Noise Impact Assessment

Downer Lismore Asphalt Plant

550 Nimbin Road

Blakebrook, NSW

Prepared For: Downer EDI Works Pty Ltd

C/- Element Environment Pty Ltd

August 2025

MAC252441-01RP1V1

Muller Acoustic Consulting

mulleracoustic.com

Document Information

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CONTENTS

1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by Element Environment Pty Ltd (Element), on behalf of Downer EDI Works Pty Ltd (Downer) to prepare a Noise Impact Assessment (NIA) to quantify potential noise emissions associated with the proposed extension of hours for the Downer Lismore Asphalt Plant, situated within the Blakebrook Quarry, at 550 Nimbin Road, Blakebrook, NSW (the 'project').

The NIA has quantified potential operational, sleep disturbance and road traffic noise emissions from the project and recommends reasonable and feasible noise controls where required.

This assessment has been undertaken in accordance with the following documents:

- NSW Environment Protection Authority (EPA), Noise Policy for Industry (NPI) 2017;
- NSW Department of Environment, Climate Change and Water (DECCW) – NSW Road Noise Policy (RNP), March 2011;
- NSW Environment Protection Authority (EPA), Approved methods for the measurement and analysis of environmental noise in NSW, 2022;
- Australian Standard AS 1055:2018 - Acoustics - Description and measurement of environmental noise - General Procedures;
- International Organisation for Standardisation (ISO) 9613-1:1993 (ISO9613:1) - Acoustics - Attenuation of Sound During Propagation Outdoors - Part 1: Calculation of the Absorption of Sound by the Atmosphere;
- International Organisation for Standardisation (ISO) 9613-2:1996 (ISO9613:2) - Acoustics - Attenuation of Sound during Propagation Outdoors - Part 2: General Method of Calculation; and
- ISO/TR 17534-3 - Acoustics — Software for the calculation of sound outdoors — Part 3: Recommendations for quality assured implementation of ISO 9613-2 in software according to ISO 17534-1.

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

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2 Project Description

2.1 Project Background

Downer operate an existing asphalt plant situated within the Blakebrook Quarry (the 'quarry') site at 550 Nimbin Road (Lot 54 DP1254990), Blakebrook, NSW, approximately seven (7) kilometres (km) northwest of Lismore, in the Lismore City local government area (LGA) (see **Figure 1**).

The Blakebrook Quarry is owned and operated by Lismore City Council (LCC) and Downer lease a portion of the site, on which the asphalt plant is located.

The quarry and ancillary asphalt plant currently operate under State Significant Development (SSD) consent MP07_0020.

Development consent MP07_0020 for the Blackbrook Quarry Project was originally granted on 24th November 2009 by the Minister for Planning, under the former Part 3A of the EP&A Act. The consent has since been modified on two separate occasions.

2.2 Project Description

The Blakebrook Quarry is seeking approval to modify the existing development consent. The proposed changes include:

- Allowing the Asphalt Plant operations to receive and re-use recycled materials in its asphalt production. This heavily reduces the reliance on virgin materials, as well as reducing the embodied carbon emissions associated with asphalt, making operations more environmentally friendly and sustainable. The recycled materials proposed to be used include:
    - Allowing the site to receive and process up to 15,000 tonnes (t) of Reclaimed Asphalt Pavement (RAP) each year, with a maximum of 10,000t stored on-site at any one time. RAP is a recycled road product and by utilising this, the reliance on virgin materials required to make asphalt will be reduced.
    - Receiving and processing up to 10,000t per year of recovered glass sand, with storage of up to 2,500t at any time.
    - Receiving and processing up to 1,500t per year of crumb rubber and 350t per year of TonerPlas (a recycled plastic product), with up to 45t of crumb rubber and 20t of TonerPlas stored on-site at once.
- Increasing the asphalt production and transport limit from 50,000t to 100,000t per year.

- Extending the operating hours of the asphalt plant to permit operations as needed on a 24-hour basis, while the quarry will continue to operate within its existing approved hours. This extension does not necessarily mean the plant would operate 24/7, however as required based on demand.
- Making minor administrative updates to some of the existing consent conditions.

