

# **Appendix 11a**

## **Noise Impact Assessment**

prepared by

**Muller Acoustic Consulting  
Pty Ltd**

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# Noise Impact Assessment

Copi Mineral Sands Project  
Wentworth, NSW

Prepared for: RZ Resources Limited  
C/- RW Corkery & Co Pty Limited  
July 2025  
MAC180700-04RP2V8



# *Document Information*

## Noise Impact Assessment

Copi Mineral Sands Project

Wentworth, NSW

**Prepared for:** RZ Resources Limited

C/- RW Corkery & Co Pty Limited

62 Hill Street

Orange NSW 2800

**Prepared by:** Muller Acoustic Consulting Pty Ltd

PO Box 678, Kotara NSW 2289

ABN: 36 602 225 132

P: +61 2 4920 1833

[www.mulleracoustic.com](http://www.mulleracoustic.com)

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# 1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by RW Corkery & Co Pty Limited (RWC) on behalf of RZ Resources Limited (the Applicant) to complete a Noise Impact Assessment (NIA) to quantify potential noise emissions associated with the proposed Copi Mineral Sands Project (the Project), located approximately 75km northwest of Wentworth in the Far West Region of NSW. The Project is within the Wentworth Local Government Area (LGA). **Figure 1** provides a Locality Plan.

The NIA was completed to quantify potential acoustic impacts associated with the construction and operation of the Project on the surrounding community and will accompany the Environmental Impact Statement (EIS) that is being prepared to assess the proposed development. The NIA has been prepared in accordance with the following policies and guidelines:

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI) 2017;
- NSW Government, Voluntary Land Acquisition and Mitigation Policy (VLAMP), 2018. NSW Department of Environment, Climate Change and Water (DECCW);
- NSW Department of Environment and Climate Change (DECC), Interim Construction Noise Guideline (ICNG), 2009; and
- NSW Department of Environment, Climate Change and Water (DECCW) – NSW Road Noise Policy (RNP), March 2011.

A glossary of terms, definitions and abbreviations used in this report is provided in **Appendix A**.



## 1.1 Project Overview

MAC understands that the mineral deposit is a high-grade, strandline type, continuous mineral sand placer deposit with a northwest orientated strike length of approximately 23km, and a deposit width of up to 5km.

The Project would comprise the following (**Figure 2**).

- construction and use of a range of ancillary infrastructure, including the following:
  - an Infrastructure Area including:
    - a Mine Camp;
    - a power station comprising silenced generators with a capacity of up to 30MW for use during construction only;
    - Office and Administration Area;
    - a Laydown Area, Workshop and Stores; and
    - a Rare Earth Concentrate (REC) Plant.
  - A Site Access Road and internal roads;
  - An upgraded Anabranche Mail Road; and
  - A 66kV transmission line.
- Dredge mining from an Extraction Area to extract up to approximately 46.8 million tonnes per annum (Mtpa) of overburden, up to approximately 44Mtpa of interburden and up to approximately 27.1Mtpa of ore;
- on-site processing of extracted ore using a floating wet concentrator and land-based REC Plant to produce up to approximately 475,000tpa of Mine Products;
- transportation of Mine Products in sealed containers from the Mine Site to Broken Hill via the Site Access Road, an upgraded Anabranche Mail Road and the Silver City Highway, with up to 7,500tpa of Monazite Product being transported by road to South Australia and the remainder by road to a Rail Facility on Holten Drive in Broken Hill;
- use of the existing Rail Facility in Broken Hill for the purposes of loading of Mine Product containers onto trains;

- initial placement of overburden, interburden and tailings within the Off Path Storage Facility until sufficient area within the dredge pond has been established. Following this, interburden and tailings would be placed within completed sections of the dredge pond, with overburden used to cap the placed material and for construction of the final landform;
- progressive rehabilitation of completed sections of the Mine Site, including re-establishment of a final landform and revegetation with native species to re-establish ecosystem function within the Mine Site; and
- the life of the Project would be 26 years, comprising an initial 3-year construction period, followed by 18 years of mining operations and a further period of 5 years of rehabilitation.

The mine layout is presented in **Figure 2**.

Site establishment and construction activities would be undertaken over a period of approximately two years, and would involve the following:

- survey and mark out of key boundaries;
- installation of erosion and sediment controls;
- installation of a construction laydown area;
- vegetation clearing of areas for initial infrastructure construction, access roads and the starter open cut pit;
- initial pre-strip and selective handling of topsoil;
- Site Access Road construction and Anabranh Mail Road upgrade, including bulk earthworks;
- installation of mining components and construction of a range of ancillary infrastructure, including:
  - the Mine Camp;
  - Mine Office and Workshop;
  - power generation and transmission facilities;
  - a range of roads, hardstand, vehicle parking and laydown areas suitable for all weather access by light and heavy vehicles;
  - installation of floating concentrator within starter pond; and

- construction and installation of intersection treatments and road upgrades at the junction of:
  - Anabranck Mail Road and Silver City Highway;
  - Comstock and Patton Streets;
  - Comstock and Eyre Streets;
  - Holton Drive and the Rail Facility Access Road; and

The Project would employ up to 480 persons during peak construction periods. During operations, the Project would employ up to 240 persons, and up to persons during rehabilitation.

## 1.2 Hours of Operation

**Table 1** presents the proposed operating hours for the Project. The proposed hours and combination of activities for the Project have formed the basis of the noise modelling scenarios for this assessment.

| Table 1 Hours of Operation                           |                            |                             |
|------------------------------------------------------|----------------------------|-----------------------------|
| Activity                                             | Proposed Days of Operation | Proposed Hours of Operation |
| Land Preparation                                     | 7 days per week            | 7am to 6pm                  |
| Construction Works                                   |                            | 7am to 10pm                 |
| - Road construction within Broken Hill LGA           | 7 days per week            |                             |
| - All other construction                             |                            | 24 hours per day            |
| Mining Operations                                    | 7 days per week            | 24 hours per day            |
| Processing Operations                                | 7 days per week            | 24 hours per day            |
| Transportation Operations                            |                            |                             |
| - Mine Product transportation within Broken Hill LGA | 7 days per week            | 7am to 10pm                 |
| - All other transportation                           |                            | 24 hours per day            |
| Maintenance Operations                               | 7 days per week            | 24 hours per day            |
| Rehabilitation Works                                 | 7 days per week            | 7am to 10pm                 |

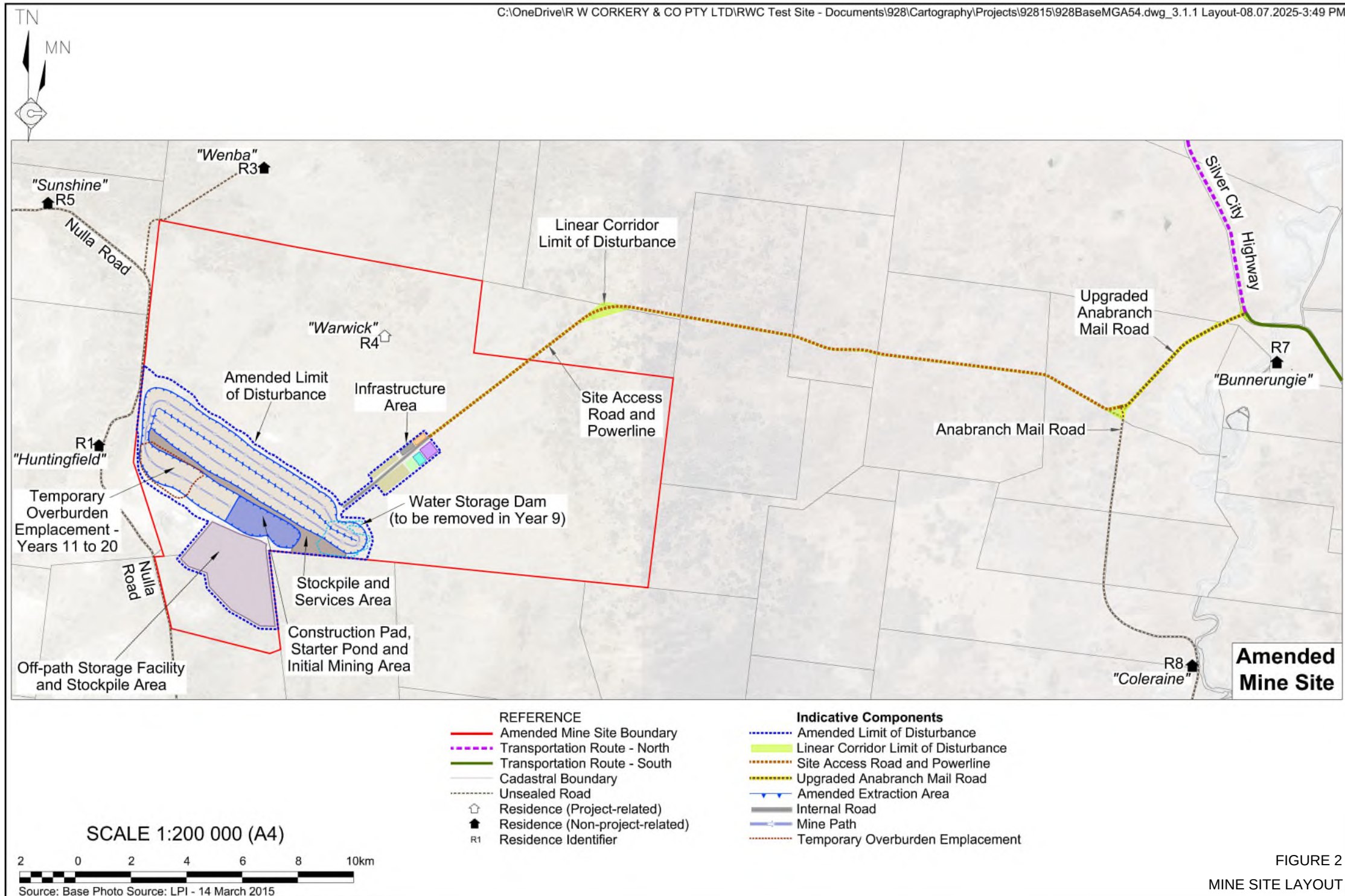


FIGURE 2  
MINE SITE LAYOUT

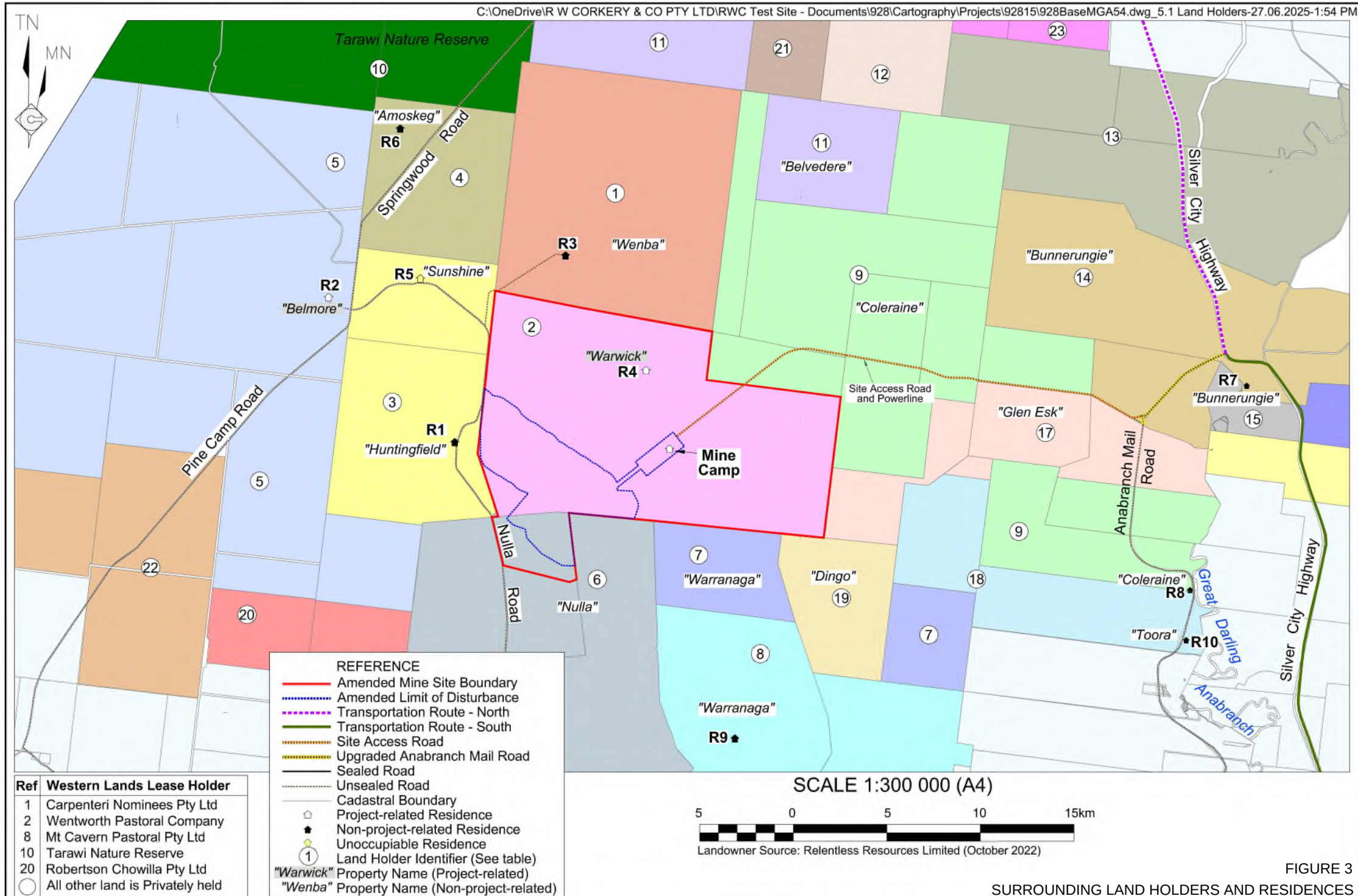
### 1.3 Sensitive Receivers

The Project is situated approximately 75km northwest of Wentworth in the Murray Basin region of southwestern NSW. Receivers in the locality are categorised as rural residential. The addresses and coordinates MGA(54) for the nearest potentially affected residential receivers to the Project are summarised in **Table 2** and shown on the Surrounding Land Holder Map in **Figure 3**.

**Table 2 Residential Receiver Locations**

| Receiver ID | Receiver Name          | Status                  | MGA 54 Coordinates |              | Approximate Distance to Limit of Disturbance (km) | Approximate Distance Transport Route (km) <sup>1</sup> |
|-------------|------------------------|-------------------------|--------------------|--------------|---------------------------------------------------|--------------------------------------------------------|
|             |                        |                         | Easting (m)        | Northing (m) |                                                   |                                                        |
| R1          | Huntingfield Homestead | Permanently Occupied    | 527467             | 6279758      | 1.3                                               | >10                                                    |
| R2          | Belmore Homestead      | Permanently Occupied    | 520721             | 6287457      | 1.2                                               | >10                                                    |
| R3          | Wenba Homestead        | Intermittently Occupied | 533434             | 6289711      | 7.8                                               | >10                                                    |
| R4          | Warwick Homestead      | Project Related         | 537702             | 6283593      | 5.1                                               | 5.2                                                    |
| R5          | Sunshine Homestead     | Unoccupied              | 525584             | 6288440      | 2.4                                               | >10                                                    |
| R6          | Amoskeg Homestead      | Permanently Occupied    | 524542             | 6296515      | 8.7                                               | >10                                                    |
| R7          | Bunnerungee Homestead  | Permanently Occupied    | 569784             | 6282712      | >10                                               | 2.1                                                    |
| R8          | Coleraine Homestead    | Permanently Occupied    | 566903             | 6271879      | >10                                               | 9.4                                                    |
| R9          | Warranaga Homestead    | Permanently Occupied    | 542438             | 6263941      | >10                                               | >10                                                    |
| R10         | Toora Homestead        | Permanently Occupied    | 566539             | 6269233      | >10                                               | >10                                                    |
| MC          | Mine Camp              | Project Related         | 522478             | 6287752      | within boundary                                   | 0.5                                                    |

Note 1: Denotes the offset distance between the receiver location and the Anabranck Mail Road between the Mine Site Boundary and Silver City Highway.



## 1.4 Coverage of Secretary's Environmental Assessment Requirements

The key issues to be addressed, as identified in the Secretary's Environmental Assessment Requirements (SEARs) and other government agency requirements are reproduced in **Table 3**.

| <b>Table 3 Coverage of SEARs and Other Government Agency Requirements</b>                                                                                                                                                                                                                                                                                                                                                                                           |                                          |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| Noise and Vibration Assessment Requirement                                                                                                                                                                                                                                                                                                                                                                                                                          | Relevant Section(s)                      |
| <b>Coverage of SEARs</b>                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                          |
| The likely construction, operational and off-site noise impacts of the development, and cumulative noise impacts (considering other mining developments in the locality), in accordance with the Interim Construction Noise Guideline (or as updated subject to transitional arrangements), NSW Noise Policy for Industry, NSW Road Noise Policy and Rail Infrastructure Noise Guideline (as applicable), and the Voluntary Land Acquisition and Mitigation Policy. | <b>Section 5</b>                         |
| An assessment of the likely noise impacts of the development in accordance with the <i>Noise Policy for Industry</i> , and the <i>Voluntary Land Acquisition and Mitigation Policy (2018)</i> ;                                                                                                                                                                                                                                                                     | <b>Section 5</b>                         |
| If a claim is made for specific construction noise criteria for certain activities, then this claim must be justified and accompanied by an assessment of the likely construction noise impacts of these activities in accordance with the <i>Interim Construction Noise Guideline</i> ;                                                                                                                                                                            | <b>Section 3.1 &amp;<br/>Section 5.1</b> |
| An assessment of the likely road noise impacts of the development in accordance with the <i>NSW Road Noise Policy</i> .                                                                                                                                                                                                                                                                                                                                             | <b>Section 5.5</b>                       |
| <b>Coverage of Issues identified by Other Government Agencies</b>                                                                                                                                                                                                                                                                                                                                                                                                   |                                          |
| <b>NSW EPA (4/05/2022)</b> - The Environmental Assessment (EA) should address how the required goals outlined below will be met for each potential impact.                                                                                                                                                                                                                                                                                                          |                                          |
| The EA should describe mitigation and management options that will be used to prevent, control, abate or mitigate identified potential environmental impacts associated with the project and to reduce risks to human health and prevent degradation of the environment.                                                                                                                                                                                            | <b>Section 4.2 &amp;<br/>Section 5.2</b> |
| The goals of the Project should include design, construction, operation and maintenance of plant and equipment in accordance with relevant EPA policy, guidelines and criteria, and in order to minimise potential impacts from noise on surrounding receptors.                                                                                                                                                                                                     | <b>Section 4 &amp;<br/>Section 5</b>     |
| Potential noise sources are assessed in accordance with the <i>Noise Policy for Industry</i> (EPA, 2017).                                                                                                                                                                                                                                                                                                                                                           | <b>Section 5.2</b>                       |
| Where required mitigation measures are proposed (e.g. appropriate equipment chosen to minimise noise levels).                                                                                                                                                                                                                                                                                                                                                       | <b>Section 5.2</b>                       |
| All residential or noise sensitive premises likely to be impacted by the development must be identified and included in the assessment. (EPA)                                                                                                                                                                                                                                                                                                                       | <b>Section 1.3</b>                       |
| The potential noise impacts associated with any traffic increases need to be assessed in accordance with the <i>NSW Road Noise Policy</i> (EPA, 2011). (EPA)                                                                                                                                                                                                                                                                                                        | <b>Section 5.5</b>                       |

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## 2 Noise Policy and Guidelines

The following section summarises relevant policy and guidelines pertinent to undertaking a noise impact assessment for this type of project.

### 2.1 Interim Construction Noise Guideline

The ICNG sets out procedures to identify and address the impacts of construction noise on residences and other sensitive land uses. This section provides a summary of noise objectives that are applicable to the assessment. The ICNG provides two methodologies for the assessment of construction noise emissions:

- quantitative, which is suited to major construction projects with typical durations of more than three weeks; or
- qualitative, which is suited to short term infrastructure maintenance (for projects with a typical duration of less than three weeks).

