

6. Assessment of Impacts

6.1 Introduction and Environmental Setting

6.1.1 Introduction

Section 6 and Appendices 5 to 15 of the EIS present an assessment of impacts of the Project as exhibited. As the amended Project would result in a range of amended Project-related impacts, this section of the *Amendment Report* presents an overview of the anticipated impacts associated with the amended Project. A brief comparison of the environmental impacts of the Project as exhibited and as amended is also provided.

While the key features of the environment surrounding the amended Mine Site remain largely unchanged, the following subsections provide a brief description of the existing topography, drainage and climate as those aspects would apply to the amended Project.

As operation of the Rail Facility would remain unchanged as a result of the amended Project, those aspects of the Project are not addressed in this Section.

6.1.2 Topography and Drainage

Section 6.1.2 of the EIS provides a description of the topography and drainage within and surrounding the amended Mine Site. In summary, the amended Mine Site is situated within a relatively flat area of the central Murray Darling Basin. Regional topography is characterised by sequences of ridges and lunettes interspersed with broad swales and drainage depressions.

Regionally, drainage is dominated by the Darling River. The Great Darling Anabranch, located approximately 20km east of the amended Mine Site, is a relict channel of the Darling River and flows in a generally southerly direction before also merging with the Murray River at Wentworth.

Lake Victoria, located approximately 30km to the south of the amended Mine Site, forms an integral component of the regulated Murray River system, with water levels controlled by a series of embankments and locks.

Within the Mine Site, topography is characterised by a series of low ridges and drainage depressions, with gentle slopes typically less than 1% or 1:100 (V:H), with localised areas with slopes of approximately 5% or 1:20 (V:H).

Section 6.7 describes the surface water environment within the amended Mine Site. In summary, however, the amended Project would no longer disturb the Western Salt Pan and disturbance of the Central Catchment would be substantially reduced.

6.1.3 Climate

Section 6.1.3 of the EIS presents an overview of the meteorological setting of the Project. While the setting remains largely unchanged, **Table 6.1.1** presents updated climate data generated by the Scientific Information for Landowners (SILO) database, managed by the Queensland Department of Environment and Science for a point in the centre of the Mine Site.

Table 6.1.1
Updated SILO Climate Data

	Jan	Feb	Mar	April	May	June	July	Aug	Sept	Oct	Nov	Dec	Annual
Temperature (C°) – SILO (1889 to 31 December 2024)													
Mean maximum temperature	33.2	32.5	29.2	24.3	19.8	16.5	16.1	18.1	21.5	25.1	28.7	31.4	24.7
Mean minimum temperature	17.3	17.0	14.4	10.7	7.9	5.7	5.0	5.9	8.2	10.8	13.7	15.8	11.0
Rainfall (mm) – SILO (1889 to 31 December 2024)													
Mean rainfall	18.3	18.6	14.1	16.4	22.1	20.9	19.7	21.4	21.3	23.6	20.1	19.0	235.4
Highest rainfall	119.1	214.1	110.5	118.1	103.2	89.5	62.2	84.3	101.0	122.0	82.6	188.7	592.6
Lowest rainfall	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.4	0.0	0.0	0.0	53.1
Highest daily rainfall	53.4	93.8	53.7	32.8	35.6	37.3	27.0	31.7	37.1	48.1	49.4	111.7	111.7
Mean Monthly Evaporation (mm) – SILO (1889 to 31 December 2024)													
Class A Pan	314.0	255.1	214.0	131.1	78.7	54.1	61.4	92.2	136.1	194.8	244.7	298.0	2074.0
Source: Queensland Department of Environment and Science													

6.2 Groundwater

6.2.1 Introduction

The Groundwater Impact Assessment for the Project as exhibited was prepared by GEO-ENG and is presented as Appendix 5 of the EIS (GEO-ENG, 2024). Section 6.2 of the EIS presents a summary of that assessment. GEO-ENG (2024) was peer reviewed by Mr James Williams of Hydro Consulting Services who determined that that assessment was comprehensive and well calibrated with an overall confidence level suitable for a Class 1 to Class 2 model and that the model was “fit for purpose”.

The EIS and GEO-ENG (2024) were reviewed and the following agencies provided groundwater-related submissions.

- Department of Climate Change, Energy, the Environment and Water – Water Group (DCCEEW-Water)
- Environment Protection Authority
- National Parkes and Wildlife Service
- SA Water

Of these, only DCCEEW-Water provided a recommendation to be addressed prior to determination, namely that the Applicant must demonstrate that suitable water allocations are available to account for the anticipated water take. This matter is addressed in Section 6.2.6.

An updated *Groundwater Impact Assessment* for the amended Project was prepared by GEO-ENG and is presented as **Appendix 4** and is referred to hereafter at GEO-ENG (2025). The following subsections provide a summary of those aspects of the assessment that have changed as a result of the proposed Amendment.

6.2.2 Existing Environment

The existing groundwater setting needs to be considered in determining the approach applied to the groundwater modelling which then informs the assessment of the Project’s potential impacts on that setting. A comprehensive description of the existing environment used to inform the amended *Groundwater Impact Assessment* is provided in Sections 3 to 10 of GEO-ENG (2025).

The Existing Environment as presented in Section 6.2.2 of the EIS remains unchanged and may be summarised as follows.

- Three aquifers exist within the vicinity of the amended Mine Site as follows.
 - Upper Aquifer (up to 50m below ground level) – including the Loxton-Parilla Sands, host of the Copi Mineral Sands Deposit. Water quality within the Upper Aquifer is poor, with a total dissolved solids concentration of approximately 61,000mg/L, slight less than twice the concentration of sea water.
 - Middle Aquifer (greater than 200m below ground level).
 - Lower Aquifer (greater than 400m below ground level).

- These aquifers are separated by thick clay layers are not hydraulically connected. The Upper Aquifer is the only aquifer that would be disturbed by the Project.
- Water levels within the Upper Aquifer in the vicinity of the amended Mine Site are generally flat, with elevations between 24.2m AHD and 24.8m AHD.

6.2.3 Amended Management and Mitigation Measures

The proposed management and mitigation measures as presented in Section 6.2.3 of the EIS and **Appendix 3** of this document would remain unchanged, with the exception of an additional commitment to monitor off-site bores at the request of surrounding landholders.

6.2.4 Amended Assessment of Impacts

6.2.4.1 Introduction

GEO-ENG (2025) prepared an updated numerical model to assess the likely groundwater-related impacts associated with the amended Project. Section 11 of GEO-ENG (2025) provides a detailed description of the model's development whilst Section 12 describes the results of the assessment. The following subsections provide an overview of changes to those sections from the model prepared for the EIS (GEO-ENG, 2024). In addition, the groundwater assessment was the subject of a peer review by Mr James Williams of Hydro Consulting Services. Appendix I of GEO-ENG (2025) presents a copy of Mr Williams' review and Section 6.2.4.6 presents an overview of that document.

6.2.4.2 Conceptual Groundwater Model

The conceptual groundwater model is a descriptive representation of the groundwater system that forms the basis for the numerical groundwater flow model. The conceptual groundwater model as presented in Section 6.2.4.2 and Table 6.2.5 of the EIS remains unchanged.

6.2.4.3 Numerical Model Design

The 2025 model design remains largely unchanged from the 2024 model design presented in Section 11 of GEO-ENG (2025) and summarised in Section 6.2.4.3 of the EIS. Minor amendments in the 2025 numerical model presented in GEO-ENG (2025) are summarised below.

- Modelled layers – GEO-ENG (2025) reduced the number of model layers from six to three, with the layer representing the Upper Aquifer divided into two
- Modelled mining operations – GEO-ENG (2025) simulated the amended mining operations described in Section 3.5 and **Appendix 1**.
- Modelled bore pumping – The 2024 numerical model simulated groundwater extraction from two production bores screened in the Upper Aquifer and located the vicinity of the starter pond for the life of the Project in. The 2025 numerical model similarly assumed two production bores, however the nominal locations of

those bores were simulated as moving with the dredge pond to allow for lowering of the water table ahead of mining operations. This would allow for extraction of clay-rich material using dry mining techniques. The bores were modelled initially with an extraction requirement of up to 7,401ML/y to allow for water level management in the dredge pond. After the initial years, the modelled production rate from the bores would be around 1,900ML/y to allow for processing, mining and reverse osmosis plant operation

- Modelled hydraulic properties and modelling scenarios - GEO-ENG (2024) utilised two separate calibration scenarios; one that allowed a smooth variation in hydraulic conductivity between pilot points (smooth scenario) and the other using fixed hydraulic conductivities for strandline (orebody) areas and surrounding sand (sharp scenario). GEO-ENG (2025) states that recent exploration drilling indicated that distribution of hydraulic conductivity between the sharp and smooth scenarios is most likely. As a result, a single scenario only was modelled.

6.2.4.4 Model Calibration

GEO-ENG (2025) states that steady-state validation of the model returning a good fit to measured data, with a scaled root mean square error of 3.38%, indicating a good fit to available water level data, and that the modifications to the model are consistent with previous calibration models.

6.2.4.5 Predicted Impacts

Groundwater Take

Table 6.2.1 presents the anticipated annual volumes of groundwater take during construction and operation of the Project.

Table 6.2.1
Predicted Project-related Groundwater Take

Year	Dredge Pond (ML/year)	Production Bores (ML/year)	Total (ML/year)	Year	Dredge Pond (ML/year)	Production Bores (ML/year)	Total (ML/year)
-3	-	1,180	1,180	9	639	1,892	2,532
-2	-	660	660	10	647	1,918	2,565
-1	35	5,105	5,136	11	737	1,892	2,629
1	408	7,401	7,810	12	775	1,892	2,667
2	736	1,892	2,629	13	552	1,892	2,444
3	850	1,892	2,742	14	549	1,892	2,441
4	973	1,879	2,852	15	678	1,892	2,571
5	982	1,892	2,874	16	690	1,892	2,582
6	917	1,879	2,797	17	830	1,892	2,722
7	784	1,892	2,676	18	931	1,256	2,187
8	674	1,892	2,567	19	646	200	846

Note 1: Year 19 corresponds to the first year of post-mining rehabilitation prior to and during backfilling of the final void.

Source: GEO-ENG (2025) – After Table 17

Initial rates of groundwater extraction from production bores during construction and Year 1 are expected to be up to approximately 7,401ML/year. Once the dredge pond has been established, the pumping rate from the production bores would be reduced to around 1,900ML/year until Year 18 when the pumping rate would decrease to 200ML/year in Year 19 (first year post mining). GEO-ENG (2025) notes that during mining operations a significant proportion of groundwater extracted via the production bores would be subsequently returned to the dredge pond.

Inflow to the dredge pond to offset evaporation is expected to increase gradually from zero during construction to 736ML/year during Year 2 mining operations. During mining operations inflows would vary between 549ML/year and 982ML/year, after which inflow would decrease back to zero as the final dredge pond is backfilled to surface.

Total groundwater take would vary between 660ML/year and 7,810ML/year during construction and Year 1. Groundwater take during Years 2 to 18 would vary between 2,187ML/year and 2,874ML/year before decreasing to 846ML/year in Year 19. Groundwater take during Year 20 and after would be limited to that required for rehabilitation operations.

Groundwater Drawdown

Extraction of groundwater from production bores and dredge pond losses would result in drawdown of the standing water level within and adjacent to the Mine Site. GEO-ENG (2025) has modelled Project-related groundwater drawdown, with **Figures 6.2.1 to 6.2.3** presenting snapshots of the modelled groundwater drawdown at the end of Years 1, 5, 10, 15, 18 and 20. The modelling results may be summarised as follows.

During construction, groundwater depressurisation/drawdown centred on the proposed production bores would gradually develop and deepen, reaching an average lowering of about 7m in Year 1, as water levels within the dredge pond are managed to facilitate construction and floating of the dredges and Wet Concentration Plant.

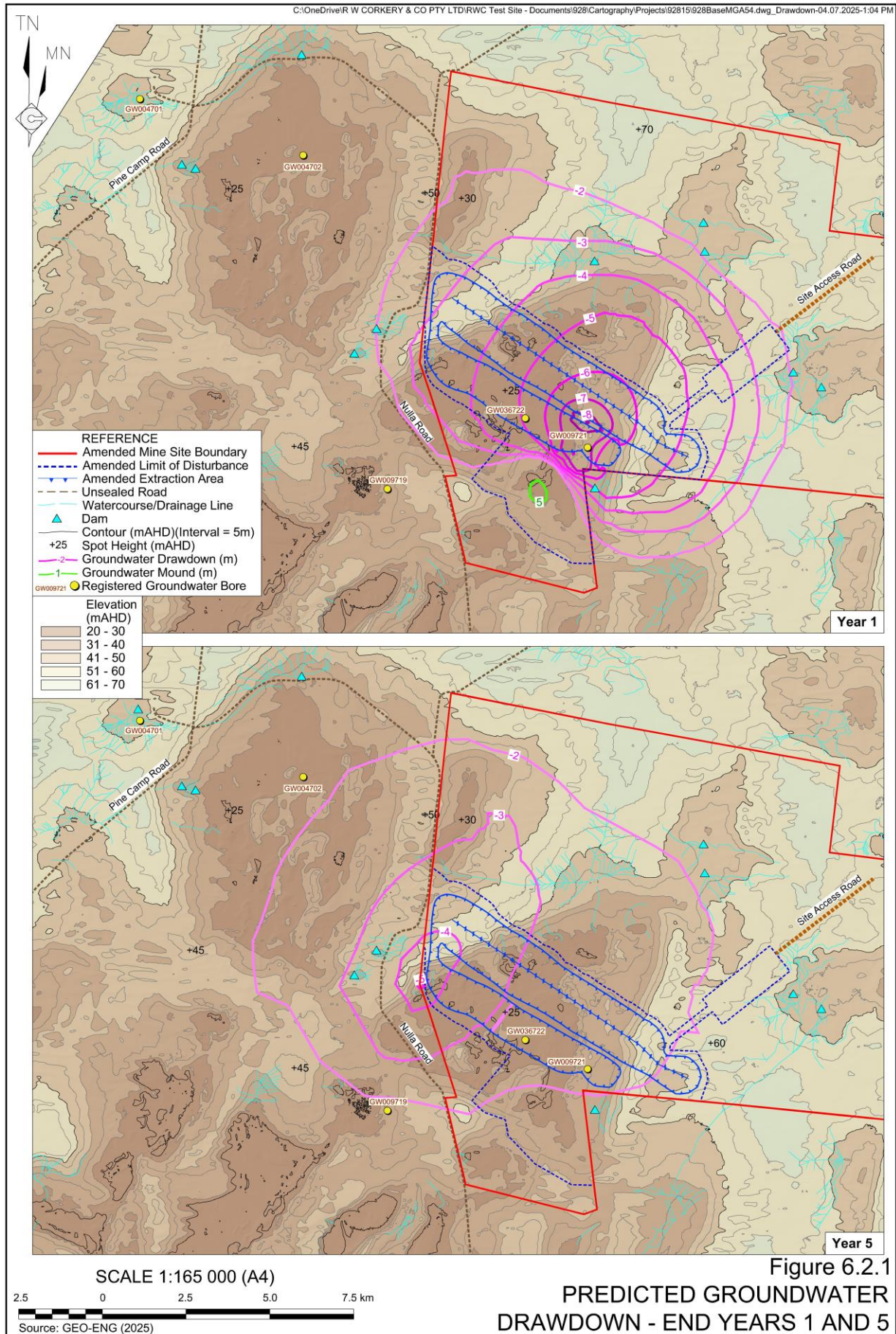
During initial mining operations in Year 1 to 3, a temporary groundwater mound would develop under the Off Path Storage Facility as a result of the placement of wet interburden and sand reject into the facility, with seepage of water from the Facility raising the water table. The Applicant would actively monitor the water level surrounding the Off Path Storage Facility and would implement measures to prevent groundwater being discharges at the surface.

By contrast, water would be pumped into and out of the Water Storage Dam but no mounding of the water table is expected because the Dam is underlain by the Blanchetown Clay with its substantially lower hydraulic conductivity.

By Year 5, the mounding of the water table under the Off Path Storage Facility is expected to have dissipated and the amplitude of the dredge pond-related drawdown of the water table is expected to be approximately 5m deep.

During Year 18 mining operations, the maximum extent of groundwater depressurisation / drawdown, as defined by the 2m drawdown contour would be up to approximately 20.5km long parallel to the mine path and approximately 12.1km across perpendicular to the mine path.

Following the completion of mining operations, groundwater depressurisation/drawdown would largely dissipate within 10 years.



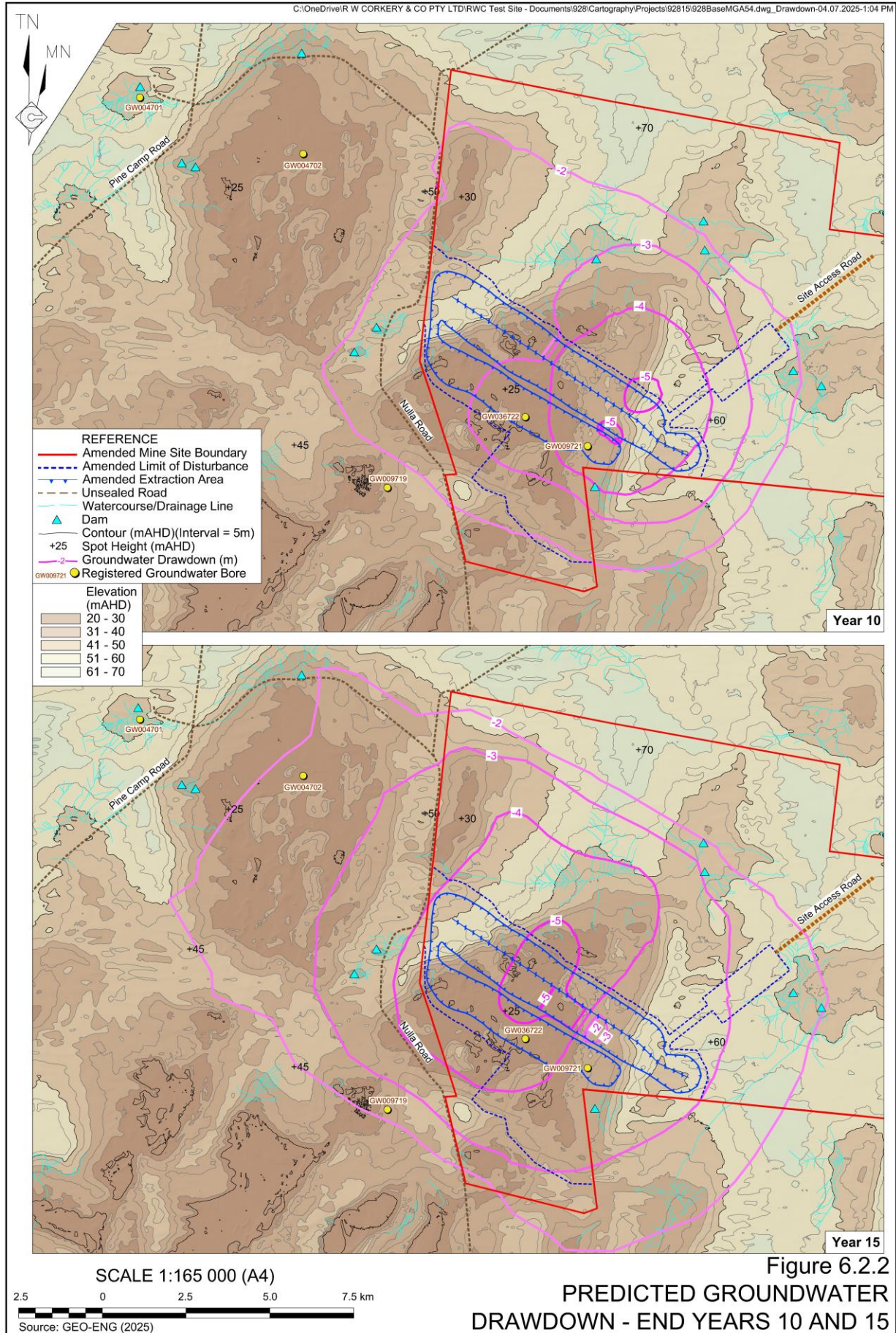
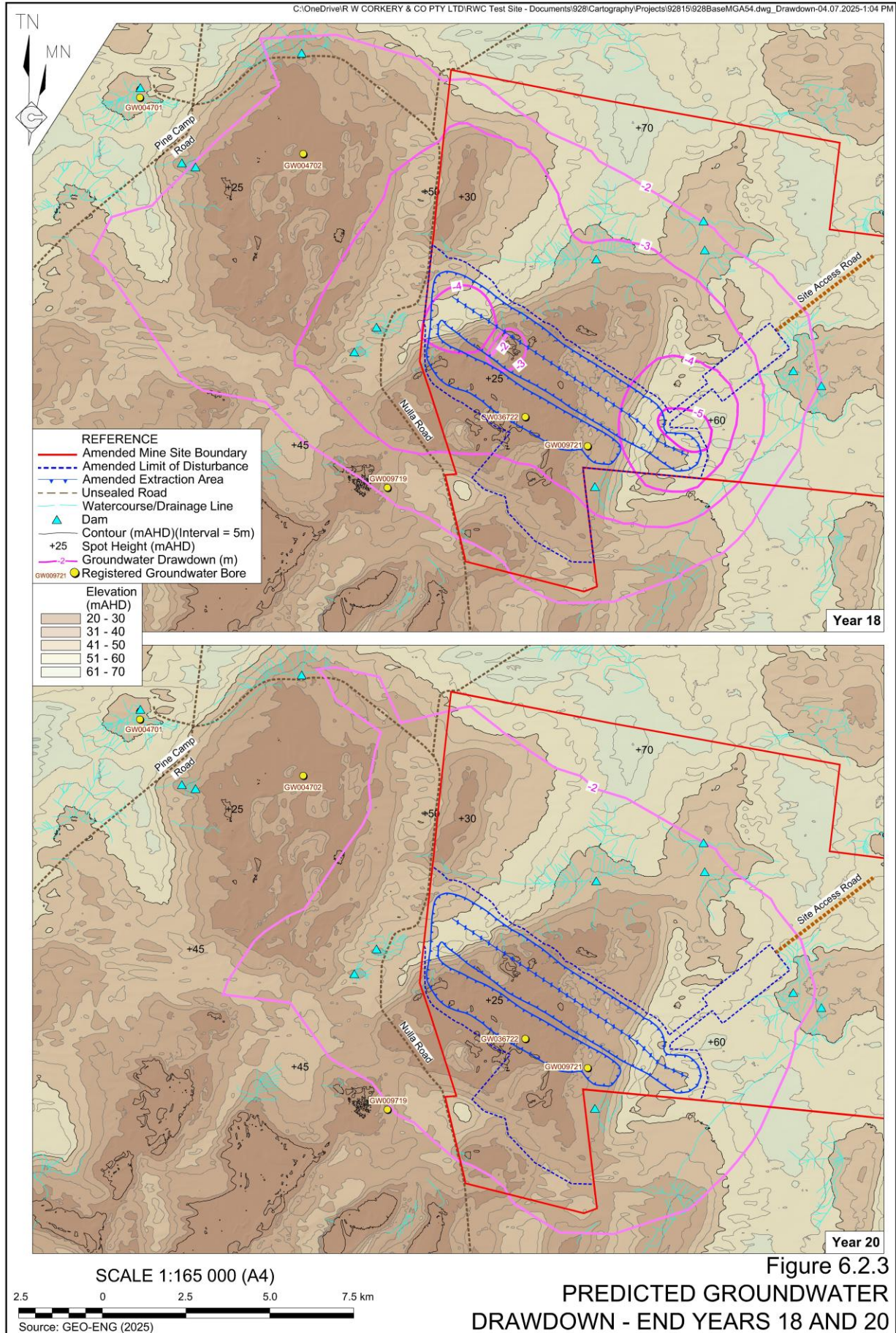


Figure 6.2.2
PREDICTED GROUNDWATER
DRAWDOWN - END YEARS 10 AND 15



Surrounding Groundwater Users

Four registered bores occur within the zone of groundwater depressurisation/drawdown as follows (**Figures 6.2.1 to 6.2.3**). Section 6.2.2.3 and Table 6.2.2 of the EIS provide background information on each of these bores. Expected Project-related impacts on these bores may be summarised as follows.

- GW009721 – this bore is located on Warwick Station and is owned by the Applicant. Construction records indicate that the bore is screened within the Middle Aquifer and is presumed to not be hydraulically connected to the Upper Aquifer. A search for the bore could not locate it and it is presumed to be destroyed. The bore would be removed during mining operations and, should it be relocated, it would be plugged and sealed in accordance with the requirements of the document *Minimum Construction Requirements for Water Bores in Australia*.
- GW036722 – this bore, comprising three separate bores located in close proximity to each other, is located on Warwick Station and is owned by NSW Water. The bores are used for monitoring purposes, with the bores separately screened within the Upper, Middle and Lower Aquifers. The bores would be removed during mining operations, and it would be plugged and sealed in accordance with the requirements of the document *Minimum Construction Requirements for Water Bores in Australia*. The Applicant has committed to installing replacement bores in an alternate location at the discretion of Water NSW.
- GW004702 – this bore is located on Huntingfield/Sunshine Station and is owned by a neighbouring landholder. Construction records indicate that the bore is screened within the Middle Aquifer. A search for the bore could not locate it. Given that the Upper and Middle Aquifers are not hydraulically connected, the Project would not impact on the operation of the bore.
- GW009719 – this bore is located on Nulla Station and is owned by a neighbouring landholder. Construction records indicate that the bore is screened within the Middle Aquifer. A search for the bore could not locate it. Given that the Upper and Middle Aquifers are not hydraulically connected, the Project would not impact on the operation of the bore.

Surrounding Groundwater Dependent Ecosystems

The impact to surrounding groundwater dependent ecosystems has been assessed by BioAus (2025a) (see Section 6.3.2.3) who determined that the most salt tolerant species that occurs within the Mine Site would likely be unable to utilise groundwater of the salinity of the Upper Aquifer. As a result, impacts to groundwater dependent ecosystems are not anticipated.

Groundwater Quality

Section 12.8 of GEO-ENG (2025) states that the Project is not expected to significantly alter the groundwater quality of the hypersaline Upper Aquifer.

Aquifer Interference Policy Considerations

The *Aquifer Interference Policy* describes a series of acceptable thresholds for water level and quality changes that are known as “minimal impact considerations”. The minimal impact considerations depend upon whether the water source is classed as “highly productive” or “less productive.” As the groundwater within the Upper Aquifer has a total dissolved solid concentration of more than 1,500mg/L, the aquifer is defined as a “less productive” groundwater system.

Appendix H and Table 18 of GEO-ENG (2025) assesses the amended Project against the criteria identified by the *Aquifer Interference Policy*. In summary, there are two levels of minimal impact considerations specified in the *Aquifer Interference Policy*. If the predicted impacts of the Project are less than the Level 1 minimal impact considerations, then these impacts will be considered as acceptable. If the predicted impacts are less than the Level 2 impact criteria, will be considered acceptable if appropriate studies demonstrate to the Minister’s satisfaction that the variation will not prevent the long-term viability of the dependent ecosystem.

Table 18 of GEO-ENG (2025) identifies the amended Project would not exceed any Level 1 impact assessment thresholds, with the exception of the water table threshold for high priority groundwater dependent ecosystems.

The water table threshold for a Level 2 impact for high priority groundwater dependent ecosystems is “more than 10% variation in the water table.” In this case GEO-ENG (2025) notes that the threshold would be a 5cm variation in the water table. However, BioAus (2025a) has determined that the most salt tolerant species that occurs within the Mine Site would likely be unable to utilise groundwater of the salinity of the Upper Aquifer. As a result, the Applicant contends that the amended Project would not impact upon the long-term viability of the groundwater dependent ecosystems in the vicinity of the Mine Site.

6.2.5 Peer Review Conclusions

As with the EIS, the Peer Review for the groundwater assessment was undertaken by Mr James Williams of Hydro Consulting Services (HCS, 2025) and is presented as Appendix I of GEO-ENG (2025). GEO-ENG provided the conceptual groundwater model and the *Groundwater Impact Assessment* to Mr Williams at key points throughout the assessment to ensure review components were addressed. The results of the peer review may be summarised as follows.

- Overall, the groundwater assessment is comprehensive, and generally consistent with the requirements outlined in Table 9 of the *Minimum Groundwater Modelling Requirements for SSD / SSI Projects*.
- The numerical groundwater model for both the smooth and sharp scenarios are well calibrated, with root mean square and scaled root mean square errors indicating an accurate fit to available data.
- The overall confidence level of the numerical groundwater model is Class 1 to Class 2 and the model is “fit for purpose” as:
 - there would be minimal predicted groundwater impacts beyond the Mine Site;
 - groundwater quality of the Upper Aquifer is hypersaline and of low value; and
 - there would be no significant impacts to environmental receptors or beneficial users.

Mr Williams again concluded that the numerical groundwater model developed by GEO-ENG for the Project was consistent with the NSW *Aquifer Interference Policy* and the *Australian Groundwater Modelling Guidelines*.

6.2.6 Amended Licencing

The groundwater resources of the Upper Aquifer within the Mine Site are part of the Western Murray Porous Rock Groundwater Source of the NSW MDB Porous WSP. The long-term annual extraction limit for this Source identified in Clause 25(4) of the WSP is 226 GL/yr.

GEO-ENG (2025) identifies that maximum groundwater take would be 7,810ML/year during Year 1, with between 2,187ML/year and 2,874ML/year extracted during Years 2 to 18, decreasing to that required for rehabilitation operations during Year 20 and after. At the time of finalisation of this document Applicant was in commercial negotiations with a third party in relation to a range of matters, including acquisition of sufficient groundwater allocation for the Project. In the event that those negotiations are unsuccessful, the Applicant would apply for a suitable allocation under the next Controlled Allocation Order under the *Water Management Act 2000*.

6.2.7 Amended Monitoring

There is no change to the proposed monitoring as presented in Section 6.2.6 of the EIS, with the exception that bore GW004716 located within Belmore Station would be incorporated into the proposed groundwater monitoring network.

6.2.8 Conclusion

The existing groundwater setting is well understood with the assessment of the Project utilising a calibrated numerical groundwater model that has been peer reviewed and deemed “fit for purpose”.

Based on numerical modelling predictions, the key outcomes of the assessment of changes to the groundwater system arising from the Project include the following.

- The mining impact on the groundwater table would be limited to a few kilometres from the Mine Site.
- Over the Project-life, the average annual groundwater take is predicted to be less than 3GL/year, with a maximum of 7.8GL/year in Year 1 of mining operations.
- The Applicant obtain sufficient allocation to account for the maximum direct groundwater take from production bores, plus the indirect take from evaporation.
- There would be no ongoing groundwater take following the cessation of Project related activities.
- There would be no reduced access to groundwater for surrounding groundwater users.

- The Project would result in the removal of a NSW DCCEEW monitoring bore, namely GW036722. The Applicant would replace the bore in consultation with NSW DCCEEW.
- As the Upper Aquifer at the Mine Site is hypersaline, no potential impacts to groundwater quality are anticipated.

Based on the outcomes of the numerical groundwater modelling and assessment by GEO-ENG (2025), it is considered that potential impacts to the groundwater setting are minimal and the amended Project is permissible under the *Aquifer Interference Policy*.

6.3 Biodiversity

6.3.1 Introduction

The Biodiversity Development Assessment Report (BDAR) for the Project as exhibited was prepared by EnviroKey Pty Ltd and is presented as Appendix 6 of the EIS (EnviroKey, 2024). Section 6.3 of the EIS presents a summary of that assessment.

The EIS and EnviroKey (2024) were reviewed by the (then) Biodiversity, Conservation and Science Division (BCS). In response, EnviroKey provided a revised BDAR which was provided to BCS. BCS provided additional feedback on the revised BDAR and based on that information, EnviroKey determined it had insufficient resources to undertake the survey requirements required to address BCS's feedback. As a result, EnviroKey withdrew from the Project and a new consultancy, Biodiversity Australia Pty Ltd (BioAus), were engaged to complete the BDAR.

The updated BDAR prepared by BioAus for the Amended Project is presented as **Appendix 5** and referred to hereafter as BioAus (2025a). BioAus completed additional surveys to address the feedback provided by BCS, and to include the changed aspects of the Amended Project. BioAus utilised data collected and assessed by EnviroKey (2024) throughout their report. The following subsections provide a summary of BioAus (2025a).

In addition, Biodiversity Australia prepared a Matters of National Environmental Significance (MNES) Significance Assessment for those entities identified under the *Commonwealth Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). That report is referred to hereafter as BioAus (2025b) and presented as **Appendix 6**. Section 6.3.7 presents a summary of BioAus (2025b).

For the sake of clarity and consistent with BioAus (2025a), the following terminology has been used in this subsection (**Figure 6.3.1**).

- Development Footprint – Mine Site – consistent with the Limit of Disturbance – Mine Site elsewhere in this document.
- Development Footprint – Linear Corridor – consistent with the Limit of Disturbance – Linear Corridor elsewhere in this document.
- Development Footprint – cumulative term for the above.
- Subject Land - Comprising the entirety of all Lots the subject of the Disturbance Footprint. It is noted that the Subject Land has been determined in accordance with the requirements of the *Biodiversity Assessment Method* and is substantially larger than the Development Footprint.
- Assessment Area – comprising the subject land plus a 1,500m buffer (500m for the Linear Corridor).

Finally, it is noted that the following areas have been excluded from the Assessment Area assessed by BioAus (2025a) for the following reasons.

- Rail Facility – The Rail Facility comprises an existing hardstand area and no additional areas of disturbance are proposed.
- Intersection upgrades within Broken Hill LGA – The proposed disturbance associated with each of the intersections would be undertaken within areas of prior disturbance, devoid of native vegetation.

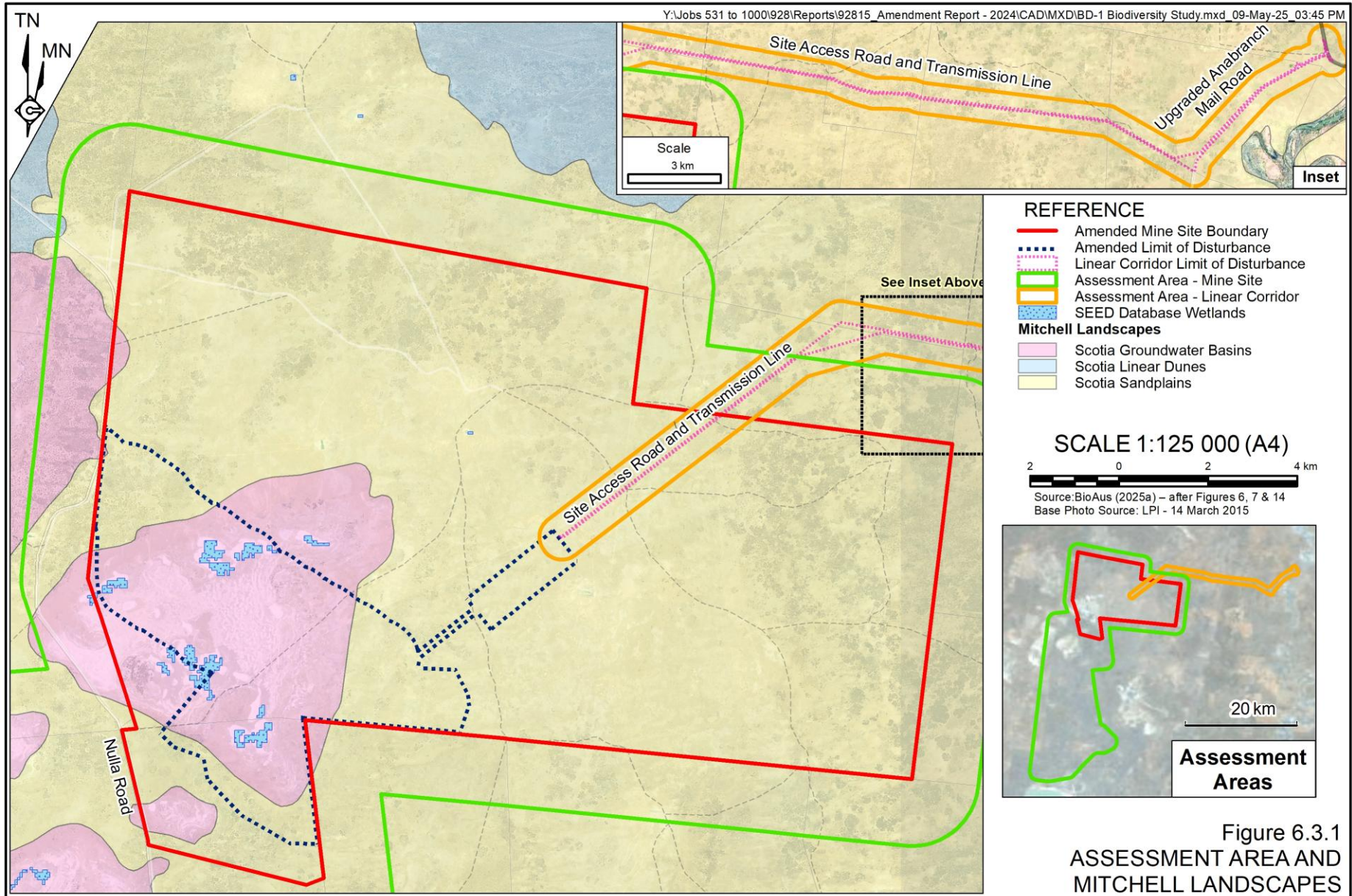


Figure 6.3.1
ASSESSMENT AREA AND
MITCHELL LANDSCAPES

6.3.2 Regional Setting and Mapping

The Assessment Area is located entirely within the Murray Darling Depression Interim Biogeographical Region of Australia (IBRA) and South Olary Plain IBRA subregion.

The following NSW (Mitchell) Landscapes occur within the Assessment Area (**Figure 6.3.1**).

- Scotia Groundwater Basins – small sub-circular to irregular relict saline lakes and lunettes of Quaternary age with extensive associated sandplains and isolated dunes.
- Scotia Sandplains – slightly undulating Quaternary aged sandplains with areas of east-west trending sand dunes, broad swales and small depressions.

Table 6.3.1 provides a summary of the landscape features within and surrounding the Assessment Area.

Table 6.3.1
Landscape Features

Feature	Present on Site?	Present on Adjoining Land?	Description
Waterways (Rivers and Streams)	No	No	Murray River flows east to west and is approximately 19km south of the Assessment Area. The Great Darling Anabranch flows north to south and is approximately 26km east of the Development Footprint – Mine Site and 45m east of the Development Footprint – Linear Corridor.
Important Local Wetlands	No	No	Four salt pans (lakes) are present within the Assessment Area mapped as 'wetlands' under the NSW Wetlands Layer. The salt pans are expressions of the ground water and occasionally collect surface water runoff. Lake Victoria, located approximately 28km south of the Assessment Area is a key water storage system in the River Murray System and plays a critical role the conservation and management of water resources within the MDB.
Connectivity Features	No	No	Tarawi Nature Reserve is approximately 8km north of the Assessment Area.
Areas of Geological Significance (e.g. karst, caves, crevices, cliffs)	Yes	Yes	Gypsum soils associated with lunette rises occur within the Assessment Area. These are preferentially favoured by gypsum obligate species such as <i>Austrostipa nullanulla</i> (Endangered). These gypsum soils correspond with PCT 253.
Soil Hazard Features	No	No	No specific soil hazards have been identified within the assessment area.

Source: BioAus (2025a) modified after Table 3

6.3.2.1 Native Vegetation Extent and Cleared Lands

BioAus (2025a) state that native vegetation covers 99.7% of the Assessment Area. Cleared or highly disturbed land also occurs throughout the Assessment Area as a result of agricultural pastoral activities. These include a network of vehicle tracks, dams, troughs and fence lines. There is also existing infrastructure present such as homesteads, yards and shearers quarters. BioAus (2025a) found that cleared land covers approximately 108.3ha of the Disturbance Footprint - Mine Site and 28ha of the Disturbance Footprint - Linear Corridor.

6.3.2.2 Mapped Biodiversity Values

BioAus (2025a) state that there are areas of Biodiversity Value mapped as wetlands within the Assessment Area, which correspond to the four salt pans. Desktop assessments conducted by BioAus (2025a) found Biodiversity Values within the Assessment Area do not meet the eligibility criteria for Areas of Outstanding Biodiversity Value as identified in the *Biodiversity Conservation Act 2016*. Additionally, BioAus (2025a) used the Important Habitat Maps tool in the BAM Calculator (BAM-C) to determine if areas of important habitat for threatened species were present within the assessment area. This tool indicated no areas of important habitat are mapped within the Assessment Area.

6.3.2.3 Groundwater Dependent Ecosystems

Initial desktop assessments by BioAus (2025a) showed there were varying levels of potential for Groundwater Dependent Ecosystems (GDE) to occur within the Assessment Area. However, the groundwater that could be utilised by plant communities is highly saline (see Section 6.2.2) and is unlikely to support any GDEs. BioAus (2025a) states that the most salt tolerant species *Halosarcia pergranulata* subsp. *pergranulata* (an indicator species for PCT 64) would likely be unable to utilise groundwater with such extreme salinity levels.

6.3.3 Desktop Assessment Methodology

6.3.3.1 Introduction

BioAus (2025a) undertook an extensive desktop assessment to identify known significant biodiversity values within and in the vicinity of the Assessment Area. This data was then used in part to select and design specific field survey methodologies in accordance with the *Biodiversity Assessment Method 2020* (BAM, 2020). The following subsections present an overview of the desktop assessment and field survey component of the biodiversity assessment.

