GEMINI PROJECT

EA Application: Response to Secondary Information Request

PREPARED FOR

MAGNETIC SOUTH

AUGUST 2021

aarc
ENVIRONMENTAL SOLUTIONS

BRISBANE OFFICE
Suite 5, 1 Swann Road
Taringa, QLD 4068
P +61 7 3217 8772

CAIRNS OFFICE
PO Box 4887
Cairns, QLD 4879
P +61 7 4057 9402

E info@aarc.net.au
AARC.NET.AU
ABN: 620 818 920
ACN: 71 620 818 920

Document Control

Project Name:	Gemini Project
Report Title:	EA Application: Secondary Information Request Response
Client:	Magnetic South
Project Manager:	Gareth Bramston

Version	Comments	Author	Reviewer	Date
Draft issued for client review		BM	GB	25 May 2021
DES preliminary submission		BM	GB	31 May 2021
Final DES submission		BM	GB	17 August 2021

Table of Contents

1 Introduction 1
1.1 Background 1
2 Conceptual Project Layout 3
2.1 Geotechnical stability of Pit AB high wall 3
2.1.1 DES Comment 3
2.1.2 DES Requirement 3
2.1.3 Response 3
3 Traffic and Train Load Out Facility Construction 5
3.1 Train Load Out Facility access 5
3.1.1 DES Question 5
3.1.2 DES Requirement 5
3.1.3 Response 5
3.2 Traffic impacts of mine accommodation access 6
3.2.1 DES Question 6
3.2.2 DES Requirement 6
3.2.3 Response 6
3.3 Red Hill Road / Capricorn Highway intersection traffic impacts 6
3.3.1 DES Question 6
3.3.2 DES Requirement 6
3.3.3 Response 7
4 Groundwater 8
4.1 Relationship between streamflow and groundwater levels 8
4.1.1 DES Comment 8
4.1.2 DES Requirement 8
4.1.3 Response 8
4.2 Major anions and cations 12
4.2.1 DES Comment 12
4.2.2 DES Requirement 12
4.2.3 Response 13
4.3 Groundwater flow direction, identification of impact and reference bores 14
4.3.1 DES Comment 14
4.3.2 DES Requirement 15

4.3.3 Response 15

5 Geochemical Assessment of mine waste materials 19

5.1 Drill hole sample depth 19

5.1.1 DES Comment 19

5.1.2 DES Requirement 19

5.1.3 Response 19

5.2 Drill hole locations 19

5.2.1 DES Comment 19

5.2.2 DES Requirement 19

5.2.3 Response 20

6 Geochemical assessment of Coal Reject Material 21

6.1 Placement and encapsulation of rejects material 21

6.1.1 DES Comment 21

6.1.2 DES Requirement 21

6.1.3 Response 21

6.2 Coal reject sampling methodology 21

6.2.1 DES Comment 21

6.2.2 DES Requirement 22

6.2.3 Response 22

6.2.4 DES Comment 22

6.2.5 DES Requirement 22

6.2.6 Response 23

7 Soils and Land Suitability 24

7.1 Post Mining Land Use (PMLU) 24

7.1.1 DES Comment 24

7.1.2 DES Requirement 24

7.1.3 Response 24

8 Terrestrial ecology and Environmental Offsets Strategy 29

8.1 Area of impact for prescribed environmental matters 29

8.1.1 DES Comment 29

8.1.2 DES Requirement 29

8.1.3 Response 29

9 Aquatic ecology 33

9.1 Environmental Values for water quality 33
9.1.1 DES Comment 33
9.1.2 DES Requirement 33
9.1.3 Response 33
10 Air Quality and Greenhouse Gases 34
10.1 Ambient air quality monitoring data 34
10.1.1 DES Comment 34
10.1.2 DES Requirement 34
10.1.3 Response 34
10.2 Impact of revised mine camp location 36
10.2.1 DES Comment 36
10.2.2 DES Requirement 37
10.2.3 Response 37
10.3 Impact to sensitive receivers SR31 and SR32 38
10.3.1 DES Comment 38
10.3.2 DES Requirement 38
10.3.3 Response 38
10.4 Emission quantities over years of mine 38
10.4.1 DES Comment 38
10.4.2 DES Requirement 38
10.4.3 Response 38
10.5 Meteorological data used in modelling 39
10.5.1 DES Comment 39
10.5.2 DES Requirement 39
10.5.3 Response 39
11 Noise 40
11.1 Impact of revised mine camp location 40
11.1.1 DES Comment 40
11.1.2 DES Requirement 40
11.1.3 Response 40
11.2 Sensitive receivers SR31 and SR32 41
11.2.1 DES Comment 41
11.2.2 DES Requirement 41
11.2.3 Response 41

List of Figures

Figure 1: Revised conceptual project layout and location of adjacent sensitive receivers 2

Figure 2: Location of monitoring bores and water gauge stations 9

Figure 3: Alluvium and stream flow monitoring data 10

Figure 4: Groundwater level in, and base of, Tertiary sediments 16

Figure 5: Groundwater level and contours in Permian coal seams 17

Figure 6: Proposed Post Mining Land Use (PMLU) LSC for cattle grazing 26

Figure 7: Regulated Vegetation (Of Concern Regional Ecosystem (RE)) 30

Figure 8: Regulated vegetation (RE within a defined distance to a Vegetation Management Act 1999 (VM) watercourse.. 31

Figure 9: Connectivity Areas.. 32

Figure 10: Annual distribution of winds at the Project site predicted by TAPM/CALMET................... 35

Figure 11: Seasonal distribution of winds at the Project site predicted by TAPM/CALMET................ 36

List of Tables

Table 1: Pit design parameters for excavated eastern highwall 4

Table 2: Existing and proposed alluvial groundwater monitoring bores 18

Table 3: Pre and post mining cattle grazing LSC areas 25

Table 4: Post mining land suitability class that will be achieved for areas with a post mining land-use of grazing 27

Table 5: Significant Residual Impacts to Prescribed Environmental Matters 29

Appendices

Appendix A: Revised Traffic Impact Assessment

Appendix B: Groundwater Technical Memorandum

Appendix C: Figures for Groundwater Technical Memorandum

Appendix D: Mine Waste Geochemistry Technical Memorandum

Appendix E: Air Quality Technical Memorandum

Appendix F: Revised Noise Impact Assessment

1 Introduction

1.1 Background

The Gemini Project is a greenfield, open-cut metallurgical coal mine project, which will produce pulverised coal injection (PCI) coal and coking coal for export to the international steel making industry. The Project will be developed and managed by Magnetic South Pty Ltd, a private Australian based company which was founded in 2006. The executive team of Magnetic South has some 60 years' experience in the development and operation of metallurgical coal assets and agribusiness in central Queensland.

The Project is located in the Bowen Basin, approximately 110 km east of Emerald and 125 km southwest of Rockhampton, in central Queensland. Blackwater, a larger town serving mines in the region, is located approximately 34 km to the west.

An application for a site-specific environmental authority was submitted by Magnetic South on 23 October 2019 (application reference number APP0043095). The administering authority considered the EA application, and issued Magnetic South with an information request on 31 January 2020. Magnetic South provided a response to this information request in December 2020, accompanied by a revision to the EA Application Supporting Information document.

A notification of change for the Project was submitted to DES in Jan 2021, notifying of changes to the project layout in response to landholder consultation.

The minor revisions to the Project layout include the following:

- Relocation of the camp and associated infrastructure to the south of the Capricorn Highway, on Lot 4 on RP801280 and Lot 1 on HT424, to be accessed via the main mine access road.
- Removal of the Train Load Out Facility (TLO) access road from the Redrock Park Property to an alternate location further to the east.

An application to amend the ML surface area has also recently been made, to reflect the change in infrastructure location described in the EA application. The revised conceptual project layout, showing the updated camp location, surface rights extent and the nearest sensitive receivers is provided in Figure 1.

A secondary information request was received from DES in February 2021, which included questions in relation to the traffic, air and noise quality impacts of the revised Project layout, as well as a number of additional questions in relation to groundwater, geochemistry, water quality objectives, vegetation disturbance areas, post mining land use and Pit AB geotechnical stability.

In response to the secondary information request, a revision to the Traffic Impact Assessment (Appendix A) and Noise Impact Assessment (Appendix F) has been prepared. Supplementary technical memorandums have also been provided in relation to groundwater, mine waste geochemistry, air quality and noise (Appendices B-E). The purpose of this document is to provide a response to each question, specifically addressing each of the issues raised in the secondary information request and directing the administering authority to further information contained within the additional assessments and supplementary technical memorandums, where applicable.

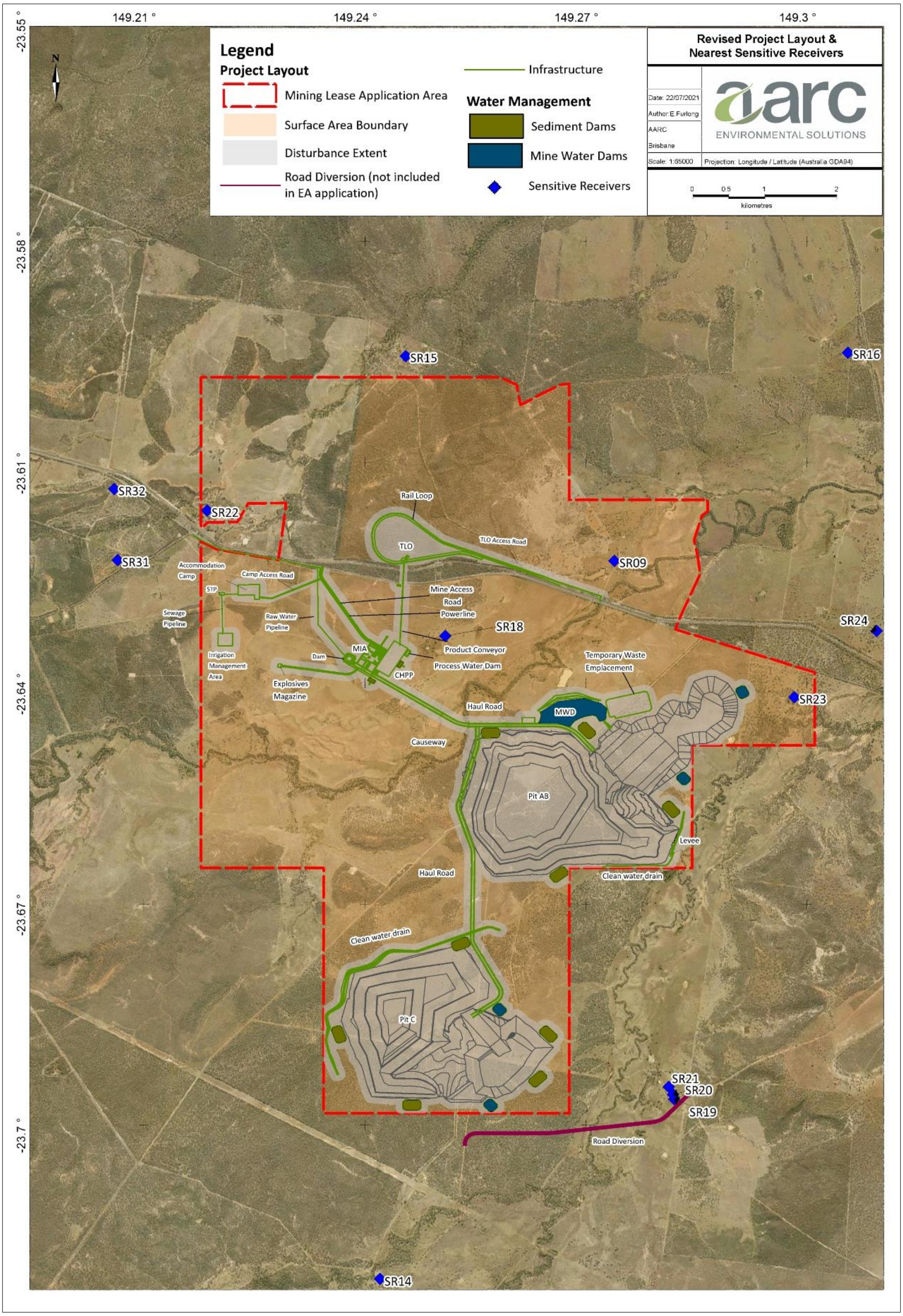

Figure 1: Revised conceptual project layout and location of adjacent sensitive receivers

2 Conceptual Project Layout

2.1 Geotechnical stability of Pit AB high wall

2.1.1 DES Comment

Figure 7 - Conceptual Layout of the Gemini Project shows that the crest of the high wall on the southern end of the Pit AB final void is proposed to extend right to a corner boundary of the tenure, MLA 700056. Table 7 states that a 100 metre buffer has been included around the perimeter of the disturbance footprint, but it is not clear if the buffer has been applied to this part of Pit AB final void area. The Revised Supporting Information does not sufficiently address information requirements, such as, the expected geotechnical stability of the final battered high wall and potential liability of high wall failure. The assessing officer's concern is that as the final landform is proposed to be so close to the tenure boundary, there is a possibility that high wall failure may cause impacts outside of the tenure boundary.

2.1.2 DES Requirement

Provide further information to justify the position of the final void for Pit AB with regard to the concerns of creating disturbance and impacts to environmental values (EVs) outside of the tenure boundary. Alternatively, provide a revised conceptual project layout that includes an appropriate buffer between the battered high wall of Pit AB final void and MLA 700056 boundary.

2.1.3 Response

2.1.3.1 Buffer around perimeter of disturbance footprint

Figure 7 in Section 3.1 of the *Revised EA Application Supporting Information* shows the conceptual project layout, including a 100m buffer within which disturbance may occur (also shown in Figure 1 of this report). The authorised disturbance areas provided in Table 7 include this 100 m buffer. The purpose of this 100 m buffer is to provide design flexibility for activities that may require disturbance beyond the original design infrastructure footprint. This 100m disturbance area has been reduced on the eastern edge of the AB Pit, due to the proximity of the mining lease (ML) boundary. The eastern edge of the AB Pit will be located approximately 50m from the edge of ML during mine operations, and the top of the final battered highwall (following backfill, regrading and rehabilitation activities) will be located approximately 15m from the edge of lease.

It was not intended that a 100 m buffer would be maintained between mining activities and the edge of the ML.

2.1.3.2 Geotechnical stability of the final battered high walls

The conceptual mine plan was based on preliminary geotechnical studies completed for the Project. The excavated eastern high wall slopes were designed to achieve a factor of safety of 1.3 during mine operations (refer to Table 1). The highwall slopes will then be flattened during rehabilitation, in order to achieve a stable post mining landform.