Due to the nature of the proposed works, the quantitative method has been applied in this assessment. The quantitative method includes identification of potentially affected receptors, description of activities involved in the project, derivation of the construction noise management levels, quantification of potential noise impact at receptors and, provides management and mitigation recommendations.

#### 2.1.1 Standard Hours for Construction

**Table 4** presents the ICNG recommended standard hours for construction works.

| Table 4 Recommended Standard Hours for Construction |                    |
|-----------------------------------------------------|--------------------|
| Daytime                                             | Construction Hours |
| Monday to Friday                                    | 7am to 6pm         |
| Saturdays                                           | 8am to 1pm         |
| Sundays or Public Holidays                          | No construction    |

These recommended hours do not apply in the event of direction from police, or other relevant authorities, for safety reasons or where required in an emergency to avoid the loss of lives, property and/or to prevent environmental harm.

It is anticipated that land preparation activities would occur between 7am and 6pm daily, on a campaign basis. Road construction activities within Broken Hill are anticipated to occur between 7am and 10pm daily, while other construction activities will be undertaken 24 hours per day.

### 2.1.2 Out of Hours Construction

Works conducted outside of recommended standard hours are considered out of hours work (OOH). The ICNG suggests that any request to vary the hours of construction activities as identified above shall be:

- considered on a case-by-case basis or activity-specific basis;
- accompanied by details of the nature and need for activities to be undertaken during the varied construction hours;
- accompanied by written evidence that activities undertaken during the varied construction hours are strongly justified;
- appropriate consultation with potentially affected receivers and notification of the relevant regulatory authorities has occurred; and
- all practicable and reasonable mitigation measures will be put in place.

Given the remote location of the Mine Site and the requirement for personnel and equipment to be transported long distances to site, out of hours construction activities are warranted for the Project. The Applicant has consulted with surrounding residents and no objections to out of hours construction operations have been raised. Finally, practicable and reasonable mitigation measures will be implemented to minimise noise impacts during construction.

### 2.1.3 Construction Noise Management Levels

Section 4 of the ICNG details the quantitative assessment method involving predicting noise levels and comparing them with the Noise Management Level (NML) and are important indicators of the potential level of construction noise impact. **Table 5** reproduces the ICNG Noise Management Level for residential receivers. The NML is determined by adding 10dB (standard hours) or 5dB for Out of Hours (OOH) to the Rating Background Level (RBL) for each specific assessment period.

**Table 5 Noise Management Levels**

| Time of Day                                                                                                                       | Management Level                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|-----------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                                                   | LAeq(15min) <sup>1</sup>             | How to Apply                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Recommended standard<br>hours: Monday to Friday<br>7am to 6pm Saturday<br>8am to 1pm No work on<br>Sundays or public<br>holidays. | Noise affected<br>RBL + 10dB         | The noise affected level represents the point above which there may be some community reaction to noise.<br><br>Where the predicted or measured LAeq(15min) is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level.<br><br>The proponent should also inform all potentially impacted residents of the nature of work to be carried out, the expected noise levels and duration, as well as contact details.                                                                                                                                                            |
|                                                                                                                                   | Highly Noise Affected<br>75dBA (HNA) | The highly noise affected level represents the point above which there may be strong community reaction to noise.<br><br>Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account times identified by the community when they are less sensitive to noise such as before and after school for work near schools, or mid-morning or mid-afternoon for work near residences; and if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times. |
| Outside recommended<br>standard hours.                                                                                            | Noise affected<br>RBL + 5dB          | A strong justification would typically be required for work outside the recommended standard hours.<br><br>The proponent should apply all feasible and reasonable work practices to meet the noise affected level.<br><br>Where all feasible and reasonable practices have been applied and noise is more than 5dBA above the noise affected level, the proponent should negotiate with the community.<br><br>For guidance on negotiating agreements see Section 7.2.2 of the ICNG.                                                                                                                                                                              |

Note 1: The Rating Background Level (RBL) is an overall single figure background level representing each assessment period over the whole monitoring period. The RBL is used to determine the construction noise management levels for noise assessment purposes and is the median of the ABL's.

### 2.1.4 Construction Sleep Disturbance

Section 4.3 of the ICNG (DECC, 2009) states that a sleep disturbance assessment is required where construction activities are planned to occur for more than two consecutive nights. Given that construction activities are anticipated to occur during out of hours periods, sleep disturbance has been considered in this assessment.

## 2.2 Noise Policy for Industry

The EPA released the Noise Policy for Industry (NPI) in October 2017 which provides a process for establishing noise criteria for consents and licenses enabling the EPA to regulate noise emissions from scheduled premises under the Protection of the Environment Operations Act 1997.

The objectives of the NPI are to:

- provide noise criteria that is used to assess the change in both short term and long-term noise levels;
- provide a clear and consistent framework for assessing environmental noise impacts from industrial premises and industrial development proposals;
- promote the use of best-practice noise mitigation measures that are feasible and reasonable where potential impacts have been identified; and
- support a process to guide the determination of achievable noise limits for planning approvals and/or licences, considering the matters that must be considered under the relevant legislation (such as the economic and social benefits and impacts of industrial development).

The policy sets out a process for industrial noise management involving the following key steps:

1. Determine the Project Noise Trigger Levels (PNTLs) (ie criteria) for a development. These are the levels (criteria), above which noise management measures are required to be considered. They are derived by considering two factors: shorter-term intrusiveness due to changes in the noise environment; and maintaining the noise amenity of an area.
2. Predict or measure the noise levels produced by the development with regard to the presence of annoying noise characteristics and meteorological effects such as temperature inversions and wind.
3. Compare the predicted or measured noise level with the PNTL, assessing impacts and the need for noise mitigation and management measures.
4. Consider residual noise impacts - that is, where noise levels exceed the PNTLs after the application of feasible and reasonable noise mitigation measures. This may involve balancing economic, social and environmental costs and benefits from the proposed development against the noise impacts, including consultation with the affected community where impacts are expected to be significant.

5. Set statutory compliance levels that reflect the best achievable and agreed noise limits for the development.
6. Monitor and report environmental noise levels from the development.

### 2.2.1 Project Noise Trigger Levels (PNTL)

The policy sets out the procedure to determine the PNTLs relevant to an industrial development. The PNTL is the lower (ie, the more stringent) of the **Project Intrusiveness Noise Level** (PINL) and **Project Amenity Noise Level** (PANL) determined in accordance with Section 2.3 and Section 2.4 of the NPI.

### 2.2.2 Rating Background Level (RBL)

The Rating Background Level (RBL) is a determined parameter from noise monitoring and is used for assessment purposes. As per the NPI, the RBL is an overall single figure background level representing each assessment period (day, evening and night) over the noise monitoring period.

### 2.2.3 Project Intrusiveness Noise Level (PINL)

The PINL ( $L_{Aeq}(15min)$ ) is the  $RBL + 5dB$  and seeks to limit the degree of change a new noise source introduces to an existing environment. Hence, when assessing intrusiveness, background noise levels need to be measured.

For low noise environments, such as rural environments, minimum assumed RBLs apply within the NPI and can be adopted in lieu of completing background noise measurements. This is considered the most conservative method for establishing noise criteria for a project. These result in minimum intrusiveness noise levels as follows:

- Minimum Day RBL = 35dBA;
- Minimum Evening RBL = 30dBA; and
- Minimum Night RBL = 30dBA.

Due to the rural nature of the locality, the PINLs for the Project have been determined based on the minimum  $RBL+5dBA$ .

## 2.2.4 Project Amenity Noise Level (PANL)

The PANL is relevant to a specific land use or locality. To limit continuing increases in intrusiveness levels, the ambient noise level within an area from all combined industrial sources should remain below the recommended Amenity Noise Levels specified in Table 2.2 (of the NPI). The NPI defines two categories of Amenity Noise Levels:

- **Amenity Noise Levels (ANL)** – are determined considering all current and future industrial noise within a receiver area; and
- **Project Amenity Noise Level (PANL)** – is the recommended level for a receiver area, specifically focusing the project being assessed.

Additionally, Section 2.4 of the NPI states: “to ensure that industrial noise levels (existing plus new) remain within the recommended Amenity Noise Levels for an area, a Project Amenity Noise Level applies for each new source of industrial noise as follows”:

**PANL** for new industrial developments = recommended **ANL** minus 5dBA.

The following exceptions apply when deriving the PANL:

- areas with high traffic noise levels;
- proposed developments in major industrial clusters;
- existing industrial noise and cumulative industrial noise effects; and
- greenfield sites.

Furthermore, where the PANL is applicable and can be satisfied, the assessment of cumulative industrial noise is not required.

The recommended Amenity Noise Levels as per Table 2.2 of the NPI are reproduced in **Table 6**.

**Table 6 Amenity Noise Levels**

| Receiver Type                                                                                  | Noise Amenity Area | Time of day                        | Recommended Amenity Noise Level<br>dB LAeq(period)                                                                |
|------------------------------------------------------------------------------------------------|--------------------|------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| Residential                                                                                    | Rural              | Day                                | 50                                                                                                                |
|                                                                                                |                    | Evening                            | 45                                                                                                                |
|                                                                                                |                    | Night                              | 40                                                                                                                |
|                                                                                                | Suburban           | Day                                | 55                                                                                                                |
|                                                                                                |                    | Evening                            | 45                                                                                                                |
|                                                                                                |                    | Night                              | 40                                                                                                                |
|                                                                                                | Urban              | Day                                | 60                                                                                                                |
|                                                                                                |                    | Evening                            | 50                                                                                                                |
|                                                                                                |                    | Night                              | 45                                                                                                                |
| Hotels, motels, caretakers' quarters, holiday accommodation, permanent resident caravan parks. | See column 4       | See column 4                       | 5dB above the recommended Amenity Noise Level for a residence for the relevant noise amenity area and time of day |
| School Classroom                                                                               | All                | Noisiest 1-hour period when in use | 35 (internal)<br>45 (external)                                                                                    |
| Hospital ward                                                                                  |                    |                                    |                                                                                                                   |
| - internal                                                                                     | All                | Noisiest 1-hour                    | 35                                                                                                                |
| - external                                                                                     | All                | Noisiest 1-hour                    | 50                                                                                                                |
| Place of worship                                                                               |                    |                                    |                                                                                                                   |
| - internal                                                                                     | All                | When in use                        | 40                                                                                                                |
| Passive Recreation                                                                             | All                | When in use                        | 50                                                                                                                |
| Active Recreation                                                                              | All                | When in use                        | 55                                                                                                                |
| Commercial premises                                                                            | All                | When in use                        | 65                                                                                                                |
| Industrial                                                                                     | All                | When in use                        | 70                                                                                                                |

Notes: The recommended Amenity Noise Levels refer only to noise from industrial noise sources. However, they refer to noise from all such sources at the receiver location, and not only noise due to a specific project under consideration. The levels represent outdoor levels except where otherwise stated.

Types of receivers are defined as rural residential; suburban residential; urban residential; industrial interface; commercial; industrial – see Table 2.3 and Section 2.7 of the NPI.

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

### 2.2.5 Maximum Noise Assessment Trigger Levels

The potential for sleep disturbance from maximum noise level events from a Project during the night-time period needs to be considered. The NPI considers sleep disturbance to be both awakenings and disturbance to sleep stages.

Where night-time noise levels from a development/premises at a residential location exceed the following criteria, a detailed maximum noise level event assessment should be undertaken:

- LAeq(15min) 40dB or the prevailing RBL plus 5dBA, whichever is the greater; and/or
- LAmax 52dB or the prevailing RBL plus 15dBA, whichever is the greater.

A detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period.

Other factors that may be important in assessing the impacts on sleep disturbance include:

- how often the events would occur;
- the distribution of likely events across the night-time period and the existing ambient maximum events in the absence of the development;
- whether there are times of day when there is a clear change in the noise environment (such as during early morning shoulder periods); and
- current understanding of effects of maximum noise level events at night.

## 2.3 Voluntary Land Acquisition and Mitigation Policy

The Voluntary Land Acquisition and Mitigation Policy (VLAMP, November 2018) describes the NSW Government's policy for voluntary mitigation and land acquisition actions undertaken to address noise impacts from State significant mining, petroleum and extractive industry developments. It aims to provide a balance between economic development and protecting the health, preserve amenity and control intrusive noise where potential impacts are identified.

The VLAMP outlines methods to determine the significance of potential exceedances of relevant noise assessment criteria and identifies potential treatments for those exceedances (VLAMP Table 1) and has been reproduced in **Table 7**.

**Table 7 Characterisation of Noise Impacts and Potential Treatments (VLAMP Table 1)**

| If the predicted noise level minus the project noise trigger level is: | And the total cumulative industrial noise level is:                                                                                                                                                                            | Characterisation of impacts:                    | Potential treatment:                                                                                                                                                             |
|------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| All time periods<br>0-2dBA                                             | Not applicable                                                                                                                                                                                                                 | Impacts are considered to be <b>negligible</b>  | The exceedances would not be discernible by the average listener and therefore would not warrant receiver-based treatments or controls                                           |
| All time periods<br>3-5dBA                                             | < recommended Amenity Noise Level in Table 2.2 of the NPI; or<br>> recommended Amenity Noise Level in Table 2.2 of the NPI, but the increase in total cumulative industrial noise level resulting from the development is >1dB | Impacts are considered to be <b>marginal</b>    | Provide mechanical ventilation / comfort condition systems to enable windows to be closed without compromising internal air quality / amenity.                                   |
| All time periods<br>3-5dBA                                             | > recommended Amenity Noise Level in Table 2.2 of the NPI, and the increase in total cumulative industrial noise level resulting from the development is >1dB                                                                  | Impacts are considered to be <b>moderate</b>    | As for marginal impacts but also upgraded facade elements like windows, doors or roof insulation, to further increase the ability of the building facade to reduce noise levels. |
| Day and evening<br>>5dBA                                               | < recommended Amenity Noise Levels in Table 2.2 of the NPI                                                                                                                                                                     | Impacts are considered to be <b>moderate</b>    | As for marginal impacts but also upgraded facade elements like windows, doors or roof insulation, to further increase the ability of the building facade to reduce noise levels. |
| Day and evening<br>>5dBA                                               | > recommended Amenity Noise Levels in Table 2.2 of the NPI                                                                                                                                                                     | Impacts are considered to be <b>significant</b> | Provide mitigation as for moderate impacts and see voluntary land acquisition provisions above.                                                                                  |
| Night<br>>5dBA                                                         | Not applicable                                                                                                                                                                                                                 | Impacts are considered to be <b>significant</b> | Provide mitigation as for moderate impacts and see voluntary land acquisition provisions above.                                                                                  |

### Voluntary Mitigation Rights

A consent authority should only apply voluntary land mitigation rights where, even with the implementation of best practice management at the mine site:

- the noise generated by the development would meet the requirements of Table 1 (VLAMP) such that the impacts would be characterised marginal, moderate or significant at any residence or privately owned land; or
- the development would increase the total industrial noise level at any residence on privately owned land by more than 1dBA and noise levels at the residence are already above the recommended Amenity Noise Levels in Table 2.2 of the NPI; or
- the development includes a private rail line, and the use of that private rail line would cause exceedances of the recommended acceptable levels in Table 6 of Appendix 3 of the RING by greater than or equal to 3dBA at any residences on privately owned land.

### Voluntary Acquisition Rights

A consent authority should only apply voluntary land acquisition rights where, even with the implementation of best practice management at the mine site:

- the noise generated by the development would be characterised as significant, according to Table 1 (VLAMP), at any residence on privately owned land; or
- the noise generated by the development would contribute to exceedances of the acceptable noise levels plus 5dB in Table 2.2 of the NPI on more than 25% of any privately owned land where there is an existing dwelling or where a dwelling could be built under existing planning controls; or
- the development includes a private rail line, and the use of that private rail line would cause exceedances of the recommended maximum criteria outlined in Table 6 of Appendix 3 of the RING by greater than or equal to 3dBA at any residences on privately owned land.

Impacts would be classified as significant where:

- during the daytime and evening periods, noise levels from the Project are >5dBA above the PNTLs and the total cumulative industrial noise level is greater than the recommended Amenity Noise Levels in Table 2.2 of the NPI; or
- during the night-time period, noise levels from the Project are >5dBA above the PNTLs.

## 2.4 Road Noise Policy

The road traffic noise criteria are provided in the Department of Environment, Climate Change and Water NSW (DECCW), Road Noise Policy (RNP), 2011. The policy sets out noise criteria that provide for a degree of amenity appropriate for the land use and road category.

For some industries such as mines and extractive industries, that are not served by arterial roads, a principal haulage route may be identified. The RNP indicates that where local authorities identify a 'principal haulage route', the noise criteria for the route should match those for arterial/sub-arterial roads, recognising that they carry a different level and mix of traffic to local roads. Road noise criteria relevant to this assessment are presented in detail in **Section 3.4**.

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### 3 Assessment Criteria

The following sections summarise the relevant noise criteria for the Project.

#### 3.1 Construction Noise Management Levels

The NMLs for construction activities for standard construction hours and out of hours periods are summarised in **Table 8**.

| Table 8 Construction Noise Management Levels |                            |                |                       |
|----------------------------------------------|----------------------------|----------------|-----------------------|
| Location                                     | Assessment Period          | RBL<br>dB LA90 | NML<br>dB LAeq(15min) |
| All Residential Receivers                    | Standard Hours             | 35             | 45 (RBL+10dBA)        |
|                                              | Out of Hours Day           | 35             | 40 (RBL+5dBA)         |
|                                              | Out of Hours Evening/Night | 30             | 35 (RBL+5dBA)         |

The RNP provides additional guidance as to the likelihood of sleep disturbance resulting from maximum noise level events. The RNP points out the following:

- triggers for and effects of sleep disturbance have not been conclusively determined. In other words, at the current level of understanding, it is not possible to establish absolute noise level goals that would correlate to levels of sleep disturbance (for all or even a majority of people).
- the RNP suggests that:
  - maximum internal noise levels below 50 dBA to 55 dBA are unlikely to awaken people from sleep; and/or
  - one or two events per night, with maximum internal noise levels of 65 dBA to 70 dBA, are not likely to affect health and wellbeing significantly.

Therefore, where maximum noise trigger levels are exceeded, an additional assessment has been completed to protect against sleep disturbance adopting an external maximum noise levels of 65dBA (to account for 10dB attenuation for a residential façade with windows open) have been adopted for this assessment.

## 3.2 Operational Noise

### 3.2.1 Project Intrusiveness Noise Levels

The PINLs are presented in **Table 9** and have been determined based on the RBL +5dBA.

| <b>Table 9 Project Intrusiveness Noise Levels</b> |                     |                          |                |
|---------------------------------------------------|---------------------|--------------------------|----------------|
| Receiver                                          | Period <sup>1</sup> | Minimum RBL <sup>2</sup> | PINL           |
|                                                   |                     | dB LA90                  | dB LAeq(15min) |
| All Residential<br>Receivers                      | Day                 | 35                       | 40             |
|                                                   | Evening             | 30                       | 35             |
|                                                   | Night               | 30                       | 35             |

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

Note 2: Minimum RBLs adopted.

### 3.2.2 Project Amenity Noise Levels

The PANL for residential receivers potentially affected by the Project are presented in **Table 10**. It is noted that the Mine Camp is located within the Project boundary and represents a Project-related receiver. Notwithstanding, assessment is undertaken with respect to the Amenity Noise Levels for “temporary accommodation” as per Table 2.2 of the NPI.

| <b>Table 10 Amenity Noise Levels and Project Amenity Noise Levels</b> |                       |                                |                                  |                             |
|-----------------------------------------------------------------------|-----------------------|--------------------------------|----------------------------------|-----------------------------|
| Receiver Type                                                         | Noise<br>Amenity Area | Assessment Period <sup>1</sup> | NPI Recommended ANL <sup>2</sup> | PANL                        |
|                                                                       |                       |                                | dB LAeq(period)                  | dB LAeq(15min) <sup>3</sup> |
| Residential                                                           | Rural                 | Day                            | 50                               | 53                          |
|                                                                       |                       | Evening                        | 45                               | 48                          |
|                                                                       |                       | Night                          | 40                               | 43                          |
| Mine Camp <sup>4</sup>                                                | Rural                 | Day                            | 55                               | 58                          |
|                                                                       |                       | Evening                        | 50                               | 53                          |
|                                                                       |                       | Night                          | 45                               | 48                          |

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

Note 2: Recommended Amenity Noise Levels as per Table 2.2 of the NPI.