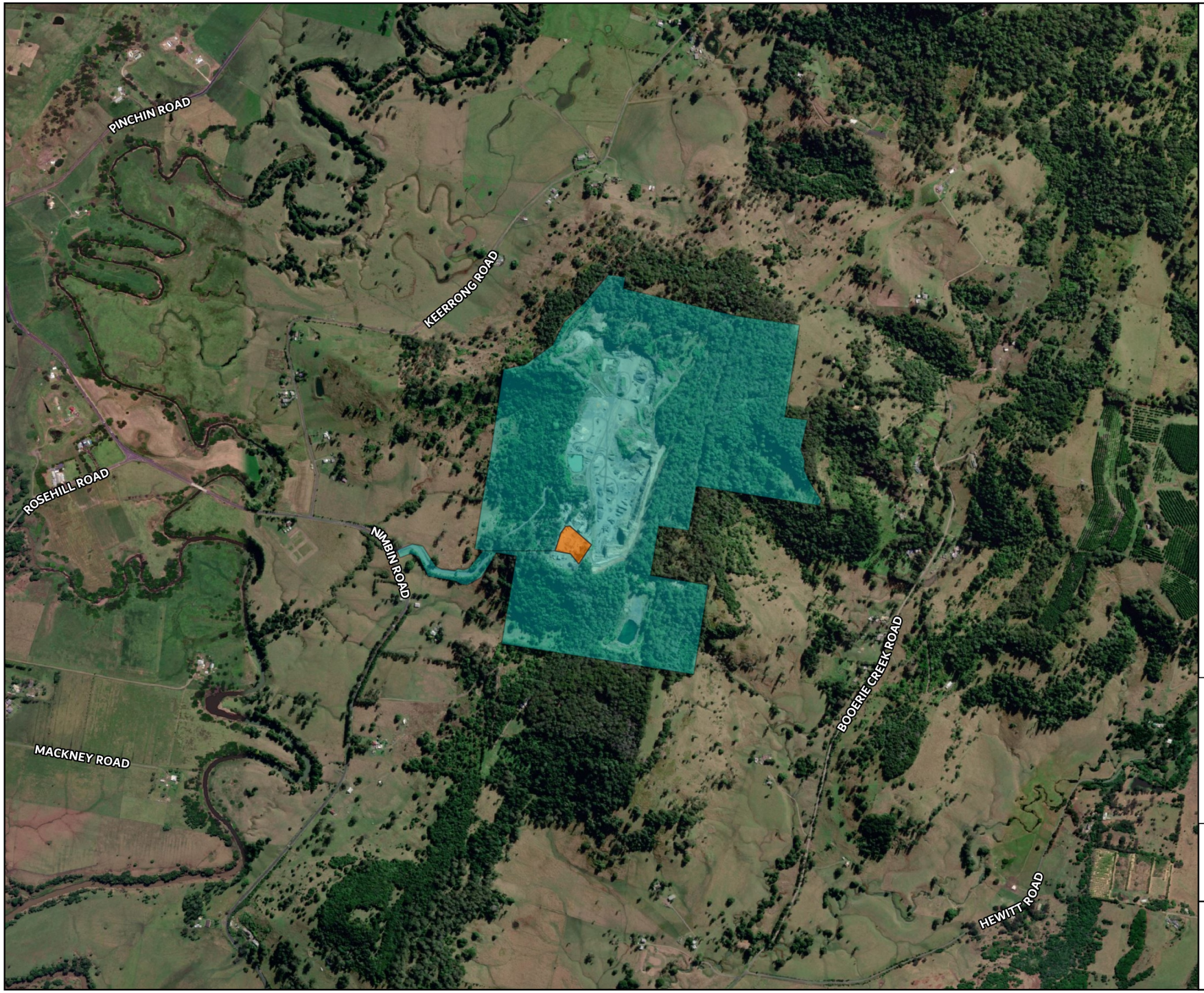


FIGURE 1

LOCATION MAP

MAC252441-01

LISMORE ASPHALT PLANT

KEY

Project Site (Asphalt Plant)

Blakebrook Quarry

0 200 400 600 800 m

N

mac
Muller Acoustic Consulting

2.3 Receiver Review

The site and surrounds are generally zoned RU1 – Primary Production, with small areas to the northeast and the southwest of the quarry zoned C2 – Environmental Conservation. The nearest residences are located approximately 615m from the existing asphalt plant, and approximately 150m from the site access road.

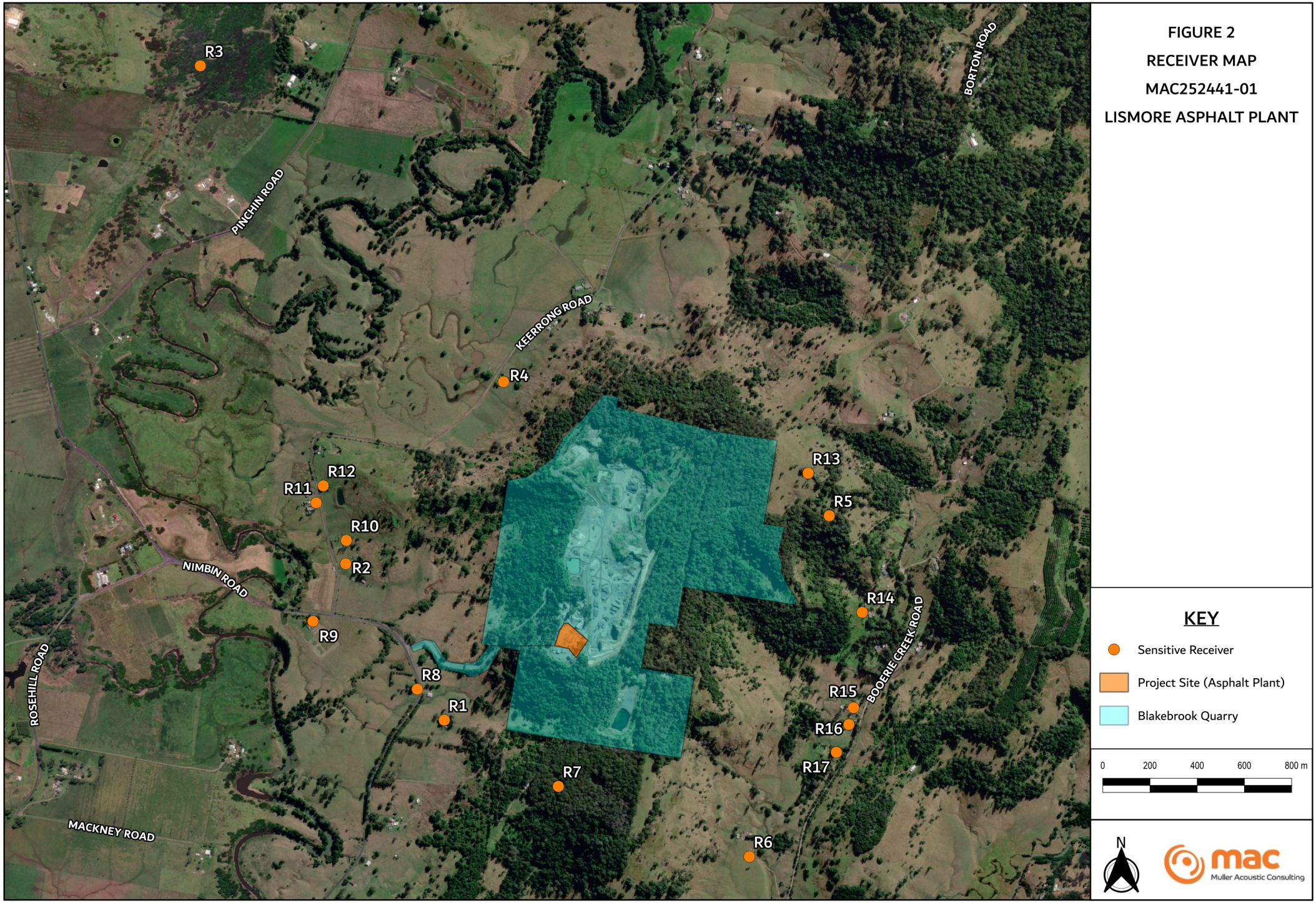
The Noise Impact Assessment for the Blakebrook Quarry Asphalt Plant (Assured Environmental Pty Ltd, 2019; Ref: 11558_R_3) (the 'historic assessment') identified seven potentially sensitive receivers (R1 – R7) surrounding the quarry. This assessment has considered the receivers identified in the historic assessment and identified a further 10 receivers located within approximately 1,250m of the asphalt plant site.

A summary of the nearby sensitive receivers is provided in **Table 1**, while **Figure 2** provides a locality plan showing the position of these receivers in relation to the project.