6.3.3.2 Database Searches and Mapping

The following databases were used to search for listed flora and fauna species, populations and communities within and surrounding the Assessment Area.

- Department of Climate Change, Energy, the Environment and Water Protected Matters Search Tool (DCCEEW 2024a).
- Department of Climate Change, Energy, the Environment and Water MNES SPRAT Profiles (DCCEEW 2024b).
- Department of Climate Change, Energy, the Environment and Water - Interim Biogeographic Regionalisation for Australia (IBRA).
- NSW Department of Climate Change, Energy, the Environment and Water Threatened Biodiversity Data Collection (NSW DCCEEW 2024c).
- NSW Department of Climate Change, Energy, the Environment and Water - BioNet/Atlas of Wildlife (NSW DCCEEW 2024d).

- NSW Department of Climate Change, Energy, the Environment and Water - Regional Corridors and Key Habitat Mapping (NSW DCCEEW 2024e).
- NSW Department of Climate Change, Energy, the Environment and Water - Biodiversity Values Map and Threshold Tool and digital data layer (NSW DCCEEW 2024f).
- NSW Department of Climate Change, Energy, the Environment and Water – NSW State Vegetation Type Map (NSW DCCEEW, 2024g).

Vegetation mapping was considered when reviewing and validating vegetation communities present within the Assessment Area. BioAus (2025a) and EnviroKey (2024) reviewed the most recent vegetation datasets for the locality including the State Vegetation Type Map: Western Region v1.0 (VIS ID4492) and the State Vegetation Type Map (which supersedes the Western Region map). BioAus also utilised high resolution Lidar mapping photographs provided by the Applicant to inform their vegetation mapping decisions.

6.3.3.3 Ecosystem Credit and Species Credit Species

Following vegetation mapping of the Assessment Area, BioAus (2025a) identified candidate species using the BAM-C. Threatened flora and fauna species were assessed by BioAus (2025a) and either adopted or discarded as a candidate species (see **Section 6.3.5**). A habitat constraints assessment was undertaken by BioAus (2025a) to determine the likelihood of occurrence for each candidate species. If the species was likely to occur based on the habitat constraints assessment, field surveys were undertaken to ground-truth presence or absence of the species. Additional detail on how candidate species were determined can be found in Sections 4.1 and 4.2 of BioAus (2025a).

6.3.4 Field Survey Methodology

Comprehensive field surveys were undertaken to assess biodiversity values within the Assessment Area in accordance with BAM (2020). Field surveys undertaken by EnviroKey spanned from January 2018 and January 2024. Field surveys undertaken by BioAus spanned from November 2024 to February 2025. EnviroKey records obtained prior to June 2020 were discarded due to these being gathered outside the 5-year window. The following sub-section summarises the methodologies used in the field assessments.

6.3.4.1 Native Vegetation Survey

Flora field survey methods included a combination of Vegetation Integrity (VI) Plots established in each identified Plant Community Type (PCT), threatened flora transects, and targeted searches. The floristic survey effort by BioAus (2025a) and EnviroKey (2024) is presented in **Figure 6.3.2**.

Vegetation Integrity Survey

Vegetation integrity survey plots were undertaken by BioAus (2025a) within the Development Footprint as per the BAM (2020). Each plot consisted of a 20m x 20m plot in which floristic composition and structural attributes were collected, and a 20m x 50m plot to collect ecosystem function attributes. Further details of information collected in each plot is presented in Section 3.1.1 of BioAus (2025a).

The vegetation within the Development Footprint is highly disturbed from overgrazing and historic land use, as a result there are differences in vegetation integrity within PCTs. Multiple Vegetation Zones were established by BioAus (2025a) to accurately reflect these differences in vegetation integrity.

6.3.4.2 Fauna Survey

Fauna field surveys were carried out using a range of methodologies specific to targeted species, which are summarised in **Table 6.3.2**. Full detail can be found in Section 4.3 of BioAus (2025a) and Section 2.4.3 of EnviroKey (2024). The fauna survey effort is presented in **Figure 6.3.3**.

Table 6.3.2
Targeted Fauna Survey Methods

Page 1 of 2

Fauna Survey Method	Details and Survey Effort	
	EnviroKey (2024)	BioAus (2025a)
Targeted Random Meander Fauna Searches		Two observers conducted a 30-minute random meander within the habitat type. Number of searches per targeted habitat type was dependent on the habitat area size (ha).
Diurnal bird surveys and call playback	Active searches for birds during 20-minute bird survey periods. Opportunistic bird surveys when traversing the Assessment Area at other times - 243 locations, total of 4,860 minutes (81 hours). Call playback undertaken at the conclusion of each 20-minute bird survey period - 243 locations, total of 729 minutes (12.15 hours).	Mallee bird TEC (PCT 170 and 171) – 42 surveys for a combined 20 hours and 58 minutes over 45.8km of transects. Birds of prey - six combined foot and vehicle surveys for a combined 12 hours and 12 minutes of survey effort over 191.4km of transects. Little Eagle – Two consecutive days of survey, 20 minute raptor survey points along transects, two replicates of each transect, during the hottest time of day
Elliot and pitfall trapping	Baited 'A' size Elliot traps spaced approximately 5m apart in transects of 20 traps, left in situ for four nights, and checked each morning and afternoon - 11 locations, total of 880 trap nights.	Concurrent Elliot and pitfall trapping surveys were undertaken targeting Desert mouse (<i>Pseudomys desertor</i>) and Crowned gecko (<i>Lucasium stenodactylum</i>) - 3 locations, 84 pitfall trap nights and 120 Elliot trap nights.
Funnel trap line	Six funnel traps were established along a 20m drift fence for a maximum of four nights to target frogs, reptiles and small mammals – 10 locations, total of 120 trap nights.	
Camera trap surveys	Motion-activated infrared cameras were pointed at bait stations or water points - 20 locations, total of 87 camera trap nights.	
Herpetological searches	Sites searched systematically by an experienced herpetologist for a period of 30 minutes - 74 locations, total of 2,220 minutes (37 hours).	Nocturnal spotlight, physical habitat searches, and Elliot and pitfall trapping. Random meander (4 hours, 2 minutes) or in a slow-moving vehicle (7 hours, 17 minutes).

Table 6.3.2 (Cont'd)
Targeted Fauna Survey Methods

Fauna Survey Method	Details and Survey Effort	
	EnviroKey (2024)	BioAus (2025a)
Nocturnal Spotlight and call playback surveys	<p>Call playback of target species (Bush Stone Curlew) intermittently for 5 minute periods followed by 5 minute listening periods. Spotlighting for minimum of 60 minutes following call playback searches.</p> <p>Vehicular spotlighting while travelling across the Biodiversity Survey Area at night.</p> <p>Echolocation call recording during 60 minute spotlight search periods.</p> <p>Mobile echolocation call recording while travelling across the Assessment Area at night.</p> <p>Stationary echolocation call recording unit set up at a water point.</p> <p>Survey effort: 160 person minutes across eight sites, total of 800 minutes (13.3 hours).</p>	<p>Southern hairy-nosed wombat - Burrows /warrens, scats, and individuals were searched using high-power hand-held torches and thermal binoculars. Each search spanned a minimum of 60 person minutes and was replicated in the same area on the following night - 20 transects conducted over 47 hours and 7 minutes and 164 kilometres.</p> <p>Masked Owl - Spotlight searches were conducted followed by broadcast recording of the masked owl's call for 15 seconds, repeated 6 times - 7 sites surveyed 6 times, conducted in the late evening (8 pm – 12 am) and early morning (2:30 – 5:30 am).</p>
Scat and Sign Search		10 minute searches at the conclusion of each diurnal bird survey. Opportunistic inspection of scat and tracks during other surveys - 243 searches, total of 40.5 hours.
Song Meters		Song meter acoustic recording activated during sunrise and sunset periods - 42 hours.
Tree hollow search		Recorded opportunistically during bird surveys
Microbat call recording and analysis		Microchiropteran bat calls were recorded using Anabat Swift, Anabat Chorus, and Anabat Express detectors over four deployment periods in suitable habitat - 24 survey nights, 6 sites, 2 locations.
Source: EnviroKey (2024) – after Section 2.4.3. BioAus (2025a) - after Section 4.3		

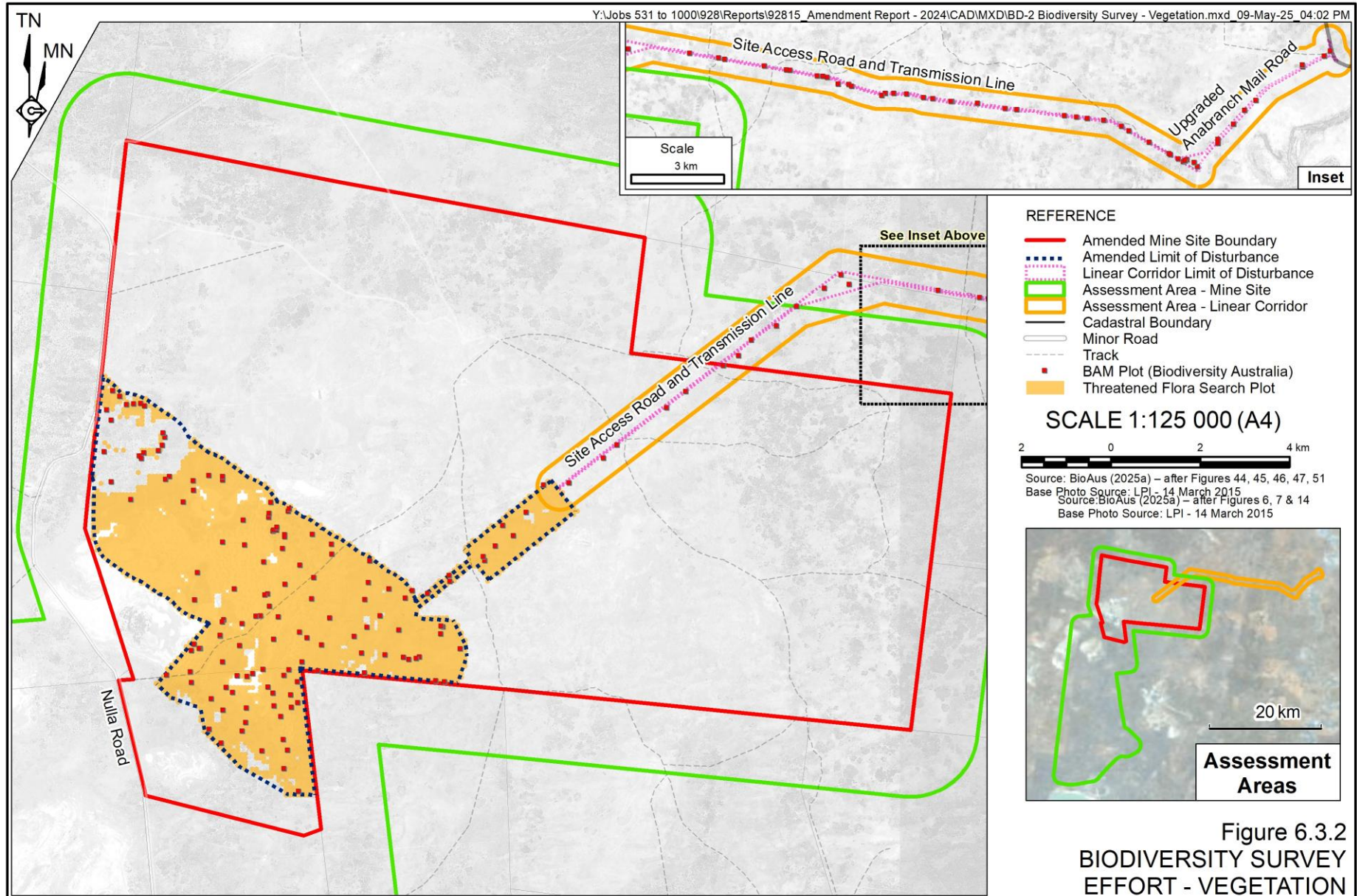
6.3.4.3 Limitations

Survey Timing

The survey timing for targeted threatened fauna species in late 2024 and early 2025 coincided with the recommended survey period for all fauna species except for the Little Eagle (*Hieraetus morphnoides*), where the survey window is from August to October. Weather conditions were conducive to the detection of all other species, including threatened species, across a range of seasonal and yearly survey periods (BioAus, 2025a).

A Little Eagle individual was recorded outside the disturbance footprint, but within the Assessment Area in December 2024. Targeted surveys for the species were conducted from 6 to 11 of August 2025 and it was not detected.

Additionally, surveys for the Painted Burrowing Frog (*Neobatrachus pictus*) were not conducted during heavy rain in November 2024 due to site access issues and the absence of rain events that meet the species requirements (>50mm of rain) since then. In July 2025, Dr. John Read (SF23/131995) provided an expert report presented as Appendix A-5 of BioAus (2025a). That report states the Development Footprints are unlikely to provide important habitat for this species and the species is unlikely to occur within the Development Footprints.



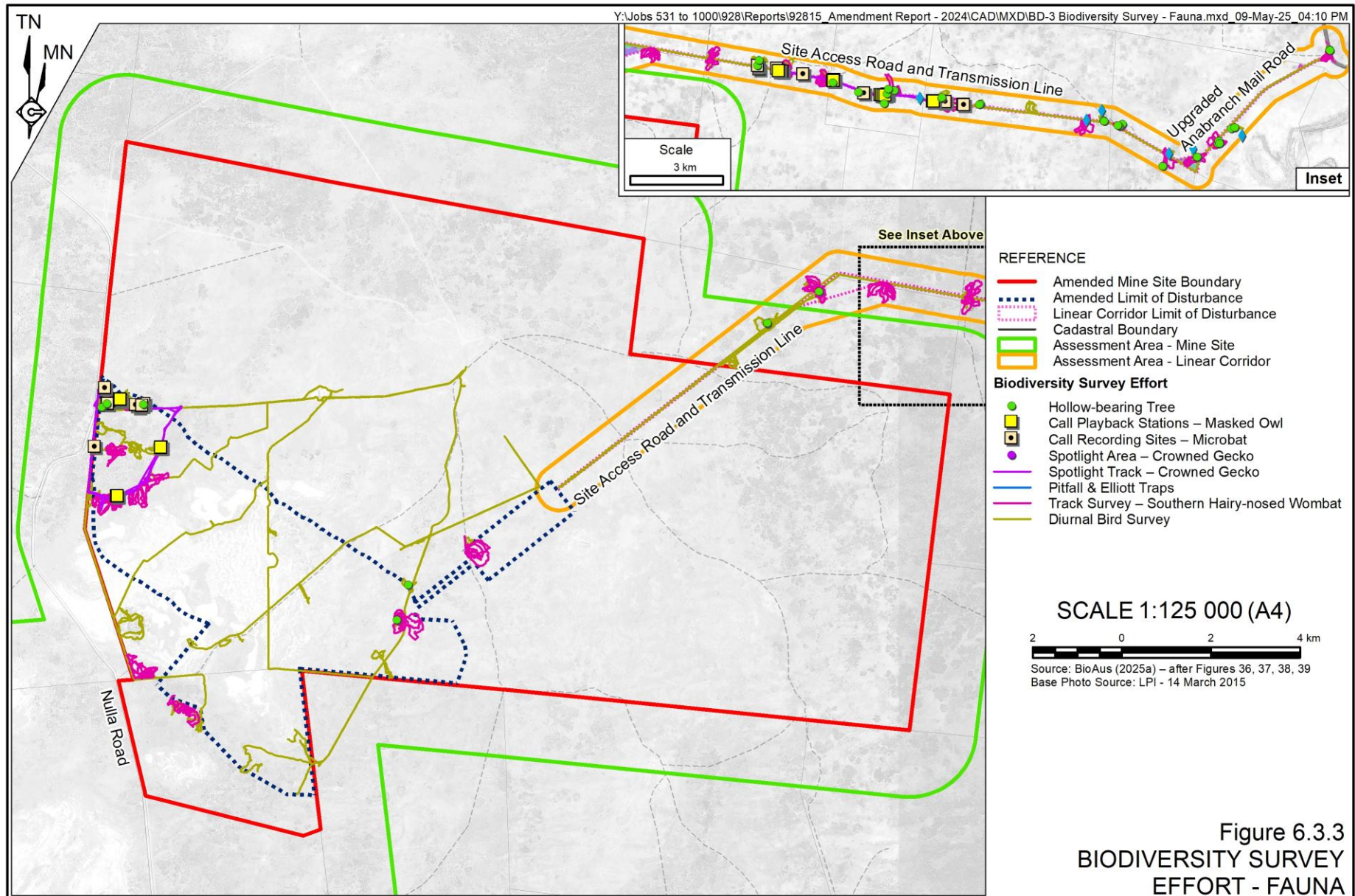


Figure 6.3.3
BIODIVERSITY SURVEY
EFFORT - FAUNA

6.3.5 Results

6.3.5.1 Plant Community Types

A desktop assessment was carried out reviewing the NSW State Vegetation Type Mapping available on NSW SEED. The assessment identified 20 PCTs within the Development Footprint (see Section 3.1.3 of BioAus (2025a)).

BioAus (2025a) identified 13 PCTs of Low-Moderate and Low condition occur within the Development Footprint, with 11 in the Disturbance Footprint - Mine Site and 6 in the Disturbance Footprint - Linear Corridor (Tables 6.3.3 and 6.3.4 and Figure 6.3.4).

Table 6.3.3
Plant Community Type VI Scores

Vegetation Community	Vegetation Zone	No. of plots	Patch Size (ha)	Area Impacted (ha)	VI Score			
					Comp.	Struct.	Funct.	Total
Development Footprint - Mine Site								
58	Low	22	≥100	189.77	52	73.4	55	59.8
64	Low	23	≥100	641.45	58.7	72.7	-	65.4
152	Low	9	≥100	250.43	80.3	37.1	-	54.6
154	Low	73	≥100	1566.76	80.1	17.3	-	37.2
157	Low-Moderate	3	≥100	3.58	70.1	97.0	-	82.5
157	Low	17	≥100	491.8	68.2	86.2	-	76.7
170	Low	12	≥100	1.97	48.5	17.3	30.5	29.5
171	Low	8	≥100	5.55	79.5	85.6	38.6	64
215	Low-Moderate	1	≥100	0.82	43.3	23.1	-	31.6
215	Low	3	≥100	5.09	14.7	27.6	-	20.1
221	Low-Moderate	2	≥100	3.2	52.0	85.3	64.2	65.8
221	Low	9	≥100	391.93	39.2	65.2	75.6	57.8
253	Low	14	≥100	139.72	44.4	39.7	-	42.0
254	Low	1	≥100	1.16	45.2	81.1	-	60.5
Development Footprint - Linear Corridor								
28	Low	2	≥100	0.77	80.8	94.2	21.4	54.6
58	Low	22	≥100	48.65	52	73.4	56	59.8
143	Low	4	≥100	17.52	52.8	67.5	-	59.7
154	Low	73	≥100	103.04	80.1	17.3	-	37.2
170	Low	12	≥100	13.62	48.5	173	30.5	29.5
171	Low	8	≥100	6.56	79.5	85.6	38.6	64
Source: BioAus (2025a) modified after Table 32 and Table 33.								

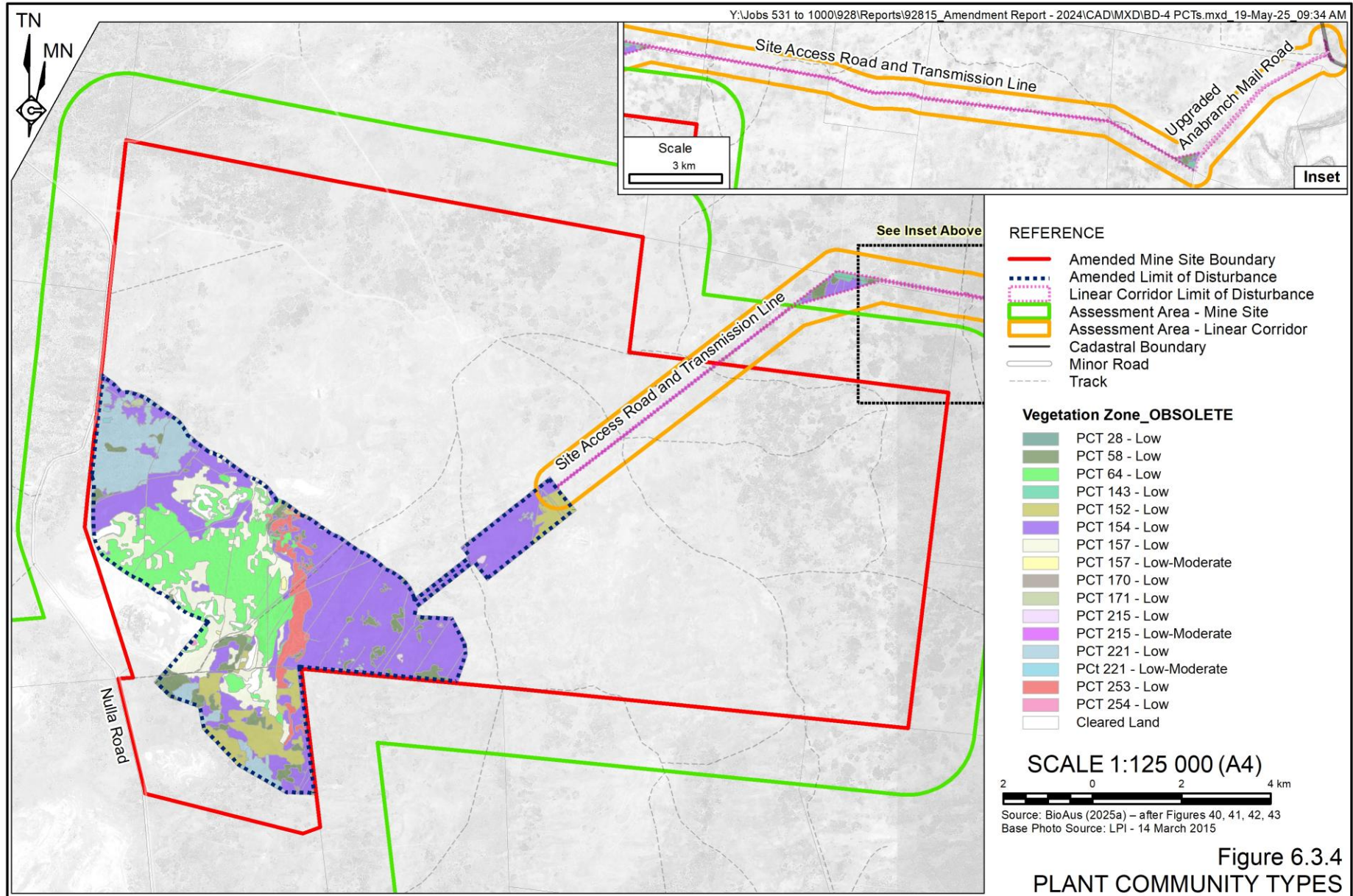


Table 6.3.4
Plant Community Types within the Assessment Area

PCT		Condition	Development Footprint	
Code	Name		Mine Site (ha)	Linear Corridor (ha)
28	White Cypress Pine open woodland of sand plains, prior streams and dunes mainly of the semi-arid (warm) climate zone	Low	-	0.77
58	Black Oak – Western Rosewood open woodland on deep sandy loams mainly in the Murray Darling Depression Bioregion	Low	189.77	48.65
64	Samphire – Water Weed – Sea Heath shrubland saline wetland of depressions of the arid and semi-arid (warm zones)	Low	641.13	-
143	Narrow-leaved Hopbush – Scrub Turpentine – Senna shrubland on semi-arid and arid sandplains and dunes	Low	-	17.52
152	Lunette chenopod shrubland mainly of the Murray Darling Depression Bioregion	Low	250.43	-
154	Pearl Bluebush low open shrubland of the arid and semi-arid plains	Low	1,566.76	103.04
157	Bladder Saltbush shrubland on alluvial plains in the semi-arid (warm) zone including Riverina Bioregion	Low-Moderate	3.58	-
		Low	491.8	
170	Chenopod sandplain mallee woodland/shrubland	Low	1.97	13.62
171	Spinifex linear dune mallee mainly of the Murray Darling Depression bioregion	Low	5.55	6.56
215	Woollybutt Grass open grassland on red earths of the inland plains	Low-Moderate	0.82	-
		Low	5.09	
221	Black Oak – Pearl Bluebush open woodlands of the sandplains of the semi-arid warm and arid climate zones	Low-Moderate	3.2	-
		Low	391.93	
253	Gypseous shrubland on rises in the semi-arid and arid plains	Low	139.72	-
254	Black Oak - Bladder Saltbush on light clays in the arid zone	Low	1.16	-

Source: BioAus (2025a) – modified after Table 5 and Table 32

6.3.5.1 Endangered Ecological Communities

BioAus (2025a) identified three potential Endangered Ecological Communities (EEC) associated with PCTs present within the Development Footprint (**Table 6.3.5**). However, all three potential EECs did not meet the final determination to be considered EECs and were not considered further.

Table 6.3.5
Endangered Ecological Communities

EEC Name	BC Act Status	EPBC Act Status	Associated PCTs	Area within Mine Site (ha)	Area within Linear Corridor (ha)	Final Determination for EEC?
Sandhill Pine Woodland	E	-	PCT 28	-	0.77	No
<i>Acacia loderi</i> shrublands & <i>Acacia melvillei</i> Shrubland	E	-	PCT 58	189.77	48.65	No
			PCT 170	1.97	13.62	No
<i>Acacia loderi</i> shrublands	E	-	PCT 143	-	17.52	No
			PCT 154 Low	1566.76	103.04	No

E = Endangered

Source: BioAus (2025a) – modified after Table 5 and Section 3.2

6.3.5.1 Ecosystem Credit Species

Ecosystem credit species are threatened species which can be reliably predicted to occur by vegetation surrogates and landscape features. **Table 6.3.6** presents the list of predicted ecosystem credit species determined by the BAM-C as potentially occurring within the Assessment Area based on identified PCTs, patch sizes and native vegetation cover.

Table 6.3.6
Predicted Ecosystem Credit Species

Page 1 of 2

Scientific Name	Common Name	Listing Status	
		BC Act	EPBC Act
<i>Antechinomys laniger</i>	Kultarr	E	-
<i>Aprasia inaurita</i>	Mallee Worm-lizard	E	-
<i>Artamus cyanopterus</i>	Dusky Woodswallow	V	-
<i>Calamanthus campestris</i>	Rufous Fieldwren	V	-
<i>Cercartetus concinnus</i>	Western Pygmy Possum	E	-
<i>Certhionyx variegatus</i>	Pied Honeyeater	V	-
<i>Chalinolobus picatus</i>	Little Pied Bat	V	-
<i>Cinlosoma castanotum</i>	Chestnut Quail-thrush	V	-
<i>Circus assimillis</i>	Spotted Harrier	V	-
<i>Ctenotus brooksi</i>	Wedgesnout Ctenotus	V	-
<i>Cyclodomorphus melanops elongatus</i>	Mallee Slender Blue-tongue lizard	E	-
<i>Daphoenositta chrysoptera</i>	Varied Sittella	V	-
<i>Delma australis</i>	Marble-faced Delma	E	-
<i>Drymodes brunneopygia</i>	Southern Scrub-robin	V	-
<i>Echiopsis curta</i>	Bardick	E	-
<i>Epthianura albifrons</i>	White-fronted Chat	V	-
<i>Falco hypoleucos</i>	Grey Falcon	E	-
<i>Falco subniger</i>	Black Falcon	V	-
<i>Glossopsitta porphyrocephala</i>	Purple-crowned Lorikeet	V	-
<i>Grantiella picta</i>	Painted Honeyeater	V	V

Table 6.3.6 (Cont'd)
Predicted Ecosystem Credit Species

Page 2 of 2

Scientific Name	Common Name	Listing Status	
		BC Act	EPBC Act
<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle (foraging)	V	-
<i>Hamirostra melanostemon</i>	Black-breasted Buzzard (foraging)	V	-
<i>Hieraaetus morphnoides</i>	Little Eagle (foraging)	V	-
<i>Hylacola cautus</i>	Shy Heathwren	V	-
<i>Leipoa ocellata</i>	Malleefowl	E	V
<i>Lichenostomus cratitus</i>	Purple-gaped Honeyeater	V	-
<i>Lophochroa leadbeateri</i>	Pink Cockatoo (foraging)	V	-
<i>Lophoictinia isura</i>	Square-tailed Kite (foraging)	V	-
<i>Ningauai yvonneae</i>	Southern Ningauai	V	-
<i>Neophema chrysostoma</i>	Blue-winged Parrot	V	V
<i>Pseudomys bolami</i>	Bolam's Mouse	E	-
<i>Nyctophilus corbeni</i>	Corben's Long-eared Bat	V	V
<i>Stagonopleura guttata</i>	Diamond Firetail	V	V
<i>Pachycephala inornata</i>	Gilbert's Whistler	V	-
<i>Pomatostomus temporalis temporalis</i>	Grey-crowned Babbler (eastern)	V	-
<i>Vespadelus baverstocki</i>	Inland Forest Bat	V	-
<i>Ramphotyphlops endoterus</i>	Interior Blind Snake	E	-
<i>Strophurus elderi</i>	Jewelled Gecko	V	-
<i>Pyrrholaemus brunneus</i>	Redthroat	V	-
<i>Pseudonaja modesta</i>	Ringed Brown Snake	E	-
<i>Pseudomys hermannsburgensis</i>	Sandy Inland Mouse	V	-
<i>Melanodryas cucullata cucullata</i>	South-eastern Hooded Robin	V	V
<i>Aphelocephala leucopsis</i>	Southern Whiteface	V	V
<i>Sminthopsis macroura</i>	Stripe-faced Dunnart	V	-
<i>Tiliqua occipitalis</i>	Western Blue-tongued Lizard	V	-
<i>Saccolaimus flaviventris</i>	Yellow-bellied Sheath-tail-bat	V	-
E = Endangered, V = Vulnerable			
Source: BioAus (2025a) after Table 38			

6.3.5.2 Species Credit Species

A preliminary list of predicted species credit species was determined by the BAM-C as potentially occurring within the Assessment Area based on an assessment of geographic and habitat features. For each predicted species, BioAus (2025a) considered the likelihood of occurrence and the presence of suitable habitat to determine whether they should be retained or excluded from further assessment. In summary, BioAus (2025a) included 19 flora species and 13 fauna species as candidate Species Credit Species. **Table 6.3.7** presents the list of Species Credit Species of which BioAus (2025a) conducted targeted surveys for and whether they were found present within the Assessment Area. In summary, BioAus (2025a) recorded two threatened fauna species (Pink Cockatoo and Little Eagle) and one threatened flora species (*Austrostipa nullanulla*) during field surveys of the Assessment Area.

Table 6.3.7
Predicted Species Credit Species

Scientific Name	Common Name	Retained	Present on Site	Exclusion Reason	Listing Status	
					BC Act	EPBC Act
Flora Species						
<i>Acacia acanthoclada</i>	Harrow Wattle	Yes	No	-	E	-
<i>Acacia carnerorum</i>	Purple-wood Wattle	Yes	No	-	V	V
<i>Atriplex infrequens</i>	A Saltbush	Yes	No	-	V	V
<i>Austrostipa metatoris</i>	A Spear-grass	Yes	No	-	V	V
<i>Austrostipa nullanulla</i>	Nulla Grass	Yes	Yes	-	E	-
<i>Brachyscome papillosa</i>	Mossgiel Daisy	Yes	No	-	V	V
<i>Calotis moorei</i>	A burr daisy	Yes	No	-	E	E
<i>Cratystylis conocephala</i>	Bluebush Daisy	Yes	No	-	E	-
<i>Dodonaea stenozyga</i>	Desert Hopbush	Yes	No	-	CE	-
<i>Kippistia suaedifolia</i>	Fleshy Minuria	Yes	No	-	E	-
<i>Lasiopetalum behrii</i>	Pink Velvet Bush	Yes	No	-	CE	-
<i>Lepidium monoplocoides</i>	Winged Peppergrass	Yes	No			
<i>Leporhynchus waitza</i>	Button Immortelle	Yes	No	-	E	-
<i>Pimelea serpyllifolia</i>	Thyme Rice Flower	No	No	Mine Site is more than 50km from Murray River	E	-
<i>Pterostylis cobarensis</i>	Greenhood Orchid	Yes	No	-	V	-
<i>Santalum murrayanum</i>	Bitter Quandong	Yes	No	-	E	-
<i>Swainsona colutooides</i>	Bladder Senna	Yes	No	-	E	-
<i>Swainsona pyrophila</i>	Yellow Swainson-pea	Yes	No	-	V	-
<i>Swainsona sericea</i>	Silky Swainson-pea	Yes	No	-	V	-
Fauna Species						
<i>Ardeotis australis</i>	Australian Bustard	Yes	No		E	-
<i>Burhinus grallarius</i>	Bush Stone-curlew	Yes	No	-	E	-
<i>Haliaeetus leucogaster</i>	White-bellied Sea-eagle	Yes	No		V	-
<i>Hamirostra melanosternum</i>	Black-breasted Buzzard	No	No		V	-
<i>Hieraaetus morphnoides</i>	Little Eagle	No	Yes	Not recorded during TBDC listed species survey period	V	-
<i>Lasiorhinus latifrons</i>	Southern Hairy-nosed Wombat	Yes	No		E	-
<i>Lophochroa leadbeater</i>	Pink Cockatoo	Yes	Yes	No breeding habitat or breeding behaviour observed	V	-
<i>Lophoictinia isura</i>	Square-tailed Kite	Yes	No	-	V	-
<i>Lucasium stenodactylum</i>	Crowned Gecko	Yes	No	-	V	-
<i>Manorina melanotis</i>	Black-eared Miner	Yes	No	-	CE	E
<i>Neobatrachus pictus</i>	Painted Burrowing Frog	No	TBC	Expert report provided ruling species out	E	-
<i>Pachycephala rufogularis</i>	Red-lored Whistler	Yes	No	-	CE	V
<i>Polytelis anthopeplus</i>	Regent Parrot	No	No	Habitat and geographic limitations not met	E	V
<i>Pseudomys desertor</i>	Desert Mouse	Yes	No	Expert report provided ruling species out	CE	-
<i>Myotis macropus</i>	Southern Myotis	Yes	No	Habitat constraint not met	V	-

Source: BioAus (2025a) after Tables 39, 40 and 41

Little Eagle (*Hieraaetus morphnoides*)

A single Little Eagle was identified and recorded outside the TBDC survey window at Warwick Station Homestead, approximately 2km from the Development Footprint – Mine Site in December 2024. Targeted surveys for the Little Eagle were conducted from 6 to 11 of August 2025 and the species was not detected. The Little Eagle was therefore excluded from the BDAR due to not being recorded within the TBDC listed species survey period, or within potential breeding habitat within the Development Footprint – Mine Site.

A Spear Grass (*Austrostipa nullanulla*)

A. nullanulla is a small perennial spear grass associated with lunettes and rises comprised of gypseous soils. The known distribution of the species extends from far southwest NSW through to South Australia where it is scattered across the state. The number of mature individuals is estimated to be 210,000, with 200,000 occurring in NSW and 10,000 in South Australia. A total of 3.84ha of scattered *A. nullanulla* was confirmed within the Assessment Area (Figure 6.3.5).

Desert Mouse (*Pseudomys desertor*)

The Desert Mouse was not found during surveys conducted by BioAus (2025a) or Envirokey (2024). In July 2025, Dr. John Read (SF23/131992) provided an expert report presented as Appendix A-5 of BioAus (2025a). That report states the Development Footprints are unlikely to provide important habitat for this species and the species is unlikely to occur within the Development Footprints Dr Read based this conclusion on the dominance of heavily degraded habitat from heavy grazing and the abundance of foxes and feral cats observed within the Development Footprints (BioAus, 2025a). As such, the Desert Mouse was excluded as a Species Credit Species.

Painted Burrowing Frog (*Neobatrachus Pictus*)

The Painted Burrowing Frog was not found during surveys conducted by BioAus (2025a) or Envirokey (2024). In July 2025, Dr. John Read (SF23/131995) provided an expert report presented as Appendix A-5 of BioAus (2025a). That report states the Development Footprints are unlikely to provide important habitat for this species and the species is unlikely to occur within the Development Footprints. Potentially suitable, yet low likelihood breeding habitat was identified at 5 locations within the Development Footprint. In May 2025, song meters were deployed to these locations to monitor for this species during the next heavy rainfall event (>50mm). However, the extensive areas of unsuitable saline wetlands and paucity of quality ephemeral swamps or rockholes makes it unlikely the Development Footprints would provide habitat for the Painted Burrowing Frog (BioAus, 2025a). As such, BioAus (2025a) excluded the Painted Burrowing Frog as a Species Credit Species within the BAM-C. Notwithstanding this, the Applicant would continue to maintain the deployed song metres until a suitable rainfall event has occurred.

6.3.6 Assessment of Impacts

6.3.6.1 Introduction

This subsection presents an assessment of the anticipated Project-related impacts on flora and fauna species and communities. Both direct and indirect impacts are considered together with relevant legislative considerations.

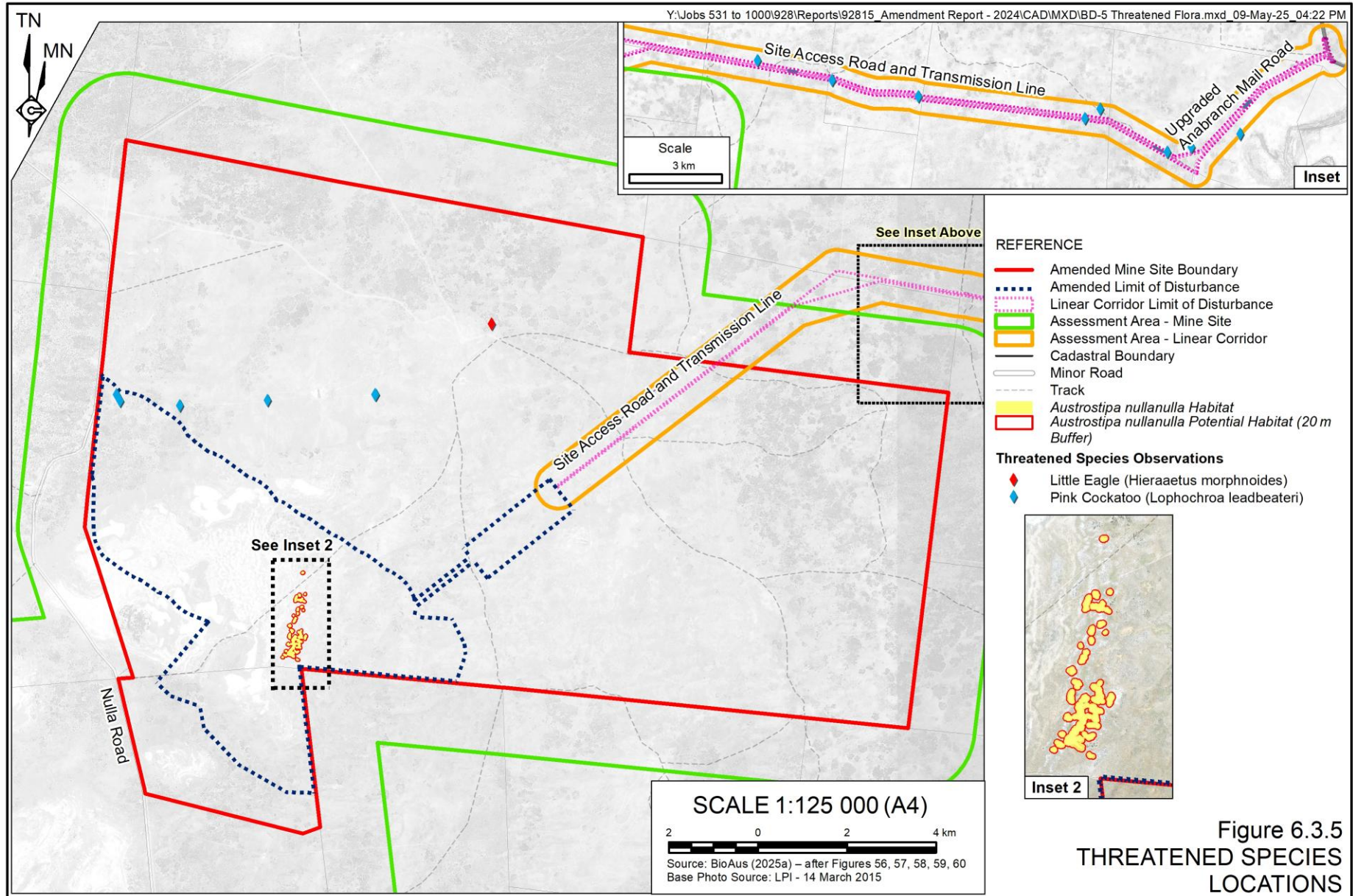


Figure 6.3.5
THREATENED SPECIES
LOCATIONS

6.3.6.2 Direct Impacts

The greatest risk of potential impacts on threatened species and biodiversity values from the Project would occur during the construction and operation phases. BioAus (2025a) found the Project would result in the removal of 3,883.08ha of native vegetation and 136.41ha of roads, tracks and other cleared land. The Project would also result in the removal of 3.84ha of *A. nullanulla* habitat.

The impacted vegetation provides forage, refuge and nesting habitat for fauna species. At least 9 of the hollow bearing trees that would be removed have potential to provide nesting/denning habitat for hollow-obligate species.

Finally, the proposed disturbance actions would occur as mining operations progress, meaning that the proposed disturbance would occur progressively throughout the life of the Project. This would be accompanied by progressive rehabilitation and reestablishment of native vegetation communities, resulting in a gradual restoration of biodiversity values over the medium to long-term.