Note 3: Includes a +3dB adjustment to the amenity period level to convert to a 15-minute assessment period as per Section 2.2 of the NPI.

Note 4: Project Mine Camp.

### 3.2.3 Project Noise Trigger Levels

The PNTL are the lower of either the PINL or the PANL. **Table 11** presents the derivation of the PNTLs in accordance with the methodologies outlined in the NPI.

| Table 11 Project Noise Trigger Levels |                    |                                |                     |                     |                     |
|---------------------------------------|--------------------|--------------------------------|---------------------|---------------------|---------------------|
| Receiver Type                         | Noise Amenity Area | Assessment Period <sup>1</sup> | PINL dB LAeq(15min) | PANL dB LAeq(15min) | PNTL dB LAeq(15min) |
| Residential                           | Rural              | Day                            | 40                  | 53                  | 40                  |
|                                       |                    | Evening                        | 35                  | 48                  | 35                  |
|                                       |                    | Night                          | 35                  | 43                  | 35                  |
| Mine Camp <sup>2</sup>                | Rural              | Day                            | n/a                 | 58                  | 58                  |
|                                       |                    | Evening                        | n/a                 | 53                  | 53                  |
|                                       |                    | Night                          | n/a                 | 48                  | 48                  |

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

Note 2: Project Mine Camp.

### 3.2.4 Maximum Noise Trigger Levels

The maximum noise trigger levels shown in **Table 12** are based on night-time RBLs and trigger levels as per Section 2.5 of the NPI. The trigger levels will be applied to transient noise events that have the potential to cause sleep disturbance.

| Table 12 Maximum Noise Trigger Levels |           |                          |           |
|---------------------------------------|-----------|--------------------------|-----------|
| Residential Receivers                 |           |                          |           |
| LAeq(15min)                           |           | LAmax                    |           |
| 40dB LAeq(15min) or RBL + 5dB         |           | 52dB LAmax or RBL + 15dB |           |
| Trigger                               | 40        | Trigger                  | 52        |
| RBL +5dB                              | 35        | RBL +15dB                | 45        |
| <b>Highest</b>                        | <b>40</b> | <b>Highest</b>           | <b>52</b> |

Note: Monday to Saturday; Night 10pm to 7am. On Sundays and Public Holidays Night 10pm to 8am

Note: NPI identifies that maximum of the two values is to be adopted which is shown in bold font.

### 3.3 Voluntary Land Acquisition and Mitigation Policy Significant Criteria

The VLAMP significance criteria (where impacts would be classified as significant as above) applicable to the Project are presented in **Table 13**. The criteria assume that the total cumulative industrial noise level is attributable to the Project as there is no other significant industrial noise source in the area.

**Table 13 VLAMP Project Specific Significance Criteria**

| Catchment     | Period  | PNTL<br>dB LAeq(15min) | VLAMP Significant Impact Thresholds |                            |                                         |
|---------------|---------|------------------------|-------------------------------------|----------------------------|-----------------------------------------|
|               |         |                        | Voluntary Acquisition <sup>1</sup>  |                            | Vacant Lands Acquisition <sup>2</sup>   |
|               |         |                        | Recommended ANL<br>dB LAeq(period)  | PNTL+5dB<br>dB LAeq(15min) | Recommended ANL +5dB<br>dB LAeq(period) |
| All receivers | Day     | 40                     | 50                                  | 45                         | 55                                      |
|               | Evening | 35                     | 45                                  | 40                         | 50                                      |
|               | Night   | 35                     | 40                                  | 40                         | 45                                      |

Note 1: Voluntary acquisition rights where the Project Noise Level (PNL) exceeds the PNTL by more than 5dB.

Note 2: Project Noise Levels (PNL) exceed the relevant criteria on more than 25% for any privately-owned land parcels.

### 3.4 Road Traffic Noise Criteria

In accordance with the RNP, this assessment has adopted the 'Freeway/arterial/sub-arterial road' category for the designated inbound and outbound transport routes, consistent with the classification of the Transport Route on Anabranche Mail Road as a 'principal haulage route'. Silver City Highway, Patton Street, Comstock Street, Eyre Street, Holton Drive and Ryan Street / Creedon Street are all consistent with the classification of 'Freeway/arterial/sub-arterial road' category. **Table 14** reproduces the road traffic noise assessment criteria relevant for this road type.

**Table 14 Road Traffic Noise Assessment Criteria for Residential Land Uses**

| Road category                      | Type of Project/development                                                                | Assessment Criteria - dB(A) |                     |
|------------------------------------|--------------------------------------------------------------------------------------------|-----------------------------|---------------------|
|                                    |                                                                                            | Day (7am to 10pm)           | Night (10pm to 7am) |
| Freeway/arterial/sub-arterial road | Existing residences affected by additional traffic on existing freeways/sub-arterial/roads | 60dB(A)                     | 55dB(A)             |
|                                    | generated by land use developments                                                         | LAeq(15hr)                  | LAeq(9hr)           |

Note: For road noise assessments, the day period is from 7am to 10pm (ie there is no evening assessment period as there is with operational noise). Night is from 10pm to 7am.

Additionally, the RNP states where existing road traffic noise criteria are already exceeded, any additional increase in total traffic noise level should be limited to 2dB, which is generally accepted as the threshold of perceptibility to a change in noise level.

### 3.4.1 Relative Increase Criteria

In addition to meeting the assessment criteria, any significant increase in total traffic noise at receivers must be considered. Receivers located in 'quiet areas', where road traffic noise levels are typically 12dB or more below the relevant criteria, that experience increases in total traffic noise levels above those presented in **Table 15** due to the addition of Project vehicles should be considered for mitigation.

**Table 15 Increase Criteria for Residential Land Uses**

| Road Category                                       | Type of Project/Development                                                                                                               | Total Traffic Noise Level Increase, dB(A) |                     |
|-----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|---------------------|
|                                                     |                                                                                                                                           | Day (7am to 10pm)                         | Night (10pm to 7am) |
| Freeway/arterial/sub-arterial roads and transitways | New road corridor/redevelopment of existing road/land use development with the potential to generate additional traffic on existing road. | Existing traffic                          | Existing traffic    |
|                                                     |                                                                                                                                           | LAeq(15hr)                                | LAeq(9hr)           |
|                                                     |                                                                                                                                           | +12dB (external)                          | +12dB (external)    |

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## 4 Modelling Methodology

A computer model was developed to quantify Project noise emissions to neighbouring receivers using DGMR (iNoise, Version 2024) noise modelling software. iNoise is an intuitive and quality assured software for industrial noise calculations in the environment. 3D noise modelling is considered industry best practice for assessing noise emissions from projects.

The model incorporated a three-dimensional digital terrain map giving all relevant topographic information used in the modelling process. Additionally, the model uses relevant noise source data, ground type, attenuation from barrier or buildings and atmospheric information to predict noise levels at the nearest potentially affected receivers. Where relevant, modifying factors in accordance with Fact Sheet C of the NPI have been applied to calculations.

The model calculation method used to predict noise levels was in accordance with ISO 9613:1 and ISO 9613:2 including corrections for meteorological conditions using CONCAWE<sup>1</sup>. The ISO 9613 standards are the most used noise prediction method worldwide. Many countries refer to ISO 9613 in their noise legislation. However, the ISO 9613 standard does not contain guidelines for quality assured software implementation, which leads to differences between applications in calculated results. In 2015 this changed with the release of ISO/TR 17534-3. This quality standard gives clear recommendations for interpreting the ISO 9613 method. iNoise fully supports these recommendations. The models and results for the 19 test cases are included in the software.

### 4.1 Construction Noise Modelling Parameters

#### 4.1.1 Site Establishment and Construction

Project development would occur with the initial construction phase consisting of site access road construction and bulk earthworks, followed by the construction of site buildings and infrastructure including the mine camp, internal roads, water management infrastructure, offices, workshops, laboratory, weighbridge and power supply and distribution.

Construction activities are typically considered to be progressive and will occur at several different locations simultaneously. One combined worst-case scenario was modelled, representative of construction of site access road and bulk earthworks, including formation of laydown areas, and tailings and overburden emplacement areas.

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<sup>1</sup> Report no. 4/18, "the propagation of noise from petroleum and petrochemical complexes to neighbouring communities", Prepared by C.J. Manning, M.Sc., M.I.O.A. Acoustic Technology Limited (Ref.AT 931), CONCAWE, Den Haag May 1981

Noise emission data and assumptions used in this assessment are summarised in **Table 16**. It is noted that the construction phase noise model assumed all plant operating at peak capacity for 100 per cent of the assessment period. It is therefore considered that the predicted noise levels represent worst-case emissions. Equipment sound power levels were generally sourced from manufacturer specifications, with noise levels for the CAT 789 water cart measured by MAC personnel.

**Table 16 Single Octave Equipment Sound Power Levels, dB LAeq(15min) ( $re 10^{-12} W$ )**

| Noise Source/Item                                | Octave Band Centre Frequency, Hz |     |     |     |      |      |      |      | Total, dBA <sup>1</sup> |
|--------------------------------------------------|----------------------------------|-----|-----|-----|------|------|------|------|-------------------------|
|                                                  | 63                               | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |                         |
| Site Construction Works                          |                                  |     |     |     |      |      |      |      |                         |
| Bulldozer (CAT D10T) (x2)                        | 90                               | 99  | 102 | 104 | 112  | 107  | 103  | 92   | 115                     |
| Scraper (Case Steiger AFS 550 dual scraper) (x3) | 88                               | 97  | 100 | 102 | 110  | 105  | 101  | 90   | 113                     |
| Grader (CAT 18M)                                 | 86                               | 85  | 87  | 99  | 105  | 104  | 95   | 85   | 109                     |
| Excavator (CAT 6020) (x2)                        | 91                               | 100 | 103 | 105 | 113  | 108  | 104  | 93   | 116                     |
| Front-end Loader (CAT992)                        | 87                               | 103 | 107 | 107 | 103  | 108  | 102  | 96   | 113                     |
| Haul Truck (CAT 785) (x9)                        | 72                               | 97  | 104 | 113 | 110  | 107  | 104  | 97   | 116                     |
| Water Cart (CAT 789)                             | 83                               | 98  | 103 | 109 | 110  | 106  | 100  | 94   | 114                     |
| Diesel Generators (30MW) <sup>2</sup>            | 105                              | 110 | 110 | 113 | 107  | 104  | 98   | 91   | 117                     |

Note 1: Sound Power Level for individual item of plant or equipment.

Note 2: Diesel generators to 30MW total capacity, for example, 15 x 2,500 kva silenced BS Power generators at 102dBA Lw each.

#### 4.1.2 Intersection Upgrade Works

In addition to site establishment works, the Project would involve construction of the Site Access Road (approximately 27km) from Anabranh Mail Road to the Infrastructure Area, realign and upgrade approximately 6.1km of Anabranh Mail Road from the Site Access Road to the Silver City Highway, and installation of intersection treatments at the junctions of:

- Anabranh Mail Road and Silver City Highway;
- Comstock Street and Patton Street;
- Comstock Street and Eyre Street; and
- Holton Drive and the Rail Facility Southern Access Road.

Upgrade works at Anabranh Mail Road would involve widening, grading and rolling the existing road. Typical items of equipment would include graders, smooth drum rollers, water carts and delivery trucks. It is noted that there are no sensitive receivers within 3km of the Site Access Road. Hence, it is considered that construction of the Site Access Road would not result in noise levels above the NMLs at any sensitive receiver locations.

The intersection upgrade works would typically involve minor kerb and guttering realignment, reconstruction of pedestrian ramps, modification of drainage pits and minor road widening works with new sealed pavement. Works would typically be undertaken over a period of a few days at each intersection location. Construction equipment may include delivery trucks, small excavator (5.5t), skid steer loaders, grader (Cat140 or similar), generator, concrete saw, asphalt paver, vibratory roller and light vehicles. It is noted that due to the confined nature of the intersection works, not all equipment would operate simultaneously, hence, the noisiest plant (concrete saw – Patton Street / Comstock Street and Eyre Street / Comstock Street; grader – Rail Facility Southern Access) have been considered.

Noise emission data for the upgrade to Anabranh Mail Road and the intersection treatments are provided in **Table 17**.

**Table 17 Single Octave Equipment Sound Power Levels, dB LAeq(15min) ( $re 10^{-12} W$ )**

| Noise Source/Item             | Octave Band Centre Frequency, Hz |     |     |     |      |      |      |      | Total, dBA <sup>1</sup> |
|-------------------------------|----------------------------------|-----|-----|-----|------|------|------|------|-------------------------|
|                               | 63                               | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |                         |
| Anabranh Mail Road            |                                  |     |     |     |      |      |      |      |                         |
| Construction Fleet            | 92                               | 100 | 105 | 110 | 114  | 111  | 104  | 96   | 117                     |
| Intersection Upgrade Works    |                                  |     |     |     |      |      |      |      |                         |
| Concrete Saw                  | 92                               | 91  | 96  | 100 | 105  | 110  | 116  | 109  | 118                     |
| Rail Facility Southern Access |                                  |     |     |     |      |      |      |      |                         |
| Grader (CAT 18M)              | 86                               | 85  | 87  | 99  | 105  | 104  | 95   | 85   | 109                     |

## 4.2 Operational Noise Modelling Parameters

The model incorporated three-dimensional digitised ground contours for the fixed plant and surrounding area, as derived from proposed Project plans superimposed onto the surrounding land base topography. Where relevant, modifying factors in accordance with Fact Sheet C of the NPI have been applied to calculations.

### 4.2.1 Meteorological Analysis

Noise emissions from industry can be significantly affected by prevailing weather conditions. Wind has the potential to increase noise at a receiver when it is at low velocities and travels from the direction of the noise source. As the strength of the wind increases, the noise produced by the wind will mask the audibility of most industrial sources.

Meteorological conditions that enhance received noise levels include source to receiver winds and the presence of temperature inversions. To account for potential enhancements, the NPI specifies that the source to the receiver wind component speeds up to 3m/s for 30% or more of the time in any seasonal period (i.e. day, evening or night), is considered to be a feature wind and predictions must incorporate these conditions.

To determine the prevailing conditions for the Project, weather data during the period January 2018 to December 2019 was obtained from the onsite weather station located at coordinates (MGA54) 550020, 6285480. The data was analysed using the EPA's Noise Enhancement Wind Analysis (NEWA) program in order to determine the frequency of occurrence of winds speeds up to 3m/s in each seasonal period.

**Table 18** summarises the results of the wind analysis and includes the dominant wind direction and percentage occurrence during each season for each assessment period. The results of the detailed analysis of meteorological data are presented in **Appendix B**.

**Table 18 Seasonal Frequency of Occurrence Wind Speed Intervals**

| Season | Period <sup>1</sup> | Wind Direction<br>$\pm(45^\circ)$ | % Wind Speeds (m/s) |
|--------|---------------------|-----------------------------------|---------------------|
|        |                     |                                   | 0.5 to 3 m/s        |
| Summer | Day                 | NE, E, ESE, SE                    | 8                   |
|        | Evening             | ENE                               | 15                  |
|        | Night               | S                                 | 13                  |
| Autumn | Day                 | SSW, SW, WSW                      | 10                  |
|        | Evening             | SE                                | 20                  |
|        | Night               | S                                 | 24                  |
| Winter | Day                 | SW, WSW, W                        | 11                  |
|        | Evening             | ESE                               | 14                  |
|        | Night               | W                                 | 17                  |
| Spring | Day                 | SSW                               | 9                   |
|        | Evening             | S                                 | 16                  |
|        | Night               | S                                 | 22                  |

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

Based on the results of this analysis, prevailing winds are not applicable for the assessment and the relevant meteorological conditions adopted are summarised in **Table 19**.

**Table 19 Modelled Site-Specific Meteorological Parameters**

| Assessment Condition <sup>1</sup> | Temperature | Wind Speed /<br>Direction | Relative Humidity | Stability Class |
|-----------------------------------|-------------|---------------------------|-------------------|-----------------|
| Daytime - Calm                    | 20°C        | n/a                       | 60%               | n/a             |
| Evening - Calm                    | 10°C        | n/a                       | 60%               | n/a             |
| Night - Inversion                 | 10°C        | n/a                       | 90%               | G               |

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

#### 4.2.2 Operational Noise Modelling Scenarios

Mining operations would commence with a starter pond at the southeastern extent of the deposit. The starter pond would be extracted using conventional free dig, load and haul mining techniques. Extracted overburden, namely materials located above the water table with no heavy mineral, would be used to construct infrastructure within the Mine Site or stockpiled for later use during rehabilitation operations.

Following establishment of the starter pond, the first dredge(s) would be installed, followed by the floating Wet Concentrator Plant and subsequent dredges.

Interburden, namely material located below the water table with no heavy mineral, would be extracted using floating dredges. Interburden would initially be transferred to the Off Path Storage Facility. Once the dredge pond has achieved its minimum operational size, extracted interburden would be used to backfill completed sections of the Extraction Area.

Ore, namely material with sufficient heavy mineral to justify processing, would be extracted using a floating dredge. The ore would be transferred to the floating Wet Concentration Plant for processing.

Tailings and interburden placed within the Extraction Area would be used to progressively backfill completed sections of the Extraction area and would be covered by overburden and soil before being rehabilitated.

Two modelling scenarios were adopted for this assessment (see indicative mining schedule **Figure 4** and **Figure 5**), and included:

- Scenario 1 – Year 6 mining operations; and
- Scenario 2 – Year 16 mining operations.

These scenarios represent the worst-case operating conditions, with the maximum number of plant and equipment operating simultaneously, at the locations with the highest potential impact on neighbouring receivers, during each of the assessment periods. The operational activities are summarised as follows:

- vegetation removal, soil stripping and site preparation (daylight hours only);
- excavation, transportation and placement of overburden using excavators and haul trucks (dry mining operations);
- mining of the interburden and ore material using dredges and pumping of the ore material to the floating Wet Concentration Plant for conventional gravity separation and then the Rare Earth Concentrate Plant (REC Plant) for further mineral separation;
- transportation of Mine Product via road by AB-Triple or AB-Quad road trains;
- maintenance of stockpiled overburden and tailings; and
- operation of the solar farm and BESS for energy supply.

Mobile plant noise emission data used in modelling for this assessment were obtained from manufacture's specifications and the MAC database. The indicative mining fleet for each assessed operational scenario is provided in **Table 20**, and noise emission levels used in the modelling are summarised in **Table 21**.

