



CHPP & Rail Amendment Supporting Information for Application to Amend EA 0002912

for the Vulcan Coal Mine

December 2021

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1 INTRODUCTION

Mining and Energy Technical Services Pty Ltd (METServe) has been engaged by Vitrinite Pty. Ltd., owner of Qld Coal Aust No.1 Pty. Ltd. and Queensland Coking Coal Pty. Ltd. (Vitrinite) to prepare an application to amend Environmental Authority EA0002912.

This document provides a description of the proposed amendments to the approved Vulcan Coal Mine (VCM) and forms the basis of environmental assessment and management outcomes.

2 CURRENT APPROVED OPERATIONS

2.1 PROPONENT

Queensland Coking Coal Pty Ltd (QCC) and Queensland Coal Aust No. 1 (QCA1) are the joint EA and ML holders. Vitrinite is majority owner of QCC and QCA1.

2.2 PROJECT OVERVIEW

Vitrinite holds approved Environmental Authority (EA0002912) and holds Mining Lease (ML 700060) authorising the extraction of black coal, quarry material and crushing and screening activities. The regional location is presented in **Figure 1**.

The VCM is approved to operate for approximately 4 years and extracting approximately 6 Million tonne (Mt) of Run of Mine (ROM) hard coking coal at a rate of up to 1.95 Million tonnes per annum (Mtpa). The Project will target the Alex and multiple Dysart Lower coal seams. Truck and shovel mining operations will be employed to develop the pit. ROM coal is currently approved to be trucked off site for toll washing.

A small out-of-pit waste rock dump will be established prior to commencing in-pit dumping activities that will continue for the life of the operation. Ancillary infrastructure, including a ROM pad, Mine Infrastructure Area (MIA), offices, roads and surface water management infrastructure have been established on site.

A realignment of the existing Saraji Road and services infrastructure to the eastern boundary of the Mining Lease area, adjacent to the existing rail easement, is also approved. The re-alignment will occur on lease; however, the connection back to the existing alignment of Saraji Road to the north will extend off lease and is approved through an alternative process under the Land Act, 1994.

In-pit dumping will fill the majority of the pit during operations with the remaining final void to be backfilled upon cessation of mining, resulting in the establishment of a low waste rock dump landform over the former pit area. The initial out-of-pit waste rock dump will be rehabilitated in-situ.



See Inset

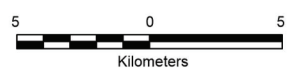
10SP208611

DYSART

- LEGEND**
- Mining Lease 700060
 - Mineral Development Licence 3039
 - Lot 10 Plan 208611
 - Railway
 - Road

Survey Area, Amended ML Boundary - MetServe (2019); MLA - Vitrinite (2019); Imagery - ESRI, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community.

Vitrinite
Vulcan Complex Project
Project Location



Scale: 1:200,000 (A4)

16/02/2021
Datum: GDA94
Projection: MG455

FIGURE 1

3 PROPOSED AMENDMENT

3.1 OVERVIEW

The proposed amendment primarily includes the establishment of a Coal Handling and Preparation Plant (CHPP), Train Load-out facility (TLO) and a dedicated rail loop on ML700060. Establishment of this infrastructure at the VCM Project provides Vitrinite with a reliable and secure mechanism for transport of its coal to market. Ancillary infrastructure will include product stockpiles, updated water management infrastructure, access roads and a number of minor amendments to existing infrastructure layouts. **Figure 2** presents the proposed amended Project layout.

Construction of the CHPP, TLO and the rail loop, is expected to be completed within 18 months. Once commissioned, operation of the CHPP, TLO and rail loop will replace the current approved road haulage of ROM coal to third party processing facilities, which will continue in the interim period.

The amendment will significantly reduce heavy vehicle traffic on the road network in the latter stages of the project. It is also important to note that only dry tailings, rather than wet tailings, will be produced and stored at the VCM.

The amendment will necessitate the inclusion of the following additional ERA in EA0002912:

ERA 31- Mineral Processing (2) processing, in a year, the following quantities of mineral products, other than coke - (b) more than 100,000t.

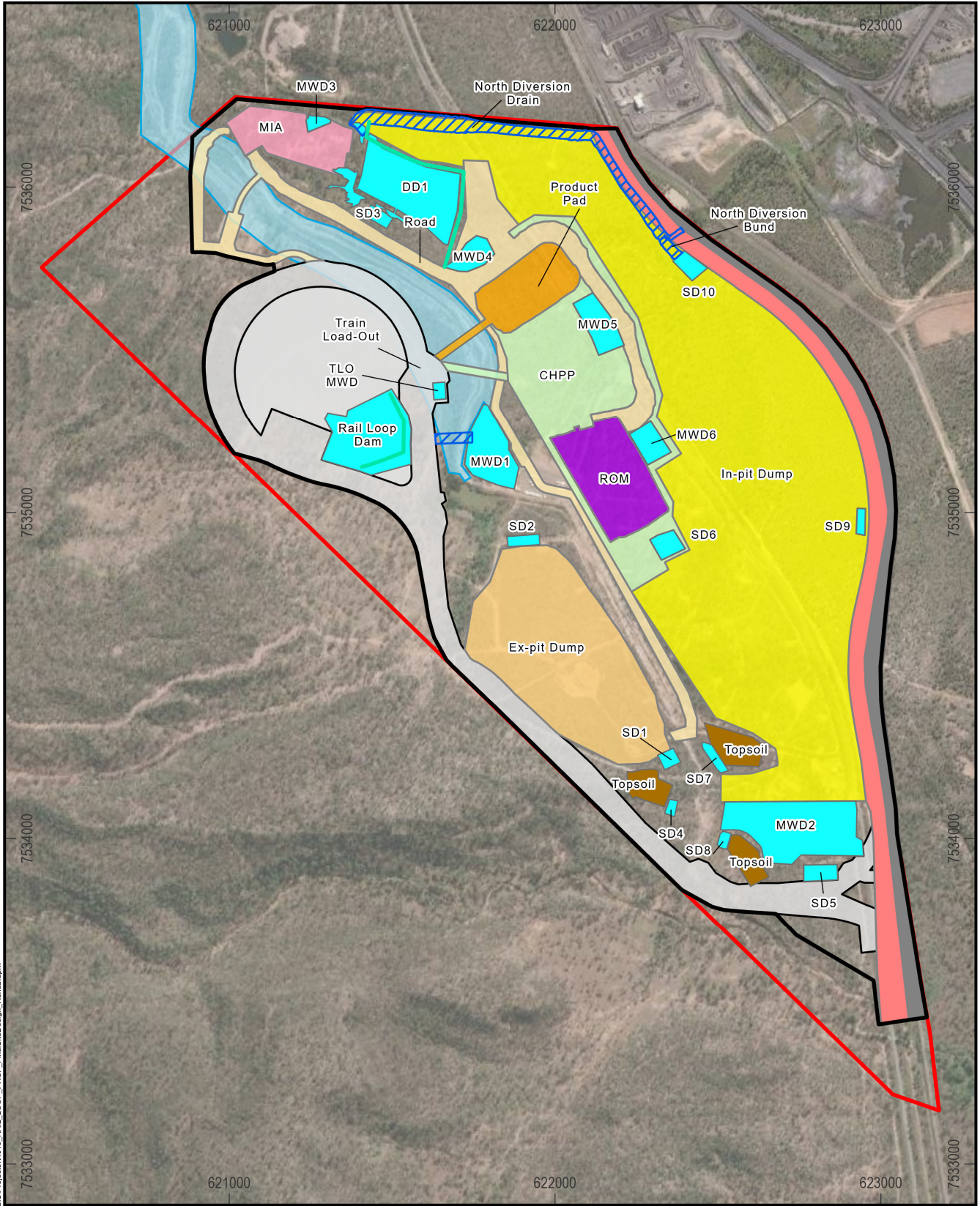
3.2 CHPP

The Project will include a modular CHPP to process ROM coal into a number of marketable products (coking coal and thermal coal). In summary the CHPP will operate as follows:

- Haul trucks will deliver ROM coal from the pit to the ROM hopper. The trucks will dump directly into the ROM hopper or onto the 100 kt ROM stockpile for reclaim by a front end loader.
- The raw coal will be sized before being conveyed to a 300 t raw coal surge bin before being fed to the CHPP at up to 550 t/h.
- The CHPP will be an open steel structure. Coal will be processed through three circuits to produce a primary and secondary product (metallurgical and thermal).
- Tailings will be dewatered in a tailings treatment facility to produce a dry tailings product. Recovered water will be recirculated to the process plant for reuse.
- Coarse, fine and dry tailings will be conveyed to a reject bin, where it will be trucked loaded into trucks for placement within active waste rock dumps (primarily within the in-pit dump).
- Products will be conveyed and stacked on the product coal stockpiles. Product coal will be reclaimed via dozer push into coal valves and conveyed to the TLO.

The revised infrastructure area is presented in **Figure 2** and identifies the general layout of the ROM stockpile, CHPP, Product stockpile, TLO and Rail. Connecting conveyors and road networks also traverse this area. Key water management infrastructure (dams) is also presented on **Figure 2**. The Surface Water Management Assessment Report (**Appendix 1**) provides further detail on the design and functionality of the revised water management system.

The CHPP will operate 24 hours a day, seven days per week.



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Legend	
	ML700060 Boundary
	VCM Revised Maximum Disturbance Footprint
	Dam Wall
	Water Pipeline Corridor
	Water Management
Infrastructure	
	CHPP
	Ex-pit Dump
	In-pit Dump
	MIA
	Dam
	Rail
	ROM
	Rail Loop
	Road
	Saraji Road
	Stockpile
	Train Load-Out Product Pad

Vulcan Coal Mine Site Layout

Meters

Scale: 1:17,000 (A4)

6/12/2021

Datum: GDA94
Projection: MGA55

VITRINITE
BRIGHTER COAL

METSERVE
Mining & Energy Technical Services Pty Ltd

FIGURE 2

Source: State of Queensland (Department of Resources) 2021, Vitrinite 2019-2021, METServe 2021, Maxar.

The CHPP is anticipated to operate for the final 2 years of the current approved VCM and is anticipated to produce the material quantities presented in **Table 1**.

Table 1 Indicative Schedule

Year	Total ROM Coal (tpa)	Total Waste Rock (tpa)	Total anticipated coal (ROM coal) - toll wash (tpa)	Total anticipated product coal – wash on site (tpa)	Total rejects/ dry tailings produced on site (tpa)
1	959,000	3,477,000	959,000		
2	1,506,000	6,627,000	1,506,000		
3	1,698,000	6,185,000		985,000	713,000
Total	4,163,000	16,289,000	2,465,000	985,000	713,000

3.2.1 Water Demand, Supply and Management

The addition of the CHPP will increase the site water demand. Vitrinite has secured supply from the Bingegang pipeline which will supply supplementary water demands as required. Vitrinite also has approval to receive mine affected water from neighbouring mine sites.

A key objective of the mine site water management system is to reuse surface water from coal processing and runoff captured within the mine affected water system. Recycling mine water will reduce the required volume of water from external sources.

3.2.2 Power Supply

Initial power supply for the CHPP will be provided via increased Genset capacity. In future, Vitrinite may seek to establish connection to the local grid supply, sourced from Dysart substation.

3.2.3 Processing Wastes

All processing wastes, including reject material and dry process tailings, will be stored within active waste rock dumps (primarily the in-pit dump), removing the requirement for a tailings storage facility at the site. Priority will be given to disposal of processing wastes within in-pit dumps at depth; however scheduling constraints may necessitate storage of some material in out-of-pit waste rock dumps.

Overall, the Acid Base Accounting results confirm that most of the coal reject materials, represented by the samples tested, have relatively low sulphide content, excess ANC, and are classified as NAF. As a bulk mixed material, it is expected that coal reject will have a relatively low risk of generating acidic drainage. On this basis, co-disposal of coarse and fine reject materials and subsequent disposal within cells in waste rock materials is likely to be beneficial and eliminate any residual risk (RGS, 2020). This is because coal reject materials typically remain moist and any oxidation will only occur at surface (i.e., the fine reject will fill the gaps between the coarse reject particles and generally limit oxygen ingress). The coarse reject would also provide some geotechnical stability to the mixed reject cell structure. The in-pit disposal of mixed coarse and fine reject materials within waste rock cells is also a low risk strategy as the much larger volume of waste rock typically has very low sulphur content and excess ANC. This mining waste management strategy is currently used at a number of coal mines in the Bowen Basin (RGS, 2020).

Waste water will be recycled within the CHPP circuit to minimise raw water demand and storage and disposal requirements.

3.3 RAIL LOOP AND TRAIN LOAD-OUT FACILITY

The TLO will be positioned on the eastern side of the loop, on the western side of the existing levee (**Figure 2**). Product coal will be transported by aerial conveyor, across the levee from the product stockpile to the TLO. Appropriate design controls will be incorporated to manage potential impacts on surface water systems from fugitive coal from the overpassing conveyor.

The TLO will link the product stockpiles with the proposed rail loop to load at a rate of 3,500 tph. The train load out facility will be managed via a fully automated system, including overload protection and load veneering. The facility will be positioned over the rail line and will incorporate a suitable under rail spillage pit.

Water for the TLO demand is proposed to be sourced from the mine dams. A nominal TLO demand of 0.05 ML/d (200 kL/d) was assumed.

The rail loop will connect to the existing network in the south east of the Mining Lease and will traverse the south western boundary of the ML. The loop is positioned in the western portion of the ML, between the ML boundary and the existing BMA flood levee that runs north-south through the ML. The loop will require approximately 4.5 km of rail to be located on the ML. A number of areas of cut and fill will be required along the alignment to facilitate required grades.