Table 1 Sensitive Receiver Locations

Receiver[1]	Description	Receiver Type	Coordinates (GDA94/MGA56)	
			Easting	Northing
R1	588 Nimbin Road	Residential	523922	6817601
R2	22 Keerong Road	Residential	523504	6818263
R3	145 Pinchin Road	Residential	522889	6820373
R4	166 Keerong Road	Residential	524173	6819034
R5	365 Booerie Creek Road	Residential	525552	6818467
R6	210 Booerie Creek Road	Residential	525213	6817023
R7	484 Nimbin Road	Residential	524405	6817320
R8	533 Nimbin Road	Residential	523807	6817732
R9	577 Nimbin Road	Residential	523366	6818020
R10	28 Keerong Road	Residential	523507	6818362
R11	37 Keerong Road	Residential	523379	6818522
R12	38 Keerong Road	Residential	523409	6818594
R13	387 Booerie Creek Road	Residential	525463	6818647
R14	329A Booerie Creek Road	Residential	525692	6818058
R15	289 Booerie Creek Road	Residential	525655	6817654
R16	277 Booerie Creek Road	Residential	525635	6817583
R17	263 Booerie Creek Road	Residential	525582	6817465

Note 1: Receivers R1 to R7 represent receivers assessed in the historic assessment. Receivers R8 to R17 represent additional receivers identified within 1,250m of the asphalt plant site.


R3
PINCHIN ROAD
BORTON ROAD
KEERRONG ROAD
R4
R13
R12
R11
R5
R10
R2
NIMBIN ROAD
R14
BOOERIE CREEK ROAD
R9
ROSEHILL ROAD
R8
R15
R1
R16
R17
R7
MACKNEY ROAD
R6
FIGURE 2
RECEIVER MAP
MAC252441-01
LISMORE ASPHALT PLANT
KEY
Sensitive Receiver
Project Site (Asphalt Plant)
Blakebrook Quarry
0
200
400
600
800 m
N
mac
Muller Acoustic Consulting

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3 Noise Policy and Guidelines

3.1 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.

3.1.1 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.

3.1.2 Rating Background Level (RBL)

The Rating Background Level (RBL) is a parameter determined 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.

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

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

3.1.3 Project Intrusiveness Noise Level (PINL)

The PINL ($LA_{eq(15min)}$) 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.

Background noise levels need to be determined before intrusive noise can be assessed. The NPI states that background noise levels to be measured are those that are present at the time of the noise assessment and without the subject development operating. For the assessment of modifications to existing premises, the noise from the existing premises should be excluded from background noise measurements. It is note that the exception is where the premises has been operating for a significant period of time and is considered a normal part of the acoustic environment; it may be included in the background noise assessment under the following circumstances:

- the development must have been operating for a period in excess of 10 years in the assessment period/s being considered and is considered a normal part of the acoustic environment; and,
- the development must be operating in accordance with noise limits and requirements imposed in a consent or licence and/or be applying best practice.

Where a project intrusiveness noise level has been derived in this way, the derived level applies for a period of 10 years to avoid continuous incremental increases in intrusiveness noise levels. This approach is consistent with the purpose of the intrusiveness noise level to limit significant change in the acoustic environment. The purpose of the project amenity noise level is to moderate against background noise creep.

3.1.4 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.

Where relevant this assessment has considered influences of traffic with respect to amenity noise levels (ie areas where existing traffic noise levels are 10dB greater than the recommended amenity noise level).

Furthermore, Section 2.4 of the NPI states "*where the project amenity noise level applies and it can be met, no additional consideration of cumulative industrial noise is required.* "

The recommended amenity noise levels as per Table 2.2 of the NPI are reproduced in **Table 2**.

Table 2 Amenity Noise Levels

Receiver Type	Noise Amenity Area	Time of day	Recommended amenity noise level 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) 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

Note: 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: 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.

3.1.5 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:

- $L_{Aeq(15min)}$ 40dB or the prevailing RBL plus 5dBA, whichever is the greater, and/or
- L_{Amax} 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.

3.2 Road Noise Policy

The road traffic noise criteria are provided in the Road Noise Policy (RNP), 2011. The policy sets out noise criteria (refer **Table 3**) applicable to different road classifications for the purpose of quantifying traffic noise impacts.

Table 3 Road Traffic Noise Assessment Criteria			
Road category	Type of project/development	Assessment Criteria – dBA	
		Day (7am to 10pm)	Night (10pm to 7am)
Freeways/arterial/ sub-arterial Roads	Existing residences affected by additional traffic on freeways/arterial/sub-arterial roads generated by land use developments	60dB LAeq(15hr)	55dB LAeq(9hr)
Local roads	Existing residences affected by additional traffic on local roads generated by land use developments	55dB LAeq(1hr)	50dB LAeq(1hr)
School Classrooms	Proposed road projects and traffic generating developments	40dB LAeq(1hr) (internal) when in use	N/A
Hospital Wards		35dB LAeq(1hr) (internal)	35dB LAeq(1hr) (internal)
Places of Worship		40dB LAeq(1hr) (internal)	40dB LAeq(1hr) (internal)
Open Space (active use)		60dB LAeq(1hr)	N/A
Open Space (passive use)		55dB LAeq(1hr)	N/A
Isolated residences in commercial or industrial zones		Refer to AS2107 for internal levels	
Mixed Use development		Each component to be considered separately	
Childcare Facilities		Sleeping rooms 35dB LAeq(1hr) (internal) Indoor play areas 40dB LAeq(1hr) (internal) Outdoor play areas 55dB LAeq(1hr) (external)	

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 2dBA, which is generally accepted as the threshold of perceptibility to a change in noise level.

4 Assessment Criteria

4.1 Historic Noise Limits

Blakebrook Quarry and Asphalt Plant currently operate in accordance with Environment Protection Licence (EPL #3384) and development consent MP 07_0020, Mod 3, which prescribes the following noise limits:

L4.1 Noise from the premises must not exceed an $LA_{eq(15\ minute)}$ noise criterion of 36dB(A) at Location 2 and 7 and 35dB(A) at all other sensitive receivers, except expressly provided by this licence.

It is noted that the current approved hours of operation for the facility, including the asphalt plant, are 7am to 6pm Monday to Friday and 7am to 3pm on Saturday. However, L6.3 of EPL #3384 and Condition 2A, Schedule 3 of the development consent indicates that the licensee may undertake limited campaign asphalt plant operations (within the limits imposed in the EPL and Approval) outside of the operating hours.

Notwithstanding, assessment of the extended hours of operation of the asphalt plant is undertaken in accordance with the methodologies prescribed in the current NSW industrial noise guideline (NPI), including establishment of contemporary criteria.