Geotechnical assessment of the post mining landform has now been undertaken for the Project. A final slope of 18° is proposed for the weathered upper sections of the void high walls (alluvium, Tertiary clay and weathered Permian zone) (instead of the previously described 22°). This additional geotechnical control will ensure the final void design achieves a minimum Factor of Safety of 1.5 for the entire Project. Where space is limited by proximity to the ML boundary, minor adjustments will be made in the detailed design phase of the Project, to ensure all disturbance is contained within the ML footprint both during and post-mining.

These minor changes will not result in significant changes to the mine plan layout and the location of the highwall in relation to the mining lease will remain unchanged to that which is shown in Figure 1.

It is proposed that the void design parameters summarised in Table 1 will replace previous design criteria described in Sections 4 and 5 of the *Revised EA Application Supporting Information*.

Table 1: Pit design parameters for excavated eastern highwall

Material / area	**High wall slope during mine operations to achieve SF of 1.3**	**High wall slope for final rehabilitated landform to achieve SF of 1.5**
Cenozoic soil (alluvium and Tertiary clay) (0-55m) and distinctly weathered Permian material	45° slopes with 20m batters in Cenozoic soil/distinctly weathered Permian material. A 15 m wide catch bench is proposed at the base of this horizon.	Maximum slope of 18°
Unweathered strata / coal measures	65° batters in slightly weathered/fresh coal measures. A 15 m catch bench is required every 50 m.	Maximum slope of 22°

3 Traffic and Train Load Out Facility Construction

3.1 Train Load Out Facility access

3.1.1 DES Question

An existing access road off the Capricorn Highway, Red Hill Road, is proposed to be the revised intersection and access road for the Train Load Out Facility (TLO). No detail has been provided regarding:

- existing condition of the intersection and road
- justification for its suitability for TLO construction and operation access
- whether upgrades will be necessary to make the intersection and road suitable for intended uses
- reference to a traffic impact assessment for the Capricorn Highway / Red Hill Road intersection.

The original application states, in section 3.3.4 of the supporting information, that Red Hill Road is only suitable for light vehicles but the revised section 3.3.4 and the notice of changed application state that construction equipment can be mobilised to the TLO along this access; however, no further detail has been provided about how this will be possible.

3.1.2 DES Requirement

Provide further detail and justification to demonstrate that Red Hill Road / Capricorn Highway intersection and Red Hill Road will be suitable for access to the TLO during construction and operation phases by addressing the concerns raised.

3.1.3 Response

Additional modifications have been proposed to the TLO access to address the concerns raised in the information request. A revised *Gemini Project Traffic Impact Assessment* (Cardno April 2021) (TIA) is provided in Appendix A.

3.1.3.1 TLO heavy vehicle access

To address concerns, heavy vehicle access to the TLO facility during construction is now proposed via a short temporary access track from the Capricorn Highway, to be located within the footprint of the product conveyor belt. This temporary heavy vehicle access will include a temporary level crossing over the existing rail line, to be in operation for the construction of the TLO and rail loop only, when larger volumes of materials are expected to be trucked to the site.

During operations, heavy vehicle access to the TLO is not required. Bulk materials required for maintenance will be transported to the Project via rail.

An assessment of the proposed temporary intersection with the Capricorn Highway is provided in Section 7.6 of the revised TIA. A figure showing the location of the proposed temporary access track is provided in Section 5.1.1 of the revised TIA (Appendix A).

3.1.3.2 TLO light vehicle access

Light vehicle (LV) access to the TLO during construction and operation will be via the existing Capricorn Highway / Red Hill Road intersection. An assessment of the existing road condition is provided in Section 3.1.5 of the revised TIA. It is anticipated that during peak construction and operations there will be approximately 4 light vehicle movements per day. The existing intersection is therefore considered to be suitable for the required light vehicle access requirements during construction and operations.

3.2 Traffic impacts of mine accommodation access

3.2.1 DES Question

Figure 1-1 and Figure 1-2 do not show the revised mine layout as per the notice of change application.

It is not clear what impacts the revised location of mine accommodation – which is now proposed to be accessed from the main mine access road – will have in terms of the potential increase in drive-in-drive-out traffic entering the mine access road, given that it is predicted that 80% of the operation workforce will be drive-in-drive-out on a weekly basis.

3.2.2 DES Requirement

Provide updated mine layout figures in the traffic impact assessment report. Provide a revised Appendix A: Traffic Impact Assessment to address the potential impacts of the proposed relocation of mine accommodation on traffic using the Capricorn highway and mine access intersection, as per the written notice of changed application. Alternatively, provide a justification of why the potential impact does not warrant updates to the Traffic Impact Assessment.

3.2.3 Response

The intersection impact assessment for the mine access road has been updated to include camp accommodation traffic (refer to Section 7.4 of the revised TIA (Appendix A)).

3.3 Red Hill Road / Capricorn Highway intersection traffic impacts

3.3.1 DES Question

The intersection Capricorn Highway / Red Hill Road has not been included in the assessment scope for State Intersections, and, as per the notice of changed application, this is the only proposed access road to the TLO. The written notice of change states that the road will only be used for two vehicle movements daily. It is not clear if this includes construction equipment during the TLO construction phase. Red Hill Road is directly adjacent to Charlevue Creek. Queensland Globe mapping indicates this is a watercourse with a stream order of 5 and contains Matters of State Environmental Significance (MSES) downstream. According to Figure 61 of the revised supporting information, Red Hill Road also falls within flood zone levels. However, the potential impacts to EVs related to Charlevue Creek have not been clearly addressed with regard to Red Hill Road use during construction and operation phases and contingency plans to access the TLO in case of flooding.

3.3.2 DES Requirement

Provide more information about the potential impacts to traffic of using Red Hill Road and the intersection with the Capricorn Highway, differentiating between the frequency and intensity of impact during TLO construction and operation phases and including consideration to the potential for flooding.

3.3.3 Response

An assessment of the Capricorn Highway / Red Hill Road intersection has now been included in Section 3.1.5 of the revised TIA (Appendix A). The revised TIA also included information about the frequency and intensity of traffic using the Capricorn Highway / Red Hill Road intersection during mine construction and operation (refer to Section 5.1 of the revised TIA) and an assessment of the traffic impacts of the project (Section 7.5).

It is anticipated that during both peak mine construction and operations there will be approximately 4 light vehicle movements per day. Heavy vehicle access to the TLO during construction is now proposed via an alternate temporary access. The minor increase in traffic associated with a small number of light vehicle movements is unlikely to impact environmental values outside of the existing road footprint. It is therefore not expected that there will be any impacts to downstream environmental values as a result of use of this intersection for light vehicles.

It is anticipated that on average the Red Hill Road train underpass will flood every one to two years. Should flooding occur emergency access to the TLO will be maintained via the rail level crossing or through private property via landholder agreements.

An erosion and sediment control plan (ESCP) has been prepared for the Project, which outlines the strategies to manage erosion, and the release of sediment into receiving waters, during Project construction and operations (including the potential impacts of Project traffic) (refer to section 6.1.6 of the *Gemini Project Erosion and Sediment Control Plan* (AARC 2020).

Water quality monitoring will be undertaken during mine operations (including at a location downstream of Red Hill Road in Charlevue Creek) in accordance with the *Gemini Project Receiving Environment Monitoring Program Design Document* (AARC 2020) to ensure the effectiveness of employed control measures, including the enforcement of sediment quality trigger values.

4 Groundwater

4.1 Relationship between streamflow and groundwater levels

4.1.1 DES Comment

Two downstream gauging and water quality monitoring stations are noted to have been installed on Charlevue and Springton Creeks (CC2 and SC2). It is understood that flow will be recorded continuously during a flow event. The date of installation and the data collected should be provided. These monitoring stations are considered to be important in establishing the relationship between creek flow and ground water levels.

4.1.2 DES Requirement

Provide the date of installation of the downstream flow gauging and water quality monitoring stations.

Provide the stream flow and water quality data that has been collected to date.

Collate this information with alluvial and groundwater dependent ecosystem (GDE) aquifer information to identify the relationship between streamflow and groundwater levels.

4.1.3 Response

Water gauge stations were installed at Charlevue Creek and Springton Creek on 19 November 2020.

Groundwater level data loggers have been installed in the Charlevue Creek alluvium monitoring bore (DW7076W) and Springton Creek alluvium monitoring bore (DW7292W1) since December 2018 and July 2020, respectively.

The location of existing groundwater monitoring bores and surface water gauging stations, along with identified potential GDE areas in the project area, are shown in Figure 2.

Time series plots of rainfall (derived from the SILO data drill), water level and water quality data (collected from the gauging stations and alluvium bores) are provided in Figure 3 and a summary of the key findings is provided below. A more detailed analysis is also provided in the *Response to DES Comments on the EA Submission – Gemini Project* (JBT Consulting, May 2020) (Groundwater Technical Memorandum) (Appendix B).

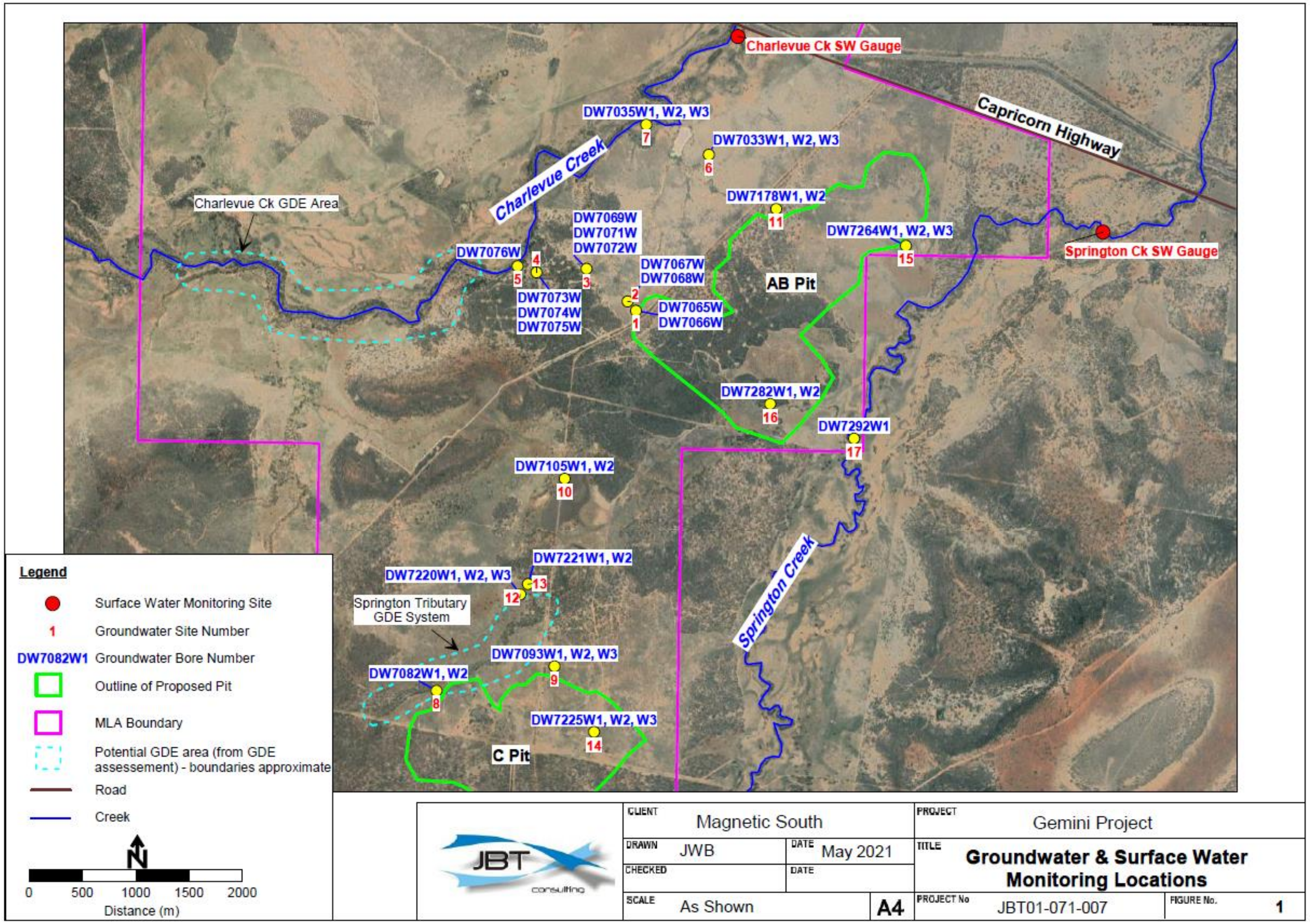

Figure 2: Location of monitoring bores and water gauge stations

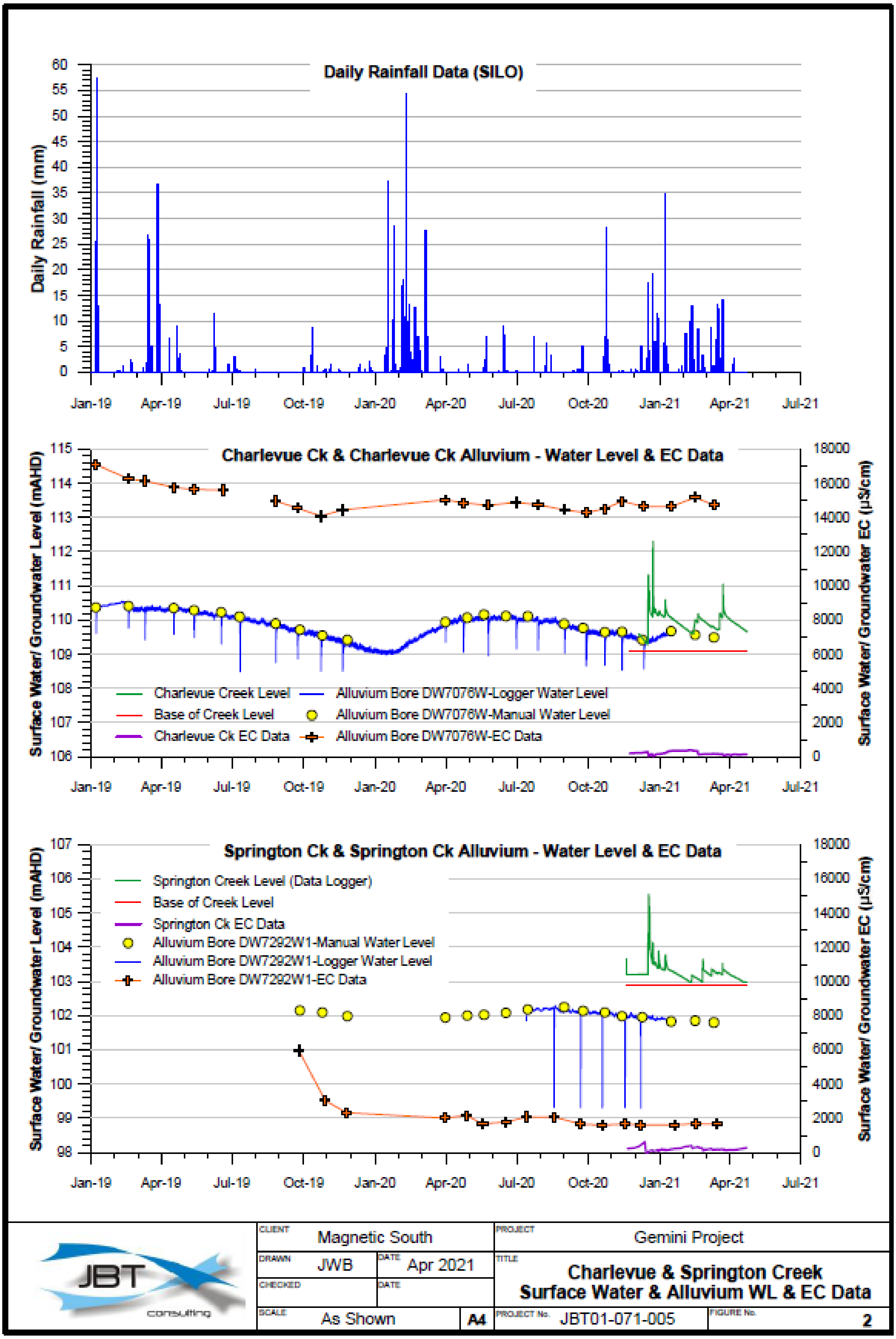

Figure 3: Alluvium and stream flow monitoring data

4.1.3.1 Charlevue Creek surface water and alluvium

The analysis of groundwater level data and stream flow data as it relates to the potential Charlevue Creek GDE (provided in Appendix B) concluded the following:

- Surface water levels in Charlevue Creek are highly reactive to rainfall, with water levels rising by more than 3 m in response to rainfall and failing relatively quickly towards the base of creek level during non-rainfall periods.
- Alluvial groundwater levels in the Charlevue Creek alluvium monitoring bore (DW7076W) are also shown to respond to high rainfall/streamflow events, rising and falling by up to 1.5 m between the wet season and dry season. Although less pronounced than the surface water reactivity to rainfall, seasonal (wet season/dry season) rise and fall in alluvial water level can be seen in the data, indicating that the alluvium is seasonally recharged by wet season streamflow events.
- The electrical conductivity (EC) of Charlevue Creek surface water is low, ranging between ~65 and 400 µS/cm. By contrast, the EC of groundwater within the Charlevue Creek alluvium at DW7076W is very high, ranging between ~14,000 to 17,000 µS/cm.
- A distinct seasonal variation in groundwater EC is not evident at DW7076W. This could indicate that a lens of fresh, low EC, low density water (from seasonal recharge) is occurring over a deeper zone of denser, higher EC groundwater. This interpretation is consistent with the findings of the *Groundwater Dependent Ecosystem Assessment* (3D Environmental 2020) (GDE Assessment), which postulates that the Charlevue Creek GDE area is supported by an unconfined, fresh alluvial aquifer perched above older Quaternary alluvium and Tertiary sediments. To further investigate this theory an additional groundwater monitoring bore could be installed within the sandy interval at this site (i.e. adjacent to bore DW7076W) and fitted with a water level/EC data logger.
- To monitor and detect future changes in the relationship between surface water flow, alluvium and the underlying groundwater units, a nested groundwater monitoring site will be designed and installed adjacent to the water gauge station prior to the commencement of mining activities, i.e:
  - Install one bore screened within the Charlevue Creek alluvium
  - Install one bore screened within underlying Tertiary strata
  - Install one bore screened within the underlying Permian strata at the shallowest depth where groundwater occurs
  - Install water level data loggers within all bores and undertake regular testing
  - Undertake hydraulic conductivity testing (i.e. slug testing) on all bores.

4.1.3.2 Springton Creek surface water and alluvium

The analysis of groundwater level data and stream flow data as it relates to the potential Springton Creek Tributary System GDE (provided in Appendix B) concluded the following:

- Streamflow response to rainfall and seasonal trends in the alluvial groundwater levels in the Springton Creek alluvium monitoring bore (DW7292W1) were similar to those described above for Charlevue Creek (although there was less variation in wet season/dry season water levels). This indicates that the Springton Creek alluvium is also seasonally recharged by wet season streamflow events.
- Springton Creek surface water EC had a similar EC range to Charlevue Creek. However, the EC of alluvial groundwater from DW7292W1 was much lower than at Charlevue Creek (generally <2,000 µS/cm).
- As with Charlevue Creek, EC levels do not appear to reduce with wet season recharge. It is therefore possible that this alluvial groundwater system is also stratified, as has been postulated above for Charlevue Creek. This is an interpretation consistent with the GDE Assessment, which indicates that the Springton Creek Tributary System GDE is supported by a seasonally variable perched aquifer.
- There are already a number of existing nested bores installed in the Tertiary and Permian groundwater in/adjacent to the Springton Creek Tributary System GDE (DW7220, DW7221, DW7082, DW7093) (refer to Figure 2). Site DW7082 has been identified as a suitable location to install an alluvium bore, which would

provide a better understanding of the relationship between the alluvium and the underlying groundwater units in this location. This would also provide an additional impact monitoring bore for Pit C (also outlined in Section 4.3.3.3).

- To better understand the relationship between surface water and alluvium in Springton Creek an additional alluvium groundwater monitoring bore could be installed within the sandy interval at the eastern extent of the mining lease on Springton Creek. This would also provide an additional downstream / impact monitoring bore for Pit AB (also outlined in Section 4.3.3.3).
- In order to provide an upstream/reference bore for Pit C mining activities, it is also proposed to install an additional monitoring bore in the Springton Creek alluvium upstream of Pit C, prior to mining activities commencing in this area (Year 12) (also outlined in Section 4.3.3.3).

4.2 Major anions and cations

4.2.1 DES Comment

The information supporting the conclusions that have been made in relation to the limited hydraulic connectivity between the regional groundwater table and the perched aquifer that supports the GDE's (Appendix F: Groundwater Dependent Ecosystems Assessment) as well as the limited connectivity between the perched alluvium and deeper groundwater systems remain of concern to the department.

The conclusion is that it is unlikely that the project will reduce surface flows that replenish the perched GDE aquifer and that impacts of drawdown will not be propagated into the perched aquifer system, which is likely disconnected.

The proportions of major cations and anions within different monitoring bores can provide an indication of the degree of connectivity between groundwater bores. The major cations include sodium, potassium, calcium and magnesium and the major anions include chloride, sulphate, bicarbonate and carbonate.

Hydraulic conductivity has only been calculated for one (1) of the alluvial bores using the result from a single test to demonstrate that the alluvium is hydraulically isolated. Hydraulic conductivity testing should be provided to justify the conclusions drawn relating to the hydraulic conductivity of the GDE and alluvial aquifers.

The department has been unable to identify indicators/ thresholds/triggers that have been identified specifically for the purpose of protecting GDE values. While it is noted that conclusions have been drawn around the lack of connectivity between surface water, deeper groundwater and the GDE aquifers; there is little data to support the conclusions. A trigger of 2m/year has been assigned for an unconsolidated quaternary alluvial aquifer, and it is unclear how a 2m/year drawdown is believed to afford the relevant necessary protection to GDE's.

The department still considers it necessary to include indicators, thresholds and limits in drawdown that will be relevant to the protection of GDE values.

4.2.2 DES Requirement

All major anions and cations must be monitored for all bores in accordance with the current proposed monitoring regime. Produce a figure(s) that visualise the ionic chemistry of the groundwater samples, for example, a piper diagram.

Conduct adequate hydraulic conductivity testing of alluvial aquifers and include the data and results in the response. Identify and justify appropriate draw down triggers and management actions for the protection of GDE values.

4.2.3 Response

4.2.3.1 Box and whisker plots

Box and whisker plots for pH, field EC and sulphate have been produced for surface water, Quaternary alluvium, Tertiary sediments and Permian sediments, and are provided in Figures 3 - 5 of Appendix C. A summary of the relevant key findings is provided below. A more detailed analysis of these plots is provided in the Groundwater Technical Memorandum (Appendix B).

The EC ranges are highly variable, but showed the following trends:

- Surface water EC was generally relatively low, ranging from 65 to 392 µS/cm in Charlevue Creek and 1 to 615 µS/cm in Springton Creek.
- Quaternary alluvium EC was relatively high (particularly at Charlevue Creek), ranging from 14,079 µS/cm to 17,106 µS/cm at Charlevue Creek and 1,594 to 5,948 µS/cm at Springton Creek.
- Tertiary sediment EC is generally >7000 µS/cm
- Permian sediment EC is generally >10,000 µS/cm.

A number of observations were also made in relation to EC and groundwater levels in the nested bores located in/adjacent to the Springton Creek Tributary GDE area (DW7220, DW7221, DW7105) (refer to Figure 2 for locations):

- At site DW7220, both the Tertiary bore (W1) and shallow Permian bore (W2) recorded an EC of <2,000 µS/cm, which is much lower than was generally observed for these units. While the deeper Permian bore at this site (W3) had an EC range of 17,398 to 20,693 µS/cm.
- At site DW7221 the shallow Permian bore (W1) also recorded a relatively low EC ranging from 3,325 to 3,979 µS/cm. The deeper Permian bore (W2) records a higher EC range of 7,851 to 16,059 µS/cm.
- The data from these nested bores supports the theory in the GDE Assessment that the potential GDE's in this area are supported by a seasonally variable perched aquifer. This theory is further supported by the water level data collected from bores in this area, as follows:
  - Tertiary bore DW7220W1 records a water level that is approximately 16 mbgl while the deeper bores at this location record a water level of approximately 20 mbgl, indicating a potential for downward flow (i.e. recharge) at this site. The depth to groundwater at this site is considered too deep to support vegetation.
  - Tertiary bore DW7105W1 is dry, while the adjacent shallow Permian bore DW7105W2 records a water level of approximately 32 mbgl. The high EC range of the Permian bore at this location (949 to 1,367 µS/cm) indicates that recharge is occurring from the shallow groundwater system to the Permian strata at this site. The depth to groundwater at this site is also considered too deep to support vegetation.

4.2.3.2 Piper diagrams

Separate Piper diagrams for Tertiary bores, Permian Bores and surface water/Quaternary alluvium bores are provided in Figure 6 of Appendix C, as well as a combined diagram showing the data from all these water sources. A summary of the relevant key findings is provided below. A more detailed analysis of these diagrams is provided in the Groundwater Technical Memorandum (Appendix B).

- Plots for the surface water and alluvium bores are indicative of surface water recharge to the alluvial groundwater system.
- Plots for the Tertiary and Permian bores show increasing sodium and chloride with depth, indicating increased groundwater residence time (i.e. increasing salinity as groundwater moves downwards through the sediments).

- This data further supports the interpretation that the alluvium is receiving surface water recharge (as outlined in Section 4.1.3).

4.2.3.3 Conclusion

- Streamflow and alluvium water level and EC data indicates that recharge is occurring seasonally from the Springton Creek and Charlevue Creek into the adjacent alluvial groundwater.
- Salinity data presented in the box and whisker plots further supports the theory from the GDE Assessment (outlined in Section 4.1.3 above) that the potential GDE's identified in the ML are supported by a shallow seasonally variable perched aquifer systems.
- The depth to groundwater in the Springton Creek Tributary GDE area is generally considered too deep to support vegetation.
- Ongoing monitoring of major cations and anions will be included in the groundwater monitoring program for interpretive purposes, and to enhance the understanding of hydraulic isolation/connectivity between aquifer systems.

4.2.3.4 GDE drawdown triggers

Isotopic testing of groundwater samples and twig (xylem) samples taken from potential GDE areas do not demonstrate any overlap, with groundwater demonstrating much more depleted isotopic values (refer to section 4.3 of the GDE Assessment for details). However, twig samples did overlap with isotopic values of surface waters. These results indicate that trees within the identified potential GDE areas are not utilising groundwater in the regional Tertiary or alluvial aquifers, even when groundwater would be within reach of maximum rooting depth. The GDE Assessment further postulates that any groundwater usage by trees on the Project site is from fresh perched aquifers that are recharged from surface water and are disconnected from the regional aquifer. This theory is supported by the groundwater data (as discussed in Section 4.1 and 4.2 above).

It is therefore considered that if GDEs are present within the Project area, they are dependent on perched aquifers which are disconnected from the regional aquifer system.

However, to further understand the system, installation of additional monitoring bores is proposed prior to the commencement of mining activities (as detailed in Section 4.1.3).

As further data is collated and the system is better understood, specific GDE drawdown indicators/thresholds /limits will be developed if appropriate, prior to the commencement of mining activities.

4.3 Groundwater flow direction, identification of impact and reference bores

4.3.1 DES Comment

The groundwater network is representative of the groundwater units present, in that bores are located within each of the groundwater units; however, the bore locations have not been demonstrated to be representative of the directional flow of groundwater and reflect the up and down gradient for each groundwater unit. Furthermore, bore location continues to appear to be random and the spatial distribution is not well justified in terms of anticipated impacts from potential sources of contamination. Locations of reference bores should be located upgradient as opposed to just being 'distant'. The demonstration of conceptual understanding of ionic chemistry and groundwater flow direction is important to evaluate if the bore network is appropriate and representative. There does not currently appear to be an upgradient or reference bore proposed for the alluvial aquifers.

4.3.2 DES Requirement

Detailed conceptual understanding of the direction of groundwater flow needs to be demonstrated. Provide a figure illustrating ground water level contours indicating directional flow of groundwater. To demonstrate that the bore network is entirely representative of up and down gradient for each groundwater unit, produce a figure that visualises the ionic chemistry of the groundwater samples, for example, a piper diagram.

Provide justification for a lack of reference bores and up/down gradient bores for the alluvial aquifer or alternatively install the necessary bores.

4.3.3 Response

4.3.3.1 Groundwater flow direction in Tertiary sediments

A map of the elevation base of the Tertiary sediments (based on date for the site geological model) and the water level data for Tertiary sediment monitoring bores is provided in Figure 4. The Tertiary groundwater system in the ML area is shown to be intersected by a Permian ridge (shown in Grey), which separates the northern and southern parts of the mining lease. The groundwater flow direction in the Tertiary sediments in the ML area is therefore interpreted as being quite localised – moving towards the areas of lower Tertiary base elevation from areas where the preferential recharge occurs (e.g. the area around bore DW7220W1 (refer to Section 2.1.2 of Appendix B. A more detailed analysis is provided in Section 2.1.3 of Appendix B.

