Noise Impact Assessment

Bluestone Hard Rock Quarry
253 Springvale Road
Elderslie, NSW

Prepared for: Bluestone Hardrock Pty Ltd
April 2026
MAC242303-01RP1V2

Muller Acoustic Consulting

Document Information

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1 Introduction

Muller Acoustic Consulting Pty Ltd (MAC) has been commissioned by Bluestone Hardrock Pty Ltd to prepare a Noise Impact Assessment (NIA) to quantify emissions from the proposed hard rock quarry to be established at Springvale Road, Elderslie, NSW (the 'Project').

The NIA has quantified project related noise emissions from construction and operations 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 and Climate Change (DECCW) – NSW Interim Construction Noise Guideline (ICNG), July 2009;
- NSW Department of Environment, Climate Change and Water (DECCW) – NSW Road Noise Policy (RNP), March 2011;
- 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;
- 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.
- Australia and New Zealand Environment Council (ANZEC) Guideline – Technical Basis for Guidelines to Minimise Annoyance Due to Blasting Overpressure and Ground Vibration (ANZEC Guideline), September 1990; and
- Standards Australia AS2187.2-2006 (AS2187.2) – Explosives—Storage and Use Part 2: Use of Explosives.

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

1.1 Assessment Requirements

The NIA has been prepared in accordance with the NSW DPIE's Secretary's Environmental Assessment Requirements (SEARs) for the Project, issued on 16 October 2024. The SEARs identify matters which must be addressed in the assessment and essentially form the Project's terms of reference. **Table 1** lists individual requirements relevant to this NIA and where they are addressed in this report.

Table 1 Noise Related SEARs

SEAR	Section
A detailed assessment of the likely construction, operational and off-site transport noise impacts of the development in accordance with the:	
Interim Construction Noise Guideline	Section 9
NSW Noise Policy for Industry	Section 7
NSW Road Noise Policy	Section 8
having regard to the Voluntary Land Acquisition and Mitigation Policy	Section 7.5
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 under the Interim Construction Noise Guideline	Section 9
Proposed blasting hours, frequency and methods	Section 3.6
A detailed assessment of the likely blasting impacts of the development (including noise, vibrations, overpressure, visual and odour) on people, animals, buildings, infrastructure and significant natural features, having regard to the relevant ANZEC guidelines	Section 10.3
Reasonable and feasible mitigation measures to minimise noise emissions	Section 7.3
Monitoring and management measures	Not required. Project design satisfies with PNTLs.

2 Project Location and Receiver Review

A review of residential receivers in proximity to the Project has been completed and are summarised in **Table 2.** Residential receivers are classified by their typical land use zoning in accordance with Table 2.3 of the NPI. For this assessment, the NPI Rural Residential category has been adopted. **Figure 1**provides a locality plan showing the position of these receivers in relation to the project.

Table 2 Receiver Locations

Receiver	Description	Receiver Type	Coordinates (GDA2020/MGA56)	
			Easting	Northing
R01	169 Springvale Road	Rural Residential	346168	6393802
R02	178 Springvale Road	Rural Residential	346630	6393638
R03	159B Cranky Corner Road	Rural Residential	347679	6394363
R04	199 Springvale Road	Rural Residential	345937	6392949
R05	209 Springvale Road	Rural Residential	346187	6392869
R06	122 Springvale Road	Rural Residential	345833	6392634
R07	Lot 49 Blind Creek Road	Rural Residential	344298	6396441
R08	118 Blind Creek Road	Rural Residential	343260	6396484
R09	Lot 52 Blind Creek Road	Rural Residential	343901	6397314
R10	109 Blind Creek Road	Rural Residential	342896	6396763
C01	Pet Motel	Commercial	346385	6393826