Controlled level crossings are proposed where the rail line will cross Saraji Road and connect to the existing Goonyella rail network.

Product coal will be railed from the Project rail loop onto the Goonyella Rail network. Export options include Dalrymple Bay to the north and the RG Tanna terminal, in Gladstone, to the south.

3.4 WATER MANAGEMENT INFRASTRUCTURE

The approved site water management system has been updated to incorporate the proposed project layout amendments (refer **Figure 2**). The updated water management system will be designed in accordance with the current approved water management objectives, which are:

- separate diverted water from mine affected water to ensure that up catchment water and mine affected water do not mix wherever practicable;
- capture of mine affected runoff (e.g. mine industrial area, CHPP, Product/ROM, pad workshop runoff), storage and priority reuse as mine water supply;
- divert up-catchment water runoff from upstream catchments around the active mining area;
- limit external catchment runoff draining into pits;
- manage sediment from disturbed catchment areas (e.g. out-of-pit waste rock emplacements, cleared/pre strip areas) by using erosion and sediment control (ESC) measures prior to release offsite;
- reuse onsite water (e.g. mine affected water) where possible to support mine operational water demands (and therefore limit mine affected water inventories under normal operating conditions); and
- manage any mine affected water releases to the receiving environment to meet environmental release conditions (not proposed).

Additional infrastructure areas will be serviced by new mine affected water dams with other disturbances managed via an updated ESC Plan.

3.5 ACCESS ROADS

Additional access and service tracks are proposed to be established on the western side of the levee to provide access to the TLO and to the rail loop infrastructure. Levee crossings will be appropriately designed to maximise safe access whilst not unacceptably affecting levee functionality.

3.6 WORKFORCE

The proposed CHPP and rail loop will require a construction workforce of approximately 130 people for a period of 18 months.

The operational workforce will increase to approximately 27 permanent staff. The mining contractor positions are expected to remain the same at 53.

Overall the project operational workforce will decrease by 36 fte positions due to the addition of the CHPP, TLO and Rail personnel and the removal of approximately 40 fte road haulage positions.

3.7 AMENDMENTS TO APPROVED INFRASTRUCTURE

The addition of the CHPP, TLO and rail loop will necessitate the re-positioning/ realignment of some of the existing approved project infrastructure. This is discussed in the following sections.

3.7.1 Infrastructure Area

As discussed above, the project infrastructure area has been reconfigured to facilitate logical flow of material and to best suit the geographical constraints of the site (levee and advancing open pit). The revised layout is presented in **Figure 2**.

3.7.2 Water Management System

As discussed above, the water management system layout has been reconfigured to manage the revised infrastructure layout and associated runoff types. The revised layout is presented in **Figure 2** and a comparison between the approved layout and the proposed layout is presented in **Figure 3**. Further information on the water management system is provided in **Appendix 1**.

3.7.3 Explosives Magazine

The existing approved explosives magazine will not be established in the previously proposed and approved location in the western portion of the Mining Lease. This area is now required to facilitate construction and operation of the rail loop and required exclusion zones can no longer be maintained. Instead, explosives will be delivered to site on an as-needs basis with no long term storage on site proposed.

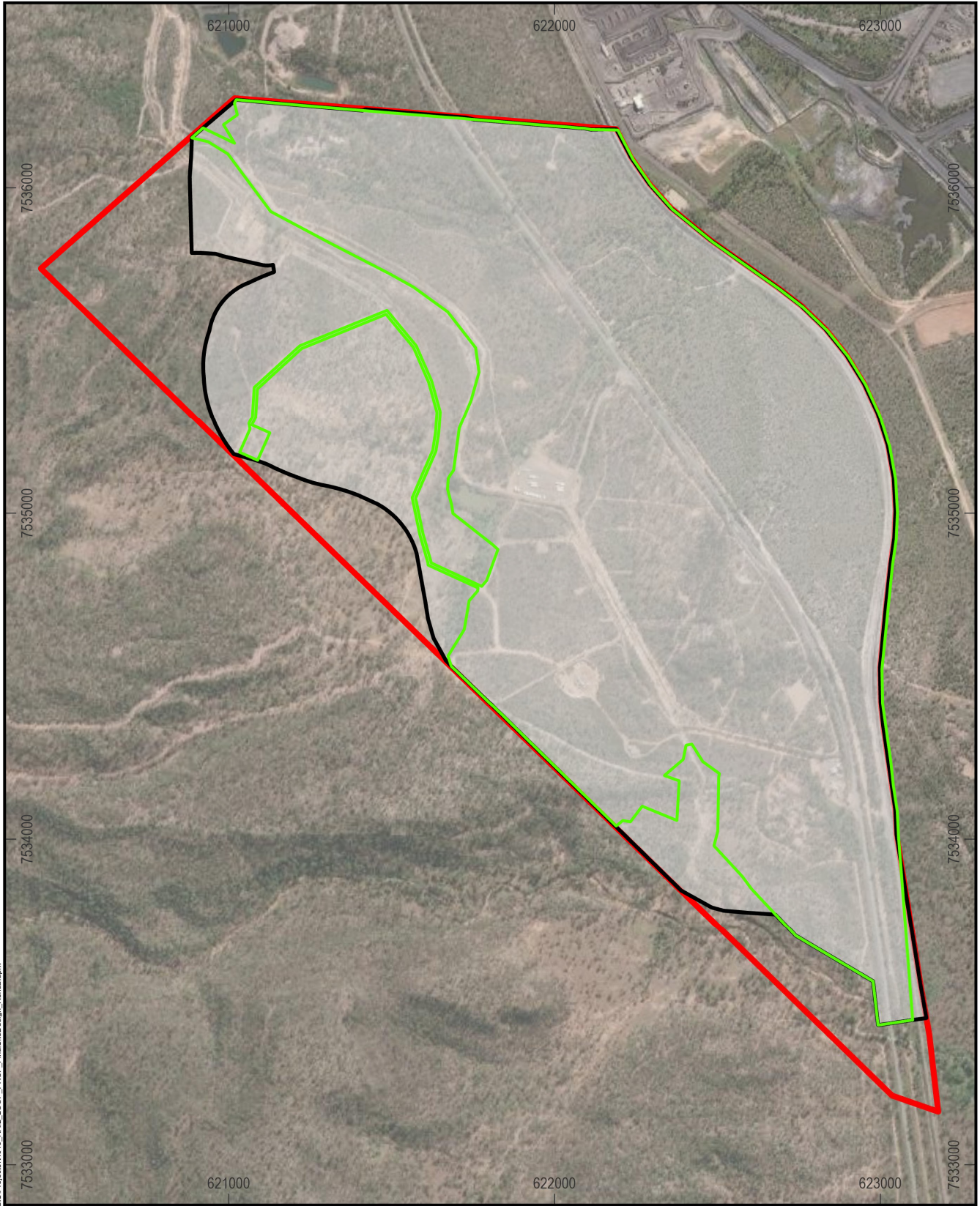
3.8 AMENDMENTS TO APPROVED ACTIVITIES

The addition of the proposed CHPP, TLO and rail operations will mean that the loading and haulage of ROM coal will no longer be required. This will reduce heavy vehicle road traffic along Saraji Road and the Peak Downs Highway by an average of 80 truck movements per 24 hours each way.

3.9 REHABILITATION AND CLOSURE

The current approved Progressive Rehabilitation and Closure Plan (PRCP) has been updated to address the decommissioning and rehabilitation of the proposed additional infrastructure and disturbance and the changes to previously proposed infrastructure and disturbance.

For the purposes of this application and the PRCP, it is assumed that all infrastructure will be removed upon cessation of the VCM. Should additional coal resources be identified, it is anticipated that the infrastructure would be retained for further use.



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Legend

- VCM Revised Maximum Disturbance Footprint
- VCM Authorised Maximum Disturbance Footprint
- ML700060 Boundary

Vulcan Coal Mine

Previously Approved Footprint vs Project Amended Footprint



Meters

Scale: 1:17,000 (A4)

30/11/2021



Datum: GDA94
Projection: MGA55



Figure 3

Source: State of Queensland (Department of Resources) 2021, Vitrinite 2019-2021, METServe 2021, Maxar.

4 PROPOSED CHANGES TO ENVIRONMENTAL AUTHORITY EA0002912

The following section outlines any changes that are proposed to EA0002912 to allow for the proposed amendment which primarily includes the establishment of a Coal Handling and Preparation Plant (CHPP), Train Load-out facility (TLO) and a dedicated rail loop on ML700060.

The amendment will necessitate the inclusion of the following additional ERA in EA0002912:

ERA 31- Mineral Processing (2) processing, in a year, the following quantities of mineral products, other than coke - (b) more than 100,000t.

4.1 SCHEDULE A: GENERAL

Condition A2: an update to the figure in Appendix 1 Project Layout – Authorised Disturbance Areas with the layout presented **Figure 2** of this document is required to depict the proposed Site Layout and maximum disturbance footprint. This could be relabelled Appendix 1. Site Layout – Authorised Disturbance Areas.

No further changes to Schedule A are proposed.

4.2 SCHEDULE B: AIR

No changes are proposed to Schedule B.

4.3 SCHEDULE C: WASTE

No changes are proposed to Schedule C.

4.4 SCHEDULE D: NOISE AND VIBRATION

No changes are proposed to Schedule D.

4.5 SCHEDULE E: GROUNDWATER

No changes are proposed to Schedule E.

4.6 SCHEDULE F: SURFACE WATER

Table F1: Water Release Locations from Sediment Dams: an update to the table is required to align with the proposed Site layout.

Condition F27: the label of Appendix 1 requires update to Site Layout – Authorised Disturbance Areas.

4.7 SCHEDULE H: LAND

No changes are proposed to Schedule H.

5 DESCRIPTION OF ENVIRONMENTAL VALUES, POTENTIAL IMPACTS AND MITIGATION MEASURES

5.1 LAND

The Project has been developed on mining lease (ML) 700060, which covers an area of approximately 407 hectares (ha) and is situated over underlying tenures (EPC 1732 and EPC 1234). A list of the properties, tenure, usage and landowners with the ML boundary are outlined in **Table 2** below.

The Project falls within the Isaac Regional Council local government area, which has a distinct mining influence with multiple significant coal mining operations in the immediate vicinity of the mine.

Table 2: Land Tenure and Real Property Descriptions for the Mine

Lot/Plan	Tenure	Usage	Owner	Area (ha)
10/SP325345	Lands Lease	Extractive	BHP/Mitsubishi Alliance (BMA)	369
26/CNS125	Lands Lease	Rail Freight Transport	Aurizon	13
Saraji Road	Roads Reserve	Road for Public Use	Isaac Regional Council	25

The Mine lies on plains and foot slopes along the eastern edge of the Harrow Range. The Harrow Range (immediately west of the Mine) is generally 100-170 meters higher than the surrounding plain. The plain itself slopes gently towards the east, and varies in elevation from 270 mAH on the west to 250 mADH in the east.

As described in the Progressive Rehabilitation and Closure Plan (PRC Plan) for the Project, the post-mining land use (PMLU) for the disturbed areas of the Project is low intensity cattle grazing. As this was the pre-mining land use and stakeholder consultation during the development of the PRC Plan confirmed stakeholder support of cattle grazing as the PMLU, there is no proposed change to the final landform.

Further discussion regarding environmental values of land, including terrestrial ecology, soil and land use are provided below in Sections 5.2 and 5.3 below.

5.2 TERRESTRIAL ECOLOGY

As part of the initial EA application (APP0051420) for the VCM, a Terrestrial Ecology Assessment was undertaken (METServe 2020) and presented as part of the application supporting information. The assessment was based on a combination of field surveys and a review of past records of matters of environmental significance from the general region. Field surveys were undertaken in 2018-2019, spanned multiple seasons, and covered a much broader region (6,566.5 ha) than the Mining Lease (ML700060) area for the Project (407.3 ha).

Based on the above assessment, a desktop ecological impact assessment has been undertaken to assess the impacts of the revised VCM layout, with the inclusion of a CHPP, TLF, dedicated rail loop and ancillary infrastructure, on ML700060. The impact assessment re-assesses the revised project footprint (i.e., the approved footprint and the additional disturbance area required by the amendment) against the baseline ecological data presented by METServe (2020). It is essential to note that the underlying Bulk Sample Project footprint does not form part of the VCM ecological assessment, but its features are assumed to form part of baseline conditions for the purposes of environmental assessment of the VCM. This is important when considering potential offset requirements for the VCM, as the Bulk Sample Project has already been referred and assessed for offsets. Further detail regarding the requirement for offsets for the revised project has also been provided.

The Terrestrial Ecology Assessment is provided in **Appendix 2**. A summary is provided below.

5.2.1 Environmental Values

A detailed description of the environmental values of the VCM and larger survey area are outlined in Section 4 of the Terrestrial Ecology Assessment for the VCM (METServe 2020). Environmental values are summarised below for the proposed disturbance area.

The revised VCM footprint is located within the Brigalow Belt bioregion. Habitats within the entire ML area have been heavily modified by past cattle grazing and clearing. No new regional ecosystems will be disturbed as a result of the revised project footprint with the composition of the regional ecosystem vegetation listed in **Table 3** and displayed in **Figure 4**.