6.3.6.3 Indirect Impacts

Potential indirect impacts associated with the Project are summarised in **Table 6.3.8**. Further detail describing the indirect impacts of the Project can be found in Section 5.3 of BioAus (2025a). The identified indirect impacts would be managed as outlined in Section 6.3.7.

Table 6.3.8
Potential Indirect Impacts to Biodiversity Values

Page 1 of 2

Indirect Impact	Timing	Nature	Impact	Consequence
Habitat Fragmentation	Construction / operation	<ul style="list-style-type: none"> Native Vegetation Threatened species habitat 	<ul style="list-style-type: none"> Impacts fauna dispersal Alters microclimate Increases edge effects 	Existing habitat is of low condition and somewhat fragmented.
Erosion and Sedimentation	Construction / operation	<ul style="list-style-type: none"> Native Vegetation 	<ul style="list-style-type: none"> Reduces productive top spoil Sediment run-off to adjacent catchments 	Mitigations to retain topsoil and reduce sediment run-off would reduce these impacts.
Wildlife Injury/mortality	Construction / operation	<ul style="list-style-type: none"> Fauna 	<ul style="list-style-type: none"> Fauna in vegetation becoming trapped and/or killed during clearing Vehicle strike 	Mitigation measures for clearing and transport would reduce these impacts.
Weed Exasperation	Construction / operation	<ul style="list-style-type: none"> Native Vegetation 	<ul style="list-style-type: none"> Increased weed incursion from disturbed areas and earthmoving equipment/materials 	Mitigation measures for cleaning of machinery would reduce the risk of introducing new weeds.
Feral Pest Fauna	Project Life	<ul style="list-style-type: none"> Native Vegetation Native Fauna 	<ul style="list-style-type: none"> Competition Disease spread Habitat destruction 	Lethal control of existing pest species and monitoring measures would reduce the impacts of pest fauna.

Table 6.3.8 (Cont'd)
Potential Indirect Impacts to Biodiversity Values

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Indirect Impact	Timing	Nature	Impact	Consequence
Noise and Vibration	Construction / operation	<ul style="list-style-type: none"> Native Fauna 	<ul style="list-style-type: none"> Adverse behaviour Population density Breeding success 	Clearing in stages and monitoring noise levels will minimise the impact.
Light spill	Construction / operation	<ul style="list-style-type: none"> Native Fauna 	<ul style="list-style-type: none"> Disorientation Alters foraging, communication and breeding behaviours. 	Detailed design of Mine Site ensures most light spill remains within the Limit of Disturbance.
Movement obstruction by fencing	Construction / operation	<ul style="list-style-type: none"> Native Fauna 	<ul style="list-style-type: none"> Injury by collision with fencing Fatalities by becoming stuck in fencing 	Mitigation measures would reduce this risk.
Increased dust	Construction / operation	<ul style="list-style-type: none"> Native Vegetation 	<ul style="list-style-type: none"> Reduce photosynthesis resulting in lowered condition 	Mitigation measures such as wetting trucks and track surfaces will reduce this risk.

Source: BioAus (2025a) modified after section 5.3

6.3.6.4 Prescribed Impacts

Table 6.3.9 presents the Prescribed Impacts which would occur as a result of the Project. Full details of the Prescribed Impacts can be found in Section 5.4 of BioAus (2025a).

Table 6.3.9
Prescribed Impacts

Impact	Nature	Extent	Duration	Consequences	Mitigation
Karst, caves, crevices, cliffs, rocks or other geological features of significance	Gypsum soils associated with lunette rises	Removal of 135.88ha of PCT253 which is associated with gypsum soil	Temporary until rehabilitation	Negative effects on <i>Austrostipa nullanulla</i> population	Rehabilitate gypsum soils. Fund research on <i>A. nullanulla</i>
Habitat connectivity	Fauna movement <i>A. nullanulla</i> habitat connectivity	Removal of 3883.08ha of native vegetation	Ongoing until rehabilitation	Negative effects on fauna behaviour Reduced flora and fauna dispersal and gene flow	Rehabilitation plan to include staged development and rehabilitation.
Waterbodies, water quality and hydrological processes	Salt pans. Localised groundwater	Removal of large sections of salt pans	Permanent until final landscape is reprofiled	Due to the very high salinity of salt pans and groundwater, there is a low probability of fauna and flora dependence	Final landscape reprofiled to include salt pans.
Vehicle strikes of fauna	Fauna mortality	Likelihood of vehicle strike limited to the access track network	Construction and operation	Direct mortality of fauna	Traffic management plan would implement speed limits and reduce traffic density

Source: BioAus (2025a) – After Section 5.4

6.3.6.5 Serious and Irreversible Impacts

Introduction

It is noted that determination in relation to Serious and Irreversible Impact is a matter for the Biodiversity, Conservation and Science Division (BCS). This subsection and Section 5.6 of BioAus (2025a) presents information in relation to the matters for consideration by BCS.

Austrostipa nullanulla

BioAus (2025a) identify impacts from the Project on *A. nullanulla* as potentially a Serious and Irreversible Impact due to evidence of limited geographic distribution (clause 6.7(2)(c) *Biodiversity Conservation Regulation 2017* (BC Reg). BioAus (2025a) found *A. nullanulla* occupies an area of 3.84ha within PCT 253 (Figure 6.3.5). *A. nullanulla* is formally known from only two locations outside the Amended Mine Site, namely Nulla station and Nanya station, which are 85km apart with the amended Mine Site positioned directly between. A desktop review by BioAus (2025a) found a concentration of occurrence records near the salt pans 10km south-west of the Mine Site, indicating the Mine Site is likely part of a third location. Anecdotal evidence from surrounding landholder suggests that the species also occurs on surrounding landholdings, with those reports to be confirmed through studies to be commissioned by the Applicant post-approval.

Clauses 6.5 and 6.7(2)(c) of the BC Reg state that potential Serious and Irreversible Impacts threatened species must be considered where an entity is known from 3 or fewer locations.

Further included in the justification are criteria that an entity has an area of occupancy (AOO) less than 10 km² and/or an extent of occurrence (EOO) of less than 100 km². As AOO and EOO data are not currently available, BioAus (2025a) created an EOO polygon for the NSW population using records from Atlas of Living Australia, EnviroKey (2024), and BioAus (2025a). The EOO encompassing all these records was 2726.93 km². Insufficient data are available to calculate the AOO. Nevertheless, *A. nullanulla* qualifies as an SAI entity due to the limited number of locations in NSW with records of the species.

Rehabilitation Potential

Due to the limited data available on this species, it is unknown how successful rehabilitation after mining activities would be. Through desktop review, BioAus (2025a) found *A. nullanulla* has a ‘Very High Sensitivity to Loss’ associated with clearing due to its limited distribution and a ‘Very High’ level of biodiversity concern. However, *A. nullanulla* also has a ‘High Sensitivity to Gain’ due to its ability to respond positively to management and colonise improved habitats. It is likely that with mitigation measures such as excluding grazers with fencing and restoring gypsum soils, habitat suitability could be restored.

The Applicant, with support from Federation University and Biodiversity Australia, intend to propose and fund a PhD/Honours program to undertake a study on the rehabilitation of *A. nullanulla*. The proposed research would incorporate methods used in pre-existing conservation sites at Nulla and Nunya Stations, as well as rehabilitation trials undertaken by one of the Applicant’s employees, to test whether *A. nullanulla* can be re-established during postmining rehabilitation efforts. The study will also monitor the species’ abundance, extent and condition on the Mine Site and elsewhere to determine population trends and devise long-term management strategies that could be implemented in conservation plans for the species elsewhere throughout its range.

If rehabilitation efforts are successful and *A. nullanulla* can be reestablished on the Mine Site, measures to prevent any subsequent impacts would include the establishment of exclusion fencing, feral pest control, and monitoring.

Research suggests mining infrastructure, once fully rehabilitated, can offer beneficial environmental benefits for species resulting from large scale landscape works and large fenced areas which exclude feral predators and grazing.

6.3.7 Matters of National Environmental Significance

6.3.7.1 Introduction

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) addresses 'Matters of National Environmental Significance' (MNES). Potentially relevant MNES to the Project include:

- listed threatened species and ecological communities; and
- listed migratory species protected under international agreements.

Under the EPBC Act, if a project has the potential to have a significant impact on MNES, it is required to be referred to the Commonwealth Department of Climate Change, Energy, the Environment and Water for assessment as to whether it represents a 'controlled action' and therefore requires approval from the Commonwealth Minister for the Environment.

The MNES Significance Assessment for those entities identified under the EPBC Act is presented as **Appendix 6** and is referred to hereafter as BioAus (2025b). The following presents a summary of that report.

6.3.7.2 High Risk Entities

The following MNES entities were either recorded by BioAus (2025b) in the Assessment Area or were predicted likely to occur due to suitable habitat being present. These entities have a higher risk of potentially having a more than a remote chance of a significant impact as a result of the amended Project and have been subjected to a detailed impact assessment in line with the *MNES Significant impact guidelines 1.1*.

Mallee Bird Community TEC

The Mallee Bird Community is a Threatened Ecological Community (TEC) made up of an assemblage of bird species dependent on mallee vegetation. The Linear Corridor within the Project Site provides large enough vegetation patch sizes of PCT 170 and PCT 171 to meet the diagnostic criteria for the Mallee Bird Community TEC. However, only two terrestrial bird species from the Mallee Bird Community diagnostic birds list are present, which means the criteria for this TEC are not met. BioAus (2025b) states the Project will have less than a remote chance of causing a significant impact on the TEC, and referral to the Commonwealth Minister is not warranted.

South-eastern Hooded Robin (*Melanodryas cucullata cucullata*)

The South-eastern Hooded Robin was recorded on several occasions during surveys (BioAus, 2025b). Within the Development Footprint, 662ha of PCTs 58, 170, 171, 221 and 254 provide forage and refuge habitat, with other parts of the Development Footprint providing roosting and nesting habitat. However, due to the degradation of the vegetation by agriculture and feral goats, the habitat criteria for this species as identified by BioAus (2025b) is not met. The removal of 662ha constitutes 0.92% of the overall Assessment Area, of which 68,330ha will be retained. Therefore, the vegetation to be removed is a relatively minor proportion and not considered critical habitat for the species. BioAus (2025b) state the impacts of the Project on South-eastern Hooded Robin habitat are not considered to be significant under the EPBC guidelines.

Southern Whiteface (*Aphelocephala leucopsis*)

The Southern Whiteface was recorded in the Assessment Area on several occasions during surveys (BioAus, 2025b). The Southern Whiteface requires tree cover (<30%), shrub/native grass cover and an understorey of litter cover (>30%). Habitat containing these features for breeding and foraging as defined by BioAus (2025b) is not present within the Development Footprint largely due to disturbance by agriculture and feral goats. The removal of 2,846ha constitutes 3.93% of the overall Assessment Area, of which 68,330ha will be retained. Therefore, the vegetation to be removed is a relatively minor proportion and not considered critical habitat for the species. BioAus (2025b) state the impacts of the Project on the Southern Whiteface are not considered to be significant under the EPBC guidelines.

Pink Cockatoo (*Lophochroa leadbeateri leadbeateri*)

The Pink Cockatoo was recorded in the Development Footprint and in the adjacent land (BioAus, 2025b). BioAus (2025b) determined that suitable habitat for the Pink Cockatoo included treed communities of PCTs 58, 170, 171, 221, 253 and 254 within at least 5ha of intact native vegetation and corridors, and within 500m of permanent fresh water. Nesting habitat requires hollows greater than 10cm in diameter. Habitat critical to the survival of the Pink Cockatoo is present on the Project Site in terms of vegetation types associated with the species and 34 trees bearing hollows greater than 10 cm in diameter were recorded; however, the lack of fresh water is likely to limit reliance on the Project Site for nesting. In addition, BioAus (2025b) and EnviroKey recorded no breeding activity within the Assessment Area during multiple surveys over eight years. BioAus (2025b) state the impacts of the Project on the Pink Cockatoo are not considered to be significant under the EPBC guidelines.

Corben's Long-eared Bat (*Nyctophilus corbeni*)

Anabat surveys conducted by BioAus (2025b) recorded calls of *Nyctophilus* species, but these could not be reliably differentiated and could belong to either the Corbens Long-eared Bat or the Lesser Long-eared Bat. Due to Project timelines and the extensive area of the Development Footprint, Corbens Long-eared Bat has been assumed present. The Corbens Long-eared Bat is relatively understudied, with little known about their population numbers, habitat distribution and reproductive biology (BioAus, 2025b). More recent research suggests critical habitat would be represented by maternity roosts, however their characteristics are not well understood (BioAus, 2025b). The vegetation that would be cleared provides forage, refuge, and roosting habitat for the species. At least nine of the hollow bearing trees identified have the potential to provide nesting/denning habitat.

This species is considered to have a large home range with several roost sites found within a 4km range (BioAus, 2025b). Colonies will travel large distances at night and will use a roost site for a single night (BioAus, 2025b). This would indicate that this species would have a lesser reliance on any one habitat area in a mosaic of large tracts of native vegetation, of which occur within and in the vicinity of the Assessment Area. BioAus (2025b) state the impacts of the Project on the Corben's Long-eared Bat are not considered to be significant under the EPBC guidelines.

6.3.7.3 Lower Risk Entities

BioAus (2025b) determined the following MNES entities have potential to occur within the Project Site but have a lower risk of having a non-remote chance of significant impact. It is noted that none of the following species were found present by BioAus (2025b) during extensive flora and fauna surveys across the Assessment Area. BioAus (2025b) conducted streamlined MNES significance assessments for the lower risk entities and determined that none of these species have more than a remote chance of incurring a Significant Impact and thus, referral to the Commonwealth Department of Climate Change, Energy, the Environment and Water is not considered necessary.

Flora

- A Saltbush (*Atriplex infrequens*)
- Winged Peppergrass (*Lepidium monophlooides*)
- Desert Greenhood (*Pterostylis xerophila*)
- Menindee Nightshade (*Solanum karsense*)
- Slender Darling-pea (*Swainsona murrayana*)
- Yellow Swainson-pea (*Swainsona pyrophila*)

Fauna

- Murray Mallee Striated Grasswren (*Amytornis striatus howei*)
- Malleefowl (*Leipoa ocellata*)
- Grey Falcon (*Falco hypoleucos*)

6.3.7.4 Conclusion

From this assessment, BioAus (2025b) determined that no MNES has more than a remote chance of incurring a significant impact and thus, referral to the Commonwealth Department of Climate Change, Energy, the Environment and Water (Cth DCCEEW) is not necessary. Notwithstanding, the Applicant consulted with the Cth DCCEEW who recommended referral of the Project. The Applicant has agreed to do so.

6.3.8 Avoidance, Management and Mitigation Measures

6.3.8.1 Introduction

The Applicant has designed the Project to avoid impacts to biodiversity values to the extent feasible, to mitigate unavoidable impacts, and to offset any residual impacts. The following subsections present the process followed to avoid and minimise impacts, outlines the proposed mitigation measures, and summarises the proposed biodiversity offset strategy.

6.3.8.2 Avoidance of Impacts

While the size and location of the development footprint is largely dictated by the underlying ore resource, there have been four major design iterations of the development footprint over the 7-year Project design phase.

The initial version the Project design presented in the EIS (Version 3.0) included a 900m buffer zone surrounding the Extraction Area. An internal review of Version 3.0 conducted by RWC and the Applicant's Environment Manager determined the biodiversity impacts of the buffer zone were not reasonable from a biodiversity perspective. As a result, the design team were instructed to reduce the buffer zone from the initial 900m to 300m. Subsequently in late 2024, the Applicant removed Huntingfield and Sunshine Stations from the Mine Site (design Version 4.0). However, the Version 3.1 Limit of Disturbance within Warwick and Nulla Stations remained unchanged. The reduction in the buffer zone from 900m to 300m resulted in a reduction of the proposed Disturbance Footprint – Mine Site of 728ha (4,526ha to 3,798ha). Impacts to biodiversity were further reduced by strategically locating Project infrastructure in areas deemed to be the lowest ecological value.

Similarly, the Linear Corridor width has undergone several design iterations over the 7-year span of the Project design phase. The Linear Corridor was aligned to utilise existing disturbance, such as roads, infrastructure and historically disturbed lands. The Disturbance Footprint – Linear Corridor was also reduced from an initial width of 120m (444.42ha) to the current 42m (218.43ha) to maximise the retention of areas of intact habitat and lessen the extent of disturbance to vegetation and habitat connectivity. Additionally, this reduction Project would successfully avoid impacts on any BC Act listed EECs and will have no impact on any important areas from the Important Habitat Map.

BioAus (2025a) made note that the change in land management as a result of the Project would have positive outcomes for overall ecological health of the land within the Limit of Disturbance. The Project Site has historically been used for pastoral activities and has been subject to heavy grazing by goats and sheep, degrading much of the vegetation. The Project would lead to a cessation of grazing activities and an increase in control of feral pastoral animals. This would allow remnant and rehabilitated vegetation to increase, supporting greater abundance and diversity of native flora and fauna. The change in land management is therefore expected to enhance and contribute to the long-term sustainability of biodiversity on the land of the proposed development.

6.3.8.3 Mitigation of Impacts

The Applicant would implement the following management and mitigation measures to minimise those residual impacts on biodiversity values which cannot be avoided. The proposed measures represent the full range of reasonable and feasible mitigation measures taking into consideration the residual risk to biodiversity presented in **Appendix 3**. Further detail on mitigation measures can be found in section 5.5 and Table 48 of BioAus (2025a).

Clearing of Native Vegetation

- Prepare and implement the following management plans prior to the commencement of construction operations.
 - A *Biodiversity Management Plan* to outline the management measures to be implemented throughout the life of the Project to minimise potential biodiversity-related impacts. The plan would include:
 - additional mitigation measures and implementation timeframes during construction and operation of the Project;
 - trial and research project to be implemented;
 - an unexpected finds protocol for threatened species;
 - monitoring of selected threatened species present or potentially present within the Mine Site, including but not limited to the Painted Burrowing Frog; and
 - monitoring of remnant and reestablished vegetation.
 - A *Rehabilitation Management Plan* in accordance with the latest NSW Resources Regulator requirements and guidelines.
- Avoid and minimise clearing of native vegetation through the implementation of planning and survey controls, where possible.
- Stage clearing to minimise the extent of clearing at any one time, where possible.
- Locate any ancillary infrastructure areas (e.g. vehicle parking, laydown yards, growth medium stockpiles) to avoid high value biodiversity areas, where possible.
- Install appropriate signage and/or barriers to delineate ‘No Go Zones’, ‘Environmental Protection Area’, and the limit of approved disturbance areas.
- Clearly identify limit of clearing areas in site inductions.

Impacts to *Austrostipa Nullanulla*

- Ensure that *A. nullanulla* is identified as a target species in the *Biodiversity Management Plan* and the *Rehabilitation Management Plan* and identify species-specific management and mitigation measures, including:
 - pre-mining exclusion of grazing fauna from known habitat to enable adequate seed collection prior to clearing;

- place gypsum-rich soils on the eastern margins of the Salt Pans during rehabilitation to provide specific habitat for *A. nullanulla* and maximise the potential for post-mining establishment of the species; and
- the construction of grazing enclosures around retained habitat areas.

Impacts to Hollow-bearing Trees

- Develop a pre-clearing protocol which includes a requirement for detailed mapping of habitat features, and ensures that a suitably qualified and trained fauna handler is present during hollow-bearing tree clearing to rescue and relocate any displaced fauna.

Impacts to Surface and Groundwater

- Ensure that appropriate surface water and groundwater water controls are implemented (see **Sections 6.2** and **6.7**).
- Ensure site vehicles carry spill kits.
- Implement controls such as sediment fences, mulching or jute matting where appropriate.

Impacts on Native Flora and Fauna

- Ensure that soil and seed material is not transferred into the Mine Site to prevent weed invasion.
- Ensure that any weed infestations within the Mine Site are identified and mapped and appropriate weed management is implemented as outlined in the *Biodiversity Management Plan* and the *Rehabilitation Management Plan*.
- Implement a feral animal management program, and outline this program in the *Biodiversity Management Plan*, to reduce and/or manage populations of feral animals at the Mine Site including goats, rabbits, pigs, foxes and cats.
- Ensure that site-specific management plans consider measures to mitigate impacts to biodiversity values associated with noise, vibration, waste, lighting, and air pollution.

Contingency Measures

In addition to the above, the Applicant would implement the following contingency mitigation measures should the following triggers be exceeded.

- Unapproved clearing of areas of native vegetation.
 - Cease all activities in the area of unapproved clearing.
 - Report the unapproved clearing to the relevant government agency and undertake rectification or additional offsetting as required.
 - Review internal processes for ground disturbing activities implement improvements to prevent a recurrence.

- Monitoring indicates weed or pest abundance at unacceptable levels.
 - Amend and improve the existing weed and pest control strategy in consultation with surrounding landholders.
- Unanticipated or excessive fauna deaths or injuries associated with direct (i.e. vehicle strike, contamination) or indirect (i.e. light, noise, dust) causes.
 - Investigate the root cause of the unanticipated deaths or injuries and implement additional control measures as required.

6.3.9 Offsetting of Residual Impacts

6.3.9.1 Ecosystem Credit Requirements

BioAus (2025a) determined the ecosystem credit requirements for the Project using the BAM-C. **Table 6.3.10** identifies the numbers and classes of credits required to be retired in accordance with the variation rules.

The Applicant was advised on 13 June 2025 of a change to the BAM-C credit calculation methodology which substantially increased the biodiversity credit requirements for the Project.

Table 6.3.10
Ecosystem Credit Requirements and Trading Groups

PCT	Offset Trading Group	Ecosystem Credits Mine Site	Ecosystem Credits Linear Corridor
28	Sandhill Pine Woodland in the Riverina, Murray-Darling Depression and NSW South Western Slopes bioregions	-	21
58 low	Semi-arid Sand Plain Woodlands >=50% and <70%	4,961	1,272
64 low	Inland saline Lakes <50%	15,714	-
143 low	Sand Plain Mulga Shrublands <50%	-	392
152 low	Aeolian Chenopod Shrublands <50%	5,125	-
154 low	Aeolian Chenopod Shrublands <50%	21,838	1,436
157 low	Riverine Chenopod Shrublands >=50% and <70%	16,497	-
157 low - moderate	Riverine Chenopod Shrublands >=50% and <70%	129	-
170 low	Dune Mallee Woodlands <50%	22	151
171 low	Dune Mallee Woodlands <50%	133	158
215 low	Sand Plain Mulga Shrublands <50%	38	-
215 low-moderate	Sand Plain Mulga Shrublands <50%	10	-
221 low	Semi-arid Sand Plain Woodlands <50%	8,496	-
221 low-moderate	Semi-arid Sand Plain Woodlands <50%	79	-
253 low	Inland Saline Lakes <50%	2,199	-
254 low	Riverine Chenopod Shrublands <50%	26	-
Subtotal:		75,267	3,430
Total Ecosystem Credits:		78,697	

Source: BioAus (2025a) – after Tables 49 and 50

6.3.9.2 Species Credit Requirements

BioAus (2025a) determined the species credit requirements for the Project using the BAM-C. **Table 6.3.11** identifies the numbers and classes of credits required to be retired in accordance with the variation rules.

Table 6.3.11
Species Credits for the Project

Name of Threatened Species	BC Act Status	EPBC Act Status	PCT	Species Credits
A spear-grass (<i>A. nullanulla</i>)	Endangered	-	154_low	8
			253_low	630
Total Species Credits				638
Source: BioAus (2025a) – After Tables 51 and 52				

6.3.9.3 Proposed Biodiversity Offset Strategy

The Applicant proposes to establish one or more Stewardship Sites within or surrounding the Mine Site to generate the majority of required ecosystem and species credits for the Project. A program to identify suitable locations for Stewardship Sites has commenced, with desktop analysis, supported by limited ground truthing, indicating that sufficient credits within the relevant Offset Trading Groups occur within the area assessed. Commercial negotiations with landholders and further desktop and on-ground studies were ongoing at the time of finalisation of this document.

A further consideration in establishing one or more Stewardships Sites is the mineral prospectivity of the surrounding land. The Applicant has since 2020 substantially extended the known extent of the mineral sand deposits and identified additional deposits. Exploration operations continue to be undertaken to better define the extent of those deposits, as well as to identify or “sterilise” areas where mineralisation does not occur.

In light of the above, the Applicant recognises an inherent tension between providing adequate biodiversity offsets for the Project while not sterilising mineral sands resources for future generations. As a result, the Applicant would undertake additional exploration drilling to confirm the presence/absence of mineral sand within potential Stewardship Sites.

The Applicant would also, prior to determination:

- identify staging for the retirement of the required biodiversity credits; and
- identify the likely source for credits for retirement of the Stage 1 biodiversity credits, including the location of proposed Stewardship Sites.

Finally, the Applicant would continue to liaise with Federation University, owner of “Nanya” station, located approximately 35km to the north of the Mine Site, in relation to a suitable partnership to:

- establish research projects related to management of biodiversity in the area surrounding the Mine Site, including for *A nullanulla*; and
- the potential to utilise a portion of “Nanya” station as a Stewardship Site.

The Applicant would also implement a program to research and share knowledge and resources in relation to rehabilitation of disturbed landscapes within and surrounding the Mine Site and reestablishment of threatened species and communities within such landscapes. This would include establishing a seed harvesting, storage and spreading program and nursery.

6.3.10 Conclusion

BioAus (2025a) has determined that the Project would result in the following biodiversity related impacts:

- Direct impacts to approximately 3,883.08ha of native vegetation including:
 - 3,692.92ha located within the Disturbance Footprint - Mine Site; and
 - 190.16ha located within the Disturbance Footprint - Linear Corridor.
- Direct impacts to 3.84ha of *A. nullanulla*.
- Various indirect impacts to vegetation and fauna.
- Prescribed impacts including disturbance of the following.
 - 135.88ha of PCT 253 and associated gypsum soils.
 - Temporary removal of salt pans.

The Applicant would retire 78,697 ecosystem credits and 638 species credits using one or more Stewardship Sites or through purchase of the required credits from third parties, with any residual credit requirements retired via a payment into the Biodiversity Conservation Fund.

6.4 Soils and Land Capacity

6.4.1 Introduction

The Soil and Land Capability Assessment for the Project as exhibited was prepared by Sustainable Soils Management and is presented as Appendix 7 of the EIS (SSM, 2024). Section 6.4 of the EIS presents a summary of that assessment.

The EIS and SSM (2024) were reviewed by a range of agencies who provided soil and land-related submissions. These submissions are presented in detail in the *Submissions Report*. The Department of Primary Industries – Agriculture provided comment on the EIS and SSM (2024), stating that the SEARs have been adequately addressed and that the potential impacts on, and mitigation measures for, grazing properties by the mining and rehabilitation operations have been adequately assessed.

An updated *Soil and Land Impact Assessment* for the amended Project was prepared by SSM and is presented as **Appendix 7** and is referred to hereafter at SSM (2025). The following subsections provide a summary of those aspects of the assessment that have changed as a result of the proposed Amendment.

6.4.2 Guidelines

The updated *Soil and Land Capability Assessment* was conducted following guidelines presented in the following documents.

- *Australian Soil and Land Survey Handbook* (NCST, 2009)
- *Guidelines for Surveying Soil and Land Resources* (McKenzie et al., 2008)
- *The land and soil capability assessment scheme: second approximation* (OEH, 2012)
- *Primefact 1063: Infrastructure proposals on rural land* (Kovac and Briggs, 2013)

6.4.3 Assessment Methodology

Section 6.4.4 of the EIS details the assessment methodology adopted for the Soil and Land Capacity Assessment. The updated report was prepared using the Soil Study Area and data collected for SSM (2024) (**Figure 6.4.1**). It is noted that the Soil Study Area extends beyond the boundary of the Mine Site. Information in relation to the soils and land of those areas outside the Mine Site is presented for the sake of completeness. The Amended Project would not result in disturbance of areas outside the Mine Site boundary.

6.4.4 Soil Properties

6.4.4.1 Introduction

A detailed description of the existing soil and land capability within the Soil Study Area is provided in SSM (2024) and Section 6.4 of the EIS. The following is a summary of the updated descriptions of soil properties provided by SSM (2025) for the Amended Project.

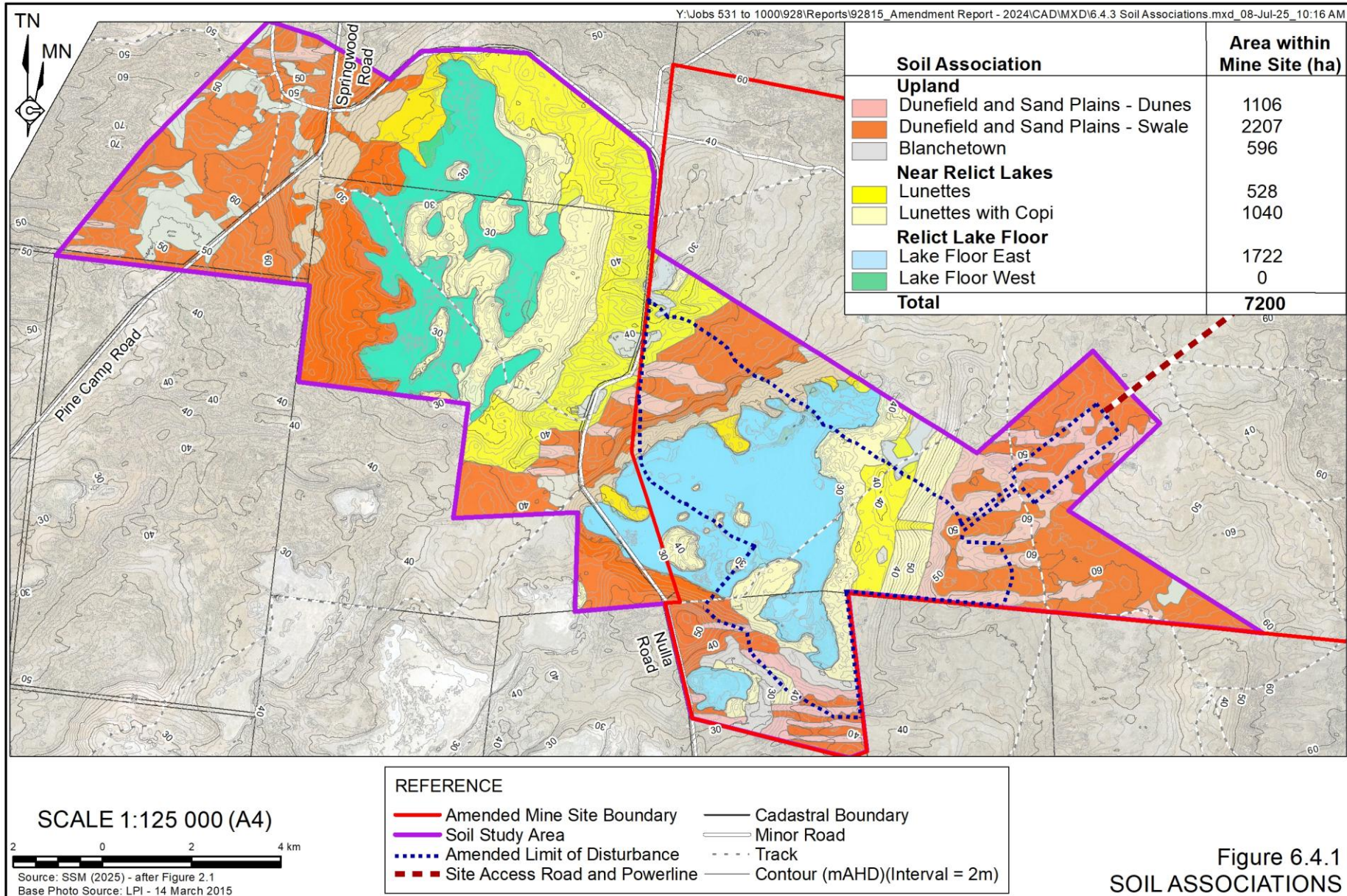


Figure 6.4.1
SOIL ASSOCIATIONS

6.4.4.2 Soil Associations

Individual zones of soil with varying suitability for use during rehabilitation were mapped by SSM (2025). In doing so, the depth to soil properties that would limit plant growth, and the degree of this limitation was considered.

The Soil Study Area was divided into 3 landform groups, which include:

- dunefields, sandplains and small depressions;
- relict lakes; and
- lunettes formed from windblown sediment that came from lakes.

Within these landform groups, seven Soil Associations were defined, six of which occur within the Mine Site. **Table 6.4.1** describes their properties and **Figure 6.4.1** presents the distribution of each.

Table 6.4.1
Soil Associations and Chemical Properties

Association	ASC Order	pH _{H2O}	Chloride	Carbonate	Sulphate	Cations
Dunefield and Sand Plains-Dunes	Calcarosol (82%)	Increased from 8.9 to 9.5 with depth	Desirably low to 60cm depth in all sites, and to 100cm in 9 of 11 sites	Increased from 4% to 19% with depth	Low except 500mg/kg in the 60 to 100cm layer	Calcium dominant. Layer at 30 to 100cm was slightly sodic
Dunefield and Sand Plains-Swales	Calcarosol (79%)	Increased from 8.9 to 9.5 with depth	Desirably low to 30cm in sites, to 60cm in 37 sites, and 100cm in 32 sites	Increased from 4% to 18% with depth	Low except 550mg/kg in the 60 to 100cm layer	Calcium dominant. Layer at 30 to 100cm was slightly sodic
Blanchetown Clay	Calcarosol (53%) Chromosol (37%)	9	Desirably low to 15cm in 18 sites and to 100cm in 1 site	Generally increased from 6 to 9% with depth	Low in 0 to 30cm layer. Increased to much greater concentration in the 60 to 100cm layer	Sodium dominant
Lunettes	Calcarosol (77%), Arenosol (33%)	Increased from 8.7 to 9.3 with depth	Desirably low for all samples	Increased from 4% to 10% with depth	Low except 800mg/kg in the 60 to 100cm layer	Calcium dominant
Lunette with Copi	Calcarosol (82%)	8.5	Desirably low to 15cm in all sites, to 30cm in 19 sites, and to 100cm in 9 sites	Increased from 4% to 9% with depth	Increased from 1,200 to 5,300mg/kg with depth	Calcium dominant, but results contaminated by soluble salts
Lake Floor East	Hydrosol (73%)	8.3	Toxic to most plants. Thin topsoil of less saline soil in elevated patches	Averaged 2 to 3%	Greater than 4,000mg/kg for all layers	Sodium dominant in soluble salts

Source: SSM (2025) – Modified after Table 2.1

6.4.4.3 Acid Sulphate Risk Assessment

Sampling in the Soil Study Area indicated that there is a low likelihood for Potential Acid Sulphate Soil within the amended Mine Site.

6.4.4.4 Land and Soil Capability Assessment

Land and soil capability (LSC) is assessed OEH (2012). That document identifies eight classes of land capability, relevantly including the following.

- Class 8 (extremely low capability land) – Limitations are so severe that the land is incapable of sustaining any land use apart from nature conservation.
- Class 7 (very low capability land) - Land has severe limitations that restrict most land uses and generally cannot be overcome. On-site and off-site impacts of land management practices can be extremely severe if limitations not managed. There should be minimal disturbance of native vegetation.
- Class 6 (low capability land) - Land has very high limitations for high-impact land uses. Land use restricted to low-impact land uses such as grazing, forestry and nature conservation. Careful management of limitations is required to prevent severe land and environmental degradation.

SSM (2025) found that approximately 5,477 ha (76%) of the Soil Survey Area within the amended Mine Site is LSC Class 6 with the remaining 1,722 ha (24%) classified as LSC Class 8, indicating limited capacity for the land to withstand disturbance (**Figure 6.4.2**). Wind erosion is expected to be the dominant hazard across the amended Mine Site, along with waterlogging and salinisation in the salt pans.

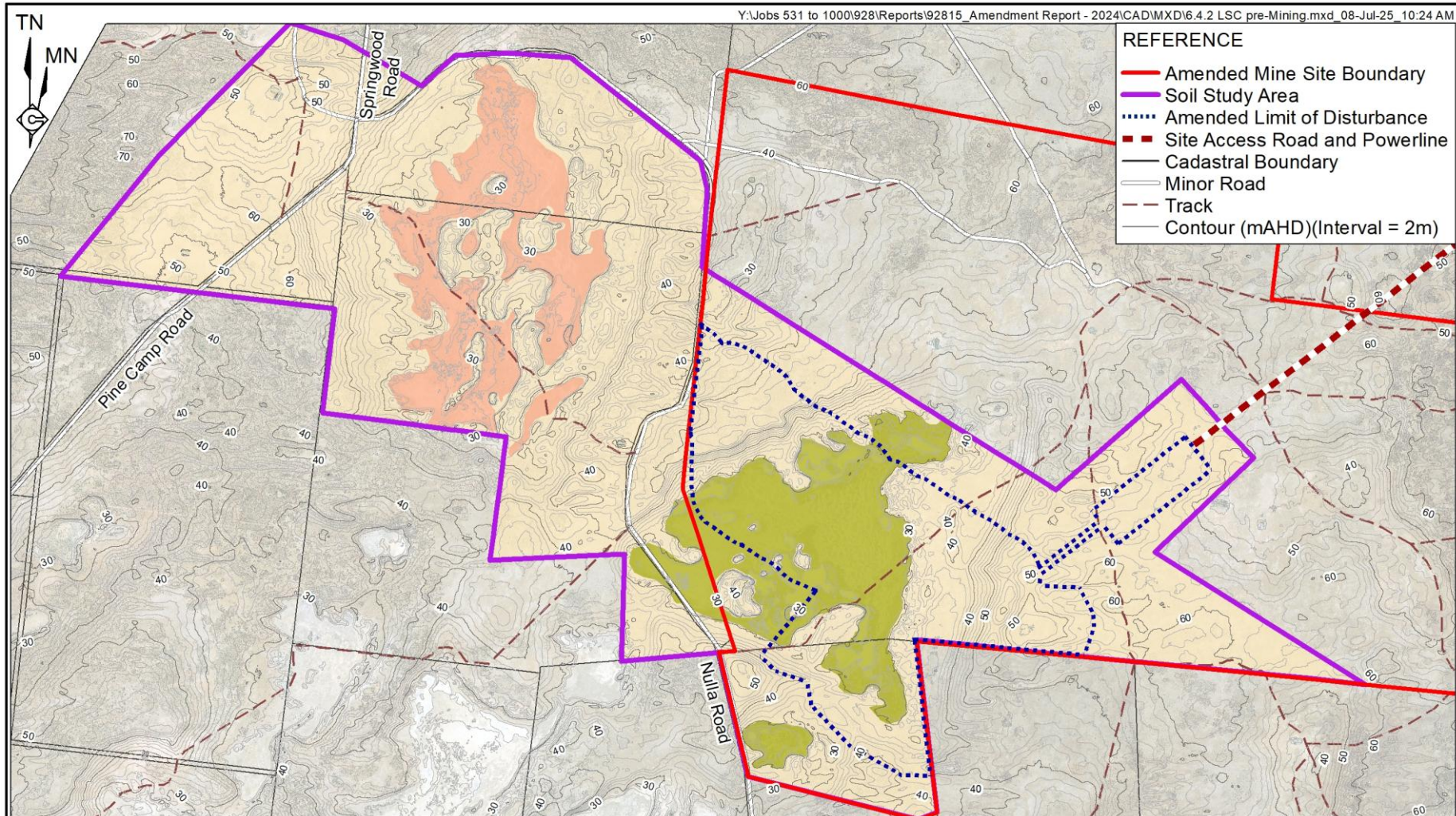
6.4.5 Soil Stripping and Placement Recommendation

6.4.5.1 Soil Stripping Recommendations

Table 6.4.2 presents the soil stripping depths recommended and available volume calculated by SSM (2025). In summary between 0.2m and 0.4m of topsoil and 0.3m and 1m of subsoil would be stripped. No stripping of soils within the following soil associations is recommended.

- Lake Floor East Soil Association (topsoil and subsoil) – SSM (2025) determined that the soils of this soil association are toxic to plant life and, as a result, should not be stripped.
- Blanchetown Soil Association (subsoil only) – SSM (2025) determined that subsoils of the Blanchetown Soil Association were not suitable for stripping as the material is too saline and the Exchangeable Sodium Percentage is too high for use in rehabilitation operations.

Other areas of disturbance, including the Infrastructure Area, would be largely returned to the pre-mining landform. Soils from those areas would be stockpiled adjacent to the disturbance area and respread over the same area once no longer required for mining purposes. As a result, the soil availability and demand within these areas would be largely balanced and have not been assessed by SSM (2025).