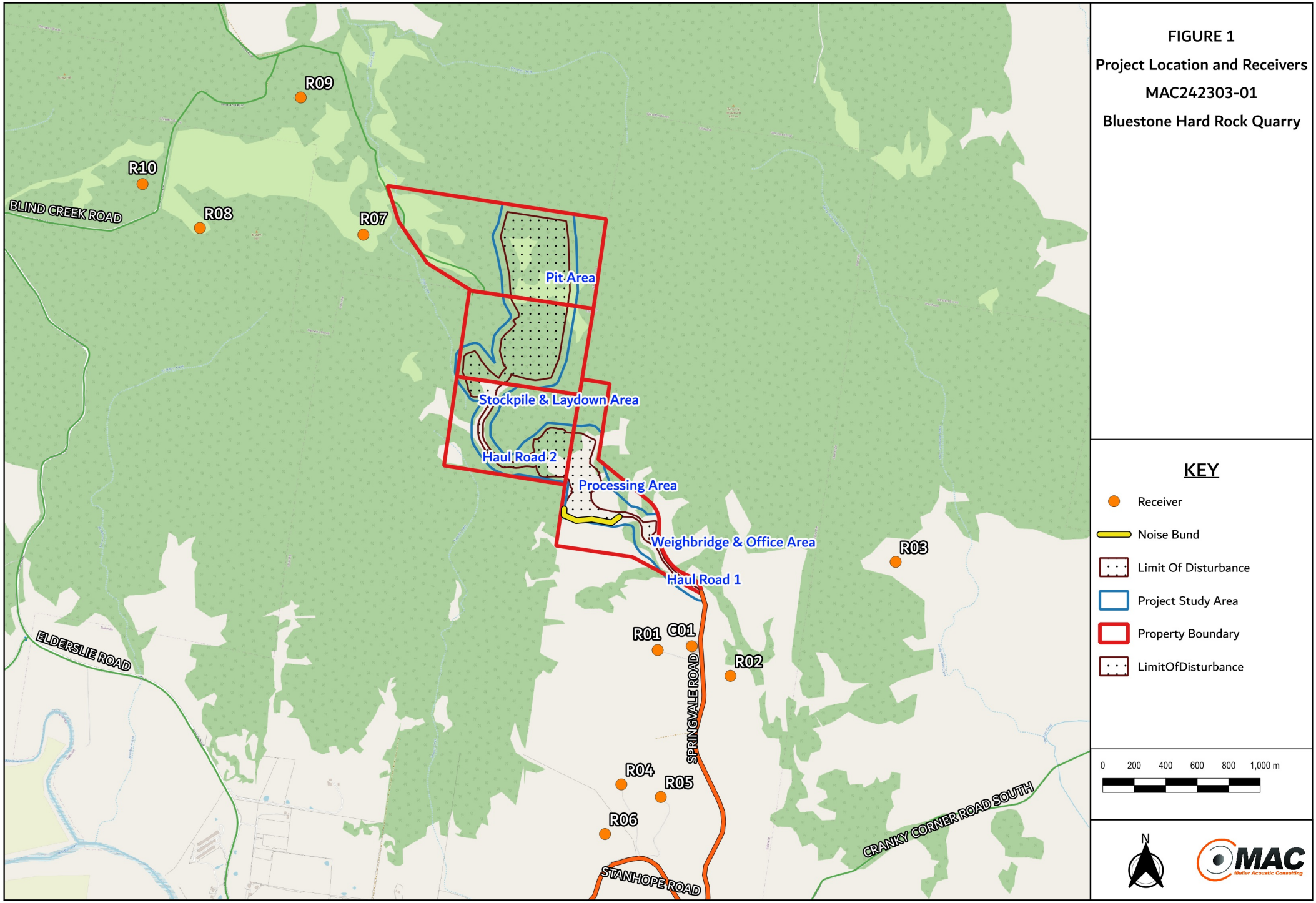

FIGURE 1

Project Location and Receivers

MAC242303-01

Bluestone Hard Rock Quarry

KEY

- Receiver
- Noise Bund
- Limit Of Disturbance
- Project Study Area
- Property Boundary
- LimitOfDisturbance

0 200 400 600 800 1,000 m

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3 Project Description

The Project is a quarry for the extraction of hard rock and gravel to supply aggregate and conglomerate suitable for road base and concrete batching in the local region. The Project site is within the locality of Elderslie and Glendon Brook, approximately 10km northwest of the community of East Branxton, NSW (refer **Figure 1**).