Table 3: Regional Ecosystems within the Mining Lease

Regional Ecosystem	Description
11.10.3	<i>Acacia shirleyi</i> open forest on coarse-grained sedimentary rocks. Crests and scarps.
High-value regrowth 11.3.25	<i>Eucalyptus camaldulensis</i> forest fringing drainage lines.
High-value regrowth 11.5.9	<i>Eucalyptus crebra</i> and other <i>Eucalyptus</i> spp. and <i>Corymbia</i> spp. woodland on Cainozoic sand plains and/or remnant surfaces.
High-value regrowth 11.10.3	<i>Acacia shirleyi</i> open forest on coarse-grained sedimentary rocks. Crests and scarps.
High-value regrowth 11.10.7	<i>Eucalyptus crebra</i> woodland on coarse-grained sedimentary rocks.
Non-remnant	Cleared pasture and young regrowth.

5.2.1.1 Biodiversity

Field surveys of the broader survey area detected 22 species of mammal, 133 species of bird, 34 species of reptile, 11 species of frog and 422 species of vascular plants across the region containing the VCM. Species accumulation curves fitted to the data suggested that the majority of biodiversity present onsite was detected during the broader surveys.

5.2.1.2 Weeds

A total of 56 species of non-native plants were recorded within the broader survey area. Of these, seven species of weeds present within the survey area are category 3 restricted matters under the *Biosecurity Act 2014*, which prohibits their sale, trade or spread. These restricted weeds are:

- *Cryptostegia grandiflora* (Rubber Vine);
- *Harrisia martinii* (Harrisia Cactus);
- *Hymenachne amplexicaulis* (Olive Hymenachne);
- *Jatropha gossypifolia* (Bellyache Bush);
- *Opuntia stricta* (Prickly Pear);
- *Opuntia tomentose* (Velvet Pear); and
- *Parthenium hysterophorus* (Parthenium).

5.2.1.3 Pest Animals

The following eight species of non-native animals were recorded within the broader survey area:

- Feral Cat (*Felis catus*)*;
- Red Fox (*Vulpes vulpes*)*;
- Dingo (*Canis lupus dingo*)*;
- European Rabbit (*Oryctolagus cuniculus*)*;
- House Mouse (*Mus musculus*);

- House Mouse (*Mus musculus*);
- Feral Pig (*Sus scrofa*)*;
- Cane Toad (*Rhinella marina*); and
- Common Myna (*Acridotheres tristis*).

Species marked with an asterisk are category 3, 4 and 6 restricted matters under the *Biosecurity Act 2014*. The Red Fox, Dingo and European Rabbit are also category 5 restricted matters under the *Biosecurity Act 2014*. Category 3 restricted matters must not be distributed or released, category 4 restricted matters must not be moved, category 5 restricted matters must not be kept, and category 6 restricted matters must not be fed.

5.2.1.4 Environmentally Sensitive Areas

No category A, B or C environmentally sensitive areas occur in or near the revised VCM area.

5.2.1.5 Groundwater-dependent Ecosystems

The revision of the project is not associated with any change to the risks to groundwater-dependent ecosystems. These risks remain negligible.

5.2.1.6 Protected Areas

No national parks, conservation parks, resource reserves, special wildlife reserves, nature refuges or coordinated conservation areas are located in or near the revised VCM area.

5.2.1.7 Marine Matters

No marine parks, marine plants or fish habitat protected under the *Fisheries Act 1994*, *Fisheries Regulation 2008* or the *Marine Parks Act 2004* are contained in the revised VCM area.

5.2.1.8 Designated Precinct in Strategic Environmental Areas

No strategic environmental areas are listed for the Isaac Regional Council area.

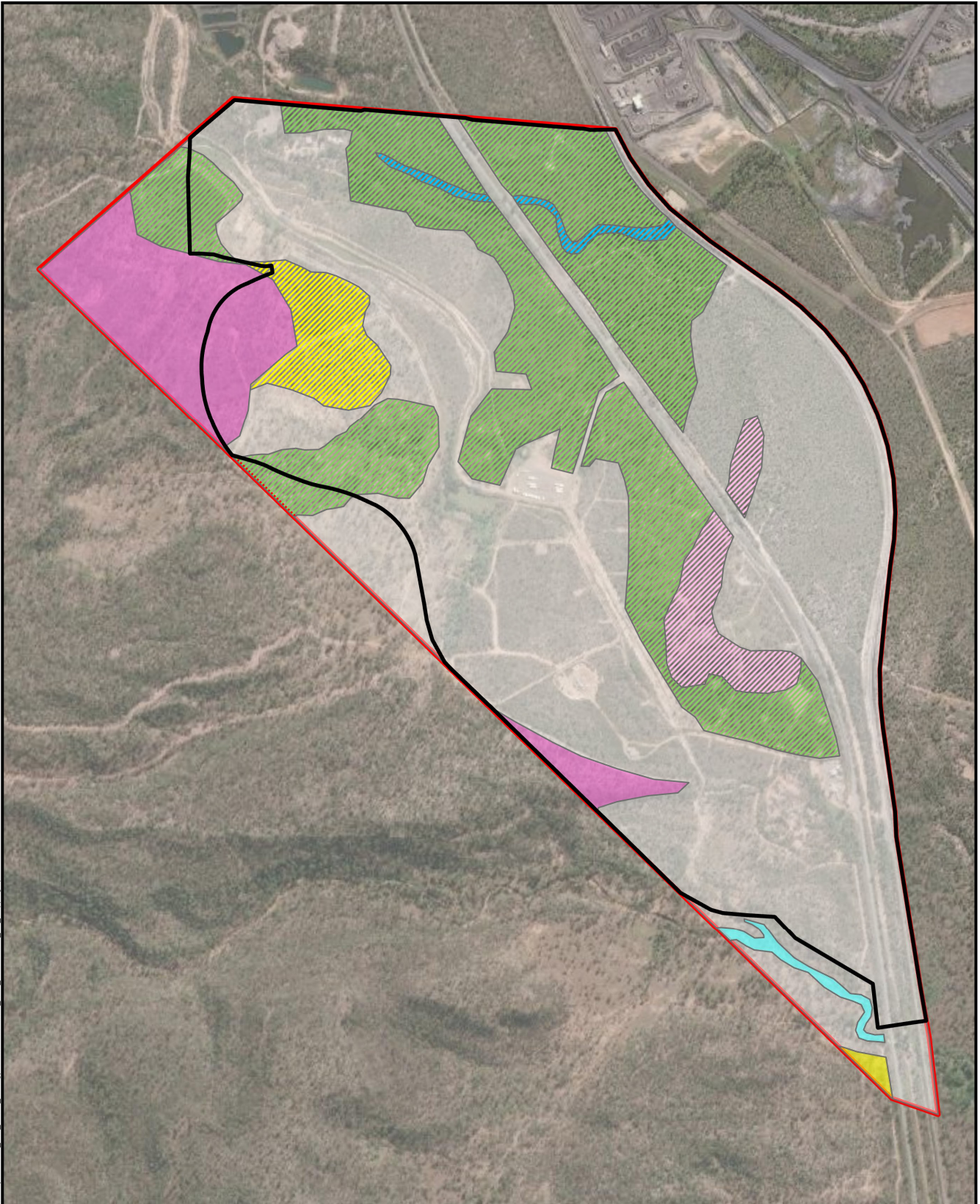
5.2.1.9 Wetlands and Watercourses

No wetlands or watercourses of high ecological significance are located within the revised VCM area.

5.2.1.10 Secured Offset Areas

No legally secured offset areas from other projects are located in or near the revised VCM area.

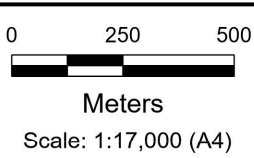
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- Legend**
- ▬ ML700060 Boundary
 - VCM Revised Maximum Disturbance Footprint
 - RE**
 - 11.10.3
 - 11.10.7
 - 11.3.25
 - HVR 11.10.3
 - HVR 11.10.7/11.10.3
 - HVR 11.3.25
 - HVR 11.5.9
 - non-rem

Source: State of Queensland (Department of Resources 2021; Vitrinite 2019, 2021; METServe 2020; Maxar.

Vulcan Coal Mine
Revised Project Footprint and Field Verified Regional Ecosystem Mapping



6/12/2021

Datum: GDA94
Projection: MGA55

Figure 4



5.2.2 Potential Impacts on Environmental Values

5.2.2.1 Clearing

The revised project footprint is 274.9 ha in area (an increase of 75.2 ha to that currently approved). Based on field-verified regional ecosystem mapping, a total of 13.1 ha of remnant vegetation (category B regulated vegetation), 88.8 ha of high-value regrowth (category C regulated vegetation) and 173 ha of cleared pasture is contained within the revised project footprint (an increase of 9 ha, 24.1 ha and 42.1 ha respectively, to that currently approved).

As it is for a resource activity under the *Environmental Protection Act 1994* (Section 107), the revised project footprint represents exempt clearing work under the *Vegetation Management Act 1999*. Nevertheless, any disturbance to vegetation classed as a prescribed matter may be subject to offsets.

No new vegetation categories will be disturbed as a result of the revised project footprint. The only vegetation category to be disturbed that qualifies as a matter of State environmental significance is category R, which occurs within 50 m of watercourses. However, offsets are not required for Category R vegetation as it is not a prescribed matter.

Overall, the only Regulated Vegetation that is a matter of State environmental significance to be disturbed by the revised project footprint is 15.1 ha of category R vegetation and 22.4 ha of watercourse vegetation (made up of category C or R). Neither of these is a prescribed matter and these impacts are therefore not subject to offsets.

5.2.2.2 Threatened Species

5.2.2.2.1 Koala

No primary habitat for Koalas will be removed as a result of the revised project footprint. The revised project footprint will result in 14.0 ha of secondary habitat and 72.3 ha of marginal habitat for Koalas being removed. This is 11.0 ha more secondary habitat and 13.1 ha more marginal habitat than that currently approved to be removed.

The removal of secondary and marginal habitat may qualify as a significant residual impact under the *Queensland Environmental Offsets Policy Significant Residual Impact Guideline*.

5.2.2.2.2 Greater Glider

No habitat for Greater Gliders will be removed as a result of the revised Project. The Project will not introduce any new barriers to dispersal for the Greater Glider, as continuous tracts of riparian habitat remain connected along all waterways in the survey area. All operational areas associated with lighting and/or noise (e.g., CHPP, TLO, mine pit, waste rock dump, mine offices) will be located further than 500m from this habitat. Any impacts to the species from lighting or noise are likely to be negligible due to the few trains utilising the loop (approximately five per week) and the reduction of rail speed within the rail loop.

5.2.2.2.3 Squatter Pigeon

The revised project footprint requires the clearing of 105.7 ha of primary habitat for Squatter Pigeons and 22.0 ha of secondary habitat for Squatter Pigeons. This is 44.6 ha more primary habitat and 6.2 ha more secondary habitat than that currently approved. No sources of water used by Squatter Pigeons are expected to be removed by the Project.

While attempts were made to position infrastructure away from habitat for the Squatter Pigeon, due to the large scale of this habitat across the local region, disturbance of this habitat could not be completely avoided. The revised project footprint was designed to avoid clearing a dam that the species uses for drinking. Furthermore, the overall Project footprint was minimised by utilising in-pit dumping of overburden.

Ecologically significant locations for threatened species in Queensland are defined by the *Queensland Environmental Offsets Policy Significant Residual Impact Guideline* as "breeding, feeding, nesting, migration or resting sites".

As habitat mapped for Squatter Pigeons can contain sites used for feeding and nesting, any disruption to this habitat could constitute a significant impact to the species, according to this guideline. The scale of this disruption is, however, very small relative to the total extent of “ecologically significant locations” available for the species locally.

5.2.2.2.4 Short-beaked Echidna

The removal of 274.9 ha (75.2 ha more than currently approved) of potential habitat for the revised project footprint therefore amounts to a loss of 2–5 territories. Given the extensive and continuous matrix of potential habitat to the west and south of the Project, these prescribed actions will have a negligible effect on local populations.

5.2.2.2.5 Other threatened Species

The additional threatened species below were also assessed as part of the revised project footprint and were considered to not be impacted:

- Rufous Fantail;
- Fork-tailed Swift;
- Ornamental Snake;
- Latham’s Snipe and Australian Painted-snipe;
- Common Death Adder;
- Red Goshawk;
- Yakka Skink;
- Annual Wiregrass;
- Ghost Bat;
- Dunmall’s Snake;
- Allan’s Lerista; and
- King Bluegrass.

5.2.2.2.6 General Impacts

Other potential general impacts have been considered but are deemed negligible:

- habitat fragmentation;
- edge effects;
- direct mortality;
- vehicle collisions;
- dust;
- groundwater drawdown;
- noise and vibration;
- waste;
- weeds and pest animals, and
- cumulative impacts.

5.2.3 Mitigation Measures

A detailed description of the mitigation measures proposed for the VCM and larger survey area are outlined in Table 5-3 of the Terrestrial Ecology Assessment for the Vulcan Coal Mine (METServe 2020). Mitigation measures are summarised below for the proposed disturbance area where applicable to potential impacts on environmental values.

