



Appendix 7

Noise and Vibration Impact Assessment

prepared by
**Spectrum Acoustics
Pty Limited**

(Total No. of pages including blank pages = 38)



ENVIRONMENTAL IMPACT STATEMENT

Grantham Park Holdings Pty Limited
Bungendore Sands Extension Project

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Grantham Park Holdings Pty Limited

ACN: 140 626 099

Bungendore Sands Extension Project

Noise and Vibration Impact Assessment

Prepared by

Spectrum Acoustics Pty Limited

March 2020

Appendix 7

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Grantham Park Holdings Pty Limited

ACN: 140 626 099

Bungendore Sands Extension Project Noise and Vibration Impact Assessment

Prepared for: R.W. Corkery & Co. Pty Limited
62 Hill Street
ORANGE NSW 2800

Tel: (02) 6362 5411
Email: orange@rwcorkery.com

On behalf of: Grantham Park Holdings Pty Limited
182 Boundary Street
PADDINGTON NSW 2021

Tel: 0407 672 676
Email: jim@material.com.au

Prepared by: Spectrum Acoustics Pty Limited
30 Veronica Street
CARDIFF NSW 2285

Tel: (02) 4954 2276
Email: neil@spectrumacoustics.com.au

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COMMONLY USED ACRONYMS

AHD	Australian Height Datum
ANZEC	Australian and New Zealand Environment and Council
DEC	Department of Environment and Conservation
DECC	Department of Environment and Climate Change
DECCW	Department of Environment, Climate Change and Water
DPE	Department of Planning and Environment
EIS	<i>Environmental Impact Statement</i>
ENM	Environmental Noise Model
EPA	Environment Protection Authority
OEH	Office of Environment and Heritage
MS	Morning Shoulder
NPI	<i>NSW Noise Policy for Industry</i>
PNTLs	project noise trigger levels
QPRC	Queanbeyan-Palerang Regional Council
RBL	Rating Background Levels
RH	relative humidity
RMS	Roads and Maritime Services
RNP	<i>NSW Road Noise Policy</i>
RTA	Renzo Tonin Associates
SEARs	Secretary's Environmental Assessment Requirements
SPL	Sound Pressure Level
VLAMP	<i>Voluntary Land Acquisition and Mitigation Policy</i>

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EXECUTIVE SUMMARY

A Noise and Vibration Impact Assessment has been conducted for the proposed expansion of the Bungendore Sands Quarry (the Proposal), located approximately 5km north of Bungendore, 31km northeast of Queanbeyan in NSW and 45km east-northeast of the Canberra CBD. The proposed operating hours are as follows.

Proposed Hours of Operation

Activity	Monday to Friday	Saturday	Sunday
Site Establishment	6:00am – 5:00pm	6:00am – 2:00pm	-
Extraction	6:00am – 5:00pm	6:00am – 2:00pm	-
Processing	6:00am – 5:00pm	6:00am – 2:00pm	-
Loading and Transportation	6:00am – 5:00pm ¹	6:00am – 2:00pm	-
Rehabilitation	6:00am – 5:00pm	6:00am – 2:00pm	7:00am – 6:00pm ²
Maintenance	6:00am – 5:00pm	6:00am – 2:00pm	7:00am – 6:00pm ²
Note 1: The Operator would ensure that it consulted the operator of the school busses on Tarago Road between the Site Entrance and Bungendore during preparation of the Transportation Management Plan.			
Note 2: Low impact noise activities only.			
Source: Grantham Park Holdings Pty Limited			

Documents referred to in conducting the assessment include:

- *NSW Noise Policy for Industry (NPI)*, EPA (2017);
- *NSW Road Noise Policy (RNP)*, OEH (2011);
- *Technical basis for guidelines to minimise annoyance due to blasting overpressure and ground vibration* (ANZEC); and
- *Voluntary Land Acquisition and Mitigation Policy (VLAMP)*, DPE (2014).

The NPI default minimum night time noise trigger level of **35 dB(A), $L_{eq(15min)}$** have been adopted for all assessed residential receivers, due to proposed operations between 6am and 7 am which is defined as night time by the EPA.

An assessment of available meteorological data found that winds of speeds up to 3 m/s occurred for less than 20% of the time during all seasons, implying that winds are not an assessable feature with regards to noise impact assessment. Due to the proposed operations during the night time period 6am – 7am, noise modelling also considered a 4°C/100m temperature inversion, or F class atmospheric stability.

Noise modelling was conducted to produce point to point calculations and noise contours for three operational scenarios to individual residential receivers surrounding the Project Site. Results are presented in tabular form.

Predicted operational noise levels were considerably less than the noise assessment trigger levels at all non-project-related receivers. Noise impacts over privately owned land were also lower than acceptable amenity levels.

The predicted cumulative noise level component from the Proposal would be below the adopted cumulative noise trigger level. The requirement for further assessment of noise impacts from nearby quarries was not triggered.

Off-site traffic would be below the night time traffic noise criterion of 50 dB(A), $L_{eq(9\text{hour})}$ for sub-arterial roads for all assessed receivers, based on a conservative assumption that heavy vehicle traffic generation between 6am and 7am would be the same as maximum daytime heavy vehicle numbers.

In summary, the assessment has found that the Proposal would be able to operate within appropriate criteria for operational and road traffic noise emissions as may be imposed by Queanbeyan-Palerang Regional Council (QPRC) in a Project Approval. Noise compliance monitoring has not been recommended due to the predicted noise impacts being well below the relevant trigger levels.

1. INTRODUCTION

Spectrum Acoustics Pty Limited has been commissioned by R.W. Corkery & Co. Pty Limited on behalf of Grantham Park Holdings Pty Limited (the Applicant) to undertake an assessment of the proposed expansion of the Bungendore Sands Quarry (the Proposal), located approximately 5km north of Bungendore, 31km northeast of Queanbeyan in NSW and 45km east-northeast of the Canberra CBD (the Project Site) (see **Figure 1**).

This report provides:

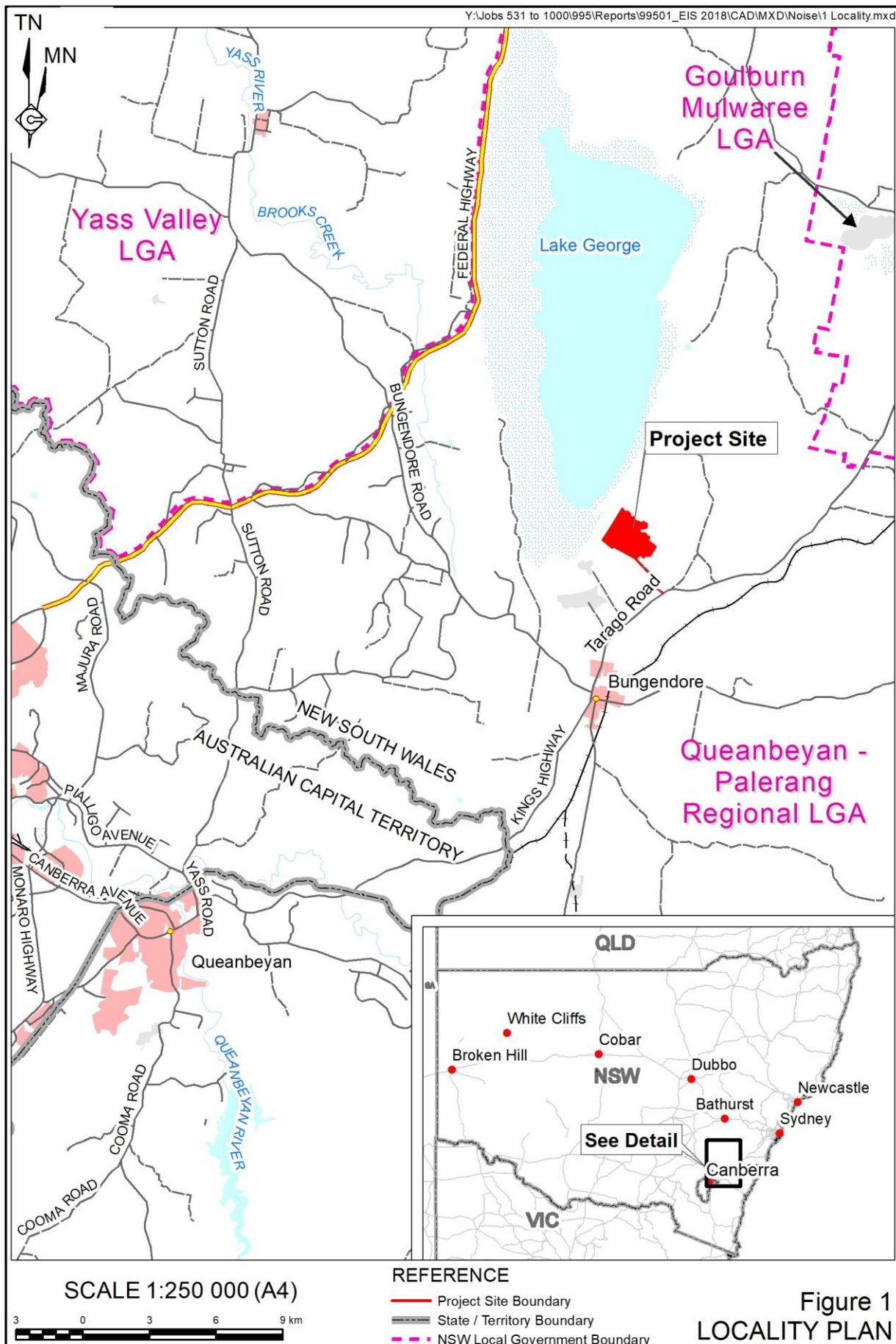
- an overview of the acoustic environment around the Project Site, based upon recent and historical background noise measurements;
- an outline of the acoustic criteria relevant to the Proposal;
- an assessment of the predicted noise levels associated with the Proposal and as to the adverse impacts on the existing acoustic environment in vicinity of the proposed operations including traffic noise; and
- an outline of the required noise mitigation measures and monitoring.