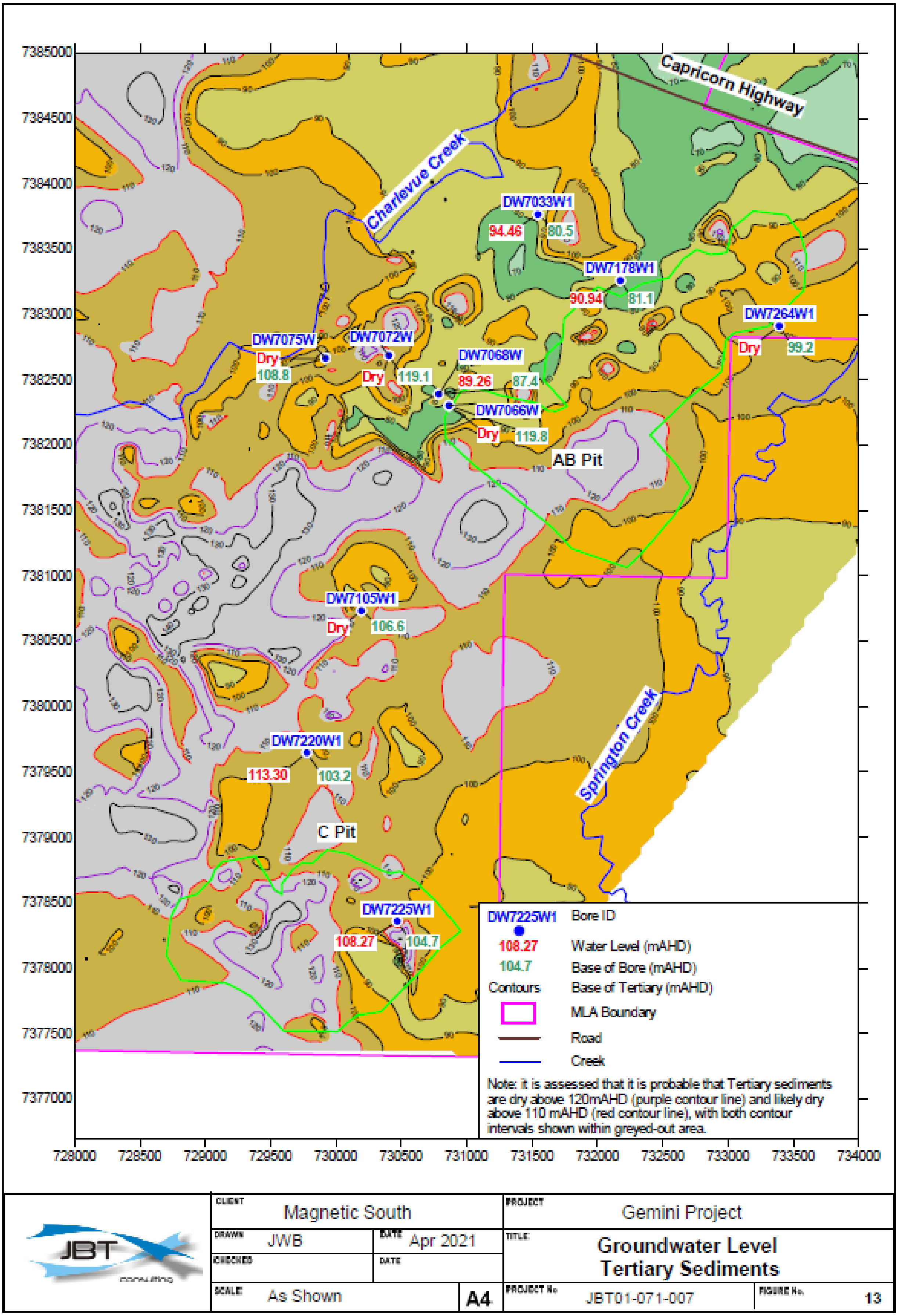

Figure 4: Groundwater level in, and base of, Tertiary sediments

4.3.3.2 Groundwater flow direction in Permian sediments

Groundwater level contours for the Permian sediments are shown in Figure 5. The data indicates that the groundwater flow direction in the Permian sediments is from the south-southwest to north-north-east.

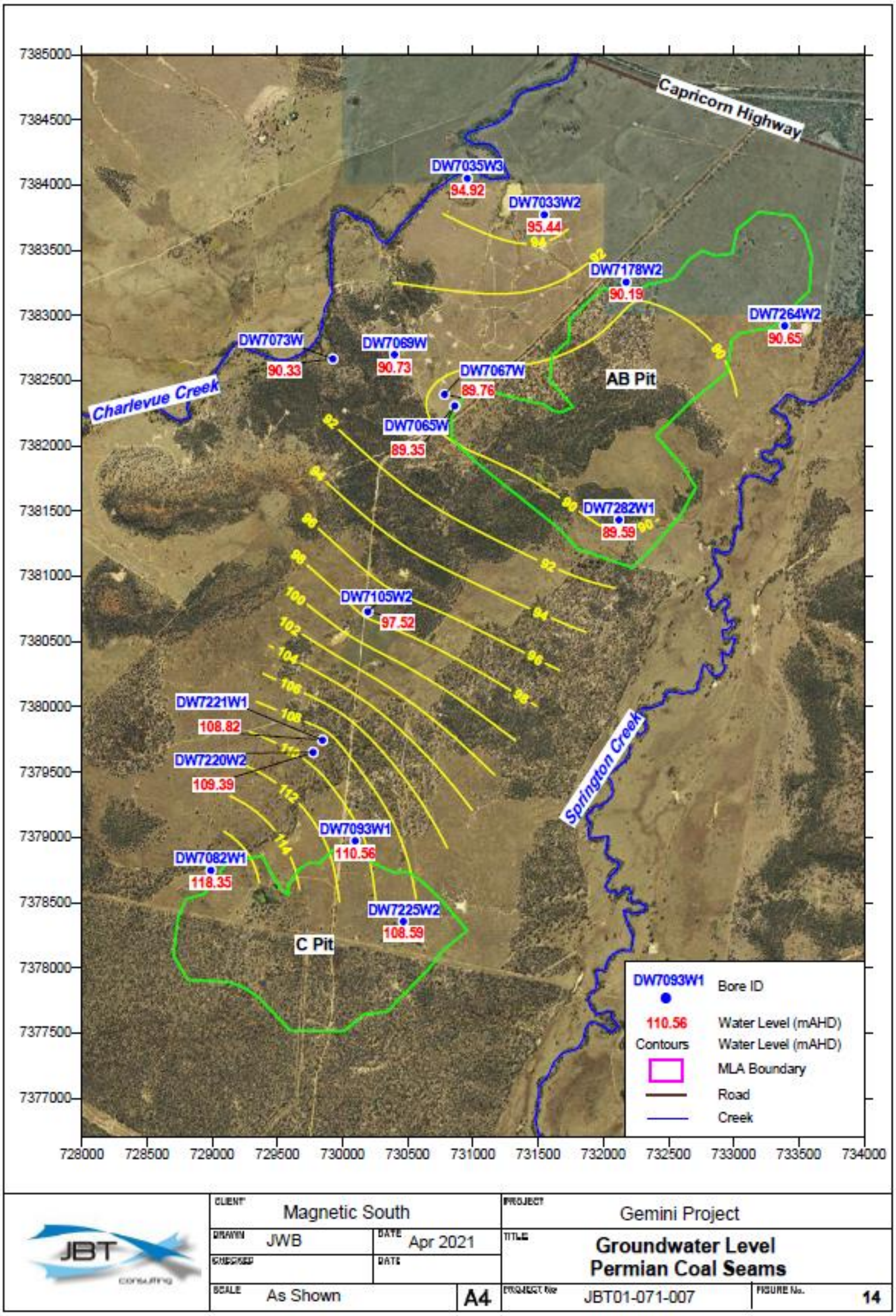

Figure 5: Groundwater level and contours in Permian coal seams

4.3.3.3 Alluvium monitoring bores

The location of existing/proposed groundwater monitoring reference/impact bores for the alluvial aquifer is shown in Table 2. The proposed new monitoring bores are to be installed prior to commencement of mining activities.

Table 2: Existing and proposed alluvial groundwater monitoring bores

	Charlevue Creek alluvium	**Springton Creek alluvium**
Upstream/reference bore	Charlevue Creek alluvium monitoring bore DW7076W Additional alluvium monitoring bore proposed to be installed (refer to Section 4.1.3.1).	Springton Creek alluvium monitoring bore DW7292W1 Additional alluvium monitoring bore proposed to be installed upstream of Pit C prior (refer to section 4.1.3.2).
Downstream/impact bore	Additional alluvium monitoring bore proposed to be installed adjacent to the water gauge station (refer to Section 4.1.3.1).	Alluvium monitoring bore proposed to be installed upstream of the water gauge station (refer to Section 4.1.3.2) Alluvium monitoring bore proposed to be installed at site DW7082 (refer to Section 4.1.3.2).

5 Geochemical Assessment of mine waste materials

5.1 Drill hole sample depth

5.1.1 DES Comment

In Section 2.1, it states, "recoverable coal will come from the Rangal coal seams but may also target the Upper Burngrove formation." Figure A2 in Attachment A indicates that the Upper Burngrove coals seams are found at depths of approximately 175 metres (m) to 250m. However, in section 3.1, Table 3-1 indicates the maximum sample depth was 158.00 metres. It is not clear how these samples are representative of the geochemical characteristics of the Upper Burngrove Formation.

5.1.2 DES Requirement

Provide further explanation for the maximum sample depth, including justification that it is representative of geochemical characteristics and amount of potential mining waste materials expected to be encountered in the Upper Burngrove Formation given that Figure A2 identifies the coal seam presence at 175m to 250m, while the samples were taken at a shallower depth.

5.1.3 Response

The Gemini Project will target the Rangal Coal Measures (Aries, Castor and Pollux seams). It is not planned to mine coal seams in the Upper Burngrove Formation. Please refer to Section 2.1 of the *RGS Technical Memorandum: Geochemical Assessment of Mine Waste Materials* (RGS, May 2021) (Mine Waste Geochemistry Technical Memorandum) (Appendix D) for further information.

5.2 Drill hole locations

5.2.1 DES Comment

Table 3-1 in Section 3.1 of the Appendix G: Geochemical Assessment of Mining Waste Materials (RGS, Sep 2019) presents the drill hole identification (ID) numbers from which samples were taken for geochemical assessments, that is DW7002, DW7003 and DW7012. The drill hole ID numbers correspond to locations provided in Figure A3 (Attachment A) of Appendix G. Figure A3 shows that the three (3) drill holes sample sites are in the centre of MLA 700056 tenure area, in an area that is not proposed to be disturbed by activities associated with the mining project. Neither Appendix G nor the Revised Supporting Information document provide discussion of the sufficiency of the geochemical sampling sites to be representative of the characteristics of the mining waste materials likely to be encountered. It is not clear how the drill hole samples sites are representative of mining waste materials likely to be encountered for Gemini Project when the samples have been taken from outside the proposed areas for Pit AB and Pit C.

5.2.2 DES Requirement

Ensure a representative sampling regime is conducted for the assessment of geochemical properties of mining waste materials likely to be encountered. Provide a statement to justify that the chosen sampling regime sufficiently reflects the likely characteristics of mining waste materials encountered for Gemini Project, given the samples have been taken from outside the areas proposed to be disturbed by Pit AB and C.

5.2.3 Response

The three drill holes (DW7002, DW7003 and DW7012) used to collect representative samples of mining waste (spoil) materials were drilled in 2017 from an additional resource area that was targeted in early mine planning and subsequently dropped (as shown in Figure 1).

While it is acknowledged that the three drill holes are located outside the planned open pit areas, the chosen sampling regime is considered to sufficiently reflect the likely characteristics of mining waste materials encountered for the Gemini Project for the following reasons:

- Magnetic South has drilled 36 partially cored coal quality holes in the Pit AB and Pit C areas. The drilling consisted of five 150 mm large diameter (LD) cores twinned with four 100 mm cores at four sites. The major coal seams AR3, CAS, PLU1 and PLU2 were intersected in all holes as well as roof and floor samples.
- The cores were subjected to pre-treatment, washability and flotation testing on samples from both the thicker and thinner plies, and also provided sufficient coal and dilution mass to make up a simulated bulk ROM sample for bulk processing to generate product, reject and tailings material. This material was subjected to specialist handleability, thickening and dewatering test work, as well as physical, chemical, XRD and geotechnical characterization of the potentially clay rich reject and tailings.
- Results from quality testing showed very little variation between trace elements concentrations such as Sulphur, Phosphorus and Chlorine.
- The sedimentary stratigraphic profile, and overburden and interburden materials encountered at the drill hole locations DW7002, DW7003 and DW7012 is very similar to those encountered at the planned open pit areas (soil, clay, sandstone and siltstone).
- The Rangal Coal Measures are mined at a number of locations in the Bowen Basin. Mine spoil is typically very low in sulphur, has excess acid neutralising capacity (ANC) and is classified as Non-Acid Forming (NAF). These characteristics are typical of spoil characteristics at proposed and actual coal mines in close proximity to the Project such as the Walton Coal Project, Baralaba, Jellinbah and Yarrabee mines.

The three holes (DW7002, DW7003 and DW7012) are located in the same overburden and interburden strata at Pit AB and Pit C. This provides geological justification that these samples are representative of the material proposed to be mined from Pit AB and Pit C. Validation sampling will be undertaken during operations to confirm this conclusion.

6 Geochemical assessment of Coal Reject Material

6.1 Placement and encapsulation of rejects material

6.1.1 DES Comment

Regarding the expected coal reject material disposal, the Revised Supporting Information document states in Section 12.3, Table 68: "Coal rejects will be disposed of within Pit AB and Pit C and out-of-pit waste rock emplacements." Further in Section 13.4.1 and 13.4.4, respectively, it is stated: "Coal reject material will be placed where there is a lower risk of connectivity to surface water or groundwater resources." "Coal reject materials and any potentially acid forming waste rock materials identified will be selectively handled and encapsulated within waste rock emplacements and well away from the outside surface of rehabilitated landforms, where there is a low risk of connectivity to surface water or groundwater resources." Appendix H and the Revised Supporting Information document do not give clear locations of where coal reject material will be disposed of other than, generally, within the waste rock or spoil emplacements and at a depth where there is a lower risk of connectivity to surface water or groundwater resources.