- Vitrinite employees and contractors are to be made aware of environmental obligations and compliance requirements through a site induction program;
- the edges of the project footprint are to be marked out, to prevent unnecessary accidental clearing of neighbouring habitats;

- overburden is mostly to be returned to the mined pits, to limit the total disturbance footprint of the project;
- topsoil removed from each site in preparation for mining is to be stored and managed in accordance with a Progressive Rehabilitation and Closure Plan, to protect a favourable growing medium for vegetation post-mining;
- post-mine rehabilitation should aim for a post-mine land use with similar environmental values to those being lost (see the Progressive Rehabilitation and Closure Plan); clearing should occur in stages, to allow fauna the opportunity to exit the area;
- injured fauna is to be taken to the nearest wildlife carer or veterinarian;
- any injury and/or mortality is to be communicated to the Department of Environment and Science within 24 hours;
- Vitrinite employees and contractors will be made aware of environmental obligations and compliance requirements through the site induction program;
- putrescible waste is to be stored in animal-proof containers and removed from site; and
- all vehicles that will enter undisturbed parts of the site are to be washed and certified prior to arrival at the project site, to restrict the introduction of new weeds. Weed management activities will control weeds in high traffic areas.

5.2.4 Matters of National Environmental Significance

The only listed MNES relevant to the revised project footprint is, "Listed threatened species and ecological communities".

Prior to the revision of the Project, Vitrinite referred the Project to the Commonwealth Government Department of Agriculture, Water and the Environment (DAWE). As a controlled action, the Project is currently being assessed through Preliminary Documentation, which is in its final stages and approval is anticipated imminently. The Preliminary Documentation assessment revealed that, despite avoidance and mitigation measures to be taken, the Project is likely to have significant residual impacts on the following two listed threatened species:

- Squatter Pigeon (southern) (*Geophaps scripta scripta*) – Vulnerable; and
- Koala (*Phascolarctos cinereus*) (combined populations of Queensland, NSW and the ACT) – Vulnerable.

The revised project will likely result in further but minor residual impacts to the same two species', the Koala and Squatter Pigeon. No additional listed threatened species will be impacted. The additional potential impacts associated with these two species will be referred to DAWE under the EPBC Act.

Mitigation measures and residual impacts are discussed in the assessment report, however based on the environmental values present and the small duration of the project, ecological impacts are generally considered to be low.

5.2.5 Offset Requirements

Offsets are required if the residual impacts to prescribed matters, after avoidance and mitigation measures have been implemented, are considered significant in accordance with the relevant guidelines.

Offsets for impacts on ecological values may be required under State and Commonwealth Offsets Policies. Further discussion of the significance of these impacts under the respective guideline criteria is provided in the Terrestrial Ecology Assessment (**Appendix 2**). As was the case in the original EA application, if further offsets are required for the Koala and Squatter Pigeon, it is proposed that these be facilitated through the existing offset secured by Vitrinite for these species under the EPBC Act.

5.3 SOIL AND LAND USE

The complete VCM Soil and Land Suitability Assessment Report (AARC Environmental Solutions, 2021) was provided as part of the EA0002912 application and assessed environmental values and existing conditions and detailed the potential impacts and mitigation measures. A summary is provided below.

5.3.1 Environmental Values

The environmental values to be protected or enhanced include:

- A beneficial post mining land use: low intensity grazing using appropriate grass species; and
- A stable non-polluting landform.

5.3.2 Potential Impacts on Environmental Values

5.3.2.1 Soil Characterisation

Mapping at a scale of 1:100,000 based on soil surveys completed by AARC (2020) revealed two soil management units (SMUs) within the ML (**Figure 5**). These are described below.

Limpopo SMU

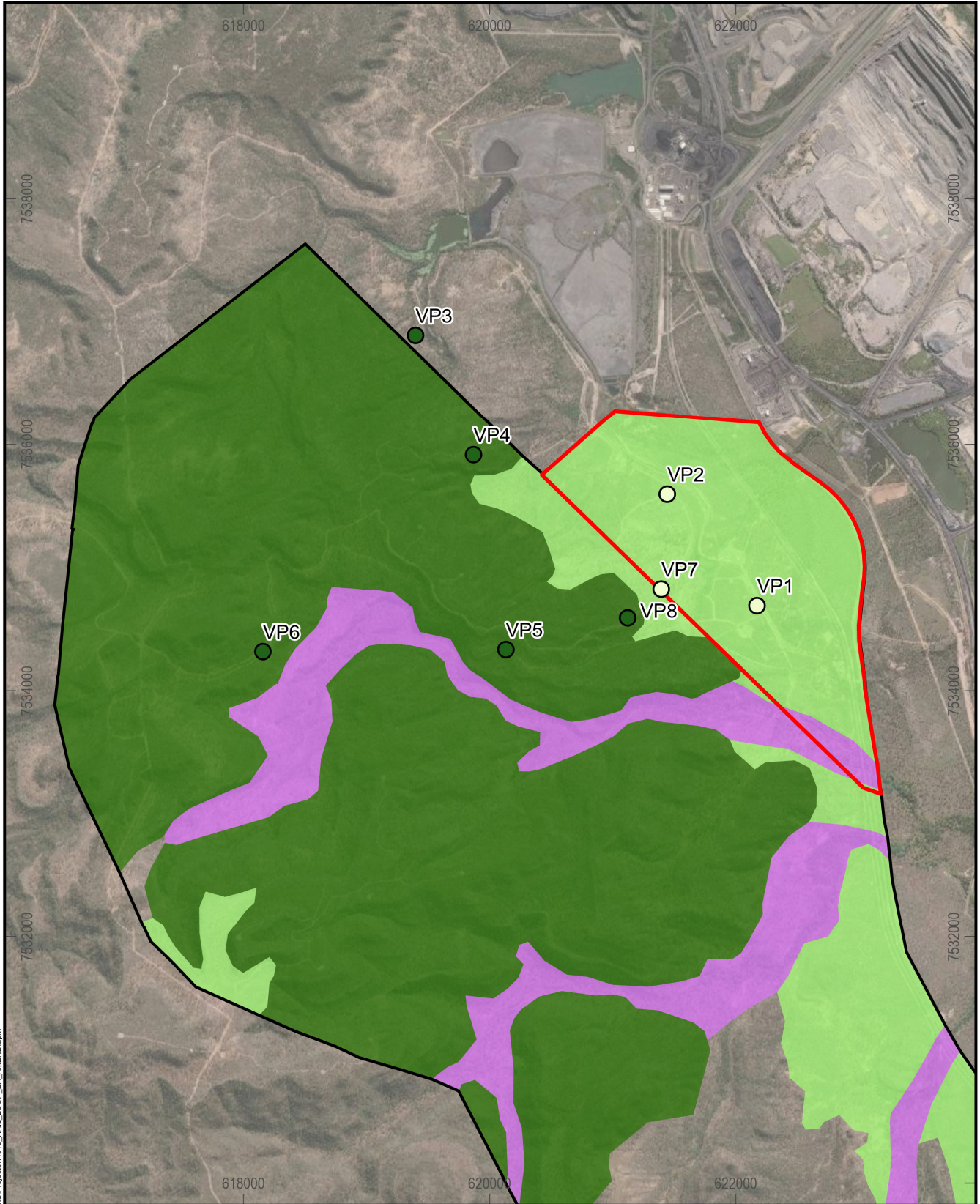
The Limpopo SMU belongs to the Monteaagle land system and the Back Creek geological group. This is a brown texture-contrast soil unit which comprises of 96% of the ML. Soils are classed as brown sodosols, with texture grades from sands to clay sands in the surface and light clays in the deeper horizons.

The Limpopo SMU has a moderately acidic soil profile (pH 5.5 – 5.6). Salinity levels are very low, sandy surface soils are non-sodic and not vulnerable to dispersion. However, clay subsoils (below 0.5 m) are sodic and susceptible to dispersion. The topsoil is dominated by sand (79 %), with silt (8 %) and clay (10 %), which creates a soil texture that has a potential risk of slumping. Limpopo SMU soils have been assessed as deficient in phosphorus, nitrates, potassium, copper, zinc and boron.

Zambezi SMU








The Zambezi SMU belongs to the Cotherstone land system and the TQa geological formation (late-Tertiary to Quaternary poorly constructed alluvium). This is a grey texture-contrast soil, with a sandy surface and clay subsoil which comprises of 4 % of the ML located in the south east corner in the vicinity of North Creek.

The Zambezi SMU has a slightly acidic (pH 6.4 to 6.7) topsoil (up to 0.3 m deep), which becomes progressively alkaline with depth (up to pH 9 at > 0.8 m depth) and mildly acidic (pH 6) subsoil. Salinity levels are low throughout the soil profile, with the subsoil being strongly sodic and the risk of dispersion is high below 0.3 m depth (Emerson Class 2). The topsoil is dominated by sand (77 %), with silt (14 %), clay (9 %) and gravel (<1 %), which creates a loose to weak platy structure. Zambezi SMU soils have been assessed as deficient in nitrates, sulphates, phosphorus, copper, zinc and has a low organic matter content (2 %).



Path: S:\Projects\W010_Vulcan_Complex_Project_Jupiler_section\AARC\SIS\Projects\W010_RAIL_LOOP_EA_AMEND.aprx

Legend

- | | |
|--|---|
|  ML700060 | Soil Management Units |
|  Study Area |  Crocodile |
| Soil profiles |  Limpopo |
|  Crocodile |  Zambezi |
|  Limpopo | |

Vulcan Coal Mine
Soil Management Units



Scale: 1:45,000 (A4)

24/11/2021


 Datum: GDA94
Projection: MGA55

Figure 5



Source: AARC Environmental Solutions 2019, Maxar.

5.3.2.2 Land Use Suitability

The land within the ML has been modified by historical land uses, including:

Agricultural activities In an effort to promote pasture improvement, vegetation within flat and undulating areas has been cleared throughout the ML.

Mining activities Ancillary infrastructure including buildings, access tracks and a surface water diversion levee have been constructed on the ML prior to the VCM. An exploration program and subsequent bulk sample has been extracted from the VCM.

An assessment of land use suitability for agricultural activities (including cattle grazing and dryland cropping) has been undertaken (AARC 2020) in accordance with the Guidelines for Agriculture Land Evaluation in Queensland (DSITI and DNRM 2015) and Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland – Land Suitability Assessment Techniques (DME 1995).

Under these guidelines, there are five land suitability classes for assessing land use. Land is considered less suitable as the severity of limitations for a land use increase, as listed in **Table 4** below. The land suitability class reflects the score of the most limiting attribute for a given SMU. An increase in limitations may reflect either:

- reduced potential for production;
- increased inputs to achieve an acceptable level of production;
- increased inputs to prepare the land for suitable production; or
- increased inputs required to prevent land degradation.

Table 4: Agricultural and Conservation Land Uses

Class	Agricultural Description	Conservation Description
Class 1	Suitable land with negligible limitations. This is highly productive land requiring only simple management practices to maintain economic production.	Areas well suited for conservation uses must possess significant conservation benefits in the pre-mining environment and be capable of being returned to that use post-mining.
Class 2	Suitable land with minor limitations. Limitations either reduce production or require more than the simple management practices of class 1 land to maintain economic production.	Areas suited to conservation use in that a significant component of the pre-mining conservation values can be restored post-mining. There will however be some loss in conservation values where soil terrain or hydrological post-mining conditions may inhibit the full replication of the pre-mining values.
Class 3	Suitable land with moderate limitations. Limitations wither further lower production or require more than those management practices of class 2 land to maintain economic production.	These lands contain significant conservation values pre-mining, however restoration of all of these values may not be feasible. These areas could, however be restored to a form of conservation use which provides alternative conservation benefits.
Class 4	Marginal land. Land which is presently considered unsuitable due to severe limitations. The long term significance of these limitations on the proposed land use is unknown or not quantified. The use of this land is dependent upon undertaking additional studies to determine whether the effect of the limitation(s) can be reduced to achieve sustained economic production.	These lands contain limited conservation value pre-mining and/or the values are incapable of being effectively restored post-mining to any alternative conservation use which provides similar benefits. The area could however be restored to provide a stable form of use which does not impact on the surrounding conservation values.
Class 5	Unsuitable land. Land with extreme limitations that preclude its use.	These lands contain no significant conservation values.

For cattle grazing:

Class 1 and Class 2 Land is considered suitable for grazing improved pastures with maximum grazing productivity achieved in most seasons.

Class 3 Land is considered suitable for grazing improved pastures; however, it is less productive than Class 1 and Class 2 land.

Class 4 Land is categorised as marginal for grazing improved pastures, although it is largely considered suitable for grazing native pastures of variable quality.

Class 5 Land is unsuitable for any form of pasture improvement and is limited to low productivity grazing of native pastures.

Within the ML, the land use suitability for cattle grazing is mostly limited by pH controlled nutrient deficiency (most distinct is phosphorus) and water availability. These limitations have the potential to impact cattle grazing through a reduction in pasture growth and nutrient value of pasture species. A summary of the land use suitability assessment for the VCM is provided in **Table 5** below.

Table 5: Summary of Land Suitability Limitations for Cattle Grazing

	Limpopo SMU	Zambezi SMU
Water Availability	3	4
Nutrient Deficiency	4	4
Soil Physical Factors	1	1
Salinity	1	1
Rockiness	1	1
Microrelief	1	1
pH	2	2
Exchangeable Sodium Percentage	1	1
Wetness	2	2
Water Erosion	1	1
Flooding	1	2
Vegetation Regrowth	2	2
Overall Suitability Rating	4	4

All land within the ML has been classified as Class 4 land, which is marginal land with severe limitations for suitability as use in cattle grazing. However, it is important to note that the land suitability framework is used as a guide to determine the potential land suitability and should be considered alongside historical land use. Therefore the land is considered suitable for cattle grazing.

For dryland cropping:

Class 1 and Class 2 Land is considered suitable for rainfed broadacre cropping with negligible or minor limitations and limited management requirements to sustain this use.

Class 3 Land is considered suitable, however it is likely to be less productive than Class 1 or Class 2 lands.

