastructure by mining operations including by dust, unauthorised clearance and fire	Likely	Minor	High	Mining operations, haul roads and processing areas designed to reduce clearing requirements and impacts Design rehabilitation program to facilitate low-intensity grazing as final land use Implementation of a communications and operating protocol with pastoralist Access and compensation agreement in place covering losses Stakeholder Engagement Plan	Unlikely	Minor	Low	Yes- see Section 8.1.13
Interference with Prominent Hill operations due to proximity of haul road operations	Unlikely	Minor	Low	Implementation of a communications and operating protocol with OZ Minerals Prominent Hill mine Protocol will address interference with adjacent operations (including dust), emergency procedures, communications and issues management processes, land management (native vegetation, alteration of surface water flows) and dispute resolution (as minimum)	Unlikely	Minor	Low	No

7.15 Heritage

7.15.1 Context

The Peculiar Knob project area is within the Antakirinja Matu-Yankunytjatjara Native Title Claim (SC95/7) and this area is traversed by ethnographic trails and storylines of significance to the Antakirinja Matu-Yankunytjatjara. Indigenous heritage sites of significance were recorded within the Peculiar Knob project area on the Register of Sites and Objects, held by the Aboriginal Affairs and Reconciliation Division (AARD).

Site surveys and negotiations with the Claimants were undertaken in November 2007, April 2008, October 2008, December 2009 and January 2011 as part of the existing Peculiar Knob mining operations. Native Title agreements with the Antakirinja Land Management Aboriginal Corporation (ALMAC) now called Antakirinja Matu-Yankunytatjara Aboriginal Corporation (AMYAC) were completed for the project.

Additional surveys were undertaken over the area of ML6442 and MPL147 in December 2013. An additional site inspection was undertaken in January 2014 to discuss alternative layouts for the Eastern WRD and the potential to impact significant men and women's mythological sites. Re-alignment of the Eastern boundary of the Eastern WRD was undertaken to ensure avoidance of the creek east of the proposed WRD. However due to technical and engineering constraints avoidance of the women's mythological sites was unlikely to occur if the Eastern WRD was to proceed.

The AMYAC Board reached a position that enabled a mutually acceptable outcome to be agreed with Southern Iron. An application was made on 30 June 2014 to the Minister under Section 23 of the Aboriginal Heritage Act in relation to disturbance of areas of significance.

7.15.2 Potential impacts

The potential impacts relating to heritage are summarised in Table 7-31.

Table 7-36: Impact event analysis- Heritage

Source	Pathway	Barrier	Environmental receptor	Consequences
Disturbance or destruction of Aboriginal heritage sites by mining operations	Mine operations uncovering sites/artefacts or disturbing existing heritage sites	Existing site survey, heritage area delineation and database search	Aboriginal heritage	Disturbance of heritage sites

7.15.3 Control and management strategies

Table 7-32 provides details for the risk assessment for heritage, any control and management strategies to be implemented, and the associated outcomes and measurement criteria.

Table 7-37: Risk assessment- Heritage

Aspect and impact	Level of risk (inherent) LHD/CON/IRL			Controls/ Management strategies	Level of risk (residual) LHD/CON/RRL			Outcome measurement requirement
Disturbance or destruction of Aboriginal heritage sites by mining operations.	Possible	Medium	High	Mining operations designed to avoid known Aboriginal heritage sites. Implement protocol and procedures with the AMYAC for the discovery of Aboriginal sites/relics and in the event a discovery is made. Include procedure in mine operational management plans Implement measures in Native Title Mining Agreement for Mineral Production Peculiar Knob (between Arrium Mining (Southern Iron Pty Ltd) and AMYAC). Conduct clearance surveys with AMYAC as required. Include as part of employee and contractor induction process.	Unlikely	Medium	Moderate	Yes- see Section 8.1.14

7.15.4 Evaluation of residual risk

If there are no control and management measures, the primary risk associated with Aboriginal heritage would be 'High'.

No places or items of European heritage have been identified within the project area including the mine site area, haul/access road, old accommodation village, water supply infrastructure and rail loop.

During construction of the Peculiar Knob mine and current operations there were no incidents related to disturbance of items of Aboriginal heritage, indicating that the adopted control and management measures have been effective. Agreement was reached with the AMYAC for establishment of the Eastern WRD in an area of significance to men and women's mythological sites. An application was made on 30 June 2014 to the Minister under Section 23 of the Aboriginal Heritage Act in relation to disturbance of areas of significance. On this basis it is reasonable for the residual risk to be 'Moderate'.

7.16 Waste disposal

7.16.1 Context

Domestic wastes from the accommodation village, service areas and industrial waste (waste oils, packaging, construction material and drums) are generated by the current operations.

The predicted volumes of waste for the project were calculated based on a similar sized mining accommodation village and mining project, then quantified for the life of the project (three to four years). The calculations assume that each person generates 1.5 kg of waste per day. The total expected waste volume generated in the mine life has been estimated at 10,950 cubic metres. A detailed breakdown is included in Section 3.10.

All waste from Southern Iron operations are collected and transported for disposal in an EPA licensed waste management facility and this will continue.

Previous approval to establish a solid waste landfill near the accommodation village was received from the EPA, however there are currently no plans to build the facility.

7.16.2 Potential impacts

The potential impacts relating to waste disposal are detailed in Table 7-33.

Table 7-38: Impact event analysis- Waste disposal

Source	Pathway	Barrier	Environmental receptor	Consequences
Industrial and general wastes	Amenity, soil, surface water or groundwater	Waste Management Plan	Amenity, soil, surface water or groundwater	Contamination of soil, surface water and groundwater Reduction in amenity due to litter discharged off-site Attraction of pests and feral animals

7.16.3 Control and management strategies

The following control and management procedures are adopted:

- segregate waste at source for recycling where feasible
- segregate potentially hazardous waste for pickup by licensed contractor
- transport waste to an EPA licenced waste management facility.

Table 7-34 provides details of the risk assessment for the current procedures including collection and disposal of waste to an EPA licenced waste management facility.

7.16.4 Evaluation of residual risk

The primary risk associated with waste disposal has been assessed as ‘Low’ as waste is collected and transported to an EPA licenced waste management facility. Consequently, specific outcome and measurement criteria have not been developed.

Table 7-39: Risk assessment- Waste disposal

Aspect and impact	Level of risk (inherent) LHD/CON/IRL			Controls/ Management strategies	Level of risk (residual) LHD/CON/RRL			Outcome measurement requirement
Contamination of soil, surface water and groundwater due to management of industrial and general wastes	Unlikely	Negligible	Low	Management by: • segregate waste at source for recycling where feasible • segregate potentially hazardous waste for pickup by licensed contractor • transport waste to an EPA licenced waste management facility	Unlikely	Negligible	Low	No
Loss of amenity due to vermin, litter and odour	Unlikely	Minor	Low	Management by: • segregate waste at source for recycling where feasible • segregate potentially hazardous waste for pickup by licensed contractor • transport waste to an EPA licenced waste management facility	Unlikely	Minor	Low	No

7.17 Blasting and vibration

7.17.1 Context

The project area is located 30 km east of the Stuart Highway approximately 700 km northwest of Adelaide and approximately 60 km southeast of Coober Pedy. The surrounding land is used for pastoral activities, mainly sheep and cattle grazing. The closest significant industrial development is the Prominent Hill mine which is located approximately 25 km southeast of the project area.

The nearest pastoral residence to the ML and MPL is the Twins homestead (on McDouall Peak pastoral station) located approximately 45 km to the south.

7.17.2 Potential impacts

The potential impacts relating to blasting and vibration are detailed in Table 7-35.

Table 7-40: Impact event analysis-Blasting and vibration

Source	Pathway	Barrier	Environmental receptor	Consequences
Blasting activities	Vibration via ground surface Shock wave via atmosphere Fly rock via air Fumes via atmosphere	Short duration of blasting Industry standard blasting protocols Distance to receptors Limit mass instantaneous charge (MIC) Correct use of suitable explosive type	Prominent Hill operations and accommodation camp Adjacent pastoral leaseholders	Reduced amenity/complaints Safety hazard Damage to third-party property

7.17.3 Control and management strategies

Blast management procedures address the potential impacts of vibration, overpressure, fly-rock, dust and noise on the environment, personnel, equipment and surrounding land and facilities. Blasts are managed in accordance with industry best practice for explosives handling, blast design, initiation systems and impact controls. All blasts are designed and supervised by qualified, trained and experienced personnel.

Specific controls within the blast management procedures include:

- an exclusion zone of 500m from the blast for personnel
- an exclusion zone of 300m from the blast for equipment
- notifications prior to blasting
- clearance activities before the blast
- an allocated blasting controller (i.e. responsible shot-firer)

- emergency preparedness during the blast
- standard communication methods during the blast
- post-blast checks
- clearance at the conclusion of blasting.

All potential risks and impacts are controlled and maintained below levels recommended in Australian Standard AS 2187.2: 2006.

The nearest residence to the proposed mine site is within the Prominent Hill accommodation camp (25 km south) and the pastoral residences range from 27 km to 70 km from mining operations. At these distances the effects of blasting will be insignificant.

Table 7-36 provides details of the risk assessment for blasting and vibration, any control and management strategies to be implemented, and the associated outcomes and measurement criteria.

7.17.4 Evaluation of residual risk

The primary risks associated with blasting and vibration is ‘Low’. The likelihood that fly rock would land on the surrounding properties is rare.

Blasting at the Peculiar Knob mine is of low intensity and will be undertaken under strict conditions and will be well-shielded within the pit.

Implementation of the proposed control and management measures has resulted in a ‘Low’ residual risk.

Table 7-41: Risk assessment- Blasting and vibration

Aspect and impact	Level of risk (inherent) LHD/CON/IRL			Controls/ Management strategies	Level of risk (residual) LHD/CON/RRL			Outcome measurement requirement
Blasting activities leading to injury or damage from vibrations, air over pressure and fly rock	Unlikely	Minor	Low	Protocols for blasting activities to minimise impact, which are based on Australian Standard AS 2187.2 Explosives - storage and use of explosives Limit mass instantaneous charge (MIC) to reduce any release of excess energy Any complaints received will be investigated and actions put in place to achieve an agreed resolution within one month of the complaint. Details will be communicated to DEM Any safety incidents relating to fly rock will be reported to DEM and SafeWork SA	Rare	Negligible	Low	No
Ground vibration impacting adjacent residents	Unlikely	Minor	Low	Standard Industry blast practices Limit mass instantaneous charge (MIC) to reduce any release of excess energy Protocols for blasting activities to minimise impact	Rare	Negligible	Low	No
Air-borne shock waves (over pressure) and noise impacting adjacent residents	Possible	Negligible	Low	Standard Industry blast practices Protocols for blasting activities to minimise impact Adequate and correct type of stemming use to contain the explosive within the blast hole	Rare	Negligible	Low	No

7.18 Care and maintenance

7.18.1 Context

Care and maintenance activities are outlined in Section 3.13. The potential impacts specific to a care and maintenance for Peculiar Knob have been identified. The risks associated with aspects and impacts have been assessed to determine where any additional outcomes (and associated measurement criteria) will apply during care and maintenance.

7.18.2 Potential impacts

The potential impacts related to care and maintenance activities are detailed in Table 7-42:.

Table 7-42: Impact event analysis - care and maintenance

Source	Pathway	Barrier	Environmental receptor	Consequences
Hazardous substance, raw water and chemical spills	Waste disposal Water storage Hydrocarbon storage	Removal of all hazardous substances and chemicals from site. Decommission and drain raw water infrastructure	Soil Surface water Groundwater	Loss of soil quality Contamination of soil, surface water and groundwater
Erosion of WRD and sedimentation	Drainage lines along preferential pathways	Sedimentation controls and monitoring protocols Design of WRD	Native vegetation Fauna Surface water Soil	Reduced rehabilitation land function capability and failed vegetation cover Decrease in surface water quality Impact to downstream ecosystem function Loss of soil quality and quantity
Entrapment of fauna	Turkey Nest Pit Borrow pit Drill holes	Turkey Nests to be drained and holed Bund placed across entrances to open borrow pits	Fauna	Entrapment of fauna in Turkey Nest, pit or borrow pit resulting in loss of abundance of fauna species
Weeds establishing on bare and disturbed areas	Vehicle traffic Cleared areas	Vehicle washdown Pest Plant and Animal Control Strategy Continuous weed mapping Re-establishment of native vegetation cover	Native vegetation	New weeds and increased abundance of existing weed species Breach of the Landscape SA Act 2019
New pest animal species Increase in abundance of existing pest animal species	Migration onto site from surrounding land Inappropriate disposal of general waste	Removal of all food wastes from site	Native vegetation Fauna	Predation on native fauna

Surface water inflow	WRD	Design of WRD PAF cells to encapsulate all PAF material	Surface water Soil Native vegetation	Percolated stormwater flushing oxidised PAF material out of the WRD as actual acid
Surface water inflow	Altered drainage lines Haul road intercepts natural drainage lines Pit and borrow pit	Stormwater management and controls	Flora and fauna Surface water	Impact to downstream ecosystem function due to altered flow regime Pit and/or borrow pit acting as water storage catchment depriving downstream vegetation receptors of sufficient moisture Altered flow regime impacts surface water runoff during heavy rainfall events
Surface water inflow	Altered or blocked drainage lines	Inspection and maintenance prior to care and maintenance finalisation	Rail Loop line	Sedimentation impacts result in drains not able to contain sufficient water following heavy rainfall events
Infrastructure	Haul road Drains Underpass	Rehabilitation of open areas Inspection and maintenance of infrastructure	Livestock Visual amenity	Potential injuries to livestock Reduced visual amenity at underpass location due to cleared area and material stockpile
Unauthorised site access onto tenements	Site security failures	Site security Fencing Signage	Member of the public	Injury or fatality to members of the public

7.18.3 Control and management strategies

Table 7-43: provides details for the risk assessment, control and management strategies and the associated outcomes and measurement criteria for the mine in care and maintenance. Controls and management strategies will be subject to ongoing review until mining recommences.

7.18.4 Evaluation of residual risk

The primary risks associated during care and maintenance were identified as ‘Low’ to ‘High’. The risk assessment will be subject to ongoing review until mining recommences.

With implementation of due diligence, standard industry practices and specific controls and management measures, the residual risk has been determined to be Low, with the exception of the risk aspect/impact of unauthorised access onto the ML/MPL resulting in a safety issue which remains as ‘High’, given the potential consequences.

Table 7-43: Risk assessment- Mothballing – Care and maintenance

Aspect and impact	Level of risk (inherent) LHD/CON/IRL			Controls/Management strategies	Level of risk (residual) LHD/CON/RRL			Outcome measurement requirement
Flora and Fauna								
Erosion of WRD batters resulting in reduced rehabilitation land function capability and failed vegetation cover	Likely	Minor	High	Batter slopes to the approved landform profile and place available topsoil on the top of the slope so that weathering processes causes the soil to migrate down slope into its natural residence.	Unlikely	Minor	Low	Final Mothball audit and annual inspections demonstrate that WRDs have been rehabilitated in compliance to Section 3.13
Pit and/or borrow pit acting as water storage catchment depriving downstream vegetation receptors of sufficient moisture	Possible	Minor	Moderate	Drainage windrows and a barrier windrow for pit and haul road borrow pits will be installed to prevent water inflow	Unlikely	Minor	Low	Final Mothball audit and annual inspections demonstrate that drainage barrier windrow for pit and haul road borrow pits installed to prevent water inflow in compliance to Section 3.13. Corrective actions are to be closed out within three months or as otherwise agreed with the Regulator.
Entrapment of fauna in Turkey Nest, pit or borrow pit resulting in loss of abundance of fauna species	Possible	Minor	Moderate	Turkey Nests will be drained and holed to prevent fauna entrapment and/or drowning The open borrow pits will have a bund placed across all entrances to prevent water inflow	Unlikely	Minor	Low	Final Mothball audit demonstrates that turkey nest dams and borrow pits have been closed in compliance to Section 3.13
Permanent loss of vegetation diversity or abundance due to dust deposition	Rare	Minor	Low	There are no dust emission sources during care and maintenance	Rare	Minor	Low	No

Pest plants and animals								
New weeds and increase in abundance of existing weed species	Possible	Minor	Moderate	Cleared areas will be inspected during the final audit for new weed infestations, and these will be treated as per Weed Management Plan Re-establishment of native vegetation cover	Unlikely	Minor	Low	Final Mothball audit and annual inspections demonstrate that open areas have been closed and allowed to re-vegetate in compliance to Section 3.13 and that all and any weeds present at the time of the audit or inspections other than those pre-existing according to the most recent flora monitoring report (Cooe 2015) are hand removed or sprayed with herbicide. Corrective actions are to be closed out within three months or as otherwise agreed with the Regulator
Increase in abundance of pest animal species at long term water source within EML6373	Possible	Minor	Moderate	Involvement in ad-hoc pest control programs in conjunction with Ingomar Station	Unlikely	Minor	Moderate	Demonstration of involvement in ad-hoc pest animal control programs with Ingomar Station within the vicinity of EML6373 and any complaints of increased abundance of pest animal species within the vicinity of EML6373 compared to other areas due to the presence of the long term water source are recorded, investigated and closed out within 30 days or as otherwise agreed with the regulator and the complainant.