The total area of the Project site is approximately 186 hectares (ha) however the total disturbance area is considerably smaller comprising approximately 63.4ha and comprises the following lots:

- Lot 65 DP 752473, Blind Creek Road, Glendon Brook.
- Lot 904 DP 1061259, Blind Creek Road, Elderslie.
- Lot 903 DP 1061259, Blind Creek Road, Elderslie.
- Lot 5 DP 1102521, 253 Springvale Road, Elderslie.

3.1 Extraction

Immediately prior to extraction, vegetation will be cleared using a dozer or excavator within the approved disturbance area. Extraction of the target hard rock resource will be undertaken through a combination of drilling and blasting. Following each blast, the material will be loaded into dump trucks using an excavator or front-end loader and transported via Haul Road 2 to the Processing Area for crushing and screening. Dozers will be required to be used within the Pit Area to construct loading areas and relocate the blasted material as required to improve operational efficiencies.

3.2 Product Processing and Stockpiling

Extracted rock will be processed in the Processing Area. Initially a mobile crusher and screening plant will be used, however this plant will become fixed once extraction within the Pit Area commences.

All hard rock material will produce concrete grade aggregates, manufactured sands and dust, ballast and road base. The finished product will be transferred to designated stockpile locations within the Processing Area prior to loading onto registered haulage trucks.

3.3 Internal Haul Roads

Two Internal haul roads (Haul Road 1 and Haul Road 2) will be used to provide transport links between key operational areas within the Project site. These roads will be designed to accommodate the safe and efficient movement of heavy vehicles such as haul trucks and loaders, enabling the transport of raw material from the Pit Area to the Processing Area.

3.4 Loading of Registered Haulage Trucks

Registered haulage trucks (road trucks) will access the site via quarry gates at the northern end of Springvale Road and drive along the sealed section of Haul Road 1 until they arrive at the Weighbridge and Office Area.

The road trucks will then proceed to the Processing Area to be loaded with product from the designated stockpile locations using a front-end loader. Loaded trucks will then proceed to the weighbridge to be weighed and travel southeast along Haul Road 1 exiting the site through the quarry gates at Springvale Road.

3.5 Site Access and Haulage from the Site

The single access point to the Project site for light and heavy vehicles will be at the northern end of Springvale Road, an unmarked two lane sealed road.

Loaded trucks (semi-trailer / truck and dog trailer with maximum weight fully laden of 50 tonnes) will leave the site and travel approximately 2.1km south along Springvale Road to the intersection with Stanhope Road. Vehicles will turn right at the intersection and travel approximately 2.5km, generally in a southwest direction to the intersection with Elderslie Road. Vehicles will then travel along Elderslie Road, generally in a south direction, for approximately 6.3km to the intersection with the New England Highway / Maitland Street, East Branxton. Vehicles will then turn left and travel in an easterly direction to the New England Highway / Wine Country Drive intersection. Loaded trucks would then continue to travel in an easterly direction along the New England Highway or in most cases turn right into Wine Country Drive and enter the Hunter Expressway via the interchange located 800m to the southwest. (refer **Figure 2**).

3.6 Hours of Operation

Generally, the quarry will operate six days per week between 6am and 6pm. Extraction, haulage and processing will occur from 7am to 6pm. Loading of road trucks will occur between 6.30am to 4pm, Monday to Friday 6am to 6pm. **Table 3** provides a summary of the proposed operating periods for the various components of the quarry operations with respect to NPI assessment periods.

Table 3 Hours of Operation

			NPI Assessment Period
Extraction and Processing	Monday to Friday	7:00am to 5:00pm	Daytime
	Saturday	8:00am – 1:00pm	Daytime
	Sunday/Public Holidays	No Extraction and Processing	N/A
Internal product transfers to stockpiles	Monday to Friday	7:00am to 5:00pm	Daytime
	Saturday	8:00am – 1:00pm	Daytime
	Sunday/Public Holidays	No internal product transfers	N/A
Road Haulage	Monday to Friday	6:30am – 4:00pm	Morning Shoulder, Daytime
	Saturday	No Haulage	N/A
	Sunday/Public Holidays	No Haulage	N/A
Drilling and Blasting	Monday to Friday	9:00am – 5:00pm	Daytime
Maintenance	Monday to Saturday	6:00am to 6:00pm	Morning Shoulder, Daytime
	Sunday/Public Holidays	No Maintenance	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. Morning Shoulder – the period from 5am to 7am.