This noise and vibration impact assessment has been prepared in accordance with the NSW Noise Policy for Industry (EPA, 2017), Road Noise Policy (OEH, 2011) and the Secretary's Environmental Assessment Requirements (SEARs) for the Project, issued on 5 August 2019 by the NSW Department of Planning and Environment (DPE) (see **Table 9**). The requirements provided by DPE from the Environment Protection Authority (EPA) and Queanbeyan-Palerang Regional Council (QPRC) have also been considered during the preparation of this report. **Appendix 1** records the coverage of the requirements from DPE, EPA and QPRC within this report.

1.1 OVERVIEW OF THE PROJECT

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

- Ongoing extraction of sand and limited volumes of overburden and interburden (clay and silt) within the remainder of the Approved Extraction Area and a 77ha proposed Extraction Area, to a maximum depth of 10m, producing up to 400,000t of sand products per year for a period of 20 years.
- Continued on-site screening, classifying and stockpiling of extracted material to produce a range of sand products using the existing Sand Classification Plant.
- Continued transportation of sand products to the Operator's customers using a combination of rigid vehicles and truck and dog combinations and existing Quarry Access Road and public transportation routes.
- Continued management and settlement of fines and process water using the existing and proposed Fines Settling Cells and Process Water Ponds.
- Establishment of ancillary infrastructure, including bunds and water management structures.
- Construction and rehabilitation of a final landform that would be safe, stable, non-polluting, and suitable for a future land use of nature conservation and agriculture.



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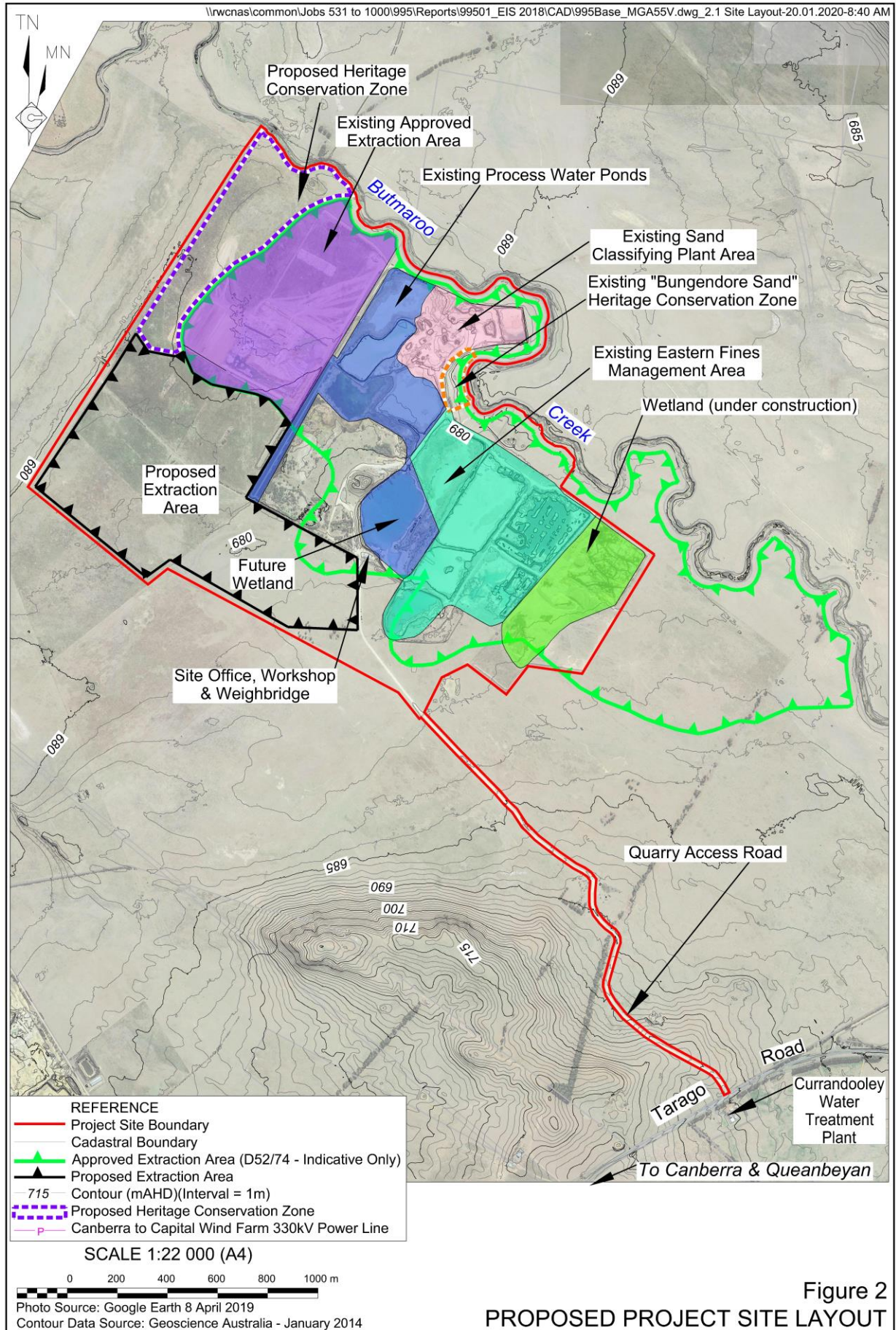


Table 1 lists the proposed hours of operation for a range of activities that would be undertaken at the Project Site throughout the life of the Proposal.

Table 1
Proposed Hours of Operation

Activity	Monday to Friday	Saturday	Sunday
Site Establishment	6:00am – 5:00pm	6:00am – 2:00pm	-
Extraction	6:00am – 5:00pm	6:00am – 2:00pm	-
Processing	6:00am – 5:00pm	6:00am – 2:00pm	-
Loading and Transportation	6:00am – 5:00pm ¹	6:00am – 2:00pm	-
Rehabilitation	6:00am – 5:00pm	6:00am – 2:00pm	7:00am – 6:00pm ²
Maintenance	6:00am – 5:00pm	6:00am – 2:00pm	7:00am – 6:00pm ²
Note 1: The Operator would ensure that it consulted the operator of the school busses on Tarago Road between the Site Entrance and Bungendore during preparation of the Transportation Management Plan.			
Note 2: Low impact noise activities only.			
Source: Grantham Park Holdings Pty Limited			

The hours nominated in **Table 1** are those that the Applicant would operate within, not that they would be operating throughout the entire nominated periods. That is, the nominated hours would provide the flexibility needed to undertake all Project-related activities, when required. The flexibility achieved by the proposed operating hours would be important in order that the Applicant can respond to large volume or urgent orders from its customers.