Further information is required to ensure that there is sufficient capacity for the achievement of the proposed disposal requirements with respect to the proposed final landform.

6.1.2 DES Requirement

Provide a discussion of the likely position of disposed coal reject material within the out-of-pit and in-pit waste rock emplacements and demonstrate that there is sufficient capacity for proposed coal reject material disposal, including sufficient quantities of benign material to encapsulate potentially acid forming waste.

6.1.3 Response

It is estimated that less than 10 Mt of coal reject material will be generated over the life of the mine, while the volume of waste rock materials to be generated is estimated to be over 1000 Mt. The volume of coal reject material will make up a very small proportion of the total spoil materials (<1%).

It is anticipated that most coal reject materials have a relatively low risk of acid generation, while the overwhelming majority of waste rock waste samples are classified as non-acid forming, with excess acid neutralising capacity.

Reject material will be placed at least 10 m from the edge of the final spoil storage areas, such that it remains encapsulated and is not exposed near the surface of the final rehabilitated landforms/edge of void.

Ongoing sampling and geochemical testing of mining waste materials will be strategically undertaken during mine operations to verify the findings of the geochemical assessments and additional management measures will be employed where necessary to ensure reject materials are adequately neutralised.

Please refer to Section 2.3 of the Mine Waste Geochemistry Technical Memorandum (Appendix D) for further information.

6.2 Coal reject sampling methodology

6.2.1 DES Comment

Table 2.1 in Section 2.1 assigns geochemical samples to a sample number according to the coal seam (AR2, AR3, CAS, PLU1, PLU2); however, it is unclear what consideration was given to spatial variability across the coal seams. It is noted that the samples are composite. It is not clear what influence this has on geochemical characteristics of the samples where quality may be variable across the coal seam.

6.2.2 DES Requirement

Provide a list of the coal reject drillhole ID numbers for each generated composite coal reject sample detailed in Table 2.1 of section 2.1. Provide further information on how the geochemical characteristics across a coal seam is considered in the assessment of the quality of coal reject material from each coal seam or each composite sample.

6.2.3 Response

6.2.3.1 Drill hole ID numbers contributing to each composite sample

Geochemical testing was undertaken for each of the target coal seams (Aries, Castor and Pollux). Evaluation of the anticipated geochemistry of coal reject materials requires a number of tests, including coal quality, processing methodologies and reject material geochemistry. This requires a high volume of material to be provided to the laboratory. It was therefore necessary to form composite samples for each coal seam using material from multiple drill holes. In consideration of the proportionately small volume of rejects to be produced and disposed of over the life of mine and the fact that reject waste streams will comprise a mixture of any number of coal seam waste products, the approach of composite sample testing across coal seams is considered appropriate.

Section 2.4 of the Mine Waste Geochemistry Technical Memorandum (Attachment D) provides details on which drill holes were used to form each of the composite samples.

6.2.3.2 Geochemical characteristics across coal seams

Sulphur contours plotted for the main target seams indicate that the total sulphur content of the coal seams is relatively consistent across the open pit areas. It is therefore considered that the average geochemical nature of bulk coal reject materials generated from processing the target coal seams is also likely to be consistent (although some natural variability will occur). Further detail, including figures showing total sulphur contours for the main target coal seams, is provided in Section 2.4 of the Mine Waste Geochemistry Technical Memorandum, describing coal reject sampling drill hole locations and overall representativeness.

6.2.4 DES Comment

Figure A3 provides the locations of the drill hole sites from which samples were extracted for geochemical assessment of coal rejects material. Figure A3 shows that one (1) drill hole was taken from the proposed area of Pit C (drill hole ID number DW7253C), while eight (8) where taken from the proposed area of Pit AB. Neither Appendix H nor the Revised Supporting Information document provide discussion of the sufficiency of the geochemical sampling sites to be representative of the characteristics of the mining waste materials likely to be encountered. It is not clear how the drill hole samples sites are representative of mining waste materials likely to be encountered for Gemini Project when the samples have been taken from outside the proposed areas for Pit AB and Pit C.

6.2.5 DES Requirement

Ensure a representative sampling regime is conducted for the assessment of geochemical properties of coal reject material likely to be produced. Provide a statement to justify that the chosen sampling regime sufficiently reflects the likely characteristics of coal reject material produced by the Gemini Project.

6.2.6 Response

It is acknowledged that the majority of coal reject material samples were taken from the Pit AB area.

As outlined in Section 6.2.3.2 above the average total sulphur content of the coal seams is relatively consistent across the open pit areas. The average geochemical nature of the bulk coal reject materials generated from processing the target coal seams is also likely to be relatively consistent. The coal reject samples are therefore expected to reflect the characteristics of the coal reject material at the Project. However, validation sampling and geochemical testing of mining waste materials will be undertaken during mine operations to verify the findings of the geochemical assessments. Please refer to Section 2.5 of the Mine Waste Geochemistry Technical Memorandum (Attachment D) for further detail.

7 Soils and Land Suitability

7.1 Post Mining Land Use (PMLU)

7.1.1 DES Comment

Appendix I provides pre-mining land suitability classes for grazing, which range from Class 2 to 4. It is stated that, “the majority of areas in the final landform will aim to restore a post-mining land use of grazing.” However, “grazing” is not defined by a land suitability class that it will aim to achieve. Further discussion in this section describes areas that may not achieve the pre-mining land suitability class, “such as steeper outer slopes of spoil”, but these areas are not referenced by a specific location.

For the mining disturbance domains that have a post-mining land use of grazing, it is unclear which areas are proposed to achieve the pre-mining land suitability class and which areas will not, and furthermore, what land suitability class for grazing they are proposed to achieve.

7.1.2 DES Requirement

Provide more detailed explanation and acceptance criteria for the post-mining land use “grazing”, particularly:

- The land suitability class/es that will be achieved for areas with a post mining land-use of “grazing”, including if it will return to pre-mining land suitability class or different
- If an area will have a different class to pre-mining, provide justification for how the proposed post-mining land suitability class is appropriate
- If “grazing” will achieve varying land suitability classes in the post-mining landform, provide proposed areas and locations for each class
- Given land suitability classes are assessed against limitations, provide the parameters that will demonstrate that an area has achieved the proposed post-mining land suitability class.

7.1.3 Response

The post mining cattle grazing Land Suitability Class (LSC) proposed to be achieved for each mine domain is shown in Figure 6. This was determined based on the *Land Suitability Assessment Technique* (DME 1995)), with consideration of the pre-mining LSC (refer to Figure 7 SLSA Assessment) and physical characteristics of the post mining landscape, such as topography, recreated soil profiles and the underlying substrate (e.g. mine waste).

The pre mining cattle grazing LSC that was determined for the project area is shown in Figure 7 of the *Gemini Project Soil and Land Suitability Assessment* (AARC, July 2019) (SLSA Assessment)).

The calculated area (in hectares) for each pre and post mining LSC within the project disturbance area is provided in Table 3.

Justification for the proposed post mining LSC of each Rehabilitation Area (RA) is provided in Table 4.

The parameters that will be used to demonstrate achievement of the post mining cattle grazing LSC are the same parameters which were used to assess the pre-mining land use suitability, as identified in the *Land Suitability Assessment Technique* (DME 1995): water availability, nutrient deficiency, soil physical factors, salinity, rockiness, ESP, wetness, topography, water erosion, flooding and vegetation regrowth.

Table 3: Pre and post mining cattle grazing LSC areas

Area (ha)						
	Class 2	**Class 3**	**Class 4**	**Class 5**	**Class 3/5**	**Total**
Pre-mining	63.2	1644.0	246.3	0	0	1953.5
Post-mining	0	631.5	1027.1	224.4	70.5	1953.5
Change from pre to post	-63.2	-1012.5	+780.8	+224.4	+70.5	0

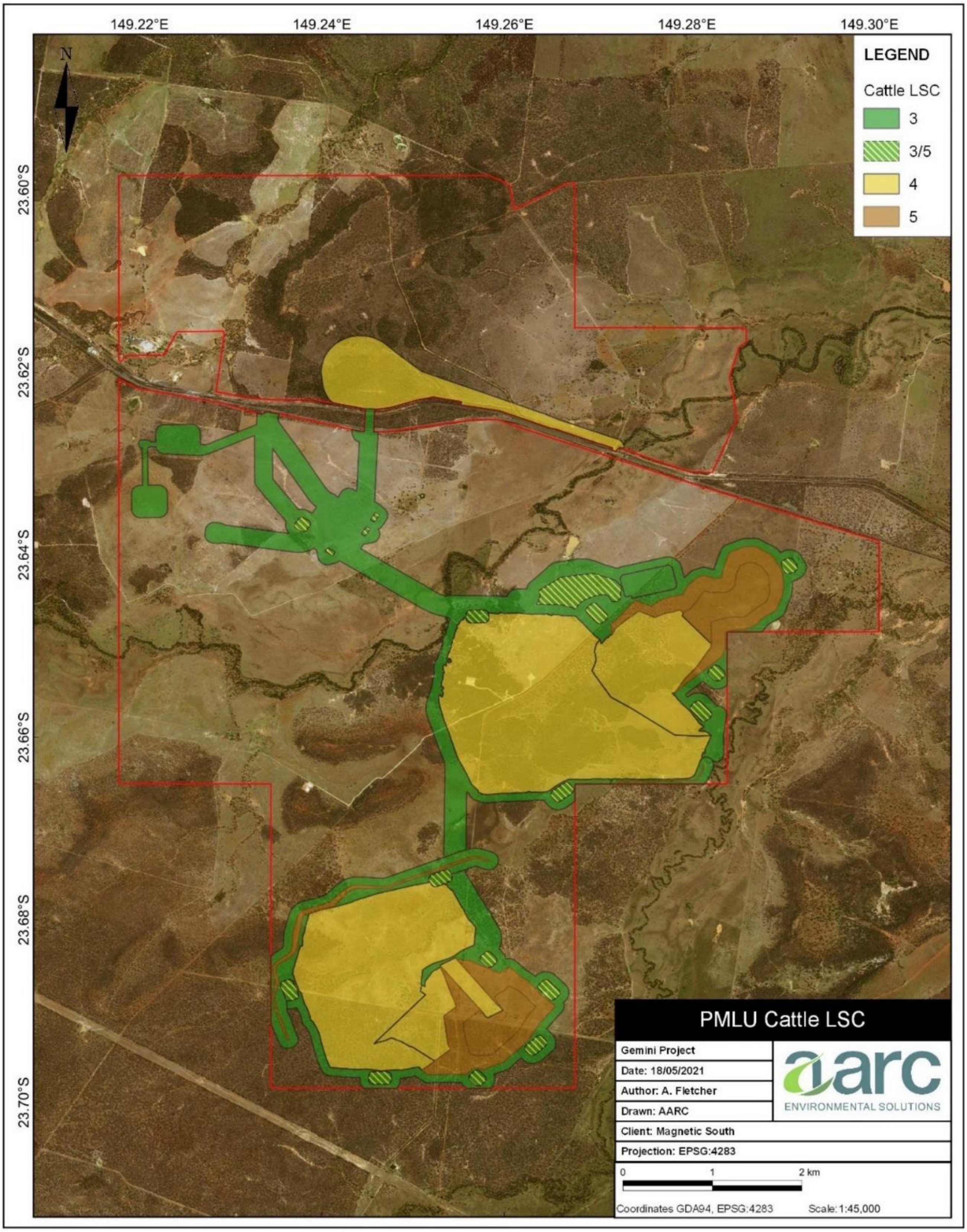

Figure 6: Proposed Post Mining Land Use (PMLU) LSC for cattle grazing

Table 4: Post mining land suitability class that will be achieved for areas with a post mining land-use of grazing

Area	Rehabilitation area description	Proposed PMLU	Pre-mining LSC (cattle grazing)	Post-mining LSC (cattle grazing)	Justification proposed post-mining LSC
RA1	Pit AB in pit and out of pit waste emplacements	Grazing	Class 3 & 4	Class 4	<u>Slope</u> It is planned that the final waste emplacements will have a maximum slope of approximately 6°, which is not anticipated to greatly impact the productivity for cattle grazing. However, the soil characteristics and nature of the underlying waste is anticipated to lead to increased limitations of land productivity in these areas, as outlined below. <u>Soils</u> The Pit AB footprint is comprised of areas with a cattle grazing LSC of 3 and 4, which are associated with the Geoffrey and Charlevue soil management units (SMUs), respectively. The Charlevue SMU has a variable pH, ranging from 5.4 (strongly acid) in the topsoil to 7.9 (moderately alkaline) in the lower subsoil. EC is medium in the surface soil (0.28-0.43 dS/m) and increases to high in the subsoil (0.46 dS/m). Chloride is considered to be high from 0.2 m depth downwards (>600 mg/kg), which can cause toxicity by interfering with plants' osmotic capacity. Due to the stark difference in textures between the topsoil and subsoil layers, pH for the Geoffrey SMU changes quite dramatically down the soil profile. Sandy, massive horizons (0.0-0.6 m) are moderately acidic, with pH gradually increasing with depth from 5.8 to 6.0. The clay B2 horizon has a pH value over two units higher (8.1) and is classified as 'moderately alkaline'. This is likely due to the increased CEC of the clay in the B2 horizon compared with the sand in the upper horizons. As such, it is expected that the recreated soil profile in this area would practically achieve a cattle grazing LSC of 4. <u>Plant Available Water Capacity</u> The pre-mining plant available water capacity (PAWC) for the Charlevue and Geoffrey SMUs have been assessed at 75-100mm (LSC 3). PAWC is identified as one of the limiting factors for productivity of these SMUs. It is anticipated that the chemical and physical properties of the underlying spoil material, combined with anticipated post mining soil depths, is such that the growth medium will be reduced to the top 20-40cm, effectively reducing the LSC for cattle grazing to Class 4 in this area. <u>Erosion Risk</u> Recreated post-mining landforms, such as in pit and out of pit spoil, will initially present an increased risk of erosion. Particularly on the slopes of the out of pit spoil dumps. Cattle grazing at a reduced intensity is therefore recommended, until such time that landforms stabilise and soil profiles further develop. This change in productivity is expected to be consistent with cattle grazing LSC 4.
	Pit C in pit and out of pit waste emplacements	Grazing	Class 3	Class 4	<u>Slope</u> It is planned that the final waste emplacements will have a maximum slope of approximately 6°, which is not anticipated to greatly impact the productivity for cattle grazing. However, the soil characteristics and nature of the underlying waste is anticipated to lead to increased limitations of land productivity in these areas, as outlined below. <u>Soils</u> The Pit C footprint is comprised of LSC3 areas, associated with the Geoffrey, Namoi and Cooinda SMUs. <u>Plant Available Water Capacity</u> The pre-mining plant available water capacity (PAWC) for the Geoffrey and Cooinda SMUs have been assessed at 75-100mm (LSC 3), with Namoi assessed at 100-125mm (LSC 2). PAWC is identified as one of the limiting factors for productivity of the Geoffrey and Cooinda SMUs. It is anticipated that the chemical and physical properties of the underlying spoil material, combined with anticipated post mining soil depths, is such that the growth medium will be reduced to the top 20-40cm, effectively reducing the PAWC to LSC (cattle grazing) 4 in this area. <u>Erosion Risk</u> Recreated post-mining landforms, such as in pit and out of pit spoil, will initially present an increased risk of erosion. Particularly on the slopes of the out of pit spoil dumps. Cattle grazing at a reduced intensity is therefore recommended, until such time that landforms stabilise and soil profiles further develop. This change in productivity is expected to be consistent with cattle grazing LSC 4.
RA2	Temporary waste rock emplacements	Grazing	Class 3	Class 3	No change to the LSC for cattle grazing is predicted.