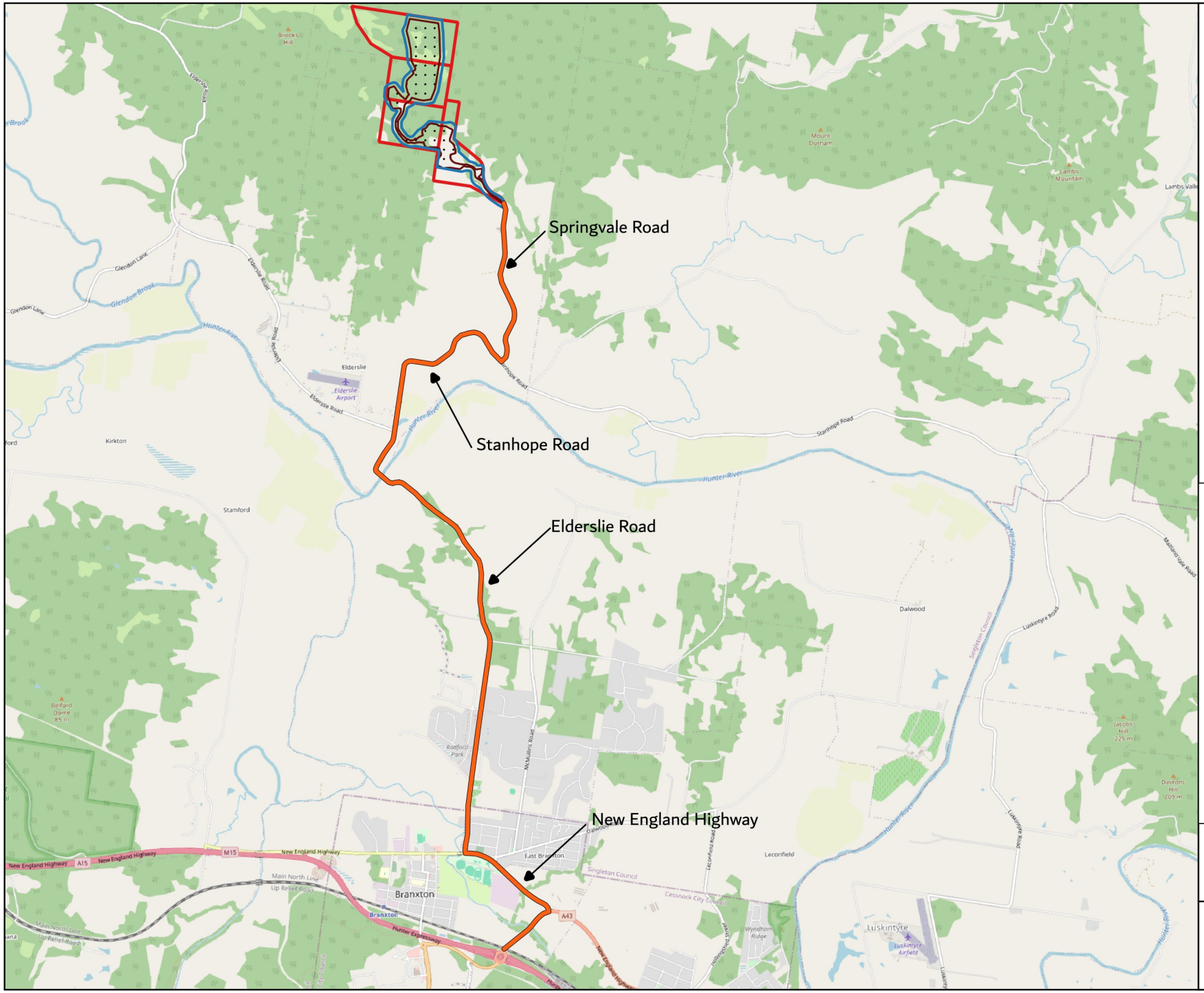

FIGURE 2

Project Location and Transportation Route

MAC242303-01

Bluestone Hard Rock Quarry

KEY

- Receiver
- Transportation Route
- Limit Of Disturbance
- Property Boundary
- Project Study Area

0 700 1,400 2,100 2,800 m

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4 Noise Policy and Guidelines

4.1 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) (i.e. 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.