Inappropriate disposal of general waste leading to an increase in predator pest animal numbers	Possible	Minor	Moderate	Removal of all food wastes from site	Unlikely	Minor	Low	Final Mothball audit demonstrates that all food scraps and wastes have been removed from site in compliance to Section 3.13
Soil								
Loss of soil quantity through erosion of the WRD	Likely	Minor	High	Batter slopes to the approved landform profile and place available topsoil on the top of the slope so that weathering processes causes the soil to migrate down slope into its natural residence	Unlikely	Minor	Low	Final Mothball audit demonstrates that WRDs have been rehabilitated in compliance to Section 3.13
Erosion of topsoil in cleared and disturbed areas across the project area.	Possible	Minor	Low	Cleared areas to be rehabilitated and stabilised	Unlikely	Minor	Low	Final Mothball audit and annual inspections demonstrates that open areas at the mine site, the accommodation village, the underpass and Wirrida have been rehabilitated in compliance to Section 3.13 and there are no ongoing soil erosion or stability issues. Corrective actions are to be closed out within three months or as otherwise agreed with the Regulator.
Contamination of soil and loss of soil quality due to hydrocarbon leak	Unlikely	Minor	Low	All hydrocarbons and chemicals will be removed from site. Residual fuel tanks, if any, will remain in bunded facilities in compliance with AS 1940 and EPA bunding guidelines.	Rare	Minor	Low	N/A

Contamination of soil and loss of soil quality due to raw water leaks from water infrastructure	Unlikely	Minor	Low	Raw water pumps will be removed and pipeline decommissioned and drained	Rare	Minor	Low	N/A
Increased level of salt in topsoil due to saline water use for dust suppression activities	Rare	Minor	Low	Haul road had been sealed and no water applied for dust suppression since October 2014. No water will be applied for dust suppression during care and maintenance No impacts to vegetation from the use of saline water for dust suppression have been identified by annual assessment conducted by suitably qualified external specialist to-date	Rare	Minor	Low	N/A
Surface water								
Decrease in surface water quality due to sedimentation impacts from erosion of WRD	Unlikely	Minor	Low	Batter slopes to the approved landform profile and place available topsoil on the top of the slope so that weathering processes causes the soil to migrate down slope into its natural residence.	Unlikely	Minor	Low	Final Mothball audit demonstrates that WRDs have been rehabilitated in compliance to Section 3.13
Impact to downstream ecosystem function due to erosion from WRD	Unlikely	Minor	Low	Batter slopes to the approved landform profile and place available topsoil on the top of the slope so that weathering processes causes the soil to migrate down slope into its natural residence	Unlikely	Minor	Low	Final Mothball audit demonstrates that WRDs have been rehabilitated in compliance to the approved to Section 3.13
Percolated stormwater flushing oxidised PAF material out of the WRD as actual acid	Unlikely	Minor	Low	Temporary capping of the PAF cell within the WRD in compliance with Section 3.13. The temporary capping does not allow deep saturation of the cap material during rainfall events, shallow saturation causing preferential shedding of stormwater rather than infiltration. Evaporation between rainfall events would dry the saturated cap and minimise the likelihood of further infiltration during a subsequent rainfall event (LBW Environmental Projects 2016, see Appendix I). The likelihood of sufficient saturation of the cap and underlying PAF occurring, resulting in migration of contaminants to receptors, is considered very low and given the low regional rainfall, would most likely require a	Unlikely	Minor	Low	Biannual soil sampling at locations shown in Figure 7-7 demonstrate that acid rock drainage (ARD) has not occurred. Biannual inspection demonstrates that the temporary cover of the PAF has not resulted in loss of stability or cover depth due to erosion.

				number of rainfall events in close sequence (LBW Environmental Projects 2016, see Appendix I).				Final Mothball audit demonstrates temporary PAF cover is in accordance with Section 3.13
Altered flow regime impacts surface water runoff during heavy rainfall events	Possible	Minor	Moderate	External stormwater flow will be diverted around the pit and WRD. Stormwater that falls within the Mine and WRD footprint will drain into the mine pit.	Unlikely	Minor	Low	Final Mothball audit and annual inspections demonstrates that drainage has been constructed in accordance with Section 3.13 and the integrity of the flow control structures remain intact. Corrective actions are to be closed out within three months or as otherwise agreed with the Regulator.
Sedimentation impacts result in drains not able to contain sufficient water following heavy rainfall events leading to safety issue on rail loop line	Unlikely	Minor	Low	All drainage channels and culverts around the rail loop will be inspected and any required maintenance will be undertaken prior to completion to ensure that they are capable of performing as designed The loop line will not be used while the mine is in care and maintenance phase	Unlikely	Minor	Low	N/A
Operational induced gully erosion where the haul road intercepts drainage lines exceed >0.5m deep or >1.5m long or >0.8m wide greater than the natural gully erosion that existed prior to mining operations	Unlikely	Minor	Low	The haul road has been sealed, a V drain has been constructed along the length of the haul road and culverts have been installed at all interception points Photo monitoring to date has not identified any erosion or drainage issues.	Unlikely	Minor	Low	N/A
Groundwater								

Hydrocarbon leak or spill contaminating groundwater	Unlikely	Minor	Low	All hydrocarbons and chemicals will be removed from site. Residual fuel tanks, if any, will remain in bunded facilities in compliance with AS 1940 and EPA bunding guidelines	Unlikely	Minor	Low	N/A
Reduction in regional groundwater levels impacting the Greater Artesian Basin springs and South West Springs Zone and pastoralists	Unlikely	Minor	Low	Production wells have been decommissioned during the mothball stage and as of October 2016 groundwater levels in the Penrhyn and Camp bore field production wells have returned to within 0.04 to 0.17 m below top of collar (btoc) from pre-production levels measured in 2011. This is considered to be within the range of natural variability. It is also considered that groundwater levels have reached a steady state within the range of natural variability as measured in the differential between the October 2016 levels and the April 2016 levels in the production fields being between 0.01 to 0.14m. In the same period, monitoring levels in the Stafford borefield, which has never been commissioned, varied between 0.08 to 0.14m. (See Table 7-44:)	Unlikely	Minor	Low	Biannual monitoring of groundwater levels during 2016 and 2017 to be measured in monitoring boreholes for Stafford, Penrhyn and Camp Water Borefields (see Figure 7-10) demonstrate that ground water levels remain within pre-construction levels, monitoring will then cease until groundwater extraction recommences
Reduction in groundwater availability and quality in regional bores due to reduction in groundwater levels and increase in salinity of available water	Unlikely	Minor	Low	Production wells will be decommissioned during the care and maintenance phase and it is expected that groundwater availability and quality will return to background levels in a short time period	Unlikely	Minor	Low	Annual and biannual analysis of groundwater levels and quality parameters of EC, pH and major components at Penrhyn and Camp Borefields and biennially at Stafford borefield (see Figure 7-10) during 2016 and 2017 demonstrate no elevated levels of potential contaminants, monitoring will then cease until groundwater extraction recommences

Waste disposal

Inappropriate disposal of general waste leading to loss of amenity	Possible	Minor	Moderate	All general waste, chemicals, hydrocarbons, explosives and septic/sewerage will be removed from site	Unlikely	Minor	Low	Final Mothball audit demonstrates that all wastes have been removed from site in accordance with Section 3.13
Visual amenity								
Reduced visual amenity at underpass location due to cleared area and material stockpile	Possible	Minor	Moderate	Open area to be rehabilitated except for 10% left for storage of haul road maintenance sealing aggregates Remaining soil stockpile to be profiled	Unlikely	Minor	Low	Final Mothball audit demonstrates that areas have been rehabilitated in accordance with Section 3.13
Public safety								
Unauthorised access onto ML/MPL resulting in a safety issue	Likely	Medium	High	A bund will be installed at access ramps into the pit and onto the WRD to prevent public access Gates and signage will be installed as necessary to prevent/deter public access The gates at the entrance from the Stuart Highway will be closed and locked. Signage will be installed to prevent/deter public access Gates and signage will be installed at the Old Stuart Highway to prevent/deter public access The open borrow pits will have a bund placed across all entrances to ensure public safety	Possible	Medium	High	Final mothball audit and six-monthly site inspections demonstrates that bunds, locked gates and signage are in place in accordance with Figure 3-79
Adjacent land use and third-party property								
Potential injuries to livestock from access to haul road, drains and underpass	Unlikely	Minor	Low	There will not be any traffic on the haul road. Drains are not steep enough or deep enough to be a hazard to livestock	Unlikely	Minor	Low	N/A

Table 7-44: Groundwater

Bore field	Bore	Drawdown Threshold (m)	Baseline Levels	April 2016 Level (mbtoc)	October 2016 Level (mbtoc)	Water Level Change (m) Apr-Oct 2016	Water Level Change (m) Baseline to Oct 2016
Stafford (not in production)							
	HN WPR62A		33.34 (July 2014)	33.33	33.25	0.08	0.09
	HN48		33.66 (Apr 2008)	33.08	32.95	0.13	0.71
	HN49		33.96 (Apr 2008)	33.4	33.31	0.09	0.65
	HN73		31.57 (Apr 2008)	31.42	31.29	0.13	0.28
	HN77		31.73 (Apr 2008)	31.28	31.14	0.14	0.59
Penrhyn							
	PMB-01	0.6	25.4 (Mar 2011)	25.58	25.53	0.05	-0.13
	PMB-02	0.6	42.6 (Mar 2011)	42.86	42.77	0.09	-0.17
	PMB-03	0.6	36 (Mar 2011)	36.22	36.13	0.09	-0.13
	PMB-04	0.6	31.6 (Mar 2011)	31.81	31.68	0.13	-0.08
	PMB-05	0.6	19.6 (Mar 2011)	18.43	18.42	0.01	1.18

Accommodation Camp							
	PKWB-02	1.5	54.9 (Jul 2011)	55.12	54.98	0.14	-0.08
	PKWB-04A	1	62 (Jul 2011)	62.24	62.1	0.14	-0.1
	PKWB-05	1.5	53.2 (Jul 2011)	53.38	53.24	0.14	-0.04
	PKWB-06	1.5	54.3 (Jul 2011)	54.54	54.4	0.14	-0.1
	Site F	1	51.5 (Jul 2011)	51.66	51.54	0.12	-0.04

*Positive change to water level indicates water level rise above baseline levels. mbtoc = metres below top of casing.

7.19 Closure and rehabilitation

7.19.1 Context

Mining is a temporary land use that allows for the re-establishment of environmental values following cessation of the mining activities. The goal of rehabilitation is to return the disturbed land to a condition suitable for the agreed post-mining land uses.

Rehabilitation of both native vegetation and agricultural land use to facilitate ongoing biodiversity conservation and agricultural activities is the proposed post-mining land use objective for the project.

The primary objectives of the rehabilitation and closure of the site (see Section 5) are to ensure that:

- the external visual amenity of the site is harmonious with the local surrounds
- the area is left in a safe, stable condition that supports a resilient, self-sustaining natural ecosystem suitable for the post-mining land use identified in consultation with closure stakeholders
- risks to health and safety of the public and fauna are as low as reasonably practicable.

Table 7-45:, Table 7-46: and Table 7-47: provide an outline of the broad aspects and potential closure and rehabilitation impact events.

Table 7-45: Natural environmental impacts

Aspects (Impact events)	Impact receptors	Consequences
Dust	Vegetation	Long term effects on vegetation due to dust deposition
Weeds	Vegetation Soil	Ongoing incursion of declared weed species
Stormwater flows	Drainage systems Vegetation Soil	Reduction of stormwater flows in natural drainage systems impacting dependent ecosystems
WRD stability of slopes and ARD	Soil Surface water	Erosion issues Impact to soil and surface water
Haul roads	Soil Surface water	Erosion issues Drainage issues

Table 7-46: Social impacts

Aspects (Impact events)	Impact receptors	Consequences
Final landform	Visual amenity	Deterioration in visual amenity Risk to human health
Disturbance to heritage areas by mining operations	Indigenous communities	Depletion of Aboriginal affinity to the area
Change in land use	Pastoral leaseholder Local community Visitors/tourists	Restricted access

Table 7-47: Economic impacts

Aspects (Impact events)	Impact receptors	Consequences
Change in land use	Pastoral leaseholder Local community and businesses	Less commercial activity/employment

The development of post-mine land uses will be undertaken in consultation with key stakeholders. The selected option will ensure the site is restored to support a self-sustaining ecosystem suitable for the agreed post-mine land use.

Section 5 provides further details in relation to mine closure and rehabilitation for the Peculiar Knob operations.

7.19.2 Potential impacts

Potential impacts events (see Table 7-48:) associated with rehabilitation and closure issues have been identified as:

- final landforms and revegetation are not integrated into the surrounding environment
- final landforms are unstable and create previously non-existent (i.e. pre-mining) risks to the health and safety of the public and fauna
- inadequate topsoil is available for rehabilitation activities and results in failure to re-establish the pre-mining ecosystem and landscape function
- industrial and/or domestic wastes are left on site post closure
- reduction in soil quality (due to inappropriate storage of PAF material) results in reduced capacity for soils to promote vegetation re-establishment
- quality and quantity of groundwater available to third-party users and dependent ecosystems is compromised as a result of project operations.

Table 7-48: Impact event analysis- Mine closure

Source	Pathway	Barrier	Environmental receptor	Consequences
WRD final remediated landform	Unacceptable rehabilitation completion criteria	Community consultation on mine closure plans	Community Land function Ecosystem function	Reduction in visual amenity
Loss of soil quantity	Mining operations and WRD construction	Topsoil management plan	Soil Land function Ecosystem function	Inadequate rehabilitation due to insufficient topsoil
Industrial or general waste materials left on site post-closure	Amenity, soil, surface water or groundwater	All waste disposed at an EPA licenced waste management facility Rehabilitation and closure strategy (see Section 5)	Amenity, soil, surface water or groundwater	Contamination of soil, surface water and groundwater
Reduction in soil quality (due to inappropriate storage of PAF material, fuel and chemical contamination) resulting in reduced capacity for soils to promote vegetation re-establishment	Mining activities	Design of WRD Design of fuel and chemical storage areas Rehabilitation and closure strategy (see Section 5)	Soil	Loss of soil quality
Quality and quantity of groundwater available to third-party users and dependent ecosystems compromised as a result of project operations	Mining operations and development of WRD and ROM pad	Groundwater located below base of open pit Water extraction in accordance with DEW water license Water supply areas located significant distance from GAB springs	GAB springs and West Springs Zone Pastoralists	Decrease in groundwater levels impacting GAB springs and West Springs Zone Decrease in availability of groundwater for pastoralists
Quality and quantity of surface water available to dependent ecosystems compromised as a result of project operations	Stormwater drainage	Closure designs to incorporate long-term controls.	Water dependent ecosystems	Stormwater contamination

7.19.3 Control and management strategies

Table 7-49: provides details for the risk assessment, control and management strategies and the associated outcomes and measurement criteria for post-closure. Controls and management strategies will be reviewed as operations progress and as closure plans are refined towards the end of mine life.

7.19.4 Evaluation of residual risk

The primary risks associated with post-closure were identified as 'Low' to 'High'. The risk assessment will be reviewed as operations progress and as closure plans are refined towards the end of mine life.

With implementation of due diligence, standard industry practices and specific controls and management measures, the residual risk has been determined to be 'High', given that it is considered that should an impact event occur, (which would be a rare occurrence) the consequence would be 'Extreme' consequence due to the external factors and the high level of human involvement in any risk.

Table 7-49: Risk assessment-Post-closure

Aspect and impact	Level of risk (inherent) LHD/CON/IRL			Controls/ Management strategies	Level of risk (residual) LHD/CON/RRL			Outcome measurement requirement
Final landforms and revegetation are not integrated into the surrounding environment	Unlikely	Minor	Low	Design of closure landforms considers integration with surrounding environment through height, batter design and final landform shape and form. Implementation of the measures in Section 5 during operations. Section 5 identifies closure and rehabilitation activities for identified domains associated with the project.	Rare	Negligible	Low	Yes-see Section 8.2
Final landforms are unstable and create previously non-existent (i.e. pre-mining) risks to the health and safety of the public and fauna	Unlikely	Minor	Low	Closure landform designed to minimise risks to the health and safety of the public and fauna (as far as practicable) Implementation of the measures in Section 5 during operations. Section 5 identifies closure and rehabilitation activities for identified domains associated with the project. Health and safety risks to the public and fauna are to be considered in the closure plan for each identified domain.	Rare	Negligible	Low	Yes – see Section 8.2
Inadequate topsoil available for rehabilitation activities resulting in failure to re-establish the pre-mining ecosystem and landscape function	Possible	Negligible	Low	Strategically located topsoil stockpiles away from dust suppression activities to reduce soil salination. Location of topsoil stockpiles to also be away from surface drainage channels to reduce risk of erosion during flow events Implement topsoil stockpile management procedure to assist in maximising topsoil collection and ensuring quality during stockpiling activities e.g. use of older stockpiled material. Implement measures in Sections 4 and 5 to address the strategic use of limited stockpile resources during rehabilitation activities.	Rare	Negligible	Low	Yes-see Section 8.2
Industrial and / or domestic waste materials are left onsite post closure	Possible	Minor	Moderate	Inclusion of waste collection facilities in design. Provision of ongoing waste collection and disposal during operations to minimise waste / litter issues on site. Details included in the Waste Management Plan.	Unlikely	Minor	Low	Yes-see Section 8.2

Reduction in soil quality (due to inappropriate storage of PAF material) resulting in reduced capacity for soils to promote vegetation re-establishment	Possible	Medium	High	WRD to include an encapsulation cell for the placement of PAF material. Implementation of a program to undertake periodic checking of potentially acid forming material during mining activities	Unlikely	Minor	Low	Yes – see Section 8.2
Quality and quantity of groundwater available to third-party users and dependent ecosystems compromised as a result of project operations	Possible	Medium	High	Operational water supplies to be sourced from multiple locations. Locations are significant distances from groundwater dependent ecosystems. Implementation of a groundwater monitoring program during operations to monitor potential impacts from water abstraction activities. Monitoring regime to include monitoring of regional bores to identify potential impacts to third-party users and/ groundwater dependent ecosystems.	Possible	Minor	Moderate	Yes – see Section 8.2
Quality and quantity of surface water available to third-party users and dependent ecosystems compromised as a result of project operations	Possible	Medium	High	Run off from site to be collected in diversion channels and directed through sediment traps prior to discharge to the environment. Design of operations to include opportunistic use of this water and water caught in pit back through operations e.g. dust suppression to minimise the need for off-site release. Regular inspections and maintenance of sediment and erosion control devices during operations. Disposal of collected material to be facilitated within mine WRD. Development and implementation of surface water quality monitoring program during operations (note: monitoring program will be opportunistic due to nature of flows in the area). As a minimum, inspections will be carried out after >10mm of rainfall in one day.	Possible	Minor	Moderate	Yes – see Section 8.2

8. OUTCOME MEASUREMENT CRITERIA AND COMPLIANCE

8.1 Outcome measurement criteria- Operations

The following sub-sections describe the make-up of the measurement criteria statements for each of the operational outcomes to be managed in accordance with Minerals Regulatory Guidelines MG2b. Sections 8.1.1 to 8.1.16 details operational outcome measurement criteria for Peculiar Knob operations.

8.1.1 Native vegetation

The outcome measurement criteria for native vegetation are presented in Table 8-1.