4.2 Operational Project Noise Trigger Levels (Criteria)

This section outlines the determination of PNTLs and Maximum Noise Assessment Trigger Levels in accordance with NPI methodology.

4.2.1 Existing Noise Environment

Based on the rural locality, and low likely existing noise levels, background noise monitoring has not been conducted for this project. Hence, the minimum assumed Rating Background Level (RBL) of 30dBA has been adopted for the evening and night time periods, in accordance with NPI methodology.

It is noted the proposed increase in production would be facilitated by an extension of the hours of operation to 24 hours. It is anticipated that the day period operations would remain consistent with the existing approved activities. Hence, assessment is undertaken for the evening and night periods only. Notwithstanding, the contemporary criteria is derived for all assessment periods (day, evening and night).

4.2.2 Project Intrusiveness Noise Levels

The PINLs for the project are presented in **Table 4** and have been determined based on the RBLs +5dBA.

Table 4 Project Intrusiveness Noise Levels

Receiver	Period[1]	Adopted RBL dB LA90(period)	PINL dB LAeq(15min)
All Residential 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.

4.2.3 Project Amenity Noise Levels

The relevant PANL for residential receivers potentially affected by the project are presented in **Table 5**.

Table 5 Amenity Noise Levels and Project Amenity Noise Levels

Receiver Type	Noise Amenity Area	Assessment Period[1]	Recommended ANL dB LAeq(period)	ANL dB LAeq(period)[2]	PANL dB LAeq(15min)[3]
Residential	Rural	Day	50	50	53
		Evening	45	45	48
		Night	40	40	43

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 Amenity Noise Level equals the Amenity Noise Level as there is no other industry in the area.

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.

4.2.4 Project Noise Trigger Levels

The PNTLs are the lower of either the PINLs or the PANLs. **Table 6** presents the derivation of the PNTLs in accordance with the methodologies outlined in the NPI. For this assessment the night time PNTL of 35dB LAeq(15min) is the limiting criteria for residential receivers.

Table 6 Project Noise Trigger Levels

Catchment	Assessment Period1	PINL dB LAeq(15min)	PANL dB LAeq(15min)	PNTL dB LAeq(15min)
Residential Receivers (Rural)	Day	40	53	40
	Evening	35	48	35
	Night	35	43	35

Note: 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.

4.2.5 Maximum Noise Trigger Levels

The maximum noise trigger levels shown in **Table 7** 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 7 Maximum Noise Trigger Levels (Night)

Residential Receivers			
$L_{Aeq(15min)}$		L_{Amax}	
40dB $L_{Aeq(15min)}$ or RBL + 5dB		52dB L_{Amax} or RBL + 15dB	
Trigger	40	Trigger	52
RBL +5dB	35	RBL +15dB	45
Highest	**40**	**Highest**	**52**

Notes: Monday to Saturday; Night 10pm to 7am. On Sundays and Public Holidays Night 10pm to 8am. Morning Shoulder 5am to 7am; Evening Shoulder 10pm to 12am.

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

4.3 Road Traffic Noise

MAC understands that access to the site would be via Nimbin Road, which is classified as a 'sub arterial road', in accordance with Section 2.2 of the RNP. The road traffic noise assessment criteria for this assessment, as per the RNP, are presented in **Table 8.**

Table 8 Road Traffic Noise Assessment Criteria

Road category	Type of project/development	Assessment Criteria – dBA	
		Day (7am to 10pm)	Night (10pm to 7am)
Freeways/arterial/ sub-arterial Roads	Existing residences affected by additional traffic on freeways/arterial/sub-arterial roads generated by land use developments	60dB $L_{Aeq(15hr)}$	55dB $L_{Aeq(9hr)}$

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 2dBA, which is generally accepted as the threshold of perceptibility to a change in noise level.

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5 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[1]. 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.

5.1 Assessment Scenarios

The modification to the operations of the asphalt plant would primarily involve an increase in the production rate to 100,000tpa and a change in operating hours to allow 24/7 operations. It is noted that there are no changes proposed to the existing operations of the quarry. Furthermore, day time operation of the asphalt plant would remain essentially the same as the existing approved operations. Hence, the assessment has considered the operation of asphalt plant during the evening and night time only.

The assessment parameters, including source sound power levels, analysis of annoying characteristics and meteorological analysis is provided in the following sections.

[1] 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

5.1.1 Sound Power Levels

Table 9 presents the sound power level for each noise source modelled in this assessment. Single octave sound power levels are provided in **Appendix B**.

It is noted that sound power levels for the asphalt plant were provided by the plant manufacturer (Ammann). Similarly, sound power levels for the front-end loader were sourced from manufacturers specifications (Komatsu), while sound power levels for the road trucks were sourced from the CNOSSOS-EU database.

Table 9 Acoustically Significant Sources - Sound Power Levels dBA (re 10^{-12} Watts)

Noise Source	Detail / Description	Modelled Sound Power Level dB LAeq(15min)	Source Height[1]
Operation			
Cold Feed System	Cold Feeder (x6)	76 (each)	1m
Drying / Heating System	Drum	92	2m
	Burner Device	101	2m
Dust Collection	Exhaust Fan	93	1.5m
	Stack[2]	112	12m
Mixing Tower	Hot Elevator	90	10.4m
	Vibrating Screen (Casing and Drive)	95	3.5m
	Oversized Discharge Duct	104	1.5m
	Mixer	94	3.5m
	Container Compressor	75	3m
Filter Supply	Filter Elevator	85	1m
Asphalt Storage Silo	Discharge to Mixer from Silo	88	4m
RAP	Addition System	93	3m
Front End Loader	Komatsu WA480	108	2m
Road Trucks	10 / hr[3]	104	1.5m
Maximum Noise Level Assessment (L_{Amax}), Night time periods (10pm to 7am)			
Truck (Passby)[4]		104	1.5m
Loading Truck (Impact)		114	3m

Note 1: Height above the relative ground level below source.

Note 2: Modelled as a point source with vertical discharge.

Note 3: Modelled as a moving source.

Note 4: Modelled as a point source at the closest point on the site access road to the nearby sensitive receivers.

5.1.2 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. A detailed assessment of annoying characteristics has been undertaken for the Project, is provided in full in **Appendix C** and summarised below. It is noted that due to the nature of the asphalt plant operations, intermittent noise is unlikely to be a feature of the site and has not been considered further.

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 (16.9dB). 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 for each receiver location. Hence, no correction for low-frequency noise is applied.