Area	Rehabilitation area description	Proposed PMLU	Pre-mining LSC (cattle grazing)	Post-mining LSC (cattle grazing)	Justification proposed post-mining LSC
RA5	Residual void low walls	Grazing	Class 3 & 4	Class 4	<u>Slope</u> It is planned that the final waste emplacements will have a maximum slope of approximately 6°, which is not anticipated to greatly impact the productivity for cattle grazing. However, the soil characteristics and nature of the underlying waste is anticipated to lead to increased limitations of land productivity in these areas, as outlined below. <u>Soils</u> The Charlevue SMU has a variable pH, ranging from 5.4 (strongly acid) in the topsoil to 7.9 (moderately alkaline) in the lower subsoil. EC is medium in the surface soil (0.28-0.43 dS/m) and increases to high in the subsoil (0.46 dS/m). Chloride is considered to be high from 0.2 m depth downwards (>600 mg/kg), which can cause toxicity by interfering with plants' osmotic capacity. Due to the stark difference in textures between the topsoil and subsoil layers, pH for the Geoffrey SMU changes quite dramatically down the soil profile. Sandy, massive horizons (0.0-0.6 m) are moderately acidic, with pH gradually increasing with depth from 5.8 to 6.0. The clay B2 horizon has a pH value over two units higher (8.1) and is classified as 'moderately alkaline'. This is likely due to the increased CEC of the clay in the B2 horizon compared with the sand in the upper horizons. As such, it is expected that the recreated soil profile in this area would practically achieve a cattle grazing LSC of 4. <u>Plant Available Water Capacity</u> The pre-mining plant available water capacity (PAWC) for the Charlevue and Geoffrey SMUs have been assessed at 75-100mm (LSC 3). PAWC is identified as one of the limiting factors for productivity of these SMUs. It is anticipated that the chemical and physical properties of the underlying spoil material, combined with anticipated post mining soil depths, is such that the growth medium will be reduced to the top 20-40cm, effectively reducing the LSC (cattle grazing) to Class 4 in this area. <u>Erosion Risk</u> Recreated post-mining landforms, such as in pit and out of pit spoil, will initially present an increased risk of erosion. Particularly on the slopes of the out of pit spoil dumps. Cattle grazing at a reduced intensity is therefore recommended, until such time that landforms stabilise and soil profiles further develop. This change in productivity is expected to be consistent with cattle grazing LSC 4.
RA6	Clean water drains	Native vegetation	Class 3	Class 5	Clean water drains will become permanent landforms, which will incorporate geomorphic and riparian vegetation features and provide ongoing habitat and connectivity to Springton Creek.
	Other water Management Infrastructure (mine water dams, sediment dams, raw water dams)	Grazing/native vegetation	Class 2 & 3	Class 3 / Class 5	The pre-mining footprint of these areas is predominantly comprised of LSC 3 areas (associated with the Geoffrey and Namoi SMUs), with a small pocket of LSC 2 area located near the Mine infrastructure Area (associated with the Kosh SMU). If water storage facilities are identified by the post-mining landholder as of value to their future use of the land, an agreement may be is entered into to retain water storages, in which case these areas will have a post mining LSC of 5. Otherwise, they will be regraded to natural surface levels and returned to a grazing land use. It is anticipated that areas returned to a post mining land use of cattle grazing can be returned to LSC 3. Given the small area of Class 2 soils that will be stripped for the project, it is considered that the most viable and beneficial option for these soils will be to use them for mixing with other more problematic soils.
RA7	Train loadout facility (TLO)	Grazing	Class 3 &4	Class 4	<u>Soils</u> The TLO footprint is comprised of LSC 3 and 4 areas associated with the Geoffrey and Nigel soil management units (SMU). The area is predominantly Class 4 land. The pH within the Nigel SMU is highly variable, changing from 6.3 (slightly acid) in the topsoil to 8.5 (strongly alkaline) in the lower subsoil. EC follows a similar pattern, changing from very low between 0.0-0.3 m depth, to medium in the subsoil. CEC increases with depth from low (6.8 meq/100g) to moderate (17.4 meq/100g), likely due to the increased clay content in the subsoil layers. It is therefore anticipated that this area can returned to a post mining cattle grazing LSC of 4.
	Mine infrastructure areas (CHPP, camp, STP, effluent irrigation area, roads).	Grazing	Class 2 & 3	Class 3	<u>Soils</u> The majority of these areas have a cattle grazing LSC of 3 (associated with the Geoffrey SMU), with an area of cattle grazing LSC 2 in the road and effluent irrigation area footprints, associated with Kosh and Normanby SMUs. As described above, the pH for the Geoffrey SMU changes quite dramatically down the soil profile. Sandy, massive horizons (0.0-0.6 m) are moderately acidic, with pH gradually increasing with depth from 5.8 to 6.0. The clay B2 horizon has a pH value over two units higher (8.1) and is classified as 'moderately alkaline'. This is likely due to the increased CEC of the clay in the B2 horizon compared with the sand in the upper horizons. As these infrastructure areas will remain relatively flat, consistent with the surrounding landscape, it is anticipated these areas can be returned to post-mining cattle grazing LSC of 3. Given the small area of Class 2 soils that will be stripped for the project, it is considered that the most viable and beneficial option for these soils will be to use them for mixing with more problematic soils.

8 Terrestrial ecology and Environmental Offsets Strategy

8.1 Area of impact for prescribed environmental matters

8.1.1 DES Comment

The maximum extent of impact (ha) has been provided as a total area for all regulated vegetation that are regional ecosystems within a defined distance of a vegetation management watercourse and for connectivity areas that are regional ecosystems. It is unclear the maximum extent of impact (ha) to each regional ecosystem identification for both these prescribed matters. The draft EA conditions for impacts to prescribed environmental matters does not include reference figures associated with Table H2 to provide context about the locations of prescribed environmental matters being offset and therefore, it is unclear the locations within the project area they are located.

8.1.2 DES Requirement

As per the mining guideline for Model Mining Conditions (ESR/2016/1936, Version 6.02, Effective 07 Mar 17) for Impacts to Prescribed Environmental Matters, provide the location of impact and area (ha) of maximum extent of impact for each regional ecosystem (RE) within the prescribed environmental matters for regulated vegetation and connectivity areas. For the location of impact, multiple figures that reference only the areas of the prescribed environmental matters that are being impacted by the resource activity, is preferable.

8.1.3 Response

A revised Table H2 has been prepared providing a breakdown of the area of each regional ecosystem (RE) for each of the Prescribed Environmental Matters (Table 5).

Table 5: Significant Residual Impacts to Prescribed Environmental Matters

<table>
<tr><th>Prescribed Environmental Matter</th><th colspan="2">Description</th><th colspan="2">Maximum Extent of Impact (ha)</th><th>Figure</th></tr>
<tr><td rowspan="5">Regulated Vegetation</td><td>Of concern regional ecosystem</td><td>RE 11.3.2</td><td colspan="2">2.57</td><td>Figure 7</td></tr>
<tr><td rowspan="4">Regional ecosystems within a defined distance of a vegetation management watercourse</td><td>RE 11.5.2</td><td>31.01</td><td rowspan="4">58.32</td><td rowspan="4">Figure 8</td></tr>
<tr><td>RE 11.3.2</td><td>0.59</td></tr>
<tr><td>RE 11.7.2</td><td>17.82</td></tr>
<tr><td>RE 11.3.25</td><td>8.9</td></tr>
<tr><td colspan="2" rowspan="4">Connectivity Areas</td><td>RE 11.3.2</td><td>3.15</td><td rowspan="4">710.7</td><td rowspan="4">Figure 9</td></tr>
<tr><td>RE 11.3.25</td><td>21.85</td></tr>
<tr><td>RE 11.5.2</td><td>374.02</td></tr>
<tr><td>RE 11.7.2</td><td>311.68</td></tr>
</table>

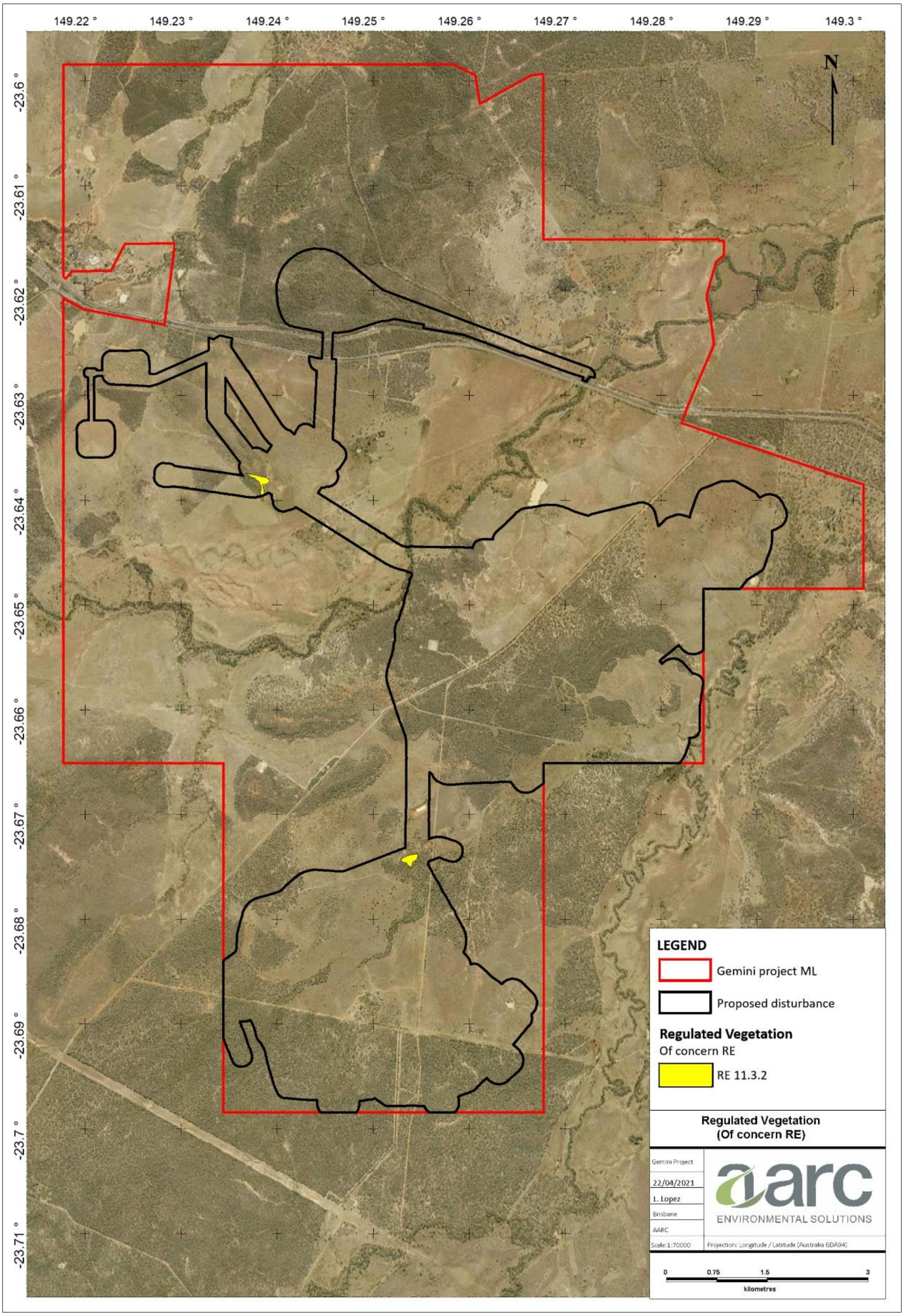

Figure 7: Regulated Vegetation (Of Concern Regional Ecosystem (RE))