Table 8-1: Outcome measurement criteria- Native vegetation

Outcome	What will be measured & form (method) of measurement	Locations	Outcome achievement	Frequency	Control or baseline data
Clearance of native vegetation is no greater than 971.55 ha	Total clearance area records of vegetation clearance	Operation areas	Ground surveys of operational areas demonstrates that the total area cleared does not exceed the approved area of 971.55 ha as per Table 4-1: Vegetation clearance (see Section 4)	Annual	Clearance permit database as per Table 4-1: Vegetation clearance (see Section 4)
No permanent loss of abundance or diversity of native vegetation through clearance, dust/contaminant deposition, fire, reduction in water supply or other damage caused by mining operations on or off the Land or Licence area, unless a significant environmental benefit has been approved in accordance with relevant legislation	Abundance and diversity of native vegetation annual flora survey by qualified external consultant	Impact and Control sites as shown on Figure 7-3.	No statistical decrease in vegetation abundance or diversity of native vegetation attributed to mine operations as determined by a qualified external consultant when compared to control sites	Annual	Baseline flora survey (EBS 2007 and Cooe 2013) Dust deposition monitoring data
Leading Indicator: Any vegetation death attributed to mine derived dust, contamination, fire or other damage Any incident of unauthorised vegetation clearance					

8.1.2 Native fauna

The outcome measurement criteria for native fauna are presented in Table 8-2.

Table 8-2: Outcome measurement criteria- Native fauna

Outcome	What will be measured & form (method) of measurement	Locations	Outcome achievement	Frequency	Control or baseline data
No permanent loss of native fauna diversity or abundance in the Licence area and in adjacent areas caused by mining operations (including fire) on or off the tenements No native fauna injuries or deaths due to mining operations that could reasonably have been prevented	Density and diversity of fauna annual fauna survey by qualified external consultant	Impact and Control sites as shown on Figure 7-3	No significant decrease in abundance or diversity of native fauna attributed to mining operations (including fire) as determined by a qualified external consultant when compared to control sites	Annual	Baseline fauna survey (EBS 2007)
Leading indicator: Lower capture trends at impact sites compared to control sites					

8.1.3 Weeds and plant pathogens

As the movement of personnel, vehicles, machinery and equipment to and from site increases the risks of introducing new weeds, or increasing the abundance of existing weed species, an outcome and measurement criteria for weeds and plant pathogens is required. Table 8-3 presents the outcome measurement criteria.

Table 8-3: Outcome measurement criteria- Weeds, pests and plant pathogens

Outcome	What will be measured & form (method) of measurement	Locations	Outcome achievement	Frequency	Control or baseline data
No introduction of new species of weeds, plant pathogens or pests (including feral animals), nor sustained increase in abundance of existing weed or pest species in the Licence area or Land compared to adjoining land, from the construction, operation and post mine completion	The presence of new weed species or increase in existing weeds compared to baseline flora survey (EBS 2007)	MLs, MPLs and EMLs– focusing on disturbed and mine activity areas or areas near permanent water Control sites (Figure 7-3)	Weeds and plant pathogens are controlled on the tenements No new weed or plant pathogen incursion or sustained increase in density, abundance or distribution on the tenements (caused by mining operations) compared to adjoining property	Annual	Baseline flora survey (EBS 2007 and Cooe 2013)
Leading indicator: Audits of inspection records for vehicles and machinery show that all vehicles have been certified as clean before operating on site. Any record of an incursion of a new weed species or a new pest animal species on site or increase in existing weed density or distribution	Trends in weed distribution Cleanliness of vehicles and machinery	MLs, MPLs and EMLs	All vehicles and machinery certified as clean	As required	Records

8.1.4 Pest animals

As the movement of personnel, vehicles, machinery and equipment to and from site increases the risks of introducing new pests, or increasing the abundance of existing pest species, an outcome and measurement criteria for pest animals is required. Table 8-4 presents the outcome measurement criteria.

Table 8-4: Outcome measurement criteria- Pest animals

Outcome	What will be measured & form (method) of measurement	Locations	Outcome achievement	Frequency	Control or baseline data
No introduction of new species of weeds, plant pathogens or pests (including feral animals), nor sustained increase in abundance of existing weed or pest species in the Licence area or Land compared to adjoining land, from the construction, operation and post mine completion	Annual fauna monitoring observations by external expert Abundance of pest species compared to baseline survey Involvement in ad-hoc pest control programs with Ingomar Station and McDouall Peak Station	MLs, MPLs and EMLs Mine operational areas (Accommodation village – if re-established)	Pest animals are controlled on the tenements No introduction of new pest animal species and no statistically significant increase in the abundance of pest animal species at mine operational areas	Annual Pest control programs as required	Baseline fauna survey (EBS 2007) Weed and Pest Management Plan Stakeholder communication notes
Leading indicator: An increasing trend of sightings of pest species. Trends noted in annual monitoring					

8.1.5 Soil

The outcome measurement criteria for soil are presented in Table 8-5.

Table 8-5: Outcome measurement criteria – Soil

Outcome	What will be measured & form (method) of measurement	Locations	Outcome achievement	Frequency	Control or baseline data
The existing (pre-mining) soil quality and quantity is maintained	Gully erosion extent compared to pre-mining as demonstrated by photographic records Serviceability of silt traps and erosion control devices as indicated by inspection records	MLs, MPLs, EMLs	Operational induced gully erosion is not to exceed >0.5m deep or >1.5m long or >0.8m wide greater than the natural gully erosion that existed prior to mining operations All erosion control structures are in place and maintained	Annual Weekly	Baseline survey Soil Management Plan Onsite records of environment incidents
	Soil salinity (EC)	Monitoring sites (see Figure 7-6)	No demonstrated soil impacts associated with saline water use for dust suppression impact when compared to control site	Annual	Baseline data
Sufficient topsoil is removed and managed to ensure adequate reinstatement of pre mining land use at mine closure All topsoil that is removed and stockpiled maintains its viability for use in rehabilitation	Topsoil stockpile disturbance, compaction, sheet erosion, gully erosion, significant weeds controlled and signage in place	Topsoil locations: Refer to Figure 7-6	Topsoil has been stripped, stockpiled and maintained in delineated and labelled stockpile locations to a single paddock dump height without disturbance, compaction, noxious weed infestations and sheet or gully erosion at locations referenced in Figure 7-6	During clearing, at completion of clearing, and annual inspection of stockpiles	Topsoil management records Site inspection reports
Leading indicator: Any record of erosion control device not being maintained Eroded gullies not exceeding >0.3m deep or >1.00m long or >0.6m wide without management intervention Any topsoil management incident					

8.1.6 Stormwater

The outcome measurement criteria for stormwater are presented in Table 8-6.

Table 8-6: Outcome measurement criteria - Stormwater

Outcome	What will be measured & form (method) of measurement	Locations	Outcome achievement	Frequency	Control or baseline data
Mining operations do not cause water runoff from the licence or lease area that results in flooding of adjacent areas, to an extent greater than that which could reasonably be expected to occur prior to mining operations being established on the licence or lease area	Gully erosion by observation Inspection of silt traps and surface drainage systems	MLs, MPLs, EMLs	Gully erosion to not exceed >0.5m deep or >1.5m long or >0.8m wide greater than the natural gully erosion that existed prior to mining operations All stormwater control infrastructure is in place and maintained All corrective actions are logged and closed out within 30 days or as otherwise agreed with the regulator	Quarterly and within five days of >10mm rainfall events	Water Management Plan
No adverse impact to the quality and quantity of surface water caused by mining operations to existing users and water dependent ecosystems No water contaminated as a result of mining operations leaves the Licence or Lease area or results in loss of or contamination of soil on or off the Licence or Lease area	Inspection of fuel, oil and chemical storage areas Review of records of incidents and management of spills	Fuel and chemical storage areas MLs, MPLs, EMLs	Facilities are designed, constructed and operated in accordance with EPA Guidelines Spills greater than 20 litres per incident on site are managed in accordance with Chemical and Fuel Management Plan All corrective actions are closed out within 30 days of the incident, or as otherwise agreed with an affected party or the Regulator	Annual As required	EPA Guidelines Australian Standards Chemical and Fuel Management Plan Onsite records of environment incidents Water Management Plan
	Audit of records of storage of PAF material within WRD	WRD	All PAF material encapsulated in designated areas of WRD	Annual	ARD Management Plan
All mine waste materials left on site are chemically and physically stable	Soil sample analysis of metals (Al, As, Cd, Cr, Cu, Fe, Mn, Hg, Ni, Pb, Zn) pH and S	Sample locations (refer Figure 7-7)	Levels do not elevate beyond an order of magnitude above baseline levels	Six monthly	Soil sample analysis November 2015

No contamination and/or pollution of natural water drainage systems, streams and rivers, groundwater, land and soils occurs either on or off site is caused by waste products and hazardous materials used in mine operations	Inspection of fuel, oil and chemical storage areas Review of records of incidents and management of spills	Fuel and chemical storage areas MLs, MPLs	Facilities are designed, constructed and operated in accordance with EPA Guidelines Spills greater than 20 litres per incident on site are managed in accordance with Chemical and Fuel Management Plan All corrective actions are closed out within 30 days of the incident, or as otherwise agreed with an affected party or the Regulator	Annual As required	EPA Guidelines Relevant Australian Standards Chemical and Fuel Management Plan Onsite records of environment incidents Water Management Plan

8.1.7 Groundwater

The outcome measurement criteria for groundwater is detailed in Table 8-7. While no outcomes are required in relation to contamination because the primary risks are 'Low', water quality monitoring will be undertaken and trends noted.

Table 8-7: Outcome measurement criteria - Groundwater

Outcome	What will be measured & form (method) of measurement	Locations	Outcome achievement	Frequency	Control or baseline data
Mining activity or activities authorised by the Licence do not result in an adverse impact to the quality and quantity of groundwater to existing users and water dependent ecosystems	Standing water levels in monitoring wells (see Figure 7-10) Volume of groundwater extracted from borefields Groundwater quality in production and monitoring wells (see Figure 7-10)	Stafford, Penrhyn and Camp Water Borefields	Actual water volumes extracted do not exceed allowances as stated in water extraction licences (Stafford, Penrhyn and Camp Bore borefields) SWL of groundwater is within drawdown threshold as described in Table 7-18	Monitoring schedule as per Table 8-8	Baseline survey Groundwater monitoring data Water Management Plan
Leading indicator: SWL of groundwater is within drawdown threshold as described in Table 7-18 Groundwater extraction does not exceed volume allocation detailed in water extraction licences No elevated levels of potential contaminants identified in annual groundwater sample analysis					

Table 8-8: Groundwater monitoring schedule

Parameter	Sampling Site	Frequency
Camp Borefield		
Production bores		
• Water pumping (kL)	PKWB-01A and PKWB-03A	Weekly
• Water levels		Opportunistically
• Water quality (EC and pH)		Quarterly
• Major component analysis		Annually
Monitoring bores		
• Water levels	PKWB-01. PKWB-02, PKWB-03, PKWB-04A, PKWB-05, PKWB-06, Site F, and inactive production bores	Quarterly
• Water quality (EC and pH)		6 months/annual
• Major component analysis		Annually
Penrhyn Borefield		
Production bores		
• Water pumping (kL)	PCWP-02A and TNB-01	Weekly
• Water levels		Opportunistically
• Water quality (EC and pH)		Quarterly
• Major component analysis		Annually
Monitoring bores		
• Water levels	PCWP-02, TNB-01A, PMB-01 to PMB-05 and inactive production bores	Quarterly
• Water quality (EC and pH)		6 months/annual

• Major component analysis		Annually
Stafford Borefield		
Production bores		
• Water pumping (kL)	HN48, HN73, HN77	NA
• Water levels		Occasionally
• Water quality (EC and pH)		Annually
• Major component analysis		2 yearly
• Water levels	Bedrock monitoring bore HNWPR-102	6 months
• Water levels	Algebuckina-Cadna-Owie monitoring bores	6 months
• Water levels	New Hodges, Black Oak	6 months
• Water quality	Woolshed, Hawks Nest	Annually

8.1.8 Air quality

Air quality impacts from dust have been rated as low primary risk. Outcome measurement criteria have been developed to align with previous PEPR outcomes (see Table 8-9).

Monitoring of dust complaints by the public, pastoral lease holders or third-party mining operations will be undertaken by Peak Iron Mines and remedial action will be undertaken within 72 hours.

In addition, dust fall monitoring locations at selected locations around the mine operations and along the haul road have been established (see Figure 7-5). There are several monitoring locations that are located along the haul road, and as indicated previously the haul road has been spray-sealed with bitumen. On this basis, it is proposed that sites PK 2, PK3 and PK5 will be considered to be background sites for the monitoring program.

Table 8-9: Outcome measurement criteria - Air quality

Outcome	What will be measured and form (method) of measurement	Locations	Outcome achievement	Frequency	Control or baseline data
No permanent loss of abundance or diversity of native vegetation in areas adjacent to mining operations due to dust, unless a significant environmental benefit has been approved in accordance with relevant legislation	Vegetation health associated with mine-derived dust as determined by qualified and experienced specialist	PK Vegetation impact and control sites (see Figure 7-3)	No demonstrated health impacts to vegetation at impact sites compared to control sites	Annual	Baseline flora survey (EBS 2007 and Cooe 2013) Dust deposition monitoring data

8.1.9 Radiation and asbestiform materials

No specific outcomes and measurement criteria were developed for radiation issues. The outcome measurement criteria for asbestiform minerals is provided in Table 8-10)

Table 8-10: Outcome measurement criteria- Asbestiform materials

Outcome	What will be measured and form (method) of measurement	Locations	Outcome achievement	Frequency	Control or baseline data
No risk to human health from asbestiform minerals	Audit of the Fibrous Minerals Management Plan and actions by appropriately qualified Occupational Hygienist	All mining operations areas	Full compliance to the Fibrous Minerals Management Plan is demonstrated	Annual	Fibrous Minerals Management Plan Fibrous Minerals deposition data records

8.1.10 Visual amenity, nuisance noise and light

In dealing with noise, it is considered that "managing by exception" is appropriate given the low risk associated with this aspect of mining operations. As a result, no specific outcome measurement criteria was developed. In the event that noise becomes an operational issue on site (based on complaints received), the PEPR requires Peak Iron Mines to develop a Noise and Vibration Management Plan for implementation on site.

An outcome measurement criteria has not been developed for lighting as risks associated with this aspect were 'Low' (see Table 7-29:).

In order to meet the lease and licence conditions, an outcome measurement criteria has been developed for visual amenity.

In order to demonstrate achievement of the outcomes, monitoring is proposed during operations. Table 8-11 provides details of the monitoring associated with visual amenity that will be implemented.

Table 8-11: Outcome measurement criteria- Visual amenity

Outcome	What will be measured and form (method) of measurement	Locations	Outcome achievement	Frequency	Control or baseline data
The form, contrast and reflective aspects of mining operations are visually softened to blend in with the surrounding landscape, if visible from the Stuart Highway	Audit of progressive rehabilitation activities	WRDs	Progressive rehabilitation is being undertaken as per Section 5	Annual (during operations)	Closure and rehabilitation strategy (see Section 5) Onsite records
Leading indicator: Any audit finding that progressive rehabilitation is not being implemented in accordance with Section 5					

8.1.11 Traffic

The outcome measurement criteria for traffic are detailed in Table 8-12.

Table 8-12: Outcome measurement criteria - Traffic

Outcome	What will be measured & form (method) of measurement	Locations	Outcome achievement	Frequency	Control or baseline data
No traffic accidents involving the public at mine access points that could have been reasonably prevented	Independent investigation of recorded traffic accidents	Mine-related access points	No traffic incidents or accidents with members of the public at mine access points that could have been reasonably prevented through implementation of preventative measures All corrective actions are closed out within thirty days or as otherwise agreed by the Regulator	As required	Traffic Management Plan Outcomes of investigations
No adverse impact to public roads due to mining operations	Records of inspections undertaken on public roads Records of maintenance undertaken on public roads Road maintenance records	Public roads	No adverse impact to public roads, as a direct result of mining operations Maintenance in accordance with DPTI agreement	Annual	Baseline survey Traffic Management Plan
Leading Indicator: Any incident or complaint related to project traffic Records of annual audits demonstrate that public roads including public access and egress points are maintained in accordance with the agreement with DPTI					

No unaddressed complaints from pastoralist relating to stock losses as a result of mine related traffic	Complaints of stock loss caused by mine traffic	MLs, MPLs and EMLs	Complaints logged, investigated and responded to within 48 hours All corrective actions are closed out within 30 days of notification of an incident or complaint, or as otherwise agreed with the impacted party or the Regulator Signed access and compensation agreement is in place and includes a livestock injury and fatality clause	As required	Records of complaints Traffic Management Plan
Leading Indicator: Any incident or complaint related to death or injury of domestic stock					

8.1.12 Public safety

The outcome measurement criteria for traffic are detailed in Table 8-13.

Table 8-13: Outcome measurement criteria - Public safety

Outcome	What will be measured & form (method) of measurement	Locations	Outcome achievement	Frequency	Control or baseline data
No third-party injuries and/or deaths resulting from operations traffic, dust generation or unauthorised entry to the operations that could have been reasonably prevented	Audit of records, to determine any incidences of unauthorised entry, by an independent third-party. Records would include: • Daily shift reports • Mines Inspection record • Monthly safety incident report KPIs Regulatory compliance audits conducted by Peak Iron Mines	MLs, MPLs, EMLs	No injuries or death of members of the public due to unauthorised entry to the mine site that could have been reasonably prevented through implementation of preventative measures	As required	Onsite records
Leading Indicator: Monthly inspections of the condition of security provisions for operational areas show that unauthorised entry has occurred					

8.1.13 Adjacent land use and third-party property

The outcome measurement criteria for adjacent land use and third-party property are detailed in Table 8-14.

Table 8-14: Outcome and measurement criteria - Adjacent land use and third-party property

Outcome	What will be measured & form (method) of measurement	Locations	Outcome achievement	Frequency	Control or baseline data
No unauthorised damage (including that caused by fire) to adjacent public or private property and infrastructure, including the Stuart Highway, from mining operations No adverse impacts to third-party land use on property adjacent to and on the Land as a result of mining operations, other than those agreed between the Tenement holder and the affected user No adverse impacts to adjacent land uses	Records and/or complaints of damage to public and private property	MLs, MPLs, EMLs	No unauthorised damage to adjacent public or private property Complaints and/or incidents logged, investigated and responded to within 48 hours Corrective actions closed out within 30 days of receiving a complaint, or as otherwise agreed with the affected party or the Regulator	As required	Onsite records

8.1.14 Heritage

The outcome measurement criteria for heritage are detailed in Table 8-15.

Table 8-15: Outcome measurement criteria-Heritage

Outcome	What will be measured and form (method) of measurement	Locations	Outcome achievement	Frequency	Control or baseline data
No disturbance to Aboriginal or European sites, objects, remains, artefacts or sites of significance unless prior approval under the relevant legislation is obtained	Incidents of the discovery of suspected Aboriginal artefacts, remains and/or sites of significance	MLs, MPLs, EMLs	Records demonstrate that discoveries of suspected Aboriginal artefacts, remains and/or sites of significance were left without further disturbance, reported to the authorities and investigated. Records demonstrate that work recommenced only after being authorised by the appropriate authority in accordance with the *Aboriginal Heritage Act 1988*	As required	Incident reports related to discovery of suspected artefacts or sites of significance
Leading indicator: Any incident relating to disturbance of heritage sites, suspected artefacts or remains					

8.1.15 Waste disposal

The primary risk associated with waste disposal has been assessed as 'Low' as waste is collected and transported to an EPA licenced waste management facility. Consequently, specific outcome and measurement criteria have not been developed. No outcome management is required.