An assessment of tonality was undertaken to identify dominant tones associated with the asphalt plant. 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 asphalt plant operations do not result in dominant tones. Hence, no correction for tonality is applied.

5.1.3 Meteorological Analysis

Noise emissions can be influenced by prevailing weather conditions. Light stable winds (<3m/s) and temperature inversions have the potential to increase noise at a receiver.

Fact Sheet D of the NPI provides two options when considering meteorological effects:

- adopt the noise enhancing conditions for all assessment periods without an assessment of how often the conditions occur – a conservative approach that considers a source to receiver winds for all receivers and F class temperature inversions with wind speeds up to 2m/s at night; or
- determine the significance of noise enhancing conditions. This requires assessing the significance of temperature inversions (F and G Class stability categories) for the night time period and the significance of light winds up to 3m/s for all assessment periods during stability categories other than E, F or G.

Standard meteorological conditions and noise-enhancing meteorological conditions as defined in Table D1of the NPI are reproduced in **Table 10**.

Table 10 Standard and Noise-Enhancing Meteorological Conditions

Meteorological Conditions	Meteorological Parameters
Standard Meteorological Conditions	Day/evening/night: stability categories A–D with wind speed up to 0.5m/s at 10m AGL.
Noise Enhancing Meteorological Conditions	Daytime/evening: stability categories A–D with light winds (up to 3 m/s at 10m AGL). Night-time: stability categories A–D with light winds (up to 3m/s at 10m AGL) and/or stability category F with winds up to 2m/s at 10 m AGL.

A detailed analysis of the significance of noise enhancing conditions has not been undertaken and hence, the NPI noise enhancing meteorological conditions have been applied to the noise modelling assessment are presented in **Table 11**.

Table 11 Modelled Meteorological Parameters

Assessment Condition[1]	Temperature	Wind Speed[2]/ Direction	Relative Humidity	Stability Class[2]
Evening	10°C	3m/s all directions	50%	D
Night	10°C	2m/s all directions	50%	F

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: Implemented using CONCAWE meteorological corrections.

5.2 Road Traffic Noise Assessment Methodology

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.

It is noted that the historic noise impact assessment (Assured Environmental, 2019) included an assessment of road traffic noise for the day period (7am to 10pm), with a worst-case scenario of 300 heavy vehicle movements per hour, or 3,300 heavy vehicle movements across the entire day. The existing limit of heavy vehicles from the site is 150 trucks per day. Hence, the historic assessment considered a heavy vehicle scenario far greater than what is practically possible from the site. Given that the historic assessment demonstrated compliance with the applicable RNP criteria based on 3,300 vehicles per day, any additional truck movements during the day period resulting from the extension of hours to 10pm, would also comply. Therefore, the road traffic noise assessment as part of this study has been undertaken for the night period (10pm to 7am) only.

The proposed heavy vehicle movements during the night period were provided by Downer. Based on a worst-case scenario of up to 1,000t of product during the night, it is anticipated that there would be up to 45 heavy vehicle movements between 10pm and 7am.

A review of aerial imagery identified that the closest residential receiver to Nimbin Road (533 Nimbin Road) is approximately 15m form the carriageway centre line. The sign-posted speed limit along Nimbin Road is typically 100km/h.

The modelled road traffic parameters are summarised in **Table 12**.

Table 12 Road Traffic Noise Modelling Parameters

Noise Source/Item	Lw dBA re 10-12 W	Movements[1]	Speed, km/h	Source Height, m[2]
Heavy vehicle (rigid, semi trailer or b-double)	104	45	100	1.5

Note 1: Number of vehicle movements during the night period (10pm to 7am).

Note 2: Height above ground level.

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6 Assessment Results

6.1 Operational Noise Assessment

Noise predictions from the operation of the asphalt plant during the evening and night (noise enhancing conditions) have been quantified at surrounding residential receivers to the project site and are presented in **Table 13**. Noise contour plots for the evening and night period operations are provided in **Figure 3** and **Figure 4**.

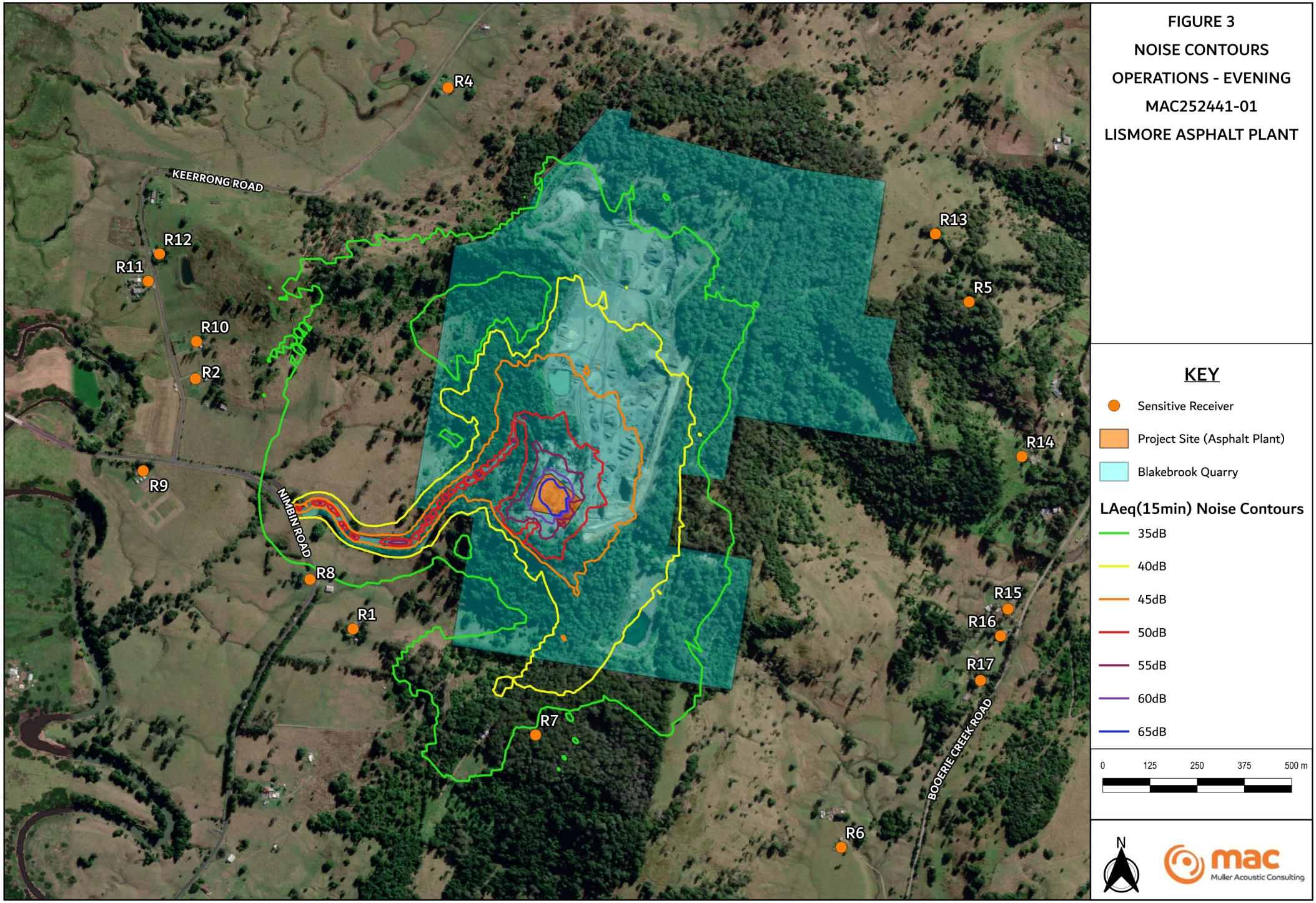
The results of the assessment demonstrate that operational noise emissions would achieve the PNTLs for the evening and night periods, at all assessed receiver locations. The highest noise levels are predicted to be up to 35dB $LA_{eq(15min)}$ at receiver R8, which is located nearest to site access road.