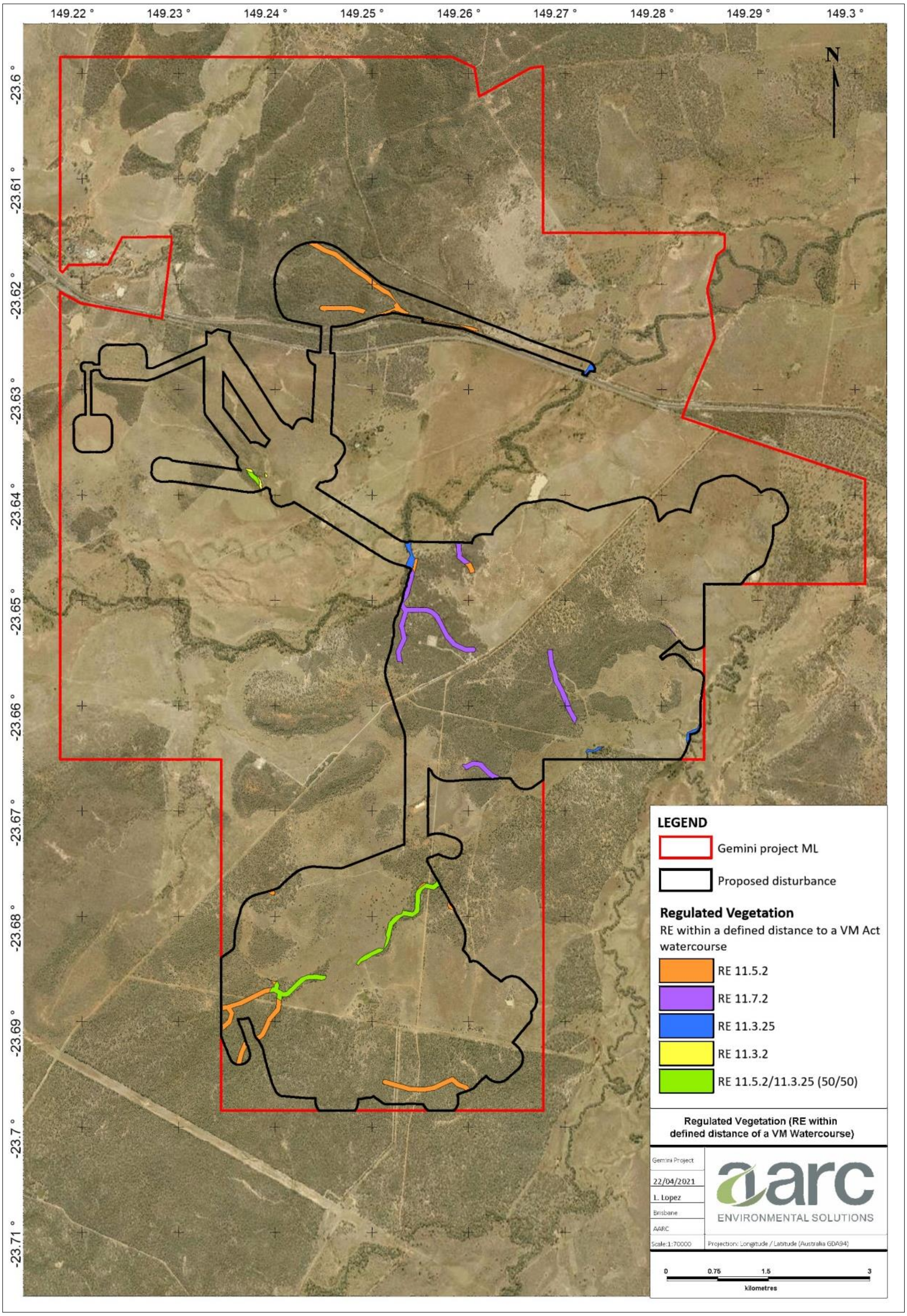

Figure 8: Regulated vegetation (RE within a defined distance to a Vegetation Management Act 1999 (VM) watercourse

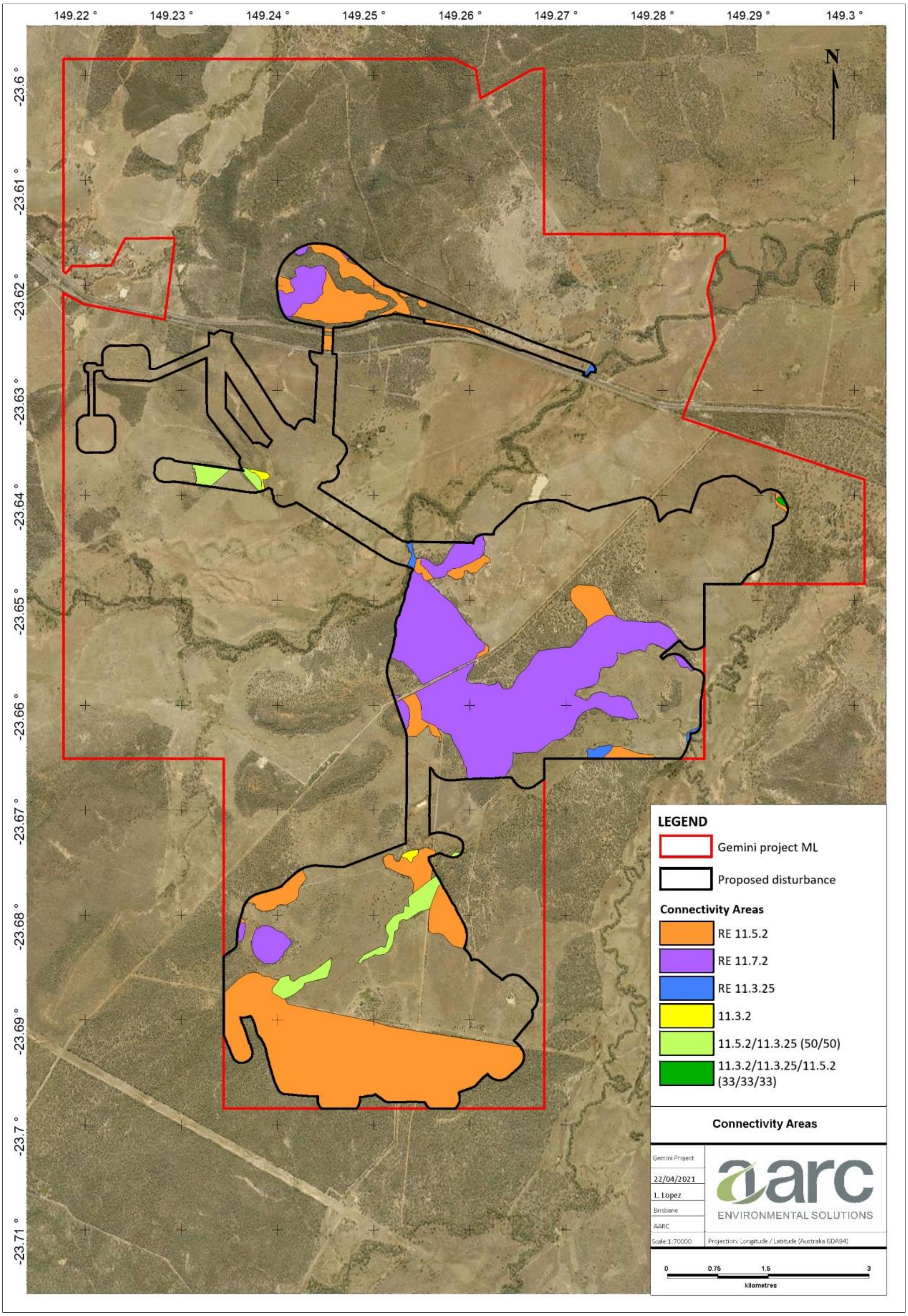

Figure 9: Connectivity Areas

9 Aquatic ecology

9.1 Environmental Values for water quality

9.1.1 DES Comment

Section 4.1 states: "EHP identifies ten EVs in the Mackenzie River (2013b) sub- basin. Two of these are deemed relevant for the waters surrounding the study area: 1. protection of aquatic ecosystem values; and 2. suitability for stock watering." Discussion about the other eight (8) EVs for waters listed in the Environmental Protection (Water) Policy 2009 has not been addressed to provide sufficient explanation for why only two (2 EVs are relevant. Please also note, the original application for Gemini Project was submitted on 23 October 2019. Environmental Protection (Water) Policy 2009 was superseded by Environmental Protection (Water and Wetland Biodiversity) Policy 2019 (EPP Water 2019) on 1 September 2019. Section 6 of the EPP Water 2019 defines eleven (11) EVs for waters to be enhanced and protected.

9.1.2 DES Requirement

Ensure references to subordinate legislation are current for the time of original submission of the EA application for Gemini Project. Address all EVs for waters providing justification for why they may or may not be relevant.

9.1.3 Response

Section 7.2.3 of the application is to be removed and replaced with the following:

In accordance with section 6 and Schedule 1 of the *Environmental Protection (Water and Wetland Biodiversity) Policy 2019* (EPP (Water)), environmental values (EVs) and water quality objectives (WQOs) for the Mackenzie River Sub-basin area are those described in the *Mackenzie River Sub-basin Environmental Values and Water Quality Objectives* document (DES 2011) (Mackenzie River WQOs document). Charlevue Creek and Springton Creek form part of the basin's southern tributaries.

EVs ascribed to the southern tributaries of the Mackenzie River Sub-basin are:

- Protection of aquatic ecosystems (moderately disturbed)
- Suitability for farm supply and use
- Suitability for stock water
- Suitability for human consumption of aquatic foods
- Suitability for primary contact recreation
- Suitability for secondary contact recreation
- Suitability for visual recreation
- Suitability for drinking water
- Suitability for industrial use
- Cultural and spiritual values

A list of WQOs for the environmental values described above is provided in the *Mackenzie River WQOs document*.

10 Air Quality and Greenhouse Gases

10.1 Ambient air quality monitoring data

10.1.1 DES Comment

It is noted from Section 3.3.3.2.1 of Appendix L that air quality data from Department of Environment and Science (the department) monitoring station in Blackwater has been used to provide ambient background concentrations. Section 9.2.3.1 of Revised Supporting Information states that data from the department's monitoring station in Blackwater adequately accounts for potential cumulative contributions from surrounding industry, including Bluff Coal Mine. Bluff Coal Mine is 12 kilometres (km) from Gemini Project. Blackwater is located a further 23km west of Bluff Coal Mine, i.e., a total of 35 km from Gemini Project. Ambient background concentrations measured at Blackwater would, therefore, not be representative of the ambient air quality at Gemini, which is a lot closer to Bluff, for example, than Bluff is to Blackwater. Gemini Project is also located in a different direction from Bluff than Blackwater, and therefore, ambient air quality as influenced by prevailing winds, for example, would be quite different.

Section 9.2.3.1 also states that Bluff Coal Mine is currently in care and maintenance with no certainty of return to operations. Therefore, it is not clear if air quality modelling for Gemini Project has accounted for the worst case scenario which assumes Bluff Coal Mine is operating at full capacity at the same time as Gemini Project.

10.1.2 DES Requirement

Explain how Blackwater monitoring data is expected to adequately account for the potential contributions to existing air quality and adequately represent cumulative impacts to air quality in the assessment model, with particular reference to Bluff Coal Mine.

10.1.3 Response

An explanation for how the Blackwater monitoring data adequately accounts for potential contributions to air quality, and adequately represent cumulative impacts to air quality in the assessment model, is provided below. Refer to Item 1 in the *Response to Further Information Request: Gemini Project: Air Quality and Greenhouse Gas Assessment* (Katestone, May 2021) (Air Quality Technical Memorandum) (Appendix E)) for further detail.

10.1.3.1 Period of data available for analysis

DES commenced monitoring PM10 and PM2.5 at Bluff in November 2020. Consequently, there is insufficient data available from DES's Bluff monitoring station to adequately characterise air quality. The Bluff Coal Mine is currently in care and maintenance with no certainty of return to operation.

At the time of the current Air Quality and Greenhouse Gas Assessment (Katestone, Dec 2020) (AQGGA), DES's Blackwater monitoring station was the closest monitoring station to the Project which had more than 12 months of PM10 and PM2.5 data available for analysis.

10.1.3.2 Proximity to other mines

The Blackwater monitoring station is located approximately 35 km west of the project and is surrounded by five mines located between 6km and 18km from the station, with three of the mines located within 11km. Those three mines are estimated to have emitted 21,242 tonnes of PM10 to air for the 2019/2010 based on NPI reporting.

The Bluff monitoring station is located within 1km of the Bluff Coal Mine. There are no other mines located within 11km of the Bluff monitoring station. The Gemini Project has only one mine within 11km and that is the Bluff Coal Mine, located 11km to the west. The Bluff Coal Mine was estimated to have emitted 1,098 tonnes of PM10 to air for the 2019/2020 reporting period.

10.1.3.3 Wind direction

The Bluff Coal Mine is located approximately 11km to the west of the Project site. As detailed in Appendix A of the AQGGA and shown in Figure 10 and Figure 11 of this report, the meteorological data for the Gemini Project illustrates that winds occur infrequently from the west (less than 8% of the time).

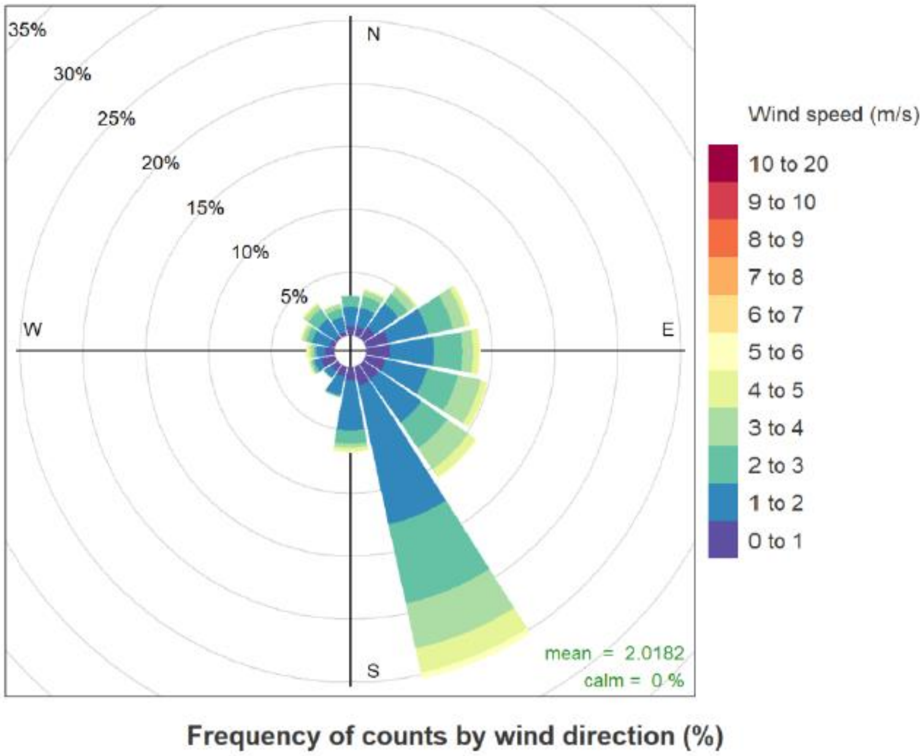

Figure 10: Annual distribution of winds at the Project site predicted by TAPM/CALMET

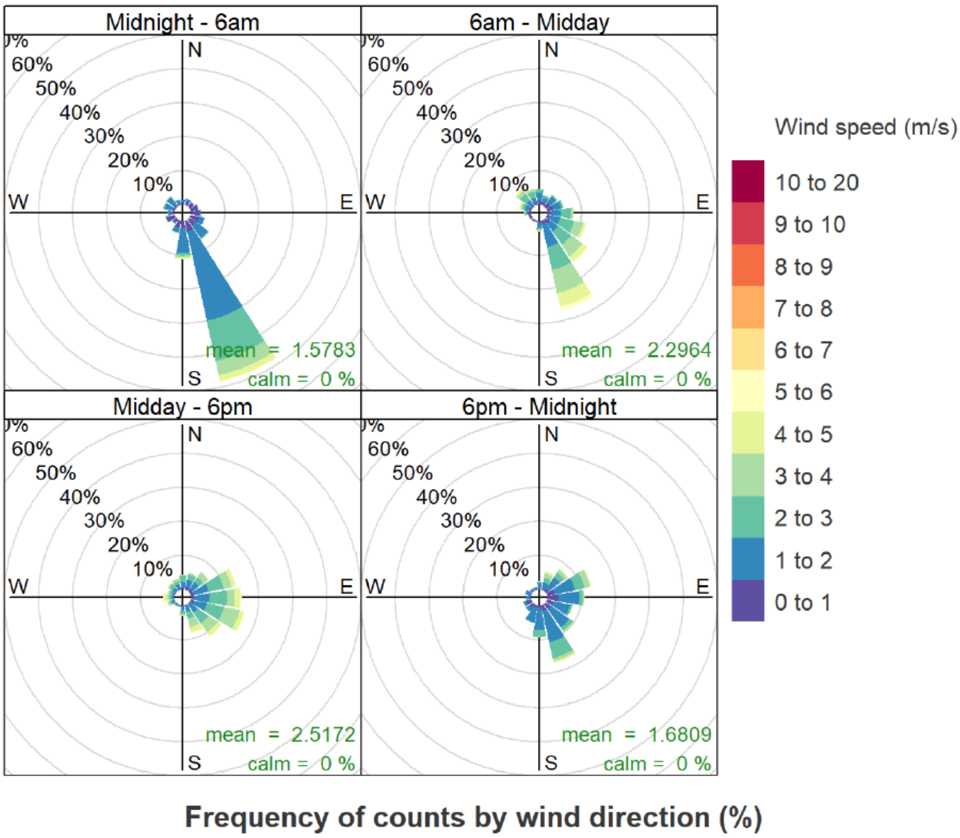

Figure 11: Seasonal distribution of winds at the Project site predicted by TAPM/CALMET

10.1.3.4 Summary

In summary, DES's Blackwater monitoring station is expected to adequately account for the potential contribution from the Bluff Coal mine on sensitive receptors near to the Gemini Project for the following reasons:

- There are three mines located within 11km of Blackwater monitoring station, which are closer than the Bluff Coal Mine is to the Gemini Project.
- The emissions to air from those mines are estimated to be 20 times higher than the emissions from the Bluff Coal Mine.
- Given the low frequency of the winds from the west and distance from Bluff Coal mine to the Gemini Project, it is unlikely that Bluff Coal mine will contribute significantly to dust at the sensitive receptors surrounding the Gemini Project.