8.1.16 Blasting and vibration

The primary risks associated with blasting and vibration is 'Low'. The likelihood that fly rock would land on the surrounding properties is rare.

Blasting at the Peculiar Knob mine is of low intensity and will be undertaken under strict conditions and will be well-shielded within the pit.

Implementation of the proposed control and management measures has resulted in a 'Low' residual risk. No outcome management is required.

8.2 Outcome measurement criteria -Care and Maintenance

Outcome and measurement criteria and the monitoring program for care and maintenance phase are presented in Table 8-16.

Table 8-16: Mothballing outcomes, measurement criteria and monitoring program for Peculiar Knob

Outcome	What will be measured and form (method) of measurement	Locations	Outcome achievement	Frequency	Control or baseline data
Mining landform is rehabilitated, revegetated and integrated with the surrounding landscape	Final audit and bi-annual inspections of WRD rehabilitation	Mine WRDs (ML6314 & EML6366)	WRDs have been rehabilitated in compliance to Section 3.13 and that erosion of WRD batters hasn't resulted in reduced rehabilitation land function capability and failed vegetation cover WRD profiling to the approved 15 degree slope with topsoil placed on the upper slope Corrective actions are to be closed out within three months or as otherwise agreed with the Regulator	Six monthly	Environment Audit Report
No permanent loss of native fauna diversity or abundance caused by mining operations on or off the tenements	Abundance and diversity of native fauna	Fauna impact and control sites (Figure 7-3)	No statistical decrease in abundance or diversity of native fauna attributed to mine operations as determined by a qualified external consultant when compared to control sites	Final monitoring in November 2015 until operations re-commence	EBS 2007
No permanent loss of abundance or diversity to native vegetation through clearance, dust/contaminant deposition, fire or other damage caused by mining operations on or off the tenements, unless a significant environmental benefit has been approved in accordance with relevant legislation	Abundance and diversity of native vegetation and vegetation health	Vegetation impact and control monitoring sites (Figure 7-3)	No statistical decrease in abundance or diversity of native vegetation or vegetation health impacts attributed to mine operations as determined by a qualified external consultant when compared to control sites	Final monitoring in November 2015 until operations re-commence	Cooe 2015
	Ground surveys of native vegetation clearance	MLs, MPLs and EMLs	Total area cleared does not exceed the approved area of 971.55 ha as per Table 4-1: Vegetation clearance and Table 4-2: SEB compensation (see Section 4).	Final survey in November 2015 until operations re-commence	
	Final audit against Turkey's nest and borrow pit rehabilitation works in accordance with Section 3.13	Mine pit and Haul road borrow pits and turkey's nest dams (ML6314	Drainage barrier windrows placed across entrance to pit and borrow pits. Turkey's nest dams drained and holed	Single audit after completion of mothball	Environment Audit Report

		& EML6366) (MPL125, MPL126, MPL127, MPL128, MPL129 & MPL 130)		rehabilitation works	
No introduction of new or sustained increase in abundance of existing weed species on the mining lease or adjoining property (caused by mining operations)	Bi-annual inspection against open area rehabilitation works and weed control	All areas (ML6314 and EML6366) (MPL125, MPL126, MPL127, MPL128, MPL129 and MPL 130)	Open areas rehabilitated or allowed to re-vegetate (as per Section 3.13) and weeds, if present at the time of inspection (other than those pre-existing according to the most recent flora monitoring report), removed immediately or works planned to control them Corrective actions are to be closed out within three months or as otherwise agreed with the Regulator.	Six monthly	Environment Audit Report Cooe 2015
No sustained increase or introduction of new pest animal species on the mining lease compared to adjoining pastoral land	Review of stakeholder communication notes	Mine site (ML 6314) Accommodation Village (MPL127) Wirrida (MPL 131)	Involvement in ad-hoc pest control programs have been discussed and undertaken as required with Ingomar Station and McDouall Peak Station	As required	Ecological Horizons 2015 Annual compliance report
No sustained increase or introduction of new pest animal and plant species on the mining lease compared to adjoining pastoral land	Review of stakeholder communication notes	EML6373	Involvement in ad-hoc pest control programs have been discussed and undertaken as required with Ingomar Station Any complaints of increased abundance of pest animal species within the vicinity of EML6373 compared to other areas due to the presence of the long term water source are recorded, investigated and closed out within 30 days or as otherwise agreed with the regulator and the complainant Pest control that is consistent with regional expectations and the Landscape SA Act 2019	As required	Annual compliance report

No long term impact on local surface water environmental values as a result of altered flow regimes	Inspection of drainage flow control structures	Mine pit and haul road borrow pits and Turkey's nest dams (ML6314 & EML6366) (MPL125, MPL126, MPL127, MPL128, MPL129 & MPL 130)	Drains and drainage barrier windrows placed across entrance to pit and borrow pits (as per Section 3.12) and the integrity of the flow control structures remains intact Corrective actions are to be closed out within three months or as otherwise agreed with the Regulator	Annual	Environment Audit Report
No long term impact on local surface water environmental values as a result of erosion and sedimentation	Inspection of drainage flow control structures.	Mine, WRD, underpass, accommodation village, Wirrida (ML6314 & EML6366) (MPL125, MPL126, MPL127, MPL128, MPL129 & MPL 130)	WRD profiling to the approved 15 degree slope with topsoil placed on the upper slope Open areas ripped Soil stockpiles profiled Corrective actions are to be closed out within three months or as otherwise agreed with the Regulator	Annual	Environment Audit Report
No long term impact on local surface water environmental values as a result of deterioration of surface water quality due to contamination	Soil sampling and analysis Annual inspection of drainage flow control structures Final Mothball Audit	Soil sampling locations (see Figure 7-7) WRD (ML6314 & EML6366)	Soil sample analysis demonstrates that acid rock drainage (ARD) has not occurred Final Mothball audit demonstrates temporary PAF cover is in accordance with Section 3.13 Annual inspections demonstrate that drainage has been constructed in accordance with Section 3.13 and the integrity of the flow control structures remains intact. Corrective actions are to be closed out within three months or as otherwise agreed with the Regulator	Annual	Environment Audit Report Annual Compliance report

No adverse impact to the quantity and quality of groundwater to existing users and environmental values caused by mining operations	Water levels	Penrhyn, Camp and Stafford borefields (see Figure 7-10)	That all depth and quality levels have returned similar to pre-production values	Bi-annual – groundwater levels (during 2016 and 2017)	October 2016 Groundwater levels (Table 7-44:)
	Water Quality (EC & pH) Major component analysis	Penrhyn and Camp borefields Stafford borefield	No elevated levels of potential contaminants	Annual and bi-annual (during 2016 and 2017) Biennially Monitoring will then cease until groundwater extraction recommences	Annual Compliance report
No long term visual impact to highway users	Inspection of rehabilitation activities	Highway Underpass	Open areas scarified, and remaining stockpile profiled Underpass area has been rehabilitated in compliance with Section 3.13	Single audit after completion of mothball rehabilitation works	Environment Audit Report
No public injuries or death resulting from unauthorised entry to the site that could be prevented by Peak Iron Mines	Site inspection	Stuart highway, Old Stuart Highway, Mine site, Village boundary fence. Entrance to Wirrida from Penrhyn road	That all security bunds, fencing, locked gates and signage are in place and remain in place (see Figure 3-79)	Six monthly Final Mothball audit	Environment Audit Report
No unauthorized damage to adjacent public or private property or infrastructure from mining operations	Site inspection	Mine site (ML 6314) Accommodation Village (MPL127)	No waste materials or food scraps remain on site, in bins or other locations All wastes have been removed from site in accordance with Section 3.13	Single audit after completion of care and	Environment Audit Report

		Wirrida (MPL 131)		maintenance rehabilitation works	

8.3 Outcome measurement criteria- Post closure

Outcome measurement criteria for post-closure are presented in Table 8-17. These will be reviewed as operations progress and as closure plans are refined towards the end of mine life. These outcomes are to assist in meeting final land use requirements endorsed by the community and stakeholders and are subject to change with ongoing engagement and consultation. In addition, an outline of monitoring requirements that will be implemented by Peak Iron Mines for closure is included in Table 8-17.

Table 8-17: Closure outcomes, measurement criteria and monitoring program for Peculiar Knob

Outcome ID number	Outcome	What will be measured and form (method) of measurement	Locations	Outcome achievement	Frequency	Control or baseline data
1	Post mining landform and vegetation is integrated and harmonised with the surrounding landscape	Audit of final landform profile Revegetation audit	All mining infrastructure and operations area rehabilitation closure domains	WRDs constructed and remediated in accordance with design, closure and rehabilitation strategy described in Section 5	At mine closure	Section 5
2	Where practicable, the pre-mining ecosystem and landscape function are re-established Where practicable, pre mining land use is re-established	LFA stability, infiltration and nutrient cycling indices compared to analogue sites using LFA monitoring and analysis tools based on Tongway and Hindley 2004	Control and impact monitoring sites (refer to Figure 7-3)	LFA curve and final land use has moved above the critical threshold of sustainability as determined by a suitable qualified independent assessor Final land use is suitable for low-intensity grazing	Annually after completion of rehabilitation works until the target is met	EBS 2007 and Cooe 2013
3	Post mining landforms are physically stable Risks to the health and safety of the public and fauna, so far as it may be affected by mining operations, are as low as reasonably practicable	Post-closure audit Geotechnical review of stability of open pit and WRD post-mining landform(as per FWP11)	Open pit, WRD, water ponds	Post closure audit shows: • all ponds/pits (not required by pastoralists) removed/refilled or re-contoured to be compatible with the local landscape • all wells either capped or filled to surface to avoid leaving traps for small fauna Open pit and WRD are physically stable	Mine closure and annually as agreed with Mining Regulator	Audit records Geotechnical assessment reports Geotechnical review (FWP11)
Leading indicator: Results of WRD Survey (FWP07) and Stability Modelling (FWP08) provide indication of slope stability for WRDs (see Table 8-18)						

4	Loss of soil quality and quantity is minimised	Review of topsoil quantity and quality as per database	All mining infrastructure and operations areas	Records demonstrate that all available topsoil is/was stripped and stockpiled in accordance with topsoil stockpile management	Annual surveys of topsoil stockpiles Mine closure	Audit records Mine log
Leading indicator: During operations, internal review of success of topsoil management and rehabilitation activities						
5	All infrastructure and equipment removed from the site No industrial or domestic waste left on site	Evidence of infrastructure or equipment remaining on site	All mining infrastructure and operations areas	Final closure and divestment audit report demonstrates that all fixed mine infrastructure is demolished, disposed of or removed from site within two years of mine closure	Within two years following closure	Audit records
6	All mine waste materials left on site are chemically and physically stable Prior to lease relinquishment, a stable landform that does not erode more than adjacent undisturbed areas, has been achieved	Soil sampling and analysis of: • metals (Al, As, Cd, Cr, Cu, Fe, Mn, Hg, Ni, Pb, Zn) • nutrients • pH Treatment of PAF as per encapsulation sequence	Sites downstream of WRD drainage lines	Operational reports and material testing indicate sequencing of encapsulation / treatment of PAF within WRD in compliance with design requirements for ARD management	Mine closure Annually for five years	Groundwater monitoring database
Leading indicator: FWP02 (Mine and Waste Production Schedule), FWP04 (Monitoring Program for Confirmation of Concept Design) and FWP05 (Geotechnical Testing) provide site-specific data to confirm design criteria (see Table 8-18) Surface water and groundwater monitoring records indicate no contamination from ARD Annual Progressive Rehabilitation Compliance Audit and final landform profile and revegetation audit by a suitable independent professional demonstrates WRDs constructed and remediated in accordance with design, closure and rehabilitation strategy described in Section 5						
7	No compromise of the quality and quantity of groundwater to existing users and water dependent ecosystems	Volume extracted. Depth: standing water levels (Table 7-18) Groundwater quality – (pH, EC, TDS, major ions (Ca, Mg, Na, K, Si, Cl,	Stafford, Penrhyn and Camp Water borefields – monitoring and production	Groundwater levels/drawdown are the same or better than predicted modelled drawdown levels Water quality consistent with baseline water quality	As per the groundwater monitoring schedule (Table 8-8)	Groundwater monitoring records Water Management Plan

		HCO_3/CO_3), trace elements (Al, As, Cu, Fe, Mn, Mo, Ni, Se, U, Zn)	bores (Figure 7-10)			
8	No compromise of the quality and quantity of surface water to existing users and water dependent ecosystems	Ephemeral water course sediment quality analysed for mine derived contaminants: • metals (Al, As, Cd, Cr, Cu, Fe, Mn, Hg, Ni, Pb, Zn) • nutrients • pH Site inspection of surface water management structures	Locations as per Figure 7-6	Surface water drainage channel quality downstream is consistent with pre-mining surface water drainage channel quality upstream Mine closure and annual inspection reports demonstrate that silt traps, erosion control devices, contour banks and formed drains, are in place and maintained.	Mine closure Annually	Soil sample analysis database

8.4 Forward Work Plan

MG2B requires that a detailed cover design be developed prior to the cessation of mining activities. The requirements for detailed design are outlined below:

- conceptual cover system design including specifications, drawings and plans for construction, operations and completion of all facilities
- seepage assessment to support the detailed design (needs to reference relevant leading practice guidelines including the GARD Guide and the MEND/NEDEM Guidance documents)
- geochemical assessment to support the detailed closure/cover design
- geotechnical assessment to support the detailed closure/cover design
- long term stability/erosion assessment to support the detailed closure/cover design
- an updated program of works to address uncertainty and assumptions (including provisions for any field trials, test work, studies, modelling, and/or collection of site-specific data to validate/calibrate the model).

The GARD Guide (INAP 2009) outlines an approach for developing an appropriate detailed cover design from an initial conceptual design. In accordance with the GARD Guide and MG2B, this PEPR presents a conceptual cover design based on a body of work that characterises the WRD and mining environment, assesses the geotechnical and geochemical nature of the waste rock and WRD materials and presents preliminary seepage modelling and erosion/stability assessments to support the conceptual cover design. The GARD Guide recommends implementation of a monitoring program to test the concept design prior to development of a detailed design to confirm design assumptions and find opportunities for optimisation.

To develop a detailed cover design, further work is necessary to reduce uncertainty in the design parameters, particularly around soil and rock properties for numerical seepage modelling and detailed erosion and stability modelling. Further understanding of the mine production and waste rock generation is required to develop a PAF cell construction schedule and determine final volumes and profiles for the WRDs.

Table 8-18 outlines a Forward Work Plan (FWP) to be completed over a 12 to 18 month period to address uncertainty and assumptions in a series of field trials, tests and collection of site-specific data to validate and calibrate models and additional studies. The objective and/or justification for each work item is presented along with an indicative schedule.

Work packages will require development of work plans to guide specific procedures and tests, and also define objectives more clearly prior to commencement of an individual item of work. Field work can be completed as a single package, although packages are separated in the FWP to address technical requirements specific to a particular outcome.

The FWP schedule assumes a kick-off date for forward works in line with the beginning of high-grade extraction activities on site. This schedule is subject to further mine planning outcomes and other aspects of the project outside of the WRD design program. As such, the schedule may be accelerated or extended, or revised to address these factors, but in any case, will be managed to ensure the FWP delivers a final WRD cover design for the mine closure plan.

Table 8-18: Forward Work Plan and schedule

Item of work	Description	Justification	Stage (as per WRD staging – see Section 3.7.9)
FWP01-Geotechnical Assessment	Site visit to ascertain the existing site conditions, general batter conditions, areas of duress. Initial sampling and testing program to gain initial estimates for assumed geotechnical, permeability and erodibility parameters. Develop scope of work for detailed hydrogeological and geotechnical field investigations.	The site visit will reveal site constraints, including access issues, initial estimates of available on-site resources for capping materials, the presence of erosion on different soils and slope angles and current in-situ angles of repose.	1
FWP02-Mine and Waste Production Schedule	Determine final rock volumes, *draft* PAF cell staging and intermediate cover requirements, stockpiling and earthworks scheduling for life of mine.	A draft mine waste general plan will provide the basis to size the PAF cells via modelling and consideration of practical guidelines for WRD construction. To provide supporting data for Closure Outcome ID-6 (see Table 8-17)	1
FWP03-Fieldwork for Seepage Modelling	Geotechnical testing and/or sampling to characterise cap layer topsoil characteristics to allow for: • Compaction curve (i.e. Proctor curve) • Hydraulic conductivity (saturated and unsaturated) • Consolidation-saturated permeability relationship • Soil water characteristic or moisture retention curve.	Sufficient numbers of representative soils and waste materials will need to be collected and shipped to a NATA registered laboratory to enable parameter estimates including curves describing the relationships between grain size, saturation, and compaction to strength, hydraulic conductivity and erodibility.	1
FWP04-Monitoring Program for Confirmation of Concept Design	Monitor field performance of existing WRD cap comprised of: • Climate • Moisture content • Pore-water pressure including positive and negative pressure • Rainfall and rainfall intensity, and evaporation, with without vegetation cover • Net percolation • Temperature of waste rock • Oxygen • Erosion Installation of continuous monitoring equipment will minimise costs and field visits. Further details to be developed in a work plan, which defines performance indicators.	The monitoring program will provide nominally up to 2 years of record of rainfall, evaporation and the resulting infiltration that might occur to PAF for one or more theoretical cap designs. Monitoring of existing caps would be employed as well as (potentially) the construction of trial caps and lysimeters to measure infiltration rates for other design concepts. To provide supporting data for Closure Outcome ID-6 (see Table 8-17)	1
FWP05-Geotechnical Testing	The geotechnical laboratory test program completed on both the	The program is designed to determine physical and hydraulic parameters of the	1

	potential cover material and mine waste material samples. Laboratory tests to determine the following parameters: • Atterberg limits (and possibly X-ray diffraction to determine clay mineralogy) • Emerson Class testing • Specific gravity • Compaction curve (i.e. Proctor curve) • Saturated hydraulic conductivity • Consolidation-saturated permeability relationship • Soil water characteristic or moisture retention curve.	materials for input to soil-atmosphere cover system design and numerical models. To provide supporting data for Closure Outcome ID-6 (see Table 8-17)	
FWP06-Update Seepage Modelling	Use SEEP/W or VADOSE to more accurately assess the range of seepage rates and cumulative seepage to current or future WRDs. Use SEEP/W to further assess unsaturated flow characteristics.	Preliminary modelling predicts minimal seepage infiltration into 1.5 m cover. The preliminary modelling was based on water balance and storage of seepage in pore space rather than unsaturated flow characteristics and pore pressures. This may overestimate seepage. It is proposed to: • compare the value of using SEEP/W versus VADOSE for the proposed modelling (cost, level of conservatism, availability of suitable data to calibrate the model etc.) • Develop one or more cross-sectional seepage models with the chosen software package to assess the range of potential outcomes for different cap design, under different assumptions of rainfall, rainfall intensity and evaporation, and cover material properties • develop nomographs that describe the likely range of infiltration and or seepage outcomes under different design assumptions.	1
FWP07-Survey of WRD	Geometrical data gathering through feature survey or LiDAR	Required to improve and or enable 12D volume modelling, improved seepage modelling, and slope stability modelling. To provide supporting data for Closure Outcome ID-3 (see Table 8-17)	1
FWP08-Stability Modelling	Slope/W for stability modelling to determine foundation and NAF layer stability for eastern WRD and slope stability for both WRDs	Further work on this is required that should be integrated with the seepage modelling to estimate the range of phreatic surface locations, including potential seepage face elevations following large infiltration events.	1

		To provide supporting data for Closure Outcome ID-3 (see Table 8-17)	
FWP09-Flood Study	Estimate discharge from channels and design flood levels to determine flood immunity for WRD foundation, base layer and stormwater management features	Part of the overall water management plan and understanding for the long term closure plan. This work will also support the erodibility assessment .	2
FWP10-Final WRD cover design	Data and information obtained from the studies undertaken in FWP01 to FWP09 will be used to develop a detailed design for the final cover design.	To provide a Final WRD cover design	2
FWP11-Geotechnical review	A geotechnical review would be undertaken to consider the WRD as part of the abandonment barrier along the open pit north wall crest, to include: • wall geometry including maximum pit depth • comparison of assessed potential for instability versus actual wall performance • ground conditions including materials exposed, weathering grades and structural conditions • quantitative and qualitative monitoring data • groundwater conditions.	To provide supporting data for Closure Outcome ID-3 (see Table 8-17)	At closure

8.5 Compliance plan

8.5.1 Operator compliance monitoring

Monitoring programs will be implemented to measure compliance with the measurement criteria summarised in Section 8.1, 8.2 and 8.3. Standard Operating Procedures have been developed in support of the monitoring programs. An Environmental Inspection Form used to record compliance is provided in Appendix L.