Class 4 Land is categorised as marginally suitable for rainfed broadacre cropping or would require significant inputs to ensure land use sustainability.

Class 5 Land is unsuitable, with extreme limitations and cannot be sustainably used for rainfed broadacre cropping.

Within the ML, the land use suitability for rainfed broadacre cropping is mostly limited by nutrient deficiency and water availability. These deficiencies have the potential to impact crop health, yield and is likely to induce water stress in crops. A summary of the land use suitability assessment for the VCM is provided in **Table 6** below.

Table 6: Summary of Land Suitability for Rainfed Broadacre Cropping

	Limpopo SMU	Zambezi SMU
Water Availability	4	5
Nutrient Deficiency	4	4
Soil Physical Factors	1	1
Soil Workability	1	1
Salinity	1	1
Rockiness	1	1
Microrelief	1	1
pH	2	3
Topography	1	2
Water Erosion	2	2
Flooding	1	3
Overall Suitability Rating	4	5

The land within the ML has been classified as Class 4 land (96 %) and Class 5 land (4 %) which is marginal land with severe limitations for suitability as use in rainfed broadacre cropping. This land would require significant fertiliser application, resulting in a reduction of economic productivity of this land use. Therefore the land is considered unsuitable for rainfed broadacre cropping.

5.3.3 Mitigation Measures

Soil management and post-mining landform design are important aspects to be considered and managed during operations in order to reinstate the pre-mining land use of cattle grazing, and prevent deterioration of land suitability beyond that which is currently present. As such, the following mitigation measures will be implemented to prevent any unnecessary adverse impacts to topsoil quality or land use suitability:

Topsoil Harvesting

Topsoil will be stripped to a depth of 0.3 m in all disturbance areas. Where the mine plan allows, topsoil will be directly applied to rehabilitation areas. Where this immediate use is not feasible, topsoil will be stored in temporary topsoil stockpiles.

Topsoil Stockpiling

Where stockpiling of topsoil is required, the following measures for soil management will be implemented where relevant and practicable, to reduce the risk of soil degradation and improve the chances of rehabilitation success:

- topsoil should ideally be stockpiled for the minimum time;

- topsoil stockpiles will be less than 2 m high and be contoured and positioned in a manner that encourages water drainage and discourages erosion;
- grass and herbaceous plants germinating from the soil seed bank will be maintained as a protective cover for stockpiles;
- if stockpiles fail to develop a natural grass cover, they will be seeded with a fast-growing, non-invasive, commercially available sterile grass species;
- if there is a risk of a grass cover not establishing voluntarily, stockpiles will be ripped and seeded with a quick establishment pasture species;
- stockpiles will be monitored annually for weeds, and control measures implemented to prevent contamination of the topsoil resource; and
- topsoil stockpiles will be located in an area fenced from livestock.

Topsoil Amelioration

The nutrient status of topsoil for the Zambezi and Limpopo SMUs requires that several measures are undertaken to improve topsoil quality and achieve the post-mining land use:

- organic matter will be applied to topsoil during rehabilitation to assist with binding of soil aggregates and resistance to soil breakdown, resulting in an improvement to soil structure;
- if available, compost or manure will be applied to topsoil during rehabilitation to increase carbon levels, provide more exchange sites for necessary cations and increase water holding capacity; and
- a phosphorus based fertiliser will be applied to topsoil before application to rehabilitation areas to improve the severe nutrient deficiency of this mineral.

Post-Mining Landform Design

The topsoil of Zambezi and Limpopo SMUs have the potential to be dispersive and are susceptible to erosion. As such, the topsoil will require measures to manage the landform stability on the final landform slopes to achieve erosion rates that resemble background rates.

Slope gradients 1 – 5 %: will have a minimum of 50% grass cover

Slope gradients 10 – 15 %: will have a 30% rock mulch cover with a minimum of 50 % grass cover

5.4 WETLANDS

The VCM Aquatic Ecology Study (FRC Environmental 2020), provided as part of the EA0002912 application, assessed environmental values, existing conditions and detailed the potential impacts and mitigation measures for wetlands within and surrounding the VCM.

This study concluded that there was no mapped high ecological value waters (wetlands and watercourses) and mapped high ecological significance wetlands either near the VCM or within the broader study area.

Further, the WRM EA Amendment Surface Water Assessment (Error! Reference source not found.) states that the Queensland Globe Service (Queensland Government, 2019) was used to identify any wetlands in the vicinity of the Project. There were no matters of state environmental significance (MSES) wetlands, wetland values or wetland protection areas identified in the vicinity of the Project.

5.5 AIR QUALITY

The complete VCM Air Quality Assessment Report provided as part of the EA0002912 application assessed environmental values and existing conditions and detailed the potential impacts and mitigation measures.

5.5.1 Environmental Values

The Environmental Protection (Air) Policy 2019 establishes the environmental values of the air environment to be enhanced or protected in Queensland. The EVs nominated are:

- protecting health and biodiversity of ecosystems;
- human health and wellbeing;
- protecting the aesthetics of the environment, including the appearance of building structures and other property; and
- protecting agricultural use of the environment.

5.5.2 Potential Impacts on Environmental Values

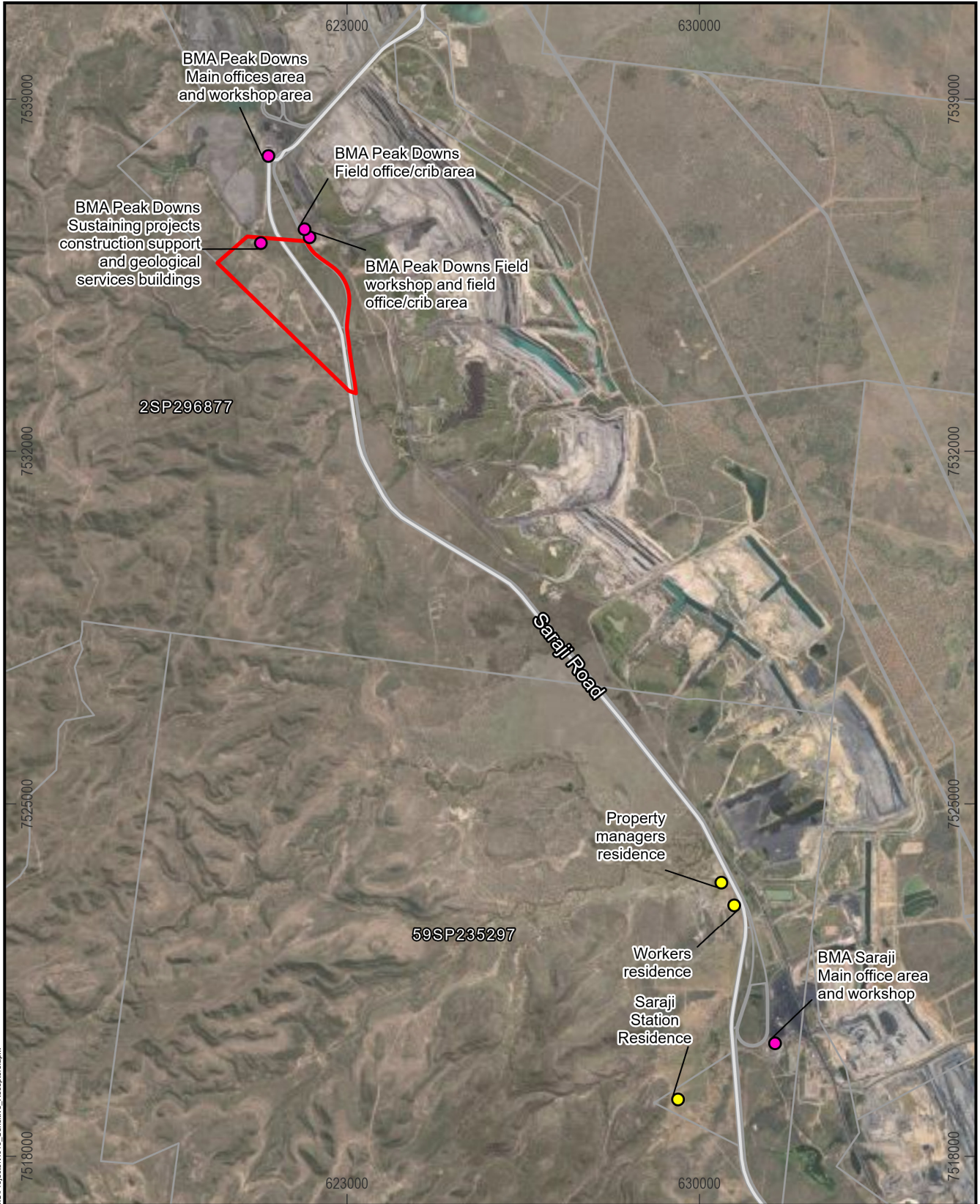
5.5.2.1 Sensitive Receptors

It is anticipated that coal processing and rail load out activities will increase the potential impacts on the local air environment.

Sensitive receptors in proximity to the Mine have been identified and are provided in **Table 7** and **Figure 6** below. The closest residential receptor identified in proximity to the Mine is located 12.1 km to the south east. It is therefore unlikely that amended operations at the mine would have a measurable impact on any of the residential receptors. A number of receptors identified in the area are operating coal mines and as such, have been classified as commercial receptors with very low sensitivity. The below assessment provides further discussion regarding the existing air environment, potential impacts from the proposed amendment and the impact on identified receptors.

Table 7: Sensitive Receptors in Proximity to the Mine

Receptor ID	Type	Description	Easting (km)	Northing (km)	Distance from the Mine
1	Commercial	BMA Peak Downs Mine	621288.7	7536144	100 m NE
2		BMA Peak Downs Mine	622256.2	7536261	244 m NE
3		BMA Peak Downs Mine	622156	7536420	1.6 km N
4		BMA Peak Downs Mine	621438.8	7537872	Onsite
5	Residential	Property Manager	630434	7523439	12.1 km SE
6		Workers Accommodation	630689	7522987	12.8 km SE
7	Commercial	BMA Saraji Mine	631500	7520239	15.3 km SE
8	Residential	Saraji Station Residence	629573	7519127	15.5 km SE



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Legend

- Road
- Property Boundary
- ML700060 Boundary

Sensitive Receptors

- Commercial
- Residential

Source: State of Queensland (Department of Resources) 2021, Vitrinite 2021, Earthstar Geographics.

Vulcan Coal Mine

Air Quality Sensitive Receptors

0 1 2 4

Kilometers

Scale: 1:110,000 (A4)

24/11/2021

Datum: GDA94
Projection: MGA55

Figure 6

5.5.2.2 Existing Air Environment

There are several existing sources in the vicinity of the VCM which may generate dust, including a number of existing coal mines (Caval Ridge Mine, Peak Downs Mine and Saraji Mine). Other sources of dust generation in the environment may include:

- natural sources, including pollen and seeds;
- wheel generated dust from vehicles on dirt roads;
- agricultural activities; and
- wind erosion of un-vegetated land.

The existing ambient air quality in the vicinity of the VCM has been assessed through data obtained from the Moranbah (Cunningham Way) and Moranbah (Utah Drive) air quality monitoring stations operated by the Department of Environment and Science. The available dataset is considered to be reliable and suitable for use in determining representative ambient dust concentrations for the existing ambient air quality for the VCM.

PM₁₀

Data sourced from the DES air quality station for particulate matter with an aerodynamic diameter less than 10 microns (PM₁₀) is summarised in **Table 8** below.

- 2019 24 hour average concentrations of PM₁₀ were above 50µg/m³ on 32 days. DES's monthly air quality bulletins noted that the combination of air emission sources including dust storms, local dust sources, bush fires and planned hazard reduction burns were likely to have contributed to the elevated particle levels on the majority of days with concentrations of PM₁₀ above 50µg/m³.
- 2018 24 hour average concentrations of PM₁₀ were above 50 µg/m³ on 15 days. DES's monthly air quality bulletins note that smoke from bushfires or vegetation burning were likely to have contributed to the elevated particulate levels on the majority of days with concentrations of PM₁₀ above 50µg/m³.
- 2017 24 hour average concentrations of PM₁₀ were above 50 µg/m³ on seven days. DES's monthly air quality bulletins note that vegetation fires and low wind speed conditions were likely to have contributed to the elevated particulate levels on the majority of days with concentrations of PM₁₀ above 50 µg/m³.

Table 8: Summary of 24 Hour Average PM₁₀ Concentrations at Moranbah

Year	Max	No. of Days > 50µg/m ³	70 th Percentile (µg/m ³)	Average
2014	49.9	0	24.0	20.2
2015	91.9	4	25.7	21.8
2016	48.0	0	24.5	21.4
2017	66.0	7	29.5	25.8
2018	113.6	15	34.0	29.8
2019	217.8	32	35.0	30.1

PM_{2.5}

Monitoring of particulate matter with an aerodynamic diameter less than 2.5 microns (PM_{2.5}) at the DES air quality station recently commenced in October 2019, which represents a dataset which is insufficient for determining ambient background levels of PM_{2.5}. As such, data collated from the Moranbah South Environmental Impact Statement (EIS) (2015) and Caval Ridge EIS (2010) has been used for the purpose of determining the ambient background concentrations of PM_{2.5} at the VCM. This data has presented the following background level of PM_{2.5}:

- Annual average – 3.6 µg/m³
- 24 hour average (70th percentile) – 4.3 µg/m³

TSP

The air quality station at Moranbah does not monitor total suspended particulates (TSP).