**Table 20 Indicative Mining Fleet**

| ID                     | Equipment              | Indicative Make / Model | Period of Operation | Number of Equipment |                    |
|------------------------|------------------------|-------------------------|---------------------|---------------------|--------------------|
|                        |                        |                         |                     | Year 6 Operations   | Year 16 Operations |
| Concentrate Management |                        |                         |                     |                     |                    |
| REC<br>Plant           | Excavator              | Komatsu PC300 or        | All                 | 2                   | 2                  |
|                        | Bulldozer              | CAT D9                  | All                 | 1                   | 1                  |
|                        | Haul Truck             | CAT 745 or equivalent   | All                 | 3                   | 3                  |
|                        | Loader                 | CAT 966 or equivalent   | All                 | 1                   | 1                  |
| Mining                 |                        |                         |                     |                     |                    |
| 1                      | Excavator              | CAT 6020                | Day                 | 1                   | 1                  |
| 2                      | Haul Truck             | CAT 785                 | All                 | 7                   | 4                  |
| 3                      | Bulldozer              | CAT D10T                | Day                 | 2                   | 2                  |
| 4                      | Grader                 | CAT 16K                 | All                 | 2                   | 2                  |
| 5                      | Water Cart             | CAT 777                 | All                 | 1                   | 1                  |
| 6                      | Bulldozer              | CAT D9                  | Day                 | 2                   | 2                  |
| 7                      | Scraper                | CAT 657                 | Day                 | 2                   | 2                  |
| 8                      | Excavator              | CAT 390                 | All                 | 1                   | 1                  |
| 9                      | Excavator              | CAT 349                 | All                 | 1                   | 1                  |
| 10                     | Excavator              | CAT 336                 | All                 | 1                   | 1                  |
| 11                     | Wheeled Loader         | CAT 992G                | All                 | 1                   | 1                  |
| 12                     | Wheeled Loader         | CAT 980K                | All                 | 1                   | 1                  |
| 13                     | Articulated Truck      | Volvo A60H              | All                 | 2                   | 2                  |
| 14                     | Articulated Truck      | Bell Moxy B50D          | All                 | 2                   | 2                  |
| 15                     | Grader                 | CAT14M                  | All                 | 1                   | 1                  |
| 16                     | Water Cart             | CAT 773                 | All                 | 1                   | 1                  |
| 17                     | Water Cart             | Moxy                    | All                 | 1                   | 1                  |
| 18                     | Dredge                 | Jet Suction Dredge      | All                 | 3                   | 3                  |
| 19                     | Wet Concentrator Plant | Floating Plant          | All                 | 1                   | 1                  |
| 20                     | Road Truck             | Road Train              | All                 | 2                   | 2                  |
| 21                     | BESS                   | Modular                 | All                 | 1                   | 1                  |

**Table 21 Single Octave Equipment Sound Power Levels, dB LAeq(15min) (re10-12W)**

| ID                             | Noise Source/Item         | Octave Band Centre Frequency, Hz |     |     |     |      |      |      |      | Total, dBA <sup>1</sup> |
|--------------------------------|---------------------------|----------------------------------|-----|-----|-----|------|------|------|------|-------------------------|
|                                |                           | 63                               | 125 | 250 | 500 | 1000 | 2000 | 4000 | 8000 |                         |
| Concentrate Management         |                           |                                  |     |     |     |      |      |      |      |                         |
| REC<br>Plant                   | Excavator (Komatsu PC300) | 79                               | 93  | 94  | 99  | 98   | 93   | 81   | 70   | 103                     |
|                                | Bulldozer (CAT D9)        | 86                               | 106 | 103 | 104 | 106  | 108  | 102  | 93   | 113                     |
|                                | Haul Truck (CAT 745)      | 86                               | 93  | 95  | 100 | 102  | 101  | 97   | 87   | 107                     |
|                                | Loader (CAT 966)          | 91                               | 96  | 98  | 105 | 103  | 101  | 95   | 86   | 109                     |
| Mining                         |                           |                                  |     |     |     |      |      |      |      |                         |
| 1                              | Excavator (CAT 6020)      | 91                               | 100 | 103 | 105 | 113  | 108  | 104  | 93   | 116                     |
| 2                              | Haul Truck (CAT 785)      | 72                               | 97  | 104 | 113 | 110  | 107  | 104  | 97   | 116                     |
| 3                              | Bulldozer (CAT D10T)      | 90                               | 99  | 102 | 104 | 112  | 107  | 103  | 92   | 115                     |
| 4                              | Grader (CAT 16K)          | 86                               | 85  | 87  | 99  | 105  | 104  | 95   | 85   | 109                     |
| 5                              | Water Cart (CAT 777)      | 71                               | 96  | 103 | 112 | 109  | 106  | 103  | 96   | 115                     |
| 6                              | Bulldozer (CAT D9)        | 86                               | 106 | 103 | 104 | 106  | 108  | 102  | 93   | 113                     |
| 7                              | Scraper (CAT 657)         | 88                               | 97  | 100 | 102 | 110  | 105  | 101  | 90   | 113                     |
| 8                              | Excavator (CAT 390)       | 79                               | 95  | 95  | 100 | 102  | 102  | 101  | 93   | 108                     |
| 9                              | Excavator (CAT 349)       | 91                               | 94  | 97  | 105 | 100  | 99   | 94   | 84   | 108                     |
| 10                             | Excavator (CAT 336)       | 91                               | 98  | 97  | 96  | 97   | 96   | 93   | 84   | 105                     |
| 11                             | Loader (CAT 992G)         | 87                               | 103 | 107 | 107 | 103  | 108  | 102  | 96   | 113                     |
| 12                             | Loader (CAT 980K)         | 82                               | 98  | 102 | 102 | 98   | 103  | 97   | 91   | 109                     |
| 13                             | Articulated Truck (A60H)  | 92                               | 99  | 101 | 106 | 108  | 107  | 103  | 93   | 113                     |
| 14                             | Articulated Truck (B50D)  | 98                               | 90  | 98  | 102 | 106  | 104  | 99   | 92   | 110                     |
| 15                             | Grader (CAT 14M)          | 84                               | 84  | 86  | 98  | 104  | 103  | 93   | 84   | 107                     |
| 16                             | Water Cart (CAT 773)      | 83                               | 98  | 103 | 109 | 110  | 106  | 100  | 94   | 114                     |
| 17                             | Water Cart (Moxy)         | 82                               | 95  | 91  | 95  | 100  | 98   | 93   | 85   | 104                     |
| 18                             | Dredge <sup>2</sup>       | 85                               | 103 | 99  | 103 | 106  | 102  | 95   | 85   | 110                     |
| 19                             | Wet Concentrator Plant    | 59                               | 71  | 88  | 82  | 84   | 89   | 89   | 82   | 95                      |
| 20                             | Road Truck                | 75                               | 90  | 97  | 103 | 102  | 102  | 97   | 93   | 108                     |
| 21                             | BESS                      | 65                               | 79  | 93  | 87  | 83   | 79   | 65   | 45   | 95                      |
| Maximum Noise Level Assessment |                           |                                  |     |     |     |      |      |      |      |                         |
| Excavator Bucket Shake         |                           | 82                               | 98  | 95  | 96  | 104  | 112  | 116  | 107  | 118                     |

Note 1: Sound Power Level for individual item of plant or equipment.

Note 2: Sound Power Level measured by MAC personnel.

### 4.2.3 Annoying Characteristics

Fact Sheet C of the NPI provides guidelines for applying 'modifying factors' corrections to account for annoying noise characteristics such as low-frequency, tonality, intermittent noise or noise of short duration. An assessment of annoying characteristics has been undertaken for the Project, and is provided in **Appendix C**. It is noted that due to the nature of the operations, intermittent noise is not considered to be a feature of the site and has not been assessed.

The analysis of low-frequency noise found that modelled noise levels from all sources exceeded the screening test of C-A weighted noise levels greater or equal to 15dB. Therefore, further analysis was undertaken to determine whether noise levels exceeded the threshold in any octave band. The results of the assessment indicated that Z weighted noise levels remained below the relevant thresholds for all octave bands. Hence, no correction for low-frequency noise is applied.

An assessment of tonality was undertaken to identify dominant tones associated with the Project. The tonal noise correction applies when the level of an octave band exceeds the level of the adjacent band on either side by at least 5dB. The results of the tonality assessment demonstrates that the operations are not anticipated to result in dominant tones. Hence, no correction for tonality is applied.

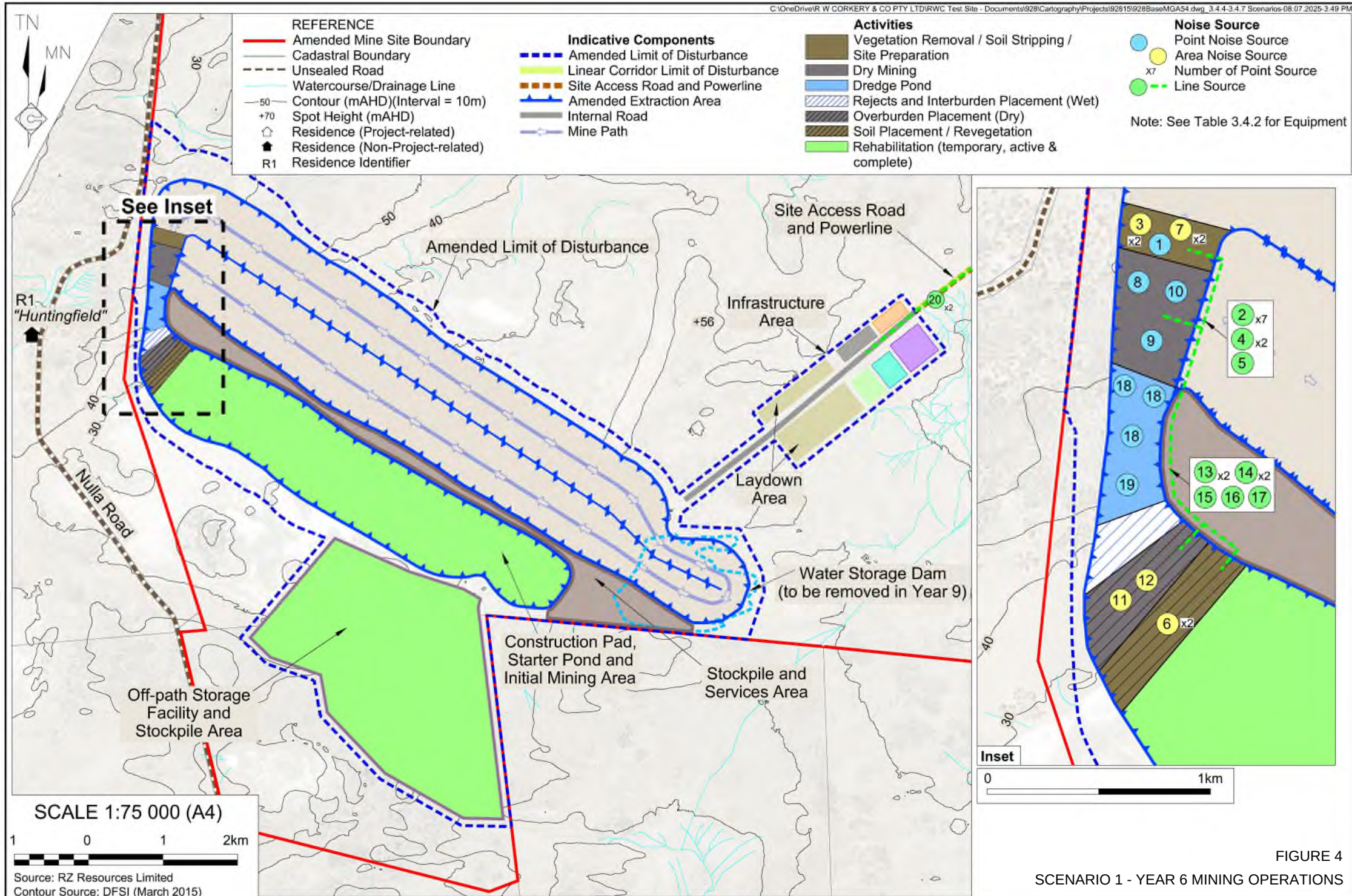


FIGURE 4

SCENARIO 1 - YEAR 6 MINING OPERATIONS

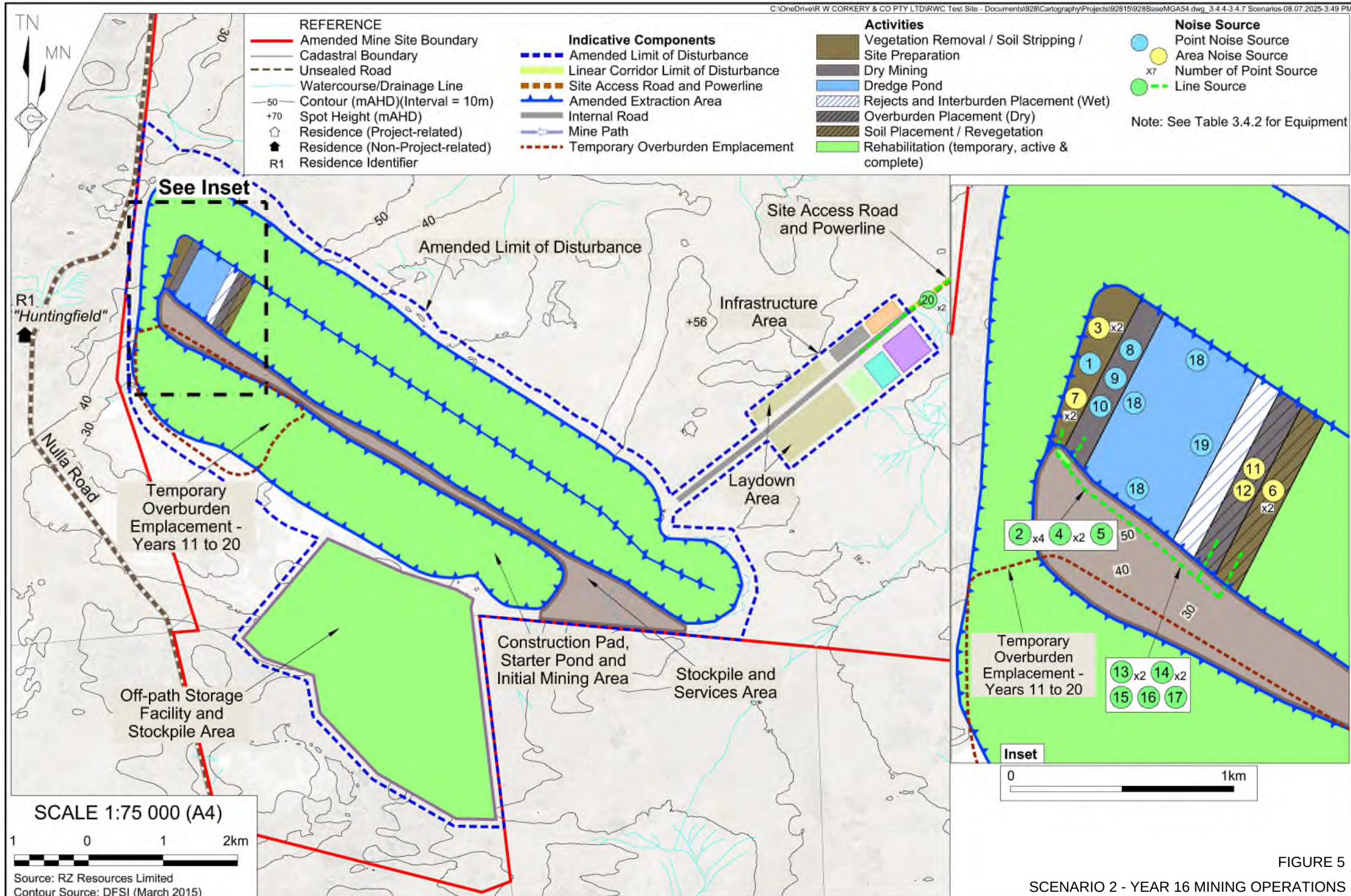


FIGURE 5

SCENARIO 2 - YEAR 16 MINING OPERATIONS

### 4.3 Road Noise Assessment Methodology

The Mine Product would be transported in sealed containers via road using AB-Triple or AB-Quad road trains to the Rail Facility off Holten Drive, Broken Hill. The travel route from the Project site would be via Anabranth Mail Road, Silver City Highway, Wentworth Road, Patton Street, Comstock Street, Eyre Street and Holten Drive.

Other light and heavy vehicles would typically travel to and from the south, with 90% of vehicles travelling via the Silver City Highway from Wentworth, Victoria and/or South Australia. 10% of light and heavy vehicles would travel from locations and equipment suppliers in Broken Hill via the Silver City Highway and Anabranth Mail Road.

MAC understands that the daily number of vehicle movements associated with the Project include:

- up to 16 laden Mine Product trucks (32 movements);
- up to 5 laden Monazite semi-trailers (10 movements);
- up to seven laden delivery trucks (14 movements);
- an average of two bus trips (four movements); and
- up to 42 light vehicle trips (84 movements).

Haulage of Mine Product within the Broken Hill LGA would occur between 7am and 10pm daily, with all other vehicle movements occurring 24 hours per day. The travel routes are provided in **Figure 6**.

The closest offset distance to receivers along the haul route are presented in **Table 22**. It is noted that the nearest receiver to Anabranth Mail Road (Residence R7) is setback more than 2km. As this receiver is unlikely to be affected by road traffic noise, it has been excluded from the assessment.

**Table 22 Closest Receivers to Haul Route**

| Street Name               | Receiver                    | MGA 54 Coordinates |              | Distance to Road |
|---------------------------|-----------------------------|--------------------|--------------|------------------|
|                           |                             | Easting (m)        | Northing (m) |                  |
| Silver City Highway       | 14098 Silver City Highway   | 558079             | 6350505      | 250m             |
| Wentworth Road            | 101 Wentworth Road          | 542258             | 6460472      | 40m              |
| Patton Street             | 4 Patton Street             | 542849             | 6461122      | 20m              |
| Comstock Street           | 43 Comstock Street          | 543486             | 6461740      | 15m              |
| Eyre Street               | 155 Eyre Street             | 543394             | 6462061      | 20m              |
|                           | St Annes Aged Care Facility | 543562             | 6462206      | 20m              |
| Holten Drive <sup>1</sup> | N/A                         | N/A                | N/A          | N/A              |

**Table 22 Closest Receivers to Haul Route**

| Street Name              | Receiver         | MGA 54 Coordinates |              | Distance to Road |
|--------------------------|------------------|--------------------|--------------|------------------|
|                          |                  | Easting (m)        | Northing (m) |                  |
| Adams Street (Wentworth) | 181 Adams Street | 584381             | 6226911      | 25m              |

Note 1: No sensitive receivers located adjacent to the haul route off Holten Drive

In addition to the normal haulage operations, the project would transport monazite directly from the Mine Site to the Port of Adelaide through Broken Hill. The monazite material would only be transported at a time when the export ship is docked at the Port of Adelaide. Therefore, the frequency and volume of truck movements is indeterminate, but would likely be up to five trucks per day (Type 1 Road Trains) when transport is scheduled from the Mine Site to the Port. The travel route from the mine site to Adelaide would be via the Silver City Highway, Kanandah Road, Ryan Street, Creedon Street and the Barrier Highway. Ryan Street and Creedon Street is flanked by residential properties on either side of the road.

Due to the low traffic volume generated by the Project over a typical day during the construction phase, road traffic noise calculation methods such as Calculation of Road Traffic Noise (CRTN - ISBN 0 11 550847 3) by Department of Transport (UK) 1988 or Traffic Noise Model (TNM) by the United States Department of Transport, Federal Highway Administration are not considered appropriate as they are primarily intended to calculate noise emissions from motorways and highways. Whilst each method has a low volume correction, the Project traffic volume is out of the scope of these methods.

Therefore, road traffic noise has been modelled using iNoise modelling software using ISO 9613-1 and ISO 9613-2 calculation methods, representing the road traffic as “moving sources” along the transport route using the parameters presented in **Table 23**.