The monitoring programs will measure the achievement of each outcome and the effectiveness of strategies implemented to reduce the identified risk associated with potential impact events. Peak Iron Mines is responsible for achieving the outcomes, implementing the monitoring program, maintaining appropriate records and reporting performance in relation to achieving the outcomes of this PEPR. Table 8-19 provides a summary of the compliance monitoring program.

All monitoring actions will be incorporated into existing site documentation and developed, reviewed and continuously improved via processes in accordance with an Environmental Management System, see Section 9.

Table 8-19: Compliance monitoring program

Environmental monitoring	Location	Frequency	Purpose	Reporting	Responsibility
Abundance and diversity of native vegetation	PK1, PK2, PK3, PK4, PK5, PK6 and PK7 control and impact locations (see Figure 7-5)	Annual	Third party assessment to determine if there is a decrease in vegetation abundance or diversity of native vegetation at impact sites, when compared to control sites as a result of mining operations	Annual survey report Annual compliance report	Peak Iron Mines
Total native vegetation clearance area	Operation areas	Annual	Site inspection to confirm total clearance areas do not exceed 971.55 ha and permit database review	Annual external report Annual compliance report	Peak Iron Mines
Density and diversity of fauna	PK1, PK3, PK5, PK6 and PK7 control and impact locations (see Figure 7-5)	Annual	Third party assessment to determine if there is a decrease in fauna abundance or diversity at impact sites, when compared to control sites, as a result of mining operations	Annual survey report Annual compliance report	Peak Iron Mines
Presence of new weed species or increase in existing weeds compared to baseline flora survey	MLs, MPLs and EMLs with a focus on disturbed mine activity areas or areas near permanent water	Annual	Third party assessment of weed abundance and diversity to identify the introduction of new or a sustained increase in the abundance of existing weeds species on the mining lease, or adjoining property as a result of mining operations	Annual survey report Annual compliance report	Peak Iron Mines
Involvement in ad-hoc pest control programs with Ingomar Station and McDouall Peak Station	PK1, PK2, PK3, PK4, PK5, PK6 and PK7 control sites (see Figure 7-5) MLs, MPLs and EMLs with a focus on disturbed mine activity areas or areas near permanent water	Annual As required	To ensure no introduction or sustained increase in abundance of weed or pest species on the mining lease or adjoining property as a result of mining operations	Participation records Site inspection records Annual survey report Annual compliance report	Peak Iron Mines
Trends in weed distribution	MLs, MPLs and EMLs	As required	To ensure all vehicles and machinery is certified as clean	Onsite records	Mining contractor
Cleanliness of vehicles and machinery	MLs, MPLs and EMLs	As required	To ensure all vehicles and machinery us certified as clean	Onsite records	Mining contractor

Gully erosion extent compared to pre-mining	MLs, MPLs and EMLs PKPM1, PKPM2, PKPM3, PKPM4, PKPM5, PKPM6, PKPM7, PKPM8, PKPM9, PKPM10, PKPM11, PKPM12, PKPM13, PKM14, PKPM15, PKPM17 and PKPM18 (see Figure 7-6)	Annual	To ensure no operationally induced gully erosion to exceed >0.5m deep or >1.5m long or >0.8m wide greater than the natural gully erosion that existed prior to mining activities	Onsite records Annual compliance report	Peak Iron Mines
Serviceability of silt traps and erosion control devices	MLs, MPLs and EMLs	Weekly	To ensure all erosion control devices are in place and maintained	Onsite records	Mining contractor
Salinity impact	PK1, PK2, PK3, PK4, PK5, PK6 and PK7 control, transition and impact sites (see Figure 7-5)	Annual	To ensure no demonstrated impact when compared to control site	Annual survey report Annual compliance report	Peak Iron Mines
Topsoil stockpile disturbance, compaction, sheet erosion, gully erosion, significant weeds controlled and signage	Topsoil stockpile locations	During clearing Completion of clearing Annual	To ensure no incidents of disturbance, compaction, sheet erosion, gully erosion, significant weeds not controlled and signage not in place	Onsite records Annual compliance report	Mining Contractor Peak Iron Mines
Gully erosion by observation	MLs, MPLs and EMLs PKPM1, PKPM2, PKPM3, PKPM4, PKPM5, PKPM6, PKPM7, PKPM8, PKPM9, PKPM10, PKPM11, PKPM12, PKPM13, PKM14, PKPM15, PKPM17 and PKPM18 (see Figure 7-6)	Quarterly After >10mm/24 hours rainfall events	To ensure no gully erosion does not exceed >0.5m deep or >1.5m long or >0.8m wide greater than the natural gully erosion that existed prior to mining activities	Onsite records	Mining Contractor
Operation and maintenance of silt traps and surface drainage systems	MLs, MPLs and EMLs	Quarterly After >10mm/24 hours rainfall events	To ensure all stormwater controls are in place and maintained	Onsite records	Mining Contractor

Fuel storage and distribution facilities consistent with design	Fuel and chemical storage areas MLs, MPLs and EMLs	Annual	To ensure consistency with EPA guidelines and approved design	Annual data review report	Peak Iron Mines
Spill management	MLs, MPLs and EMLs	As required	To ensure spills greater the 20 litres per incident are managed in accordance with Chemical and Fuel Management Plan	Onsite records	Mining Contractor
Storage of PAF material	WRD	As required	To ensure all PAF material is encapsulated in the designated area of the WRD	Onsite records	Mining Contractor Peak Iron Mines
Soil sample analysis of metals (Al, As, Cd, Cr, Cu, Fe, Mn, Hg, Ni, Pb, Zn) pH and S	ARD1 (PKPM1), ARD2 (PKPM2), ARD3 (PKPM3), ARD4 (PKPM17) and ARD5 (PKPM18), sample locations (see Figure 7-6 and Figure 7-7)	Six Monthly	To confirm levels do not elevate beyond an order of magnitude above baseline levels	Onsite records Annual compliance report	Mining Contractor Peak Iron Mines
Groundwater standing water levels	Camp Borefield (PKWB-03, PKWB-05, PKWB-06, Site F, PKWB-02, PKWB-01 and PKWB-04a) Penrhyn Borefield (TNB-01a, TNB-02, PMB-01, PMB-02, PMB-03, PMB-04, PMB-05 and PCWP-02) Stafford Borefield (HN48, HN73 and HN77 See Figure 7-10 for locations	Monitoring schedule as per Table 8-8	To ensure drawdown levels do not exceed maximum allowable limits as outlined in Table 7-18	Onsite records Annual compliance report	Peak Iron Mines
Volume of groundwater extracted from borefields	Camp Borefield (PKWB-01a and PKWB-03a) Penrhyn Borefield (TNB-02 and PCWP-02A) See Figure 7-10 for locations	Monitoring schedule as per Table 8-8	To ensure maximum allowable allowances in water licences are not exceeded	Onsite records Annual compliance report	Peak Iron Mines

Vegetation health impacts as a result of mine derived dust, determined by a qualified and experienced specialist	PK1, PK2, PK3, PK5, PK6 and PK7 control and impact locations (see Figure 7-5)	Annual	To ensure no health impacts to vegetation at impact sites compared to control sites	Onsite records Annual compliance report	Peak Iron Mines
Audit of Fibrous Minerals Management Plan (P-2-PLN-3-1005_0) by appropriately qualified occupational hygienist	All mine operation areas	Annual	To ensure compliance with the Fibrous Minerals Management Plan (P-2-PLN-3-1005_0)	Annual compliance report	Peak Iron Mines
Compliance with the closure and rehabilitation strategy	All mine infrastructure and operational areas	Annual	To ensure final waste rock dump construction and progressive rehabilitation is in line with approved PEPR	Annual compliance report	Peak Iron Mines
Traffic precautionary measures are implemented	All mine related traffic areas	As required	To ensure no traffic accidents at mine access points and the site Traffic management plan is adhered to (P-2-PLN-2-1004)	Annual compliance report	Mining Contractor Peak Iron Mines
Records of impacts to public roads and road maintenance	Public roads	Annual	To ensure no adverse impact to public roads and maintenance is in accordance with DPTI Agreement	Annual compliance report	Mining Contractor Peak Iron Mines
Stock loss complaints as a result of the project are responded to in accordance with agreed timeframes and closed out within 30 days or as otherwise agreed with the impacted party or regulator	MLs, MPLs and EMLs	As required	To ensure all complaints are responded to within 48 hours and closed out within the agreed timeframe	Onsite records	Mining Contractor Peak Iron Mines
Audit of records of unauthorised entry	MLs, MPLs and EMLs Daily shift reports Mine inspection record Monthly safety incident report	As required	To ensure no injuries or death of public due to unauthorised access that could have been reasonably prevented	Onsite records	Mining Contractor Peak Iron Mines
Damage to public and private property	MLs, MPLs and EMLs	As required	To ensure complaints are logged within 48 hours and actions closed out within agreed timeframes	Onsite records	Mining Contractor Peak Iron Mines

			To ensure no unauthorised damage		
Incidents of disturbance to Aboriginal artefacts, remains and sites of significance	MLs, MPLs and EMLs	As required	To ensure no disturbance	Onsite records Annual compliance report	Mining Contractor Peak Iron Mines

8.5.2 Compliance reporting and retention of information

Internal reporting

Internal reporting as part of Peak Iron Mines quality, safety and environmental management systems will include compliance with the outcomes and measurement criteria approved in this PEPR.

External reporting

The statement of compliance against approved outcomes will be included in the annual Compliance Report to DEM, in accordance with current regulatory guidelines, and in liaison with DEM.

8.5.3 Retention of records

As required under Regulation 65 (12) of the Mining Regulations 2011, records associated with reporting the implementation of this PEPR will be retained for a minimum period of five years after formal surrender or final expiry of the associated tenement/s.

9. OPERATOR CAPABILITY

Peak Iron Mines is committed to the ongoing monitoring, reporting and review of the environmental impacts of all our activities to facilitate the development of management plans and actions to effectively protect the environment for the communities impacted by our operations.

9.1 Environmental Management System

Peak Iron Mines have developed an Environmental Management System (EMS) framework for the Peculiar Knob Mine which conforms with the requirements of AS/NZS ISO 14001. The EMS Manual describes the overarching management framework and includes management plans (MP) and standard operating procedures (SOPs).

The Peculiar Knob EMS has been designed to provide for the environmental management requirements for operations undertaken at the Peculiar Knob mine. The management system will be compliant with relevant Australian Standards and will address the environmental aspects of activities related to mining activities as well as the environmental compliance obligations.

The EMS is applicable to both direct employees of Peak as well as all contractors and other services providers involved in carrying out activities at the Peculiar Knob mine. Ongoing development of the Peculiar Knob EMS will provide assurance that safeguards for the environment are put in place and are consistent with the standard and also ensure compliance with legal and other requirements, including those associated with tenement conditions, PEPR outcomes and measurement criteria.

Peak Iron Mines will ensure that regulatory approval has been obtained before starting mining activities and that regulatory requirements are met for the life of the operation. It will also be ensured that all contractors operating within mining and construction sites adhere to all approved PEPR conditions and operational licenses as part of the commercial contract agreements.

9.2 Compliance to Mining Regulation 2011

This section deals with the requirements of Regulation 89 pertaining to Mining Regulations 2011 under the *Mining Act 1971*:

Operational policies

Peak have developed a corporate environment policy that defines their commitment to complying with legislation, improving environmental performance, efficiently using resources, minimising and preventing pollution, communication and managing environmental risk. This policy will be made available to all Peculiar Knob personnel, including Peak employees, contractors and visitors, and is included in the EMS Manual.

The environmental policy includes, as a minimum, the overarching objectives to:

- integrate sustainable environmental management practices into operations
- inform and consult with the local community, stakeholder groups and regulators
- ensure all staff and/or contractors are aware of environmental responsibilities

- conduct monitoring and evaluation to ensure environmental compliance and obligations are achieved
- consider environmental matters and manage environmental risks
- rehabilitate sites or areas disturbed by operational activities
- use energy and water resources efficiently, minimise waste and reduce the environmental footprint
- provide training and resources required for effective environmental management
- ensure all work practices comply with the EMS, applicable laws and regulations.

Achieving compliance to environmental outcomes

Compliance with legislation and approved PEPR outcomes is achieved at site level by ensuring MPs are developed and implemented, and aligning them with PEPR approvals, and all other regulatory requirements. Site MPs therefore capture all PEPR outcomes and measurement criteria and assign controls, implementation, monitoring, measurement and reporting responsibilities to operational and/or management positions for that particular site. Specific responsibilities are documented in the responsible person's position description.

MPs have been developed to manage issues that are deemed to be of 'critical control' such as dust, topsoil, hazardous materials storage and spills response and vegetation clearance.

The principal mining contractor will also be required to develop a site Environmental Management Plan (EMP) supported by procedures. These procedures must align with the Peculiar Knob Mine EMS as a minimum standard. The EMP must consider relevant tenement conditions and PEPR outcomes and measurement criteria.

The principal mining contractor's EMP must be approved by Peak Iron Mines and is subject to compliance auditing.

Operations risk management system

Peak Iron Mines will maintain a comprehensive aspects and impacts Risk Register for every operational activity. The Risk Register rates inherent and residual risks, and lists controls, legal and other requirements.

The principal mining contractor will also maintain an aspects and impacts Risk Register as part of their AS/NZS ISO 14001 certified EMS.

Systems to monitor, evaluate and audit

All Peak Iron Mines operations and contracting firms will be audited internally by Peak Iron Mines for compliance with the AS/NZS ISO 14001 EMS standard and for compliance with all PEPR commitments, licences, works approvals, current legislation and internal standards. External auditors will review the internal audit schedule, the results of internal audits and the closing out of any issues raised during internal audits.

Systems to identify and report non-compliances

Peak Iron Mines will maintain an environmental incident reporting system. The definitions of an environmental incident will be documented in an incident reporting and investigation procedure.

Once entered into the reporting system, key personnel will be alerted and provided with a report detailing the incident. The Mine Manager will review the reports and decide if any non-compliance issues have occurred and if the incident needs to be reported to an authority.

Compliance Reports for the Peculiar Knob operations will be submitted to DEM annually.

9.3 PEPR compliance management

The site MPs ensure compliance with PEPR outcomes at the site operational level by assigning measurement and reporting responsibilities for each outcome measurement criteria. The site MPs will be reviewed annually or immediately following an approved PEPR update.

The purpose of the EMS is to provide the framework and guidance to employees and contractors in relation to documents, procedures, processes and activities, which are to be adopted and implemented to achieve compliance with all legal and other requirements including compliance to all organisational procedures and the development of the site MPs.

The EMS outlines the specific outcomes, management strategies and monitoring and measurement criteria required to ensure compliance with approved PEPRs. The EMS identifies and supports the primary responsible person/s target values, lead indicators, monitoring frequency, reporting responsibility, frequency and distribution requirements, as well as the relevant MPs and/or work SOPs for:

- vegetation
- weeds, pests and pathogens
- soil
- stormwater
- groundwater
- chemical storage and handling
- air quality (dust)
- blasting and vibration
- waste disposal
- heritage
- road traffic.

The EMS also provides:

- requirements associated with AS/NZS ISO 14001 EMS, which must be incorporated into MPs for:
    - environmental governance

- environmental training, awareness and competence
- audits and inspections
- emergency preparedness, incidents and response
- monitoring, measurement and evaluation
- management review
- documentation and records.

9.4 PEPR development and change management

9.4.1 PEPR development

The flow diagram provided in Figure 9-1 provides an overview of the inputs into the development and lodgement of the PEPR and the process that leads up to its approval by DEM. Although it is intended that the PEPR incorporates provisions for all planned activities in a particular mining area, from time to time minor variations to these activities do occur.