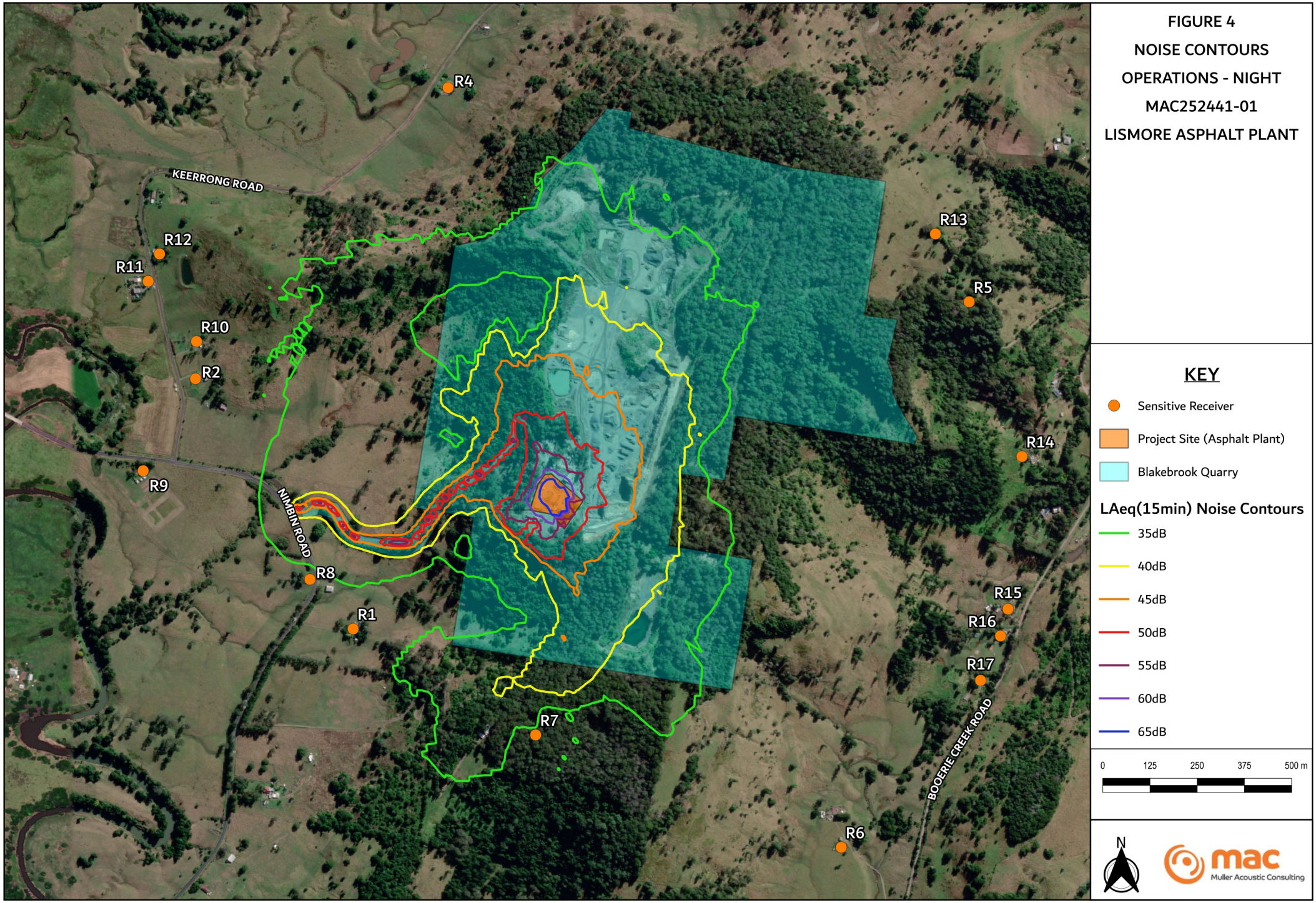
Table 13 Noise Predictions – All Receivers

Location	Predicted Noise Level dB LAeq(15min)		PNTL dB LAeq(15min)	Compliant
	Evening	Night		
R1	32	32	35	✓
R2	32	32	35	✓
R3	<30	<30	35	✓
R4	<30	<30	35	✓
R5	<30	<30	35	✓
R6	<30	<30	35	✓
R7	32	32	35	✓
R8	35	35	35	✓
R9	31	31	35	✓
R10	<30	<30	35	✓
R11	<30	<30	35	✓
R12	<30	<30	35	✓
R13	<30	<30	35	✓
R14	<30	<30	35	✓
R15	<30	<30	35	✓
R16	<30	<30	35	✓
R17	<30	<30	35	✓

Note: 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: PNTL is consistent for the evening and night periods.