4.1.1 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 (i.e., 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.

4.1.2 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.

4.1.3 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. The PINLs for the Project have been determined based on the minimum RBL+5dBA.

4.1.4 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.

The recommended amenity noise levels as per Table 2.2 of the NPI are reproduced in **Table 4**.

Table 4 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

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.

4.1.5 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.

4.2 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 provides guidance for consent authorities as to when voluntary mitigation or voluntary acquisition rights are to be applied to reduce operational noise impacts from a development on privately owned land. The policy does not apply to construction noise impacts, impacts from the public road or rail network or modifications to existing developments with legacy noise issues.

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 5**.

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.

Table 5 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 0-2dBA	Not applicable	Impacts are considered to be negligible	The exceedances would not be discernible by the average listener and therefore would not warrant receiver based treatments or controls
All time periods 3-5dBA	< recommended amenity noise level in Table 2.2 of the NPI; or > 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 marginal	Provide mechanical ventilation / comfort condition systems to enable windows to be closed without compromising internal air quality / amenity.
All time periods 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 moderate	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 >5dBA	< recommended amenity noise levels in Table 2.2 of the NPI	Impacts are considered to be moderate	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 >5dBA	> recommended amenity noise levels in Table 2.2 of the NPI	Impacts are considered to be significant	Provide mitigation as for moderate impacts and see voluntary land acquisition provisions above.
Night >5dBA	Not applicable	Impacts are considered to be significant	Provide mitigation as for moderate impacts and see voluntary land acquisition provisions above.

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.

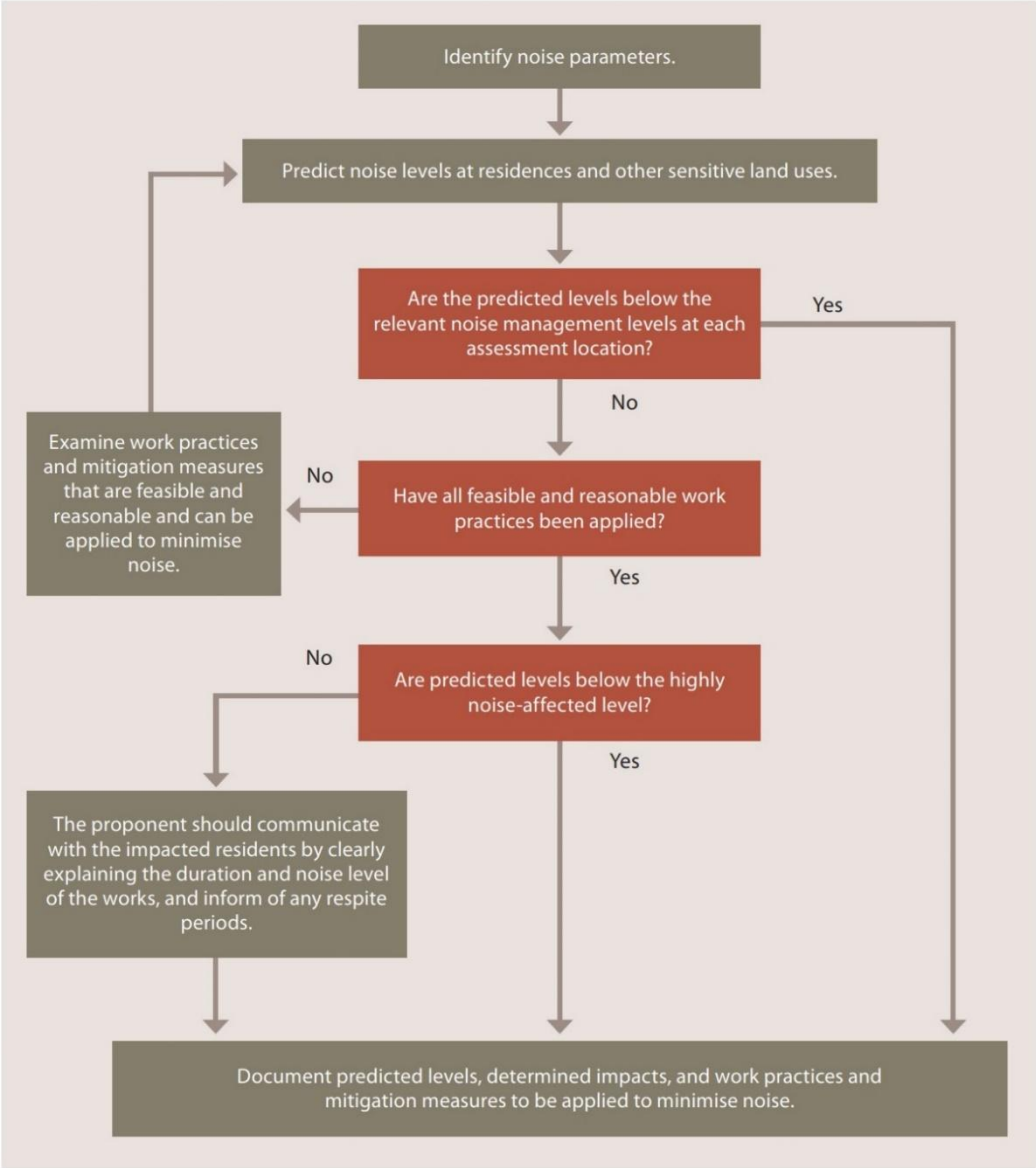
4.3 Interim Construction Noise Guideline