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- REFERENCE
- Amended Mine Site Boundary
 - Soil Study Area
 - Amended Limit of Disturbance
 - - - Site Access Road and Powerline
 - Cadastral Boundary
 - Minor Road
 - Track
 - Contour (mAHd)(Interval = 2m)

Land & Soil Capability Class	Area (ha) within Soil Study Area within Mine Site
Class 6	5477
Class 7	0
Class 8	1722
Total	7200

Note: Minor arithmetic inconsistencies are due to rounding

SCALE 1:125 000 (A4)

Source: SSM (2025)
Base Photo Source: LPI - 14 March 2015

Figure 6.4.2
LAND AND SOIL CAPABILITY - PRE MINING

Table 6.4.2
Soil Stripping Depths and Total Available Volume

Soil Association	Area (ha)	Topsoil		Subsoil	
		Stripping Depth (m)	Volume (m ³)	Stripping Depth (m)	Volume (m ³)
Dunefield and Sand Plain-Dune	396	0.35	1,384,705	0.65	2,571,595
Dunefield and Sand Plain-Swale	495	0.2	991,082	0.8	3,964,323
Lunettes	384	0.4	1,533,732	0.6	2,300,599
Lunettes with Copi	706	0.3	2,115,277	0.7	4,935,645
Blanchetown	248	0.2	495,170	0.0	-
Lake Floor East	1,289	0.0	-	0.0	-
Total	3,516		6,519,790		13,771,792
Note: Minor arithmetic discrepancies are due to rounding					
Source: SSM (2025) - Modified after Table 4.1					

6.4.5.2 Soil Placement Recommendations

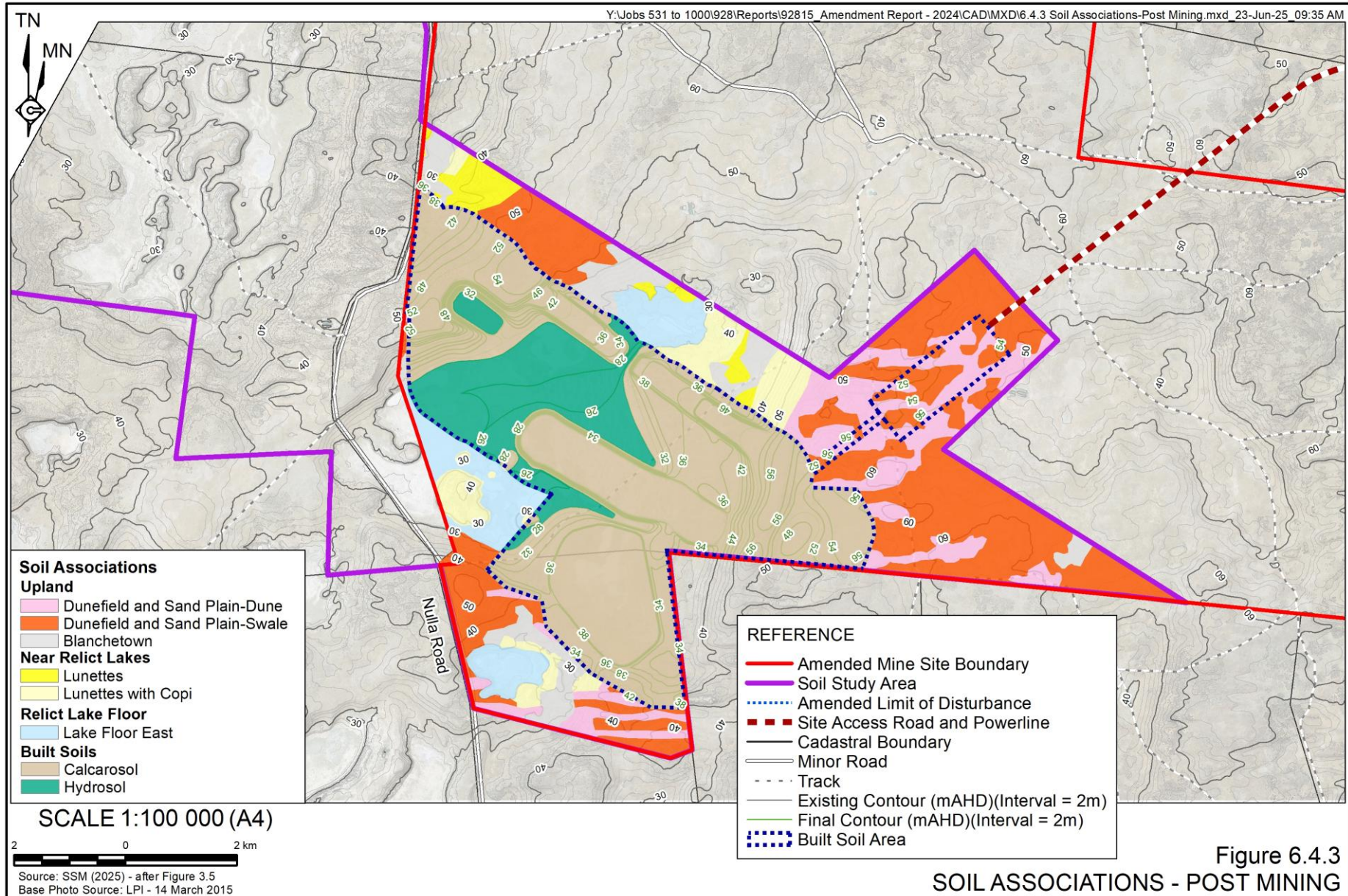
SSM (2025) identified two classifications of “built” soils as follows (Figure 6.4.3).

- Calcarosol – or soils containing calcium salts. The Calcarosols would occupy more elevated sections of the final landform and would comprise a loamy topsoil and a clayey subsoil built using topsoil and subsoil stockpiled during soil stripping operations.
- Hydrosol – or “wet” soils. The Hydrosols would occupy the floor of the Eastern Salt Pan and the backfilled final void. These soils would be in close proximity to the regional water table and would be built using clayey-rich subsoil or overburden. Stockpiled topsoil and subsoil would not be used to build the hydrosols.

Table 6.4.3 presents the recommended soil placement depths and volumes of soil that would be required for rehabilitation operations. Table 6.4.3 also presents the life of Project soil balance.

Table 6.4.3
Soil Placement Depths and Required Volume

Soil Association	Area (ha)	Topsoil		Subsoil	
		Placement Depth (m)	Volume (m ³)	Placement Depth (m)	Volume (m ³)
Calcarosol	2,791	0.23	6,416,643	0.47	13,112,271
Hydrosol	728	-	-	-	-
Total soil required			6,416,643		13,112,271
Total soil available			6,519,790		13,771,792
Life of Project Soil Balance			103,146		659,521
Note: Minor arithmetic discrepancies are due to rounding					
Source: SSM (2025) - Modified after Table 4.2					



6.4.5.3 Annual Soil Balance

Table 6.4.3 presents a life of Project soil balance. Those calculations identify a small surplus of topsoil and subsoil. However, the timing of stripping and placement of soil will be critical for ensuring that adequate materials are available for progressive rehabilitation operations when required. To ensure adequate soil resources are available for rehabilitation operations when required, the Applicant has prepared an updated annual soil balance for the life of the amended Project based on the following.

- Areas to be disturbed each year within the Built Soil Area (see Figure 3.4.3).
- Areas to be rehabilitated each year within the Built Soil Area (see Figure 3.12.2).
- The pre- and post-mining soil associations determined by SSM (2025) (Figures 6.4.1 and 6.4.3).
- Soil stripping and placement depths determined by SSM (2025) (Tables 6.4.2 and 6.4.3).

Table 6.4.4 presents the annual soil balance and soil stockpile volumes. In summary, adequate soil resources will be available for rehabilitation operations during each year of the amended Project.

Table 6.4.4
Annual Soil Balance

Year	Soil Stripping (m3)		Cumulative Soil Stockpiles (m3)		Soil Spreading (m3)	
	Topsoil	Subsoil	Topsoil	Subsoil	Topsoil	Subsoil
Construction	2,829,936	6,339,016	2,829,936	6,339,016	0	0
1	12,780	29,820	2,842,717	6,368,836	0	0
2	64,791	151,178	2,907,507	6,520,014	0	0
3	344,873	625,824	1,764,755	4,105,907	1,487,626	3,039,931
4	479,500	968,053	1,648,287	3,856,114	595,967	1,217,846
5	191,383	727,680	1,191,053	3,258,358	648,617	1,325,436
6	448,663	725,991	1,629,927	3,964,345	9,789	20,004
7	661,567	1,168,289	2,208,801	4,963,781	82,630	168,853
8	258,289	581,073	2,292,481	5,188,046	174,608	356,809
9	193,249	411,240	2,249,704	5,116,970	236,027	482,316
10	132,431	295,946	2,135,007	4,907,915	247,128	505,001
11	353,301	621,910	2,282,135	5,108,517	206,172	421,308
12	213,521	296,651	2,266,474	4,936,840	229,182	468,328
13	103,675	229,614	2,277,159	4,976,431	92,990	190,023
14	133,487	355,502	2,410,645	5,331,933	0	0
15	98,190	243,238	2,260,816	5,068,346	248,020	506,824
16	0	0	1,919,822	4,371,532	340,994	696,815
17	0	0	1,593,362	3,704,420	326,459	667,112
18	0	0	1,147,004	2,792,296	446,359	912,124
19	0	0	362,928	1,190,054	784,076	1,602,242
20	0	0	107,248	667,576	255,680	522,477

Note: Minor arithmetic discrepancies are due to rounding

Source: SSM (2025) - Modified after Table 4.3

Topsoil stockpile volumes would increase progressively until Year 3 when rehabilitation of the Year 1 Extraction Area and Year 3 when rehabilitation of the Off Path Storage Facility would be undertaken. Stockpile volumes would generally increase again during Years 6 to 15 before being progressively drawn down as mining comes to an end, but rehabilitation is ongoing. A small surplus of approximately 107,248m³ is predicted at the end of the life of the amended Project.

Subsoil stockpile volumes would progressively increase until Year 3 when rehabilitation of the Year 1 Extraction Area and Year 3 when rehabilitation of the Off Path Storage Facility would be undertaken. Stockpile volumes would generally increase again during Years 6 to 15 before being progressively drawn down as mining comes to an end, but rehabilitation is ongoing. A surplus of approximately 667,576m³ is predicted at the end of the life of the amended Project. The Applicant would manage the volume of subsoil in stockpile by either stripping less subsoil or placing a greater thickness of subsoil on the final landform.

The Applicant would maintain a soil inventory throughout the life of the amended Project, including the source, location, volume and planned destination of soils in stockpile and would include that information in the Annual Review to be prepared for the amended Project.

6.4.6 Avoidance, Management and Mitigation Measures

The Applicant would implement the management and mitigation measures presented in Section 6.4 of the EIS to ensure that any soils and land capability impacts associated with the amended Project are avoided or minimised to the extent practicable.

6.4.7 Assessment of Impacts

6.4.7.1 Soil Stripping, Stockpiling and Respreading

The major source of soil disturbance associated with the amended Project would be the stripping, stockpiling and respreading of soil. Successful rehabilitation of the Mine Site would therefore depend on the following.

- Stripping and stockpiling (or directly using) sufficient suitable topsoil and subsoil resources to provide for required rehabilitation operations.
- Preserving the quality of stockpiled soil resources by maintaining biological activity and adequate aeration in stockpiled soil.
- Respreading soils as recommended by SSM (2024 and 2025).

Assuming that the management and mitigation measures identified in Sections 6.4.5 and 6.4.6 of the EIS are implemented, SSM (2025) state that adequate soil resources would be available to rehabilitate the Mine Site. Careful management of soil resources will be required during the early years of the amended Project to ensure adequate soil is available for rehabilitation of the initial sections of the final landform.

6.4.7.2 Land and Soil Capability

SSM (2025) estimated the pre- and post-mining land and soil capability based on the *Land Soil Capability Assessment guidelines* (OEH, 2012). **Figures 6.4.2 and 6.4.4 and Table 6.4.5** present the existing and anticipated areas of each land and soil capability class within the proposed Limit of Disturbance before and following mining operations. In summary, the Project would result in an increase of approximately 561ha in the area of Class 6 land, principally as a result of construction of elevated sections of the final landform within the Eastern Salt Pan.

Table 6.4.5
Land and Soil Capability Areas – Pre and Post Mining

Land and Soil Capability Class	Area within Limit of Disturbance (ha)		
	Pre-mining	Post-mining	Change
Class 6	2,509	3,070	+561
Class 8	1,289	728	-561
Note: Apparent arithmetic inconsistencies are due to rounding			
Source: SSM (2025) – After Table 3.6			

6.4.8 Monitoring

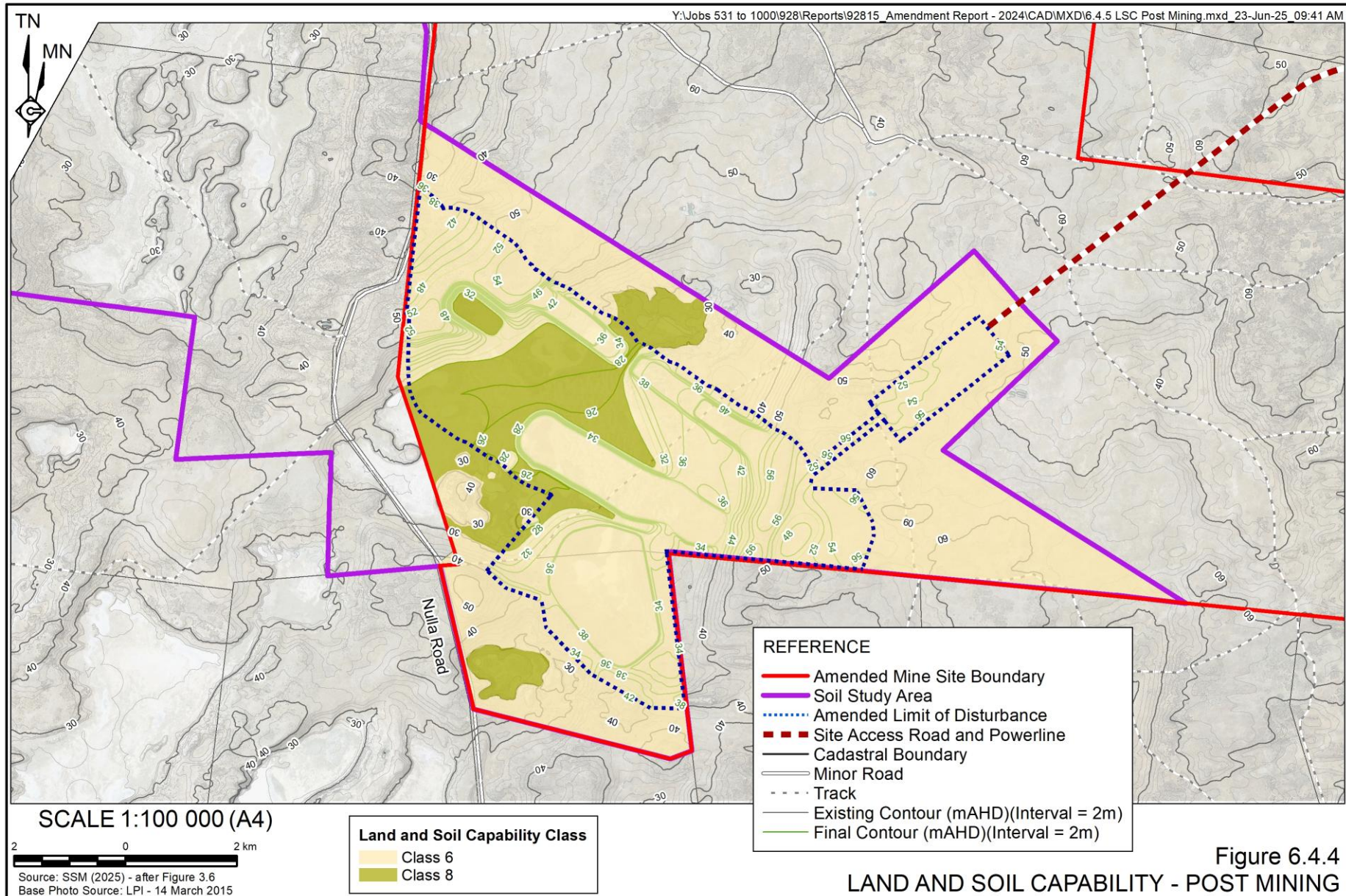
The soil related monitoring measures presented in Section 6.4.8 of the EIS remain unchanged.

6.4.9 Conclusion

The major source of soil disturbance associated with the amended Project would be continual excavation, movement and replacement of soil and overburden. The aim of soil management throughout the life of the amended Project would therefore be to minimise soil degradation through appropriate stripping, stockpiling and placement of that material. Providing that the management and mitigation measures outlined in Sections 6.4.5 and 6.4.6 of the EIS and Section 6.4.5 of this report are implemented, SSM (2025) indicates that the following Project-related impacts upon soil resources, land capability and agricultural productivity would occur.

- There is a low risk of Acid Sulphate Soils degrading soil resources within the Mine Site.
- Estimated available topsoil and subsoil resources throughout the Mine Site would allow suitable soil profiles to be reconstructed during rehabilitation operations.
- Reconstructed soil profiles would be capable of supporting and increasing levels of land capability, agricultural productivity and vegetation coverage commensurate with the existing landscape.

No Project-related soil resource impacts are anticipated on adjoining agricultural lands.



6.5 Aboriginal Heritage

6.5.1 Introduction

OzArk Environment & Heritage Pty Ltd (OzArk) prepared the *Aboriginal Cultural Heritage Assessment Report* (ACHAR) for the Project as exhibited. That report, referred to hereafter as OzArk (2024), is presented as Appendix 8 of the EIS and a summary is presented in Section 6.5 of the EIS.

Heritage NSW provided feedback on the ACHAR on 3 June 2024 stating that the Agency agreed with the proposed management measures and recommendations included in OzArk (2024) and provided recommendations in relation to draft conditions of consent.

OzArk have prepared an amended ACHAR for the Amended Project, presented as **Appendix 8a** and referred to hereafter at OzArk (2025). No additional surveys were undertaken, with the scope of the assessment limited to additional consultation with the Aboriginal community and reassessment of those sites that would be disturbed by the Amended Project.

Additionally, OzArk Environment and Heritage Pty Ltd (OzArk) prepared the Historic Heritage Assessment Report (HHAR) for the Project as exhibited. That report is presented as Appendix 13 of the EIS and a summary is presented in Section 6.12 of the EIS. OzArk have prepared an amended HHAR for the Amended Project, presented as **Appendix 8b**. The amended HHAR results in no changes to historic heritage as exhibited in the EIS and will therefore not be discussed further.

The following subsections provide a summary of those aspects of the assessment that have changed as a result of the proposed Amendment. Readers are referred to Sections 6.5.2 to 6.5.4 and 6.5.8 of the EIS for a summary of the existing environment, assessment methodology, assessment results and proposed avoidance, management and mitigation measures which remain unchanged. In addition, the Heritage Survey Area also remains unchanged and extends beyond the boundary of the Mine Site. Information in relation to sites of Aboriginal heritage significance outside the Mine Site is presented for the sake of completeness. The Amended Project would not result in disturbance of areas outside the Mine Site boundary

6.5.2 Amended Assessment of Impacts

6.5.2.1 Heritage Survey Area

OzArk (2025) identified 143 Aboriginal sites, of which all were identified by the Registered Aboriginal Parties (RAPs) as having high social or cultural value. Of these sites, 136 were assessed as having low scientific significance and seven were assessed as having moderate scientific significance. While the Amended Project provides no changes to the scientific significance of the identified sites, there is be a reduction in the number of sites that would be disturbed by the Amended Project and therefore a change in management strategy of those sites.

Figures 6.5.1 and **6.5.2** and **Table 6.5.1** identify the amended management of identified Aboriginal sites. In summary, OzArk (2024 and 2025) propose five management “groups” as follows.

- Group 1 = These sites are located within the proposed area of disturbance and would be salvaged through targeted surface artefact collection.

- Group 2 = These sites are located within the proposed area of disturbance and would be salvaged through surface artefact collection via walked transect.
- Group 3 = These sites are located within the proposed area of disturbance and would be salvaged through limited archaeological excavation of hearths for dating purposes.
- Group 4 = These sites are not located within or are partially located within the proposed area of disturbance but require management to be conserved in the landscape (e.g. fencing).
- Ungrouped – These sites are located at a distance from the proposed area of disturbance and therefore no further management is warranted.

The Amended Project would disturb 55 sites (reduced from 65 sites) and would avoid 88 sites (increased from 78 sites) (**Figure 6.5.1** and **6.5.2** and **Table 6.5.1**). Of the sites that would be disturbed, 54 would be totally impacted (reduced from 62 sites) and 1 partially impacted (reduced from 3 sites). Additionally, three sites that were previously unharmed but required a Group 4 management strategy no longer require a Group 4 management strategy as they are more than 50m from the Amended Limit of Disturbance.

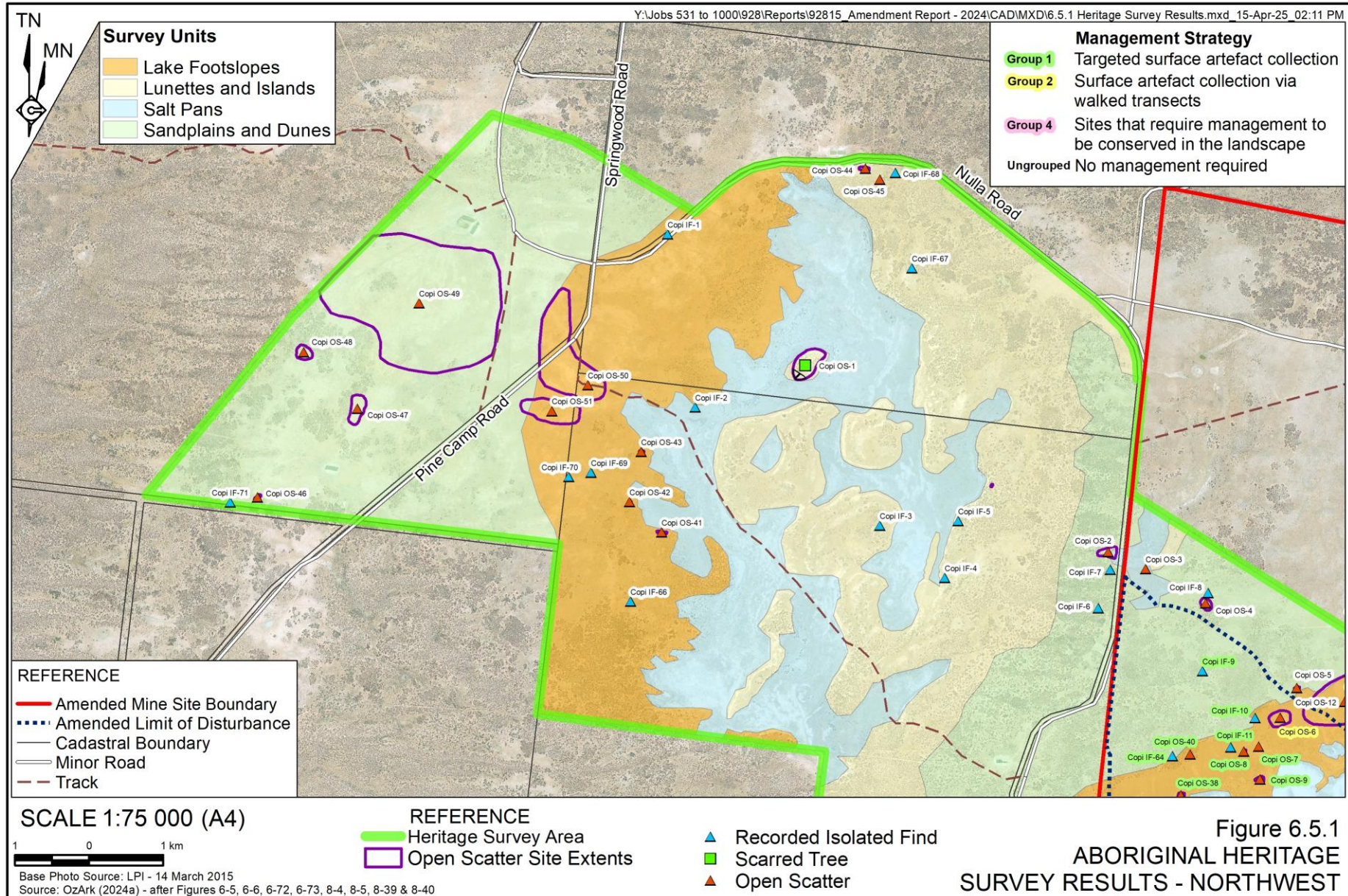
The sites which would be impacted by the Amended Project consist of 32 isolated finds, 20 artefact scatters and three artefact scatters with hearths. **Table 6.5.1** provides an updated summary of the significance assessment, degree of harm and management strategy of all 143 sites recorded within the Heritage Survey Area. Those sites which would no longer be disturbed, or which require a reduced level of management are shaded grey.

6.5.2.2 Water Jelly

Finally, Section 6.5.2.4 of the EIS describes an “Aboriginal settlement” within Warwick Station known as “Water Jelly.” Goodfellow (2006) in her history of Nulla Station stated that in 1920, Nulla Station included Warwick Station. At that time, there was a need for an outstation the northern boundary of the property. A house was purchased and relocated to “the Waltragille Tank”. The Head Stockman, Mr Harry Mitchell, a local Barkindji man, resided in the residence with his wife Alice and 12 children. Goodfellow (2006) states that the Mitchell family lived in “their own tribal ways” and that the areas was known colloquially as “Water Jelly.” The family left the station prior to its sale, with the exact date of departure unclear. Mr Mitchell died in Ivanhoe in 1936 and the station was sold in 1946.

The EIS erroneously stated that the “Water Jelly” house is the present Warwick Homestead and that the Waltragille Tank is the dam close to the homestead. The Applicant has subsequently been advised by a former resident of Warwick Station that the actual location of “Water Jelly” is approximately 2km to the east of the Infrastructure Area. The Applicant has inspected the site which includes the remains of a fireplace and chimney, house yard fence and evidence of past occupation. With the exception of the fireplace, no structures remain standing.

“Water Jelly” is located outside the Heritage Survey Area and the Limit of Disturbance and would not be disturbed by the Project. The Applicant has erected a temporary barrier to protect the site from inadvertent disturbance and will liaise with the descendants of Mr Mitchell in relation to ongoing protection and documentation of the site.



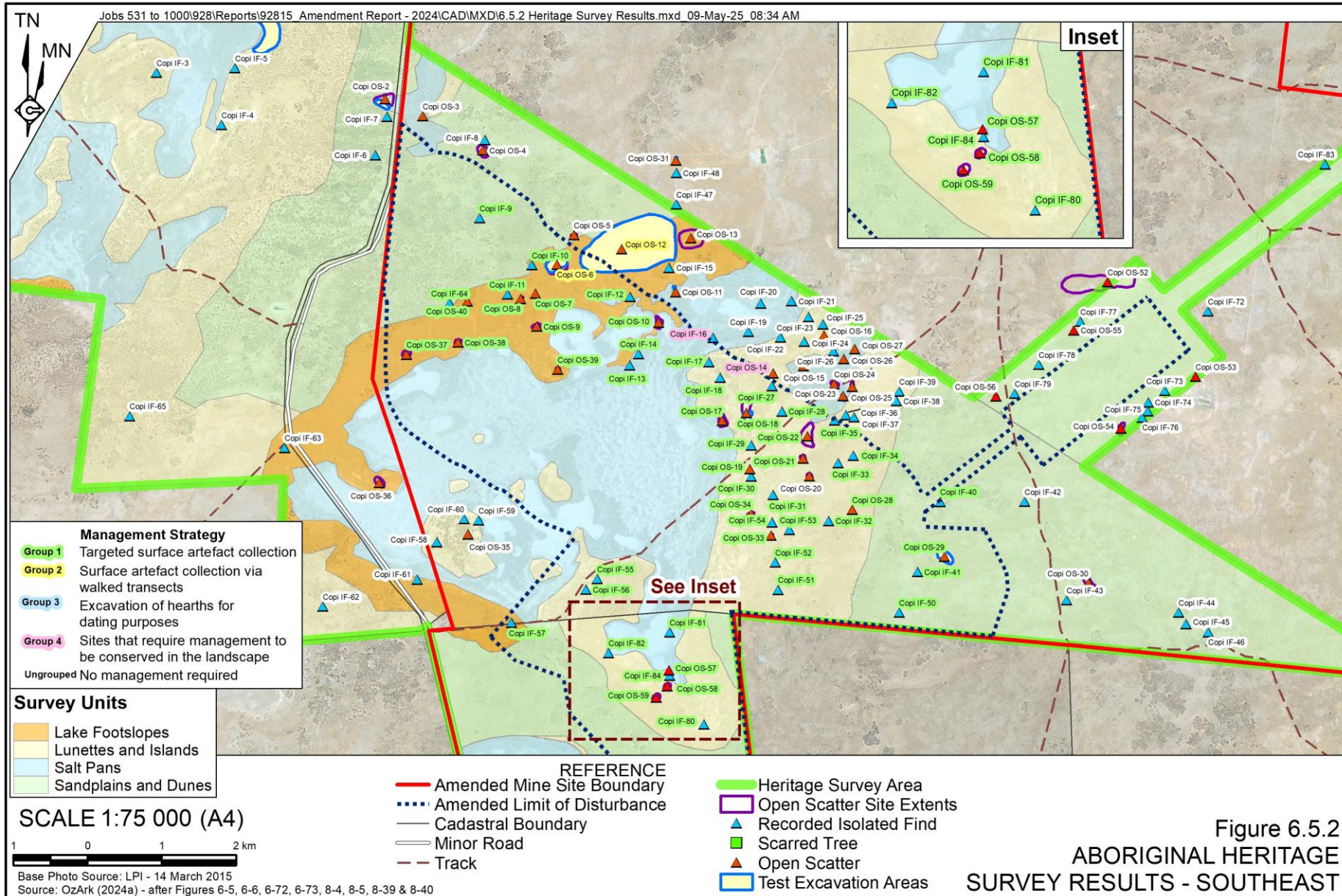


Table 6.5.1
Significance Assessment, Degree of Harm and Management Strategy
for Identified Aboriginal Sites

Page 1 of 3

Site ID	Social or Cultural Value	Scientific Value	Aesthetic Value	Historic Value	Degree of Harm	Management Strategy ¹
Copi IF-1	High	Low	Low	None	None	Nil
Copi IF-2	High	Low	Low	None	None	Nil
Copi IF-3	High	Low	Low	None	None	Nil
Copi IF-4	High	Low	Low	None	None	Nil
Copi IF-5	High	Low	Low	None	None	Nil
Copi IF-6	High	Low	Low	None	None	Nil
Copi IF-7	High	Low	Low	None	None	Nil
Copi IF-8	High	Low	Low	None	None	Nil
Copi IF-9	High	Low	Low	None	Total	Group 1
Copi IF-10	High	Low	Low	None	Total	Group 1
Copi IF-11	High	Low	Low	None	Total	Group 1
Copi IF-12	High	Low	Low	None	Total	Group 1
Copi IF-13	High	Low	Low	None	Total	Group 1
Copi IF-14	High	Low	Low	None	Total	Group 1
Copi IF-15	High	Low	Low	None	None	Nil
Copi IF-16	High	Low	Low	None	None	Group 4
Copi IF-17	High	Low	Low	None	Total	Group 1
Copi IF-18	High	Low	Low	None	Total	Group 1
Copi IF-19	High	Low	Low	None	None	Nil
Copi IF-20	High	Low	Low	None	None	Nil
Copi IF-21	High	Low	Low	None	None	Nil
Copi IF-22	High	Low	Low	None	None	Nil
Copi IF-23	High	Low	Low	None	None	Nil
Copi IF-24	High	Low	Low	None	None	Nil
Copi IF-25	High	Low	Low	None	None	Nil
Copi IF-26	High	Low	Low	None	None	Nil
Copi IF-27	High	Low	Low	None	Total	Group 1
Copi IF-28	High	Low	Low	None	Total	Group 1
Copi IF-29	High	Low	Low	None	Total	Group 1
Copi IF-30	High	Low	Low	None	Total	Group 1
Copi IF-31	High	Low	Low	None	Total	Group 1
Copi IF-32	High	Low	Low	None	Total	Group 1
Copi IF-33	High	Low	Low	None	Total	Group 1
Copi IF-34	High	Low	Low	None	Total	Group 1
Copi IF-35	High	Low	Low	None	Total	Group 1
Copi IF-36	High	Low	Low	None	None	Nil
Copi IF-37	High	Low	Low	None	None	Nil
Copi IF-38	High	Low	Low	None	None	Nil
Copi IF-39	High	Low	Low	None	None	Nil
Copi IF-40	High	Low	Low	None	Total	Group 1
Copi IF-41	High	Low	Low	None	Total	Group 1
Copi IF-42	High	Low	Low	None	None	Nil
Copi IF-43	High	Low	Low	None	None	Nil
Copi IF-44	High	Low	Low	None	None	Nil
Copi IF-45	High	Low	Low	None	None	Nil
Copi IF-46	High	Low	Low	None	None	Nil
Copi IF-47	High	Low	Low	None	None	Nil

Table 6.5.1 (Cont'd)
Significance Assessment, Degree of Harm and Management Strategy
for Identified Aboriginal Sites

Page 2 of 3

Site ID	Social or Cultural Value	Scientific Value	Aesthetic Value	Historic Value	Degree of Harm	Management Strategy ¹
Copi IF-48	High	Low	Low	None	None	Nil
Copi IF-49	High	Low	Low	None	None	Nil
Copi IF-50	High	Low	Low	None	Total	Group 1
Copi IF-51	High	Low	Low	None	Total	Group 1
Copi IF-52	High	Low	Low	None	Total	Group 1
Copi IF-53	High	Low	Low	None	Total	Group 1
Copi IF-54	High	Low	Low	None	Total	Group 1
Copi IF-55	High	Low	Low	None	Total	Group 1
Copi IF-56	High	Low	Low	None	Total	Group 1
Copi IF-57	High	Low	Low	None	Total	Group 1
Copi IF-58	High	Low	Low	None	None	Nil
Copi IF-59	High	Low	Low	None	None	Nil
Copi IF-60	High	Low	Low	None	None	Nil
Copi IF-61	High	Low	Low	None	None	Nil
Copi IF-62	High	Low	Low	None	None	Nil
Copi IF-63	High	Low	Low	None	None	Nil
Copi IF-64	High	Low	Low	None	Total	Group 1
Copi IF-65	High	Low	Low	None	None	Nil
Copi IF-66	High	Low	Low	None	None	Nil
Copi IF-67	High	Low	Low	None	None	Nil
Copi IF-68	High	Low	Low	None	None	Nil
Copi IF-69	High	Low	Low	None	None	Nil
Copi IF-70	High	Low	Low	None	None	Nil
Copi IF-71	High	Low	Low	None	None	Nil
Copi IF-72	High	Low	Low	None	None	Nil
Copi IF-73	High	Low	Low	None	None	Nil
Copi IF-74	High	Low	Low	None	None	Nil
Copi IF-75	High	Low	Low	None	None	Nil
Copi IF-76	High	Low	Low	None	None	Nil
Copi IF-77	High	Low	Low	None	None	Nil
Copi IF-78	High	Low	Low	None	None	Nil
Copi IF-79	High	Low	Low	None	None	Nil
Copi IF-80	High	Low	Low	None	Total	Group 1
Copi IF-81	High	Low	Low	None	Total	Group 1
Copi IF-82	High	Low	Low	None	Total	Group 1
Copi IF-83	High	Low	Low	None	None	Nil
Copi IF-84	High	Low	Low	None	Total	Group 1
Copi OS-1	High	Moderate	Low	None	None	Nil
Copi OS-2	High	Low	Low	None	None	Nil
Copi OS-3	High	Low	Low	None	None	Nil
Copi OS-4	High	Low	Low	None	None	Nil
Copi OS-5	High	Low	Low	None	None	Nil
Copi OS-6	High	Moderate	Low	None	Total	Group 2 & 3
Copi OS-7	High	Low	Low	None	Total	Group 1
Copi OS-8	High	Low	Low	None	Total	Group 1
Copi OS-9	High	Low	Low	None	Total	Group 1
Copi OS-10	High	Low	Low	None	Total	Group 1
Copi OS-11	High	Low	Low	None	None	Nil

Table 6.5.1 (Cont'd)
Significance Assessment, Degree of Harm and Management Strategy
for Identified Aboriginal Sites

Site ID	Social or Cultural Value	Scientific Value	Aesthetic Value	Historic Value	Degree of Harm	Management Strategy ¹
Copi OS-12	High	Moderate	Low	None	Partial	Group 2, 3, & 4
Copi OS-13	High	Low	Low	None	None	Nil
Copi OS-14	High	Low	Low	None	None	Group 4
Copi OS-15	High	Low	Low	None	None	Nil
Copi OS-16	High	Low	Low	None	None	Nil
Copi OS-17	High	Low	Low	None	Total	Group 1
Copi OS-18	High	Low	Low	None	Total	Group 1
Copi OS-19	High	Low	Low	None	Total	Group 1
Copi OS-20	High	Moderate	Low	None	Total	Groups 1 & 3
Copi OS-21	High	Low	Low	None	Total	Group 1
Copi OS-22	High	Low	Low	None	Total	Group 1
Copi OS-23	High	Low	Low	None	None	Nil
Copi OS-24	High	Low	Low	None	None	Nil
Copi OS-25	High	Low	Low	None	None	Nil
Copi OS-26	High	Low	Low	None	None	Nil
Copi OS-27	High	Low	Low	None	None	Nil
Copi OS-28	High	Low	Low	None	Total	Group 1
Copi OS-29	High	Low	Low	None	Total	Group 1
Copi OS-30	High	Low	Low	None	None	Nil
Copi OS-31	High	Low	Low	None	None	Nil
Copi OS-32	High	Low	Low	None	None	Nil
Copi OS-33	High	Low	Low	None	Total	Group 1
Copi OS-34	High	Low	Low	None	Total	Group 1
Copi OS-35	High	Low	Low	None	None	Nil
Copi OS-36	High	Low	Low	None	None	Nil
Copi OS-37	High	Low	Low	None	Total	Group 1
Copi OS-38	High	Low	Low	None	Total	Group 1
Copi OS-39	High	Low	Low	None	Total	Group 1
Copi OS-40	High	Low	Low	None	Total	Group 1
Copi OS-41	High	Low	Low	None	None	Nil
Copi OS-42	High	Low	Low	None	None	Nil
Copi OS-43	High	Low	Low	None	None	Nil
Copi OS-44	High	Low	Low	None	None	Nil
Copi OS-45	High	Low	Low	None	None	Nil
Copi OS-46	High	Low	Low	None	None	Nil
Copi OS-47	High	Low	Low	None	None	Nil
Copi OS-48	High	Low	Low	None	None	Nil
Copi OS-49	High	Moderate	Low	None	None	Nil
Copi OS-50	High	Low	Low	None	None	Nil
Copi OS-51	High	Moderate	Low	None	None	Nil
Copi OS-52	High	Moderate	Low	None	None	Nil
Copi OS-53	High	Low	Low	None	None	Nil
Copi OS-54	High	Low	Low	None	None	Nil
Copi OS-55	High	Low	Low	None	None	Nil
Copi OS-56	High	Low	Low	None	None	Nil
Copi OS-57	High	Low	Low	None	Total	Group 1
Copi OS-58	High	Low	Low	None	Total	Group 1
Copi OS-59	High	Low	Low	None	Total	Group 1

Note 1: Management groups as detailed above

Source: OzArk (2025) – modified after Table 13-2,14-1 and 15-1

6.5.3 Aboriginal Stakeholder Consultation since Exhibition

On 26 November 2024, Angela Kirby of Barkindji Maraura Elders Environment Team Limited (BMEET), one of the Registered Aboriginal Parties for the Project, advised OzArk that BMEET were objecting to the Project on the following grounds.

- “Cultural
- Waterways
- Environment
- Lack of communication
- Lack of consultation and understanding of the project”

OzArk sought further information from BMEET and no further correspondence has been received.

A copy of the draft of OzArk (2025) was sent to all RAPs on the 1 May 2025 with a 28-day review period closing 30 May 2025. No comments were received in relation to the draft document from any of the RAPs.

6.5.4 Conclusion

In conclusion, the Amended Project will reduce the overall impact of disturbance that was described in the EIS. The Amended project will reduce the number of sites that will be disturbed from 65 to 55 and increase the number of sites that will be avoided from 78, to 88. The Amended Project results in changes to 13 Aboriginal Sites in total, with 10 of those sites no longer being harmed, and three sites that were previously unharmed no longer requiring a Group 4 management strategy due to being more than 50m from the Amended Limit of Disturbance.

6.6 Traffic and Transportation

6.6.1 Introduction

Tonkin Consulting Pty Ltd (Tonkin) prepared a *Traffic Impact Assessment* (TIA) for the Project as exhibited. That report, referred to hereafter as Tonkin (2024), was presented as Appendix 9 of the EIS and a summary is presented in Section 6.6 of the EIS.

Transport for NSW provided feedback on the Project on 5 August 2024. That feedback may be summarised as follows.

- The intersection between Anabranth Mail Road and the Silver City Highway should be upgraded from the proposed Basic Auxiliary Right / Basic Auxiliary Left (BAR/BAL) intersection to a Channelised Right / Auxiliary Left (CHR/AUL) intersection.
- Additional analysis of the proposed intersection safe intersection sight distance should be provided.

An updated Traffic Impact Assessment for the amended Project was prepared by Tonkin and is presented as **Appendix 9** and is referred to hereafter as Tonkin (2025). The following subsections provide a summary of those aspects of the assessment that have changed as a result of the proposed Amendment.

6.6.2 Assessment Methodology

Section 6.6.2 of the EIS describes the guidelines used to assess traffic-related impacts associated with the Project as exhibited. Tonkin (2025) utilised the same guidelines to assess the amended Project.

6.6.3 Existing Environment

6.6.3.1 Roads

The descriptions of the public roads presented in the EIS and Tonkin (2025) along the transportation routes to and from Broken Hill and Wentworth remain unchanged. The additional roads assessed by Tonkin (2025) for the Transportation Route – Monazite are described as follows (**Figure 9**).

Kanandah and Ryan Roads

- Sealed, two-lane, two-way local road under the care and control of Broken Hill City Council.
- Sign-posted speed limit of 80km/h at southwestern end, transitioning to 50km/hr towards the northeastern end, immediately southwest of Pinnacles Road.
- Sealed width is variable from 9.8m with edge-to-edge line width of 7.2m (3.6m lanes) to 14.5m with edge-to-edge line width of 7.0m (3.5m lanes).