10.2 Impact of revised mine camp location

10.2.1 DES Comment

The list of main activities (included in Section 2 and Table 7 in Section 3.4.4) associated with Gemini Project does not include "workers' accommodation and associated infrastructure (camp access road, sewage treatment plant, sewage pipeline and effluent irrigation management area)" as proposed by the written notice of changed application and the revised conceptual mine layout. Furthermore, workers' accommodation and associated infrastructure was not included as key dust-generating activities for Gemini Project (Section 3.4.1). It is noted that these activities were not considered as a source in air quality modelling and assessment in the original EA application submission. However, given the changed application, it is not clear how the revised mine layout has the potential to impact the EVs of air at nearby sensitive receptors.

10.2.2 DES Requirement

Provide justification for why workers' accommodation and associated infrastructure, which includes camp access road, sewage treatment plant, sewage pipeline and effluent irrigation management area, has been excluded as sources from the air quality modelling and assessment. Demonstrate how the EVs of air will be enhanced or protected given the change to the conceptual mine layout.

10.2.3 Response

The AQGGA completed in December 2020 was undertaken using the revised mine layout (as shown in Figure 2 of the AQGGA). There have been no subsequent changes to the conceptual mine layout.

In response to this information request, further assessment has been undertaken to justify why the workers accommodation and associated infrastructure (camp access road, sewage treatment plant, sewage pipeline and effluent irrigation management area) have not been included in the air quality model (refer to Item 2 in in the Air Quality Technical Memorandum) (Appendix E)). The assessment deemed these sources too insignificant to be able to differentiate in the model. A summary of the key findings of the assessment is provided below.

10.2.3.1 Camp and access road

The workers accommodation camp is now located to the northwest corner of the ML, south of the highway. As shown in Figure 1 the nearest sensitive receivers (SR) to the revised mine camp location are SR22, SR31 and SR32. The revised camp location is approximately 1km south of sensitive receiver SR22, 1.5km east of sensitive receiver SR31 and 2km south east of SR32.

The camp access road to the workers' accommodation and to the mine infrastructure area will be sealed.

Traffic projections indicate that during peak operations there will be 122 trips per day when light vehicles will travel from the highway to the workers' accommodation camp, which is a distance of 0.45km, and five trips per day when the mine bus transports workers from the accommodation camp to the mine infrastructure area, which is a distance of 1.65km.

Emissions of TSP, PM10 and PM2.5 are estimated to be 0.23g/s, 0.04g/s and 0.01g/s, respectively. This is negligible, being less than 0.3% of emissions generated from the mining operations. Inclusion of these emissions would not change the outcome of the assessment.

10.2.3.2 Sewage Treatment Plant and effluent irrigation management area

The proposed STP and the effluent irrigation area are located approximately 1.5km east of sensitive receiver SR31, 2.1km south east of SR32 and 750m south of SR22.

It is estimated that during operation, up to 140 workers may be accommodated on site, and during construction up to 280 workers may be accommodated on site. The STP will be designed for a 280 EP maximum capacity (56,000 L/day). The STP will be a modular containerised design with very low odour emissions, designed in accordance with AS/NZS 1546.1:2008. This is conventional technology that is widely deployed throughout Queensland with minimal odour issues.

The following management measures will be implemented to manage aerosol drift, odour nuisance and potential impacts to human health as a result of effluent irrigation activities:

- Irrigation volumes have been designed to prevent surface run-off.
- Irrigation will cease in significant rainfall events when there is the risk of surface runoff.

- Spray drift control (low-throw sprinklers - 180º inward throw).
- Irrigation will be restricted when wind direction is not favourable, or temperature inversions present.
- Suitable wet weather storage (3 days) is to be provided in tanks, to prevent potential overflow events.

Given the STP design, proximity to nearest receptors and management measures to be put in place, it is not anticipated that there will be any impacts associated with aerosol drift and odour nuisance at the nearest sensitive receivers.

10.3 Impact to sensitive receivers SR31 and SR32

10.3.1 DES Comment

Table 2 lists sensitive receptors surrounding the project. The property name for SR31 and SR32 is “unknown”. It is not clear if the revised conceptual mine layout affects and alters the impacts to air quality at these sensitive receptors from the original application.

10.3.2 DES Requirement

Provide more information about SR31 and SR32 and the potential impacts to air at these locations given the change to the conceptual mine layout.

10.3.3 Response

SR31 and SR32 are private homesteads located on Lot 1RP61678, shown in Queensland Globe as being the ‘Dunbea’ property. As outlined in Section 10.2, given the distance of the revised camp accommodation and associated infrastructure from these receptors, and the controls to be implemented (road sealing, STP design and effluent irrigation management measures), the assessment predicts no adverse impact on environmental values at these sensitive receivers.

10.4 Emission quantities over years of mine

10.4.1 DES Comment

Table 7 presents the list of activities that will create dust emissions and provides estimates of the quantity (kg/year) of emissions that will be produced during mine operational year 2, 5 and 15. However, it is not clear how this data has been applied to conclusions of the air quality assessment.

10.4.2 DES Requirement

Provide a summary or conclusion that interprets the data in Table 7 to help provide understanding of how the emission quantities differ between years of mine operation and explain what might cause differences.

10.4.3 Response

Table 7 of the AQGGA presents the emissions to air (kg/year) of TSP, PM10 and PM2.5 per year for each mining activity (for example blasting, drilling, hauling of ROM, wind erosion). The emission rates of TSP, PM10 and PM2.5 for each activity are proportional to the activity rate for each year (as summarised in Appendix D of the AQGGA. For example, emissions of TSP from haul trucks are proportional to vehicle kilometres travelled. In Year 2 91,440 vehicle kilometres are travelled within 6 months to transport ROM coal from the pit to the CHPP, whereas in Year 15 289,108 vehicle kilometres are travelled over 12 months. The haul distance in Year 15 is 1.6 times higher than in Year 2 when taking into account period over which the haulage is undertaken. This is reflected in the emission rates in that for Year 15 it is estimated that 365,959 kg/year of TSP is emitted due to ROM coal haul compared to Year 2 where it is estimated 231,494 kg/year of TSP is emitted.

It can be seen from Table 7 of the AQGGA that overall emissions of dust are highest in Year 15. This is predominately due to emissions associated with ROM haulage and overburden haulage as well as wind erosion of rehabilitation areas. In Year 15, haul distances are the longest due to location of the pit relative to the CHPP and dumps (refer to Appendix D Table B1 of the AQGGA). In Year 15, the area assigned for rehabilitation is the greatest due to it being the year when there is the most land available for rehabilitation (refer to Appendix D Table B1 of the AQGGA).

10.5 Meteorological data used in modelling

10.5.1 DES Comment

The Air Pollution Model (TAPM) was configured using meteorological data from 2016. Configuring TAPM based on one year of historical 24-hourly data is acceptable if that year represents the worst case scenario.

10.5.2 DES Requirement

Explain and demonstrate that meteorological data from 1 January 2016 to 31 December 2016 represents the worst case meteorological conditions, very low rainfall and strong windy conditions, compared to 5 years of hourly site meteorological data.

10.5.3 Response

Meteorological modelling was conducted using the TAPM/CALMET modelling approach (refer to Appendix A of the AQGGA). This was conducted in accordance with standard industry practice.

In terms of “worst case”, the AQGGA assesses the worst-case in terms of emissions of dust to air from the proposed mining activities. For meteorology, strong wind conditions do not necessarily correlate with worst case impacts from a mining activity. For example, strong winds may give rise to dust lift off, but strong winds also help disperse the dust. Very light to calm winds on the other hand can result in elevated dust concentrations due to poor mixing and dispersion of emissions sources such as haul dust. It is important that the meteorological data that is used for the site is representative of average conditions for dust assessments.

The year 2016 was chosen as the most recent year at the time of the commencement of the assessment. Notwithstanding this, an analysis of five years of meteorological data from the Bureau of Meteorology’s station at Blackwater has been conducted. Figure 11 presents annual windroses for 2015 to 2020. Wind frequencies including the frequency of strong winds are consistent between the years. There is very little difference in average wind speeds. Therefore, the choice of 2016 as the meteorological year is adequate.

The regulatory emission estimation techniques cannot account for the effect of rainfall on dust emissions. The emissions model uses average material moisture contents. Whilst the dispersion model can characterise the effect of rainfall to reduce dust levels in the atmosphere (wet deposition), it has been conservatively assumed that rainfall does not remove dust from the atmosphere. This results in higher predicted dust levels rather than lower.

Therefore, the choice of a year with high or low rainfall does not affect the outcomes of this assessment.

11 Noise

11.1 Impact of revised mine camp location

11.1.1 DES Comment

The list of main activities associated with Gemini Project does not include “workers’ accommodation and associated infrastructure (camp access road, sewage treatment plant, sewage pipeline and effluent irrigation management area)” as proposed by the written notice of changed application and the revised conceptual mine layout. It is noted that these activities were not considered as a source in noise quality modelling and assessment in the original EA application submission. However, given the changed application, it is not clear how the revised mine layout has the potential to impact the EVs of noise at nearby sensitive receptors.

11.1.2 DES Requirement

Provide justification for why workers’ accommodation and associated infrastructure, which includes camp access road, sewage treatment plant, sewage pipeline and effluent irrigation management area, has been excluded as sources from the noise modelling and assessment. Demonstrate how the EVs of noise will be enhanced or protected given the change to the conceptual mine layout.

11.1.3 Response

In response to the secondary information request, a revision to the Noise Impact Assessment (NIA) has been prepared (Appendix F), which includes the workers’ accommodation and associated infrastructure. As outlined in Table 1.1 of the revised NIA the following noise sources have been added:

- Vehicles on camp access road
- Air-conditioning units and people talking at the camp
- Sewerage Treatment Plant (STP)
- Pumping at the irrigation management area.

Details of the additional modelled noise source data is provided in Table 6.2 and 6.3 of the revised NIA (Appendix F).

Inclusion of these additional noise sources did not result in any new exceedances of criteria. However, there were slight increases to the predicted noise outcomes at the nearest sensitive receivers. Exceedances for night-time scenarios N1 and N2 at SR10 in Mine Year 8 increased slightly from 38dBA to 39dB, (refer to Table 6.7 of the revised NIA). There were also slight increases at other sensitive receivers, but as the increase was minimal (less 0.5dB) no other updates were required for Tables 6.6 – 6.8 of the NIA.

A number of operational scenarios have previously been modelled to demonstrate that changes to mining operations (i.e. reduction in the number of machines in operation) can be implemented to prevent exceedances and ensure that compliance can be achieved at all sensitive receivers. Mitigation measures previously proposed for SR10 in Mine Year 8 were already more than sufficient to ensure night-time compliance at this location. Updates to the modelled mitigation measures were therefore not required. However, to achieve night-time compliance at SR10 and SR22 in Year 2, modelling indicate an additional 2 trucks may need to be temporarily shut down during high risk conditions in order to achieve compliance (refer to Table 8.1 of the revised NIA). It should be noted that the scenarios presented in Table 8.1 should be considered examples only, and other acoustically equivalent scenarios may be developed.

As outlined in section 8.4 of the NIA, real time noise monitoring will be undertaken at the most noise affected receptors (i.e. SR10 and SR22) prior to mining commencing. A noise monitoring survey will be then conducted at the commencement of operations to verify noise emissions for the Project and the level of noise impact at sensitive receptors. Real time noise monitoring will be implemented throughout mine operations to track noise trends, develop appropriate mitigation strategies and react to potential noise exceedances, should they occur.

11.2 Sensitive receivers SR31 and SR32

11.2.1 DES Comment

Table 2.1 lists sensitive receptors surrounding the project. The real property description for SR31 and SR32 is not provided. It is not clear if the revised conceptual mine layout affects and alters the impacts to noise at these sensitive receptors from the original application.

11.2.2 DES Requirement

Provide more information about SR31 and SR32 and the potential impacts to the EVs of noise at these locations given the change to the conceptual mine layout.

11.2.3 Response

SR31 and SR32 are private homesteads on Lot 1 on RP61678. An assessment of the noise impact at these sensitive receivers, including the camp and associated infrastructure, has been included in the revised NIA. Refer also to Section 11.1.3.

Appendix A: Revised Traffic Impact Assessment

Appendix B: Groundwater Technical Memorandum

Appendix C: Figures for Groundwater Technical Memorandum

Appendix D: Mine Waste Geochemistry Technical Memorandum

Appendix E: Air Quality Technical Memorandum

Appendix F: Revised Noise Impact Assessment