**Table 23 Road Traffic Noise Modelling Parameters**

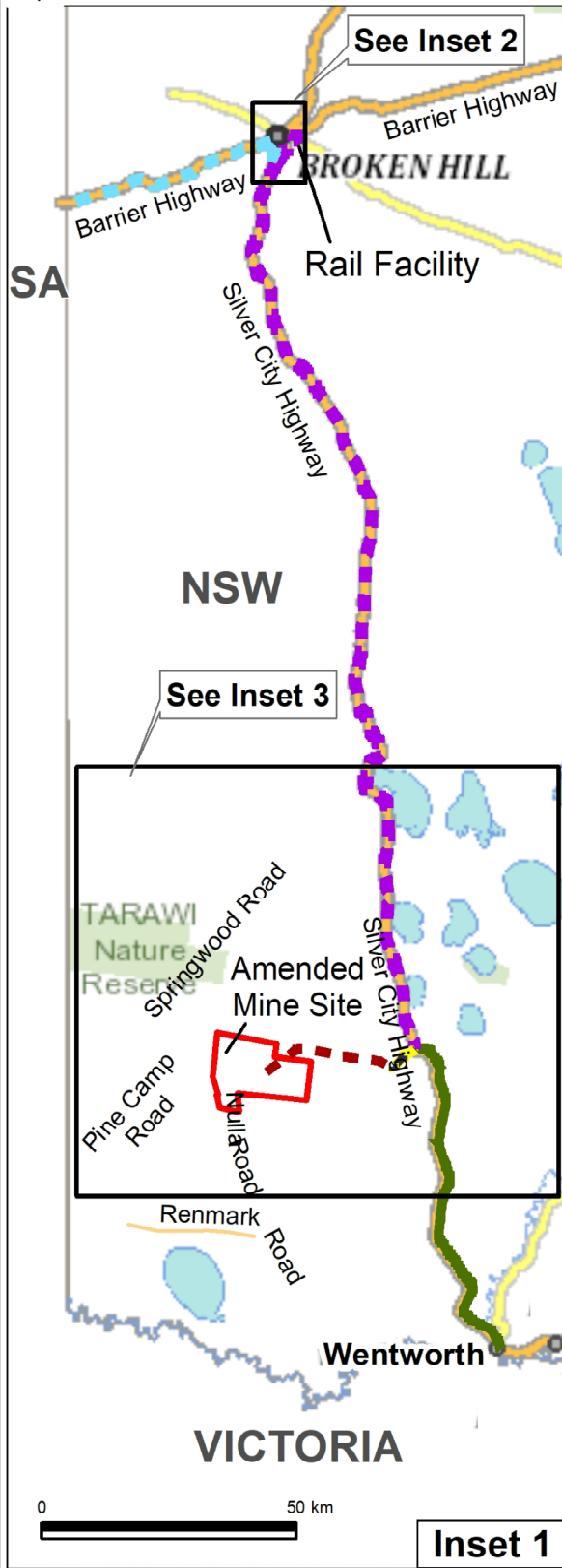
| Noise Source/Item                                        | Direction of Travel | Lw dBA<br>re 10 <sup>-12</sup> W | Movements <sup>1</sup> |       | Speed,<br>km/h <sup>2</sup> | Source<br>Height, m <sup>3</sup> |
|----------------------------------------------------------|---------------------|----------------------------------|------------------------|-------|-----------------------------|----------------------------------|
|                                                          |                     |                                  | Day                    | Night |                             |                                  |
| Heavy Vehicle <sup>4</sup><br>(AB-triple or AB-quad)     | North               | 108                              | 32                     | n/a   | 50 / 100                    | 1.5                              |
| Other Heavy Vehicle<br>(rigid, semi-trailer or b-double) | North               | 104                              | 1                      | n/a   | 50 / 100                    | 1.5                              |
|                                                          | South               | 104                              | 13                     | 3     | 50 / 100                    | 1.5                              |
| Monazite Haulage Trucks<br>(Type 1 Road Trains)          | North               | 108                              | 5                      | n/a   | 50/100                      | 1.5                              |
| Light Vehicle                                            | North               | 96                               | 4                      | 4     | 50 / 110                    | 0.75                             |
|                                                          | South               | 96                               | 38                     | 38    | 50 / 110                    | 0.75                             |

Note 1: Day period 7am to 10pm, night period 10pm to 7am.

Note 2: 50km/h on local roads, 100km/h (truck) / 110km/h (car) on Silver City Highway.

Note 3: Height above ground level.

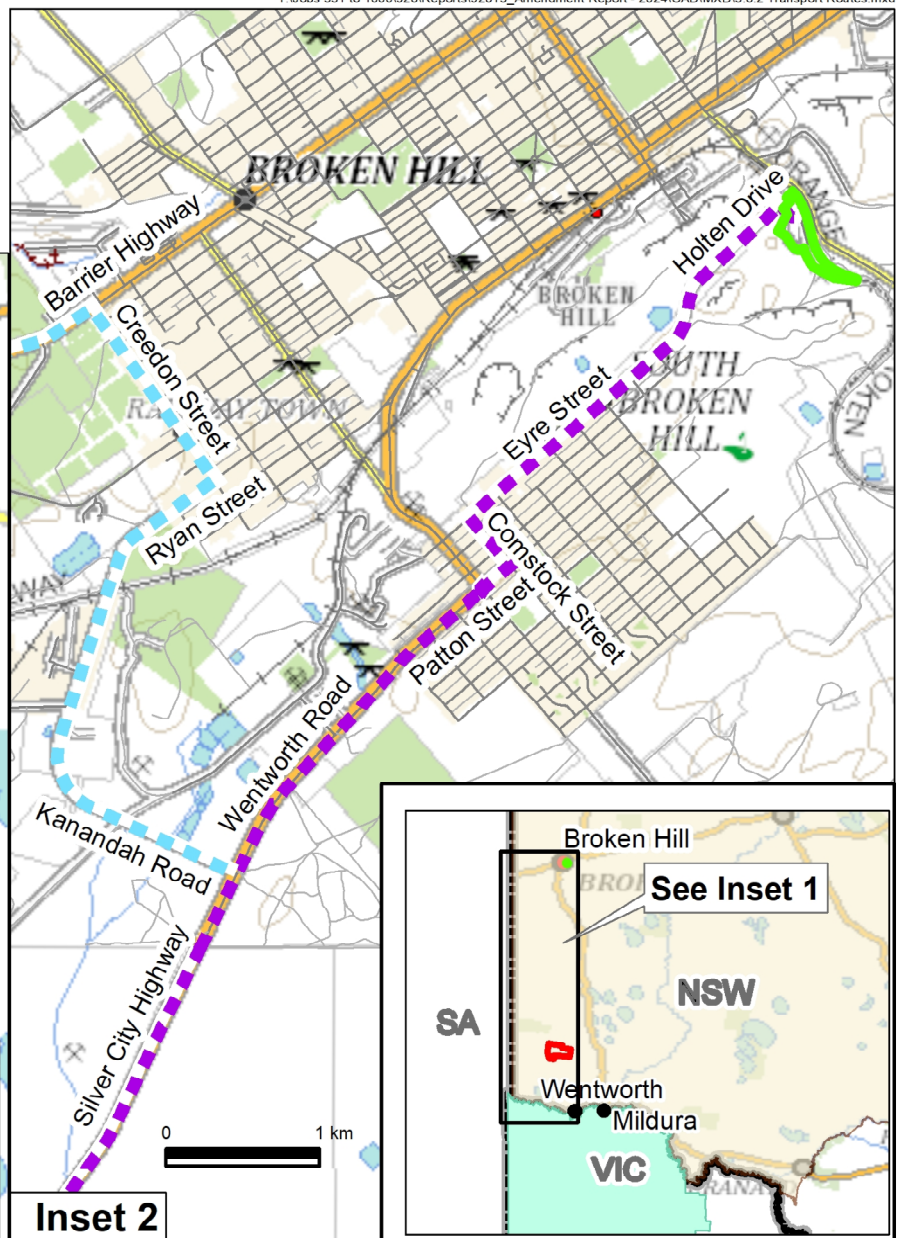
Note 4: AB-triple and AB-quad vehicle movements during day period only.



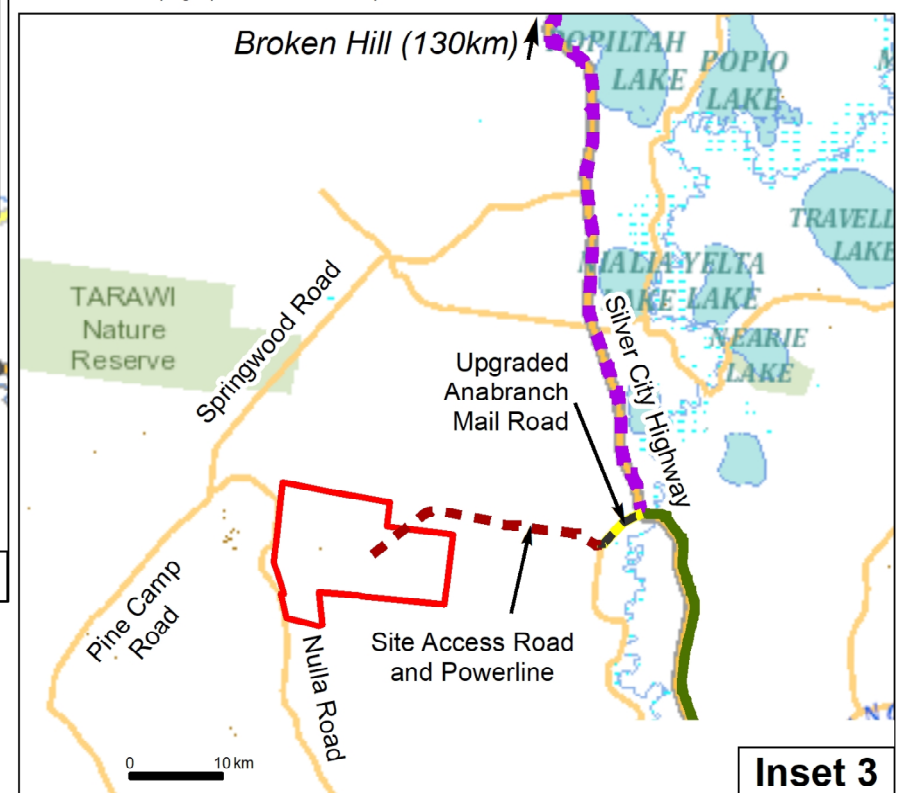
Source: NSW Topographic Web Base Map - LPI

## REFERENCE

- Amended Mine Site Boundary
- Rail Facility Boundary
- - - Site Access Road and Powerline
- - - Upgraded Anabranth Mail Road
- - - Transportation Route - North
- - - Transportation Route - South
- - - Transportation Route - Monazite



Source: NSW Topographic Web Base Map - LPI



Source: NSW Topographic Web Base Map - LPI

FIGURE 6  
TRANSPORT ROUTES

## 5 Noise Assessment Results

### 5.1 Construction Phase Noise Modelling Results

#### 5.1.1 Site Establishment and Construction

Predicted noise levels for on-site construction activities described in **Section 4.1.1** are provided in **Table 24**. The results of the analysis show that noise emissions from construction activities are predicted to satisfy the relevant noise management levels at all receiver locations during standard or hour of hours construction periods.

**Table 24 Combined Noise Predictions – Site Establishment and Construction**

| Receiver | Receiver Status         | Predicted Noise Level<br>dB LAeq(15min) | NML            |     | Compliant |
|----------|-------------------------|-----------------------------------------|----------------|-----|-----------|
|          |                         |                                         | dB LAeq(15min) |     |           |
|          |                         |                                         | Day            | OOH |           |
| R1       | Permanently Occupied    | <30                                     | 45             | 35  | ✓         |
| R2       | Permanently Occupied    | <30                                     | 45             | 35  | ✓         |
| R3       | Intermittently Occupied | <30                                     | 45             | 35  | ✓         |
| R4       | Project Related         | <30                                     | 45             | 35  | n/a       |
| R5       | Unoccupied              | <30                                     | 45             | 35  | n/a       |
| R6       | Permanently Occupied    | <30                                     | 45             | 35  | ✓         |
| R7       | Permanently Occupied    | <30                                     | 45             | 35  | ✓         |
| R8       | Permanently Occupied    | <30                                     | 45             | 35  | ✓         |
| R9       | Permanently Occupied    | <30                                     | 45             | 35  | ✓         |
| R10      | Permanently Occupied    | <30                                     | 45             | 35  | ✓         |

Note: See **Table 4** for Construction Hours.

#### 5.1.2 Intersection Upgrade Works

Predicted noise levels for road upgrade and intersection treatment activities described in **Section 4.1.2** are provided in **Table 25** for the nearest non project-related residential receivers to each of the construction sites.

The results of the analysis show that construction noise levels are anticipated to remain below the NMLs for the nearest residential receivers for construction of the all-weather access to the Rail Facility Southern Access off Holten Drive, during standard construction hours. Where works are undertaken outside of standard construction hours (ie 6pm to 10pm), noise level are predicted to exceed the relevant NMLs by up to 7dBA.

For intersection upgrade works at Patton Street / Comstock Street and Comstock Street / Eyre Street, construction noise levels are predicted to exceed the standard and out of hours NMLs and the highly noise affected (HNA) noise level of 75dB LAeq(15min) at the nearest residential receivers. It is noted that construction works would be undertaken over a period of a few days at each intersection location.

It is recommended that prior to undertaking intersection upgrade works, the Applicant should contact potentially noise affected neighbours at the earliest possible time, informing them of the nature of the works and duration of activities.

**Table 25 Combined Noise Predictions – Road and Intersection Upgrades**

| Receiver                                     | Distance to Works | Predicted Noise Level<br>dB LAeq(15min) | NML            |         |     | Compliant |
|----------------------------------------------|-------------------|-----------------------------------------|----------------|---------|-----|-----------|
|                                              |                   |                                         | dB LAeq(15min) |         |     |           |
|                                              |                   |                                         | Day            | Evening | HNA |           |
| Patton Street / Comstock Street Intersection |                   |                                         |                |         |     |           |
| 37 Comstock Street                           | ~10m              | 80                                      | 45             | 35      | 75  | <b>X</b>  |
| Comstock Street / Eyre Street Intersection   |                   |                                         |                |         |     |           |
| 137 Eyre Street                              | ~10m              | 87                                      | 45             | 35      | 75  | <b>X</b>  |
| Rail Facility Southern Access                |                   |                                         |                |         |     |           |
| Lot 7313 DP1185108                           | ~530m             | 42                                      | 45             | 35      | 75  | Day       |

Note: See **Table 4** for Construction Hours.

## 5.2 Operational Scenario Noise Modelling Results

Worst-case predicted noise levels for typical activities during Year 6 and Year 16 operations are provided in **Table 26** and noise contour plots are provided in **Appendix D**. It is noted that receiver R2 and the Mine Camp are Project related and are not considered to be sensitive receivers. R5 is a derelict residence that is unoccupied.

The results of the model show that noise emissions from Project operations are predicted to satisfy relevant criteria during all assessment periods, including the night period under strong inversion (G Class) conditions, at all non-Project related receiver locations. Notwithstanding, the Applicant proposes the following measures to manage noise emissions from the Project:

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

**Table 26 Combined Noise Predictions – Operational Scenarios<sup>1,2</sup>**

| Receiver        | Predicted Noise Level, dB LAeq(15min) |                 |       |                    |                      |                 |       |                    | PNTL, dB LAeq(15min) |         |       | Compliant |
|-----------------|---------------------------------------|-----------------|-------|--------------------|----------------------|-----------------|-------|--------------------|----------------------|---------|-------|-----------|
|                 | Scenario 1 (Year 6)                   |                 |       |                    | Scenario 2 (Year 16) |                 |       |                    | Day                  | Evening | Night |           |
|                 | Day                                   | Evening<br>Calm | Night | Night<br>Inversion | Day                  | Evening<br>Calm | Night | Night<br>Inversion |                      |         |       |           |
| R1              | 35                                    | 30              | 31    | 33                 | 32                   | <30             | <30   | <30                | 40                   | 35      | 35    | ✓         |
| R2              | <30                                   | <30             | <30   | <30                | <30                  | <30             | <30   | <30                | 40                   | 35      | 35    | ✓         |
| R3              | <30                                   | <30             | <30   | <30                | <30                  | <30             | <30   | <30                | 40                   | 35      | 35    | ✓         |
| R4 <sup>2</sup> | <30                                   | <30             | <30   | <30                | <30                  | <30             | <30   | <30                | n/a                  | n/a     | n/a   | n/a       |
| R5 <sup>3</sup> | <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    | ✓         |
| R7              | <30                                   | <30             | <30   | <30                | <30                  | <30             | <30   | <30                | 40                   | 35      | 35    | ✓         |
| R8              | <30                                   | <30             | <30   | <30                | <30                  | <30             | <30   | <30                | 40                   | 35      | 35    | ✓         |
| R9              | <30                                   | <30             | <30   | <30                | <30                  | <30             | <30   | <30                | 40                   | 35      | 35    | ✓         |
| R10             | <30                                   | <30             | <30   | <30                | <30                  | <30             | <30   | <30                | 40                   | 35      | 35    | ✓         |
| MC <sup>4</sup> | 44                                    | 44              | 44    | 46                 | 43                   | 43              | 43    | 45                 | 58                   | 53      | 48    | n/a       |

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

Note 2: Project-related receiver.

Note 3: Unoccupied residence.

Note 4: Mine Camp assessed against amenity criteria for short term accommodation.

### 5.3 Maximum Noise Level Assessment

In assessing sleep disturbance, a typical L<sub>Amax</sub> noise source of 118dB was used to represent transient events such as an excavator shaking the bucket, to the nearest residential receivers.

Predicted noise levels from L<sub>Amax</sub> events for assessed receivers are presented in **Table 27**. Results identify that Maximum Trigger Levels will be satisfied for all residential receivers. It is noted that predictions are below the EPA screening criteria, hence no further assessment or detailed analysis is required.

**Table 27 Maximum Noise Levels Assessment (Night)<sup>1,2</sup>**

| Receiver        | Predicted Noise Level) |          |                      |          | Trigger Levels |          | Compliant |
|-----------------|------------------------|----------|----------------------|----------|----------------|----------|-----------|
|                 | Scenario 1 (Year 6)    |          | Scenario 2 (Year 16) |          | dB LAeq(15min) | dB LAmax |           |
|                 | dB LAeq(15min)         | dB LAmax | dB LAeq(15min)       | dB LAmax |                |          |           |
| R1              | <32                    | <30      | <30                  | <30      | 40             | 52       | ✓         |
| R2              | <30                    | <30      | <30                  | <30      | 40             | 52       | ✓         |
| R3              | <30                    | <30      | <30                  | <30      | 40             | 52       | ✓         |
| R4 <sup>2</sup> | <30                    | <30      | <30                  | <30      | n/a            | n/a      | n/a       |
| R5 <sup>3</sup> | <30                    | <30      | <30                  | <30      | n/a            | n/a      | n/a       |
| R6              | <30                    | <30      | <30                  | <30      | 40             | 52       | ✓         |
| R7              | <30                    | <30      | <30                  | <30      | 40             | 52       | ✓         |
| R8              | <30                    | <30      | <30                  | <30      | 40             | 52       | ✓         |
| R9              | <30                    | <30      | <30                  | <30      | 40             | 52       | ✓         |
| R10             | <30                    | <30      | <30                  | <30      | 40             | 52       | ✓         |
| MC <sup>4</sup> | <30                    | <30      | <30                  | <30      | n/a            | n/a      | n/a       |

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

Note 2: Project-related receiver.

Note 3: Unoccupied residence.

Note 4: Mine Camp assessed against amenity criteria for short term accommodation.

## 5.4 VLAMP Assessment

The results of the operational noise assessment provided in **Section 5.2** demonstrates that noise emissions associated with the operation of the Project would not exceed the PNTLS at any of the assessed receiver locations. Therefore, as per the VLAMP definitions, there are no receivers that fall under voluntary land mitigation rights.

Furthermore, the modelled affection zones, (refer to **Figures D1 to D8**) are up to approximately 350ha for night period operations during strong temperature inversions, which is <25% of the land area covered by Lot 1907 DP 763791 and Lot 1940 DP 763792 (receiver R1) of 11,000ha. Hence, there are no receivers that fall under the voluntary land acquisitions rights.

## 5.5 Road Traffic Noise Results

Predicted road traffic noise levels from the Project are presented in **Table 28**. Noise levels were modelled to the nearest residential receivers along each transport route using iNoise modelling software using ISO 9613-1 and ISO 9613-2 calculation methods. Predicted noise levels included a +2.5dB façade correction and a -1.7dB ARRB correction.

The results of the road traffic noise calculations indicated that for the closest rural residential receivers to the transport route along the Silver City Highway (14098 Silver City Highway), the Project related road traffic noise levels would be up to 43.3dB LAeq(period) for the day, while residential receivers located within Broken Hill are predicted to experience road traffic noise levels of up to 48.9dB LAeq(period) during the day. It is noted that there would be no transport activities within the Broken Hill LGA during the night period.

Within the township of Wentworth, Project related road traffic noise levels are predicted at up to 39.9dB LAeq(period) during the day, and 36.0dB LAeq(period) during the night. Hence, road traffic noise levels are predicted to remain significantly below the day and night period assessment criteria. It is therefore considered that the road traffic noise criteria would be satisfied at all receiver locations.