- Reasonable road condition with some flushing and cracking observed. The underlying pavement is expected to be in adequate condition.
- The section forming part of the proposed transportation route has approval for Type (1) A-Double, Modular B-triple and AB-triple vehicle usage.

Creedon Street

- Sealed, two-lane, two-way local road under the care and control of Broken Hill City Council.
- Sign-posted speed limit of 50km/h.
- Sealed width was measured at 14.1m with an edge-to-edge line width of 7.0m (3.5m lanes).
- Reasonable road condition with some flushing observed in the spray seal pavement. The small sections of concrete pavement were also in good condition with minimal defects observed. The underlying pavement is in adequate condition.
- The section forming part of the proposed transportation route has approval for Type (1) A-Double, Modular B-triple and AB-triple vehicle usage.

Barrier Highway

- Sealed, two-lane, two-way road under the care and control of TfNSW.
- Sign-posted speed limit of 50km/h to the northeast of the Creedon Street intersection and transitions to 80km/hr immediately southwest of the intersection. The Barrier Highway transitions from 80km/hr to 110km/hr approximately 200m southwest of the Depot Road intersection.
- Sealed width was measured at 13.9m with an edge-to-edge line width of 7.6m (3.8m lanes) close to the Creedon Street intersection. The sealed width of the Barrier Highway between Broken Hill and the South Australia (SA) border varied along the alignment, however, was measured at 7.5m sealed width, with an edge line to edge line width of 7.0m (3.5m lanes). The cross section appeared relatively consistent along the alignment.
- The road condition was observed to be generally good between Creedon Street and the SA border with several sections recently resealed. Some flushing observed along most of the road. The underlying pavement is expected to be in adequate condition. Audio Tactile Line Marking was observed on both centreline and edge lines along most of the alignment but was absent on the newly resealed sections.
- The section forming part of the proposed transportation route has approval for Type (1) A-Double, Modular B-triple, B-triple and AB-triple vehicle usage.

6.6.3.2 Intersections

Anabranth Mail Road / Site Access Road Junction

Anabranth Mail Road would be realigned and an intersection with the Site Access Road would be constructed. With an anticipated operating speed of 90km/h and a 2.5 second driver reaction time and allowing for a lower coefficient of deceleration of 0.24, the required Safe Intersection Sight Distance (SISD) for the Silver City Highway / Anabranth Mail Road intersection is 270m based on the guidance presented in Austroads Guide to Road Design Part 4A the Safe Sight Distance (Austroads) and the TfNSW Supplement. Measurements completed by Tonkin (2025) indicate that the required SISD is achieved as the available sight distance is sufficient in both directions.

Silver City Highway / Kanandah Road Junction

The Silver City Highway / Kanandah Road junction is located on a designated heavy vehicle route through western Broken Hill, with the Silver City Highway having priority. The intersection currently consists of multiple pavement types including asphalt, spray seal and concrete. The asphalt approach on Kanandah road was observed to have significant crocodile cracking present. A give way sign and hold line were present on Kanandah Road.

Sight distances were taken from Kanandah Road approximately 2m behind the hold line, with a distance of 350m to the north and 150m to the south. These sight distances were in accordance with the Austroads Guide to the north, however partial obstruction by trees along the side of the Silver City Highway meant sight distances observed to the south were approximately 100m less than the recommendations in the Austroads. It is likely that observed sight distance would improve for trucks where the measurement can be taken from higher above the ground level.

Ryan Street / Creedon Street Junction

The Ryan Street / Creedon Street junction is located on a designated heavy vehicle route through western Broken Hill, with Creedon Street having priority. The intersection consists mostly of concrete pavement, with new asphalt pavement on the Kanandah Road approach. The pavement appears to be in good condition. Two give way signs and a hold line were present on Kanandah Road. A see-through effect¹ is observed at the intersection from Kanandah Road, however the presence of the intersection is reinforced through signage and line marking.

Sight distances observed from Ryan Street were in accordance with the Austroads Guide in both directions.

Barrier Highway / Creedon Street Junction

The Barrier Highway / Creedon Street junction is located on a designated heavy vehicle route through western Broken Hill, with the Barrier Highway having priority. The intersection consists of a concrete approach on Creedon Street and spray seal pavement on the Barrier Highway. The pavement appears to be in good condition. No give way sign was observed at the intersection, however a hold line was present on Creedon Street. The Barrier Highway transitions from 50km/hr to 80km/hr immediately west of the intersection.

¹ The see-through effect applies to a 4-way intersection where there is no clear indication which road is the priority road, and which road is required to stop or give way. Tonkin advise that this is very common at 4-way crossroads.

Sight distances observed from Creedon Street were in accordance with the Austroads Guide in both directions. Tonkin (2025) noted that if positioned slightly forward from where sight distances were taken from, the speed sign observed on Barrier Highway severely restricts sight distance to the west.

6.6.3.3 Traffic Volumes

Table 6.6.1 presents measured traffic count results for the existing road network which encompasses the Silver City Highway and Project-related roads, as well as estimated 2025 traffic volumes determined assuming an average annual growth rate to 1%.

For the update TIA Tonkin (2025) additionally assessed Kanandah Road, Creedon Street and the Barrier Highway traffic. Traffic data for Kanandah Road and Creedon Street were obtained from BHCC traffic counts, while traffic count data for the Barrier Highway was sourced from the Location SA Map View. This data was used to determine a baseline year 2025 daily traffic volume, with a +1% annual traffic growth. **Table 6.6.1** also presents the historic data and 2025 projected traffic volumes for these roads.

Whilst no traffic survey data is available for Wentworth Road, Tonkin (2025) estimates traffic volumes based on nearby traffic counts on Patton Street and the Silver City Highway south of Broken Hill. Traffic volumes on Anabranh Mail Road and Nulla Road are estimated to be substantially less than 50 movements per day.

6.6.3.4 Road Safety History

The review of published crash data from the five-year period between 2018 to 2022 by the Centre for Road Safety as presented in the EIS remains unchanged. A further review was undertaken of published crash data for the five-year period between 2019 to 2023 for Kanandah Road, Creedon Street and the Barrier Highway and identified the following traffic incidents (Tonkin, 2025).

- Kanandah Road/Ryan Street – One run off road crash resulting in serious injury.
- Creedon Street – Four crashes including:
 - an animal strike resulting in a moderate injury;
 - a cross-traffic collision resulting in a non-casualty (towaway);
 - a pedestrian collision resulting in a fatality; and
 - a right-angle collision resulting a non-casualty (towaway).
- Barrier Highway – Five run off road crashes that resulted in two non-casualty (towaway) crashes and three serious injury crashes.

6.6.3.5 Existing Constraints

Tonkin (2024) identified some key constraints associated with the existing public road network and the proposed use of these road sections by Project-related traffic which were presented in Section 6.6.3.5 of the EIS and these remain unchanged.

Table 6.6.1
Historic and Projected Traffic Volumes

	Daily Traffic Volume									Average Proportion of Heavy Vehicles (%)
	2006 Survey	2010 Survey	2016 Survey	2020 Survey	2021 Survey	2022 Survey	2023 Survey	2024 Survey	2025 Projected ¹	
Silver City Highway (9.9km south of Wentworth Road, Broken Hill) ¹	295								356	16.0
Silver City Highway (14.4km south of Kanandah Road, Broken Hill) ¹						428			441	25.5
Silver City Highway (12.5km north of Anabranth Mail Road) ¹					110				114	45.3
Silver City Highway (17.4km south of Anabranth Mail Road, Anabranth South) ¹	319	358							416	
Silver City Highway (80m north of Renmark Road) ¹						1,071			1,104	19.0
Patton Street			2,117			2,441			2,514	16.4
Comstock Street			562						615	14.1
Eyre Street			2,274			2,150			2,216	13.3
Holten Drive						2,633			2,713	10.7
Kanandah Road				1,764					1,854	N/A
Creedon Street							2,028		2,069	13.5
Barrier Highway	3,348								4,045	40
Barrier Highway (SA border)								600		
N/A = data not available.										
Note 1: Projection for 2025 based on the application of a 1% annual traffic growth rate applied to the most recent traffic survey data.										
Source: Tonkin (2025) – modified after Table 4.1 to Table 4.8										

6.6.4 Assessment of Impacts

6.6.4.1 SIDRA Modelling

The results of the SIDRA modelling for the busiest intersection on the transportation route, namely the intersection of Patton and Bonanza Street as presented in Section 6.6.4.1 of the EIS remain unchanged.

6.6.4.2 Cumulative Traffic Considerations

The Cumulative Traffic Considerations as presented in Section 6.6.4.2 of the EIS remain unchanged.

6.6.4.3 Pavement Conditions

Updated estimates of existing and predicted pavement traffic loadings were calculated by Tonkin (2025) using the methodology outlined in the *Guide to Pavement Technology Part 2: Pavement Structural Design* (Austroads, 2018). **Table 6.6.4** presents the existing and predicted pavement loadings in Equivalent Standard Axles (ESAs) for the Silver City Highway.

Table 6.6.2
Estimated Existing and Project-related Pavement Loadings

Transport Route Section	Estimated Pavement Loading (ESAs ¹ per lane)						Estimated Reduction in Pavement Life
	Existing			Project-related			
	Daily	Yearly	20 Year Loading ²	Daily	Yearly	Total (Project Life)	
Silver City Highway - North	175	63,875	1,406,464	58 ³	21,970	359,890	25.6% (5.1 years)
				63 ⁴	22,995	390,915	29.5% (5.9 years)
Silver City Highway - South	165	60,225	1,326,095	14 to 20	5,037 to 7,373	104,062	7.8% (1.5 years)
Note 1: ESAs = Equivalent Standard Axles.							
Note 2: Based on assumed 1% annual traffic volume growth per year.							
Note 3: Based on using BAB-Quad road trains							
Note 4: Based on using AB-Triple road trains							
Source: Tonkin (2025) – modified after Tables 7.8 and 7.9							

The assessment above indicates there will be a reduction in existing pavement life of up to 29.5% and 7.8% on the Silver City Highway to the north and south of Anabranh Mail Road respectively, assuming the existing pavement on Silver City Highway has a remaining life of 20 years. The reduction in pavement life may bring forward some pavement related rehabilitation of the Silver City Highway, however as the Highway is a State road, contributions to pavement rehabilitation/maintenance are not required by the Applicant.

Anabranh Mail Road will take the full pavement loading of the vehicles between the Mine Site and Silver City Highway (estimated at between 463,952 and 494,977 ESAs) over the life of the Project. As unsealed roads, the Applicant will contribute to 100% of the cost of design, construction and maintenance of Anabranh Mail Road as part of the Project. It is expected that re-sheeting of the road would occur on an as needs basis and would be subject to the performance of locally available gravel material.

6.6.4.4 Nulla Road

The amended Project will no longer impact Nulla Road.

6.6.5 Amended Mitigation Measures

The proposed management and mitigation measures as presented in Section 6.6.5 of the EIS and **Appendix 3** of this document would remain unchanged

6.6.6 Conclusion

Based on the results of the updated traffic impact assessment undertaken by Tonkin (2025) and the proposed management, it is assessed that the amended Project would not result in significant adverse traffic-related or road safety impacts. It is noted that transportation of heavy mineral products to Broken Hill by any means other than road transportation would not be feasible due to the location of the Project. From Broken Hill, those products would be transported by rail under separate approval.

Traffic generated by the Project would not significantly affect the operating capacity of the existing public road network. Accounting for cumulative traffic increases associated with both the Project and the Snapper and Ginkgo Mineral Sand Mining operations which also utilise the Silver City Highway transport route, it is not anticipated that Project-related traffic (including heavy mineral product transportation activities) would result in adverse traffic-related impacts.

Project-related heavy vehicles would require upgrades to a range of intersections along the Northern Transportation Route. The Applicant would complete these upgrades during the construction phase of the Project in consultation with Transport for NSW and Wentworth and Broken Hill City Councils.

It is also noted that the amended Project would have a reduced impact to the residents of Huntingfield as Nulla Road will no longer need to be realigned.

Project-related traffic would result in estimated reductions in pavement life of up to 29.5% and 7.8% respectively on the northern and southern sections of the Silver City Highway which form part of the proposed transport routes

6.7 Surface Water

6.7.1 Introduction

The *Surface Water Assessment* for the Project as exhibited was prepared by R. W. Corkery & Co. Pty Limited (RWC) and is presented as Appendix 10 of the EIS (RWC, 2024). Section 6.7 of the EIS presents a summary of that assessment.

The EIS and RWC (2024) were reviewed and the following agencies provided surface water-related submissions.

- Department of Climate Change, Energy, the Environment and Water – Water Group (DCCEEW-Water)
- Biodiversity Conservation Services (BCS)
- Environment Protection Authority (EPA)

Of these, DCCEEW-Water and the EPA made reference to preparation of a Water Management Plan post-approval. BCS recommended flood modelling and consultation with Council and the SES in relation to emergency management post approval.

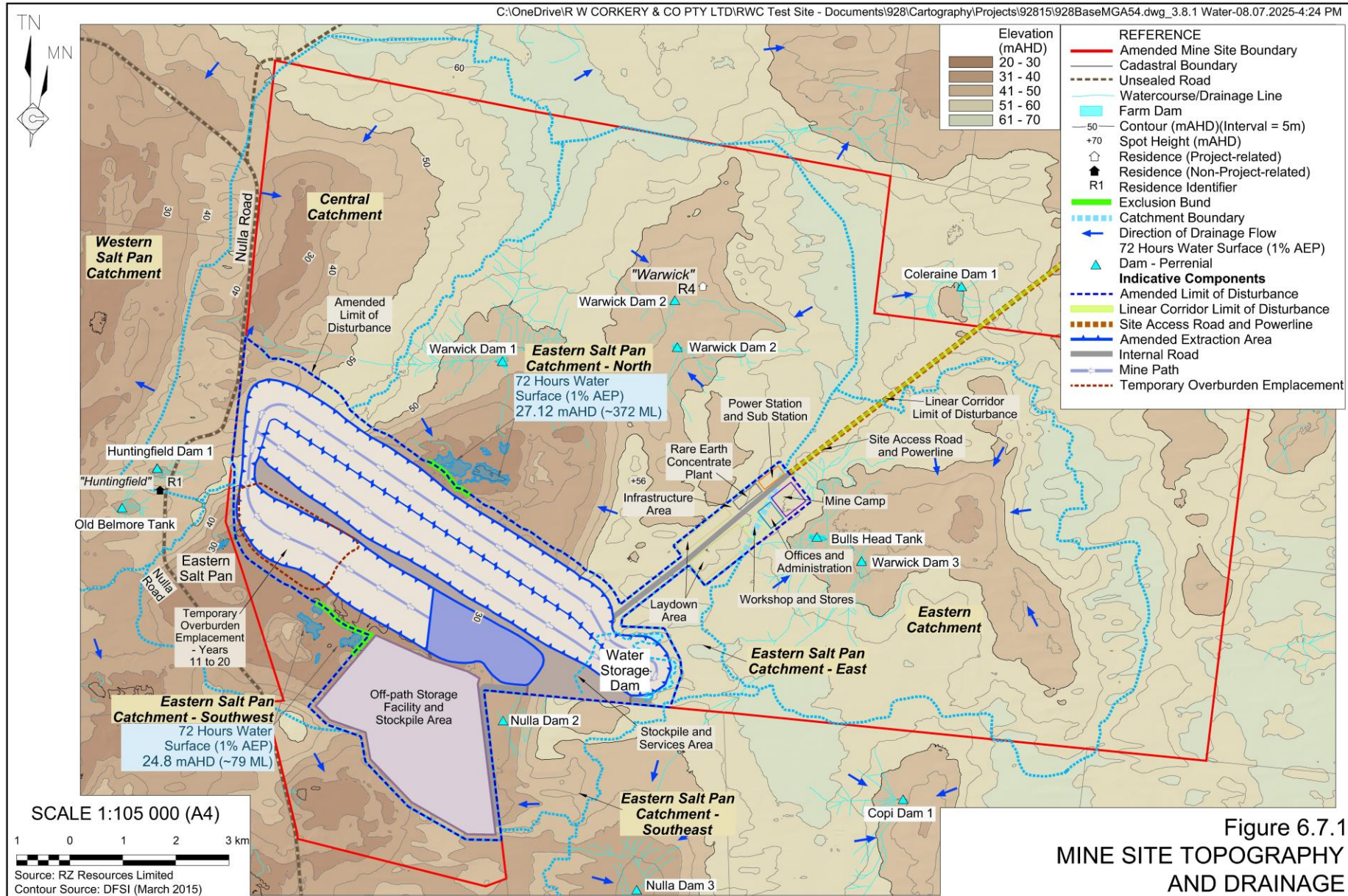
An updated *Surface Water Assessment* was prepared by RWC to address the proposed reduction in the area to be disturbed. That assessment is hereafter referred to as RWC (2025) and presented as **Appendix 10**. This subsection provides a summary of the updated *Surface Water Assessment*.

6.7.2 Amended Existing Environment

Section 6.7.2 of the EIS describes the existing environment for the Project as Exhibited. The reduction of the Limit of Disturbance would result in the following changes to the assessed surface water impacts (**Figure 6.7.1**).

- The Northwestern and Western Salt Pan Catchments would no longer be disturbed.
- The area of the Central Catchment that would be disturbed would reduce to 3.5km² (from 5km²).
- The area of the Eastern Salt Pan and Eastern Catchments that would be disturbed would remain unchanged.

RWC (2025) included updated assessments of climate and water quality which utilised data including and up to the end of 2024. The assessment methodology and source of data for these assessments remains as described in Section 6.7.2 of the EIS.



6.7.3 Amended Mitigation Measures

Section 6.7.3 of the EIS describes the Mitigation Measures for the Project as exhibited. No changes are proposed for the Amended Project.

6.7.4 Amended Assessment of Impacts

6.7.4.1 Introduction

Section 6.7.4 of the EIS describes the Assessment of Impacts for the Project as exhibited. The impacts of the Project on surface water remain unchanged or reduced. The following subsections describe any changes for the Amended Project.

6.7.4.2 Water Availability and Licensing

Section 6.7.4.1 of the EIS describes the water availability and licensing for the Project as exhibited. The Project as exhibited would have resulted in re removal and replacement of the Huntingfield Dam 2. As the Amended Project would not disturb land within the Huntingfield Station, that Dam would no longer be impacted.

In addition, the Dam Nulla 1 is located immediately to the east of the Off Path Storage Facility (**Figure 6.7.1**). The catchment for that dam is located to the east of the dam and would not be impacted by the Project.

6.7.4.3 Flow and Watercourse Function

Section 6.7.4.2 of the EIS describes the flow and watercourse function of the catchments within the Mine Site. The proportion of each of the catchments that would be disturbed under the Amended Project is as follows.

- 32% of the Eastern Salt Pan Catchment (unchanged).
- 9.6% of the Central Catchment (down from 14%).
- 1% of the Eastern Catchment (unchanged).
- <1% of the Southwestern Catchment (unchanged).
- 0% of the Western Salt Pan Catchment (down from 19%).

6.7.4.4 Water Quality Impacts

Section 6.7.4.3 of the EIS described water quality impacts associated with the Project as exhibited. The Amended Project would not result in additional water quality impacts.

6.7.4.5 Flooding Impacts

As described in Section 6.7.2 of the EIS, the Amended Mine Site is not situated within a flood planning area or a zone where inundation from floodwater could be expected to occur. Consequently, neither the development itself nor neighbouring properties would be adversely impacted by floodwater.

The Applicant would establish surface water exclusion bunds to exclude clean water from disturbed sections of the Mine Site and to prevent discharge of sediment-laden water from those areas (**Figure 3.7.1**). RWC (2024 and 2025) estimated the volumes and depths of water that would accumulate against those bunds under a 1% Annual Exceedance Probability, 72-hour rainfall event. In summary, the maximum depth of accumulated water would be approximately 1m (**Figure 3.7.1**). Accumulated water would be permitted to evaporate or infiltrate, or may be used for mining-related purposes.

6.7.5 Conclusion

The Amended Project would result in surface water impacts that would be less than those assessed for the Project as exhibited and would not result in off-site impacts to surface water users or the environment.

6.8 Noise

6.8.1 Introduction

The *Noise Impact Assessment* for the Project as exhibited was prepared by Muller Acoustic Consulting Pty Ltd (MAC, 2024) and is presented as Appendix 11 of the EIS. Section 6.8 of the EIS presents a summary of that assessment.

The EIS and MAC (2024) were reviewed by the NSW EPA who provided feedback on 24 June 2024 stating that the Agency agreed that the Project would not exceed the Project Noise Trigger Levels at any of the assessed receiver locations and that traffic noise and construction noise can be managed consistent with NSW noise policies. The NSW EPA also provided the recommendation that the Applicant should prepare and implement a *Noise Management Plan* prior to the commencement of any construction works.

An updated *Noise Impact Assessment* for the Amended Project was prepared by MAC and is presented as **Appendix 11a** and referred to hereafter as MAC (2025a). The following subsections provide a summary of those aspects of the assessment that have changed as a result of the proposed Amendment.

6.8.2 Assessment Criteria

The assessment criteria presented in Section 6.8.3 of the EIS remain unchanged.

6.8.3 Assessment Methodology

6.8.3.1 Guidelines and Software

The guidelines and software presented in Section 6.8.4.1 of the EIS to assess noise-related impacts associated remain unchanged.

6.8.3.2 Meteorological Analysis

MAC (2024 and 2025a) determined that prevailing winds are not applicable for the noise impact assessment. In light of analysis, **Table 6.8.1** presents the site-specific meteorological parameters adopted by MAC (2025a).

Table 6.8.1
Site-specific Meteorological Parameters

Assessment Condition	Temperature (°C)	Wind Speed / Direction	Relative Humidity (%)	Stability Class
Daytime ¹ – Calm	20	N/A	60	N/A
Evening ² – Calm	10	N/A	60	N/A
Night ³ – Inversion	10	N/A	90	G
N/A = not applicable.				
Note 1: Day = period between 7:00am and 6:00pm, Monday to Saturday, and 8:00am to 6:00pm on Sundays and Public Holidays				
Note 2: Evening = period between 6:00pm and 10:00pm, all days				
Note 3: Night = the remaining periods				
Source: MAC (2025a) – Table 19				

6.8.3.3 Construction Noise Modelling

Section 6.8.4.3 of the EIS describes the construction modelling scenario for the Project as exhibited. That scenario included construction of the Site Access Road and bulk earthworks and establishment of the Off Path Storage Facility. MAC (2025a) utilised the same methodology to assess the amended Project.

6.8.3.4 Road Construction and Intersection Upgrade Works

Section 6.8.4.4 of the EIS describes the road construction and intersection works and the associated equipment power levels used to assess noise-related impacts associated with the Project as exhibited. Those works would remain unchanged as a result of the proposed amendments.

6.8.3.5 Operational Noise Modelling

Proposed activities which would occur during the operational phase of the Project include vegetation, soil and overburden removal, conventional dredge mining, stockpiling, processing and transportation operations. Noise associated with the worst-case operational phases of the Project has been modelled by MAC (2025a) under the following two operational scenarios (**Figures 6.8.1 and 6.8.2**).

- Noise Scenario 1 – Year 5 – includes mining activities at the northwestern section of the Extraction Area, closest to Residence R1.
- Noise Scenario 2 – Year 16 – includes mining activities at the northwestern section of the Extraction Area, closest to Residence R1.

These scenarios represent the worst-case operating conditions, with the maximum number of plant and equipment operating simultaneously (24 hours per day), at the locations with the highest potential impact on neighbouring receivers. While it is noted that approximately 32Mt of overburden would be relocated from the Temporary Overburden Emplacement to the final dredge pond void, that material would be relocated using slucing, not conventional load, haul, dump and push methods (see Section 3.12.5 of **Appendix 1**). As a result, sound power levels associated with Years 19 and 20 would be substantially less than those associated with Years 5 and 16.

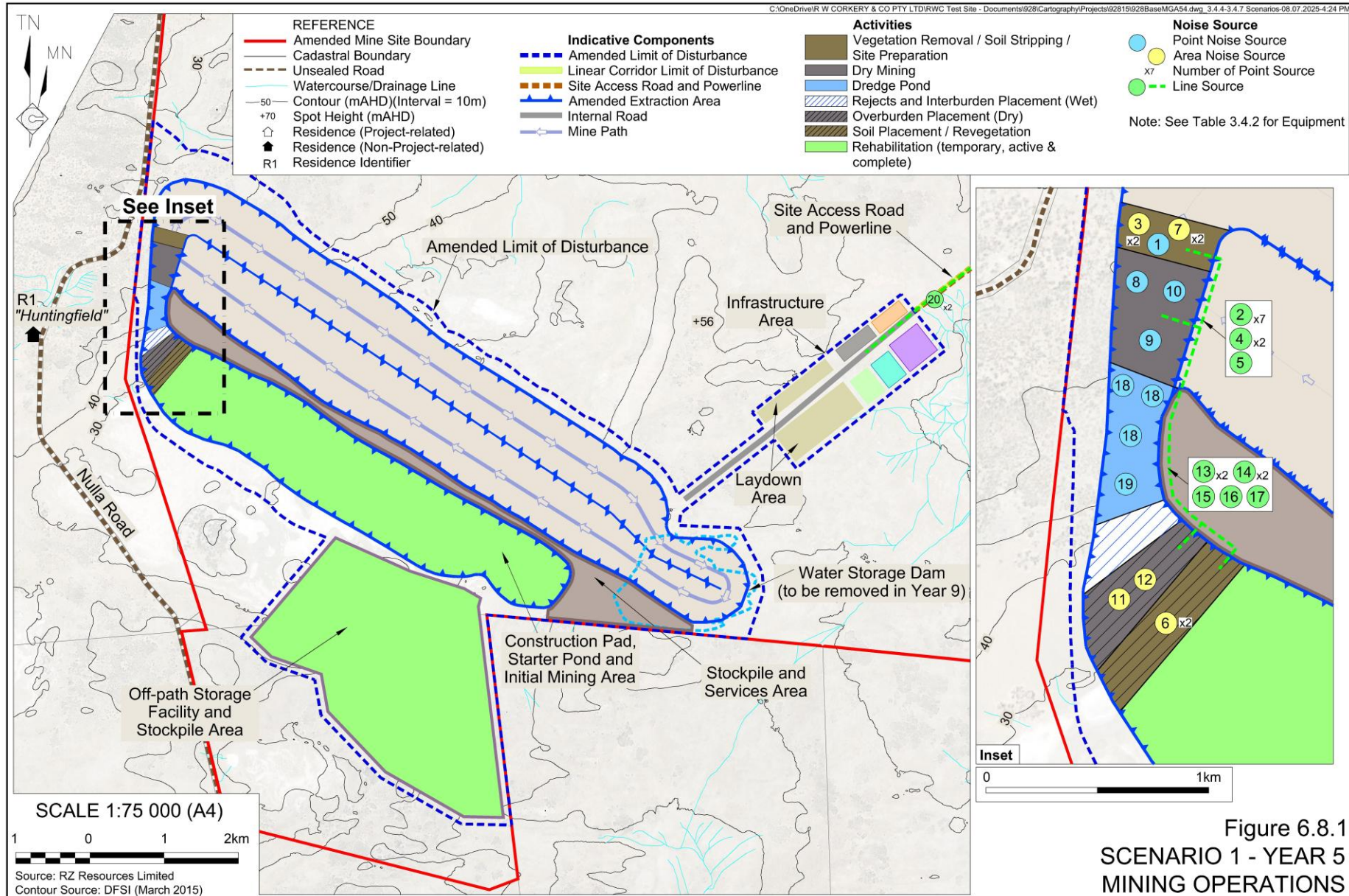


Figure 6.8.1
SCENARIO 1 - YEAR 5
MINING OPERATIONS

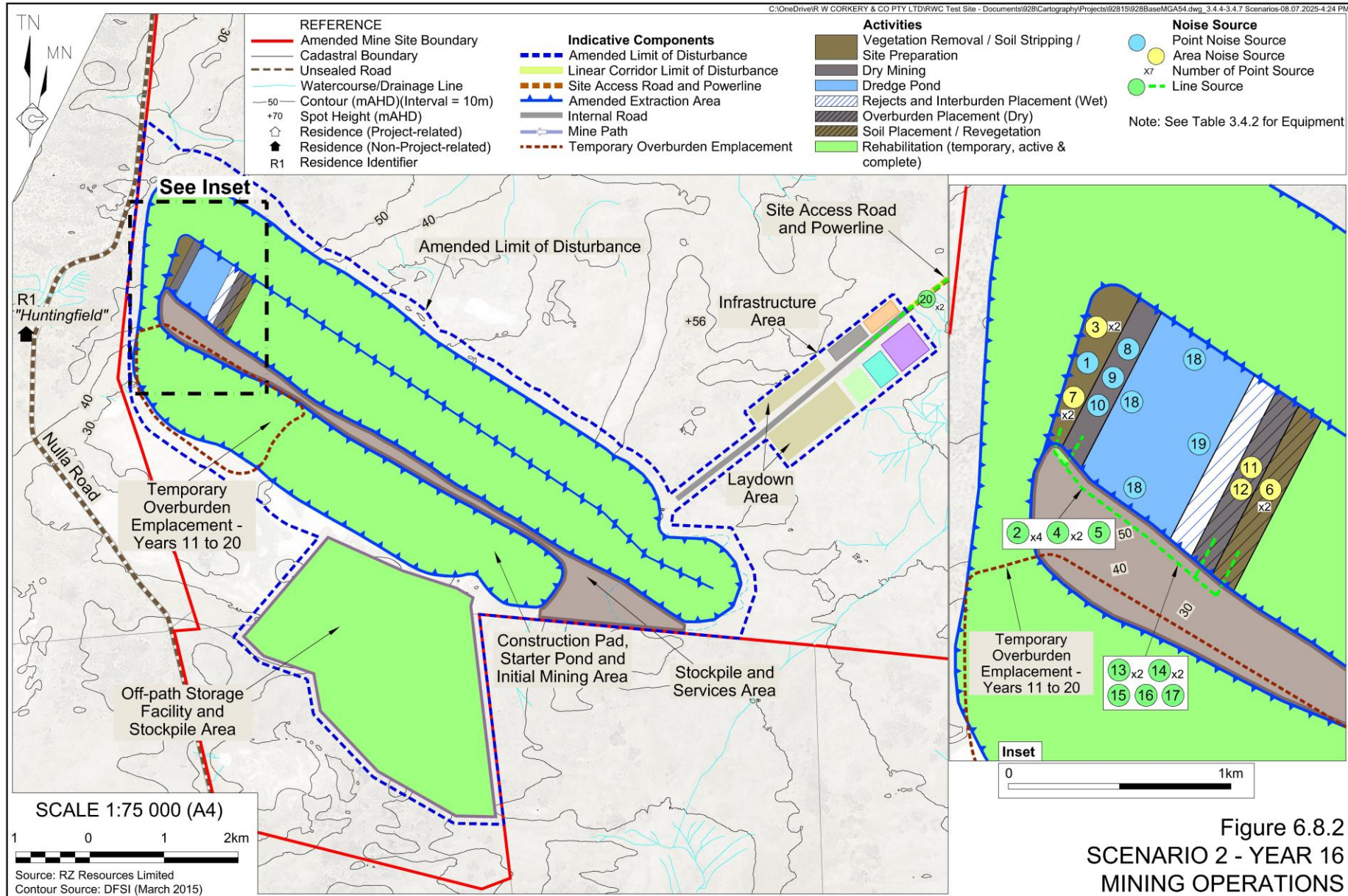


Figure 6.8.2
SCENARIO 2 - YEAR 16
MINING OPERATIONS

Table 6.8.2 presents the assumed sound power levels associated with equipment operating under the assessed scenarios.

Table 6.8.2
Operational Phase Equipment Sound Power Levels

ID	Noise Source / Item	Indicative Make / Model	Period of Operation	Number of Equipment		Total Sound Power Level (dB(A))
				Year 5	Year 16	
REC Plant	Excavator	Komatsu PC300	All	2	2	103
	Bulldozer	CAT D9		1	1	113
	Haul Truck	CAT 745		3	3	107
	Loader	CAT 966		1	1	109
1	Excavator	CAT 6020	Day	1	1	116
2	Haul Truck	CAT 785	All	7	4	116
3	Bulldozer	CAT D10T	Day	2	2	115
4	Grader	CAT 16K	All	2	2	109
5	Water Cart	CAT 777	All	1	1	115
6	Bulldozer	CAT D9	Day	2	2	113
7	Scraper	CAT 657	Day	2	2	113
8	Excavator	CAT 390	All	1	1	108
9	Excavator	CAT 349	All	1	1	108
10	Excavator	CAT 336	All	1	1	105
11	Wheeled Loader	CAT 992G	All	1	1	113
12	Wheeled Loader	CAT 980K	All	1	1	109
13	Articulated Truck	Volvo A60H	All	2	2	113
14	Articulated Truck	Bell Moxy B50D	All	2	2	110
15	Grader	CAT14M	All	1	1	107
16	Water Cart	CAT 773	All	1	1	114
17	Water Cart	Moxy	All	1	1	104
18	Dredge		All	3	3	110
19	Wet Concentrator Plant		All	1	1	95
20	Road Truck	Road Train	All	2	2	108

Source: MAC (2025a) – modified after Table 20 and Table 21

An assessment of annoying noise characteristics such as low frequency, tonality, intermittent noise, or noise short of duration has been undertaken for the Project and is provided in Appendix C of MAC (2025a). Intermittent noise is not considered to be a feature of the site and therefore, has not been assessed. Analysis of low frequency noise and tonality was undertaken. Results demonstrate that the operations are not anticipated to result in noise that exceed relevant thresholds. Hence, no correction for low-frequency noise or tonality is applied.

6.8.3.6 Sleep Disturbance

A maximum noise level assessment was undertaken to assess the potential for sleep disturbance effects from high impact noise sources. In assessing sleep disturbance, a typical L_{Amax} noise source of 118dB was used to represent transient events such as an excavator shaking the bucket.

6.8.3.7 Road Noise

Section 6.8.4.7 of the EIS describes the modelling criteria used to assess road noise impacts associated with the Project as exhibited. MAC (2025a) utilised the same methodology to assess the amended Project for the transport of mine products to Broken Hill.

In addition to the previously assessed haulage operations, MAC (2025a) also considered the transport of Monazite Product via the Transportation Route – Monazite (see Section 3.6.2.1 of Appendix 1).

6.8.4 Amended Avoidance, Management and Mitigation Measures

Section 6.8.6 of the EIS describes the avoidance, management and mitigation measures proposed for the Project as exhibited. In addition to those described in the EIS, the Applicant proposes to also implement the following measures to manage noise emissions.

- Implement a predictive forecasting system to provide daily information on meteorological conditions associated with noise enhancing conditions.
- Implement proactive measures in response to the predictive forecasting system, such as changes to operations, maximise shielding of equipment and avoidance of noisy equipment or processes; and
- Develop a Trigger Action Response Plan (TARP) with implementation of reactive management strategies in response to noise alarms triggered from real-time noise monitoring.

6.8.5 Amended Assessment of Impacts

6.8.5.1 Construction Noise Modelling

Table 6.8.3 presents the results of the combined construction noise modelling for the Project. In summary, predicted noise emissions for construction activities would satisfy the relevant construction noise management levels at all sensitive receiver locations (MAC, 2025a).

6.8.5.2 Road and Intersection Upgrade Works

As indicated in Section 6.8.3.4, the proposed amendments would not result in changes to the noise emissions associated with proposed road and intersection works, and consequently noise levels at surrounding residences would remain as described in Section 6.8.4.4 of the EIS.

6.8.5.3 Operational Noise Modelling

Table 6.8.4 presents the results of the operational noise modelling for Scenarios 1 and 2 described in Section 6.8.3.6. In summary, the results indicated that predicted noise emissions under both Scenarios would satisfy the relevant noise criteria, as well as the Voluntary Land Acquisition and Mitigation Policy (VLAMP) requirements, during all assessment periods at each of the sensitive receiver locations.

Table 6.8.3
Construction Noise Modelling Results – Site Establishment and Construction

Receiver ¹	Predicted Noise Level dB LA _{eq} (15min)	NML dB LA _{eq} (15min)		Compliant
		Day	OOH	
R1	<30	45	35	Yes
R2	<30	45	35	Yes
R3	<30	45	35	Yes
R4 ²	<30	45	35	n/a
R5	<30	45	35	Yes
R6	<30	45	35	Yes
R7	<30	45	35	Yes
R8	<30	45	35	Yes
R9	<30	45	35	Yes
R10	<30	45	35	Yes

Note 1: See **Figure 5.1** of the EIS.
Note 2: Project related receivers.
Source: MAC (2025a) – modified after Table 24

Table 6.8.4
Operational Noise Modelling Results – Operational Worst-Case Scenarios 1 and 2

Receiver	Predicted Noise Level, dB LA _{eq} (15min) ¹											Compliant
	Scenario 1 (Year 5)				Scenario 2 (Year 16)				PNTL, dB LA _{eq} (15min)			
	Day	Evening	Night	Night Inversion	Day	Evening	Night	Night Inversion	Day	Evening	Night	
R1	35	30	31	33	34	<30	<30	32	40	35	35	Yes
R2	<30	<30	<30	<30	<30	<30	<30	<30	40	35	35	Yes
R3	<30	<30	<30	<30	<30	<30	<30	<30	40	35	35	Yes
R4 ²	<30	<30	<30	<30	<30	<30	<30	<30	n/a	n/a	n/a	n/a
R5	<30	<30	<30	<30	<30	<30	<30	<30	n/a	n/a	n/a	n/a
R6	<30	<30	<30	<30	<30	<30	<30	<30	40	35	35	Yes
R7	<30	<30	<30	<30	<30	<30	<30	<30	40	35	35	Yes
R8	<30	<30	<30	<30	<30	<30	<30	<30	40	35	35	Yes
R9	<30	<30	<30	<30	<30	<30	<30	<30	40	35	35	Yes
R10	<30	<30	<30	<30	<30	<30	<30	<30	40	35	35	Yes
Mine Camp ²	44	44	44	46	43	43	43	45	58	53	48	n/a

Note 1: Day – the period from 7:00am to 6:00pm Monday to Saturday or 8:00am to 6:00pm on Sundays and public holidays; Evening – the period from 6:00pm to 10:00pm; Night – the remaining periods.
Note 2: Project-related receiver. Mine camp assessed against amenity criteria for short term accommodation.
Source: MAC (2025a) – modified after Table 26

6.8.5.4 Sleep Disturbance Assessment

Table 6.8.5 presents the predicted noise levels from LA_{max} events (i.e. 118dB) for sensitive receivers in the vicinity of the Mine Site. In summary, the maximum noise level trigger levels would be satisfied at all sensitive receivers (MAC, 2025a). As predicted noise levels are below the screening criteria, no further assessment or detailed analysis is required (MAC, 2025a).

Table 6.8.5
Maximum Noise Level Assessment Results

Receiver	Predicted Maximum Night-time ¹ Noise						Compliant
	Scenario 1 (Year 6)		Scenario 2 (Year 17)		Trigger Levels		
	dB LA _{eq(15min)}	dB LA _{max}	dB LA _{eq(15min)}	dB LA _{max}	dB LA _{eq(15min)}	dB LA _{max}	
R1	33	<30	32	<30	40	52	Yes
R2	<30	<30	<30	<30	40	52	Yes
R3	<30	<30	<30	<30	40	52	Yes
R4 ²	<30	<30	<30	<30	n/a	n/a	n/a
R5	<30	<30	<30	<30	n/a	n/a	n/a
R6	<30	<30	<30	<30	40	52	Yes
R7	<30	<30	<30	<30	40	52	Yes
R8	<30	<30	<30	<30	40	52	Yes
R9	<30	<30	<30	<30	40	52	Yes
R10	<30	<30	<30	<30	40	52	Yes
Mine Camp ²	<30	<30	<30	<30	n/a	n/a	n/a

Note 1: Day – the period from 7:00am to 6:00pm Monday to Saturday or 8:00am to 6:00pm on Sundays and public holidays; Evening – the period from 6:00pm to 10:00pm; Night – the remaining periods.

Note 2: Project-related receiver. Mine camp assessed against amenity criteria for short term accommodation.

Source: MAC (2025a) – Table 27

6.8.5.5 Road Traffic Noise Results

Table 6.8.6 presents the results for the road traffic noise assessment. In summary, predicted road traffic noise would not exceed the relevant criteria at any receiver locations (MAC, 2025a).

Table 6.8.6
Combined Noise Predictions for Road and Intersection Upgrades

Location	Receiver	Offset from Road	Assessment Criteria dB LA _{eq(15hr)}		Traffic Noise dB LA _{eq(15hr)}	Compliant
Transportation Route – North (to the Rail Facility)	14098 Silver City Highway	255m	Day	60 LA _{eq(15hr)}	43.3	Yes
			Night	55 LA _{eq(9hr)}	n/a ¹	Yes
	43 Comstock Street	15m	Day	60 LA _{eq(15hr)}	48.9	Yes
			Night	55 LA _{eq(9hr)}	n/a ¹	Yes
	St Annes (Eyre Street)	20m	Day	60 LA _{eq(15hr)}	47.0	Yes
			Night	55 LA _{eq(9hr)}	n/a ¹	Yes
Transportation Route – Monazite (to the South Australia)	44 Ryan Street	15m	Day	60 LA _{eq(15hr)}	40	Yes
			Night	55 LA _{eq(9hr)}	n/a ¹	Yes
Transportation Route – South (to Wentworth)	181 Adams Street	25m	Day	60 LA _{eq(15hr)}	39.9	Yes
			Night	55 LA _{eq(9hr)}	36.0	Yes

Note 1: No transport at night in Broken Hill LGA

Source: MAC (2025a) – modified after Table 28

6.8.5.6 Cumulative Noise Impacts

As discussed in Section 2.4, the Lake Victoria Wind Farm is a renewable energy project proposed by WestWind Energy Group located to the south and east of the Mine Site. That project is in the early stages of planning, with a *Scoping Report* (referred to hereafter as the Wind Farm *Scoping Report*) submitted and Secretary's Environmental Assessment Requirements (SEARs) issued on 22 May 2025.²

Table 2.1 presents an overview of anticipated cumulative impacts should both the Wind Farm and the Copi Project become operational. The Wind Farm Scoping Report identified that that Project may result in exceedances of the relevant construction and operations noise criteria at once residence, namely Wind Farm Residence R5, located approximately 21km to the south of the Copi Mine Site.