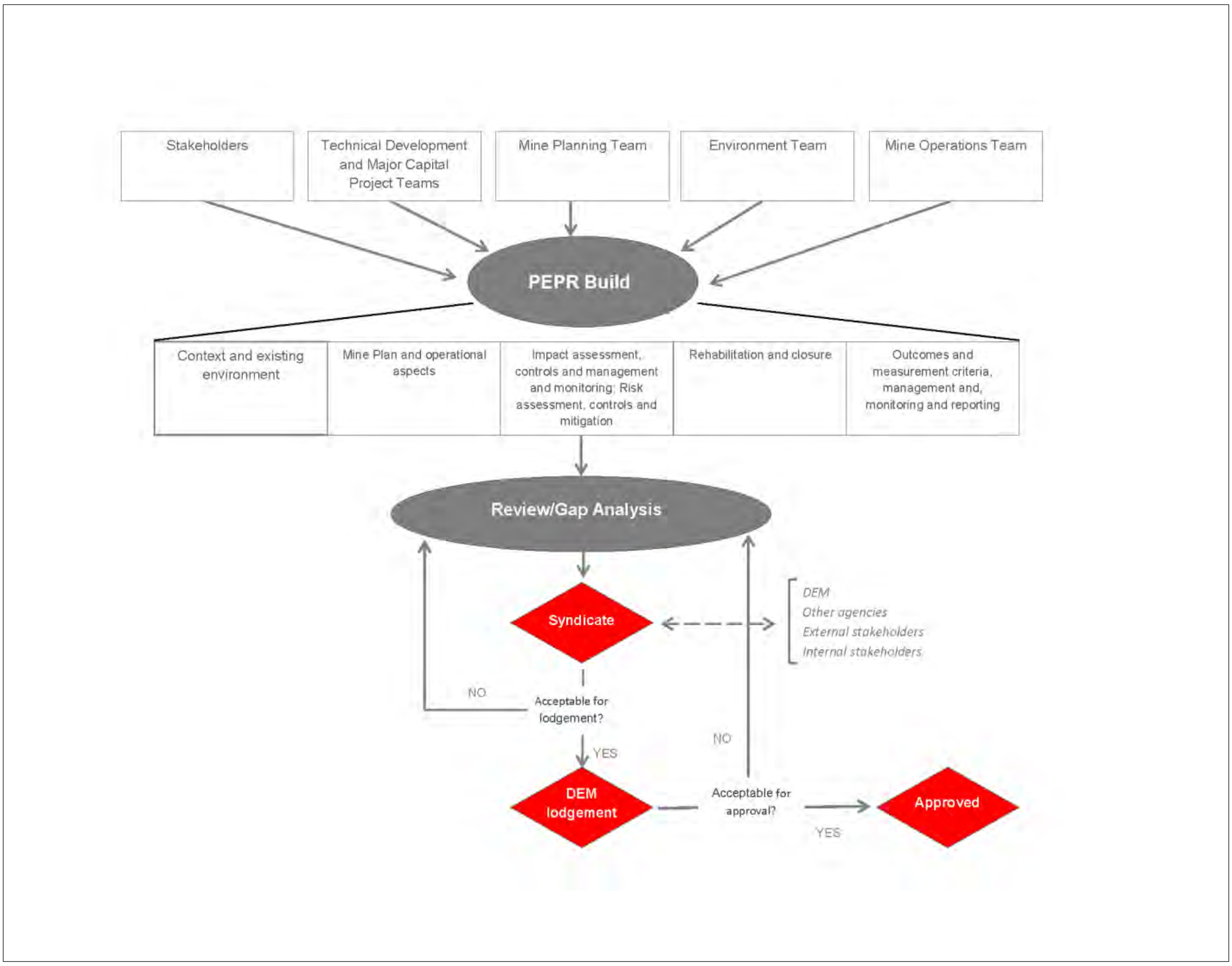


Figure 9-1: PEPR development process

9.4.2 Changes to existing and planned activities

Where a change to existing or planned operations or circumstances is required, Peak Iron Mines will undertake assessment of the proposed change and determine if the change is in or out of the scope of the approved PEPR or the originally granted lease (in accordance with Appendix 2, Assessment of changes to existing operations, Mineral Regulatory Guidelines MG3, V 3.0, DSD January 2014).

A change is considered significant (Level 1, 2 or 3) if it:

- is significantly outside the scope of that originally assessed when the lease was granted
- impacts the lease or licence conditions
- results in any additional risks or increase in the existing risk profile
- requires any modification to the approved outcomes or measurement criteria.

Significance Level 1 change (Tenement review)

For a PEPR review that requires a change which is not within the scope of the existing lease or licence conditions, such as a new or significant increase in risk level, or is outside of the scope of proposed operations that was assessed as part of the original tenement grant, requires submission of a mining proposal, including proposed changes to existing lease or licence conditions which results in a new round of public consultation. Confirmation of whether the bond, required under the *Mining Act 1971*, needs to be recalculated for the mining area.

Significance Level 2 or 3 change (PEPR review)

A PEPR review, which only requires minor alterations to existing outcomes and/or measurement criteria and is still covered by pre-existing lease conditions, will result in a review and update of the PEPR, incorporating the changes, for submission to DEM for approval.

Significance Level 4 change (minor change)

Peak Iron Mines will notify DEM of proposed operational changes that have been justified as within scope of the existing PEPR. The notification will include a description of the change and confirmation that the change will not contravene lease or licence conditions, increase environmental risks or require any modification to approved outcomes or measurement criteria.

A notification will be submitted to DEM with the following components:

- demonstration that the proposed change is within the scope of the original circulated mining proposal document
- the lease/licence condition(s) that apply to the proposed change
- the outcome(s) that apply to the proposed change
- the current risk rating for the related outcome(s) and a statement describing any increase in the existing risk profile
- the measurement criterion that applies to the proposed change
- the minor change to the operation that can be conducted within approved measurement criteria
- any supporting information or update of information already presented to DEM.

9.5 Communication of the approved PEPR

Information, strategies, plans and commitments contained within the PEPR will be communicated to Peak Iron Mines team and contractors. A dedicated team will review and assess planned activities that may vary from those presented in the approved PEPR, and in the subsequent impact and risk assessments for the preparation of Minor Change Notifications for submission to DEM (see Section 7).

Communication of the approved PEPR, and any subsequent changes or updates across the operations, involves all levels of the workforce – both employed and contracted. Communications will occur in the form of:

- special presentations and workshops

- via the procurement process as contracts include relevant requirements of the PEPR
- operational communications such as toolbox meetings, regulator notices (emailed, pinned on noticeboards), monthly management and lead team reporting, and contractor performance and project progress meetings
- the EMS and associated MPs and SOPs (see Section 9.1), so that outcomes and management criteria are met operationally (see Section 9.3).

The current approved PEPR will be maintained electronically by Peak Iron Mines and a hardcopy be available and kept onsite at the mining operation.

10. LEASE / LICENCE CONDITIONS

The ML, MPL and EML conditions for the project are contained in Appendix M. In preparing this PEPR, Peak Iron Mines has cross-referenced the conditions of the Mineral Leases, MPLs and EMLs within the contents of the PEPR to demonstrate compliance with conditions (where relevant).

A summary of where the conditions of the Mineral Lease, MPLs and EMLs have been addressed in this PEPR is included in Table 10-1 to Table 10-6.

Table 10-1: ML6314 Mining Lease Conditions

ML6314 Lease Condition		PEPR reference
FIRST SCHEDULE		
1	Mining operations authorised by this lease must be only for the recovery of Iron.	Section 1 & 3.6
2	In accordance with Section 77 of the Act, the Lessee must keep accurate records of the quantity, value and manner of disposition of all minerals mined and, whenever required to do so, submit the records for inspection by any person authorised by the Director of Mines.	Acknowledged however not specifically addressed in PEPR
3	The Lessee must not conduct any mining operations on the land until a Mining and Rehabilitation Program (MARP) has been approved by the Minister.	Acknowledged however not specifically addressed in PEPR
4	The MARP must comply with the requirements of guidelines approved by the Director of Mines and include environmental objectives and criteria that are developed in consultation with relevant stakeholders.	Sections 3, 6, 7 and 8
5	Lessee agrees approved MARP being made available for public inspection.	Acknowledged however not specifically addressed in PEPR
6	The lessee must demonstrate upon request and to the Director of Mines, the Lessee's capability and competence to comply with the requirements of the Mining Act, 1971, the conditions of this lease, and the MARP	Section 9
7	The lessee must provide to the Director of Mines a Mining and Rehabilitation Compliance Report (MARCR) on operations carried out on the lease and compliance with the approved MARP. The MARCR must be submitted every year, within 2 months after the anniversary of the date the lease was granted, or at some other time agreed with the Chief Inspector of Mines in accordance with guidelines approved by the Director of Mines. The lessee agrees to the MARCR being made available for public inspection.	Section 8.5.2, 9.2 & 9.3
8	The Lessee must, if requested by the Director of Mines, undertake an independent audit of achievement of the environmental outcomes in the MARP, by an independent expert approved by the Director of Mines. The audit will be made available to the public, in a manner and form as determined by the Director of Mines.	Acknowledged however not specifically addressed in PEPR
9	The Lessee must provide to PIRSA a Mine Completion Report prior to lease relinquishment, in accordance with guidelines approved by the Director of Mines.	Acknowledged however not specifically in PEPR
10	The Lessee must ensure that all employees and contractors on-site are properly advised and trained to ensure that all mining operations are carried out in accordance with the requirements of the Aboriginal Heritage Act, 1988.	Section 7.15 & Section 6.6 (stakeholders)

11	The Lessee must, prior to commencing operations under this lease and for the duration of the lease:	
(a)	Maintain public liability insurance to cover operations under the lease (including sudden and accidental pollution) in the name of the lessee for a sum not less than $50 million or such greater sum as specified by the Director of Mines, and make such amendments to the terms and conditions of the insurance as the Director of Mines may require.	Acknowledged however not specifically addressed in PEPR
(b)	Effect and maintain compulsory third-party insurance in respect of all motor vehicles used in relation to this lease	Acknowledged however not specifically addressed in PEPR
(c)	Effect and maintain any other policy of insurance required by law A copy of the cover note of certificate of currency for the insurance must be provided to the Director of Mines upon request. If requested by the Director of Mines, the lessee must engage an independent and reputable risk assessor to prepare a risk assessment report detailing the public liability risks arising out of the conduct of mining operations on the lease, and recommending the level of amount of public liability cover (in respect of any one occurrence) that should be effected and maintained by the lessee. In preparing the risk assessment report, the assessor must consult with the landowner and the Director of Mines. In specifying the level of insurance required, the Director of Mines accepts no liability for the completeness, adequacy of the sum insured, the limit of liability, the scoped coverage, the conditions or exclusions of the insurance in respect of how the lessee may or may not respond to any loss, damage or liability	Acknowledged however not specifically addressed in PEPR
12	The Lessee must, before commencing operations under this lease, lodge a bond in accordance with section 62 of the Mining Act, 1971 of such an amount of the surety as determined from time to time by the Minister, to cover the full cost of rehabilitation liability assessed by an independent third-party at any time. In requesting a review of the bond, the Minister may request that written quotes from a third-party are obtained by the lessee for the cost of rehabilitating the site to the requirements specified in the approved MARP. The Lessee must meet all the charges and costs in obtaining and maintaining the Bond.	Acknowledged however not specifically addressed in PEPR
SECOND SCHEDULE		
1	The Lessee must ensure all topsoil that is removed and stockpiled maintains its viability for use in rehabilitation.	Section 3.8.6 & 3.8.7 & Section 5
2	The Lessee must report any non-compliant criteria that demonstrate a breach of the environmental outcomes to be achieved (as detailed in the MARP) to the Director of Mines. A report must be provided after the Lessee becomes aware of the non-compliance, by the close of the next business day or such time period as specified in the MARP.	Section 8.5
3	The lessee must, in constructing and operating the lease ensure no water contaminated as a result of mining operations leaves the lease area or results in loss of or contamination of soil on or off the lease.	Section 7.7 & 7.8
4	The lessee must ensure, prior to relinquishing the mining lease, that a stable landform that does not erode more than adjacent undisturbed natural areas, has been achieved.	Section 5
5	The Lessee must take reasonable steps to keep the occupier of the land fully advised of their program of activities, particularly in regard to the impact on the land and rehabilitation.	Section 6
6	The lessee must, in constructing and operating the lease ensure that there is no adverse impact to the quality and quantity of ground and or surface water caused by mining operations to existing users and water dependent ecosystems.	Section 7.7 & 7.8

7	Prior to commencing any mining operations under this lease and within nine (9) months from the grant of this lease, the lessee must obtain, to the satisfaction of the Minister, all approvals (other than approvals under the Mining Act 1971 (SA)) necessary to enable the lessee to extract and supply water to this lease from: • any area within the Woomera Prohibited Area (WPA), or • from any alternate source in the event water cannot be sourced or extracted from within the WPA. The Minister may extend the period within which the approvals must be sought upon written application by the lessee.	Section 3.12.7 & 3.13.4 and Section 1

Note: At the time of issue of ML6314 ML a PEPR was known as a MARP

Table 10-2: MPL125-MPL131 Conditions

MPL125-MPL131 (inclusive) Licence Condition		PEPR reference
FIRST SCHEDULE		
1	Miscellaneous Purposes Licences are granted for the purposes of: • Haul road • Access road • Groundwater extraction • Accommodation village • Rail loop and siding • Crusher plant • Maintenance facilities For use in associated with the Peculiar Knob Mining Iron Ore Project	Section 3
2	The Licensee understands and accepts that pursuant to Section 80(2) of the Mining Act, 1971, the rights granted by this lease are modified by, and are subject to, the terms of the Consent Agreement between Southern Iron Pty Ltd and Western Plains Resources Ltd/Southern Iron Pty Ltd made on 08 June 2010 (“the Consent Agreement”) annexed to this Licence. Condition 2 – Applicable only for MPL131	Acknowledged however not specifically addressed in PEPR
3	Operations cannot commence until a Mining and Rehabilitation Program (MARP) has been approved by the Minister and a bond has been paid in accordance with Section 62 of the Mining Act.	Acknowledged however not specifically addressed in PEPR
4	The Licensee must prepare a MARP that complies with the requirements of guidelines approved by the Director of Mines and include environmental outcomes and criteria that are developed in consultation with relevant stakeholders.	Section 6, 7 & 8
5	The criteria included in the MARP must demonstrate clear and unambiguous achievement of the environmental and mine closure outcomes specified in the Second Schedule by: • Including the specific parameters to be measured and monitored by the Licensee • Specifying the locations that the parameters will be measured, or how these locations will be determined • Clearly stating the acceptable values for demonstrating achievement of the outcome, with consideration of any inherent errors of measurement • Specifying the frequency of monitoring by the Licensee • Identifying what background or control data are to be used or specify how it will be acquired (if necessary)	Section 5, Section 7 & Section 8

6	The Licensee must implement and comply with the approved MARP.	Section 7 & 8
7	The Licensee must review the MARP on request of the Director of Mines within a time specified in the request and submit the revised MARP for approval to the Director of Mines.	Section 9.4.2
8	The Licensee agrees to the approved MARP being made available for public inspection.	Acknowledged however not specifically addressed in PEPR
9	The Licensee must demonstrate upon request and to the Director of Mines, the Licensee's capability and competence to comply with the requirements of the Mining Act 1971, the conditions of this licence and the MARP.	Section 9
10	Prepare a Mining and Rehabilitation Compliance Report (MARCR) covering the operations carried out on the Lease and compliance with the approved MARP. The MARCR must be submitted every year, within 2 months after the anniversary of the date the Licensee was granted, or at some other time agreed with the Director of Mines in accordance with guidelines approved by the Director of Mines. The Licensee agrees to the MARCR being made available for public inspection.	Section 8.5.2, 9.2 & 9.3
11	If requested by Director of Mines, undertake an independent audit of achievement of environmental outcomes in MARP. The audit will be made available to the public, in a manner and form as determined by the Director of Mines.	Section 8.5
12	At least 3 months prior to Licence relinquishment or expiry prepare a Mine Completion Report in consultation with the landowner and in accordance with guidelines which demonstrates achievement of the closure criteria as specified in the current MARP.	Section 8.5
13	Insurance	Acknowledged however not specifically addressed in PEPR
14	Report any non-compliance with these conditions or approved MARP to the Director of Mines. A verbal notification must be provided within 24 hours, after the Licensee becomes aware of the non-compliance. A written report must be provided within 3 days or such time period as approved by the Director of Mines.	Section 8.5.2, 9.2 & 9.3
15	In requesting a review of a bond, if required, under the Mining Act 1971, the Minister may request that written quotes from a third-party are obtained by the Licensee for the cost of rehabilitating the site to the requirements specified in the approved MARP. The Licensee must meet all the charges and costs in obtaining and maintaining the Bond.	Acknowledged however not specifically addressed in PEPR
SCHEDULE C- ENVIRONMENTAL OUTCOMES		
1	***Visual Amenity*** The Licensee must, in constructing and operating the Lease ensure that the form, contrast and reflective aspects of mining operations are visually softened to blend in with the surrounding landscape, if visible from the Stuart Highway.	Section 7.11 & 8.1.10
2	***Air Quality*** The Licensee must, in constructing and operating the Lease ensure that there are no nuisance impacts to the public, operation of third-party mining operations or third-party infrastructure due to dust generated by mining operations.	Sections7.9 & 8.1.8
3	***Third-party Safety*** The Licensee must, in constructing and operating the Licence ensure that there are no third-party injuries and/ or deaths resulting from operations traffic, dust generation or unauthorised entry to the operations that could have been reasonably prevented.	Section 7.13 & 8.1.12