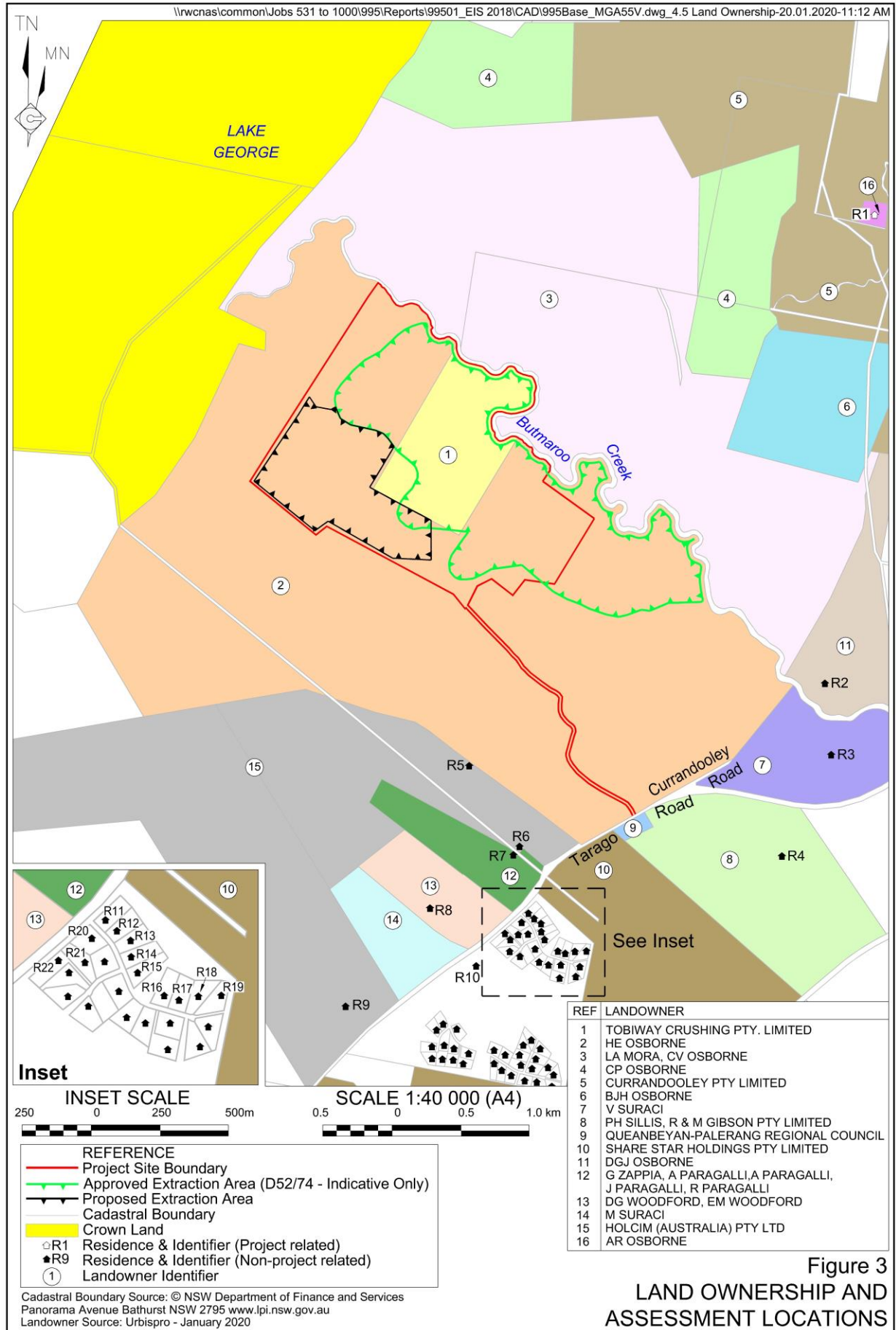
1.2 ASSESSED RECEIVERS

Privately-owned residential properties considered in this assessment are shown in **Figure 3** and listed in **Table 2**. Operational noise levels were modelled to receivers R1 to R10. Predicted levels at R8 were taken as a proxy for levels within the small subdivision comprising R11 to R22. Receiver R22 was considered in the assessment of road traffic noise.

Table 2
Residential Receivers

Receiver	Registered Landowner
R1	AR Osborne
R2	DGJ Osborne
R3	V Suraci
R4	PH Sillis, R & M Gibson Pty Limited
R5	Holcim (Australia) Pty Ltd
R6	G Zappia, A Paragalli, A Paragalli, J Paragalli, R Paragalli
R7	G Zappia, A Paragalli, A Paragalli, J Paragalli, R Paragalli
R8	DG Woodford, EM Woodford
R9	Holcim (Australia) Pty Ltd
R10	Unidentified
R22	Unidentified

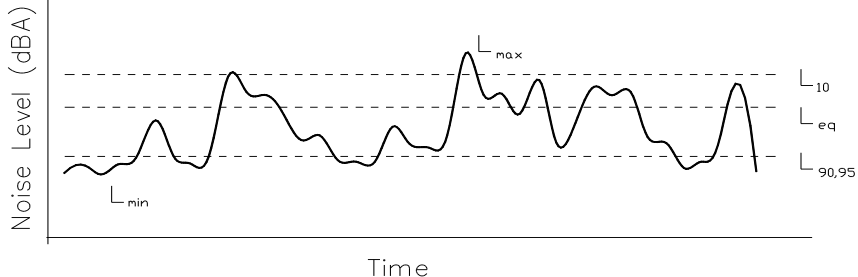
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2. DESCRIPTION OF TERMS

Table 3 contains qualitative descriptions of commonly used acoustical terms and is presented as an aid to understanding this report.

Table 3
Definition of Acoustical Terms

Term	Definition
dB(A)	The quantitative measure of sound heard by the human ear, measured by the A-Scale Weighting Network of a sound level meter expressed in decibels (dB).
SPL	Sound Pressure Level. The incremental variation of sound pressure above and below atmospheric pressure and expressed in decibels. The human ear responds to pressure fluctuations, resulting in sound being heard.
STL	Sound Transmission Loss. The ability of a partition to attenuate sound, in dB.
Lw	Sound Power Level radiated by a noise source per unit time re 1pW.
Leq	Equivalent Continuous Noise Level - taking into account the fluctuations of noise over time. The time-varying level is computed to give an equivalent dB(A) level that is equal to the energy content and time period (for noise assessments this is typically 15 minutes).
Lmax	Maximum Noise Level – used to assess the potential for disturbance from impact noise at night time
L1	Average Peak Noise Level - the level exceeded for 1% of the monitoring period.
L10	Average Maximum Noise Level - the level exceeded for 10% of the monitoring period.
L90	Average Minimum Noise Level - the level exceeded for 90% of the monitoring period and recognised as the Background Noise Level. In this instance, the L90 percentile level is representative of the noise level generated by the surrounds of the residential area.
<p>Significant Noise descriptors</p> 	

3. EXISTING ENVIRONMENT AND CRITERIA

The existing meteorological and acoustical environments of the Project Site and its surrounds have been studied to determine prevailing conditions and to allow noise goals to be set.

3.1 METEOROLOGY

The atmospheric conditions most relevant to noise assessments are temperature inversions, gentle winds (indicative of possible wind shear) and relative humidity. The NSW *Noise Policy for Industry* (NPI) (EPA, 2017) states that wind effects need to be assessed where source to receiver winds (at 10m height) of 3m/s or below occur for 30% or more of the time in any season in any assessment period.

Annual and seasonal wind roses for Canberra Airport were provided for assessment. The wind roses show that winds up to 3m/s (~10 km/h) occurred significantly less than 20% of the time during all seasons from all primary directions (+/- 45°). Predominant winds are from the west and northwest at higher wind speeds. The relative consistency of reasonably high velocity westerly winds would have been a favourable factor in the positioning of nearby wind farms.

Atmospheric stability is usually classified in terms of Pasquil Stability Classes: Classes A-C (daytime windy conditions), Classes D and E (neutral conditions) and Classes F and G (stable, usually night, no wind). In the absence of atmospheric stability class data for the site, a conservative approach has been adopted where a +4°C/100m temperature inversion has been modelled to account for the proposed night time operating times earlier than 7 am.

The following two atmospheric conditions were considered in the noise modelling.

- Condition 1 – Neutral: Prevailing condition of neutral atmosphere (20°C, no wind). Extremes of relative humidity (RH) are rarely experienced during daytime hours. A value of 70% RH was adopted.
- Condition 2 – Adverse: +4°C/100m temperature inversion has been modelled to account for the proposed night time operating times earlier than 7 am. Air temperature was modelled at 5°C at 85% RH.

3.2 EXISTING ACOUSTIC ENVIRONMENT

A conservative approach has been taken in which the NPI default minimum rating background noise levels (RBL) will be adopted for the purposes of setting project noise trigger levels. Section B2.2 of the NPI states

“If the measured background level is less than 30 dB(A) for the evening and night periods, then it is set to 30 dB(A); where it is found to be less than 35 dB(A) for the day period, then it is set to 35dB(A)”.

Accordingly, RBL's of 30 dB(A) (6am – 7am) and 35 dB(A) (7am – 6 pm) have been adopted.

3.3 PROJECT NOISE TRIGGER LEVELS

Project-generated noise within the Project Site is required to be assessed against the provisions of the NPI. In relation to the residences surrounding the Site, the NPI specifies two noise criteria: *intrusiveness and amenity criteria*.

The *Intrusiveness Criterion* limits Equivalent Continuous Noise Level (L_{eq}) from the industrial source to a value of 'background plus 5dB'. That is, the Rating Background Level (RBL) for the time period, plus 5 dB(A). The RBL (L_{A90}) is defined as the overall single figure background level representing each assessment period.

The *Amenity Criterion* aims to protect against excessive noise levels where an area is becoming increasingly developed. Amenity criteria are dependent upon the nature of the receiver area and the existing level of industrial noise. There is potentially existing industrial noise from quarries adjoining the Project Site and the residential area that is potentially affected by noise emissions from the Proposal is best described acoustically as an area with a small amount of road traffic noise.