**Table 28 Operational Road Traffic Noise Levels**

| Travel Route           | Receiver                            | Offset from Road | Period | Assessment Criteria<br>dB LAeq(period) | Traffic Noise<br>dB LAeq(period) | Compliant |
|------------------------|-------------------------------------|------------------|--------|----------------------------------------|----------------------------------|-----------|
| North<br>(Broken Hill) | 14098 Silver City Highway           | 255m             | Day    | 60 LAeq(15hr)                          | 43.3                             | ✓         |
|                        |                                     |                  | Night  | 55 LAeq(9hr)                           | n/a                              | n/a       |
|                        | 43 Comstock Street                  | 15m              | Day    | 60 LAeq(15hr)                          | 48.9                             | ✓         |
|                        |                                     |                  | Night  | 55 LAeq(9hr)                           | n/a                              | n/a       |
|                        | St Annes (Eyre Street) <sup>1</sup> | 20m              | Day    | 60 LAeq(15hr)                          | 47.0                             | ✓         |
|                        |                                     |                  | Night  | 55 LAeq(9hr)                           | n/a                              | n/a       |
|                        | 44 Ryan Street                      | 15m              | Day    | 60 LAeq(15hr)                          | 40.0                             | ✓         |
|                        |                                     |                  | Night  | 55 LAeq(9hr)                           | n/a                              | n/a       |
| South<br>(Wentworth)   | 181 Adams Street                    | 25m              | Day    | 60 LAeq(15hr)                          | 39.9                             | ✓         |
|                        |                                     |                  | Night  | 55 LAeq(9hr)                           | 36.0                             | ✓         |

Note 1: Aged care facility assessed against residential land use noise assessment criteria as per Table 4 of the RNP.

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## 6 Discussion and Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has conducted a Noise Impact Assessment (NIA) of potential emissions from the proposed Copi Mineral Sands Project (the Project), located approximately 75km northwest of Wentworth in the Far West Region of NSW. The assessment has quantified potential noise emissions including Project construction, resource extraction and processing, and dispatch of product via road trucks associated with the Project.

The results of the Noise Impact Assessment demonstrate that onsite construction phase activities and operational noise levels comply with the relevant ICNG, NPI and VLAMP criteria for all assessment periods at the most affected sensitive receiver locations. It is noted that receiver R2 and the Mine Camp are Project related receivers, while R5 is a derelict residence that is unoccupied.

During road upgrade works at the intersections of Patton Street / Comstock Street and Comstock Street / Eyre Street, construction noise levels are predicted to exceed the standard and out of hours NMLs, as well as the highly noise affected noise level at the nearest residential receivers, while construction of the all-weather access to the Rail Facility Southern Access off Holten Drive is expected to generate noise levels above the out of hours NML at nearby sensitive receiver locations. Hence, early and ongoing communication with potentially affected receivers should be undertaken prior to the initiation of works. It is noted that construction activities at each of the intersections is anticipated to occur for a few days only.

Results of the maximum noise level assessment are identified to remain below the sleep disturbance trigger levels at all residential receivers. Therefore, sleep disturbance due to noise sources within the Project are unlikely to cause awakening reactions to adjacent receivers.

Additionally, the Noise Impact Assessment demonstrates that the road noise criteria as specified in the RNP will be satisfied at the nearest potentially affected receivers for worst case operational road traffic.

In summary, the Noise Assessment supports the Environmental Impact Statement for the Project without ameliorative measures being required.

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# Appendix A – Glossary of Terms

A number of technical terms have been used in this report and are explained in **Table A1**.

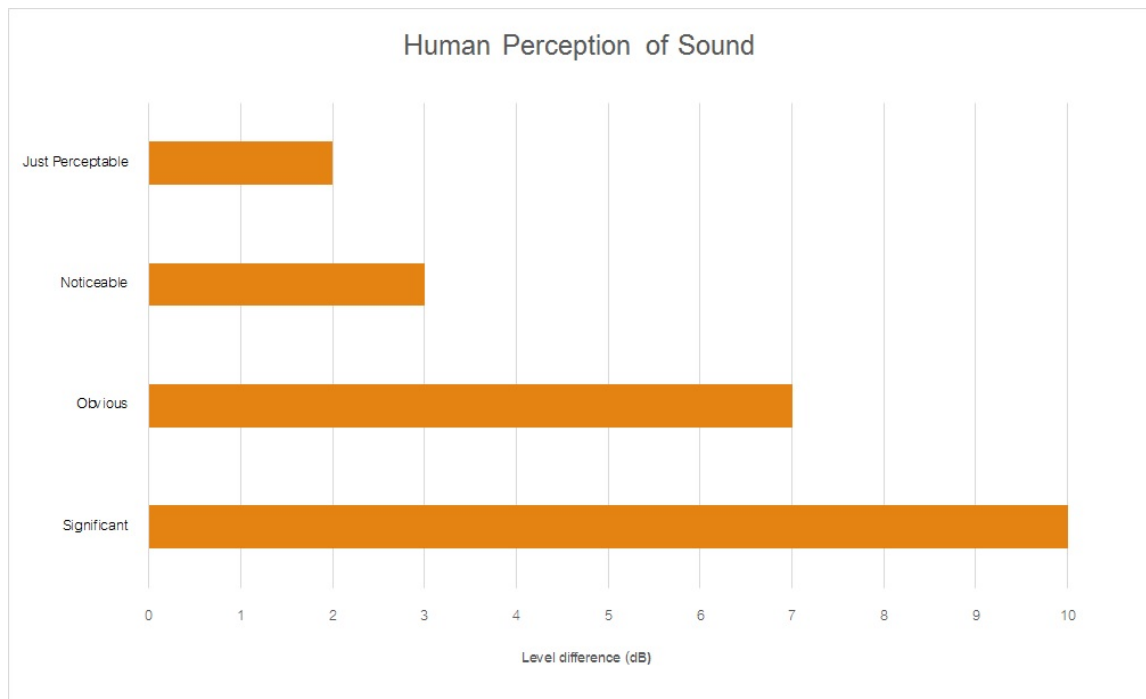
| Table A1 Glossary of Acoustical Terms |                                                                                                                                                                                                                                                                       |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Term                                  | Description                                                                                                                                                                                                                                                           |
| 1/3 Octave                            | Single octave bands divided into three parts                                                                                                                                                                                                                          |
| Octave                                | A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.                                                                                                                                           |
| ABL                                   | Assessment Background Level (ABL) is defined in the NPI as a single figure background level for each assessment period (day, evening and night). It is the tenth percentile of the measured L90 statistical noise levels.                                             |
| Ambient Noise                         | The total noise associated with a given environment. Typically, a composite of sounds from all sources located both near and far where no particular sound is dominant.                                                                                               |
| A Weighting                           | A standard weighting of the audible frequencies designed to reflect the response of the human ear to sound.                                                                                                                                                           |
| Background Noise                      | The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is usually represented by the LA90 descriptor                                                                      |
| dBA                                   | Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.                                           |
| dB(Z), dB(L)                          | Decibels Z-weighted or decibels Linear (unweighted).                                                                                                                                                                                                                  |
| Extraneous Noise                      | Sound resulting from activities that are not typical of the area.                                                                                                                                                                                                     |
| Hertz (Hz)                            | The measure of frequency of sound wave oscillations per second - 1 oscillation per second equals 1 hertz.                                                                                                                                                             |
| LA10                                  | A sound level which is exceeded 10% of the time.                                                                                                                                                                                                                      |
| LA90                                  | Commonly referred to as the background noise, this is the level exceeded 90% of the time.                                                                                                                                                                             |
| LAeq                                  | Represents the average noise energy or equivalent sound pressure level over a given period.                                                                                                                                                                           |
| LAmx                                  | The maximum sound pressure level received at the microphone during a measuring interval.                                                                                                                                                                              |
| Masking                               | The phenomenon of one sound interfering with the perception of another sound.<br>For example, the interference of traffic noise with use of a public telephone on a busy street.                                                                                      |
| RBL                                   | The Rating Background Level (RBL) as defined in the NPI, is an overall single figure representing the background level for each assessment period over the whole monitoring period. The RBL, as defined is the median of ABL values over the whole monitoring period. |
| Sound power level<br>(Lw or SWL)      | This is a measure of the total power radiated by a source in the form of sound and is given by $10 \cdot \log_{10} (W/W_0)$ . Where W is the sound power in watts to the reference level of $10^{-12}$ watts.                                                         |
| Sound pressure level<br>(Lp or SPL)   | the level of sound pressure; as measured at a distance by a standard sound level meter.<br>This differs from Lw in that it is the sound level at a receiver position as opposed to the sound 'intensity' of the source.                                               |

Table A2 provides a list of common noise sources and their typical sound level.

**Table A2 Common Noise Sources and Their Typical Sound Pressure Levels (SPL), dBA**

| Source                              | Typical Sound Pressure Level |
|-------------------------------------|------------------------------|
| Threshold of pain                   | 140                          |
| Jet engine                          | 130                          |
| Hydraulic hammer                    | 120                          |
| Chainsaw                            | 110                          |
| Industrial workshop                 | 100                          |
| Lawn-mower (operator position)      | 90                           |
| Heavy traffic (footpath)            | 80                           |
| Elevated speech                     | 70                           |
| Typical conversation                | 60                           |
| Ambient suburban environment        | 40                           |
| Ambient rural environment           | 30                           |
| Bedroom (night with windows closed) | 20                           |
| Threshold of hearing                | 0                            |

**Figure A1 – Human Perception of Sound**



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# Appendix B – NEWA Analysed Meteorology

**Table B1 NEWA Analysed Daytime Meteorological Conditions, On-site Weather Station**

| Direction<br>± 45° | Season | Day                        | Direction | Season | Day                        |
|--------------------|--------|----------------------------|-----------|--------|----------------------------|
|                    |        | Percentage<br>Occurrence % |           |        | Percentage<br>Occurrence % |
| 0                  | Summer | 6                          | 180       | Summer | 7                          |
| 0                  | Autumn | 8                          | 180       | Autumn | 9                          |
| 0                  | Winter | 8                          | 180       | Winter | 8                          |
| 0                  | Spring | 5                          | 180       | Spring | 8                          |
| 22.5               | Summer | 7                          | 202.5     | Summer | 6                          |
| 22.5               | Autumn | 9                          | 202.5     | Autumn | 10                         |
| 22.5               | Winter | 9                          | 202.5     | Winter | 9                          |
| 22.5               | Spring | 5                          | 202.5     | Spring | 9                          |
| 45                 | Summer | 8                          | 225       | Summer | 7                          |
| 45                 | Autumn | 9                          | 225       | Autumn | 10                         |
| 45                 | Winter | 7                          | 225       | Winter | 11                         |
| 45                 | Spring | 5                          | 225       | Spring | 8                          |
| 67.5               | Summer | 8                          | 247.5     | Summer | 6                          |
| 67.5               | Autumn | 9                          | 247.5     | Autumn | 10                         |
| 67.5               | Winter | 5                          | 247.5     | Winter | 11                         |
| 67.5               | Spring | 5                          | 247.5     | Spring | 8                          |
| 90                 | Summer | 8                          | 270       | Summer | 5                          |
| 90                 | Autumn | 10                         | 270       | Autumn | 9                          |
| 90                 | Winter | 7                          | 270       | Winter | 11                         |
| 90                 | Spring | 5                          | 270       | Spring | 6                          |
| 112.5              | Summer | 8                          | 292.5     | Summer | 5                          |
| 112.5              | Autumn | 9                          | 292.5     | Autumn | 8                          |
| 112.5              | Winter | 7                          | 292.5     | Winter | 10                         |
| 112.5              | Spring | 6                          | 292.5     | Spring | 5                          |
| 135                | Summer | 8                          | 315       | Summer | 5                          |
| 135                | Autumn | 9                          | 315       | Autumn | 7                          |
| 135                | Winter | 7                          | 315       | Winter | 9                          |
| 135                | Spring | 6                          | 315       | Spring | 5                          |
| 157.5              | Summer | 5                          | 337.5     | Summer | 5                          |
| 157.5              | Autumn | 7                          | 337.5     | Autumn | 8                          |
| 157.5              | Winter | 6                          | 337.5     | Winter | 9                          |
| 157.5              | Spring | 5                          | 337.5     | Spring | 5                          |

**Table B2 NEWA Analysed Evening time Meteorological Conditions, On-site Weather Station**

| Direction<br>± 45° | Season | Day                        | Direction | Season | Day                        |
|--------------------|--------|----------------------------|-----------|--------|----------------------------|
|                    |        | Percentage<br>Occurrence % |           |        | Percentage<br>Occurrence % |
| 0                  | Summer | 12                         | 180       | Summer | 9                          |
| 0                  | Autumn | 2                          | 180       | Autumn | 18                         |
| 0                  | Winter | 5                          | 180       | Winter | 13                         |
| 0                  | Spring | 3                          | 180       | Spring | 16                         |
| 22.5               | Summer | 11                         | 202.5     | Summer | 8                          |
| 22.5               | Autumn | 8                          | 202.5     | Autumn | 15                         |
| 22.5               | Winter | 8                          | 202.5     | Winter | 11                         |
| 22.5               | Spring | 7                          | 202.5     | Spring | 11                         |
| 45                 | Summer | 14                         | 225       | Summer | 5                          |
| 45                 | Autumn | 8                          | 225       | Autumn | 9                          |
| 45                 | Winter | 10                         | 225       | Winter | 11                         |
| 45                 | Spring | 6                          | 225       | Spring | 9                          |
| 67.5               | Summer | 15                         | 247.5     | Summer | 2                          |
| 67.5               | Autumn | 13                         | 247.5     | Autumn | 6                          |
| 67.5               | Winter | 9                          | 247.5     | Winter | 10                         |
| 67.5               | Spring | 5                          | 247.5     | Spring | 8                          |
| 90                 | Summer | 13                         | 270       | Summer | 2                          |
| 90                 | Autumn | 14                         | 270       | Autumn | 4                          |
| 90                 | Winter | 12                         | 270       | Winter | 7                          |
| 90                 | Spring | 10                         | 270       | Spring | 4                          |
| 112.5              | Summer | 10                         | 292.5     | Summer | 1                          |
| 112.5              | Autumn | 16                         | 292.5     | Autumn | 4                          |
| 112.5              | Winter | 14                         | 292.5     | Winter | 6                          |
| 112.5              | Spring | 14                         | 292.5     | Spring | 3                          |
| 135                | Summer | 10                         | 315       | Summer | 2                          |
| 135                | Autumn | 20                         | 315       | Autumn | 3                          |
| 135                | Winter | 12                         | 315       | Winter | 5                          |
| 135                | Spring | 15                         | 315       | Spring | 3                          |
| 157.5              | Summer | 7                          | 337.5     | Summer | 7                          |
| 157.5              | Autumn | 15                         | 337.5     | Autumn | 4                          |
| 157.5              | Winter | 10                         | 337.5     | Winter | 5                          |
| 157.5              | Spring | 13                         | 337.5     | Spring | 3                          |

**Table B3 NEWA Analysed Night-time Meteorological Conditions, On-site Weather Station**

| Direction<br>± 45° | Season | Night                      | Direction | Season | Night                      |
|--------------------|--------|----------------------------|-----------|--------|----------------------------|
|                    |        | Percentage<br>Occurrence % |           |        | Percentage<br>Occurrence % |
| 0                  | Summer | 5                          | 180       | Summer | 13                         |
| 0                  | Autumn | 6                          | 180       | Autumn | 24                         |
| 0                  | Winter | 8                          | 180       | Winter | 8                          |
| 0                  | Spring | 4                          | 180       | Spring | 22                         |
| 22.5               | Summer | 10                         | 202.5     | Summer | 13                         |
| 22.5               | Autumn | 8                          | 202.5     | Autumn | 23                         |
| 22.5               | Winter | 9                          | 202.5     | Winter | 13                         |
| 22.5               | Spring | 4                          | 202.5     | Spring | 20                         |
| 45                 | Summer | 9                          | 225       | Summer | 11                         |
| 45                 | Autumn | 7                          | 225       | Autumn | 18                         |
| 45                 | Winter | 7                          | 225       | Winter | 16                         |
| 45                 | Spring | 5                          | 225       | Spring | 18                         |
| 67.5               | Summer | 10                         | 247.5     | Summer | 9                          |
| 67.5               | Autumn | 8                          | 247.5     | Autumn | 12                         |
| 67.5               | Winter | 6                          | 247.5     | Winter | 16                         |
| 67.5               | Spring | 5                          | 247.5     | Spring | 15                         |
| 90                 | Summer | 10                         | 270       | Summer | 4                          |
| 90                 | Autumn | 11                         | 270       | Autumn | 6                          |
| 90                 | Winter | 7                          | 270       | Winter | 17                         |
| 90                 | Spring | 9                          | 270       | Spring | 9                          |
| 112.5              | Summer | 10                         | 292.5     | Summer | 2                          |
| 112.5              | Autumn | 12                         | 292.5     | Autumn | 4                          |
| 112.5              | Winter | 6                          | 292.5     | Winter | 15                         |
| 112.5              | Spring | 14                         | 292.5     | Spring | 5                          |
| 135                | Summer | 9                          | 315       | Summer | 2                          |
| 135                | Autumn | 17                         | 315       | Autumn | 4                          |
| 135                | Winter | 6                          | 315       | Winter | 14                         |
| 135                | Spring | 16                         | 315       | Spring | 3                          |
| 157.5              | Summer | 6                          | 337.5     | Summer | 3                          |
| 157.5              | Autumn | 13                         | 337.5     | Autumn | 5                          |
| 157.5              | Winter | 5                          | 337.5     | Winter | 11                         |
| 157.5              | Spring | 15                         | 337.5     | Spring | 3                          |

# Appendix C – Annoying Characteristics Assessment

## C1 Requirements to Address Annoying Characteristics

Fact Sheet C of the NPI provides guidelines for applying 'modifying factors' adjustments to account for annoying noise characteristics such as low frequency, tonality, intermittent noise, irregular or noise of short duration.

### C1.1 Low Frequency Noise

In accordance with Table C1 of the NPI, the low-frequency noise correction applies when the C minus A level is 15dB or more, and:

- Where any of the one-third octave noise levels in Table C2 (reproduced in **Table C-1**) are exceeded by up to and including 5dB and cannot be mitigated, a 2dBA positive adjustment to the measured/predicted A-weighted levels applies for the evening/night period; or
- Where any of the one-third octave noise levels in Table C2 are exceeded by more than 5dB and cannot be mitigated, a 5dBA positive adjustment to measured/predicted A-weighted levels applies for the evening/night period and a 2dBA positive adjustment applies for the daytime period.

**Table C-1 One-third octave low-frequency noise thresholds (from Table C2 of NPI)**

| Frequency<br>(Hz) | 10 | 12.5 | 16 | 20 | 25 | 31.5 | 40 | 50 | 63 | 80 | 100 | 125 | 160 |
|-------------------|----|------|----|----|----|------|----|----|----|----|-----|-----|-----|
| dB(Z)             | 92 | 89   | 86 | 77 | 69 | 61   | 54 | 50 | 50 | 48 | 48  | 46  | 44  |

Noise predictions have been completed to determine the applicability of low frequency modifying factors. The modelled C-A noise levels for the nearest residential receivers to the Project (R1, R2, R3, R4 and R5) are provided in **Table C-2**.

It is noted that 1/1 octave data has been adopted for the assessment as 1/3 octave data for the Project is unavailable. Additionally, results should be considered worst case for the site as concurrent operation of all plant and equipment was assessed. It is also noted that the assessment of low frequency noise by calculation is indicative as the inclusion of one third octaves and frequencies below 63Hz are not 100% compliant with the scope of ISO9613.