4	***Adjacent land use*** The Licensee must, in constructing and operating the Licence, ensure that there are no adverse impacts to adjacent land uses.	Section 7.14 & 8.1.13
5	***Protection of third-party property*** The Licensee must, in constructing and operating the Licence, ensure that there is no unauthorised damage (including that caused by fire) to adjacent public or private property and infrastructure.	Section 7.14 & 8.1.13
6	***Aboriginal and European Heritage*** The Licensee must, in constructing and operating the Licence, ensure that there is no disturbance to Aboriginal or European artefacts or sites of significance unless prior approval under the relevant legislation is obtained.	Sections 7.15 & 8.1.14
7	***Native Fauna*** The Licensee must, in constructing and operating the Licence ensure that there is no permanent loss of native fauna abundance or diversity in the Licence area and in adjacent areas caused by mining operations (including fire).	Sections 7.4 & 8.1.2
8	***Native Vegetation*** The Licensee must, in constructing and operating the Licence ensure no permanent loss of abundance or diversity on or off the Licence to native vegetation through: • clearance • dust/contaminant deposition • fire, or • other damage unless prior approval under the relevant legislation is obtained.	Sections 7.4 & 8.1.1
9	***Weeds and Pests (feral animals)*** The Licensee must, in constructing and operating the Licence ensure no introduction of new species of weeds, plant pathogens or pests (including feral animals), nor increase in abundance of existing weed or pest species in the Licence area compared to adjoining land.	Sections 7.5, 8.1.3 & 8.1.4
10	***Soil*** The Licensee must, in constructing and operating the Licence ensure that the existing soil quality and quantity is maintained.	Sections 7.6 & 8.1.5
11	***Groundwater and Hydrology*** The Licensee must, in constructing and operating the Licence ensure that there is no adverse impact to the quality and quantity of ground and or surface water caused by mining operations to existing users and water dependent ecosystems.	Sections 7.8 & 8.1.7
12	***Stormwater*** The Licensee must, in constructing and operating the Licence ensure no water contaminated as a result of mining operations leaves the Licence area or results in loss of or contamination of soil on or off the Licence.	Sections 7.7 & 8.1.6
13	***Flooding/runoff*** The Licensee must, in constructing and operating the Licence ensure no water runoff from the Licence results in flooding of adjacent areas, to an extent greater than that which could reasonably be expected to occur prior to mining operations being established on the Licence.	Sections 3.7.11 & 7.7
14	***Waste disposal and hazardous substances*** The Licensee must, in constructing and operating the Licence ensure that no contamination and/or pollution of natural water drainage systems, streams and rivers,	Sections 7.16 & 8.1.15

	groundwater, land and soils occurs either on or off site is caused by waste products and hazardous materials used in the mine operations.	
15	***Mine Closure*** The Licensee must demonstrate to the satisfaction of the Director of Mines that the following mine closure outcomes (in so far as they may be affected by mining operations) are expected to be achieved and sustained after mine closure: (a)Integrate and harmonise final landforms and vegetation with the surrounding landscape. (b)The risks to the health and safety of the public and fauna are as low as reasonably practical (c)Where practicable, re-establishment of the pre-mining ecosystem and landscape function (d)The site is physically stable (e)No compromise of the quality and quantity of ground and or surface water to existing users and water dependent ecosystems. (f)All mine waste materials left onsite are chemically and physically stable (g)No industrial or domestic waste left onsite. (h)Where practicable, pre mining land use is re-established.	Sections 7.19 & 8.3
OTHER ENVIRONMENTAL CONDITIONS		
16	***Complaints*** The Licensee will be responsible for recording and addressing in manner and form (to the satisfaction of the Director of Mines) any complaints received from the public	Section 6.5
17	***Communication Protocols*** The Licensee must develop to the satisfaction of the Director of Mines, a communication and operating protocol between itself and the operator of the Prominent Hill Mine, prior to the commencement of mining operations. The protocol will specify operating and communication procedures that include, but are not limited to the following matters: (a) Interference with adjacent operations (inclusive of dust) (b) Emergency procedures (c) Communications and issue management processes (d) Land management – native vegetation, alteration of surface water flows (e) Dispute resolution between the Licensee and the Prominent Hill Mine operator. The Licensee must maintain and adhere to the protocol to the satisfaction of the Director of Mines for the term of the Licence.	Section 6, 8.5.2 & 9.2
18	***Communication Protocols*** The Licensee must develop to the satisfaction of the Director of Mines, a communication and operating protocol between itself and the holders of Pastoral Lease Numbers 2147 and 2527, prior to the commencement of mining operations. The protocol will specify operating and communication procedures that include, but are not limited to the following matters: (a) Ongoing communication about the Lessee's operations (b) Receiving and considering feedback from Pastoral Lease holders (c) Interaction with Pastoral Lease operations (e.g. stock movements, water supplies and fencing) (d) Safety (e) Dispute resolution.	Section 6, 8.5.2 & 9.2

	The Licensee must maintain and adhere to the protocol to the satisfaction of the Director of Mines for the term of the Licence.	
19	***Refuelling*** Fuel storage is to be bunded in accordance with Environment Protection Authority requirements.	Sections 3.12.6, 3.13.3 & Section 7
20	***Other Legislation*** The above environmental outcomes do not derogate from the operation of any other Acts that may be applicable to this operation including (but not limited to): • *Aboriginal Heritage Act 1988* • *Environment Protection Act 1993*	Section 7.3, 7.15 & 8.1.14 Section 7.3 & 7.6.4

Table 10-3: MPL 133 and MPL 134 Conditions

MPL 133 and 134 Licence Condition		PEPR reference
FIRST SCHEDULE		
1	Miscellaneous Purposes Licence is granted for the purposes of Water Bores and associated infrastructure specifically for use in association with the mining operation known as Peculiar Knob Mining Iron Ore Project authorised under mining tenement(s) ML6314 and EMLs 6363-6382.	Section 3.11
2	Operations cannot commence until a Mining and Rehabilitation Program (MARP) has been approved by the Minister and a bond has been paid in accordance with Section 62 of the Mining Act.	Acknowledged however not specifically addressed in PEPR
3	The Licensee must prepare a MARP that complies with the requirements of guidelines approved by the Director of Mines and include environmental outcomes and criteria that are developed in consultation with relevant stakeholders.	Sections 6, 7 & 8.
4	The criteria included in the MARP must demonstrate clear and unambiguous achievement of the environmental and mine closure outcomes specified in the Second Schedule by: • Including the specific parameters to be measured and monitored by the Licensee • Specifying the locations that the parameters will be measured, or how these locations will be determined • Clearly stating the acceptable values for demonstrating achievement of the outcome, with consideration of any inherent errors of measurement • Specifying the frequency of monitoring by the Licensee • Identifying what background or control data are to be used or specify how it will be acquired (if necessary)	Section 5, Section 7 & Section 8
5	The Licensee must implement and comply with the approved MARP.	Section 7 & Section 8
6	The Licensee must review the MARP on request of the Director of Mines within a time specified in the request and submit the revised MARP for approval to the Director of Mines.	Section 9.4
7	The Licensee agrees to the approved MARP being made available for public inspection.	Acknowledged however not specifically addressed in PEPR
8	The Licensee must demonstrate upon request and to the Director of Mines, the Licensee's capability and competence to comply with the requirements of the Mining Act 1971, the conditions of this licence, and the MARP.	Section 8 & Section 9

9	Prepare a Mining and Rehabilitation Compliance Report (MARCR) covering the operations carried out on the Licence and compliance with the approved MARP. The MARCR must be submitted every year, within 2 months after the anniversary of the date the Licence was granted, or at some other time agreed with the Director of Mines in accordance with guidelines approved by the Director of Mines. The Licence agrees to the MARCR being made available for public inspection.	Section 8.5 & Section 9.3
10	If requested by Director of Mines, undertake an independent audit of achievement of environmental outcomes in MARP by an independent expert approved by the Director of Mines. The audit will be made available to the public in a manner and form as determined by the Director of Mines. The Licensee must meet all the charges and costs in undertaking the independent audit.	Section 8.5
11	At least 3 months prior to Licence relinquishment or expiry prepare a Mine Completion Report in consultation with the landowner and in accordance with guidelines which demonstrates achievement of the closure criteria as specified in the current MARP.	Section 8.5
12	Insurance	Acknowledged however not specifically addressed in PEPR
13	Report any non-compliance with these conditions or approved MARP to the Director of Mines. A verbal notification must be provided within 24 hours, after the Licensee becomes aware of the non-compliance. A written report must be provided within 3 days or such time period as approved by the Director of Mines.	Section 8.5.2 & 9.2
14	In requesting a review of a bond, if required, under the Mining Act 1971, the Minister may request that written quotes from a third-party are obtained by the Licensee for the cost of rehabilitating the site to the requirements specified in the approved MARP.	Acknowledged however not specifically addressed in PEPR
15	The Licensee must meet all the charges and costs in obtaining and maintaining the Bond.	Acknowledged however not specifically addressed in PEPR
SECOND SCHEDULE- ENVIRONMENTAL OUTCOMES		
1	***Visual Amenity*** The Lessee must, in constructing and operating the Licence ensure that the form, contrast and reflective aspects of mining operations are visually softened to blend in with the surrounding landscape, if visible from the Stuart Highway.	Sections 7.11 & 8.1.10
2	***Air Quality*** The Licensee must, in constructing and operating the License ensure that there are no nuisance impacts to the operation of third-party mining projects or users of public and private infrastructure, including the Stuart Highway, due to dust generated by activities authorized by the Licence.	Sections 7.9 & 8.1.8
3	***Third-party Safety*** The Licensee must, in constructing and operating the License ensure that There are no Third-party injuries and or deaths resulting from operations traffic, dust generation or unauthorised entry to the operations that could have been reasonably prevented.	Section 7.13 & 8.1.12
4	***Adjacent land use*** The Lessee must, in constructing and operating the Licence, ensure that there are no adverse impacts to adjacent land uses.	Section 7.14 & 8.1.13
5	***Protection of third-party property*** The Licensee must, in constructing and operating the Licence, ensure that there is no unauthorised damage (including that caused by fire) to adjacent public or private property and infrastructure, including the Stuart Highway.	Section 7.14 & 8.1.13

6	***Aboriginal and European Heritage*** The Licensee must, in constructing and operating the Licence, ensure that there is no disturbance to Aboriginal or European artefacts or sites of significance unless prior approval under the relevant legislation is obtained.	Sections 7.15 & 8.1.14
7	***Native Fauna*** The Licensee must, in constructing and operating the Licence ensure that there is no permanent loss of native fauna abundance or diversity in the Licence area and in adjacent areas caused by mining operations (including fire).	Sections 7.4 & 8.1.2
8	***Native Vegetation*** The Licensee must, in constructing and operating the Licence ensure no permanent loss of abundance or diversity on or off the Licence to native vegetation through: • clearance • dust/contaminant deposition • fire, or • other damage unless prior approval under the relevant legislation is obtained.	Sections 7.4 & 8.1.1
9	***Weeds and Pests (feral animals)*** The Licensee must, in constructing and operating the Licence ensure no introduction of new species of weeds, plant pathogens or pests (including feral animals), nor increase in abundance of existing weed or pest species in the Licence area compared to adjoining land.	Sections 7.5, 8.1.3 & 8.1.4
10	***Soil*** The Licensee must in constructing and operating the Licence ensure that sufficient topsoil is removed and managed to ensure adequate reinstatement of pre mining land use at mine closure.	Sections 7.6 & 8.1.5
11	***Groundwater and Hydrology*** The Licensee must, in constructing and operating the Licence ensure that there is no adverse impact to the quality and quantity of ground and or surface water caused by activities authorized by the License to existing users and water dependent ecosystems.	Sections 7.8 & 8.1.7
12	***Stormwater*** The Licensee must, in constructing and operating the Licence ensure no water contaminated as a result of mining operations leaves the Licence area or results in loss of or contamination of soil on or off the Licence.	Sections 7.7 & 8.1.6
13	***Flooding/runoff*** The Licensee must, in constructing and operating the Licence ensure no water runoff from the Licence results in flooding of adjacent areas, to an extent greater than that which could reasonably be expected to occur prior to mining operations being established on the Licence.	Sections 3.7.11 & 7.7
14	***Waste disposal and hazardous substances*** The Licensee must, in constructing and operating the Licence ensure that no contamination and/or pollution of natural water drainage systems, streams and rivers, groundwater, land and soils occurs either on or off site is caused by waste products and hazardous materials used in the mine operations.	Sections 7.16 & 8.1.15
15	***Mine Closure*** The Licensee must demonstrate to the satisfaction of the Director of Mines that the following mine closure outcomes (in so far as they may be affected by Licence operations) are expected to be achieved and sustained after mine closure:	Sections 7.19 & Section 8.3

	(a) Integrate and harmonise final landforms and vegetation with the surrounding landscape. (b) The risks to the health and safety of the public and fauna are as low as reasonably practical. (c) Where practicable, re-establishment of the pre-mining ecosystem and landscape function. (d) The site is physically stable. (e) No compromise of the quality and quantity of ground and or surface water to existing users and water dependent ecosystems. (f) All mine waste materials left onsite are chemically and physically stable. (g) No industrial or domestic waste left onsite (h) Where practicable, pre mining land use is re-established.	
OTHER ENVIRONMENTAL CONDITIONS		
16	***Complaints*** The Licensee will be responsible for recording and addressing in manner and form (to the satisfaction of the Director of Mines) any complaints received from the public.	Section 6.5
17	***Communication Protocols*** The Licensee must develop to the satisfaction of the Director of Mines, a communication and operating protocol between itself and the holders of Pastoral Lease number 2527, prior to the commencement of operations authorised by this Licence. The protocol will specify operating and communication procedures that include, but are not limited to the following matters: (a) Ongoing communication about the Licensee's operations (b) Receiving and considering feedback from Pastoral Lease holders (c) Interaction with Pastoral Lease operations (e.g. stock movements, water supplies and fencing) (d) Safety (e) Dispute resolution The Licensee must maintain and adhere to the protocol to the satisfaction of the Director of Mines for the term of the Licence.	Section 6, Section 8.5.2 and Section 9.2
18	***Refuelling*** Fuel storage is to be bunded in accordance with Environment Protection Authority requirements.	Sections 3.12.6 & 3.13.3
19	***Other Legislation*** The above environmental outcomes do not derogate from the operation of any other Acts that may be applicable to this operation including (but not limited to): • Aboriginal Heritage Act 1988 • Environment Protection Act 1993	Section 7.3, 7.15 & 8.1.14 Section 7.3 & 7.6.4

Table 10-4: MPL141 Conditions

MPL 141 Licence Condition		PEPR reference
FIRST SCHEDULE		
1	Miscellaneous Purposes Licence is granted for any purposes directly related to the conduct of mining operations in association with the mining operation known as Peculiar Knob Mine authorised under mining tenement (s) ML6314 and EMLs 6364, 6365, 6366, 6367, 6368, 6369, 6370, 6371, 6372, 6373, 6374, 6375, 6376, 6377, 6378, 6379, 6380, 6381, and 6382, MPL127, 128, 129, 130, 131 and 134 as outlined in the miscellaneous purposes licence proposal document dated September 2012.	Section 3.11
2	In accordance with Regulation 86(1)(a) the Licensee must provide a Compliance report every year, within 2 months after the anniversary of the date the Licence was granted, or at some other time agreed with the Minister.	Section 9.2 & 9.3
3	The Licensee agrees to the approved PEPR (section 70B(5)) and the Compliance report (Regulation 86) and any reportable incident reports (Regulation 87) being made available for public inspection.	Section 9.2 & 9.3
4	In accordance with Regulation 90(1) the Licensee must, prior to commencing operations under this Licence and for the duration of the lease maintain public liability insurance to cover all operations under the Licence (including sudden and accidental pollution) in the name of the Licensee for a sum not less than $20 million or such greater sum as specified by the Minister, and make such amendments to the terms and conditions of the insurance as the Minister may require.	Acknowledged however not specifically addressed in PEPR
5	In requesting a review of the bond required under the Mining Act 1971 the Minister may request that written quotes from an independent third-party approved by the Minister are obtained by the Licensee for the cost of rehabilitating the site to the requirements specified in the approved Program under Regulation 65(2).	Acknowledged however not specifically addressed in PEPR
6	The Licensee must meet all the changes and costs in obtaining and maintaining the Bond.	Acknowledged however not specifically addressed in PEPR
SECOND SCHEDULE- ENVIRONMENTAL OUTCOMES		
1	For the purposes of preparation of the Program for Environment Protection and Rehabilitation under section 70B (2) and associated Regulations of the Mining Act 1971, the following environmental and mine rehabilitation outcomes must be included:	
2	***Mine rehabilitation*** The Licensee must demonstrate to the satisfaction of the Director of Mines that the following mine closure outcomes (in so far as they may be affected by mining operations) are expected to be achieved and sustained after mine closure: • Integrate and harmonise final landforms and vegetation with the surrounding landscape • The risks to the health and safety of the public, native fauna and livestock are as low as reasonably practical • Where practical, re-establishment of the pre-mining ecosystem and landscape function • The site is physically stable • No compromise of the quality and quantity of ground and or surface water to existing users and water dependent ecosystems • All mine waste materials left onsite are chemically and physically stable • No industrial or commercial waste left on site	Section 7.19 & Section 8

	• Where practical, pre-mining land use is re-established.	
3	***Waste disposal and hazardous substances*** The Licensee must, in constructing and operating the License ensure that no contamination and/or pollution of natural water drainage system, streams and rivers, groundwater, land and soils occurs either on or off-site is caused by waste products and hazardous materials used in mine operations.	Section 7.16 & Section 8.3
4	***Groundwater and surface water*** The Licensee must, in constructing and operating the License ensure that there is no adverse impact to the quality and quantity of ground and surface water caused by mining operations to existing users and water dependent ecosystems.	Sections 7.7, 7.8, 8.1.6 & 8.1.7
5	***Weeds and Pests (feral animals)*** The Licensee must, in constructing and operating the Licence ensure no introduction of new species of weeds, plant pathogens or pests (including feral animals), nor sustained increase in abundance of existing weed or pest species in the Licence area compared to adjoining land.	Sections 7.5, 8.1.3 & 8.1.4
6	***Native Vegetation*** The Licensee must, in constructing and operating the Licence ensure no permanent loss of abundance or diversity on or off the Licence to native vegetation through: • clearance • dust/contaminant deposition • fire, or • other damage unless prior approval under the relevant legislation is obtained.	Sections 7.4 & 8.1.1
7	***Adjacent land use*** The Licensee must, in constructing and operating the Licence, ensure that there are no adverse impacts to adjacent land uses.	Section 7.14 & 8.1.13

Table 10-5: ML6442 Conditions

ML6442 Lease Condition		PEPR reference
FIRST SCHEDULE: ADDITIONAL TERMS		
1	The grant of the Mining Tenement authorises mining operations (only) for the recovery of Hematite Iron Ore on the Lease; and.	Section 1 & Section 3.6.
2	The grant of the Mining Tenement authorises mining operations (only) that are consistent with the mining operations described in the Mining Lese Proposal dated July 2014.	Acknowledged however not specifically addressed in PEPR
SECOND SCHEDULE: ADDITIONAL CONDITIONS		
1	***Transparency*** The Tenement Holder agrees to the Approved PEPR and any compliance reports and reportable incident reports, submitted in accordance with the Regulations, being made available for public inspection	Acknowledged however not specifically addressed in PEPR
2	***Other Legislation*** The Tenement Holder must comply with all State and Commonwealth legislation and regulations applicable to the activities undertaken pursuant to grant of the Mining Tenement including (but not limited to):	Acknowledged however not specifically addressed in PEPR