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; and
- Qualitative, which is suited to short term infrastructure maintenance (< three weeks).

The qualitative assessment methodology is a more simplified approach that relies on noise management strategies. This NIA has adopted a quantitative assessment approach which is summarised in **Figure 3.** The quantitative approach includes identification of potentially affected receivers, derivation of the construction noise management levels, quantification of potential noise impact at receivers via predictive modelling and, provides management and mitigation recommendations.

Figure 3 Quantitative Assessment Processes for Assessing and Managing Construction Noise



Source: Department of Environment and Climate Change, 2009.

4.3.1 Standard Hours for Construction

Table 6 presents the ICNG recommended standard hours for construction works.

Table 6 Recommended Standard Hours for Construction

Daytime	Construction Hours
Monday to Friday	7am to 6pm
Saturdays	8am to 1pm
Sundays or Public Holidays	No construction

Construction activities are anticipated to be undertaken during standard construction hours.

4.3.2 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 7** reproduces the ICNG Noise Management Level (NML) 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 7 Noise Management Levels

Time of Day	Management Level LAeq(15min)[1]	How to Apply
Recommended standard hours: Monday to Friday 7am to 6pm Saturday 8am to 1pm No work on Sundays or public holidays.	Noise affected RBL + 10dB	The noise affected level represents the point above which there may be some community reaction to noise. 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. 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 75dBA (HNA)	The highly noise affected level represents the point above which there may be strong community reaction to noise. 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 standard hours.	Noise affected RBL + 5dB	A strong justification would typically be required for work outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. 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. 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.

4.4 Road Noise Policy

The road traffic noise criteria are provided in the Road Noise Policy (RNP), 2011. The policy sets out noise criteria applicable to different road classifications for the purpose of quantifying traffic noise impacts. Road noise criteria relevant to this assessment are presented in detail in Section 5.3.

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5 Assessment Criteria

5.1 Operational Noise Trigger Levels (Criteria)

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

5.1.1 Intrusiveness Noise Levels

The PINL for the project are presented in **Table 8** and have been determined based on the RBL +5dBA and only apply to residential receivers. The PINLs for the project have been determined based on the minimum RBL+5dBA.

Table 8 Project Intrusiveness Noise Levels

Receiver Type	Period[1]	RBL dB LA_{90}	PINL dB $LA_{eq(15min)}$
Rural Residential	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.