Time periods for assessment as defined in the NPI are:

- Daytime – 7:00am (8:00am on Sundays) to 6:00pm;
- Evening – 6:00pm to 10:00pm; and
- Night – 10:00pm to 7:00am (8:00am on Sundays).

The project noise trigger levels for all residential receivers are derived from the lower of the existing intrusiveness criteria, the amenity criteria and the worst case or most conservative time period.

Adoption of the default minimum RBL results in a default minimum intrusiveness criteria of 35 dB(A), $L_{eq(15min)}$ (6am – 7am) and 40 dB(A), $L_{eq(15min)}$ (7am – 6 pm). The adopted worst case project noise trigger level is **35 dB(A), $L_{eq(15min)}$** . If compliance is predicted during the worst case night period, then compliance is assured for the day period, which has higher criterion, and for neutral atmospheric conditions.

3.4 CUMULATIVE NOISE LEVELS

The recommended amenity noise levels for the **total** industrial noise from all sources (new and proposed) are 50 dB(A), $L_{eq(day)}$ and 40 dB(A), $L_{eq(night)}$ for rural receivers, from Table 2.2 of the NPI.

In accordance with Section 2.4.2 of the NPI the project amenity noise level resulting from a new development is the recommended amenity noise level minus 5 dB where a receiver is not being impacted by more than three to four individual industrial noise sources, which is the case for the receivers in the present study.

The amenity noise levels to limit the potential for cumulative noise impacts are therefore 45 dB(A), $L_{eq(day)}$ and 35 dB(A), $L_{eq(night)}$.

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Section 2.2 of the NPI recommended that L_{Aeq} (period) levels should be increased by 3 dB to be comparable with the L_{Aeq} (15min) levels. Accordingly, the equivalent noise trigger level for the worst case night time period under inversion conditions is **38 dB(A), $L_{Aeq}(15min)$** .

3.5 MAXIMUM NOISE LEVELS

The potential for sleep disturbance from maximum noise level events from the Proposal during the night-time period needs to be considered. Sleep disturbance is considered to be both awakenings and disturbance to sleep stages.

Where the subject development/premises night-time noise levels at a residential location exceed:

- $L_{Aeq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or
- LAF_{max} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater,

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

- how often high noise events will occur;
- the distribution of likely events across the night-time period and the existing ambient maximum events in the absence of the subject 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 scientific literature available at the time of the assessment regarding the impact of maximum noise level events at night.

Maximum noise level event assessments should be based on the LAF_{max} descriptor on an event basis under 'fast' time response. The detailed assessment should consider all feasible and reasonable noise mitigation measures with a goal of achieving the above trigger levels. The maximum noise levels assessment levels of **52 dB(A), L_{max}** is only applicable to night - time noise emissions from all operations between 6am and 7am.

3.6 TRAFFIC NOISE

In NSW, noise from vehicle movements associated with an industrial source is assessed in terms of the NPI if the vehicles are not on a public road. If the vehicles are on a public road, the *NSW Road Noise Policy* (RNP) applies. Noise from the Proposal must, therefore, be assessed against the project noise trigger levels of the NPI and also the criteria in the RNP.

The RNP recommends various criteria based on the functional categories of roads applied by the NSW Roads and Maritime Services (RMS). The RMS differentiates roads based on a number of factors including traffic volume, heavy vehicle use, through or local traffic, vehicle speeds and applicable traffic management options. Vehicles accessing the Project Site will do so via the Tarago Road which is conservatively considered to fall under the RMS definition of a local road to the east of the site access road, and a sub-arterial road to the west of the site access road.

Table 4 shows the noise criteria relevant to local sub-arterial roads extracted from Table 3 of the RNP. For the assessment of traffic noise, the daytime period is from 7:00am to 10:00pm, whilst night is from 10:00pm to 7:00am.

Table 4
Road Traffic Noise Criteria

Situation	Recommended Criteria	
	Day (7:00am to 10:00pm)	Night (10:00pm to 7:00am)
Existing residences affected by additional traffic on existing freeway/arterial/sub-arterial roads generated by land use developments	Leq (15-hour) 60	Leq (9-hour) 55
Existing residences affected by additional traffic on local roads generated by land use developments	Leq (1-hour) 55	Leq (1-hour) 50

4. ASSESSMENT METHODOLOGY

4.1 MODELLED SCENARIOS

A full description of the Proposal is given in Section 2 of the EIS. In discussion with the Applicant, it was determined that the following two operational noise scenarios represent worst case potential for noise impacts at the surrounding residential receivers. These scenarios are briefly described below and noise source locations indicated in **Figures 4** and **5**. Noise modelling using the Environmental Noise Model (ENM v3.06) was undertaken for the atmospheric conditions described in Section 3.1.

4.1.1 Scenario 1

Worst case assumption of extraction of material at natural ground level in Cells E2 – E4. Site infrastructure area at its current location in the northwest corner of the Project Site. Product haulage trucks using the site access road. The maximum production rate of 400 000 tonnes per annum was assumed.

4.1.2 Scenario 2

Worst case assumption of extraction of material at natural ground level in Cells E8 – E10. Dozer on rehabilitation in cell E5. Site infrastructure area at its current location in the northwest corner of the Project Site. Product haulage trucks using the site access road. The maximum production rate of 400 000 tonnes per annum was assumed.

4.2 NOISE SOURCES

The sound power levels of the significant noise-generating equipment used in the modelling of each scenario are listed in **Table 5**.

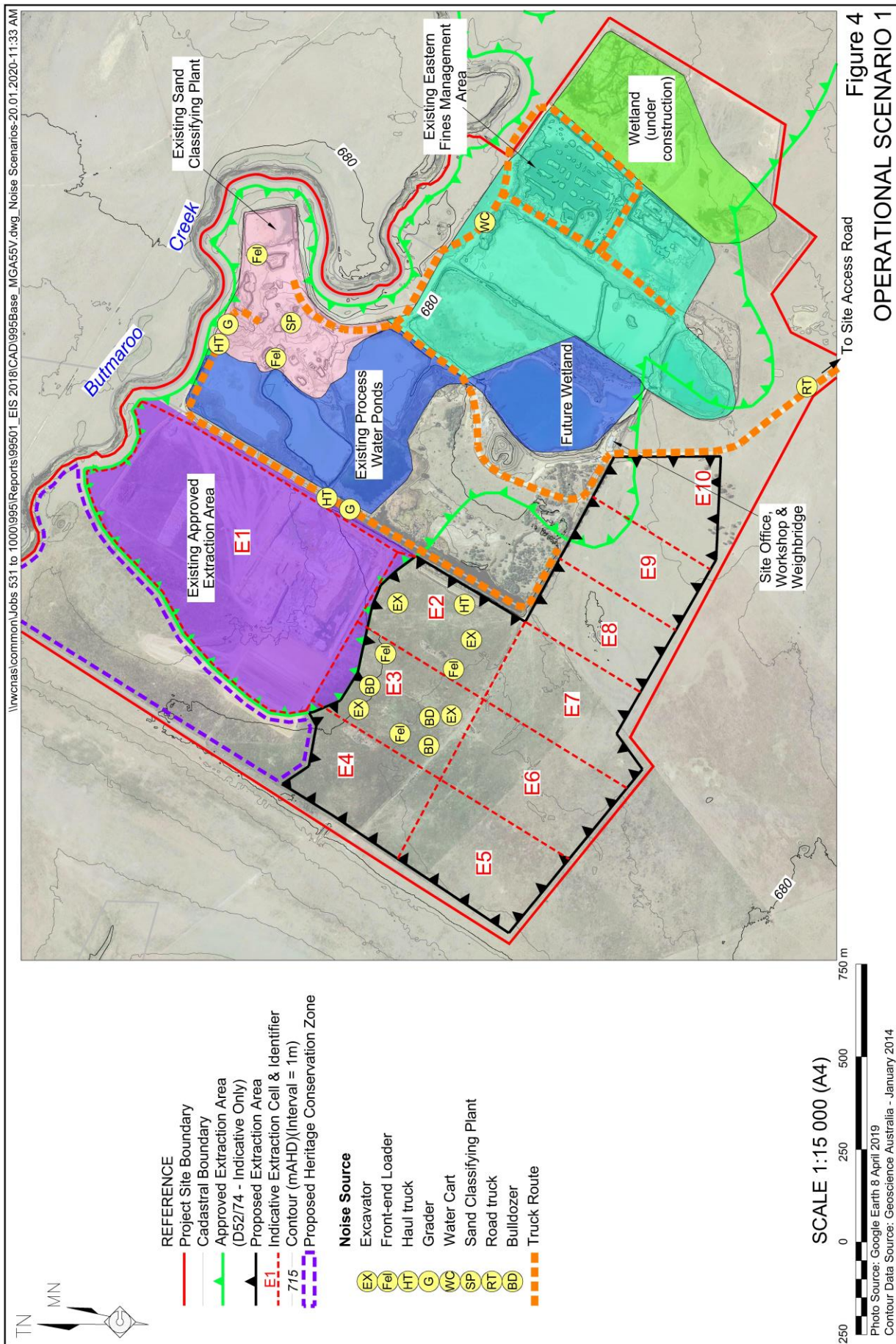


Figure 5
OPERATIONAL SCENARIO 2

REFERENCE

- Project Site Boundary
- Cadastral Boundary
- Approved Extraction Area
- (D52/74 - Indicative Only)
- Proposed Extraction Area
- Indicative Extraction Cell & Identifier
- Contour (mAHDI)(Interval = 1m)
- 715
- Proposed Heritage Conservation Zone