	• *Environment Protection and Biodiversity Conservation Act 1999* • *Development Act 1993* • *Dangerous Substances Act 1979* • *Natural Resources Management Act 2004* • *Public and Environmental Health Act 1987* • *Radiation Protection and Control Act 1982* • *Aboriginal Heritage Act 1988* • *Work Health and Safety Act 2012* • *Environment Protection Act 1993* • *Native Vegetation Act 1991* • *Mines and Works Inspection Act 1920* • *Road Traffic Act 1961.*	
SIXTH SCHEDULE: ENVIRONMENTAL OUTCOMES AND ASSOCIATED CRITERIA AND STRATEGIES PURSUANT TO REGULATION 65 OF THE *MINING REGULATIONS 2011*		
1	***Surface Water*** The tenement holder must in constructing and operating the lease ensure that there is no adverse impact to the quality and quantity of surface water caused by mining operations to existing users and water dependent ecosystems.	Section 7.7, 7.8, 8.1.6 & 8.1.7
2	***Native Vegetation*** The Tenement Holder must, in construction, operation and post mine completion, ensure no loss of abundance or diversity of native vegetation on or off the Land through; 2.1) clearance 2.2) dust/contaminant deposition 2.3) fire 2.4) reduction in water supply 2.5) other damage, unless prior approval under the relevant legislation is obtained.	Section 7.4 & 8.1.1
3	***Fauna*** The Tenement Holder must ensure that there are no native fauna injuries or deaths due to mining operations that could reasonably have been prevented	Section 7.4 & 8.1.2
4	***Weeds, Pests and Pathogens*** The Tenement Holder must, in construction, operation and post mine completion, ensure no introduction of new species of weeds, plant pathogens or pests (including feral animals), nor sustained increase in abundance of existing weed or pest species in the Land compared to adjoining land	Section 7.5, 8.1.3 & 8.1.4
5	***Soil and Land Disturbance*** The Tenement Holder must, in construction, operation and post mine completion ensure that the existing (pre-mining) soil quality and quantity is maintained	Section 3.7, 7.6 & 8.1.5
6	***Public Safety*** The Tenement Holder must, in construction and operation, ensure that post mine the risks to the health and safety of the public so far as it may be affected by mining operations are as low as reasonably practicable.	Section 7.13 & 8.1.12
7	***Visual Amenity*** The Tenement Holder must, in construction, operation and post mine completion, ensure that the form, contrasting aspects and reflective aspects of mining operations are visually softened to blend in with the surrounding landscape	Section 7.11 & 8.1.10

8	***Traffic*** The Tenement Holder must, in constructing and operating this Mineral Lease, ensure that there are no traffic accidents involving the public at mine access points that could have been reasonably prevented by the Tenement Holder	Section 7.12, 7.13, 8.1.11 & 8.1.
9	***Third-party Property*** The Tenement Holder must during construction, operation and post mine completion, ensure that there are no adverse impacts to third-party land use on property adjacent to and on the Land as a result of mining operations, other than those agreed between the Tenement Holder and the affected user	Section 7.14 & 8.1.13
10	***Aboriginal and European Heritage*** The Tenement Holder must, in construction and operation, ensure that there is no disturbance to Aboriginal or European heritage sites, objects or remains unless prior approval under the relevant legislation is obtained	Section 7.15 & 8.1.14
11	***Mine Closure and Rehabilitation*** The Tenement Holder must demonstrate to the satisfaction of the Director of Mines that the following mine closure outcomes (in so far as they may be affected by mining operations) are expected to be achieved and sustained after mine closure: 11.1) all mine waste materials left onsite are chemically and physically stable 11.2) the site is physically stable.	Section 7.19, Section 8.3 & Section 9.2

Table 10-6: MPL147 Conditions

MPL147 **Licence Condition**		**PEPR reference**
FIRST SCHEDULE: ADDITIONAL TERMS		
1	The Mining Tenement is granted for the purpose: 1.1) Of constructing, operating and maintaining a WRD, haul roads, access roads, stormwater management infrastructure, environmental monitoring and additional buffer area around operations, directly related to the conduct of mining operations authorised under mining tenement ML 6314 and ML 6442 1.2) Of undertaking the activities described in the Miscellaneous Purposes Licence management plan, incorporated in the Mining Lease Proposal document dated July 2014.	Section 1 & Section 3.
SECOND SCHEDULE: ADDITIONAL CONDITIONS		
1	***Transparency*** The Tenement Holder agrees to the Approved PEPR and any compliance reports and reportable incident reports, submitted in accordance with the Regulations, being made available for public inspection	Acknowledged however not specifically addressed in PEPR
2	***Other Legislation*** The Tenement Holder must comply with all State and Commonwealth legislation and regulations applicable to the activities undertaken pursuant to grant of the Mining Tenement including (but not limited to): • *Environment Protection and Biodiversity Conservation Act 1999* • *Development Act 1993* • *Dangerous Substances Act 1979* • *Natural Resources Management Act 2004* • *Public and Environmental Health Act 1987*	Section 7.3

	• *Radiation Protection and Control Act 1982* • *Aboriginal Heritage Act 1988* • *Work Health and Safety Act 2012* • *Environment Protection Act 1993* • *Native Vegetation Act 1991* • *Mines and Works Inspection Act 1920* • *Road Traffic Act 1961.*	
SIXTH SCHEDULE: ENVIRONMENTAL OUTCOMES AND ASSOCIATED CRITERIA AND STRATEGIES PURSUANT TO REGULATION 65 OF THE *MINING REGULATIONS 2011*		
1	***Surface Water*** The tenement holder must in constructing and operating the lease ensure that there is no adverse impact to the quality and quantity of surface water caused by mining operations to existing users and water dependent ecosystems.	Section 3.7.4, 3.7.11, 7.4.2, 7.7 & 7.8, 8.1.6 & 8.1.7
2	***Native Vegetation*** The Tenement Holder must, in construction, operation and post mine completion, ensure no loss of abundance or diversity of native vegetation on or off the Land through; 2.1) clearance 2.2) dust/contaminant deposition 2.3) fire 2.4) reduction in water supply 2.5) other damage, unless prior approval under the relevant legislation is obtained.	Section 7.4 & 8.1.1
3	***Fauna*** The Tenement Holder must ensure that there are no native fauna injuries or deaths due to mining operations that could reasonably have been prevented	Section 7.4 & 8.1.2
4	***Weeds, Pests and Pathogens*** The Tenement Holder must, in construction, operation and post mine completion, ensure no introduction of new species of weeds, plant pathogens or pests (including feral animals), nor sustained increase in abundance of existing weed or pest species in the Land compared to adjoining land	Section 7.5, 8.1.3 & 8.1.4
5	***Soil and Land Disturbance*** The Tenement Holder must, in construction, operation and post mine completion ensure that the existing (pre-mining) soil quality and quantity is maintained	Section 7.6 & 8.1.5
6	***Public Safety*** The Tenement Holder must, in construction and operation, ensure that post mine the risks to the health and safety of the public so far as it may be affected by mining operations are as low as reasonably practicable.	Section 7.13 & 8.1.12
7	***Visual Amenity*** The Tenement Holder must, in construction, operation and post mine completion, ensure that the form, contrasting aspects and reflective aspects of mining operations are visually softened to blend in with the surrounding landscape	Section 7.11 & 8.1.10
8	***Traffic*** The Tenement Holder must, in constructing and operating this Mineral Lease, ensure that there are no traffic accidents involving the public at mine access points that could have been reasonably prevented by the Tenement Holder	Section 7.12, 7.13. 8.1.11 & 8.1.12
9	***Third-party Property***	Section 7.14 & 8.1.13

	The Tenement Holder must during construction, operation and post mine completion, ensure that there are no adverse impacts to third-party land use on property adjacent to and on the Land as a result of mining operations, other than those agreed between the Tenement Holder and the affected user	
10	***Aboriginal and European Heritage*** The Tenement Holder must, in construction and operation, ensure that there is no disturbance to Aboriginal or European heritage sites, objects or remains unless prior approval under the relevant legislation is obtained	Section 7.15 & 8.1.14
11	***Mine Closure and Rehabilitation*** The Tenement Holder must demonstrate to the satisfaction of the Director of Mines that the following mine closure outcomes (in so far as they may be affected by mining operations) are expected to be achieved and sustained after mine closure: 11.1) all mine waste materials left onsite are chemically and physically stable 11.2) the site is physically stable.	Section 7.19, 8.3 & 9.2

11. REFERENCES

Australian Bureau of Statistics (ABS) 2011, Census

Cooe Pty Ltd 2013*, Vegetation Assessment of ML6314 and the Surrounding Area, Significant Environmental Benefit (SEB), November 2013,* unpublished report prepared for Arrium Mining

Cooe Pty Ltd 2015, *Peculiar Knob Iron Ore Project, Annual Compliance Monitoring of Native Vegetation for 2015, November 2015*, unpublished report for Arrium Mining.

Department of Industry Resources (DoIR) 2006a. Mining Environmental Management Guidelines, Mining in Arid Environments

Department of Industry Resources, 1997. Safety Bund Walls Around Abandoned Open Pit Mines Guideline.

Department of Industry Tourism and Resources – DITR 2007. Managing acid and metalliferous drainage: Leading practice sustainable development program for the mining industry. February 2007.

DMITRE 2012, 'Ministerial Determination 005 - Minimum information required to be provided in a mining proposal or management plan for a mineral lease (ML) and any miscellaneous purposes licence (MPL) applications for metallic and industrial minerals (excluding extractive minerals, coal and uranium)', July 2012.

EBS 2007, *Flora and Fauna Assessment, Peculiar Knob, March 2007*, unpublished report to Parsons Brinckerhoff Australia, EBS Adelaide

EBS 2009, *Biodiversity Assessment of the Proposed Peculiar Knob Haul Road and Associated Infrastructure – Alternative Alignment*, July 2009, unpublished report to Parsons Brinckerhoff Australia, EBS Adelaide.

Environment Protection Authority (EPA) 2007, *South Australian Bunding and Spill Management Guidelines*, EPA.

Environment Protection Authority 2007, *South Australian Guidelines for Separation Distances*.

EPA Guideline 080/04, 2007. Environment Protection Authority (2007). South Australian Bunding and Spill Management Guidelines.

Ecological Horizons 2015, *Peculiar Knob Fauna Monitoring Program*, November 2015, unpublished report prepared for Southern Iron Pty Ltd

Environment Protection Authority 2019, Environmental Management of Landfill Facilities-Solid Waste Disposal

Global Acid Rock Drainage (GARD) Guide. International Network for Acid Prevention (INAP) 2009. https://www.researchgate.net/publication/226280864_The_global_acid_rock_drainage_guide_GARD_Guide

Golder Associates Pty Ltd 2011, *Peculiar Knob WRD – Schedule and PAF, Technical Memorandum*, 30 May 2011, Document No. 117661020-001-TM-Rev 0, unpublished document prepared for WPG Resources, South Australia

Golder 2018, *In-situ material testing and laboratory testing for the Peculiar Knob waste dump factual report*, Document No. 18110551-001 R Rev0, 4 December 2018, unpublished report for SIMEC Mining

Holmes Air Science 2008, *Air Quality Impact Assessment: Proposed Crushing Plant and Barge Loader for a New Iron Ore Deposit near Coober Pedy*, May 2008 unpublished report prepared for Western Plains Resources

Jacobs 2018, *Peculiar Knob AMD Geochemical Validation Study,* Document No. IW153100-RP-Final Rev 0, 16 March 2018 unpublished report prepared for SIMEC Mining

Jacobs 2020, *Peculiar Knob Waste Rock Dump Concept Design: PEPR Chapter - Waste Rock Dump Management*, IH189000-REP-PEPR_Report-Rev1 | 001, 27 April 2020, unpublished report for Peak Iron Mines

LBW Environmental Projects 2016, *PAF Cell monitoring during mothballed state – Independent Verification*, October 2016, unpublished report to Arrium Mining, LBW Environmental Projects, Adelaide.

Ministerial Council on Mineral and Petroleum Resources (MCMPR) 2005, p6

MEND (Mine Environment Neutral Drainage) 2001. Mine Environment Neutral Drainage (MEND) Manual. Version 5.4.2a. March 2001.

MEND (Mine Environment Neutral Drainage) 2004. Design, construction and performance monitoring of cover systems for waste rock and tailings, report 2.21.4, vols. 1–5, edited by O'Kane Consultants Inc., MEND, July, http://mend-nedem.org/category/prevention-and-control/.

Mining Plus 2013, *Peculiar Knob New Northern Extended Waste Rock Dump Design*, 15 April 2013, unpublished Memorandum to Arrium Mining, South Australia.

Mining Plus 2013a, Arrium – *Southern Iron, Peculiar Knob PEPR Support Project - Approved Lease Waste Capacity Review*, Document No. MCARRP22-MDDS-003 Rev 3.2, 30 April 2013, unpublished report prepared for Arrium Mining, South Australia.

Morris, B. J., Davies, M. B., & Newton, A. W. (1998). Iron ore deposits of the northern Gawler Craton. Geology of Australian and Papua New Guinea Mineral Deposits. Australasian Institute of Mining and Metallurgy, Monograph Series, 22, 401-406.

Nature Foundation SA, 2011/2012 Annual Report, https://www.naturefoundation.org.au/publications/annual-reports/nf-annual-report-fy1112.pdf

NSW Department of Primary Industries DPI-MR Rehabilitation Cost Calculation Tool (ESB26/V1.7)

Parsons Brinckerhoff (PB) 2007. Peculiar Knob Iron Ore Project, Supporting Document for Mining Lease Application. Document No. 07-0246-02-2102717A. 2 August 2007. Prepared for Western Plains Resources Limited.

Parsons Brinckerhoff 2013, *Peculiar Knob Iron Ore Mining Project – Mining and Rehabilitation Program (MARP)*, unpublished report for Southern Iron Pty Ltd.

Pells Sullivan Meynink 2008, *Western Plains Resources, Peculiar Knob, Updated Geotechnical Design Criteria, Report PSM1096.R4, September 2008*, unpublished report prepared for Western Plains Resources, PSM NSW

Peter O'Bryan & Associates 2020, *Peculiar Knob Open Pit Mining Geotechnical Assessment of Waste Rock Landform Location*, May 2020, unpublished report prepared for Peak Iron Mines Pty Ltd

PIRSA 2005*, Guidelines for a Native Vegetation Significant Environmental Benefit Policy for the clearance of native vegetation associated with the minerals and petroleum industry.*

Rocktest Consulting 2014, *Peculiar Knob Waste Rock Dump Offset Assessment, May 2014*, Version 1, 21 May 2014, unpublished report prepared for Arrium Mining, South Australia.

Rockwater Proprietary Limited 2008, *Groundwater Testing at Hawks Nest Area for Peculiar Knob Project SA*.

Rockwater Proprietary Limited 2010, *Groundwater Testing Near Peculiar Knob Project SA*.

Rockwater Proprietary Limited 2011a, *Peculiar Knob Project, SA Penrhyn Borefield Groundwater Testing and Evaluation of Potential Pumping Effects*

Rockwater Proprietary Limited 2011b, *Peculiar Knob Project, SA Accommodation Camp Borefield Groundwater Testing and Evaluation of Potential Pumping Effects*

Safety Bund Walls Around Abandoned Open Pit Mines Guideline, (Department of Industry Resources, WA, 1997)

South Australian Mine Rehabilitation Liability Calculator Tool (Version 4.01)

Standards Australia 2007, Australian Standard AS 1170.4-2007 Structural Design Actions Part 4: Earthquake Actions in Australia

Southern Iron Pty Ltd 2011, Topsoil Management Plan and Procedure

Tongway, D and Hindley, N.L 2004, *Landscape Function Analysis, Procedures for Monitoring and Assessing Landscapes,* CSIRO Australia 2004, (updated February 2005).

World Health Organisation (WHO), 1999 Hazard Prevention in the Work Environment: Airborne Dust, accessed 27 April 2020: https://www.who.int/occupational_health/publications/en/oehairbornedust3.pdf

Appendix A

Key Maps and Figures

Appendix B

Geotechnical Reports

B-1: Rocktest Consulting 2014, Peculiar Knob Waste Rock Dump Offset Assessment, May 2014, Version 1, 21 May 2014, unpublished report prepared for Arrium Mining, South Australia

B-2: Jacobs 2020, Peculiar Knob Waste Rock Dump Concept Design: PEPR Chapter - Waste Rock Dump Management, IH189000-REP-PEPR_Report-Rev1 | 001, 27 April 2020, unpublished report for Peak Iron Mines

B-3: Jacobs 2018, Peculiar Knob AMD Geochemical Validation Study, Document No. IW153100-RP-Final Rev 0, 16 March 2018 unpublished report prepared for Peak Iron Mines

B-4: Pells Sullivan Meynink 2008, Western Plains Resources, Peculiar Knob, Updated Geotechnical Design Criteria, Report PSM1096.R4, September 2008, unpublished report prepared for Western Plains Resources, PSM NSW

Appendix C

WRD cross sections and long section

C-1: Northern WRD cross sections and long section

C-2: Updated pit and WRD design figures

Appendix D

WRD Slope Stability and PAF Schedule

Golder Associates Pty Ltd 2011, *Peculiar Knob WRD – Schedule and PAF, Technical Memorandum*, 30 May 2011, Document No. 117661020-001-TM-Rev 0, unpublished document prepared for WPG Resources, South Australia

Appendix E

Flora and Fauna Assessment

E-1: EBS Ecology 2007, *Flora and Fauna Assessment, Peculiar Knob, March 2007,* unpublished report to Parsons Brinckerhoff Australia, EBS Adelaide

E-2: Cooe Pty Ltd 2013, *Vegetation Assessment of ML6314 and the Surrounding Area, Significant Environmental Benefit (SEB), November 2013*, unpublished report prepared for Arrium Mining

Appendix F

Defence Agreement

Appendix G

Consultation Comments on Mining Lease Proposal

Appendix H

EPBC Approval

H-1: Expansion of the Peculiar Knob Iron Ore Project, SA (EPBC 2014/7154), dated 29/07/2014

H-2: Expansion of the Peculiar Knob Iron Ore Project, SA (EPBC 2014/154)-Variation of the conditions attached and extension of the period of effect of the approval- dated 28 April 2020, Ref: 2014/7154)

H-3: Notification of Extension of the period of effect of approval (EPBC 2014/7154), dated 28 April 2020

H-4: Variation of conditions attached to approval (EPBC 2014/7154), dated 28 April 2020

Appendix I

PAF Cell Monitoring During Mothballed State – Independent Verification

LBW Environmental Projects 2016, *PAF Cell monitoring during mothballed state – Independent Verification*, October 2016, unpublished report to Arrium Mining, LBW Environmental Projects, Adelaide.

Appendix J

Environmental Inspection Form

Appendix K

Mining Lease Conditions