Historical data analysis (as described above for PM_{2.5}) results in a value for TSP that is less than that for PM₁₀, which by definition cannot occur. This disparity is likely due to the different locations and times of monitoring. Accordingly, ambient background concentrations of TSP has been estimated based on the assumption that PM₁₀ is approximately 50 % of TSP.

Summary

The existing ambient background concentrations determined for the VCM are summarised below in **Table 9**. The potential impacts on environmental values and residential sensitive receptors have been assessed in context these concentrations.

Table 9: Ambient Background Concentrations - Air Quality

Pollutant	Averaging Period	Concentration	Comment
TSP	Annual	60.2 µg/m ³	Calculated using annual average PM ₁₀ of 30.1 µg/m ³ and assumption that PM ₁₀ is 50 % of TSP.
PM ₁₀	24-hour	35 µg/m ³	Highest 70 th percentile value at DES Moranbah, 2019.
	Annual	30.1 µg/m ³	Highest average value at DES Moranbah, 2019.
PM _{2.5}	24-hour	3.6 µg/m ³	Historical Monitoring Reports.
	Annual	4.3 µg/m ³	
Dust Deposition	Annual average	71 mg/m ² /day	

5.5.2.3 Vulcan Coal Mine Emissions

The original Air Quality Impact Assessment used meteorological and dispersion model studies to assess the effect of particulate matter emissions on concentrations of TSP, PM₁₀, PM_{2.5} and dust deposition rates in the surrounding region. The air quality impact assessment for the Mine found that the potential impacts to air quality are negligible and unlikely to cause adverse impacts to the EVs of the air environment. The results of the original assessment are provided below. Given the distances to sensitive receptors, significant increases to these results are not anticipated.

The breakdown of total emissions for all original activities associated with the Mine is provided below in **Table 10**.

Table 10: Vulcan Coal Mine - Air Quality Emissions

Activity	Emission Rates (kilograms per annum)		
	TSP	PM ₁₀	PM _{2.5}
Vulcan Coal Mine	1,365,863	547,745	138,846

The air quality assessment of the Mine found the following:

TSP

- Predicted ground-level concentrations of TSP comply with the relevant air quality objectives at all residential receptors, when assessed in isolation and cumulatively.

PM10

- Predicted 24-hour average ground level concentrations of PM10 comply with the relevant air quality objectives at all residential receptors, when assessed in isolation and cumulatively;
- Predicted annual average ground-level concentrations of PM10 comply with the relevant air quality objectives at all residential receptors, when assessed in isolation. Cumulative concentrations exceed the objective. This is because the background level of PM10, taken from measurements in Moranbah, exceeds the objective; and
- The contribution of the Project to annual average ground-level concentrations of PM10 is 0.2 µg/m³ or less than 1 % of the Air EPP objective.

PM2.5

- Predicted 24-hour and annual average ground-level concentrations of PM2.5 comply with the relevant air quality objectives at all residential receptors, when assessed in isolation and cumulatively.

Dust Deposition

- Predicted dust deposition rates comply with the guideline at all residential receptors, when assessed in isolation and cumulatively.

The air quality impact assessment for the proposed amendment has found that the potential impacts to air quality are negligible and unlikely to cause adverse impacts to the EVs of the air environment.

5.5.3 Mitigation Measures

Dust mitigation and operational controls have been included in the Mine design to limit potential impacts to air quality. These measures include, but are not limited to:

- water application on haul roads and access tracks;
- progressive rehabilitation of land no longer required for operations;
- dust suppression at the CHPP and TLO;
- veneering of Rail carriages at TLO;
- loaded road trains transporting ROM coal offsite are covered which will continue to occur for the duration of road haulage operations (until the CHPP and TLO are operational); and
- dumping on the ex-pit waste rock dump considered meteorological conditions.

The proposed amendment will not change the operation and implementation of air quality management practices previously proposed and assessed.

5.6 WASTE ROCK

The VCM Geochemical Assessment Report (RGS, 2020), was provided as part of the EA0002912 application assessed the geochemical characteristics of the overburden and coal reject materials. The proposed amendment will not materially change the operation and implementation of waste management practices previously proposed and assessed.

5.6.1 Environmental Values

There are no specific environmental values assigned with waste geochemistry. The environmental values associated with surface water and groundwaters are relevant.

5.6.2 Potential Impacts on Environmental Values

The assessment report found that overburden and interburden at the Mine had a universally low sulphide content and high acid-neutralising capacity due to high pH. All material assessed was non-acid-forming and considered essentially barren for oxidisable sulphur. One sample (from weathered coal interburden sampled south of the Mine lease area) out of 138 tested had a slightly elevated sulphide concentration and a maximum potential acidity that was similar to its acid-neutralising capacity. This caused this one sample to have a geochemical classification of "uncertain" rather than "non-acid-forming". Despite this, all other carbonaceous interburden samples were classified as non-acid-forming and, as a bulk material, carbonaceous interburden is considered to be non-acid-forming.

An analysis of the concentrations of 22 metals and metalloids (and four other trace elements) within overburden and interburden revealed that no samples were relatively enriched, compared to the mean crustal abundance of each element (RGS, 2020). The potential solubility of any metals/metalloids in the materials was investigated further through water extract and kinetic leach column tests. Most metal/metalloid concentrations tested in the water extracts were below the applied water quality guideline criteria. The main exceptions were aluminium (four samples) and copper (three samples), which have a concentration in some of the water extracts above the applied freshwater aquatic ecosystem water quality guideline value for 95% species protection (ANZECC & ARMCANZ, 2000), but below the applied guideline values for livestock drinking water.

Based on these results, the risk of potential impact on the quality of surface runoff and groundwater from mining waste materials at the Mine is low. The results of the kinetic leach column tests supported the results of the water extracts; namely, that the concentration of metals/metalloids in the leachate is low and typically below the laboratory limit of reporting. The concentrations of all metals/metalloids were below the applied water quality guideline criteria for aquatic freshwater ecosystems (95% species protection level) (ANZECC & ARMCANZ, 2000).

Acid Base Account as detailed in the Geochemical Assessment (**Appendix 3**) result shows that six coal reject samples plot in the negligible to low risk domains, three samples plot in the possible risk domain (ANC:MPA ratio is between 1.0 and 2.0) and two coarse samples plot in the increased risk domain (ANC:MPA ratio <1.0). Overall, as a bulk mixed material the coal reject material has relatively low sulfide content, excess of ANC and is classified as non-acid forming. Co-disposal of coal reject material within the in-pit waste rock dump is likely to be beneficial and eliminate any residual risk of acid generation.

Overall, surface runoff and seepage from the overburden/interburden material is expected to be pH neutral to slightly alkaline and have a low level of salinity.

5.6.3 Mitigation Measures

Whilst the waste rock geochemistry at the VCM presents little environmental risk, the following material handling activities will be undertaken.

5.6.3.1 Dry Tailings

Tailings materials produced in the CHPP will be dewatered by mechanical means to allow for the material to be disposed via haul trucks in the Jupiter pit void.

5.6.3.2 *In-Pit Dumping*

In-pit dumping will be employed to fill most of the Jupiter pit void during operations. All processing wastes, including reject material and dry process tailings will be stored within the active waste rock dumps, removing the requirement for a tailings storage facility at the VCM. The initial waste rock extracted during the early stages of the VCM will require the establishment of a small out-of-pit dump prior to commencement of in-pit dumping activities. This out-of-pit dump will be situated to the west of the Jupiter pit and once material has been taken for the backfill of the final pit void, will be rehabilitated in-situ upon the cessation of mining. Once pit development reaches the point where sufficient space has been established, in-pit dumping can commence, and will continue for the life of the pit as it proceeds Northeast. Priority will be given to disposal of processing wastes within in-pit dumps at depth, however scheduling constraints may necessitate storage of some material in the out-of-pit waste rock dump.

An assessment of the waste rock geochemistry has concluded that the waste rock does not pose a significant threat of generating acid, saline, or metalliferous drainage, and therefore does not require selective handling or treatment measures, and low permeability capping over the dump is unlikely to be required (RGS, 2019; 2020).

According to RGS (2020), the in-pit co-disposal of reject and waste rock material would actually be beneficial. This is due to the waste rock material typically having a very low sulphur content and excess acid neutralising capacity. This method of coal reject management has been successfully implemented at several existing coal mining operations in the Bowen Basin.

5.7 SURFACE WATER

The VCM Surface Water Assessment Report (WRM 2021) (**Appendix 1**), provided in support of this amendment application, has assessed environmental values, existing conditions and detailed the water management strategy inclusive of the monitoring requirements for the amended operation of the Mine. The proposed amendment will not materially change the operation and implementation of surface water management strategy previously proposed and assessed. A summary of the updated assessment is provided below.

5.7.1 Environmental Values

The Queensland Water Quality Guidelines and Environmental Protection (Water and Wetland Biodiversity) Policy 2019 (EPP WWB) establish environmental values and water quality objectives (WQOs) for natural waters in Queensland. The Mine is located within the 'Isaac western upland tributaries' area for the Isaac River sub-basin. Under the EPP WWB, the following EVs have been nominated for this area:

- Aquatic ecosystems;
- Irrigation;
- Farm supply/use;
- Stock water;
- Aquaculture;
- Human consumption;
- Primary recreation;
- Visual recreation;
- Drinking water;
- Industrial use; and
- Cultural and spiritual values.

5.7.2 Potential Impacts on Environmental Values

There are four key mechanisms through which water from the Mine could enter the receiving environment:

- dewatering and overflows from sediment dams;

- overflows from mine affected water dams and the open cut pit;
- runoff from diverted water catchments; and
- runoff from rehabilitated catchments.

5.7.3 Mitigation Measures

The strategy for the management of surface water at the Mine is based on the separation of water from different sources based on the anticipated water quality.

The main components of the surface water management system includes:

- diverted water drains to divert runoff from undisturbed catchments around areas disturbed by mining;
- a flood protection levee along the western side of the proposed Jupiter pit that may be formed by a haul road embankment;
- sediment dams and drains to collect and treat runoff from waste rock emplacement areas;
- mine-affected water drains and dams to store water pumped out of the open cut mining areas and to collect runoff from the infrastructure areas;
- culverts to convey flows through the proposed rail loop and haul road crossings of the existing drainage diversion; and
- minor works to the existing BMA levee (and spillway) and existing drainage diversion in the vicinity of the haul road crossings.

The water management system has been designed such that the risk of offsite release of mine affected water is very low, with no modelled uncontrolled releases under any climatic conditions.

In response to the change associated with the addition of the CHPP and TLO, amendments to the surface water drainage features of the final landform have been adapted for the management of surface water post-closure. These include:

- Contour banks will be constructed on batters to limit topsoil erosion until vegetation has been suitably established;
- Drainage structures will be constructed to direct runoff from disturbed areas to sediment dams;
- The plateau will be shaped to fall to the west with proposed drains and drop structures to drain the top of the landform to natural ground level;
- Mine water dams will be decommissioned following rehabilitation of infrastructure areas;
- A 10 m corridor between the pit shell crest and the toe of the final landform will be provided for drainage on the eastern side of the final landform; and
- additional contour banks on the batter slopes will assist with the shedding of surface water off the landform, assist with erosion control and avoid ponding.

The proposed amendment will not change the strategy for the management of surface water at the Mine, or the operation and implementation of surface water management practices previously proposed and assessed.

5.8 GROUNDWATER

5.8.1 Environmental Values

Environmental values are defined as the qualities of water that make it suitable for supporting aquatic ecosystems and human water uses (Department of Environment and Heritage Protection 2011). Environmental values need to be protected from the effects of habitat alteration, waste releases, contaminated runoff and changed flows to ensure healthy aquatic ecosystems and waterways that are safe for community use.

The EVs which have been outlined for the region surrounding the Mine are defined in the *Isaac River Sub-basin Environmental Values and Water Quality Objectives* document (Department of Environment and Heritage Protection, 2011) for the following areas:

- aquatic ecosystems;
- irrigation;
- farm supply/use;
- stock water;
- primary recreation;
- drinking water;
- industrial use; and
- cultural and spiritual values.

5.8.2 Potential Impacts on Environmental Values

In the vicinity of the VCM, all geological formations yield low volumes of groundwater and therefore would not typically be classified as aquifers in most hydrogeological settings. Based on the limited extent of groundwater at the VCM and the lack of change to the pit extents, little change to the outcomes of the previous groundwater impact assessment is anticipated as detailed in the Groundwater Impact Assessment (**Appendix 3**). That is:

- groundwater driven pit dewatering is not anticipated to be required (due to negligible groundwater inflows to the pit);
- the extent of groundwater drawdown is limited;
- impacts on Groundwater Dependent Ecosystems (GDEs) as a result of groundwater drawdown are not anticipated;
- impacts on the existing poor quality groundwater are not anticipated; and
- impacts on other groundwater users are not anticipated.

The potential impacts on groundwater will continue to be monitored in accordance with the EA.

5.8.3 Mitigation Measures

The Groundwater Impact Assessment (hydrogeologist.com.au 2020) proposed no mitigation strategies to prevent impact to groundwater as a result of operations at the Mine. This is due to the low probability of impact on groundwater or groundwater EVs.

Notwithstanding this, the following mitigation measures will continue to be undertaken at the Mine:

- quarterly groundwater quality monitoring will continue for the life of the Mine, using both field and laboratory methods to identify natural fluctuations in the groundwater system and to assess any change resulting from operations at the Mine;
 - groundwater quality parameters have been developed consistent with the Guideline: Model Mining Conditions (DES 2017);
 - site specific triggers will be developed following the completion of 24 months of groundwater quality data collection; and
- groundwater levels will continue to be monitored for the life of the Mine, using both manual and automatic (bore loggers) methods to identify natural fluctuations in the groundwater system and to assess any hydraulic response from the Mine.