Noise Source

- EX Excavator
- Fel Front-end Loader
- HT Haul truck
- G Grader
- WC Water Cart
- SP Sand Classifying Plant
- RT Road truck
- BD Bulldozer
- Truck Route

SCALE 1:15 000 (A4)

0 250 500 750 m

Map Labels:

- Butmaroo Creek
- Existing Sand Classifying Plant
- Existing Process Water Ponds
- Future Wetland
- Wetland (under construction)
- Existing Eastern Fines Management Area
- Site Office, Workshop & Weighbridge
- To Site Access Road
- E1, E2, E3, E4, E5, E6, E7, E8, E9, E10
- HT, G, WC, SP, RT, BD, EX, Fel

Photo Source: Google Earth 8 April 2019
Contour Data Source: Geoscience Australia - January 2014

Table 5
Noise Source Sound Power Levels

Equipment	Number	Use/Activity	Source height (m)	Lw, dB(A)	
				Leq	Lmax
Hydraulic Excavator 30-35t	4	Resource extraction and haul truck loading.	5	108	112
Bulldozer (Caterpillar D9T or similar)	1	Resource extraction (ripping/pushing), site works.	3	106	109
Front-end Loader 25t	5	Haul truck and product truck loading.	2	110	112
Articulated Haul Truck 40t	3	Raw material haulage to processing area.	3	98	112 [#]
Water Truck (Minimum 12 000 L)	1	Dust suppression activities.	3	108	113
Sand processing plant	1	Crushing and screening of raw material	5	113	116
Product truck	-	Hauling product to market	2	96*	102/112 [#]
Grader	1	Internal road maintenance	2	96	100
* 15-minute Leq per 350m of access road at 400 000tpa.					
# 102 dB(A) on site access road, 112 dB(A) impact from truck being loaded.					
Source: Grantham Park Holdings Pty Limited					

4.3 CUMULATIVE NOISE

It was established in Section 3.4 that the cumulative noise trigger level for the proposal is equal to the 38 dB(A), $L_{eq(15min)}$ operational noise trigger level. Further assessment of both operational and cumulative noise levels would only be required if the operational noise from the proposal exceeds this value.

4.4 MAXIMUM NOISE LEVELS

The Sound power levels of modelled L_{Amax} noise is shown in **Table 5**. Impact noise from individual sources was considered by comparison with the operational noise predictions.

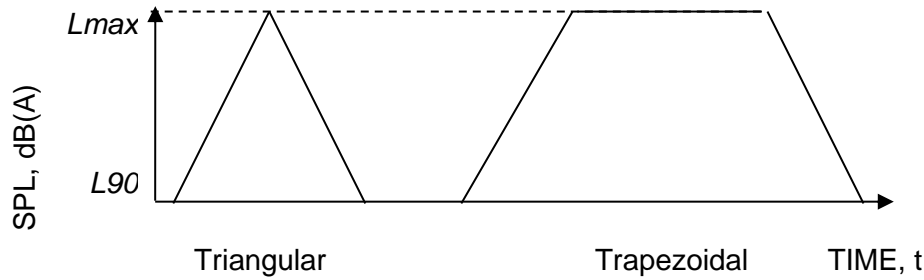
4.5 TRAFFIC NOISE

Additional traffic noise generated by the Project at residential receivers adjacent to the Tarago Road will be of a discrete rather than constant nature. There are many methods available for calculating the cumulative noise impact arising from discrete signals of various shapes. The methodology employed in this Section was sourced from the US Environmental Protection Agency document No. 550/9-74-004 *Information on Levels of Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*, March 1974.

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The document refers to *triangular* and *trapezoidal* time signals, which are illustrated in **Figure 6**. A triangular time signal rises from the background level to a peak noise level and then immediately begins to subside. A triangular time signal is a good approximation of the Sound Pressure Level (SPL) signal of a truck as it passes an observation point. A trapezoidal time signal rises from the background level to a maximum level and sustains that level for a period of time before subsiding. The trapezoidal time signal is a good approximation of the SPL signal of a train as it passes an observation point.

Figure 6 **Triangular and trapezoidal noise signals**



The value of $L_{eq,T}$ for a series of identical triangular time patterns having a maximum level of L_{max} is given by **Equation 1**.

$$L_{eq,T} = L_b + 10 \log \left[1 + \frac{ND}{T} \left(\frac{10^{(L_{max} - L_b) / 10} - 1}{2.3} - \frac{(L_{max} - L_b)}{10} \right) \right] \quad (1)$$

Where

- L_b is background noise level, dB(A)
- L_{MAX} is vehicle noise, dB(A)
- T is the time for each group of vehicles (min)
- N is number of vehicle trips
- D is duration of noise of each vehicle (min)

For calculation purposes, L_{max} is the maximum vehicle noise at the assessment point(s), and has been based on numerous measurements of quarry truck pass-by noise on sealed roads in a 100km/h zone taken by Spectrum Acoustics at receivers near other quarries in recent years. The background noise level is the level that existed prior to the introduction of the new noise, the L_{A90} level. The assessment period T corresponds to the stated criterion period, that is, 60 minutes.

For the purposes of the road traffic noise assessment, it has been assumed the closest residences to Tarago Road, at which the quarry-related truck noise is assessed, is R22 at 42m from the near edge of the road.

5. RESULTS AND DISCUSSION

5.1 PREDICTED OPERATIONAL NOISE LEVELS

Noise levels were modelled using Renzo Tonin Associates (RTA) *Environmental Noise Model* v3.06 (ENM) software. Point to point calculations were performed for receivers R1-R10 in **Table 2**. Predicted noise levels for the two modelled scenarios are summarised in **Tables 6** and **7**. Noise contours are shown in **Figures 7** to **10**.

Table 6
Predicted noise levels, dB(A), $L_{eq}(15min)$ Scenario 1

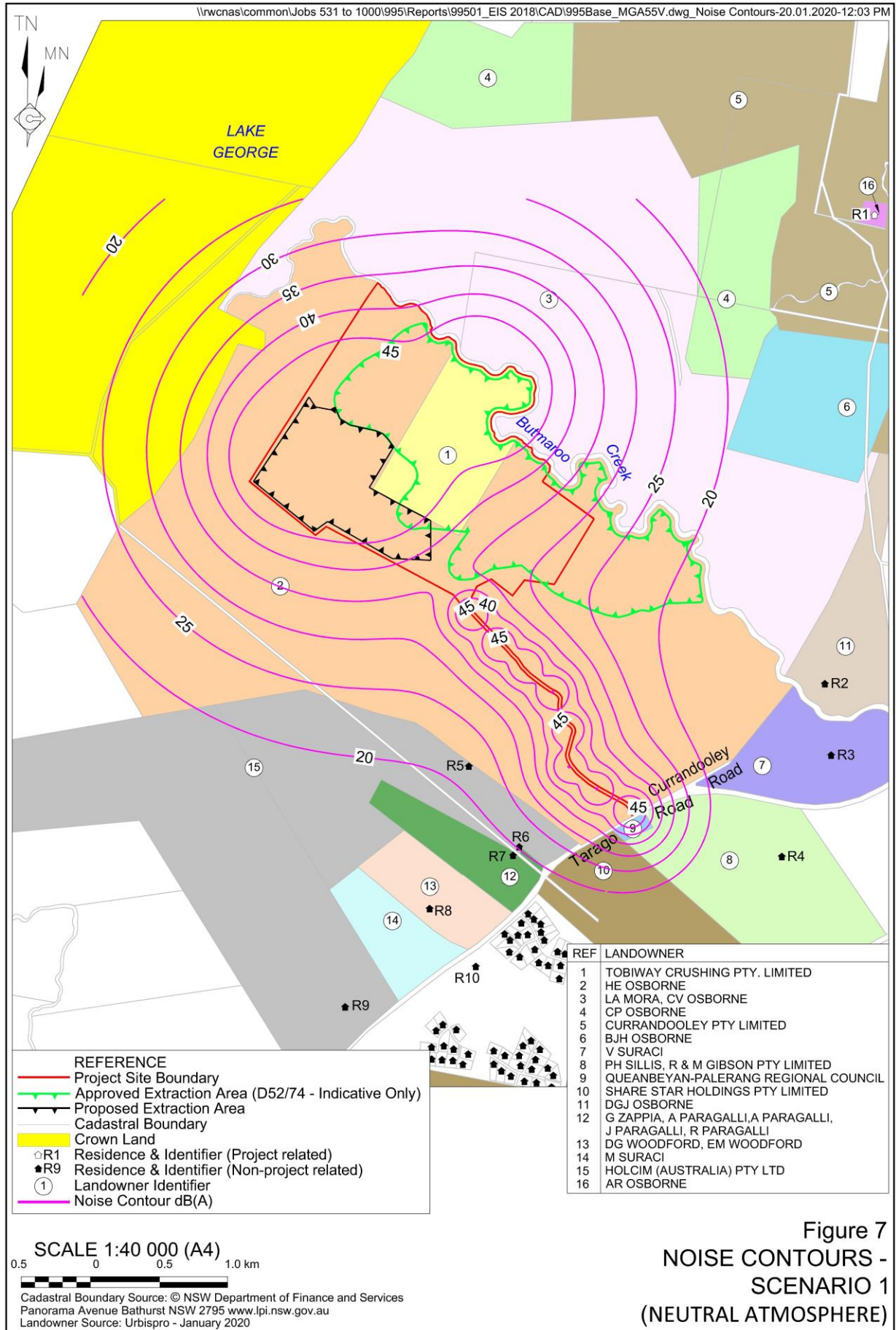
Receiver*	Product Noise Trigger level	Meteorological condition	
		Neutral	Inversion
R1	35	<20	<20
R2	35	<20	<20
R3	35	<20	<20
R4	35	<20	<20
R5	35	22	27
R6	35	20	25
R7	35	20	25
R8	35	<20	<20
R9	35	<20	<20
R10	35	<20	<20