R4
KEERRONG ROAD
R12
R11
R10
R2
R9
NIMBIN ROAD
R8
R1
R7
R6
R13
R5
R14
R15
R16
R17
BOOERIE CREEK ROAD
FIGURE 3
NOISE CONTOURS
OPERATIONS - EVENING
MAC252441-01
LISMORE ASPHALT PLANT
KEY
Sensitive Receiver
Project Site (Asphalt Plant)
Blakebrook Quarry
LAeq(15min) Noise Contours
35dB
40dB
45dB
50dB
55dB
60dB
65dB
0
125
250
375
500 m
N
mac
Muller Acoustic Consulting


R4
KEERRONG ROAD
R12
R11
R10
R2
R9
NIMBIN ROAD
R8
R1
R7
R6
R13
R5
R14
R15
R16
R17
BOOERIE CREEK ROAD
FIGURE 4
NOISE CONTOURS
OPERATIONS - NIGHT
MAC252441-01
LISMORE ASPHALT PLANT
KEY
Sensitive Receiver
Project Site (Asphalt Plant)
Blakebrook Quarry
LAeq(15min) Noise Contours
35dB
40dB
45dB
50dB
55dB
60dB
65dB
0
125
250
375
500 m
N
mac
Muller Acoustic Consulting

6.1.1 Maximum Noise Level Assessment

In assessing maximum noise events, typical L_{Amax} noise levels from transient events were assessed at the nearest residential receivers. For the maximum noise level assessment, a sound power level of 104dBA for a truck passby event and 114dBA for impact noise from truck loading were adopted for maximum noise level (L_{Amax}) events during the night period.

Predicted noise levels from $L_{Aeq(15min)}$ and L_{Amax} events for assessed receivers are presented in **Table 14.** Results identify that the maximum noise trigger levels will be satisfied for all assessed receivers.

Table 14 Maximum Noise Level Assessment (Night Morning Shoulder, Evening Shoulder)[1]

Receiver	Predicted Noise Level			Maximum Trigger Levels		Compliant
	dB LAeq(15min)	dB LAmax		dB LAeq(15min)	dB LAmax	
		Truck Passby	Impact			
R1	32	43	39	40	52	✓
R2	32	35	40	40	52	✓
R3	<30	<30	<30	40	52	✓
R4	<30	<30	34	40	52	✓
R5	<30	<30	35	40	52	✓
R6	<30	<30	<30	40	52	✓
R7	32	<30	39	40	52	✓
R8	35	47	41	40	52	✓
R9	31	35	39	40	52	✓
R10	<30	<30	37	40	52	✓
R11	<30	<30	35	40	52	✓
R12	<30	<30	35	40	52	✓
R13	<30	<30	35	40	52	✓
R14	<30	<30	<30	40	52	✓
R15	<30	<30	<30	40	52	✓
R16	<30	<30	<30	40	52	✓
R17	<30	<30	<30	40	52	✓

Note 1: Monday to Saturday; Night 10pm to 7am. On Sundays and Public Holidays Night 10pm to 8am. Morning Shoulder 5am to 7am; Evening Shoulder 10pm to 12am.

6.2 Road Traffic Noise Assessment

Predicted road traffic noise levels from the project are presented in **Table 15**. The results of the assessment demonstrate that road traffic noise levels are anticipated to be below the relevant RNP criteria for the night period at the nearest residential receiver locations. Hence, it is expected that there would be no road traffic noise impacts associated with the proposed extension of hours.

Table 15 Operational Road Traffic Noise Levels

Offset from Road	Period	Assessment Criteria dB LAeq(period)	Calculated Project Traffic Noise dB LAeq(period)	Compliant
15m	Night	55 LAeq(9hr)	45	Yes

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7 Noise Monitoring and Management

The results of the assessment for the extension of hours for the operation of the asphalt plant demonstrated compliance with the night time criterion at all receiver locations. Notwithstanding, it is recommended that the existing NMP for the Blakebrook Quarry (including asphalt plant) is updated to include a provision for attended noise monitoring within the community, in response to received complaints, if any. The operator attended noise measurements and recordings would be conducted to quantify noise emissions from the asphalt plant as well as the overall level of ambient noise.

When required, the operator shall quantify and characterise the energy equivalent (L_{Aeq}) intrusive noise level from the Project over a 15-minute measurement period. In addition, the operator shall quantify and characterise the overall levels of ambient noise over the 15-minute measurement interval. It is recommended that instrumentation used during the monitoring is to be equivalent to a Type 1 meter with 1/3 octave band analysis and have audio recording functionality for post processing source identification. It is noted that 1/3 octave band analysis is required to establish whether modification factors in accordance with the NPI are to be applied.

All acoustic instrumentation used as part of the attended monitoring program must been designed to comply with the requirements of AS IEC 61672.1-2019, Electroacoustics - Sound level meters - Specifications and shall have current calibration certificates. All instrumentation shall be programmed to record statistical noise level indices in 15-minute intervals including L_{Amax}, L_{Amin} and L_{Aeq}.

Instrument calibration shall be checked before and after each measurement survey, with the variation in calibrated levels not exceeding ±0.5 dBA. The measurement position(s) should be selected considering:

- weather conditions such as rain and wind, insect noise;
- the location and direction of any noise source/s;
- the most sensitive position at the affected receiver; and
- the need to avoid reflecting surfaces (where possible).

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8 Discussion and Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Impact Assessment (NIA) to quantify emissions associated with the proposed extension of hours for the Downer Lismore Asphalt Plant, situated within the Blakebrook Quarry, at 550 Nimbin Road, Blakebrook, NSW.

The assessment has quantified potential noise emissions pertaining to the operation of the asphalt plant during the evening and night periods, including fixed plant, mobile equipment and heavy vehicle movements. The assessment considered the worst-case scenario of all plant and equipment operating simultaneously under noise enhancing conditions.

The results of the NIA demonstrate that noise emissions from the operation would satisfy the relevant PNTLs at all assessed receivers for all assessment periods.

Furthermore, sleep disturbance is not anticipated, as emissions from maximum noise events (ie trucks passby events on the site access road and impact noise from loading trucks) are predicted to satisfy the NPIs maximum noise trigger levels.

An assessment of road traffic noise during the night period found that road traffic noise levels are anticipated to be significantly below the relevant RNP criteria.