5.9 AQUATIC ECOLOGY

The complete VCM Aquatic Ecology Study Report provided as part of the EA0002912 application assessed environmental values and existing conditions and detailed the potential impacts and mitigation measures. A summary is provided below.

5.9.1 Environmental Values

A desktop approach was used to provide a description of the aquatic ecological values of the broader study area. This included review of:

- aquatic Matters of National Environmental Significance (MNES) under the Environmental Protection and Biodiversity Conservation Act 1999 (Cth);
- aquatic matters protected under Queensland legislation, including:
 - threatened freshwater species – Nature Conservation Act 1992 (Qld);
 - features that support fisheries resources – Fisheries Act 1994 (Qld);
 - wetland protection areas as shown on the map of referable wetlands – Environmental Protection Regulation 2008 (Qld);
 - high ecological value waters – Environmental Protection (Water) Policy 2009 (Qld);
 - freshwater dependent regulated vegetation – Vegetation Management Act 1999 (Qld);
- mapped aquatic ecological features, including floodplains, wetlands and surface-expression groundwater depended ecosystems;
- hydrological data recorded at DNRME gauging station 130410A (Isaac River at Deverill);
- relevant literature, including published and unpublished technical reports, scientific papers and conservation advice statements for any MNES identified; and
- data contained in frc environmental's in-house bio-physical database.

A field survey was completed in the late wet-season (10-12 April 2019), with notably high rainfall recorded in the region in late March 2019, shortly prior to the field survey. The following aquatic ecological components were assessed at five representative sites:

- water quality measured in-situ;
- aquatic habitat;
- aquatic plants;
- macroinvertebrates;
- fish; and
- turtles.

It was determined that smaller waterways surrounding the Mine had low ecological values, based on:

- low to moderate aquatic and catchment naturalness;
- low diversity of common aquatic species;
- an absence of threatened, priority or special habitat or geomorphic features;
- limited and temporary hydrological connectivity;
- an absence of unique or representative aquatic ecosystems;
- threatened aquatic fauna are highly unlikely to occur in the study area;
- there are no high ecological value waters or declared fish habitat within the study area;
- there are no threatened wetland regional ecosystems or category B or C regulated vegetation classes in the riparian zone within the study area;
- suitable habitat for common species of turtle, fish and macroinvertebrates only occurs in some wet seasons;
- waterways in the study area are unlikely to provide important corridors for fish passage as hydrological connectivity is very limited and do not contain or link key breeding, foraging or refugial habitat for fish.

The aquatic ecological value of larger waterways of the broader study area was assessed as moderate, as they provide favourable habitat for common fish and invertebrate species, noting that in-stream aquatic habitat is restricted to temporary, isolated pools.

Aquatic MNES are not reported to occur near the Mine, and the surrounding waterways have only moderate to low importance as corridors for fish passage.

All native aquatic species recorded from waterways of the study area are tolerant of ephemeral flow, variable water quality and are widespread in the region. No sensitive aquatic environmental receptors are likely to occur in waterways surrounding the Mine.

5.9.2 Potential Impacts on Environmental Values

The aquatic ecology study assessed the potential impacts to aquatic ecological values of waterways and wetlands within and surrounding the Mine.

The scope of the aquatic ecology study was to:

- describe the ecological values of waterways and sensitive aquatic ecology receptors of the study area;
- assess the potential adverse impacts from the Mine on aquatic ecological values; and
- present mitigating measures for avoiding or reducing significant potential mine impacts on aquatic ecological values.

The following potential sources of impact on aquatic ecological values associated with the Mine were identified:

- discharge of mine-affected water to waterways
- localised sedimentation of waterways;
- localised increases in turbidity and total suspended solids;
- localised contamination of waterways;
- waterway crossings;
- cumulative impacts with other nearby mining projects; and
- introduction of aquatic weeds to waterways.

5.9.3 Mitigation Measures

Limited aquatic ecological values exist within the ML, or downstream of the Mine and therefore there were no mitigation measures recommended in the conclusions of the aquatic ecology impact report. The proposed changes are considered to be of no consequence to aquatic ecology values.

Notwithstanding this, the following mitigation measures will continue to be undertaken at the Mine:

- a surface water management plan has been developed for the Mine, and surface water management infrastructure will be established progressively to manage surface water as the Mine is developed:
 - bunds will divert clean water catchments around operational areas;
 - a series of drains and bunds will manage runoff from disturbed areas, directing water into sediment control structures;
 - a mine affected water dam will be established as a water supply dam for dust suppression, this will also receive any accumulated pit water that requires dewatering;
 - the existing surface water levee (BMA Infrastructure) will be retained during operations; and
 - discharge of mine affected water to waterways is not planned.
- an erosion and sediment control plan will be developed for the Mine, to assist with the management, reduction and mitigation of erosion and consequent transport of sediment downstream of the Mine:
 - runoff from disturbed areas will be directed into sediment control dams;
 - stormwater runoff from unsealed roads will be directed sediment traps at regular intervals; and

- sediment dams will be designed and constructed in accordance with the Best Practice Erosion and Sediment Control Guidelines (IECA 2008).
- all applicable materials will be stored and handled in accordance with the relevant legislative requirements and Australian Standards, including but not limited to the provisions of:
 - AS 3780:2008 – The storage and handling of corrosive substances
 - AS 1940:2004 – The storage and handling of flammable and combustible liquids
 - AS3833:2007 – Storage and handling of mixed classes of dangerous goods in packaged and intermediate bulk containers
 - AS 2187:1998 – The storage, transport and use of explosives
- refuelling of plant and equipment will be in designated bunded areas away from waterways;
- a spill response procedure will be implemented;
- the construction of waterway crossings will give design consideration to the development requirements for waterway barrier works (DAF 2018);
- all vehicles requiring access to private land adjacent to the Mine must have a valid biosecurity hygiene declaration; and
- a weed monitoring and response procedure will be developed.

5.10 STYGOFAUNA

The complete VCM Stygofauna Pilot Study Report provided as part of the EA0002912 application assessed environmental values and existing conditions and detailed the potential impacts and mitigation measures. A summary is provided below.

5.10.1 Environmental Values

The environmental values of stygofauna of the study area were determined using the following criteria:

- high value: threatened species listed under State or national legislation;
- moderate value: non-listed stygobites and / or suitable habitat for stygofauna present; and
- low value: only non-listed stygoxenes and / or potentially suitable habitat for stygofauna present.

In this assessment, suitable habitat means geological, hydrogeological and water quality characteristics of groundwater ecosystems that are generally known to support high diversity of stygofauna. Potentially suitable habitat means geological, hydrogeological and water quality characteristics of groundwater ecosystems that are outside of general habitat characteristics known to support diverse stygofauna communities, but within the range from which stygofauna have been recorded.

5.10.2 Potential Impacts on Environmental Values

The stygofauna pilot study assessed the potential impacts to stygofaunal values within and surrounding the Mine. The scope of the study was to:

- describe the stygofaunal values of the study area;
- assess the potential adverse impacts on mining activities on the stygofaunal values; and
- present mitigating measures for avoiding or reducing significant potential impacts of mining activities on stygofaunal values.

The bores samples for stygofauna for the pilot study are shown below in **Figure 7**.

In eastern Australia the average number of stygofauna taxa is higher when samples are collected from groundwater where the water table is less than 15 m below ground (approximately). The depth to the water table at eight of the 10 bores sampled is greater than 15 m below ground, with the remaining two having a water table greater than 15 m below ground. Therefore, the majority of bores sampled within the study area have groundwater which is generally unsuitable for stygofauna.

The mean electrical conductivity (EC) of water from which stygofauna have been sampled is generally less than 4,000 $\mu\text{S}/\text{cm}$; however, studies have shown that stygofauna have been sampled from groundwater with a wide range of EC values (11.5 $\mu\text{S}/\text{cm}$ – 54,800 $\mu\text{S}/\text{cm}$). Water quality data collected to date within the study area has recorded EC values between 2,280 $\mu\text{S}/\text{cm}$ and 21,600 $\mu\text{S}/\text{cm}$. Further, the data indicated that the EC values at only two bores were consistent with the preferred range of EC for stygofauna. Therefore, the EC value of groundwater within the study area is generally unsuitable for stygofauna.

Stygofauna have been recorded from groundwater with pH ranging from 3.5 to 10.3, with the highest diversity in groundwater with pH values between 6.5 and 7.5. Water quality data collected to date within the study area has recorded pH values between 7.81 and 8.31, and is therefore aligned with the range known to support diverse stygofaunal communities. The pH of groundwater within the study area is generally suitable for stygofauna.

Studies have shown that stygofauna are almost always absent where total dissolved solids (TDS) is greater than 115 mg/L. However, as the concentration of TDS is approximately $\text{TDS} \times 0.68$, it is likely that stygofauna would tolerate TDS concentrations of approximately 2,720 mg/L. Water quality data collected to date within the study area has recorded TDS values between 1,480 mg/L and 14,000 mg/L and is therefore inconsistent with the preferred range of TDS for stygofauna. The TDS value of groundwater within the study area is generally unsuitable for stygofauna.

Two field surveys were completed in December 2019 and March 2020. In the first field survey (December 2019), two bores (MB5 and MB12) each contained a single stygofauna: an ostracod species. In the second field survey (March 2020), two bores (MB7 and MB3) each contained a single stygofauna: an ostracod species.

Overall, the stygofauna community within the study area was assessed as having low environmental value based on:

- the absence of any listed stygofauna;
- the absence of any stygobitic (groundwater dependent) taxon;
- the limited occurrence of a single, widely distributed stygofauna (not groundwater dependent) taxon;
- the depth to water table in the study area is deeper than typical depth from which stygofauna have been reported in Queensland; and
- the concentration of TDS and EC of groundwater within the study area is higher than the range reported for groundwater from which stygofauna are typically found.

The following sources of potential impact on stygofauna as a result of mining activities were identified:

- vegetation clearing;
- contamination of groundwater;
- physical disturbance of groundwater ecosystems by:
 - removal of topsoil and overburden from development areas;
 - open cut coal mining;
 - drawdown of water tables;
 - compaction of shallow groundwater aquifers below haul roads; and
- cumulative impacts of the Mine interacting with other nearby existing and proposed mines.

5.10.3 Mitigation Measures

While the likelihood of stygofauna presence within the Mine disturbance area is low, and the insignificant environmental value associated with stygofauna in the study area, the following mitigation measure will be implemented to prevent any unnecessary adverse impacts to stygofauna as a result of mining operations.

Vegetation Clearing

The Ostracod taxon located during field surveys was found at a depth to water table well-below the root zone of terrestrial vegetation, indicating roots of terrestrial vegetation do not provide a key habitat for this taxon at the Mine. Groundwater tables at the Mine are mostly below the likely root zone of terrestrial vegetation and the zone potential of impact.

The mitigation measures to be implemented to prevent potential impacts to stygofauna as a result of vegetation clearing at the Mine include:

- clearing only the area needed for mining operations; and
- revegetating areas of disturbance as they become available.

Contamination of Groundwater

Groundwater systems of the study area have low environmental value for stygofauna, therefore it is unlikely that impacts will occur.

Notwithstanding the unlikely impact, mitigation measures to be implemented to prevent potential impacts to stygofauna as a result of contamination of groundwater at the Mine include:

- All materials of potential contamination will be stored and handled in accordance with the relevant legislative requirements and Australian Standards, including but not limited to the provisions of:
 - AS 3780:2008 – The storage and handling of corrosive substances;
 - AS 1940:2004 – The storage and handling of flammable and combustible liquids;
 - AS 3833:2007 – Storage and handling of mixed classes of dangerous goods in packaged and intermediate bulk containers;
- Refuelling will be in designated bunded areas or contained within the pit;
- Runoff from workshop areas will be managed in the mine water management system; and
- A spill response protocol will be developed and implemented.

Physical Disturbance of Groundwater Ecosystems

Groundwater systems of the study area have low environmental value for stygofauna and low value of groundwater ecosystems.