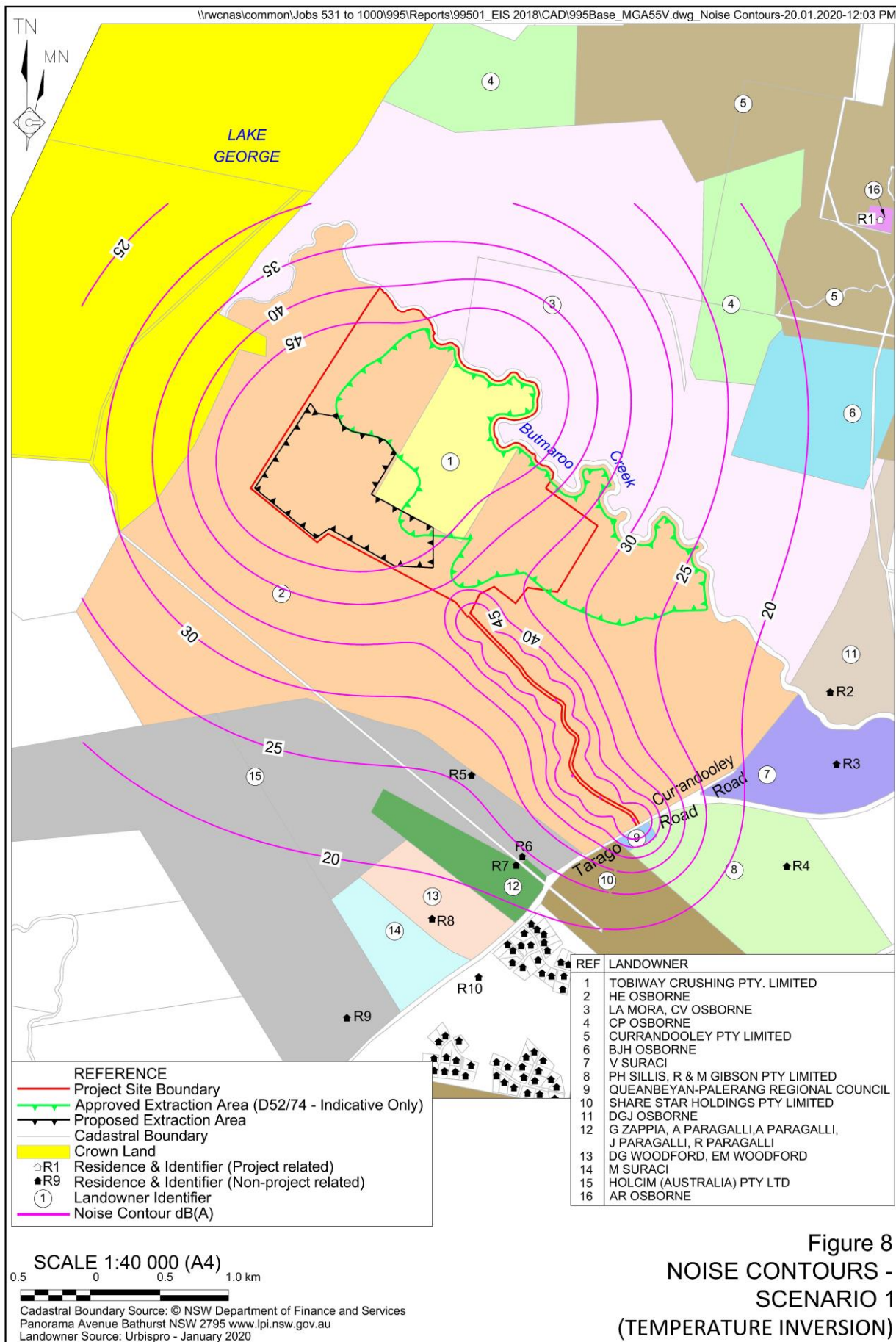
Table 7
Predicted noise levels, dB(A), $L_{eq}(15min)$ Scenario 2

Receiver*	Product Noise Trigger level	Meteorological condition	
		Neutral	Inversion
R1	35	<20	<20
R2	35	<20	<20
R3	35	<20	<20
R4	35	<20	20
R5	35	25	29
R6	35	21	25
R7	35	21	25
R8	35	<20	20
R9	35	<20	<20
R10	35	<20	<20

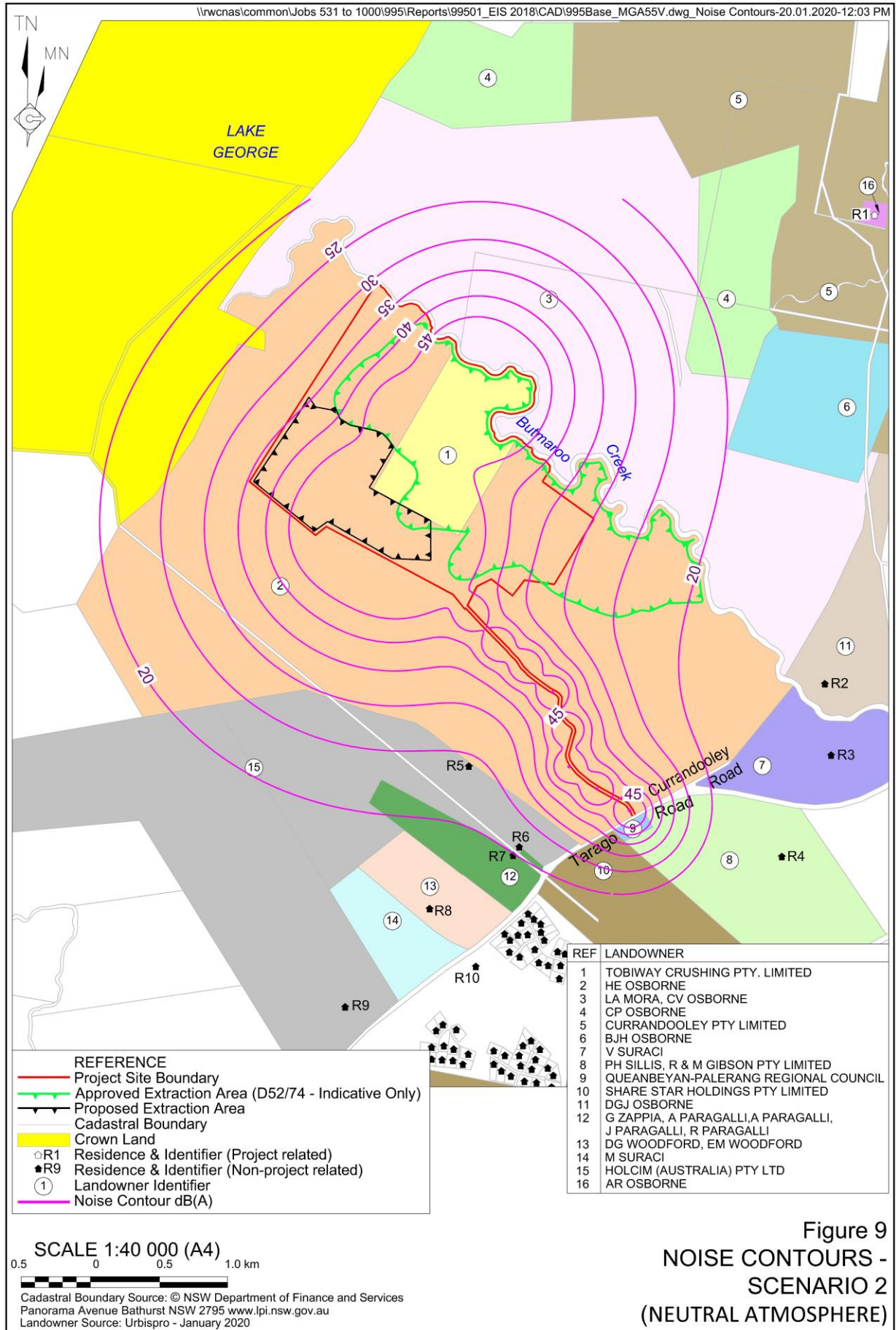
The results in **Tables 6** and **7** predict noise levels well below the project noise trigger level at all assessed receivers.