Accordingly, the Noise Impact Assessment supports the Modification Application for the project without specific management 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

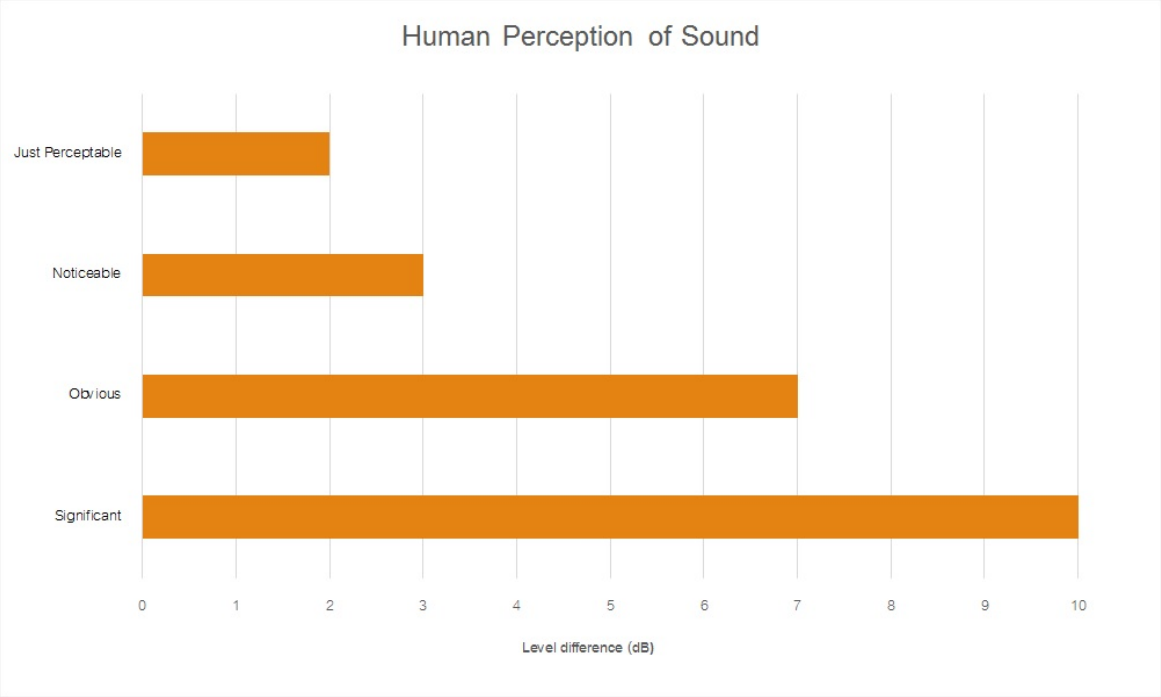
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for 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.
LAmax	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. 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 (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.log10 (W/Wo). Where W is the sound power in watts to the reference level of 10^{-12} watts.
Sound pressure level (Lp or SPL)	the level of sound pressure; as measured at a distance by a standard sound level meter. 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 – Sound Power Data

Table B1 Single Octave Equipment Sound Power Levels, dB $LA_{eq(15min)}$ ($re10^{-12}W$)									
Source/Item	Octave Band Centre Frequency, Hz								Total,
	63	125	250	500	1000	2000	4000	8000	dBA
Cold Feeder	34	45	60	71	73	69	--	--	76
Drying / Heating - Drum	66	73	77	83	83	89	83	68	92
Drying / Heating - Burner Device	70	90	92	93	96	85	93	91	101
Dust Collection - Exhaust Fan	80	86	84	86	85	85	82	64	93
Dust Collection - Stack	87	97	105	110	105	96	--	--	112
Mixing Tower - Hot Elevator	60	74	79	84	83	83	83	74	90
Mixing Tower - Vibrating Screen (Casing and Drive)	48	66	71	82	88	93	--	--	95
Mixing Tower - Oversized Discharge Duct	62	72	80	85	97	103	--	--	104
Mixing Tower - Mixer	73	79	81	89	88	88	85	76	94
Mixing Tower - Container Compressor	35	50	56	60	66	72	69	60	75
Filter Elevator	55	69	74	79	78	79	78	69	85
Discharge to Mixer from Asphalt Silo	41	59	64	75	81	86	--	--	88
RAP Addition System	63	77	82	87	86	86	86	77	93
Front End Loader	81	97	101	101	97	102	96	90	108
Road Trucks	78	84	92	98	101	97	92	84	104
Maximum Noise Level Assessment, LA_{max}									
Truck Passby Event	78	84	92	98	101	97	92	84	104
Loading Truck (Impact)	100	101	109	107	108	106	100	91	114

Appendix C – Annoying Characteristics Assessment

	Table APP-1 Tonality & Low Frequency Noise Assessment							
	Frequency (Hz)	Values (dBZ)	A-wt Spectrum	C-wt Spectrum	1/3 Octave Tonality Test	1/1 Octave Tonality Test	LFN Present (Table C1 -NPI 2017)	NPI LFN Criteria (dBZ)
Inaudible Range	10		0	0			No	92
	12.5		0	0			No	89
	16		0	0			No	86
	20		0	0			No	77
LFN Range	25	50	5	46			No	69
	31.5	45	5	42	FALSE	FALSE	No	61
	40	40	5	38	FALSE		No	54
	50	47	17	46	FALSE		No	50
	63	43	17	43	FALSE	FALSE	No	50
	80	40	17	39	FALSE		No	48
	100	39	20	39	FALSE		No	48
	125	36	20	36	FALSE	FALSE	No	46
	160	34	20	34	FALSE		No	44
	200	30	19	30	FALSE			
	250	28	19	28	FALSE	FALSE		
	315	26	19	26	FALSE			
	400	27	23	27	FALSE			
	500	26	23	26	FALSE	FALSE		
	630	25	23	25	FALSE			
	800	26	25	26	FALSE			
	1000	25	25	25	FALSE	FALSE		
	1250	25	25	25	FALSE			
	1600	21	22	21	FALSE			
	2000	21	22	21	FALSE	FALSE		
	2500	21	22	21	FALSE			
	3150	9	10	9	FALSE			
	4000	9	10	8	FALSE	FALSE		
	5000	10	10	8	FALSE			
	6300	-11	0	0	FALSE			
	8000	-10	0	0	FALSE	FALSE		
	10000	-8	0	0				
	12500		0	0				
	16000		0	0				
	20000		0	0				

Fact Sheet C – Table C1

Measure/ assess source contribution C- and A-weighted Leq,T levels over same time period. Correction to be applied where the C minus A level is 15 dB or more and:

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

Where a source emits tonal and low-frequency noise, only one 5-dB correction should be applied if the tone is in the low-frequency range, that is, at or below 160 Hz.

	Total dBA	Total dBC	C-A
Total SPL	35	52	16.9

Assessment	
Low Frequency Noise Present	No
Tonal Noise Present	No

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