Notwithstanding the low value associated with groundwater, mitigation measures to be implemented to prevent potential impacts to stygofauna as a result of physical disturbance to groundwater ecosystems at the Mine include:

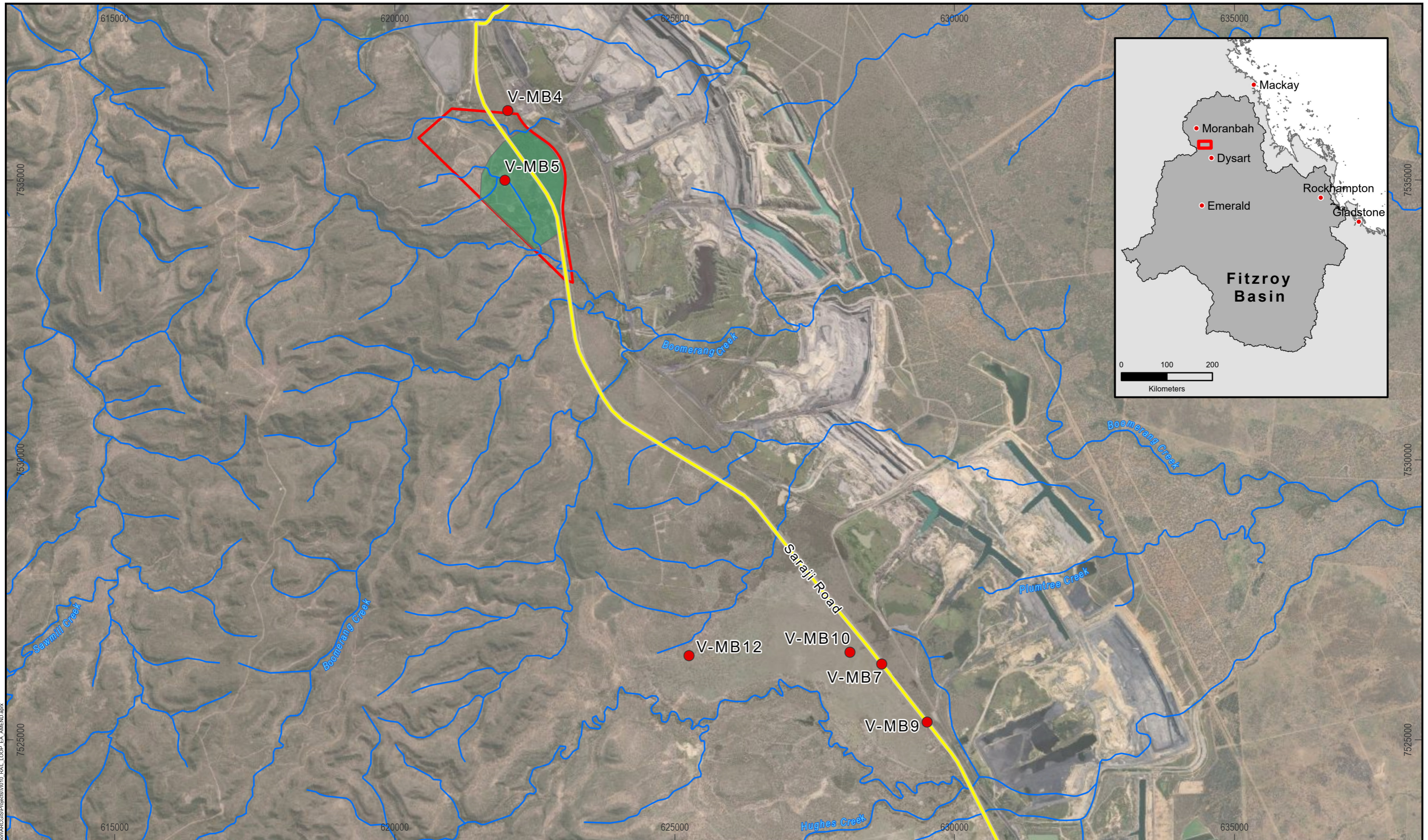
- Disturbing only areas needed for mining operations;
- Restricting transportation of coal to specific haul roads;
- Appropriate storage and stockpiling of topsoils to avoid compaction and maintain quality for rehabilitation; and
- Implementing water level and quality monitoring across an appropriately designed bore field.

Cumulative Impacts

Groundwater systems of the Broader Study Area have low environmental value for stygofauna and have been assessed to have a very limited (<1 %) cumulative influence on groundwater aquifer water levels.

Notwithstanding the limited impact on groundwater caused by development of the Mine, mitigation measures to be implemented to assess impacts to stygofauna as a result of impact to groundwater at the Mine include:

- Disturbing only areas needed for mining operations; and
- Implementing a water monitoring program across an appropriately designed bore field.



Legend

- Bores
- Road
- Drainage features
- MDL3039
- ML700060

Source: frc environmental 2020, State of Queensland (Department of Resources) 2021, Earthstar Geographics.

Vulcan Coal Mine

Bores Sampled for Stygofauna

0 1.5 3

 Kilometers

Scale: 1:65,000 (A3)

24/11/2021

Datum: GDA94
 Projection: MGA55

Figure 7

VITRINITE
 BRIGHTER COAL

METSERVE
 Mining & Energy Technical Services Pty Ltd

5.11 NOISE AND VIBRATION

The complete VCM Noise and Vibration Assessment Report provided as part of the EA0002912 application assessed environmental values and existing conditions and detailed the potential impacts and mitigation measures. A summary is provided below.

5.11.1 Environmental Values

The Queensland Environmental Protection (Noise) Policy 2019 establishes environmental values, states acoustic quality objectives for sensitive receptors and provides a framework for making decisions about the acoustic environment in Queensland.

Under this policy, the EVs to be enhanced or protected are:

- the qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystems; and
- the qualities of the acoustic environment that are conducive to human health and wellbeing, including by ensuring a suitable acoustic environment for individuals to do any of the following-
 - sleep;
 - study or learn;
 - be involved in recreation, including relaxation and conversation; and
- the qualities of the acoustic environment that are conducive to protecting the amenity of the community.

5.11.2 Potential Impacts on Environmental Values

The site is located in a rural area, with the closest residential sensitive receptor being more than 10 km away from the Mine. The closest town is Moranbah which is 35 km north-west from the Mine. Attended noise measurement and noise loggers determined that noise levels and sources are typical of the rural/mining region surrounding the Mine, with notable existing mining noise at some receptors.

The Noise and Vibration Assessment Report concluded that:

- noise impact from operations at residential receptors are compliant with noise criteria under all modelled scenarios;
- noise from haul trucks on public roads is considered compliant with noise criteria; and
- airblast levels and ground vibration are predicted to be acceptable at sensitive receptors.

Given the extended distances to residential receptors or any sensitive commercial receptors, the additional infrastructure and operations proposed at the VCM are considered to be negligible.

5.11.3 Mitigation Measures

As the predicted noise levels under all meteorological conditions for all scenarios was modelled to be well below the noise criteria, a noise monitoring program has not been implemented at the Mine. A blast monitoring program has been implemented to monitor the airblast level and ground vibration caused by blasting activities, which will continue for the life of the Mine.

5.12 WASTE

This section discusses non-mining waste management. Waste management refers to any unwanted materials – solid, liquid, or gaseous produced by human activity and the appropriate actions undertaken in their collection, storage, treatment or disposal to reduce their effect on health, the environment and aesthetics. Management practices can be employed to recover reusable resources from waste material.

Waste management practices vary for different industries and locations depending on what waste streams are produced and what facilities are available. Due to the relative isolation of some coal mines, waste management options can sometimes be limited.

The regulatory requirements governing waste management are contained within the following legislation and strategy:

- *Waste Reduction and Recycling Act 2011 (WRR Act);*
- *Waste Reduction and Recycling Regulation 2011 (WRR Regulation);*
- *Environmental Protection Act 1994 (EP Act);*
- *Environmental Protection Regulation 2019 (EP Regulation);* and
- Waste Management and Resource Recovery Strategy (WMRRS).

5.12.1 Environmental Values

During the Mine construction, operation and decommissioning phases, general and mining wastes will be managed to minimise impacts on the following environmental values:

- the life, health and well-being of people;
- the diversity of ecological processes and associated ecosystems;
- surface and groundwater quality and quantity; and
- land use capability having regard to economic considerations.

5.12.2 Potential Impacts on Environmental Values

The risk of impact to environmental values with respect to waste at the VCM is anticipated to be insignificant. The waste streams identified include:

- minor hydrocarbon waste (oil drums, oily rags, oil filters etc.)
- general waste (benign construction waste, wood, food scraps etc.)
- recyclable waste (paper, cans, glass etc.)

5.12.3 Mitigation Measures

During construction of the Mine, operation and decommissioning phases, waste will be managed to avoid adverse impacts on the life, health and wellbeing of people and the diversity of ecological processes and associated ecosystems surrounding the Mine site.

Segregation of different types of waste during generation, storage and transportation will be undertaken. The appropriate management and storage of wastes will prevent on-site and off-site pollution and enhance opportunities for reuse and/or recycling. Waste that is not regulated or able to be re used or recycled will be sent to the closest practical approved landfill facility by a licenced waste contractor. Prior to being transported to a landfill facility, all wastes will be assessed for potential re-use and recycling.

Waste management will be subcontracted to a licensed waste management contractor. The types of actions required under the contract would typically include:

- supply and maintenance of suitable waste receptacles;
- collection and transport of specified waste materials;
- recycling of materials where practicable and cost effective;
- accurate and timely documentation and reporting;
- targeted workforce awareness presentations;
- preparation and distribution of awareness materials;
- assistance in the implementation of site waste management strategies; and
- development and implementation of waste reduction, improvement and segregation activities.

The site operates in accordance with a Waste Management Plan

5.13 TRAFFIC

The VCM Transport Impact Assessment (Stantec 2021) (**Appendix 4**), provided as part of this EA0002912 amendment application, assesses environmental values and existing conditions and details the potential impacts associated with the amended project and provides relevant mitigation measures. A summary is provided below.

Based on the analysis and discussions presented within this report, the following conclusions are made:

Peak traffic demands for the Project are expected to occur in:

- 2022 (project year 2): Operations (road haulage of coal)
- 2023 (project year 3): Operations and Construction (road haulage of coal and CHPP and Rail construction traffic)
- 2024 & 2025 (project year 4 & 5): Operations (no road haulage)

Though some road links on the Peak Downs Highway are expected to have Project traffic volumes which exceed 5% of the baseline traffic volumes, the impacted road links are expected to operate well below their theoretical capacity. Road impact mitigation works as a direct result of the project are therefore not required.

During Project Year 2 and Project Year 3 the forecast Project traffic is expected to result in an increase of the forecast Annual Average Daily Traffic for Saraji Road (north of the site access) in the order of up to 8%, for Peak Downs Mine Road in the order of up to 6%, and for Saraji Road (south of the site access) in the order of up to 2%.

During Project Year 4 and Project Year 5, impacts to Council controlled road sections of Saraji Road (north and south of the site access) and Peak Downs Mine Road are expected to be in the order of 1%. A turn warrant assessment indicates that Basic left turn and Short channelised right turn treatments are required at the proposed Project access location on the Saraji Road realignment to cater for Project generated traffic for the assessment years. The requirements of this assessment have not changed from the 2020 Transport Impact Assessment.

Based on the calculated development Standard Axle Repetitions pavement impacts of greater than 5% have been identified for a number of road links on the Peak Downs Highway. A monetary contribution will likely be required to ameliorate the impact. The results of this assessment indicate that the impact correlates to a monetary contribution for state-controlled roads of \$393,959 as per Guide to Traffic Impact Assessment methodology.

It is expected that an agreement will be formed between Council and Vitrinite for the mitigation of expected pavement loading on Council controlled roads.

5.14 INDIGENOUS CULTURAL HERITAGE

The Barada Barna People (QUD380/08), represented by the Barada Barna Aboriginal Corporation RNTBC ICN 8343 (BBAC), are the native title holders for the broader Mine area, and the 'Aboriginal party' for the Mine under the Aboriginal Cultural Heritage Act 2003 (Qld).

The Proponent and the BBAC have entered into an indigenous land use agreement (body corporate agreement) (ILUA) in respect of the VCM, which is in the process of being registered with the National Native Title Tribunal. The ILUA also addresses the management of Aboriginal cultural heritage under the Aboriginal Cultural Heritage Act 2003 (Qld).

Vitrinite will work with the Traditional Owners to develop a Cultural Heritage Management Plan (CHMP). This will be undertaken to demonstrate compliance with the cultural heritage duty of care as per the *Aboriginal Cultural Heritage Act 2003*. It is the intention of Vitrinite to have the CHMP endorsed by the Traditional Owners prior to commencing mining activities.

No changes to the potential impacts or proposed management of potential cultural heritage matters are necessitated by the proposed changes.

5.15 NON-INDIGENOUS CULTURAL HERITAGE

The complete VCM Non-Indigenous Assessment Report as part of the EA0002912 application assessed environmental values and existing conditions.

Based on the assessment, there are no known historic (non-Indigenous) cultural heritage constraints to the Mine. Vitrinite will proceed with the Mine, subject to the "new finds" procedures, in compliance with Part 9 of the Queensland Heritage Act 1992 (Qld).

In the event that suspected significant historic archaeological evidence is uncovered, Vitrinite will stop work immediately, and a suitably qualified archaeologist will be consulted. Should the archaeological discovery be of potential importance to the State of Queensland, DES will be notified immediately in the prescribed form.

5.16 SOCIAL

The VCM Social Assessment Report (METServe 2020), provided as part of the original EA0002912 application, assessed environmental values and existing conditions and detailed the potential impacts and mitigation measures.

Other than a minor reduction in the proposed workforce, the proposed amendment will not change the operation and implementation of social management practices previously proposed and assessed.

5.17 STAKEHOLDER ENGAGEMENT

Vitrinite has engaged with underlying landholders, the Isaac Regional council and a number of state government departments in relation to the proposed amended activities.

The VCM proposal has been through a number of state and federal approval processes that have included public review and comments processes. No public comments have been received on any application or approval process associated with the VCM. It is small in scale and impact, short in duration and lies within a broad and long term coal mining region. For these reasons, public notification is not considered required for this EA amendment application.

6 CLOSURE AND PROGRESSIVE REHABILITATION CLOSURE PLAN

This amendment also requires an amendment of the VCM Progressive Rehabilitation and Closure Plan (PRCP). The PRCP has been updated to reflect the changes proposed and is provided with this application.

No alternative post mine land uses are proposed. Minor changes to the timeframe within which the site will be progressively rehabilitated are proposed to address the removal of more permanent infrastructure items.



Appendix 1

WRM EA Amendment Surface Water Assessment



Appendix 2

Terrestrial Ecology Assessment



Appendix 3

Geochemical Assessment and Groundwater Impact Assessment



Appendix 4

VCM Transport Impact Assessment