In order to quantify the cumulative noise impacts associated with both the Copi and Wind Farm Projects, should both become operational, the Applicant engaged MAC to complete an assessment of cumulative noise impacts. That report, presented as **Appendix 11b**, is referred to hereafter as MAC (2025b).

In assessing the cumulative noise impacts MAC (2025b) undertook the following.

- Determined the noise levels attributable to the Copi Project at the Wind Farm Residence R5 using the methodology described above and combined them with the noise emissions provided in the Wind Farm *Scoping Report*.
- Combined the noise levels from both Projects at Residence R1 (Huntingfield)

Table 6.8.7 presents the results of the cumulative noise assessment. The results may be summarised as follows.

- The Copi Project would not contribute to a net increase in noise levels at Wind Farm Residence R5.
- The Wind Farm Project would result in a net increase in noise levels at Residence R1 (Huntingfield) during the evening and night-time periods of up to 1dBA. There would be no net increase in noise levels during the day. MAC (2025b) state that the cumulative noise levels at Residence R1 (Huntingfield) are predicted to be substantially below the recommended Amenity Noise Levels for all assessment periods. In addition, an increase of 1dBA is considered to be acoustically insignificant and is unlikely to be perceptible to the human ear.

As a result, cumulative noise impacts associated with the concurrent operation of the Copi and Wind Farm Projects are likely to be insignificant.

² <https://www.planningportal.nsw.gov.au/major-projects/projects/lake-victoria-wind-farm>

Table 6.8.7
Cumulative Noise Assessment Results

Receiver	Project	Day	Evening	Night (Inversion)
Amenity Noise Level Criterion (LAeq_(15min))		53	48	43
R1 (Huntingfield)	Copi Project	35	30	33
	Wind Farm Project	<25	<25	<25
	Cumulative	35	31	34
Wind Farm Residence R5	Copi Project	<10	<10	<10
	Wind Farm Project	37	37	37
	Cumulative	37	37	37

Source: MAC (2025b) – After Table 3

6.8.6 Amended Monitoring

Section 6.8.7 of the EIS describes noise monitoring for the Project. No amendments are proposed to these measures.

6.8.7 Conclusion

Management of potential noise impacts during the site establishment and operation of the Project would involve the adoption of a range of mitigation measures as described in the EIS. The Applicant would implement a range of measures to ensure that noise criteria are not exceeded at the privately-owned residences surrounding the Mine Site.

MAC (2025a) concludes that construction and operational noise levels of the amended Project would continue to comply with the relevant criteria at all privately-owned residences, with the exception of residences in the vicinity of the proposed works at the Patton Street/ Comstock Street and Comstock Street / Eyre Street intersections. These works would be short-term in nature and would provide a substantial benefit to the affected residents. The Applicant would also contact potentially affected residents prior to undertaking the works. As a result, the anticipated noise levels are not considered significant.

Where the noise levels are anticipated to exceed standard noise management levels at the nearest receiver during intersection upgrade works within Broken Hill, communication with potentially affected residential receivers would be undertaken. It is noted that construction activities are anticipated to occur for a few days only.

6.9 Air Quality

6.9.1 Introduction

The *Air Quality Impact Assessment* for the Project as exhibited was prepared by Northstar Air Quality Pty Ltd (Northstar, 2024) and is presented as Appendix 12 of the EIS. Section 6.9 of the EIS presents a summary of that assessment.

An updated *Air Quality Impact Assessment* for the Amended Project was prepared by Northstar and is presented as **Appendix 12** and referred to hereafter as Northstar (2025a).

The EIS and Northstar (2024) were reviewed by the NSW Environment Protection Authority who provided feedback on 24 June 2024. The following presents a summary of how and where each of these matters has been addressed in Northstar (2025a). See also Table 2 of Northstar (2025a).

1. Emissions inventory is not sufficiently transparent.

Appendix C of Northstar (2025a) has been amended to include additional detail in relation the emissions inventory.

2. Emissions inventory lacks detail regarding wind erosion of exposed areas.

Section 5.2 and Appendix C of Northstar (2025a) has been amended to include additional detail in relation to assumed wind erosion rates. In summary, for each exposed area (with the exception of the product drying stockpiles), Northstar (2025a) have assumed 10% of the area is actively disturbed, and therefore capable of being a source of wind-blown dust. For the product storing stockpiles 100% of the disturbed area was assumed to be capable of being a source of wind-blown dust. This is consistent with commonly applied assumptions and accounts for the fact that typically only freshly disturbed areas or regularly trafficked areas will be a source of wind-blown dust.

3. Control factors outlined within Northstar (2024) may be difficult to achieve in practice.

Section 7.1 of Northstar (2025a) has been amended to provide additional detail on how the control factors would be achieved, including the following.

- Use of low clay/silt materials to construct unsealed roads.
- Use of low salinity water and polymers for dust suppression.
- Use of polymers to stabilise rehabilitated areas until vegetation becomes established.

4. Proposed silt content of haul roads does not reflect figures outlined in the AQIA.

Section 7.1 of Northstar (2025a) notes that low clay/silt materials would be used to construct unsealed roads. Soil and clay materials, with their elevated clay and silt content, would not be used to construct roads. The value of the silt content of haulage routes was adopted from USEPA emission factor documentation associated with similar operations.

The EIS and Northstar (2024) were also reviewed by the Department of Planning, Housing and Infrastructure who requested that modelling and predictions for the heavy metal content in dust emissions from the proposal be assessed. Sections 5.3.2, 6.1.5 and 6.2.5 of Northstar (2025a) addresses this request.

This subsection provides a summary of Northstar (2025a) and describes the management and management measures to be implemented by the Applicant.

Consistent with Northstar (2025a), terminology used within this subsection includes the following.

- Deposited dust – that fraction of suspended particulates that settles out of the air and is deposited on surfaces.
- Total Suspended Particulates (TSP) – that fraction of dust suspended in the air. TSP typically refers to particulates smaller than 30 to 50 micrometres (μm) in diameter.
- PM_{10} – suspended particulates with a diameter of $10\mu\text{m}$ or less. PM_{10} is a subset of TSP.
- $\text{PM}_{2.5}$ – suspended particulates with a diameter of $2.5\mu\text{m}$ or less. $\text{PM}_{2.5}$ is a subset of PM_{10} and TSP and is typically a combustion-related pollutant.

6.9.2 Existing Environment

6.9.2.1 Surrounding Receivers

Residences surrounding the Mine Site remain unchanged from those presented in the EIS, with the exception of Residences R2 and R5 which have been reclassified as non-Project related.

6.9.2.2 Topography and Meteorology

The local topography and meteorology are discussed in Section 6.1 of the EIS and used as key inputs in the meteorological and dispersion modelling undertaken by Northstar (2024) remain unchanged.

6.9.2.3 Potential for Cumulative Impacts

The area surrounding the Mine Site is primarily rural in nature, with no significant anthropogenic sources of particulate matter that may impact cumulatively with the Project on sensitive receivers. Northstar (2025a) therefore concludes that the incorporation of background air quality data outlined in the following section would appropriately account for any potential cumulative impacts associated with surrounding land uses.

6.9.2.4 Background Air Quality

Following an examination of meteorological and air quality data from the Mildura Airport Automated Weather Station between 2017 and 2021, Northstar (2025a) selected 2019 as the most representative year for assessment.

Northstar (2025a) notes that the Mine Site is located a significant distance from suitable air quality monitoring stations (AQMS) with publicly available data. Three potentially suitable monitoring stations were identified as follows.

- Wagga Wagga North AQMS, located in the Riverina Region of NSW approximately 581km east-southeast of the Mine Site.
- Albury AQMS, located in the Riverina Region of NSW approximately 589km southeast of the Mine Site.
- Elizabeth Downs AQMS (in South Australia), located on the outskirts of Adelaide approximately 259km southwest of the Mine Site.

The Wagga Wagga North AQMS was selected as this station represents the closest suitable AQMS with data available for the assessment year of 2019.

As TSP data was not available from any AQMS in the vicinity of the Mine Site, Northstar (2025a) relied upon a TSP:PM₁₀ ratio of 2.3404:1 (i.e. PM₁₀ is equivalent to approximately 43% of TSP) derived from an analysis of co-located TSP and PM₁₀ measurements recorded in the Lower Hunter, Illawarra and Sydney Metropolitan regions of NSW between 1999 and 2011.

Dust deposition rates have been measured by the Applicant at the following locations (See **Figure 3.3**)

- DMS1 and DMS2 - Warwick Station - December 2018 to present.
- DMS3 and DMS4 – Huntingfield Station – December 2018 to August 2021.
- DMS5 and DMS6 – Warwick Station – October 2022 to present.

While there have been elevated monthly recordings associated with individual dust storms, annual average insoluble solids deposition rates are less below 2g/m²/month. Northstar (2025a) indicate that for 2019 (representative year for modelling) the insoluble solids deposition rates was 1.2g/m²/month. As a result, the adopted annual average total insoluble solids deposition rate of 2g/m²/month is considered appropriate to allow the presentation of a conservative assessment.

No data is available on the background silica concentrations experienced in areas surrounding the Mine Site. As a result, the background concentration has been assumed to be negligible.

Table 6.9.1 presents a summary of the background air quality data adopted by Northstar (2025a). It is noted that the maximum 24-hour PM₁₀ and PM_{2.5} concentrations measured at the Wagga Wagga North AQMS exceed the relevant criteria. Exceedances of the 24-hour PM₁₀ criterion are discussed in the NSW *Annual Compliance Report for the National Environment Protection (Ambient Air Quality) Measure for 2019* (NSW DPE, 2021). In particular, extensive drought conditions, dust storms and bushfires during 2019 were identified as the primary sources for these exceedances (Northstar, 2025a).

Exceedances of the 24-hour PM_{2.5} criterion, with increased concentrations typically occurring during cooler months, are more likely to be associated with the use of wood-fired heaters in the vicinity of the Wagga Wagga North AQMS. As wood-fired heater use is not expected to contribute significantly to PM_{2.5} concentrations in the vicinity of the Mine Site, concentrations of PM_{2.5} may be lower in areas surrounding the Mine Site.

Table 6.9.1
AQIA Background Air Quality Data

Pollutant	Averaging Period	Units	Measured Value	Comment
TSP	Annual	µg/m ³	82.7	Estimated based on TSP:PM ₁₀ ratio of 2.3404:1
PM ₁₀	24-hour	µg/m ³	Daily Varying	24-hour maximum PM ₁₀ at Wagga Wagga North AQMS in 2019 measured as 251.7µg/m ³
	Annual	µg/m ³	35.3	Annual average at Wagga Wagga North AQMS in 2019
PM _{2.5}	24-hour	µg/m ³	Daily Varying	24-hour maximum PM _{2.5} at Wagga Wagga North AQMS measured as 239.6µg/m ³
	Annual	µg/m ³	11.3	Annual average at Wagga Wagga North AQMS in 2019
Deposited Dust	Annual	g/m ² /month	2	Difference in NSW EPA maximum allowable and incremental impact criterion
Silica	Annual	µg/m ³	N/A	Assumed to be negligible

Source: Northstar (2025a) – modified after Table 14

6.9.3 Potential Emission Sources

The activities and pollutants identified in Section 6.9.3 of the EIS remain unchanged, namely:

- Soil and subsoil stripping and placement
- Vegetation removal
- Overburden stripping and placement
- Loading, transportation and unloading of haul trucks with topsoil, subsoil and overburden
- Loading of mine products into trucks and transportation off site
- Wind erosion of disturbed areas
- Emissions from vehicles and equipment exhaust.

In addition, the material characterisation of overburden and reject material that would be generated by the Project was determined by RGS Environmental Consultants Pty Ltd (RGS, 2023) based on 12 representative samples. Northstar (2025a) conservatively modelled heavy metal concentrations in dust emitted from the Mine Site based on the maximum concentration recorded in the assessed samples.

6.9.4 Assessment Criteria

6.9.4.1 Particulate Matter and Deposited Dust

The guidelines and criteria used to prepare the updated AQIA are the same as those presented in Section 6.9.3.1 of the EIS.

6.9.4.2 Respirable Crystalline Silica

The adjustments discussed in Section 6.9.3.2 of the EIS for respirable crystalline silica modelling were again utilised by Northstar (2025a) for the updated AQIA.

6.9.4.3 Voluntary Land Acquisition and Mitigation Policy

The voluntary mitigation and acquisition criteria for the Project presented in Section 6.9.3.3 remain unchanged.

6.9.5 Assessment Methodology

6.9.5.1 Modelling Software and Scenarios

A dispersion modelling assessment was completed by Northstar (2025a) using the EPA approved CALPUFF atmospheric dispersion model. Modelling was performed in CALPUFF 2-dimensional (2-D) mode as a 3-D modelling assessment was not warranted based on the terrain in the vicinity of the Mine Site and the distance between sensitive receivers and the proposed activities.

The updated assessment included an assessment of particulate matter emissions associated with average operational characteristics as well as likely peak activities at the Mine Site in order to permit comparison of potential impacts against the relevant long-term (annual) and short-term (24-hour) criteria. For the purposes of the assessment, detailed dispersion modelling was undertaken for the following scenarios (see **Figures 6.8.1** and **6.8.2**).

- Scenario 1 (Year 5)
- Scenario 2 (Year 16)

These scenarios include mining activities (including all material stripping, extraction and replacement activities) representing the stripping of topsoil and removal of vegetation and overburden, extraction and processing of ore, as well as the transport of heavy mineral concentrate from the Mine Site and along Anabranh Mail Road.

In addition, to assess the impact of off-site transportation on residential receivers in the vicinity of Anabranh Mail Road, an assessment of the potential for discrete impacts at distances away from the road was performed. A nominal 5km stretch of Anabranh Mail Road has been subject to dispersion modelling, and the inputs to that assessment are presented in Appendix C of Northstar (2025a).

Table 6.9.2 provides a summary of the material and vehicle movements assessed by Northstar (2025a) for each of the scenarios.

Table 6.9.2
Project Operational Characteristics

Component	Scenario 1		Scenario 2	
	Annual Average		Annual Average	
Topsoil Stripping Rate ¹	1.1 Mtpa		0.3 Mtpa	
Overburden Extraction Rate	35.1 Mtpa		27.9 Mtpa	
Interburden Removed	34.7 Mtpa		20.6 Mtpa	
Ore Extraction Rate	20.3 Mtpa		27.0 Mtpa	
HMC transported	437,000 tpa		292,000 tpa	
Daily Heavy Vehicle Movements				
	Average	Peak	Average	Peak
Type 1 and 2 Road Train ²	26 (Type 1, 3 Trailers)	24 (Type 1, 3 Trailers)	26 (Type 1, 3 Trailers)	24 (Type 1, 3 Trailers)
	20 (Type 2, 4 trailers)	32 (Type 2, 4 trailers)	20 (Type 2, 4 trailers)	32 (Type 2, 4 trailers)
B-Double / Semi Trailer Truck / other heavy vehicle	10	10	20	20
22 seater bus	2	4	2	4
<p>Note 1: Discrepancies between topsoil stripping rates assumed by Northstar (2025a) and those presented in Table 6.4.9 relate to the fact that Northstar (2025a) relied upon an early draft of the annual soil balance. The discrepancies are not considered material for the purposes of the air quality assessment.</p> <p>Note 2: Northstar (2025a) assessed particulate emissions associated with the use of Type 1 (up to 24 movements per day) and Type 2 (up to 32 movements per day) road trains and determined that there would be no material difference in predicted impacts at sensitive receptors between the vehicle types. As a result, Type 2 road trains have been assessed.</p>				
Source: Northstar (2025a) – modified after Table 15				

6.9.5.2 Particulate Emission Factors and Controls

The emission factors for material handling processes, truck movements on unsealed roads, material screening and wind erosion presented in Section 6.9.4.2 were adopted again by Northstar (2025a).

6.9.6 Assessment of Impacts

6.9.6.1 Introduction

In order to permit the examination of Project-related impacts both in isolation and in the context of contribution to existing air quality, the results of modelling completed by Northstar (2025a) are separated into the following impact types.

- Incremental Impact – pollutant concentrations associated with the operation of the Project in isolation.
- Cumulative Impact – the incremental pollutant concentrations associated with the Project plus the background air quality pollutant concentrations.

6.9.6.2 Annual Average Dust Deposition Rates

Table 6.9.3 presents the predicted annual average dust deposition rates at residential receivers in the vicinity of the Mine Site under Scenarios 1 and 2. In summary, the results indicate negligible quantities of Project-related dust would be deposited at surrounding residences, and compliance with the relevant criterion.

Table 6.9.3
Predicted Annual Dust Deposition Rates

Receptor ¹	Annual Average Dust Deposition (g/m ² /month)				
	Incremental Impact		Background Concentration	Cumulative Impact	
	2.0			4.0	
	Scenario			Scenario	
Criterion	1	2	1	2	
R1	<0.1	<0.1	2.0	2.1	2.1
R2	<0.1	<0.1	2.0	2.1	2.1
R3	<0.1	<0.1	2.0	2.1	2.1
R5	<0.1	<0.1	2.0	2.1	2.1
R6	<0.1	<0.1	2.0	2.1	2.1
R7	<0.1	<0.1	2.0	2.1	2.1
R8	<0.1	<0.1	2.0	2.1	2.1
R9	<0.1	<0.1	2.0	2.1	2.1
R10	<0.1	<0.1	2.0	2.1	2.1
R4 ²	<0.1	<0.1	2.0	2.1	2.1
Mine Camp ²	<0.1	<0.1	2.0	2.1	2.1

Exceedances of the criterion values are shown as **bold red** text.

Note 1: See Figure 5.1

Note 2: Residence is Project-related

Source: Northstar (2025a) – modified after Tables 19 and 28

6.9.6.3 Annual Average Particulate Matter Concentrations

Table 6.9.4 presents the predicted annual incremental and cumulative particulate matter emissions at residential receivers in the vicinity of the Mine Site under Scenarios 1 and 2. In summary, annual average incremental concentrations of TSP, PM₁₀ and PM_{2.5} are expected to be all below relevant criteria.

By contrast, cumulative exceedances of the annual average PM₁₀ and PM_{2.5} criteria are predicted to occur under each scenario assessed. These exceedances are driven by elevated background concentrations that already exceed the relevant criteria (see discussion in Appendix B of Northstar (2025a)). In each case, the Project's incremental contribution is a very small contribution to the total modelled cumulative concentration.

**Table 6.9.4
Predicted Annual Particulate Matter Concentrations**

Receptor ID ¹	Annual Average Concentration (µg/m ³)								
	TSP			PM ₁₀			PM _{2.5}		
	Incremental Impact	Background Concentration	Cumulative Impact	Incremental Impact	Background Concentration	Cumulative Impact	Incremental Impact	Background Concentration	Cumulative Impact
Criterion	90			25			8		
Scenario 1									
R1	1.4	82.7	84.1	0.6	35.3	35.9	< 0.1	11.3	11.3
R2	0.1	82.7	82.8	0.1	35.3	35.4	< 0.1	11.3	11.3
R3	0.3	82.7	83.0	0.2	35.3	35.5	< 0.1	11.3	11.3
R5	0.3	82.7	83.0	0.2	35.3	35.5	< 0.1	11.3	11.3
R6	0.1	82.7	82.8	0.1	35.3	35.4	< 0.1	11.3	11.3
R7	< 0.1	82.7	82.8	< 0.1	35.3	35.4	< 0.1	11.3	11.3
R8	< 0.1	82.7	82.8	< 0.1	35.3	35.4	< 0.1	11.3	11.3
R9	< 0.1	82.7	82.8	< 0.1	35.3	35.4	< 0.1	11.3	11.3
R10	< 0.1	82.7	82.8	< 0.1	35.3	35.4	< 0.1	11.3	11.3
R4 ²	0.3	82.7	83.0	0.2	35.3	35.5	< 0.1	11.3	11.3
Mine Camp ²	0.4	82.7	83.1	0.2	35.3	35.5	< 0.1	11.3	11.3
Scenario 2									
R1	0.8	82.7	83.5	0.3	35.3	35.6	< 0.1	11.3	11.3
R2	< 0.1	82.7	82.8	< 0.1	35.3	35.4	< 0.1	11.3	11.3
R3	0.2	82.7	82.9	0.1	35.3	35.5	< 0.1	11.3	11.3
R5	0.2	82.7	82.9	0.1	35.3	35.5	< 0.1	11.3	11.3
R6	< 0.1	82.7	82.8	< 0.1	35.3	35.4	< 0.1	11.3	11.3
R7	< 0.1	82.7	82.8	< 0.1	35.3	35.4	< 0.1	11.3	11.3
R8	< 0.1	82.7	82.8	< 0.1	35.3	35.4	< 0.1	11.3	11.3
R9	< 0.1	82.7	82.8	< 0.1	35.3	35.4	< 0.1	11.3	11.3
R10	< 0.1	82.7	82.8	< 0.1	35.3	35.4	< 0.1	11.3	11.3
R4 ²	0.2	82.7	82.9	0.1	35.3	35.4	< 0.1	11.3	11.3
Mine Camp ²	0.3	82.7	83.0	0.1	35.3	35.4	< 0.1	11.3	11.3
Exceedances of the criterion values are shown as bold red text									
Note 1: See Figure 5.1 of the EIS.									
Note 2: Residence is Project-related									
Source: Northstar (2025a) – modified after Tables 18 and 27									

6.9.6.4 Maximum 24-hour Particulate Matter Concentrations

Table 6.9.5 presents the predicted maximum incremental 24-hour average PM₁₀ and PM_{2.5} concentrations for residential receivers in the vicinity of the Mine Site under Scenarios 1 and 2. The predicted maximum incremental 24-hour average PM₁₀ and PM_{2.5} concentrations alone do not exceed the relevant criteria at any of the Project-related residential receivers under all scenarios.

Table 6.9.5
Predicted Maximum Incremental 24-hour Average PM₁₀ and PM_{2.5} Concentrations

Receptor ¹	Maximum Incremental 24-hour Average Concentration (µg/m ³)			
	PM ₁₀		PM _{2.5}	
Criterion	50		25	
	Scenario			
	1	2	1	2
R1	8.0	4.8	1.2	0.7
R2	1.7	1.1	0.3	0.2
R3	1.6	1.0	0.2	0.2
R5	2.2	1.5	0.3	0.2
R6	0.8	0.6	0.1	< 0.1
R7	0.2	0.1	< 0.1	< 0.1
R8	0.2	0.2	< 0.1	< 0.1
R9	0.4	0.3	< 0.1	< 0.1
R10	0.2	0.2	< 0.1	< 0.1
R4 ²	1.3	0.9	0.2	0.1
Mine Camp ²	1.4	1.2	0.2	0.2
Exceedances of the criterion values are shown as bold red text				
Note 1: See Figure 5.1 of the EIS.				
Note 2: Residence is Project-related				
Source: Northstar (2025a) – modified after Tables 20 and 29				

In order to quantify the Project’s contribution to the daily varying PM₁₀ and PM_{2.5} concentrations, including background, Northstar (2025a) have presented highest the incremental and highest cumulative concentrations for the modelled year.

Table 6.9.6 presents the days with the highest predicted cumulative and incremental 24-hour average PM₁₀ concentrations. In summary, Residence R1 is expected to receive the highest incremental concentrations and cumulative concentrations in Scenario 1 and residence R6 expected to receive the highest incremental concentrations and cumulative concentrations in Scenario 2.

As shown in **Table 6.9.6**, concentrations of PM₁₀ that exceed criteria are largely driven by background conditions for both scenarios. Exceedances of the cumulative 24-hour PM₁₀ criterion were predicted during Scenario 1 at R1 on a number of days, although the addition of the incremental impact associated with the Project only resulted in two additional exceedances of the criterion (one at R1 on 12/04/2019, and one at R6 on 21/02/2019).

During Scenario 2, no additional exceedances of the 24-hour PM₁₀ criterion were predicted as a result of the Project, although a number of exceedances of the criterion are observed in the background air quality data, resulting from regional impacts.

Table 6.9.6
Days with the Highest Predicted Cumulative and Incremental
24-hour Average PM₁₀ Concentration

Date	Days with the highest predicted cumulative 24-hour average PM ₁₀ concentration (µg/m ³)			Date	Days with the highest predicted incremental 24-hour average PM ₁₀ concentration (µg/m ³)		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
Criterion	50			Criterion	50		
Scenario 1							
Receptor	R1			R1			
20/12/2019	1.5	251.7	253.2	22/05/2019	8.0	30.7	38.7
12/02/2019	< 0.1	221.9	222.0	25/06/2019	6.1	21.1	27.2
18/02/2019	0.5	209.7	210.2	07/06/2019	5.5	23.0	28.5
22/12/2019	< 0.1	205.5	205.6	16/06/2019	4.9	15.4	20.3
21/09/2019	< 0.1	196.8	196.9	28/07/2019	4.6	14.5	19.1
24/12/2019	< 0.1	148.3	148.4	18/05/2019	4.4	34.2	38.6
23/12/2019	< 0.1	145.8	145.9	26/06/2019	4.4	19.4	23.8
17/12/2019	2.4	131.5	133.9	24/06/2019	4.4	23.3	27.7
26/11/2019	< 0.1	133.0	133.1	26/02/2019	4.1	55.6	59.7
21/11/2019	< 0.1	130.5	130.6	05/07/2019	3.8	9.7	13.5
12/04/2019	2.5	48.1	50.6	12/04/2019	2.5	48.1	50.6
Scenario 2							
Receptor	R6			R6			
20/12/2019	< 0.1	251.7	251.8	21/06/2019	0.6	10.7	11.3
12/02/2019	< 0.1	221.9	222.0	03/07/2019	0.5	23.1	23.6
18/02/2019	< 0.1	209.7	209.8	11/04/2019	0.5	44.7	45.2
22/12/2019	< 0.1	205.5	205.6	23/06/2019	0.4	20.1	20.5
21/09/2019	< 0.1	196.8	196.9	10/04/2019	0.4	50.2	50.6
24/12/2019	0.3	148.3	148.6	19/03/2019	0.4	21.4	21.8
23/12/2019	0.3	145.8	146.1	16/03/2019	0.4	27.3	27.7
26/11/2019	< 0.1	133.0	133.1	19/06/2019	0.4	9.0	9.4
17/12/2019	< 0.1	131.5	131.6	17/02/2019	0.4	48.0	48.4
21/11/2019	< 0.1	130.5	130.6	22/02/2019	0.3	30.6	30.9
21/02/2019	0.1	49.9	50.0	21/02/2019	0.1	49.9	50.0
Exceedances of the criterion values are shown as bold red text							
Source: Northstar (2025a) – modified after Table 22 and 31							

Table 6.9.7 presents the days with the highest predicted cumulative and incremental 24-hour average PM_{2.5} concentrations. In summary, Residence R3 is expected to receive the highest incremental and cumulative concentrations in all scenarios. As shown in **Table 6.9.7**, concentrations of PM_{2.5} that exceed criteria are largely driven by background conditions for all scenarios. Predicted exceedances are only expected to occur on days when the existing PM_{2.5} background made up a significant percentage of the cumulative PM_{2.5} impact.

Table 6.9.7
Days with the Highest Predicted Cumulative and Incremental
24-hour Average PM_{2.5} Concentration

Date	Days with the highest predicted cumulative 24-hour average PM _{2.5} concentration (µg/m ³)			Date	Days with the highest predicted incremental 24-hour average PM _{2.5} concentration (µg/m ³)		
	Incremental Impact	Background	Cumulative Impact		Incremental Impact	Background	Cumulative Impact
Criterion	25			Criterion	25		
Scenario 1							
Receptor	R3			R3			
20/12/2019	< 0.1	239.6	239.7	27/08/2019	0.2	11.3	11.5
22/12/2019	< 0.1	129.4	129.5	25/08/2019	0.2	9.6	9.8
23/12/2019	< 0.1	103.6	103.7	12/08/2019	0.2	5.6	5.8
24/12/2019	< 0.1	87.5	87.6	03/08/2019	0.2	5.9	6.1
17/12/2019	< 0.1	83.2	83.3	02/08/2019	0.2	10.6	10.8
18/12/2019	< 0.1	71.6	71.7	26/08/2019	0.2	8.2	8.4
09/12/2019	< 0.1	58.8	58.9	24/04/2019	0.2	7.3	7.5
28/12/2019	< 0.1	53.2	53.3	04/05/2019	0.2	3.1	3.3
21/12/2019	< 0.1	50.5	50.6	31/07/2019	0.2	13.5	13.7
21/11/2019	< 0.1	45.5	45.6	05/05/2019	0.1	4.7	4.8
10/12/2019	< 0.1	25.0	25.1	10/12/2019	< 0.1	25.0	25.1
Scenario 2							
Receptor	R3			R3			
20/12/2019	< 0.1	239.6	239.7	27/08/2019	0.2	11.3	11.5
22/12/2019	< 0.1	129.4	129.5	25/08/2019	0.1	9.6	9.7
23/12/2019	< 0.1	103.6	103.7	26/08/2019	0.1	8.2	8.3
24/12/2019	< 0.1	87.5	87.6	03/08/2019	0.1	5.9	6.0
17/12/2019	< 0.1	83.2	83.3	12/08/2019	0.1	5.6	5.7
18/12/2019	< 0.1	71.6	71.7	24/04/2019	0.1	7.3	7.4
09/12/2019	< 0.1	58.8	58.9	02/08/2019	0.1	10.6	10.7
28/12/2019	< 0.1	53.2	53.3	05/05/2019	0.1	4.7	4.8
21/12/2019	< 0.1	50.5	50.6	31/07/2019	0.1	13.5	13.6
21/11/2019	< 0.1	45.5	45.6	18/03/2019	0.1	7.5	7.6
10/12/2019	< 0.1	25.0	25.1	10/12/2019	< 0.1	25.0	25.1
Exceedances of the criterion values are shown as bold red text							
Source: Northstar (2025a) – modified after Table 23 and 32							

6.9.6.5 Respirable Crystalline Silica

Based on the modelling results presented in **Table 6.9.3** and conservatively assuming that 100% of PM₁₀ generated by the Project is in the form of respirable crystalline silica, incremental concentrations of respirable crystalline silica under all scenarios would be less than 0.6µg/m³, significantly below the relevant criterion value of 3 µg/m³.

6.9.6.6 Toxic Metals and Individual and Toxic Air Pollutants

Sections 6.1.5 and 6.2.5 of Northstar (2025a) presents predicted toxic metal deposition rates and concentrations associated with relevant pollutants. In relation to deposition rates, multiple criteria for each pollutant, except nickel, were adopted and compared to the most stringent of those criteria. The assessment adopted highly conservative assumptions and found no exceedances of the relevant deposition criteria for any toxic metal.

In relation to principal and toxic air pollutant concentrations, all adopted criteria were predicted to be easily achieved, with concentrations of all pollutants assessed being less than 1.1% of the relevant criterion at or beyond the boundary of the Mine Site.

6.9.6.7 Off-site Transportation Assessment

Northstar (2025a) assessed a nominal 5km section of Anabranh Mail Road between the Site Access Road and the Silver City Highway and established receivers at offset distances consistent with the distance from road to nearby residences.

Figure 6.9.1 presents the results of that assessment for uncontrolled and controlled emissions. The results may be summarised as follows.

- Residence R7 is the closest residence to Anabranh Mail Road, located at a distance of approximately 2.25km from the road.
- 24-hour concentrations for PM₁₀ and PM_{2.5} decrease rapidly with increasing distance from the road.
- Uncontrolled incremental 24-hour PM₁₀ and PM_{2.5} concentrations at Residence R7 are predicted to be 8.5µg/m³ and 0.9µg/m³ respectively. This compares with the assessment criteria of 50µg/m³ and 25µg/m³ respectively.
- Taking into consideration the proposed control measures (see Section 6.9.5.2 of the EIS), the predicted 24-hour PM₁₀ and PM_{2.5} concentrations at Residence R7 are predicted to be 0.6µg/m³ and <0.1µg/m³ respectively.

6.9.6.8 Voluntary Land Acquisition and Mitigation Assessment

The results of Northstar (2025a) indicate that predicted incremental concentrations associated with the operation of the Project at non-Project related receptors are minor, and exceedances of the annual average PM₁₀ and PM_{2.5} criteria are dominated by background conditions that already exceed the relevant criteria.

The *Voluntary Land Acquisition and Mitigation Policy* also applies to private land where a development is predicted to result in exceedances of the relevant criteria over >25% of that land. The voluntary mitigation and land acquisition criteria are not exceeded for >25% of any property in the vicinity of the Mine Site.

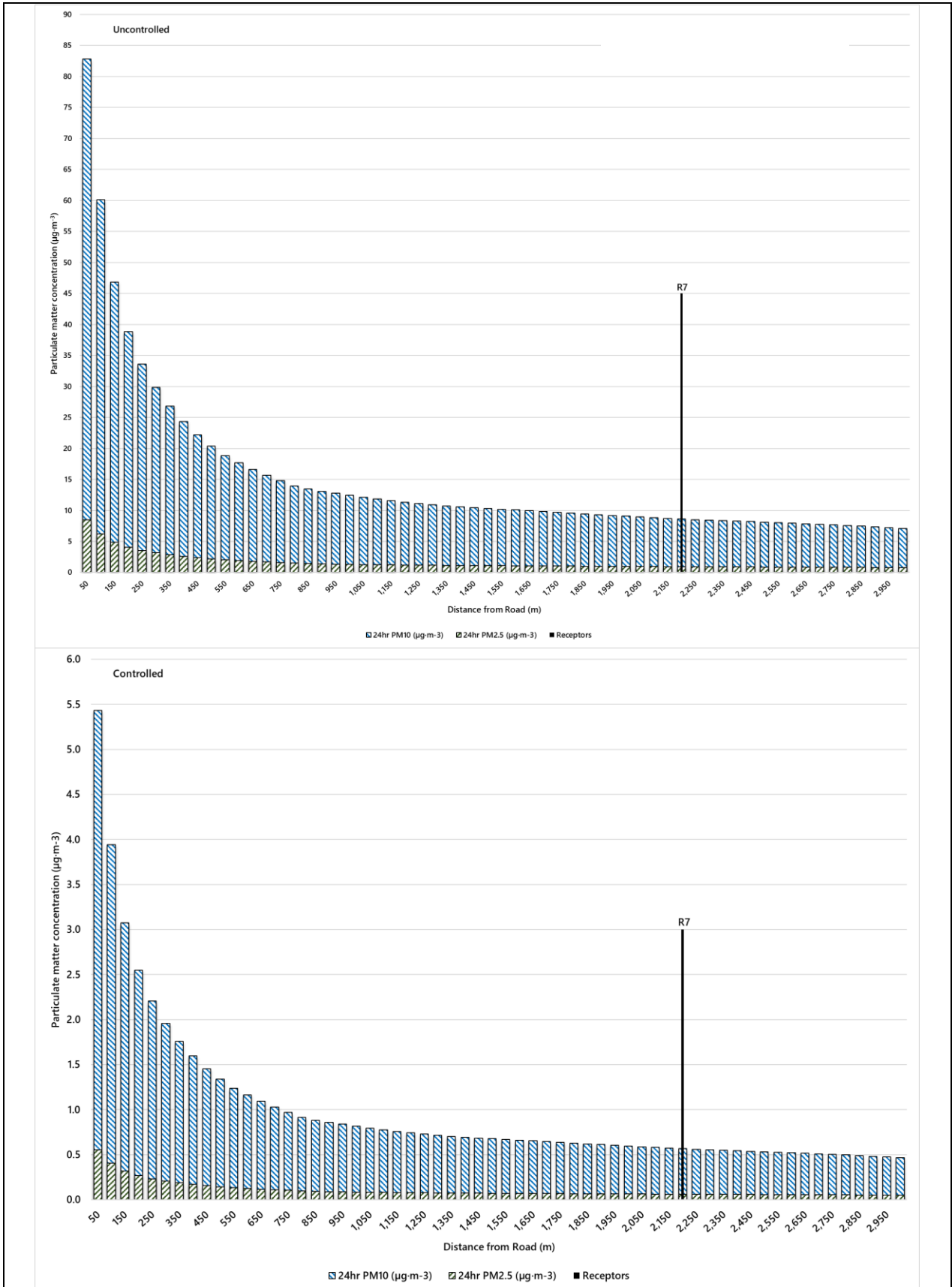


Figure 6.9.1
Off-site 24-hour Incremental Particulate Matter Concentrations

Source: Northstar (2025a) – after Figures 11 and 12

6.9.7 Avoidance, Management and Mitigation Measures

The measures described in Section 6.9.7 of the EIS will be implemented. However, in response to comments from the EPA, further information regarding the construction, maintenance and control of dust emissions from the haul roads was provided by Northstar (2025a) and are embodied in the management and mitigation measures presented below.

- Construct haul roads within the Mine Site using low-silt materials, including low-clay/silt content interburden and overburden, washed coarse reject from the Wet Concentration Plant or imported gravel.
- Utilise low salinity water, chemical suppressants and vehicle speed reduction to achieve a 90% and 75% control efficiency on internal haul roads and Anabranh Mail Road respectively.

6.9.8 Monitoring

The monitoring described in Section 6.9.8 of the EIS remains unchanged.

6.9.9 Conclusion

Management of potential air quality impacts during the site establishment and operation of the Project would involve the adoption of a range of mitigation measures. The Applicant would utilise predictive meteorological systems and site management procedures to ensure that air quality criteria are not exceeded at privately-owned residences surrounding the Mine Site.

Based on the above, the potential impact of the amended Project on air quality are considered to be minor (Northstar, 2025a).

6.10 Greenhouse Gas

6.10.1 Introduction

The SEARs identify “air quality” as a key issue for assessment in the EIS and included the following requirement related to greenhouse gas within the matters to be addressed.

- an assessment of the likely greenhouse gas emissions of the development including measures to minimise emissions having regards to the *Climate Change (Net Zero Future) Act 2023* and the EPA’s *Climate Change Policy and Climate Action Plan*, and Commonwealth Safeguard Mechanism reforms; and
- a description of the air pollution control techniques from any air emission sources of the development that would be implemented to manage and monitor efficiency and performance (including fugitive dust, particulates, emissions from vehicle movements and greenhouse gases).”

Following exhibition of the EIS, the Environment Protection Authority released the *NSW Guide for Large Emitters* (GHG Guide) in January 2025. As the application for development consent was submitted prior to the release of this GHG Guide, the Applicant contends that it is not relevant to this application. However, in recognition of the central role that the GHG Guide will have in ensuring that NSW is able to meet its greenhouse gas emissions targets, the Applicant has elected to assess the Project in accordance with the GHG Guide.

As a result, Northstar were engaged to prepare the *Greenhouse Gas Assessment* for the Project in general accordance with the GHG Guide. That assessment, hereafter referred to as Northstar (2025b), is presented as **Appendix 13**.

This subsection provides a summary of Northstar (2025b) and describes the management and management measures to be implemented by the Applicant.

6.10.2 Assessment Context

Northstar (2025b) was prepared with consideration of the following legislation and policies.

- *Climate Change (Net Zero Future) Act 2023*
- *Net Zero Plan Stage 1: 2020-30* (NSW DPIE, 2020)
- *Protection of the Environment Administration Act 1991*(POEA Act)
- *Protection of the Environment Operations Act 1997* (POEO Act)
- *National Greenhouse Energy Reporting Act 2007* (NGER Act)

6.10.3 Greenhouse Gases and Scopes

6.10.3.1 Greenhouse Gases

Northstar (2025b) assessed the gases and categories of gas addressed under the NGER Act which includes the following.

- Carbon Dioxide (CO₂)
- Methane (CH₄)
- Nitrous Oxide (N₂O)
- Sulphur Hexafluoride (SF₆)
- Hydrofluorocarbons (HFCs)
- Perfluorocarbons (PFCs)

6.10.3.2 Greenhouse Gas Emission Scopes

Northstar (2025b) considered emissions of greenhouse gases associated with three scopes described in the National Greenhouse Accounts Factors Workbook (DCCEEW, 2024a). The emissions scopes are described as follows.

- Direct Emissions (Scope 1) – emissions produced from sources within the Project Site as a result of the Applicant’s activities.
- Indirect Emissions (Scope 2 and Scope 3) – emissions generated in the wider economy as a consequence of the Applicant's activities, but which are physically produced by the activities of another organisation. There are two classes of indirect emissions, electricity and other.
 - Electricity (Scope 2) – indirect emissions which occur as a result of activities that generate electricity, heating, cooling or steam that is consumed by the Applicant, but which is generated outside that Project Site. scope 2 emissions are physically produced by the burning of fossil fuels by the generator for electricity.
 - Other (Scope 3) – indirect emissions other than electricity, which occur outside the Project Site as a result of actions by the Applicant. These may include upstream emissions, such as emissions generated in the extraction and production of fossil fuels used within the Project Site, or downstream emissions, such as emissions from the transport of the Mine Products to customers, or the emissions from outsourced activities.