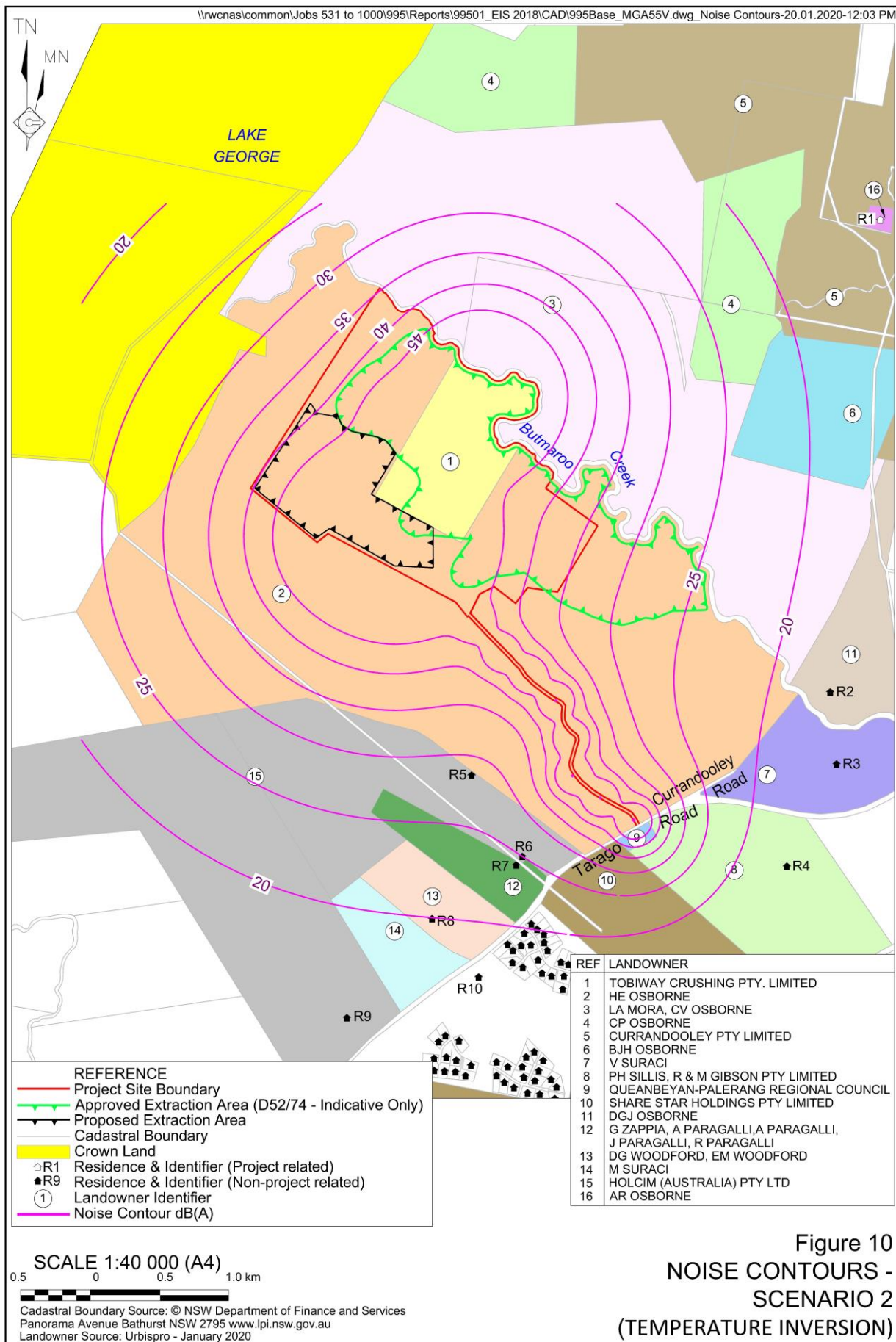
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5.2 CUMULATIVE NOISE

The worst case predicted noise levels from the project was 29 dB(A), $L_{eq}(15min)$ at R5 for Scenario 2 under inversion conditions. This is 9 dB below the cumulative noise trigger level of 38 dB(A) and further assessment of potential cumulative noise impacts is not required.

5.3 VLAMP ASSESSMENT

The DPIE's *Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extraction Industry Development* (VLAMP) lists five (5) different levels of noise impact and recommended actions. These impact levels and actions are shown in **Table 8**.

Table 8
VLAMP Noise Categories and Recommended Actions

Noise Category	Project Noise Levels	Recommended action
1. Negligible	0-2 dB(A) above PNTL	Not a discernible noise impact – no action required
2. Marginal	3-5 dB(A) above PNTL and project contributes less than 1 dB at residence	Mechanical ventilation and air conditioning
3. Moderate	3-5 dB(A) above PNTL and project contributes more than 1 dB at residence	Mechanical ventilation, air conditioning and facade upgrade
4. Significant	More than 5 dB(A) above PNTL at residence	Mechanical ventilation, air conditioning and facade upgrade, property acquisition
5. Significant	More than 5 dB(A) above amenity limit over 25% of land area	Property acquisition

The noise impact assessment in Section 5.1 found that none of the assessed receivers (residences) would be impacted under any noise category in **Table 8**. No privately-owned land would experience noise levels more than 5 dB above the project amenity level.

5.4 MAXIMUM NOISE LEVELS

The predicted operational noise levels in **Tables 6** and **7** were calculated on the assumption that all plant items in Scenarios 1 and 2 in **Figures 4** and **5** were operating simultaneously. The total scenario sound power level (excluding trucks on the site access road) is the sum of 4 x Excavators, 1 x dozer, 5 x loaders, 3 x haul trucks, a water cart, a grader and the processing plant. This total is 120 dB(A). This is greater than the maximum noise level from any individual noise source, so the received maximum noise level from an individual source will be less than the predicted operational levels in **Tables 6** and **7**, and well below the 52 dB(A) maximum noise trigger level.

When modelled in isolation, the worst case predicted noise level from the site access road was 23 dB(A), $L_{eq}(15min)$ at R5, R6 and R7. The maximum level of trucks on the site access road is 6 dB greater than the L_{Aeq} level, implying maximum levels of 29 dB(A) at these receivers. This is well below the 52 dB(A) maximum noise trigger level.