**Table C-2 Modelled C weighted and A Weighted Single Octave Band Levels, dB LAeq(15min)**

| Receiver ID | Octave Band Centre Frequency, Hz |      |      |      |      |      |       |        | Total |
|-------------|----------------------------------|------|------|------|------|------|-------|--------|-------|
|             | Weighting                        | 63   | 125  | 250  | 500  | 1000 | 2000  | 4000   |       |
| R1          | A                                | 23.5 | 24.2 | 23.8 | 32.9 | 33.3 | 19.4  | -20.4  | 36.9  |
|             | C                                | 48.9 | 40.1 | 32.4 | 36.1 | 33.3 | 18.0  | -22.2  | 49.8  |
|             | Difference (C-A), dB             |      |      |      |      |      |       |        | 12.9  |
| R2          | A                                | 25.3 | 25.4 | 24.2 | 28.3 | 33.2 | 18.5  | -18.4  | 35.8  |
|             | C                                | 50.7 | 41.3 | 32.8 | 31.5 | 33.2 | 17.1  | -20.2  | 51.4  |
|             | Difference (C-A), dB             |      |      |      |      |      |       |        | 15.6  |
| R3          | A                                | 8.1  | 9.7  | 4.5  | 2.9  | -6.0 | -50.8 | –      | 13.2  |
|             | C                                | 33.5 | 25.6 | 13.1 | 6.1  | -6.0 | -52.2 | -1.8   | 34.2  |
|             | Difference (C-A), dB             |      |      |      |      |      |       |        | 21.0  |
| R4          | A                                | 10.2 | 10.7 | 5.6  | 5.5  | 0.1  | -39.0 | -173.6 | 14.8  |
|             | C                                | 35.6 | 26.6 | 14.2 | 8.7  | 0.1  | -40.4 | -175.4 | 36.1  |
|             | Difference (C-A), dB             |      |      |      |      |      |       |        | 21.3  |
| R5          | A                                | 20.4 | 19.7 | 17.6 | 20.2 | 23.3 | 1.0   | -70.9  | 27.6  |
|             | C                                | 45.8 | 35.6 | 26.2 | 23.4 | 23.3 | -0.5  | -72.7  | 46.3  |
|             | Difference (C-A), dB             |      |      |      |      |      |       |        | 18.7  |

Analysis of the noise modelling identifies that with the inclusion of all noise sources, low frequency noise exceeds the screening test difference of C-A=15dB at receiver locations except the nearest residential receiver (R1). Further analysis was therefore undertaken to determine whether any of the 1/3 octave noise levels in Table C2 of the NPI (**Table 1**) are exceeded for Receivers R2 to R5. It is noted that where data was only available as 1/1 octave, levels in each 1/1 band were divided equally into each 1/3 octave band.

The results of the analysis of low-frequency noise thresholds found that received levels do not exceed the thresholds in **Table C-2** by more than 5dB for day period operations at any of the receiver locations. Hence, the low-frequency correction is not applied to received noise levels for this assessment.

## C1.2 Tonality

In addition to low frequency noise, a review of modifying factors for tonality have been completed. In accordance with Table C1 of the NPI, a correction for tonal noise applies when the level of 1/3 octave band exceeds the level of the adjacent band on both sides by:

- 5dB or more if the centre frequency of the band containing the tone is in the range 500-10,000Hz;
- 8dB or more if the centre frequency of the band containing the tone is in the range 16-400Hz; or
- 15dB or more if the centre frequency of the band containing the tone is in the range 25-125Hz.

MAC notes that the assessment should be completed with 1/3 octave data, however, only 1/1 octave data was available for the Project. **Table C-3**, presents the results of the 1/1 octave data tonality noise test for the Project.

The results of the analysis indicate that there are no dominant tones associated with the Project. Hence, a correction for tonality is not required.

**Table C-3 Modelled Z weighted Single Octave Band Levels, dB LAeq(15min)**

| Receiver ID | Octave Band Centre Frequency, Hz |      |      |      |      |                   |                   |                   | Total |
|-------------|----------------------------------|------|------|------|------|-------------------|-------------------|-------------------|-------|
|             | Weighting                        | 63   | 125  | 250  | 500  | 1000 <sup>1</sup> | 2000 <sup>1</sup> | 4000 <sup>1</sup> |       |
| R1          | Z                                | 49.7 | 40.3 | 32.4 | 36.1 | 33.3              | 18.2              | -21.4             | 50.5  |
| R2          | Z                                | 51.5 | 41.5 | 32.8 | 31.5 | 33.2              | 17.3              | -19.4             | 52.1  |
| R3          | Z                                | 34.3 | 25.8 | 13.1 | 6.1  | -6.0              | -52.0             | -1.0              | 34.9  |
| R4          | Z                                | 36.4 | 26.8 | 14.2 | 8.7  | 0.1               | -40.2             | -174.6            | 36.9  |
| R5          | z                                | 46.6 | 35.8 | 26.2 | 23.4 | 23.3              | -0.3              | -71.9             | 47.0  |

Note 1: For octave data for 1kHz and greater, the key difference between the octave bands is associated with atmospheric attenuation and ground absorption and noise mitigation measures (such as partial enclosures of sources, rather than a dominant tonal component from the source at these frequencies.)

## Appendix D – Noise Contour Plots

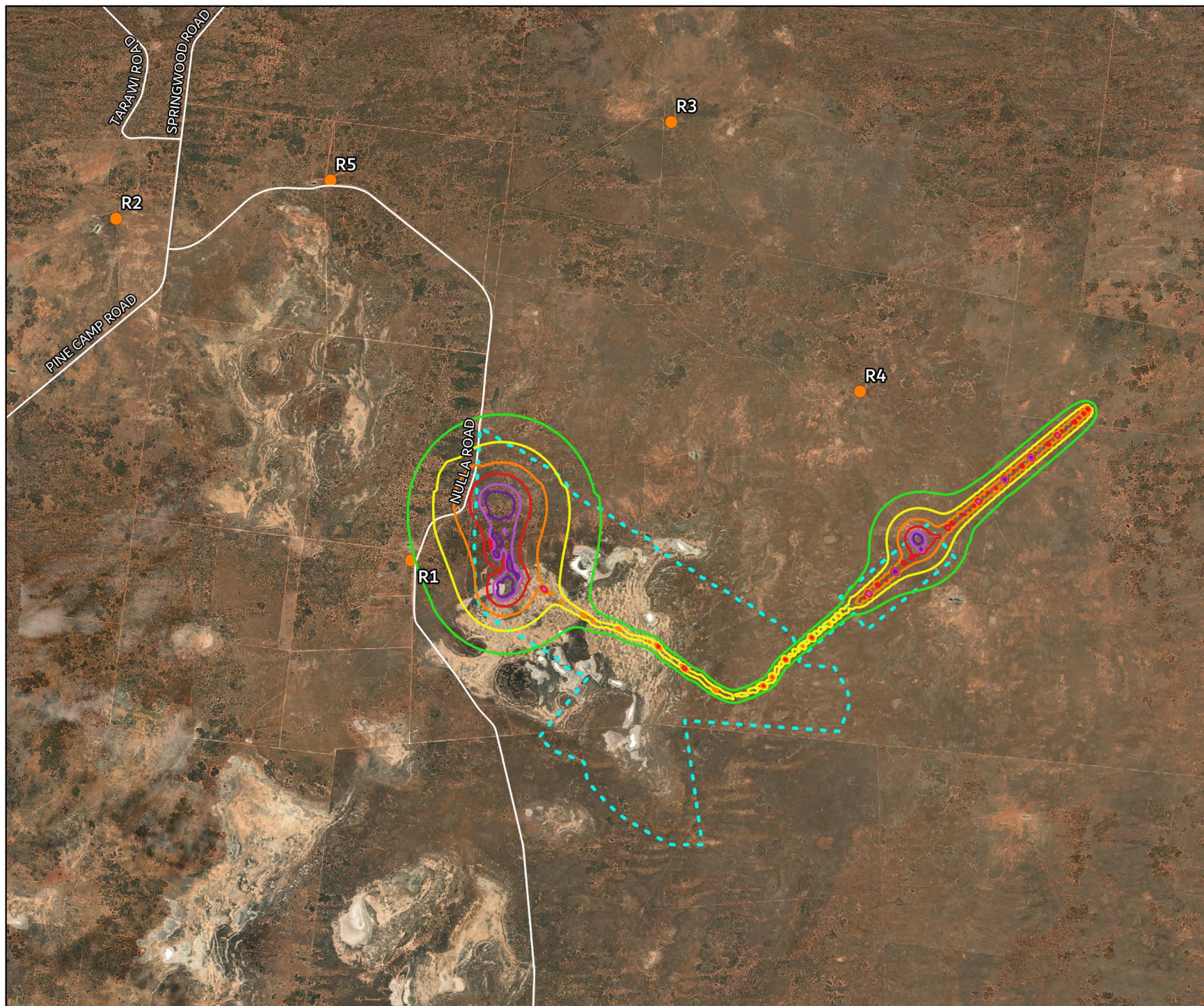


**FIGURE D1**  
**Noise Contours - Day**  
**Operational Scenario 1 - Year 6**  
**Copi Mineral Sands Project**

**KEY**

--- Limit of Disturbance

● Receivers

**LAeq(15min) Noise Contours**

— 35dB

— 40dB

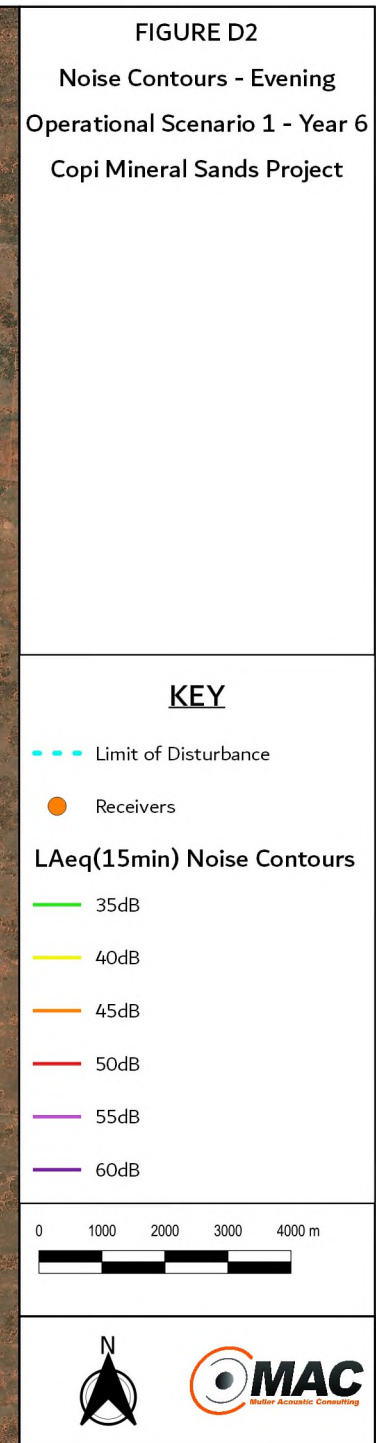
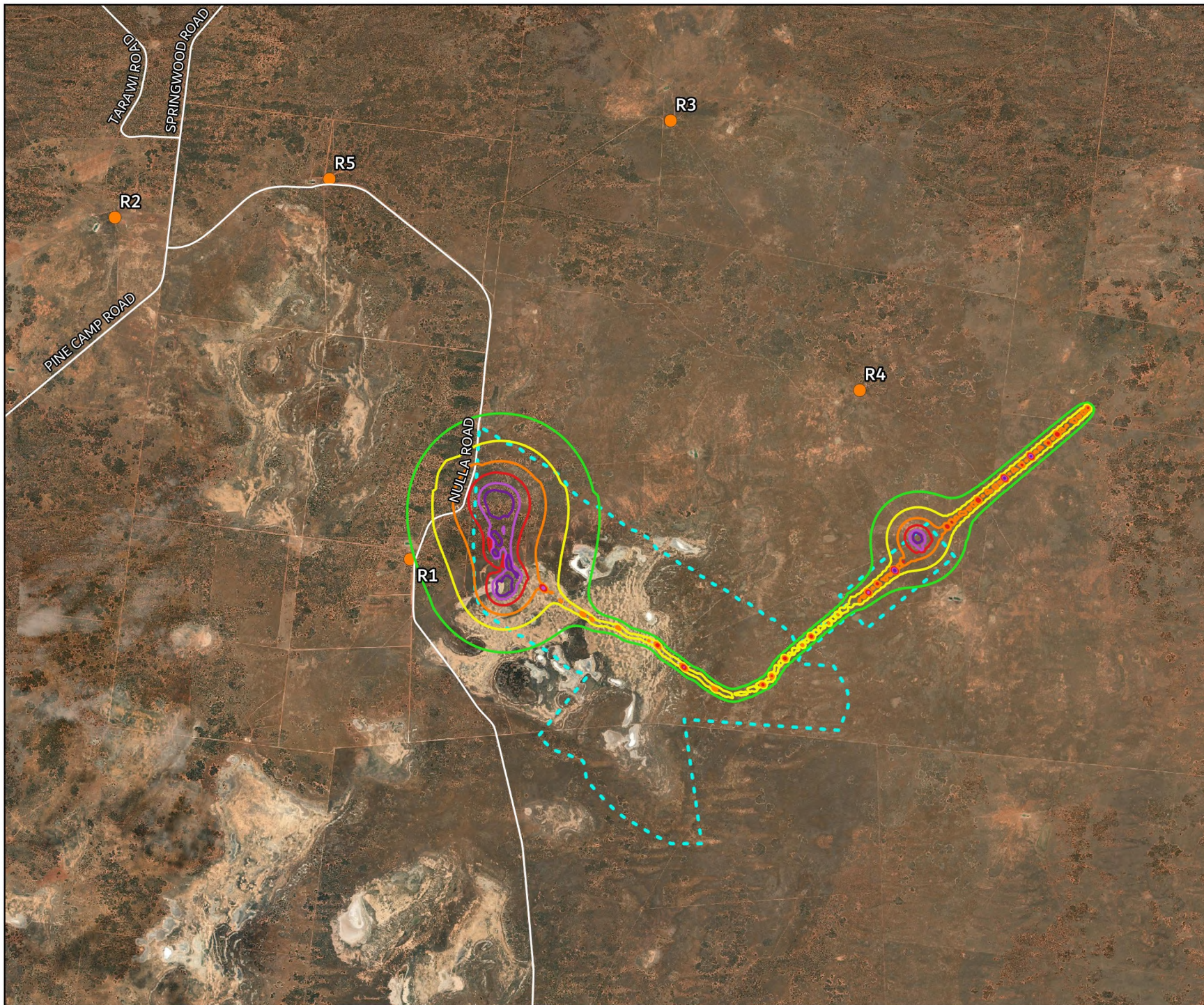
— 45dB

— 50dB

— 55dB

— 60dB





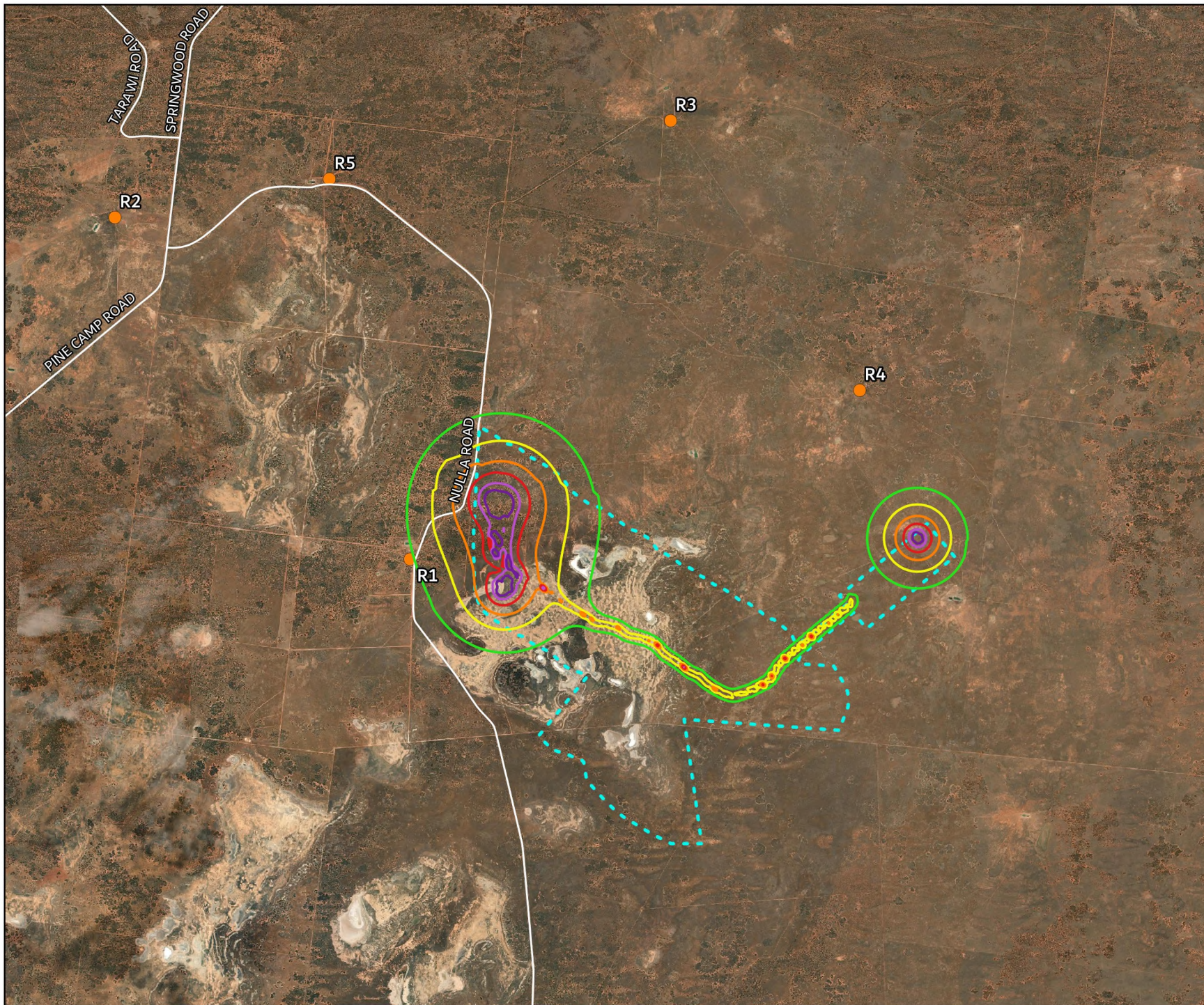


**FIGURE D3**

Noise Contours - Night

Operational Scenario 1 - Year 6

Copi Mineral Sands Project

**KEY**

--- Limit of Disturbance

● Receivers

**LAeq(15min) Noise Contours**

35dB

40dB

45dB

50dB

55dB

60dB

0 1000 2000 3000 4000 m

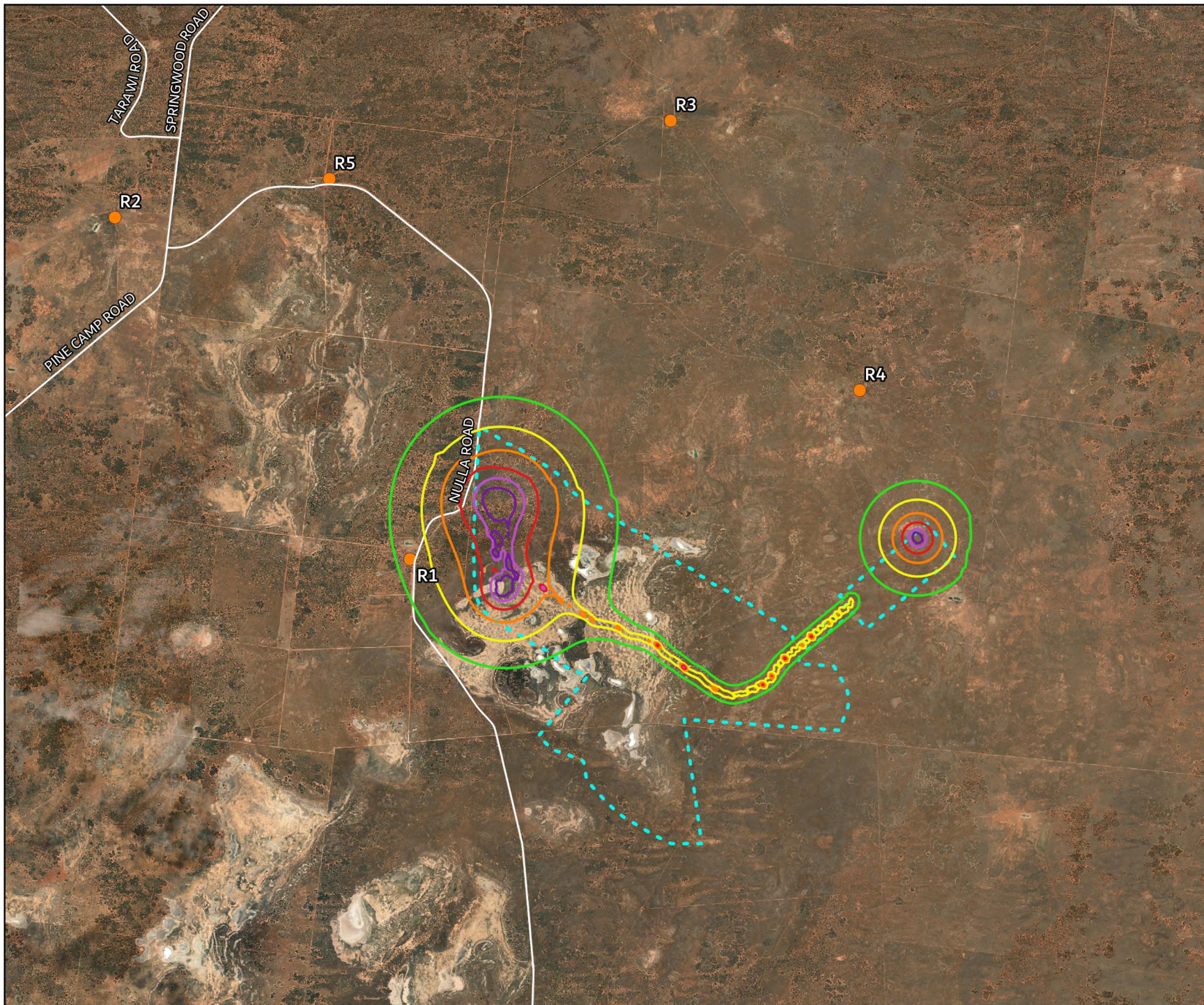


**FIGURE D4**

Noise Contours - Night  
(Temperature Inversion)