6.10.4 Assessment Methodology

6.10.4.1 Greenhouse Gas Emission Factors

Greenhouse gas emission factors are published by the Australian Government Department of Climate Change, Energy, the Environment and Water (DCCEEW) document *Australian National Greenhouse Accounts Factors 2024* (NGA Factors). The relevant emissions factors assessed by Northstar (2025b) are presented in **Table 6.10.1**.

6.10.4.2 Assessment Boundary

Northstar (2025b) nominated an assessment boundary for the assessment which included the entirety of the Project Site, namely the Mine Site, Transportation Routes and Rail Facility collectively.

6.10.4.3 Emission Sources

Table 6.10.2 presents the greenhouse gas emission sources assessed by Northstar (2025b).

**Table 6.10.1
Emission Factors**

Emission Source	Scope	Emission Factor	Units
Grid supplied electricity consumption	2	Varies by year	t CO ₂ -e/MWh
	3	Varies by year	t CO ₂ -e/MWh
Diesel combustion in generators during construction	1	2,709.7	kg CO ₂ -e/kL
	3	667.8	kg CO ₂ - e/kL
Diesel combustion in plant and equipment during construction, operation and rehabilitation	1	2,716.3	kg CO ₂ - e/kL
	3	667.8	kg CO ₂ - e/kL
Mine product transport from Project Site during operations	1	2,716.3	kg CO ₂ - e/kL
	3	667.8	kg CO ₂ - e/kL
Liquified Natural Gas (LNG) combustion in driers	1	51.53	kg CO ₂ - e/kL
	3	No scope 3 emission factor for LNG	
	3	667.8	kg CO ₂ - e/kL
LNG deliveries to the Project Site	3	667.8	kg CO ₂ - e/kL
Air conditioning	1	0.024	kg CO ₂ -e/unit
Waste generation – solid	3	0.864	kg CO ₂ -e/person
Waste generation - liquid	1	0.0	CO ₂ -e/person (managed aerobic treatment)

Source: Northstar (2025b) - Modified after Table 6

**Table 6.10.2
Greenhouse Gas Emission Sources by Project Phase**

Scope	Greenhouse Gas Emission Source	Project Phase		
		Site Establishment	Operations	Rehabilitation
1	Diesel combustion in plant and equipment	Y	Y	Y
	Diesel combustion in generators	Y	N	N
	LNG use in driers	N	Y	N
	Diesel combustion in product trucks	N	Y	N
	Leakage from air conditioning	Y	Y	Y
2	Electricity consumption (from grid)	Y ¹	Y	Y
3	Diesel combustion in plant and equipment	Y	Y	Y
	Diesel combustion in generators	Y	N	N
	Diesel combustion in product trucks	N	Y	N
	Transport of consumables (LNG, diesel) to Project Site	Y	Y	Y
	Electricity consumption (from grid)	Y	Y	Y
	Solid waste generation	Y	Y	Y

1: Grid electricity connected in last 9 months of the final year of construction

Source: Northstar (2025b) - Modified after Table 7

6.10.4.4 Emission Assumptions

To calculate emissions from the various activities related to the Project, Northstar (2025b) used data directly supplied from the Applicant and made reasonable assumptions to allow assessment of certain emissions sources through the various phases of the Project. **Table 6.10.3** presents the data and assumptions adopted for activity calculations.

Table 6.10.3
Assumptions Adopted in Activity Data Calculations

Emission Source	Project Phase	Assumption
Diesel combustion (plant and equipment)	Construction	Diesel fuel estimates provided by Applicant (see Figure 6.10.1)
	Operation	
	Rehabilitation	
Diesel combustion (generators)	Construction	Power demand (kW) during construction phase provided by Applicant. Assumed diesel combustion of 0.4 L·kWh ⁻¹ . Grid electricity connected after 3 months of third (final) year of construction phase; diesel only required for first 3 months of final construction year.
	Operation	Not required.
	Rehabilitation	Not required.
Electricity	Construction	Power demand (kW) during construction phase provided by Applicant. Grid electricity connected after 3 months of third (final) year of construction phase, so electricity consumption from grid for last 9 months of final construction year. 30 % of electricity requirement provided by certified renewable sources.
	Operation	Power demand (kW) during operational phase provided by Applicant. Assumed power demand 24 hours per day, 7 days per week. 30 % of electricity requirement provided by certified renewable sources.
	Rehabilitation	Power demand (kW) during year 1 of rehabilitation phase, same as final year of operations. 30 % of electricity requirement provided by certified renewable sources.
Liquified Natural Gas (LNG) use in driers	Construction	Not required.
	Operation	LNG use provided by Applicant.
	Rehabilitation	Not required.
LNG and diesel delivery by truck	Construction	Not required.
	Operation	Diesel fuel estimates provided by Applicant
	Rehabilitation	Not required.

Source: Northstar (2025b) - Modified after Table 9

6.10.5 Avoidance, Management and Mitigation Measures

The Applicant would implement the following management and mitigation measures in order to manage and minimise greenhouse gas emissions to the extent practicable.

- Prepare a *Greenhouse Gas and Energy Efficiency Plan*.
- Purchase 30% of electricity from externally contracted and certified renewable sources.
- Investigate options to increase the proportion of electricity from renewable sources throughout the life of the Project.
- Educate staff and contractors on the fuel-efficient operation of vehicles.
- Minimise material handling through planning and scheduling.
- Turn off all vehicles, plant and equipment when not in use.
- Ensure that all vehicles, plant and equipment are regularly serviced to ensure efficient operation.
- Clearly mark all haul roads and other roads and tracks and ensure that signposted speed limits are complied with.
- Ensure that internal haul roads and the Site Access Road are maintained in good condition to facilitate efficient travel and transportation of materials.
- Reduce gradients around the site where practicable.
- Utilise renewable fuel/blends fuel in plant and equipment where practicable.
- Use the most efficient vehicles and shortest routes to minimise fuel consumption.
- Procure the high efficiency and cost-effective vehicles/equipment where practicable.
- Investigate the use of battery electric vehicles, fuel cell electric vehicles and diesel-electric hybrid vehicles.

6.10.6 Assessment of Impacts

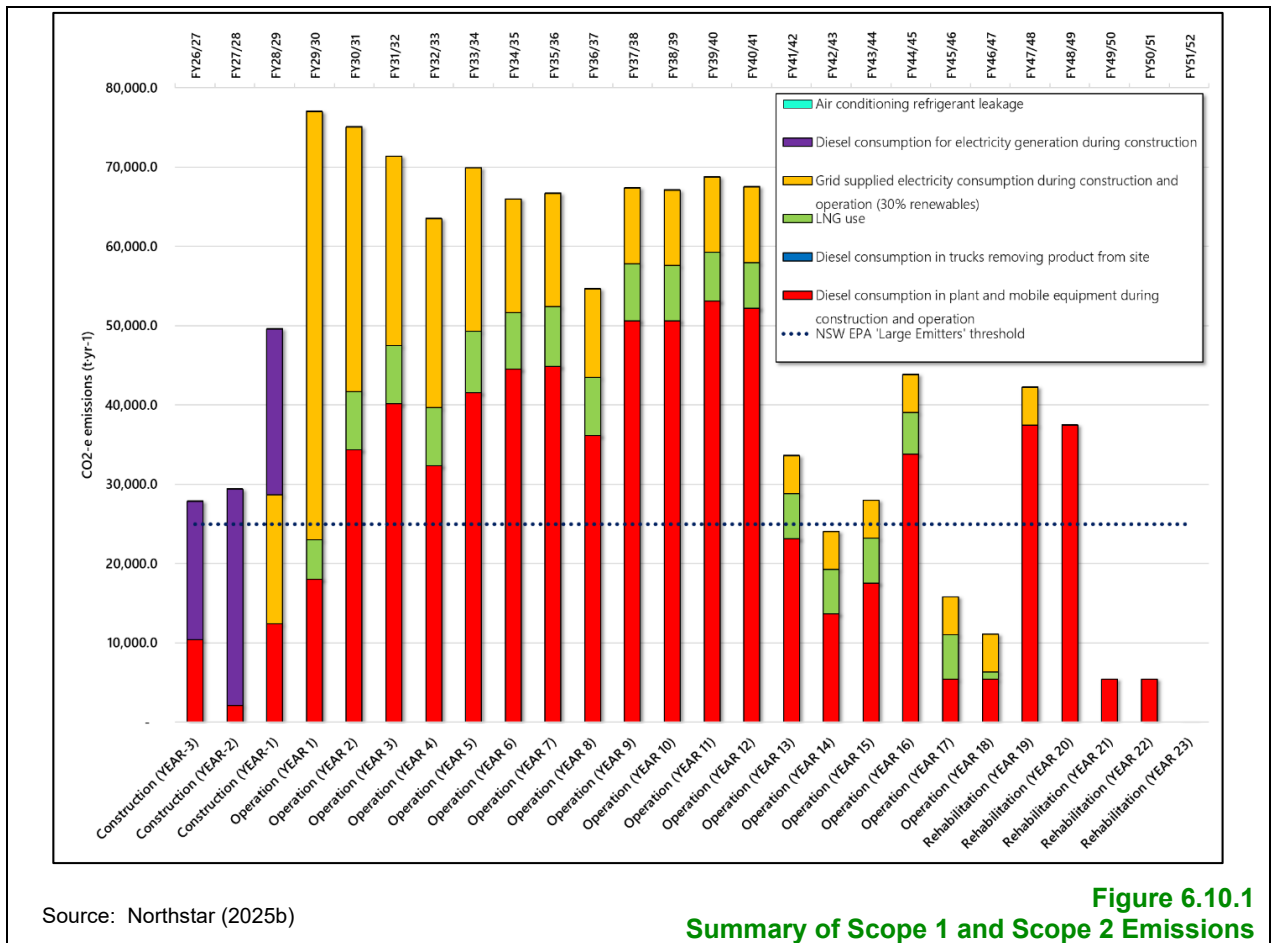
6.10.6.1 Emission Estimates

Table 6.10.4 and Figure 6.10.1 present a summary of the total scope 1, scope 2 and scope 3 emissions calculated during each stage of the Project.

Table 6.10.4
Scope 1, Scope 2 and Scope 3 Emissions Summary

Project Year	Project Phase	Scope 1 Emissions	Scope 2 Emissions	Scope 1 + Scope 2 Emissions	Scope 3 Emissions
		t CO ₂ -e/yr			
-3	Construction	27,875	0	27,875	7,298
-2	Construction	29,394	0	29,394	7,665
-1	Construction	33,379	16,224	49,603	10,395
1	Operation	23,035	53,979	77,014	9,227
2	Operation	41,718	33,340	75,058	13,277
3	Operation	47,532	23,815	71,347	12,446
4	Operation	39,697	23,815	63,512	10,516
5	Operation	49,276	20,639	69,916	12,782
6	Operation	51,691	14,289	65,979	11,249
7	Operation	52,416	14,289	66,704	11,348
8	Operation	43,526	11,113	54,639	11,450
9	Operation	57,839	9,526	67,365	15,029
10	Operation	57,595	9,526	67,121	12,753
11	Operation	59,236	9,526	68,761	13,372
12	Operation	57,980	9,526	67,506	13,152
13	Operation	28,842	4,763	33,604	5,964
14	Operation	19,267	4,763	24,030	3,611
15	Operation	23,199	4,763	27,962	4,576
16	Operation	39,084	4,763	43,847	8,594
17	Operation	11,020	4,763	15,783	1,541
18	Operation	6,320	4,763	11,083	1,608
19	Rehabilitation	37,488	4,763	42,251	9,320
20	Rehabilitation	37,488	0	37,488	9,251
21	Rehabilitation	5,405	0	5,405	1,364
22	Rehabilitation	5,405	0	5,405	1,364
23	Rehabilitation	0	0	0	35
Total		885,707	282,947	1,168,654	219,186

Source: Modified after Northstar (2025b) Table 11



6.10.6.2 Emissions Benchmarking

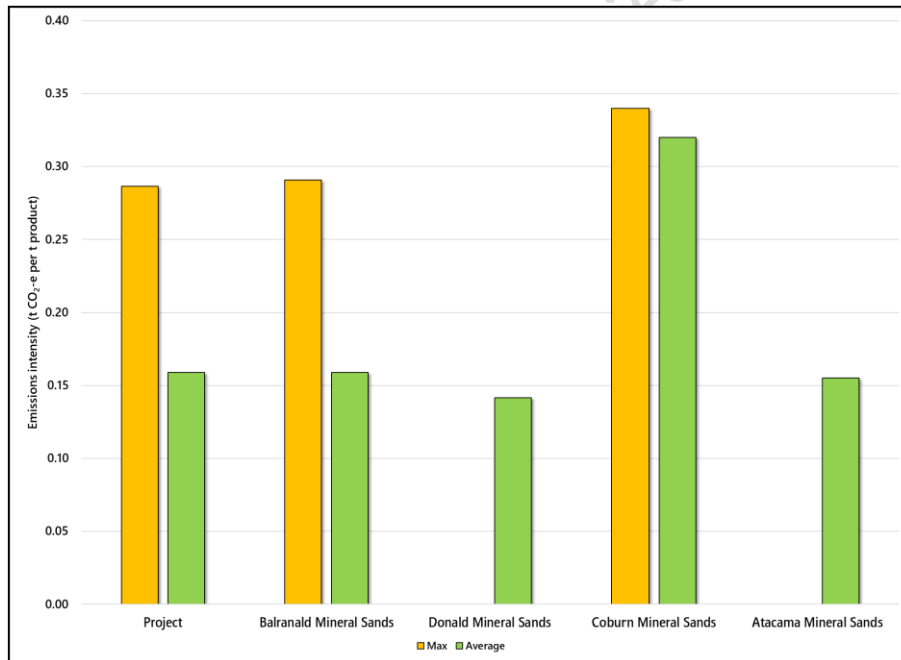
Northstar (2025b) performed a review of environmental assessments for minerals sands projects across Australia, including the greenhouse gas assessments. The emissions intensity, expressed as t CO₂-e/t (product), of each was calculated for both the project average, and maximum in any year (where information is available). The results of that analysis are presented in Figure 6.10.2. Note that only scope 1 and 2 emissions have been adopted for this exercise.

The results of the analysis show that the Project is anticipated to have comparable emissions intensity to other similar projects.

6.10.7 Emissions Goal Setting

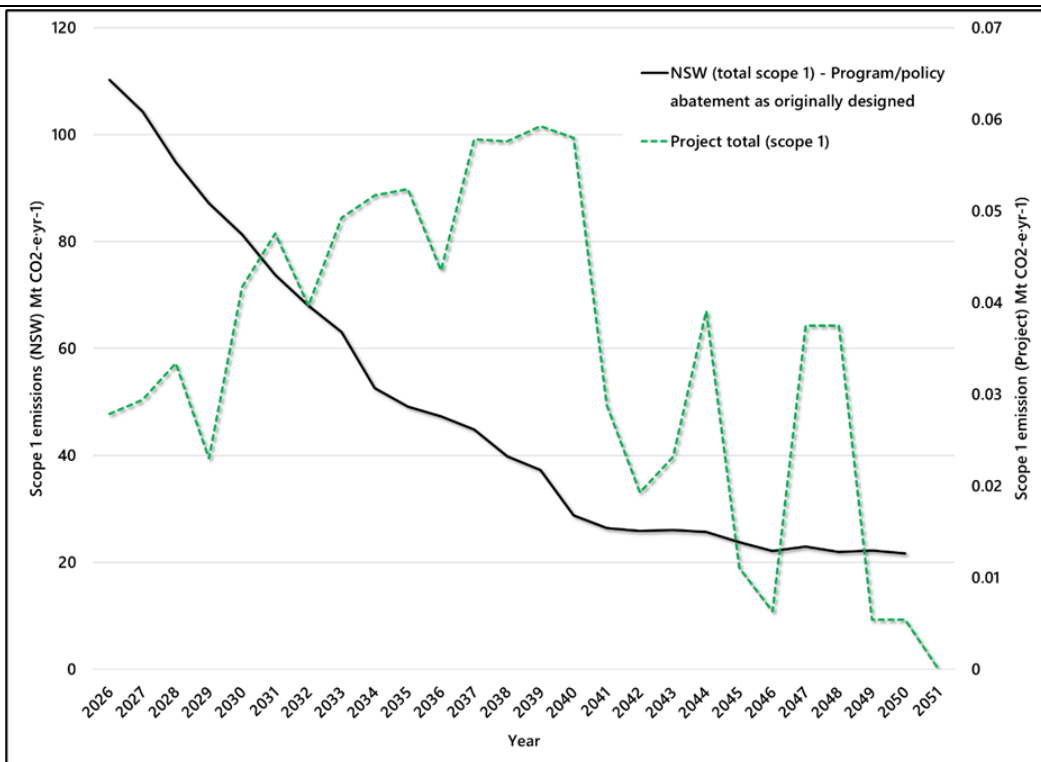
6.10.7.1 Emissions Trajectory

Figure 6.10.3 presents the anticipated scope 1 emission trajectories for NSW from 2026 to 2050, as prescribed under the GHG Guide, and for the Project. Northstar (2025b) found that emissions for the Project are expected to account for a maximum of 0.2% and an average of 0.09% of the total NSW scope 1 emissions in any year along that trajectory.



Source: Northstar (2025b)

Figure 6.10.2
Emissions intensity comparison of Project and other mineral sands projects



Source: Northstar (2025b)

Figure 6.10.3
Comparison of NSW net zero and Project Scope 1 emission trajectories (no abatement)

The scope 1 emissions trajectory for the Project is non-linear, is dominated by diesel usage and is broadly a function of material movements over the life of the Project. However, Northstar (2025b) notes that despite an increase in scope 1 emissions during the first 15 years of the Project, there is a general downward trend over the remaining 13 years.

6.10.7.2 Project Goals

The following outlines specific emission reduction goals for the Project.

Scope 1 Emissions

- Aim for a 25 % reduction in scope 1 emissions by 2030 when compared to the Project baseline.
- Aim for a 55 % reduction in scope 1 emissions by 2035 when compared to the Project baseline.

Targeting the above emissions reductions would ensure that the Project emissions trajectory matches the NSW Net Zero targets and goals.

The above emissions reductions would be targeted primarily through the adoption of the measures outlined in Section 6.10.5, which includes a GHG Management and Energy Efficiency Plan.

Detailed activity data would be collated with GHG emissions calculated at the end of each financial year and compared to the targets above. The effectiveness of the GHG management measures would be reviewed annually.

A review of the potential for use of biodiesel/blends in site equipment would be performed prior to the operational phase of the development. It is likely that to meet a scope 1 emissions reduction of 25 % by 2030 would require approximately 30 % of diesel fuel in plant and mobile equipment to be B100 biodiesel. To achieve the 55 % reduction in scope 1 emissions by 2035 would require approximately 70 % biodiesel.

Scope 2 Emissions

Project-related scope 2 emissions are anticipated to reduce over time, as the NSW electricity grid is decarbonised. Towards the end of the operational phase of the Project, calculated scope 2 emissions are approximately 9 % of the peak in year 1 of operation.

The Applicant has committed to purchasing a minimum of 30 % of the required electricity from renewable sources, including externally contracted and certified renewable sources.

6.10.8 Conclusion

GHG emissions for the 26 years of the Project life have been calculated, with the emissions intensity shown to be comparable to other mineral sands projects. The emissions reduction trajectories required by the NSW Government to meet net zero commitments have been examined, and mitigation measures provided to ensure that the Project emissions trajectory does not compromise those net zero goals.

6.11 Agriculture

6.11.1 Introduction

The Soil and Land Capability Assessment, including an assessment of the agricultural impacts, for the Project as exhibited was prepared by Sustainable Soils Management and is presented as Appendix 7 of the EIS (SSM, 2024). Section 6.10 of the EIS presents a summary of that agricultural impact assessment.

The EIS and SSM (2024) were reviewed by a range of agencies who each provided agricultural-related submissions. These submissions are presented in detail in the *Submissions Report*. The Department of Primary Industries – Agriculture provided comment on the EIS and SSM (2024), stating that the SEARs have been adequately addressed and that the potential impacts on, and mitigation measures for, grazing properties by the mining and rehabilitation operations have been adequately described.

An updated *Soil and Land Capability Assessment* for the amended Project was prepared by SSM and is presented as **Appendix 7** and is referred to hereafter at SSM (2025). The following subsections provide a summary of those aspects of the assessment that have changed as a result of the proposed Amendment.

6.11.2 Existing Environment

The soil and land capability within the Soil Survey Area is described in Section 6.4.4. In summary, SSM (2025) identified five soil associations including the following.

- Dunefield and Sand Plains-Dunes
- Dunefield and Sand Plains-Swales
- Blanchetown Clay
- Lunettes
- Lunettes with Copi
- Lake Floor East

The Lake Floor East soil association was determined to have Land and Soil Capability Classifications of Class 8 (extremely low capability land). All other Soil Associations were determined to have Land and Soil Capability Classifications of Class 6 (low capability land).

The land within the Mine Site is used for very low intensity grazing, predominantly with sheep and goats. Harvesting of feral goats is also commonly undertaken.

6.11.3 Potential Impacts

The chief Project-related impact on agricultural productivity would be the temporary exclusion of grazing from operational areas for both the life of the amended Project and any subsequent rehabilitation period required to restore the rehabilitated landform to an acceptable level of agricultural productivity.

The following discussion regarding potential impacts to agricultural productivity centres on the proposed Project-related disturbance and does not account for any potential biodiversity offsetting arrangements (e.g. stewardship sites) which may result in the permanent removal of areas from agricultural land use.

6.11.4 Avoidance, Management and Mitigation Measures

The measures outlined in Section 6.10.4 of the EIS remain unchanged and will be implemented for the amended Project

6.11.5 Assessment of Impacts

Table 6.11.1 presents a summary of land uses reported by NSW DPI (2025) as extracted from the NSW Landuse 2017 v1.2 dataset. In summary, approximately 83% of the area of agricultural holdings within the Wentworth-Balranald Region are used for grazing, with the remainder used for cropping (4%) or other purposes (SSM, 2025). Cropping is primarily undertaken close to major water sources, with no land within the Mine Site used for cropping.

Table 6.11.1
Land Uses in the Wentworth Shire LGA

Landuse	Area (ha)	Proportion
Agriculture		
Grazing native vegetation	2,157,754	82%
Cropping	108,048	4%
Grazing modified pastures	31,492	1%
Irrigated perennial horticulture	10,845	0.4%
Grazing irrigated modified pastures	1,283	0.05%
Irrigated cropping	775	0.03%
Land in transition	739	0.03%
Irrigated seasonal horticulture	735	0.03%
Irrigated land in transition	676	0.03%
Intensive animal production	103	0.004%
Intensive horticulture	33	0.001%
Subtotal	2,312,483	
Non-Agriculture		
Nature conservation	182,435	7%
Water	114,622	4%
Transport, urban and support	6,051	0.2%
Forests	5,229	0.2%
Mining	2,764	0.1%
Source: SSM (2025) – after Table 5.2		

Table 6.11.2 presents the annual value of agricultural production for the 2020/2021 financial year sourced from ABS (2021). In summary, grazing-related activities generated approximately \$43 million, or \$20 per grazed hectare. By contrast, grain cropping returned approximately \$276 per hectare of cropping land.

Table 6.11.2
Annual Value of Agricultural Production 2020/2021

Product Type	Value (\$ million)
Sheep and lambs	34
Meat cattle	9
Milk	0.005
Pigs	0.026
Other animals for meat	0.1
Grain and hay	30
Tree crops	202
Vegetables	20
Nurseries and Turf	7
Total	302
Source: SSM (2025) – after Table 5.3	

Table 6.11.3 presents stocking rates determined by ABS (2023) for the Wentworth LGA in the 2020/2021 financial year. These stocking rates have been converted to Dry Sheep Equivalent (DSE) by SSM (2025) using the conversion rates of Millear *et al* (2003). In summary, SSM (2025) determined that the Wentworth LGA had an estimated stocking rate of 451,812 DSE or 0.21 DSE/grazed ha.

Table 6.11.3
Estimated Stocking Rate for the Wentworth Shire LGA

Stock Class	Total Number	DSE/Animal	Estimated Dry Sheep Equivalent
Breeding ewe mated	188,629	1.3	245,217
Lambs marked	145,455	0.0 ¹	-
Dry ewes and wethers	69,408	1.0	69,408
Breeding cows ²	2,325	13.0	186,238
Calves	2,325	0.0 ¹	-
Dry cows, heifers and steers	9,675	10.0	96,754
Other Livestock (Goats assumed)	10,203	1.0	10,203
Total			451,812
Note 1: Lamb and calf feed requirement included with mother			
Note 2: Assume that 100% calving, so cows mated equal to calves			
Source: SSM (2025) after Table 5.4			

SSM (2025) expects that a typical sheep enterprise in the vicinity of the Mine Site would involve a self-replacing flock of Dorper bred sheep, with ewes bred on farm, rams purchased from studs, and lambs and ewes older than breeding age being sold. Based on an estimated gross margin of \$103.3/ewe and a DSE rating of 2.8 DSE per ewe (DPI, 2024), a gross margin of \$37/DSE was estimated. By combining the gross margin of \$37/DSE with the average stocking rate of 0.33 DSE/ha, SSM (2025) concludes that an annual gross margin of approximately \$12.21/ha reflects the value of agricultural production for land classed as Land and Soil Capability Class 6 in the vicinity of the Mine Site.

By contrast, SSM (2025) found that land classed as Land and Soil Capability Class 7 or Class 8 would have a stocking rate of zero and therefore a nil gross margin.

Based on the above, and the area 2,508 ha of Class 6 land to be disturbed within the 3,798ha in the disturbance footprint, the current carrying capacity of the Mine Site is estimated to be 299 Dorper ewes. Thus, SSM (2025) determined that the pre-mining annual gross margin of that land would be approximately \$30,622.

SSM (2025) found that there will be a change of 561ha of land from LSC 8 class to LSC class 6 land as a result of the rehabilitation proposed at the amended Project Site. The Infrastructure Area and that section of the Off-path Storage Facility within Nulla Station would be returned to Native Ecosystem – Grazing, while the remainder of the disturbed land would be returned to Native Ecosystem – Nature Conservation or Water Management Areas – Salt Pan.

Based on the above and the fact that the exist agricultural productivity of the Mine Site is low, SSM (2025) determined that the Project would have minimal impact on agriculture.

6.12 Radiation

6.12.1 Introduction

Section 6.11 of the EIS presents an assessment of the radiation, hazards and public safety aspects of the Project as exhibited. That assessment focused on four potential risks as follows.

1. radiation risks associated with the Monazite Product;
2. unauthorised access to the Mine Site or Rail Facility;
3. the handling, storage and disposal of hazardous materials; and
4. potential for bushfire.

The amended Project would not alter the risk levels associated with items 2 to 4 above and these risks are not discussed further.

During the exhibition of the EIS, a number of public submissions raised radiation-related matters, and the Department of Planning, Housing and Infrastructure requested additional information on radiation. Those requests may be summarised as follows.

- *The air quality impact assessment [for] the EIS does not [include] an assessment of likely radioactive dust emissions from the proposal. The Department requires that you provide the additional modelling and results for the above-mentioned aspects.*
- *Provide a technical note, including a quantitative assessment of radiative dust based on the available concentrations measured in the collected samples. Compare the results against the current/existing criteria.*

In light of this, the Applicant commissioned DBH Radiation Pty Ltd to prepare two assessments as follows.

- A *Public Radiation Risk Assessment* is presented as **Appendix 14a** and referred to hereafter as DBH (2025a).
- An assessment of *Environmental Radiation Impacts (Non-Human Biota)* presented as **Appendix 14b** and referred to hereafter as DBH (2025b).

This subsection presents an overview of that assessment.

6.12.2 Statutory Setting

6.12.2.1 Mining and Processing Operations

The principal legislation for the regulation of radiation protection of people and the environment in NSW is the *Protection from Harmful Radiation Act 1990* (Radiation Act) and the associated *Protection of Harmful Radiation Regulation 2013* (Radiation Reg). The objects of the Act include the following.

*“to secure the protection of **persons** and the **environment** from exposure to ionising and harmful non-ionising radiation to the maximum extent that is reasonably practicable, taking into account social and economic factors and recognising the need for the use of radiation for beneficial purposes,*

...
to promote the ecologically sustainable development principles.”

DBH (2025a and 2025b) have been prepared to assess the Project’s consistency with the above.

The Radiation Act is typically administered by the Environment Protection Agency. However, Clause 47 of the Radiation Reg states that powers under the Radiation Act in so far as they apply to a mine site, are to be administered by an officer appointed by the Secretary of Regional NSW. As a result, it is presumed that the Resources Regulator would regulate radiation related matters for the Applicant’s workers within the Mine Site while the NSW EPA will regulate protection of the environment and members of the public external to the Mine Site.

The document *Guidance for Licensing of Mineral-sand Mining that Generates Radioactive Residues* (NSW DECC, 2009) states that the *Code of Practice for the Radiation Protection and Radioactive Waste Management in Mining and Mineral Processing* (the Mining Code) published by the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA, 2005) must be complied with. This is a national code of practice governing how radiation protection and radioactive waste relevant to the mineral sands industry are managed.

In addition, the *Code for Radiation Protection in Planned Exposure Situations* (the Planned Exposure Code) (RPS C-1, 2020) is the principal document in Australia that sets out the requirements for the radiation protection of occupationally exposed persons, the public and the environment, The document, produced ARPANSA promotes uniformity of radiation protection and practices across all state jurisdictions, and is based on international best practice.

DBH (2025b) states that there is a need to demonstrate, rather than assume, that non-human species living in natural habitats are protected against ionising radiation risks from radionuclides released to the environment by human actions such as those proposed for the Project. The document *Guide for Radiation Protection of the Environment* (ARPANSA, 2015) outlines the framework for protection of the environment from the harmful effects of ionising radiation and the practical aspects of the process through which protection can be demonstrated. The Guide was used as the basis for DBH (2025b).

Finally, Section 21 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) identifies that a “nuclear action” as defined under the Act requires approval from the Commonwealth Minister for the Environment. Section 22(g) of the Act defines a “nuclear action” as “any ... action prescribed by the regulations.” Clauses 2.01 of the *Environment Protection and Biodiversity Conservation Regulations 2000* define a “Nuclear action” as “establishing ... a facility where radioactive materials ... are proposed to be used or stored.” Clause 2.02 of the Regulation references activity values outlined in the *Australian Radiation Protection and Nuclear Safety Regulations 2018* and defines a radioactive material as a material that has an “unsealed source activity value is greater than 10^6 and the unsealed source activity concentration value is greater than 1” with respect to activity values outlined in the *Australian Radiation Protection and Nuclear Safety Regulations 2018*.

In light of the above, the Project may be classified as a “nuclear action” under the EPBC Act and a referral under that Act is in progress.

6.12.2.2 Transportation Operations

ARPANSA has developed the *Code for the Safe Transport of Radioactive Material* (Transport Code') (RPS C-2, 2019) which establishes a national standard for safe transport of radioactive material by road and rail. The document outlines specific requirements relating to packaging, labelling and documentation of radioactive material.

The Transport Code states that the transport of materials containing natural uranium and thorium with an activity concentration of less than 10Bq/g are exempt from the provisions of the Code.

NSW DECC (2009) states that only material defined as a 'Radioactive Substance' must comply with *Transport Code*. Clause 5 of the Radiation Reg defines a 'Radioactive Substance' as a substance with an activity concentration exceeding 100Bq/g.

Notwithstanding the above, for the purposes of the Project, a criterion of 10 Bq/g has been applied for materials to be transported from the Mine Site. As a result, the Transport Code will be relevant for the Project. The Monazite Product is the only product that would exceed the 10Bq/g criterion.

In light of the above, DBH (2025a) states that transportation of Monazite Product from the Mine Site will presumably require a Radiation Management Licence issued by the NSW Environment Protection Authority under Radiation Act.

Finally, the NSW *Dangerous Goods (Road and Rail Transport) Regulation 2022* and the *Australian Code for the Transport of Dangerous Goods by Road & Rail* does not apply in relation to transport of radioactive materials.

6.12.3 Existing Environment and Radiation Sources

DBH (2025a and 2025b) present the radionuclide concentration of in situ materials, as well as intermediate and final products associated with the Project (**Table 6.12.1**). The radionuclide concentration of in situ materials was determined based on laboratory analysis of collected samples.

Table 6.12.1
Radionuclide Content of In Situ and Produced Materials

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Material	Concentrations				
	Uranium Mass(ppm)	Thorium Mass (ppm)	U-238*1 (Bq/g)	Th-232*1 (Bq/g)	Total*1 (Bq/g)
In Situ Materials					
Topsoils and overburden	0.6 – 2.3	3.7 – 8.6	0.021	0.020	0.037
Interburden ²	0.10	0.83	0.0012	0.0034	0.0046
Ore	2 to 3	10 to 12	0.031 ⁴	0.045 ⁴	0.076
Intermediate Products					
Heavy Mineral Concentrate	146	629	1.80	2.550	4.360
Wet Concentration Plant rejects	0.10	0.83	0.0012	0.0034	0.0046
Rare Earth Concentrate Plant rejects	371	2,080	4.62	8.440	13.100
Combined tailings ³	0.38	2.4	0.0047	0.0097	0.014

Table 6.12.1 (Cont'd)
Radionuclide Content of In Situ and Produced Materials

Page 2 of 2

Material	Concentrations				
	Uranium Mass(ppm)	Thorium Mass (ppm)	U-238*1 (Bq/g)	Th-232*1 (Bq/g)	Total*1 (Bq/g)
Final Products					
Primary Ilmenite	24	28	0.30	0.11	0.41
Secondary Ilmenite	42	96	0.52	0.39	0.91
Monazite	3,094	51,400	38.20	208.60	246.90
Non-magnetic concentrate	187	311	2.31	1.26	3.57
Note 1: Concentrations for Uranium and Thorium of in situ materials are based on average mass concentrations of collected samples					
Note 2: Interburden values based on the values for the Rare Earth Concentrate Plant reject material					
Note 3: The combined tailings comprise the combined Wet Concentration Plant and Rare Earth Concentrate Plant rejects.					
Note 4: Average concentration					
Source: DBH (2025a) – after Tables 1 and 2 and DBH (2025b) - after Table 1					

The radionuclide concentration of intermediate and final products was determined based on detailed metallurgical process development test work and studies on several bulk samples representative of the ore. These studies were used to determine the uranium and thorium mass concentrations in ore, products and tailings.

6.12.4 Assessment Methodology

6.12.4.1 Public Risk Assessment

Risk Sources

Potential Project-related radiation hazards to members of the public from the mining and processing of heavy minerals arise through three principal pathways:

- external irradiation;
- inhalation; and
- ingestion.

The potential contribution of each exposure pathway will depend on many factors and will differ for each project. Potential exposure pathways to members of the public from the Copi Mineral Sands Project may arise from:

- off-site releases of radioactive dust or gas;
- contamination of food and water supplies due to the migration of radionuclides from the Mine Site; and
- dispersal of radioactive material during transportation operations.

Dose Limits

The potential for noticeable health effects associated with exposure to radiation is related directly to the total exposure or dose received. For biological systems, this is expressed in terms of micro sieverts (μSv).

The risk of a radiation-related effect on an individual is the sum of all exposure pathways, including Project-related and non-Project related. Non-Project related risks could include background radiation in the environment, including from natural materials and cosmic radiation, and additional radiation sources, including from medical and other sources.

Schedule B of the Planned Exposure Code identifies that the annual dose limit for a member of the public is 1mSv or 1,000 μSv . The limit has been set conservatively low, and considerably less than the annual dose limit for an occupational worker of 20,000 μSv averaged over 5 consecutive years.

The 1,000 μSv dose limit is an administrative limit only and is not a threshold value for a health effect. Exposure to radiation greater than this limit in one year does not necessarily constitute a significant additional risk of a biological effect. Similarly, exposure to radiation at a level less than this limit does not constitute a “zero” risk scenario, with exposure to any level of radiation, Project-related or otherwise, a potential risk.

Assessment Methodology

DBH (2025a) calculated potential doses using internationally recognised methodologies, relying on conservative assumptions, including the following.

- Maximum radionuclide content of the project materials.
- Conservative dust emission and composition assumptions.

As a result, DBH (2025a) state that doses calculated are considered upper or ‘worst-case’ annual doses, rather than realistic potential dose outcomes. No mitigation measures have been considered in the calculated doses.

The *Mining Code* recommends that the dose to a Critical Group of individuals most likely to be impacted from the Project, should be assessed. For the purpose of this assessment, residents living at Residence R1 are considered to be the Critical Group (**Figure 3.3**). For the purposes of this assessment, the Critical Group is assumed to reside at Residence R1 24-hours per day, 365 days per year. Two theoretical individuals have been assessed as representative of the Critical Group as follows.

- An adult male
- A 5-year-old child

Finally, DBH (2025a) has assessed two scenarios, namely Years 5 and 17 based on dust deposition rates determined by the updated *Air Quality Assessment* (Northstar, 2025a). That report is presented as **Appendix 12** and is summarised in Section 6.9. These scenarios represent mining operations undertaken closest to Residence R1. For the majority of the life of the Project, mining operations would be undertaken at significantly greater distances from Residence R1 than the assessed.

6.12.4.2 Environmental Risk Assessment

In assessing radiation-related risk for non-human biota within and surrounding the Mine Site, DBH (2025b) has relied upon the calculated energy absorbed per unit mass of a range of organisms or the ‘absorbed dose’ for each class of organism. The units for an absorbed dose is measured in ‘grey’ (Gy). DBH (2025b) calculated the ‘absorbed dose rate’ from long-term exposure to radiation for each class of organism in ‘microgray per hour’ ($\mu\text{Gy/h}$).

In assessing the Project’s radiation-related risk to the environment, DBH (2025b) used the ERICA software tool (version 2.0.228), an internationally recognised assessment tool that allows for the estimation of dose rates for non-human biota. The tool uses a three-tiered approach as follows.

- Tier 1 assessment enables sites to be screened out where there is a negligible radiological risk to non-human biota based on a screening dose rate of $10\mu\text{Gy/h}$.
- A Tier 2 assessment allows for the selection of site-specific reference organisms and modification of input parameters to determine dose rates below which there would be no measurable population effect. The tool assumes dose rates of $40\mu\text{Gy/h}$ for terrestrial animals, birds and amphibians and $400\mu\text{Gy/h}$ for plants and other organisms.
- A Tier 3 is a more complex assessment undertaken when the dose rates identified under Tier 1 and 2 are exceeded.

DBH (2025b) assessed two exposure scenarios as follows.

- Scenario 1 – Resuspension of airborne radioactivity from operations.
This scenario assumed the following. These are highly conservative assumptions based on the results of Northstar (2025a).
 - Dust deposition rate of $1\text{g/m}^2/\text{month}$. Northstar (2025a) predicted deposited dust rates of less than $0.1\text{g/m}^2/\text{month}$.
 - Ore contributes 100% of the deposited dust. Northstar (2025a) identified that ore and mineral concentrates combined would comprise $<0.3\%$ of all dust emissions for the Project.
 - The deposited dust is homogeneously distributed through the top 2 cm of soil.
 - Dust deposition occurs for a period of 17.2 years
- Scenario 2 – Vegetation growing on and fauna occupying or burrowing into the rehabilitated landform containing buried tailings.

DBH (2025b) determined that this scenario would not present an elevated radiation-related risk for the following reasons.

- Tailings would be buried at sufficient depth below an overburden cap and are considered inaccessible.
- The tailings have an activity concentration less than the overburden cap (see **Table 6.12.1**).

- Soil concentrations on the final landform would be comparable to existing background levels and less than that considered as a result of dust deposition considered in Scenario 1.

6.12.5 Impact Assessment

6.12.5.1 Public Risk Assessment - Mining, Processing and Transport Operations

6.12.5.1.1 Critical Group

Section 9 and Appendix B of DBH (2025a) present the calculated maximum annual effective dose for the Critical Group during mining, processing and transportation operations. The following presents an overview of each of the estimated exposure pathways. **Table 6.12.2** at the end of this subsection presents the results of this assessment.

Inhalation of Airborne Dust During Operations

Suspended particulates from the Mine Site have the potential to be inhaled by a member of the Critical Group. DBH (2025a) calculated the maximum annual effective dose based on the following conservative assumptions.

- An Activity Median Aerodynamic Diameter (AMAD)³ dust particle size of 1µm and an annual average concentration of 50µg/m³. While not directly comparable, Northstar (2025a) estimate that the maximum annual average incremental concentration of PM_{2.5} at Residence R1 because of the Project alone would be <0.1µg/m³.
- 20% of the suspended particulates are ore. The emissions inventory presented in Appendix C of Northstar (2025a) identifies that ore and mineral concentrates combined would comprises less than 0.3% of all dust emissions.
- Outdoor exposure of 12 hours per day, 365 days per year.

Exposure to Radon and Thoron

Inert radioactive gases are released from minerals containing uranium and thorium. DBH (2025a) state that the radioactive gases of interest are radon-222 and radon-220. From the perspective of potential radiation exposures from these radioisotopes, the most important radionuclide is radon-222 (commonly termed ‘radon’ gas), being a decay product of radium-226. Radon-222 has a relatively longer half-life (3.8 days) compared with radon-220 (55 secs). Radon-220 is a member of the thorium-232 natural series and is commonly termed ‘thoron’ gas.

DBH (2025a) states that the physical structure and grain size of the heavy minerals mitigates the quantities of radioactive gasses that could escape from the sand grains. Furthermore, any radioactive gas released would be rapidly diluted and dispersed. Therefore, it is likely that in an open pit during mining, radioactive gas concentrations would be close to ambient levels and this exposure pathway is not considered significant.