5.5 OFF-SITE ROAD TRAFFIC NOISE

5.5.1 Traffic Types and Levels

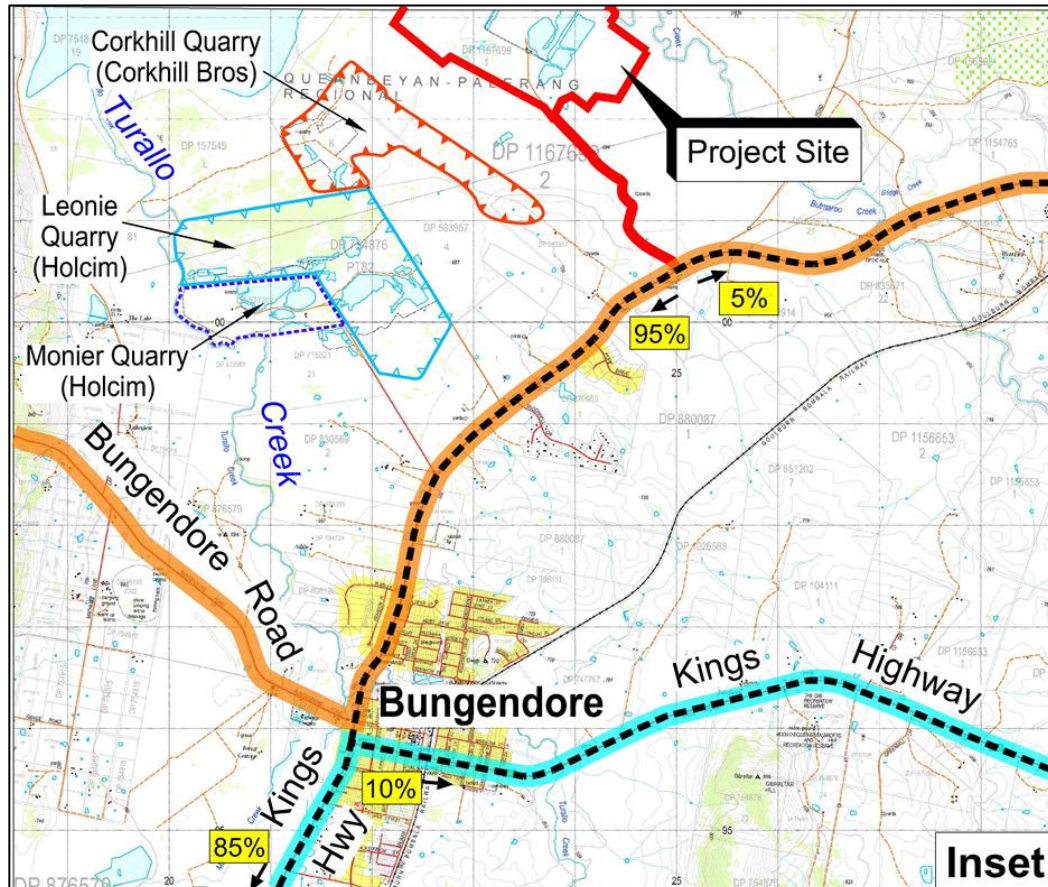
The Applicant proposes to transport up to 400,000tpa of sand products from the Project Site by road. As a result, it is anticipated that the Proposal would generate the following vehicle movements.

- An average of 30 to 35 laden movements per day.
- On occasion there would be a maximum of 70 laden movements per day.
- The maximum number of laden movements would be no more than 8 per hour.
- Employee light vehicle movements up to 20 movements or 10 return trips.

5.5.2 Product Transport Routes

The Applicant has advised that 95% of laden trucks departing the Site would travel westwards on Tarago Road and only 5% would travel eastward as indicated in **Figure 11**. Worst case traffic noise impacts would occur west of the site entrance on the section of Tarago Road (sub - arterial) between the site and the connection with Kings Highway (arterial road).

Figure 11 Product haulage route



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5.5.3 Traffic Noise Impact Assessment

Based on the maximum annual product despatch rate of 400 000t, the Project would generate up to 140 movements per day. Since 95% of movements would be west of the site entrance, there may be up to 124 heavy vehicle movements per day past the potentially most impacted receiver R22 at 42m south of Tarago Road and receivers approximately 15m from Tarago Road in Bungendore.

For receiver R22, point calculation modelling resulted in a road traffic noise level of 43 dB(A), $L_{eq(15\text{hour})}$ based on a sign posted speed of 100km/h. This is significantly below the criterion of 60 dB(A), $L_{eq(15\text{hour})}$ and is also below the night time criterion of 50 dB(A), $L_{eq(1\text{-hour})}$ for receivers near local roads.

For a receiver 15m from Tarago Road in Bungendore, the calculated road traffic noise level is 45 dB(A), $L_{eq(15\text{hour})}$ based on a sign posted speed of 50km/h. This is also significantly below the criterion of 60 dB(A), $L_{eq(15\text{hour})}$ for receivers near sub-arterial roads.

Consequently, there is minimal potential for adverse traffic noise impacts from the Project and given the low levels of predicted traffic noise impacts, a more extensive quantitative assessment is not warranted.

6. MONITORING

It is recommended that noise monitoring would not be required since the predicted noise levels from both operations and off-site traffic are well below the relevant noise trigger levels.

Table 9
Coverage of SEARs and Additional Matters

Page 1 of 2

Requirement(s)		Coverage in Report
Secretary's Environmental Assessment Requirements		
The EIS must address the following specific issues:		--
<ul style="list-style-type: none"> include a quantitative assessment of potential: 		Whole document
<ul style="list-style-type: none"> construction and operational noise and off-site transport noise impacts of the development in accordance with the <i>Interim Construction Noise Guideline, NSW Noise Policy for Industry and NSW Road Noise Policy</i> respectively; 		ICNG N/A
<ul style="list-style-type: none"> reasonable and feasible mitigation measures to minimise noise emissions; and 		N/A
<ul style="list-style-type: none"> monitoring and management measures; 		N/A
Requirements Nominated by Other Government Agencies		
Environment Protection Authority 22 July 2019	<ul style="list-style-type: none"> Identify all noise sources or potential sources from the development (including both construction and operation phases). Detail all potentially noisy activities including ancillary activities such as transport of goods and raw materials. 	Section 1.1
	<ul style="list-style-type: none"> Specify the times of operation for all phases of the development and for all noise producing activities. 	Table 1
	<ul style="list-style-type: none"> For projects with a significant potential traffic noise impact provide details of road alignment (include gradients, road surface, topography, bridges, culverts etc), and land use along the proposed road and measurement locations - diagrams should be to a scale sufficient to delineate individual residential blocks. 	N/A (Minor traffic noise impact)
	<ul style="list-style-type: none"> Identify any noise sensitive locations likely to be affected by activities at the site, 	Section 1.2
	Describe baseline conditions	
	<ul style="list-style-type: none"> Determine the existing background (LA90) and ambient (L_{Aeq}) noise levels, as relevant, in accordance with the NSW Noise Policy for Industry. 	Section 3.2
	<ul style="list-style-type: none"> Determine the existing road traffic noise levels in accordance with the NSW Road Noise Policy, where road traffic noise impacts may occur. 	N/A
	<ul style="list-style-type: none"> The noise impact assessment report should provide details of all monitoring of existing ambient noise levels 	N/A
	Assess impacts	
	<ul style="list-style-type: none"> Determine the project noise trigger levels for the site. 	Section 3.3
	<ul style="list-style-type: none"> Determination of the appropriate maximum noise level event assessment (sleep disturbance) trigger level. 	Section 3.5
	<ul style="list-style-type: none"> Maximum noise levels during night-time period (10pm-7am) should be assessed to analyse possible effects on sleep. 	Section 5.4
	<ul style="list-style-type: none"> Determine the noise levels likely to be received at the reasonably most affected location(s). 	Section 5.1
	<ul style="list-style-type: none"> The noise impact assessment report should include: <ul style="list-style-type: none"> a plan showing the assumed location of each noise source for each prediction scenario 	Figures 4 & 5

Table 9 (Cont'd)
Coverage of SEARs and Additional Matters

Page 2 of 2

Requirement(s)		Coverage in Report
Requirements Nominated by Other Government Agencies (Cont'd)		
Environment Protection Authority 22 July 2019 (Cont'd)	<ul style="list-style-type: none"> a list of the number and type of noise sources used in each prediction scenario to simulate all potential significant operating conditions on the site 	Table 5
	<ul style="list-style-type: none"> any assumptions made in the predictions in terms of source heights, directivity effects, shielding from topography, buildings or barriers, etc 	Incorporated in noise model
	<ul style="list-style-type: none"> methods used to predict noise impacts including identification of any noise models used. 	Section 5.1
	<ul style="list-style-type: none"> the weather conditions considered for the noise predictions 	Section 3.1
	<ul style="list-style-type: none"> the predicted noise impacts from each noise source as well as the combined noise level for each prediction scenario 	Section 5.1
	<ul style="list-style-type: none"> for developments where a significant level of noise impact is likely to occur, noise contours for the key prediction scenarios should be derived 	Figures 7 to 10
	<ul style="list-style-type: none"> an assessment of the need to include modification factors as detailed in Fact Sheet C of the NSW Noise Policy for Industry. 	N/A (predicted levels too low)
	<ul style="list-style-type: none"> Discuss the findings from the predictive modelling and, where relevant noise criteria have not been met, recommend additional feasible and reasonable mitigation measures. 	N/A
	<ul style="list-style-type: none"> The noise impact assessment report should include details of any mitigation proposed including the attenuation that will be achieved and the revised noise impact predictions following mitigation. 	N/A
	<ul style="list-style-type: none"> Where relevant noise/vibration levels cannot be met after application of all feasible and reasonable mitigation measures the residual level of noise impact needs to be quantified 	N/A
	<ul style="list-style-type: none"> For the assessment of existing and future traffic noise, details of data for the road should be included such as assumed traffic volume; percentage heavy vehicles by time of day; and details of the calculation process. These details should be consistent with any traffic study carried out in the EIS. 	Section 4.5 Section 5.5
Queanbeyan-Palerang Regional Council 8 August 2019	Any future development application should be accompanied by an acoustic report prepared by a suitably qualified professional giving consideration to impacts of the development upon surrounding residences.	Whole document Author is DPE recognised MAAS

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