Operational Scenario 1 - Year 6

Copi Mineral Sands Project

**KEY**

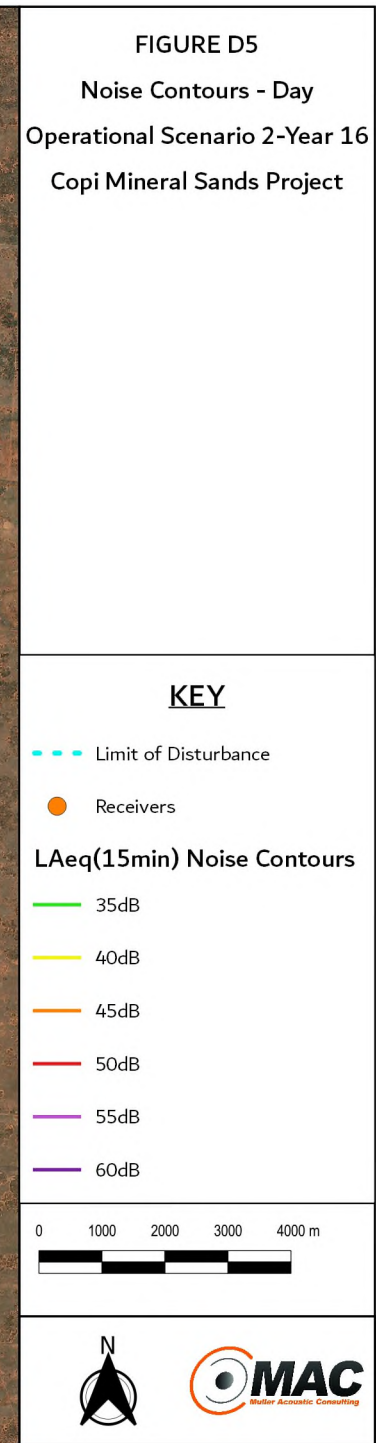
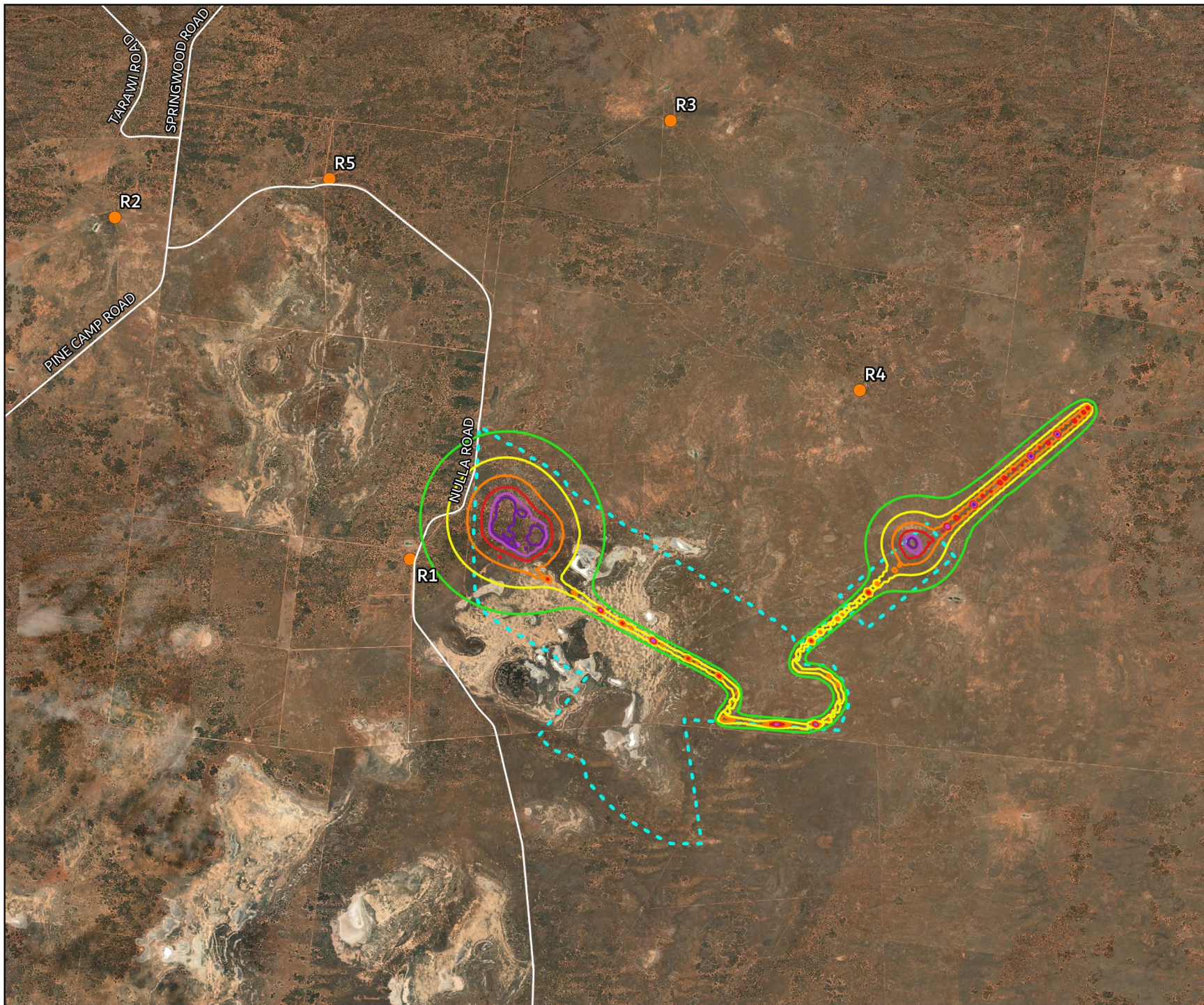
--- Limit of Disturbance

● Receivers

**LAeq(15min) Noise Contours**

- 35dB
- 40dB
- 45dB
- 50dB
- 55dB
- 60dB

0 1000 2000 3000 4000 m



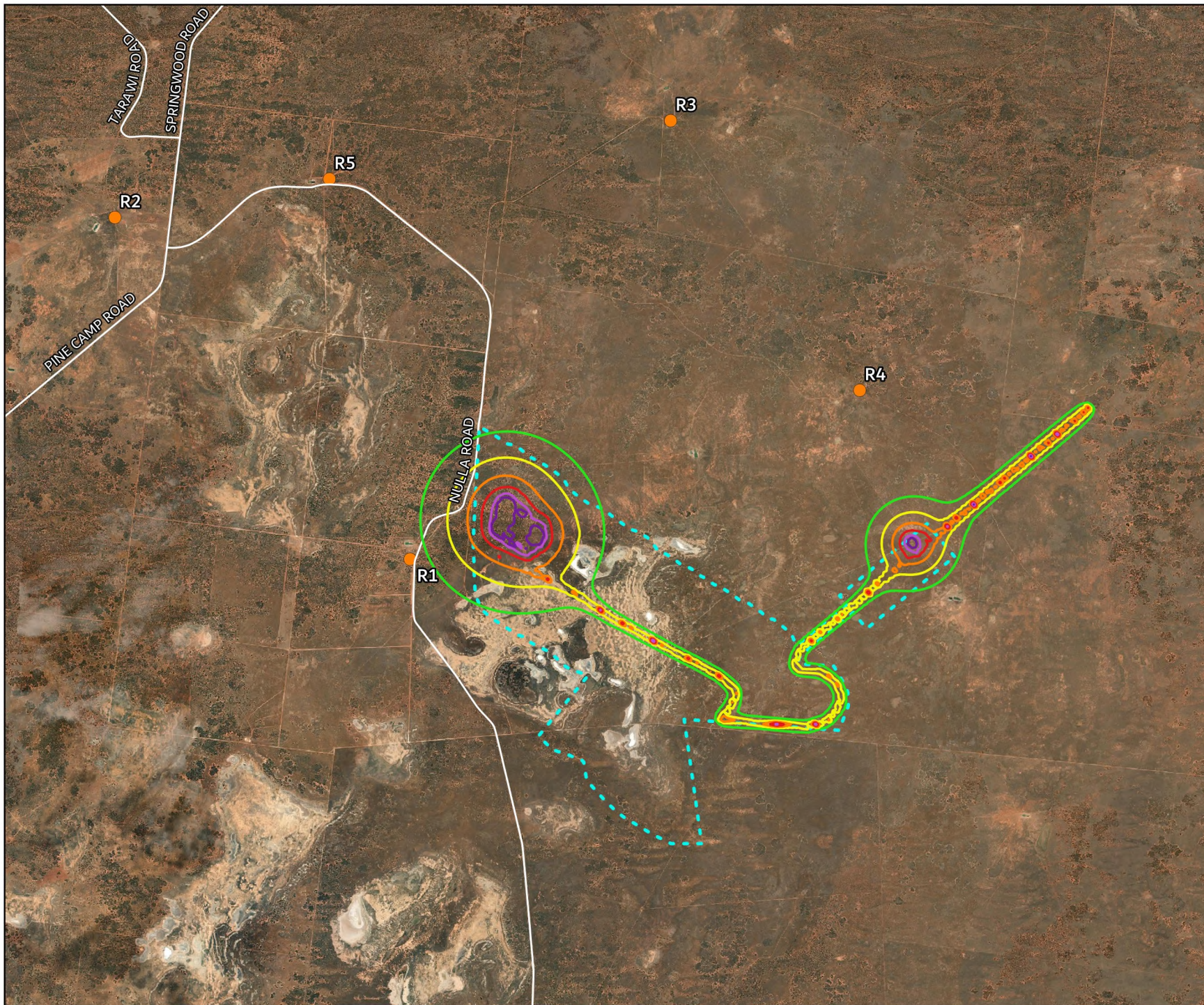


**FIGURE D6**

Noise Contours - Evening

Operational Scenario 2-Year 16

Copi Mineral Sands Project

**KEY**

--- Limit of Disturbance

● Receivers

**LAeq(15min) Noise Contours**

35dB

40dB

45dB

50dB

55dB

60dB

0 1000 2000 3000 4000 m

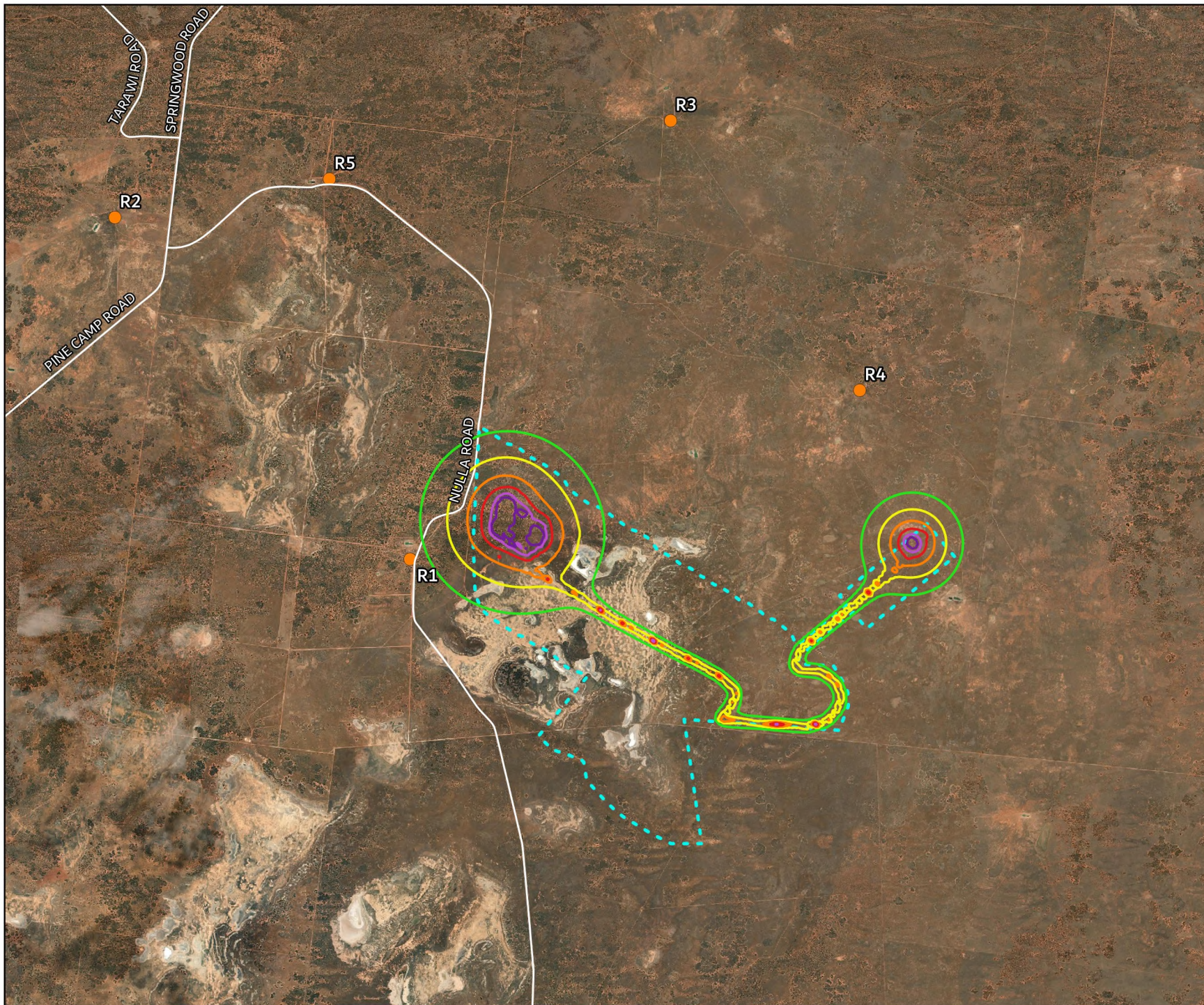


**FIGURE D7**

Noise Contours - Night

Operational Scenario 2-Year 16

Copi Mineral Sands Project

**KEY**

--- Limit of Disturbance

● Receivers

**LAeq(15min) Noise Contours**

- 35dB
- 40dB
- 45dB
- 50dB
- 55dB
- 60dB

0 1000 2000 3000 4000 m

N

**MAC**  
Radar Acoustic Consulting

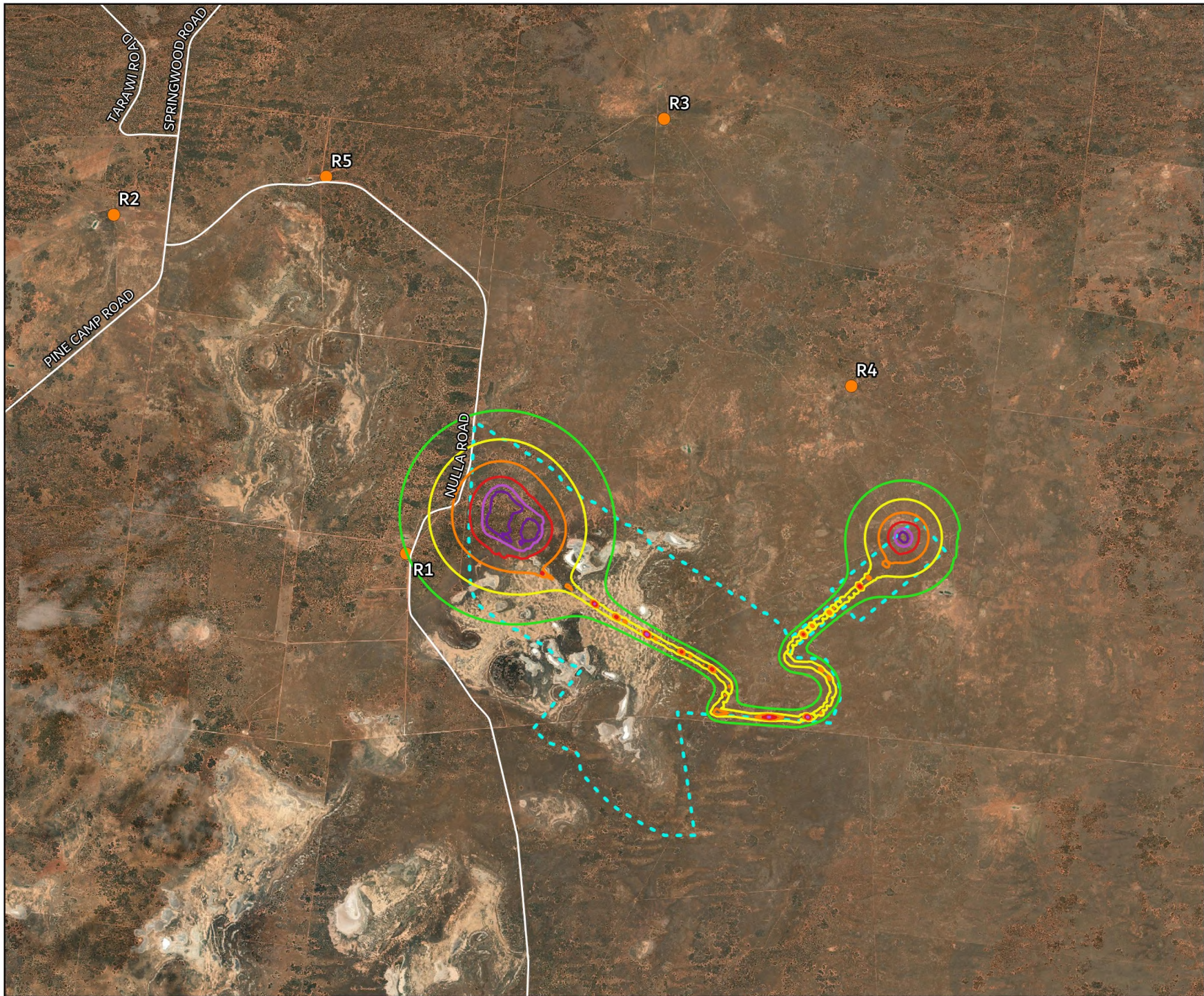


**FIGURE D8**

Noise Contours - Night  
(Temperature Inversion)

Operational Scenario 2-Year 16

Copi Mineral Sands Project

**KEY**

--- Limit of Disturbance

● Receivers

**L<sub>Aeq</sub>(15min) Noise Contours**

- 35dB
- 40dB
- 45dB
- 50dB
- 55dB
- 60dB

0 1000 2000 3000 4000 m

Muller Acoustic Consulting Pty Ltd

PO Box 678, Kotara NSW 2289

ABN: 36 602 225 132

Ph: +61 2 4920 1833

[www.mulleracoustic.com](http://www.mulleracoustic.com)