³ AMAD is a measure of the size distribution of aerosol particles, typically used in the context of radioactive aerosols. It represents the diameter where 50% of the aerosol's activity is associated with particles larger than the nominated size, and 50% less than the nominated size.

Consumption of Vegetables or Crops Grown in Impacted Soils

The scenario assumes that 100% of the vegetables consumed by a member of the Critical Group as locally grown at Residence R1. While growing of vegetables in the vicinity of the Mine Site is not typically considered viable, this exposure pathway has been included for completeness.

DBH (2025a) initially calculated baseline radionuclide doses that would be received as a result of consumption of vegetables grown in existing topsoils, namely without the Project. This was compared with expected radionuclide doses that would be received from vegetables grown in soil following completion of mining operations. In determining the composition of soils at the end of mining operations, DBH (2025a) assumed a deposition rate of $1\text{g/m}^2/\text{month}$ for the life of the Project, with 20% of the deposited dust being ore. Northstar (2025a) determined a worst-case dust deposition rate from the Project alone at Residence R1 of $<0.1\text{g/m}^2/\text{month}$. In addition, Northstar (2025a) identifies that ore and mineral concentrates combined would comprise approximately 0.2% of all dust emissions.

Consumption of Contaminated Soils

The inadvertent ingestion or swallowing of soil is an important human exposure pathway and could include:

- ingestion of soil as a result of farming activities; or
- inadvertent consumption of soils by children during daily activities.

DBH (2025a) assumed that 20% of the ingested soil has a radioactive content equivalent to that of the ore.

Consumption of Personal Tank Rainwater

Deposited dust from the Mine Site that settles on the roof of Residence R1 could be washed directly into a rainwater tank and consumed by residents. DBH (2025a) considered the following in relation to this exposure pathway.

- Soluble component – namely that component of the dust that could be dissolved into rainwater. DBH (2025a) notes that heavy minerals, are naturally highly insoluble, particularly the uranium component. As a result, the dust collected in rainwater tanks is expected to not contribute to the existing soluble radioactive component and is unlikely to be identifiable from any natural occurring variability.
- Insoluble component – Consumption dust suspended in the water is considered unlikely as dust, particularly heavy mineral, would settle at the bottom of the tank. In addition, any household water filtration system would remove the insoluble fraction should it resuspend in the tank.

Notwithstanding, DBH (2025a) calculated the maximum annual effective dose for an occupant of Residence R1 based on the following assumptions.

- 50% of the deposited material is ore.
- The concentration of dust in rainwater from the tank is 20mg/L .
- 100% of the resident's annual water consumption is rainwater from the tank.

Consumption of Locally Grown Livestock

The transfer of radionuclides to livestock via the ingestion of contaminated feed is the major pathway for livestock that determines radionuclide content in animals.

Notwithstanding, DBH (2025a) state that human consumption of any grazing animals and related produce would be an inconsequential exposure pathway relative to other pathways assessed.

Dust Inhalation and Ingestion Generated from Products and Ore Removed from the Mine Site

This exposure pathway relates to the partner of a worker responsible for the regular handling of potential contaminated work clothing for the purpose of laundering. For the purposes of this assessment, it is assumed that the partner of the worker is a member of the Critical Group.

DBH (2025a) states that dust inhalation or ingestion from material transferred off-site on clothing is considered negligible

Exposure During Transport of Products

DBH (2025a) assessed three potential exposure pathways, each associated with transportation of the mine products via the Silver City and Barrier Highways, local roads in Broken Hill and the rail network. For the purposes of this assessment, it is assumed that a member of the Critical Group travels these roads or resides at a residence along the transportation routes.

Exposure to a passenger in a vehicle following a truck loaded with product

DBH (2025a) state that the gamma radiation dose for an individual in a passenger vehicle following a truck loaded with mine products at a distance of 25m would be indiscernible from natural background levels.

However, for the sake of completeness, DBH (2025a) assumed a passenger in a vehicle following behind a truck transporting Monazite Product (the material with the highest Uranium and Thorium concentration) at an average separation distance of only 5m (for example in the Broken Hill urban area) on multiple occasions totalling 1 hour per year.

Exposure to a resident living on a Transportation Route

DBH (2025a) calculated the maximum annual effective dose of a resident living adjacent to the transportation route for Monazite Product based on the following conservative assumptions.

- A 2-second exposure or pass by time, equating to 3 hours per annum.
- A separation distance of 10 metres between the truck and a resident.

Exposure waiting at a rail crossing while a freight train of concentrate passes

DBH (2025a) calculated the maximum annual effective dose of a passenger in a stationary vehicle at a railway crossing whilst a train loaded with Non-magnetic or Ilmenite Product is passing by based on the following conservative assumptions.

- An exposure time equating to 2 hours per annum.
- A separation distance of 2m between the train and the passenger in the vehicle.

Summary of Calculated Maximum Annual Effective Dose

Table 6.12.2 presents a summary of the results calculations undertaken by DBH (2025a) based on the above assumptions. DBH (2025a) notes that the calculated doses should be considered upper ‘worst-case’ annual doses that are unlikely to be exceeded even in the worst possible meteorological conditions.

In summary, the calculated maximum annual doses of 5.2µSv for an adult, and 9.3µSv for a child, are both less than 1% of the 1,000µSv annual dose limit for a member of the public.

Finally, for context, DBH (2025a) states that the natural background annual radiation dose is estimated to be approximately 1,500µSv per year (ARPANSA 2015).

6.12.5.1.2 Non-critical Group

DBH (2025a) state that the calculated maximum annual doses presented in Table 6.12.2 are based on highly conservative assumptions for persons residing at Residence R1. Annual doses that would be received by persons not residing at Residence R1 would be less than those identified above.

Table 6.12.2
Summary of Calculated Maximum Annual Effective Dose

Exposure Pathway	Annual Dose (µSv)	
	Adult Male	Child (5 years-old)
Inhalation of Airborne Dust During Operations	1.2	0.8
Exposure to Radioactive Gas	negligible	negligible
Consumption of Vegetables or Crops Grown in Impacted Soils ¹	1.3	2.4
Consumption of Contaminated Soils	0.5	3.1
Consumption of Personal Tank Rainwater	0.9	1.7
Consumption of locally grown livestock	negligible	negligible
Inhalation and ingestion of dust during laundering of contaminated clothing	negligible	negligible
Exposure to a passenger vehicle following a truck loaded with product	0.8	0.8
Exposure to a resident living on a Transportation Route	0.1	0.1
Exposure waiting at a rail crossing while a freight train of concentrate passes	0.4	0.4
Total	5.2	9.3
Dose Limit	1,000	1,000
Note 1: Assumes 17 years of dust deposition		
Source: DBH (2025a) – after Table 6		

6.12.5.2 Public Risk Assessment - Emergency Scenarios

DBH (2025a) considered a scenario of a traffic incident that resulted in mine products being spilt on the ground. In determining the radiation dose that a member of the public may receive, DBH (2025a) assumed the following.

- Separation distance of 3m for 1 hour.
- The spilt product is not covered, and the suspected dust concentration is 1mg/m³.

DBH (2025a) determined that the estimated maximum dose for the member of the public for an incident involving Monazite Product, using conservative assumptions, would be $49\mu\text{Sv}$ from a single exposure. For mine products other than Monazite Product, the estimated maximum dose would be less than $1\mu\text{Sv}$ from a single exposure.

This assessment assumed that no emergency controls would be implemented. In reality, any incident involving mine products would trigger the Project's Emergency Management Plan which would include establishing exclusion zones around any incident and management by appropriately trained and equipped personnel only.

6.12.5.3 Public Risk Assessment - Post Mining

DBH (2025a) assessed gamma radiation-related risks for the following exposure pathways following rehabilitation of the Mine Site.

- Radiation associated with buried tailings.
As the tailings would have a radionuclide concentration less than the ore and the material would be covered by interburden and overburden, gamma radiation levels at surface would be comparable or less than the current natural pre-mining conditions.
- Radon and Thoron gas associated with buried tailings.
As the concentration of Radon and Thoron gas emitted from the ore would be indiscernible from background levels, emissions of such gasses from the tailings would be similarly indiscernible from background levels. Covering of the tailings by interburden and overburden would further reduce emissions of such gasses.
- Seepage of radionuclides from tailings into groundwater or surface water.
Seepage of radionuclides from tailings into the existing groundwater system, would be identical to or less than the existing pre-mining conditions for the following reasons.
 - Processing of the ore would utilise purely physical methods. As a result, the leachability properties of key radionuclides would not be altered.
 - The overall radionuclide levels in tailings would be lower than that of the original ore.
 - Groundwater is already impacted by radionuclides naturally present in the buried ore body.

6.12.5.4 Environmental Risk Assessment Results

Table 6.12.3 presents the results of the environmental risk assessment. In summary, the dose rate values for biota within and surrounding the Mine Site are at least two orders of magnitude less than the $10\mu\text{Gy/h}$ screening value applicable to Tier 1 assessments. The highest dose rate was $0.18\mu\text{Gy/h}$ calculated for the White Cypress Pine.

Table 6.12.3
Environmental Risk Assessment Results

Organism	Mass ¹ (kg)	Occupancy Factor ²	Dose Rate per Organism μGy/h)	Tier 1 Screening Value (μGy/h)	Tier 2 Environmental Reference Level ¹ (μGy/h)
Red Kangaroo (<i>Osphranter rufus</i>)	36	100% on soil	0.04	10	40
Emu (<i>Dromaius novaehollandiae</i>)	40	100% in air	0.0020		
Feral Goat	60	100% on soil	0.0048		
Rainbow bee-eater (<i>Merops ornatus</i>)	0.027	100% in air	0.0021		
Chestnut quail-thrush (<i>Cinclosoma castanotum</i>)	0.075	100% on soil	0.0021		
Splendid fairy wren (<i>malurus splendens</i>)	0.01	50% in air, 50% on soil	0.0021		
Pink Cockatoo (<i>Cacatua leadbeateri</i>)	0.37	50% in air, 50% on soil	0.0021		
Little Eagle (<i>Hieraetus morphnoides</i>)	0.8	100% in air	0.0021		
White Cypress Pine (<i>Callitris columellaris</i>)	471	100% on soil	0.18		
Spear grass (<i>Austrostipa nullanulla</i>)	0.2	100% on soil	0.091		
<p>Note 1: Dose rates in which it is proposed that exposure below these values (of chronic exposure), no measurable population effect would occur (IAEA 1992, UNSCEAR 1996).</p> <p>Note 2: Occupancy factor is a measure of the proportion of time a particular organism spends on the ground verses in the air, including perched in trees or other vegetations. The Emu has been assumed to have an axial centre 60cm above ground level and is therefore not considered to be 100% on soil.</p>					
Source: DBH (2025b) – After Tables 3 and 4					

6.12.6 Management and Mitigation Measures

DBH (2025a) states that the estimated worst-case dose level for members of the Critical Group would be less than 1% of the 1,000μSv regulatory annual dose limit. Similarly, DBH (2025b) states that the dose rate values for biota within and surrounding the Mine Site are at least two orders of magnitude less than the 10μGy/h screening value applicable to Tier 1 assessments. As a result, an argument can be made that no additional mitigations are warranted. Notwithstanding, measures that would be implemented minimise radiation doses for occupational workers and general dust mitigation measures would also result in minimising radiation doses for members of the Critical Group.

Section 6.11.2.3 of the EIS presents management and mitigation measures that would be implemented to manage radiation-related risks associated with the Project. Those measures are repeated here for completeness.

General

- Undertake baseline monitoring within the Mine Site, along the Site Access Road, realigned Anabranth Mail Road and Transport Routes and within the Rail Facility prior to the commencement of mining operations.
- Prepare and implement a *Radiation Management Plan* prior to the commencement of mining operations.

- Implement training and monitoring for all workers and visitors appropriate to their individual roles and level of exposure.
- Undertake monitoring of the above areas throughout the life of the Project and following the completion of mining, processing and transportation operations to demonstrate background radiation levels are no higher than pre-mining radiation levels.
- Implement an audit process to ensure compliance with the conditional requirements of all radiation-related licences, approvals and procedures.
- Provide public information in relation to transportation of Mine Products from the Mine Site.

Production, handling and storage of the Monazite Product

- Restrict access to the Rare Earth Concentrate Plant and storage areas to appropriately trained and certified individuals only.
- Ensure that Monazite Product is placed into appropriate sealed containers (205L drums or bulka bags) and is stored in sealed shipping containers labelled in accordance with the *Code for the Safe Transport of Radioactive Material*.
- Ensure that shipping containers containing mine products are appropriately stored on site pending transportation from the Mine Site.
- Ensure that mobile plant exiting the Rare Earth Concentrate Plant is thoroughly decontaminated and tested prior to exiting the plant area.

Transportation from the Mine Site to the Rail Facility

- Ensure that all licences and permits for transportation under the *Code for the Safe Transport of Radioactive Material* are obtained prior to transporting Monazite Product from the Mine Site.
- Ensure that the *Radiation Management Plan*, or an alternate Plan, addresses transportation of mine products from the Mine Site and train personnel in the procedures identified in that document, including:
 - managing radiation hazards during transportation;
 - emergency management and response, including in remote areas; and
 - managing exposure for drivers and the public.
- Ensure that all shipping containers containing mine products are suitably labelled.

6.12.7 Conclusion

Based on the above, the Applicant contends that radiation-related risks to the public associated with the mining, processing and transportation of heavy mineral ore and related products would be significantly below relevant exposure criteria established by APARNSA. Similarly, radiation risks to non-human biota associated with the Project are considered to be negligible.

6.13 Visual Amenity

6.13.1 Introduction

Section 6.13 of the EIS presents an assessment of the potential impacts of the Project as exhibited on visual amenity.

Visual amenity was raised in six public submissions. In summary, those submissions raised the following matters.

- Visibility of the Project as exhibited from Residence R1.
- The success or otherwise of rehabilitation operations and associated visual amenity impacts.
- Adverse impacts associated with the use of lights at night, both direct line of site and sky glow.

The proposed amendment to the Project would limit mining and other activities to Warwick and Nulla Stations. This would very substantially reduce visual impacts for Huntingfield and Sunshine Stations and Residence R1. Notwithstanding, the Applicant acknowledges that visual amenity impacts may still be experienced and that those impacts may be highly subjective. In particular, views that may be acceptable to one person, may not be acceptable to another

The following subsections provide an assessment visual amenity-related impacts associated with the Amended Project.

6.13.2 Existing Environment

Section 6.13.2 of the EIS describes the visual environment within and surrounding the amended Mine Site. In summary, landforms are generally flat to very low hills and residences and public vantage points are widely spaced.

6.13.3 Potential Changes to Visual Amenity

6.13.3.1 General Changes to Visual Amenity

Section 6.13.3 of the EIS describes the potential changes to the visual setting of the Project as exhibited. These include the following.

- Movement of mobile plant operating at the natural and built land surface may be visible at times, particularly as mining operations approach Residence R1 and Nulla Road. Mobile plant operating below the natural surface, including the dredges and Wet Concentration Plant, would be unlikely to be visible as they would generally be below the crest of the Extraction Area. In less elevated sections of the Mine Site, including when mining operations are being undertaken within the Eastern Salt Pan, the dredges and Wet Concentration Plant may be visible from surrounding areas.

- The Temporary Overburden Emplacement would be visible between the commencement of construction of the emplacement in Year 11 and removal in Year 19 from sections of Nulla Road and private land surrounding the Mine Site.
- Fixed plant, in particular the Rare Earth Concentrate Plant which would be up to 47m high, may be visible, from Nulla Road, albeit at a distance of approximately 10km.
- Changed landforms, including the dredge pond, Off Path Storage Facility and the rehabilitated final landform would be visible from sections of Nulla Road and surrounding landholdings.
- Raised dust from the movement of mobile plant within the Mine Site or along the Site Access Road or wind generated dust may be visible during the day from sections of Nulla Road and surrounding landholdings.
- Condensed steam emissions from the Rare Earth Concentrate Plant driers may be visible during periods of cool or humid weather, likely limited to the early morning during winter.
- Direct views of lights from mobile or fixed plant, including the dredges and Wet Concentration Plant, the Infrastructure Area or mobile lighting towers in work areas may be visible at night from sections of Nulla Road and surrounding landholdings.
- Sky glow from lights may be visible during the night from a range of vantage points surrounding the Mine Site.

6.13.3.2 Temporary Overburden Emplacement

The Amended Project includes the proposed Temporary Overburden Emplacement which would be present within the amended Mine Site between Years 5 and 19. The Emplacement would be located close to the western boundary of the amended Mine Site, adjacent to Huntingfield Station and approximately 1.3km from Residence R1. **Figure 6.13.1** presents a visual analysis of the views potentially available to an observer within Huntingfield Station and from Nulla Road. RWC undertook an analysis to quantify potential impacts to visual amenity associated with the Temporary Overburden Emplacement. That assessment included an assessment of those areas that can be seen from Residence R1, as well as an assessment of the proportion of the Emplacement that would be visible from areas to the south and west of the Mine Site.

Seen Area Analysis from Residence R1

In determining those areas that are currently and would be visible from Residence R1, RWC undertook the following.

- A digital elevation model including existing topography and the proposed Temporary Overburden Emplacement was prepared
- An observer location 1.5m above ground level in the vicinity of Residence R1 was established.
- Those areas that would be visible to an observer are that location are shown in green hachure on **Figure 6.13.1**.

In addition to land immediately surrounding the residence, land to the southwest, west and northeast would be visible from the residence.

Views of the Temporary Overburden Emplacement would be obscured by the ridgeline located to the east of the Residence with an elevation of approximately 50m AHD. By contrast, the Temporary Overburden Emplacement would have a maximum elevation of 48m AHD.

In undertaking this analysis, it is noted that the analysis has not considered vegetation surrounding the residence, nor fences or other built structures that may limit visibility of the surrounding landforms. In summary, an observer at Residence R1 is currently able to view sections of Huntingfield Station surrounding the Residence. However, views of the Temporary Overburden Emplacement would not be available from Residence R1.

Visibility of the Temporary Overburden Emplacement

To assess the proportion of the Temporary Overburden Emplacement visible from surrounding areas, a regular 100m x 100m grid was applied across the Emplacement footprint. Visibility analysis was then conducted by placing a receptor point within each grid cell and determining the frequency with which each point was visible from external locations using GIS-based cumulative viewshed modelling. The frequency data was subsequently translated into proportional visibility values, representing the percentage of the Emplacement visible from an external location. The results of that analysis are presented in **Figure 6.13.1**. In assessing these results, areas with a greater than 50% visibility would be able to view most or all of the emplacement. In comparison, areas with less than 50% visibility would be able to see proportionately less of the Emplacement.

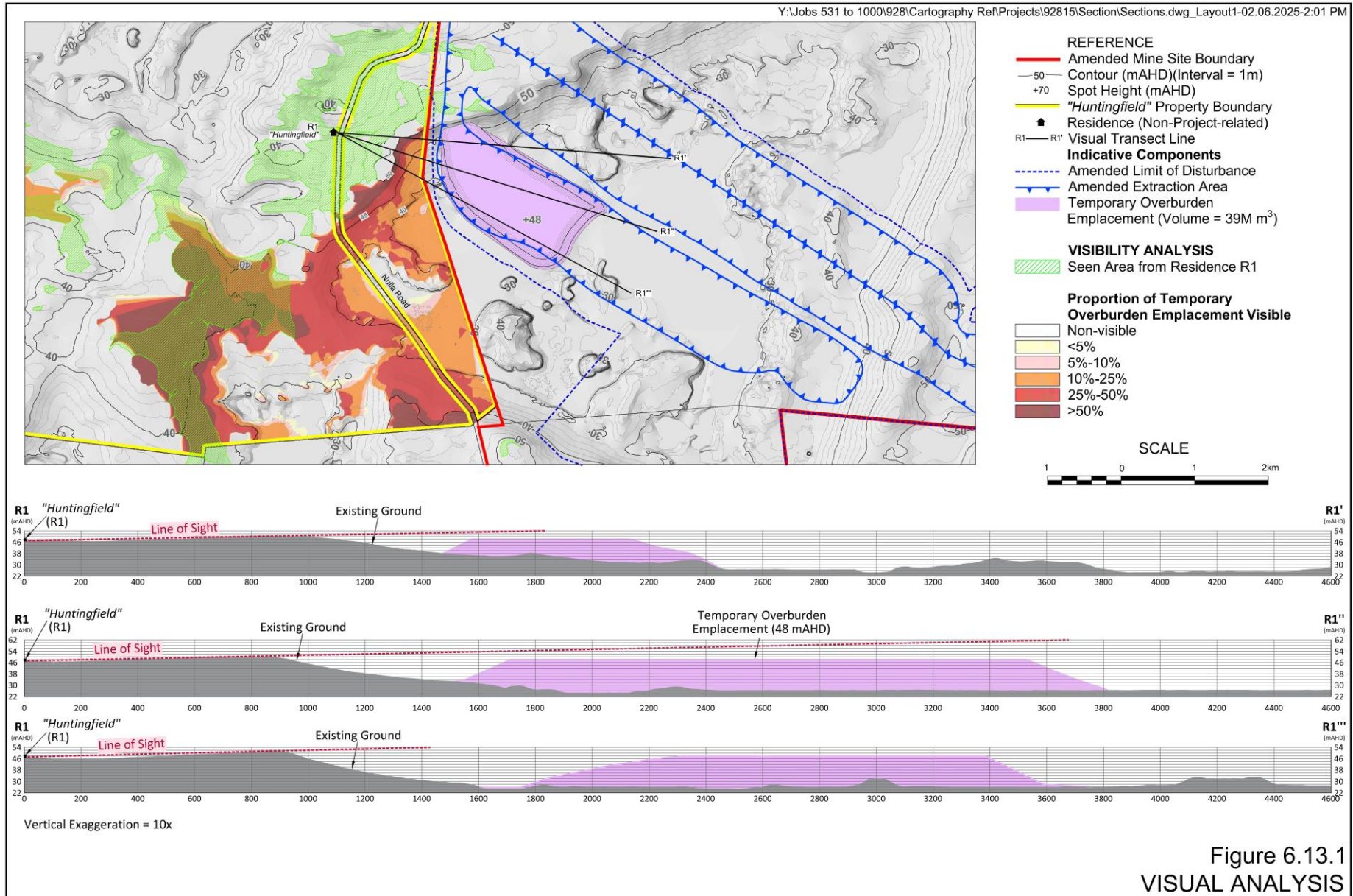
In summary, motorists using Nulla Road would be able to see a large proportion of the Emplacement for short sections of the road, typically less than 1km in length. Observers within Huntingfield Station would be able to see a large proportion of the Emplacement from elevated areas to the south of Residence R1.

As noted above, this analysis has not considered vegetation that may limit visibility of the Temporary Overburden Emplacement and the analysis presented on **Figure 6.13.1** is likely to overstate the proportion of the Emplacement that would be visible.

6.13.4 Management and Mitigation Measures

Section 6.13.4 of the EIS describes the management and mitigation measures for the Project as exhibited. Additional management and mitigation measures that would be implemented would include the following.

- Progressively shape and rehabilitate the Temporary Overburden Emplacement during construction to minimise visual amenity impacts, including preferential construction of the southern and western faces of the Emplacement to provide a visual barrier to limit views of active construction and removal of the Emplacement.



6.13.5 Assessment of Impacts

Section 6.13.5 of the EIS describes the assessment of impacts for the Project as exhibited. Taking into consideration the proposed amendments to the Project, visual amenity impacts of the amended Project may be summarised as follows. As described above, visual amenity impacts are a subjective matter and may be different for different individuals. As a result, particular individuals may be affected by changes in the visual landscape to a greater or lesser extent than described below.

The Mine Site is relatively isolated, with the only non-Project related residence with potential views being Residence R1. An observer at Residence R1 would not have direct views of the activities within the amended Mine Site, including the Temporary Overburden Emplacement. However indirect changes to the visual environment may include the following.

- Dust clouds as a result of vehicle movements or wind-blown erosion. Given the proposed dust management measures proposed (see Section 6.9.7) and fact that raised dust is a feature of the natural environment within the Mine Site, dust-related visual amenity impacts would be negligible.
- Night-time views of the Mine Site in the form of sky glow associated with sections of the Mine Site. Given the limited number of observers present and mitigation measures proposed, sky glow visual amenity impacts are considered to be negligible.

Views of the amended Mine Site would also be available from sections of Nulla Road and Huntingfield Station.

- Given the limited traffic on Nulla Road, visual amenity impacts for users of that road would be negligible.
- It is acknowledged that views of the amended Mine Site would be available to the owners of Huntingfield Station as they move around the property. In particular, the Temporary Overburden Emplacement would be visible from the southeastern section of the property. While acknowledging the subjective nature of visual amenity impacts and considering the proposed management and mitigation measures, the Applicant contends that visual amenity impacts associated with the Amended Project would not be significant.

6.14 Social Impacts

6.14.1 Introduction

The Social Impact Assessment for the Project as exhibited was prepared by Dr Jamie Seaton of Element Environment and is presented as Appendix 14 of the EIS (Element, 2024). Section 6.14 of the EIS presents a summary of that assessment.

During the exhibition period, the EIS and the social impact assessment report (Element, 2024) were reviewed by members of the community surrounding the Mine Site and further afield and a range of submissions including matters relevant the Project's social impacts were raised.

In light of this, the Applicant commissioned Dr Jamie Seaton now with Social Aspect Consulting Pty Ltd to prepare an updated *Social Impact Assessment* for the amended Project, hereafter referred to as Social Aspect (2025). Social Aspect (2025) determined that as the amended Project would not result in a material change to social impacts when compared to the original Project, that a 'basic' level of assessment was adequate for the amended Project. In completing the assessment, reliance was also placed on the updated *Social Impact Assessment Guideline* published in July 2025.

Social Aspect (2025) is presented as **Appendix 15** and this subsection presents an overview of that assessment.

6.14.2 Assessment Methodology

In preparing the amended Social Impact Assessment, Social Aspect (2025) adopted the following methodology.

- Step 1: Meeting with the Applicant and RWC representatives and desktop review
- Step 2: Review submissions received following exhibition of the EIS and the Applicant's community engagement records since the EIS submission
- Step 3: Review of EIS technical studies commissioned for the Amendment Report and presented as **Appendix 4 to 16**.
- Step 4: Analysis of identified social impacts against the impacts described in the original SIA report

6.14.3 Amended Assessment of Impacts

6.14.3.1 Social Impact Desktop Review

Social Aspect (2025) reviewed the proposed amendments and determined that the amended Project would not result in a higher magnitude of negative social impacts to people living in the social locality compared to the original Project because the proposed amendment would:

- reduce the scale of the Project;
- reduce the area of the Mine Site; and
- remove the requirement to close and realign Nulla Road.

Similarly, Social Aspect (2025) determined the proposed amendment would not result in increased positive impacts to people living in the social locality compared to the original Project.

6.14.3.2 Additional Social Impacts

Social Aspect (2025) undertook a review of the Applicant's consultation records and public submissions received in relation to the EIS for the Project. Based on that review, four negative social impacts were identified as either having a higher level of materiality to the assessment when compared with the assessment for the EIS. There are as follows.

- Community (trust) – Element (2024) identified trustworthiness of the Applicant as a factor which negatively impacted the community. This aspect was raised on eight occasions in EIS submissions and has therefore been considered material.
- Livelihoods and health/well-being (water contamination) – Anxiety about water availability was assessed for the EIS, but not anxiety about water contamination. Feelings of anxiety were expressed on ten occasions in EIS submissions and are therefore considered material.
- Health and well-being (radiation) – This issue was raised in 16 submissions and is therefore considered material for the assessment.
- Decision-making systems (lack of community engagement) – The issue of insufficient engagement by the Applicant was raised in eight submissions and is therefore considered material for the assessment.

6.14.3.3 Social Locality

Element (2024) considered both the Wentworth and Broken Hill LGA's as the social locality for the Project. In considering the amended Project, Social Aspect (2025) determined that the amended Project would not require an adjustment to the social locality for the following reasons.

- No additional land would be distributed.
- The amended Project would have similar methods and intensity as that described in the EIS.
- The amended Project would likely have similar social impacts to that described in the EIS.

6.14.3.4 Project Stakeholders

Social Aspect (2025) determined that key project stakeholders, namely landholders in the vicinity of the Mine Site, are unchanged from those identified in the EIS. Social Aspect (2025) contacted two key landholders with an invitation to discuss the amended Project. One declined the invitation until the full Amendment Report (including updated technical studies) was made available for review. The second landholder did not respond to the invitation.

6.14.3.5 Assessment of Amended Impacts

Table 5 of Social Aspect (2025) presents an assessment of likely changes to the social impacts of the Project as a result of the proposed Amendment. Most assessed impacts were determined to have a low likelihood that the proposed amendment would alter the findings of Element (2024). **Table 6.14.1** presents an overview of all aspects that Social Aspect (2025) identified as having a likelihood of a changed impact that is greater than ‘low’.

Table 6.14.1
Potential to Change the Originally Assessed Social Impacts

Relevant Social Impact	Findings of Element (2024)	Likelihood that the Proposed Amendment would Alter Findings of Element (2024), and Nature of Impact
Community (trust)	Negative impact for community cohesion and trust following range of interactions between the Applicant and a landholder during exploration activities and the EIS development period.	Trustworthiness the Applicant was identified as a negative impact on community in the EIS submissions. Commentary on this issue in the EIS submissions was more prominent than in the data analysed for the original SIA. On this basis it is predicted the proposed Project amendment would create a social impact of medium significance (possible likelihood, moderate magnitude) if it proceeds.
Livelihoods and health/well-being (water contamination)	Nil. Anxiety about water <i>availability</i> was assessed in the original SIA report, but not anxiety about water <i>contamination</i> .	A number of EIS submissions expressed fear that heavy metals/radioactive material would contaminate on-farm and public water systems. Despite the findings of specialist assessments that the proposed amendment would have no heavy metal or radiation impacts (see Sections 6.9 and 6.12), its prominence in the EIS suggests the <i>perceived impact</i> exists. The impact is deemed to be of medium significance (possible likelihood, moderate magnitude).
Decision-making systems (lack of community engagement)	Nil.	Negative sentiment was conveyed in EIS submissions in relation to the community engagement efforts of the Applicant. Some landholders and other stakeholders expressed criticism about the level of information they had received about the Project. Based on the EIS submissions, the proposed amendment is predicted to have an impact of medium significance (possible, moderate magnitude) for the decision-making ability of people in the social locality unless this scenario is addressed.

6.14.4 Amended Mitigation Measures

Social Aspect (2025) recommended the following mitigation measures to address the additional potential social impacts identified in **Table 6.14.1**.

- Provide a briefing in non-technical language to interested landowners on potential radiation and groundwater-related impacts. If required, representatives of the specialist consultants who undertook those assessments should be present.

6.14.5 Conclusion

Social Aspect (2025) concluded that the social locality, project stakeholders, and both positive and negative social impacts predicted to be created by the amended Project would be largely consistent with original Project, with the exception of the following additional social impacts identified in EIS submissions

- Health and wellbeing: anxiety about the potential impact of public exposure to radioactive material is assessed to have an impact of medium significance on health and well-being
- Community: Lack of trust in the Applicant is predicted to create a social impact of medium significance.
- Livelihoods and health/well-being: fear that heavy metals/radioactive material and mining operations generally would contaminate on-farm and public water systems, creating an impact of medium significance.
- Decision-making systems: negative sentiment towards the Applicant's community engagement efforts is predicted to have an impact of medium for people in the social locality.

6.15 Economic Impacts

6.15.1 Introduction

The Economic Impact Assessment for the Project as exhibited was prepared by Synergies Economic Consulting and is presented as Appendix 15 of the EIS (Synergies, 2024). Section 6.15 of the EIS presents a summary of that assessment.

During the exhibition period, the EIS and the economic impact assessment report (Synergies, 2024) were reviewed by relevant government agencies and members of the community surrounding the Mine Site. No submission related to the economic assessment was made by government agencies, however, a range of submissions were received from members of the community. Some submissions were strongly supportive of the Project, stating that it would bring a much-needed economic boost to the local economy. Other submissions questioned the validity of the assessment, the assumptions used and conclusion reached.

In light of the change to the proposed activities, including limiting operations to Warwick and Nulla Stations, the Applicant commissioned Synergies to prepare an updated *Economic Impact Assessment* for the amended Project, hereafter referred to as Synergies (2025) and presented as **Appendix 16**. This subsection presents an overview of that assessment.

6.15.2 Approach to the Economic Impact Assessment

Consistent with the Synergies (2024), Synergies (2025) relied upon the document the *Guideline for the Economic Assessment of Mining and Coal Seam Gas Proposals* (DPIE, 2015), as well as information provided by the Applicant. Key assumptions remained unchanged, with the assumptions related to the proposed construction and mining schedule and material movement and mine product schedules updated.

Consistent with the previous assessment, Synergies (2025) assessed the following.

- A cost-benefit analysis (CBA).
- The net benefits of the Project to the NSW community.
- A local effects analysis of the amended Project, including the employment, non-labour project expenditure, and environmental and social effects.
- An assessment of the flow-on economic impacts attributable to the amended Project.
- An assessment of the impacts of the Project on the regional labour market.

6.15.3 Cost Benefit Analysis

The CBA was prepared in accordance with the methodology described in Section 6.15.3 of the EIS. In summary, the ‘base case’ for the analysis assumed continued agricultural use of the Mine Site, while the ‘with’ Project case assumed the Project is approved and developed as described in **Appendix 1**.

Table 6.15.1 presents the results of the CBA. In summary, the amended Project would have a positive Net Present Value (NPV) of \$723 million and a benefit/cost ratio of 1.22.

Table 6.15.1
Overview of Cost Benefit Analysis Results

Metric	Estimate (\$m, Present Value)
Economic Benefits	
Value of minerals and rare earths production	\$4,014
Total economic benefits	\$4,014
Economic costs	
Foregone value of alternative land uses (grazing)	(\$0.4)
Capital and sustaining costs	(\$887)
Operating and maintenance costs	
0000 General	(\$3)
1000 Geology	(\$6)
2000 Mining	(\$842)
3000 Processing	(\$463)
4000 Mine Site Infrastructure	(\$100)
5000 Off-Site Infrastructure	(\$5)
6000 Logistics	(\$552)
7000 ESG (Land rehabilitation costs)	(\$68)
9000 Project Deliver	(\$20)
10000 Overheads	(\$188)
Subtotal	(\$2,248)
Greenhouse gas emissions and other externalities	
Road and rail externalities	(\$45)
Copi mine and MSP operations	(\$107)
Subtotal	(\$152)
Groundwater licensing costs	(\$3)
Total economic costs	(\$3,291)
Net Present Value	\$723
Benefit Cost Ratio	1.22
Note 1: Real social discount rate of 5%	
Source: Synergies (2025) – Table 6	

Synergies undertook a sensitivity analysis of the CBA based on the following assumptions.

- Discount rate (3% and 7%)
- Capital costs (±20%)
- Operating costs (±20%)
- Price projections (±20%)
- Emissions allowance unit price (±50%)
- Exchange rates (USD to AUD - ±5 basis points).

Synergies (2025) state that the sensitivity analysis show Project returns a positive NPV and benefit/cost ratio on all sensitivities with the exception of a 20% reduction in price projections at a real social discount rate of 5%. Under that scenario, the amended Project would result in an NPV negative \$80 million and a benefit/cost ratio of 0.98.

6.15.4 Net Benefits to NSW

Synergies (2025) evaluated the amended Project's net benefits to the State of NSW in accordance with the *Guideline for the Economic Assessment of Mining and Coal Seam Gas Proposals* (DPIE, 2015) and the methodology described in Section 6.15.4.1 of the EIS. **Table 6.15.2** presents the results of that analysis. In summary, the amended Project would deliver a net economic benefit to the NSW community of approximately \$214 million in present value terms at a real social discount rate of 5%.

Table 6.15.2
Analysis Results for Project Net Benefits to NSW

Item	Incremental (\$m, NPV)	NSW Community Share (%)	Net Benefit to NSW (\$m, NPV)	Net Cost to NSW (\$m, NPV)
Net producer surplus	\$248	32%	\$79	-
Corporate income tax	\$501	32%	\$160	-
Royalties	\$126	100%	\$126	-
Benefits to existing landholders	-	-	-	-
Benefits to workers	-	-	-	-
Benefits to suppliers	-	-	-	-
Net environmental, social and transport costs				
Road and rail externalities	(\$45)	100%	-	(\$45)
Copi mine operations	(\$107)	100%	-	(\$107)
Net public infrastructure costs	-	-	-	-
Total			\$366	\$152

Source: Synergies (2025) – Table 10

Synergies undertook a sensitivity analysis of the above assessment based on the following assumptions.

- Discount rate (3% and 7%)
- Price projections (±20%)
- Environmental costs – GHG emissions (±20%)
- Corporate income tax (±50%)
- Royalties (±25%).

Synergies (2025) state that the sensitivity analysis show the Project returns a positive benefit to NSW on all sensitivities with the exception of a 20% reduction in price projections at a real social discount rate of 5%. Under that scenario, the amended Project would result in an NPV negative \$65 million.

6.15.5 Local Effects Analysis

Synergies (2025) undertook the local effects analysis in a manner consistent with that described in Section 6.15.5 of the EIS. In summary, the analysis considered the Wentworth LGA, including the following.

- Local employment effects.
- Non-labour expenditure effects.
- Environmental and social effects.

The results may be summarised as follows.

- **Employment**
The Project would locally provide an additional 480 fulltime equivalent (FTE) positions during construction and 240 FTE during operations, with an assumption that 50% of those positions would be filled by residents of the Wentworth LGA.
- **Average net Project-related employee income⁴**
Synergies (2025) identified that local employees residing in the Wentworth LGA would receive an average net income of \$89,686/year for construction employees and \$61,486/year for operational employees. These average net incomes are considerably higher than the \$58,046 average net income for other employees in the Wentworth LGA. This would generate an additional approximately \$7.92 million in wages during the construction phase of the Project and \$0.41 million per year during the operational phase. This would generate additional economic activity as a substantial proportion of the wages paid would be spent within the Wentworth LGA.
- **Non-labour Project expenditure**
The costs associated with the Project's construction are estimated to result in approximately \$207.0 million being directly spent within the Wentworth LGA. During operations, the Project is expected to contribute between \$54.5 million and \$97.62 million each year to the local economy. This would be a significant boost to activity levels in all industrial sectors of the Wentworth LGA providing the Project's required goods and services.
- **Environmental and social effects**
Synergies (2025) estimated the local costs for the abatement of greenhouse gas emissions would be \$90 million whilst the amenity costs for road and rail transportation would be \$3 million.

Whilst not directly accounted for in the LEA, the Project would also result in payments to both the Wentworth Shire and Broken Hill City Councils. This would include rates payable to the Wentworth Shire Council as well as payments to both Councils under the respective Planning Agreements that would be negotiated with the Applicant.

⁴ In accordance with DPIE (2015), average net income is the disposable income remaining from gross income after superannuation and tax payments.

6.15.6 Economic Impact Assessment

Synergies (2025) undertook the economic impact assessment in a manner consistent with that described in Section 6.15.6 of the EIS using a non-linear input-output (NLIO) model described in Section 11.1 of Synergies (2025).

Table 6.15.3 details the results of the economic impact modelling for the NSW and presents the overall contributions of the Project to the NSW economy.

Table 6.15.3
Economic Impacts on NSW

Metric	Unit	Construction Phase Benefits (3 years)	Operational Phase Benefits (17 years)	Total Benefits (20 years)
Additional Output	\$million	\$1,860	\$11,500	\$13,360
Gross State Product (GSP)	\$million	\$718	\$4,300	\$5,018
Labour Income	\$million	\$463	\$1,700	\$2,163
Employment supported	FTEs (peak)	1,465	1,085	

Source: Synergies (2025) – Section 12.1.1 and 12.1.2

Table 6.15.4 details the results of the economic impact modelling for the Wentworth LGA presents the overall contributions of the Project to the Wentworth LGA.

Table 6.15.4
Economic Impacts on Wentworth LGA

Metric	Unit	Construction Phase Benefits (3 years)	Operational Phase Benefits (17 years)	Total Benefits (20 years)
Additional Output	\$million	\$1,280	\$8,360	\$9,640
Gross State Product (GSP)	\$million	\$339	\$1,220	\$1,559
Labour Income	\$million	\$181	\$707.4	\$888
Employment supported	FTEs (peak)	514	580	

Source: Synergies (2025) – Section 12.2.1 and 12.2.2

6.15.7 Regional Labour Market Impacts

The Applicant anticipates that employment levels for the amended Project would remain unchanged. As a result, the regional labour market impacts described in Section 6.15.7 of the EIS would remain unchanged.

6.15.8 Amended Mitigation Measures

Section 6.15.8 of the EIS describes the proposed mitigation measures for the Project as exhibited. No changes are proposed for the Amended Project.

6.15.9 Conclusion

The CBA undertaken by Synergies (2025) indicates that the Project would generate a NPV of \$723 million with a benefit to cost ratio of 1.22. In addition, the Project would result in a \$214 million net benefit to the State of NSW. Sensitivity analyses conducted for both the CBA and the net benefits to the State of NSW identified these were most susceptible to variation in the price received for the minerals produced by the Project with a 20% reduction in price likely to result in a negative NPV and benefit/cost ratio of less than 1.

The direct employment within the Wentworth LGA of an additional 240 fulltime equivalent (FTE) positions during construction and 120 FTE during operations would generate additional benefits to the local area economy and stimulate indirect economic activity within the local area via both wage and non-wage expenditure.

The main local environmental impacts are internalised into the initial and sustaining capital costs of the Applicant through improvements to public infrastructure, mitigation, offset and compensation costs. Residual financial costs associated with local environmental impacts are therefore likely to be immaterial.