5.1.2 Amenity Noise Levels and Project Amenity Noise Levels

The PANL for residential receivers and other receiver types (i.e. non-residential) potentially affected by the project are presented in **Table 9.**

Table 9 Amenity Noise Levels and Project Amenity Noise Levels

Receiver Type	Noise Amenity Area	Assessment Period[1]	NPI Recommended ANL dB $LA_{eq(period)}$	ANL dB $LA_{eq(period)}$[2]	PANL dB $LA_{eq(15min)}$[3]
Residential	Rural	Day	50	45	48
		Evening	45	40	43
		Night	40	35	38
Commercial	All	When in use	65	60	63

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 -5dB as there is 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.

5.1.3 Project Noise Trigger Levels

The PNTL are the lower of either the PINL or the PANL. **Table 10** presents the derivation of the PNTLs in accordance with the methodologies outlined in the NPI.

Table 10 Project Noise Trigger Levels

Receiver Type	Noise Amenity Area	Assessment Period[1]	PINL dB $L_{Aeq(15min)}$	PANL dB $L_{Aeq(15min)}$	PNTL dB $L_{Aeq(15min)}$
Residential	Rural	Day	40	48	40
		Evening	35	43	35
		Night	35	38	35
Commercial	All	When in Use	N/A	63	63

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.

5.1.4 Maximum Noise Trigger Levels

The maximum noise trigger levels shown in **Table 11** 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 11 Maximum Noise Trigger Levels (Morning Shoulder)

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**

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

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

5.2 Construction Noise Management Levels

The relevant Noise Management Levels (NMLs) for standard construction hours are presented in **Table 12**.

Table 12 Construction Noise Management Levels

Receiver Type	Assessment Period[1]	Adopted RBL dB L_{A90}	NML dB $L_{Aeq(15min)}$
Rural Residential	Standard Hours	35	45 (RBL+10dBA)
Commercial Premises	When in use	N/A	70 (external)

Note 1: Refer to Table 6 for Standard Recommended Hours for Construction.

5.3 Road Traffic Noise

Table 13 presents the road traffic noise assessment criteria reproduced from the RNP relevant to this assessment.

Table 13 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.

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6 Noise 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.

6.1 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.

[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

Standard meteorological conditions and noise-enhancing meteorological conditions as defined in Table D1of the NPI are reproduced in **Table 14**.

Table 14 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.

6.1.1 Temperature Inversions

Temperature inversions, when they occur, can increase noise levels by focusing sound waves. Temperature inversions occur predominantly at night during the winter months. For a temperature inversion to be a significant characteristic of the area it needs to occur for approximately 30% of the total time during winter, or about two nights per week.

The occurrence of temperature inversions has not been completed as the quarry predominantly operates during the daytime period.

6.1.2 Prevailing Winds

To determine the prevailing conditions for the project, weather data during the period May 2023 to May 2025 was obtained from the Bureau of Meteorology's (BOM) weather station located at Maitland Airport approximately 18km south east of the project site. The data was analysed using the EPA's Noise Enhancement Wind Analysis (NEWA) program to determine the frequency of occurrence of winds speeds up to 3m/s in each seasonal period. **Table 15** summarises the results of the wind analysis and includes the dominant wind direction and percentage occurrence during each season for each assessment period.

Table 15 Seasonal Frequency of Occurrence Wind Speed Intervals (Daytime)

Season	Period	Wind Direction ±(45°)	% Wind Speeds (m/s)
			0.5 to 3 m/s
Summer	Day	67.5	14
Autumn	Day	292.5	19
Winter	Day	292.5	27
Spring	Day	337.5	14

Based on the results of this analysis, prevailing winds are not a feature of the area. Therefore, standard meteorological conditions have been applied to the noise modelling assessment are presented in **Table 16**. A detailed analysis is presented in **Appendix B**.

Table 16 Modelled Meteorological Parameters

Assessment Condition[1]	Temperature	Wind Speed[2]/ Direction	Relative Humidity	Stability Class[2]
Day	20°C	<0.5 m/s all directions	50%	A
Day	20°C	<0.5 m/s all directions	50%	D

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.

6.2 NPI Very Noise Enhancing Conditions

Fact Sheet D of the NPI states:

'Noise limits derived for consents and licences will apply under the meteorological conditions used in the environmental assessment process, that is, standard or noise-enhancing meteorological conditions. For 'very noise-enhancing meteorological conditions' (see glossary[2]) a limit is set based on the limit derived under standard or noise-enhancing conditions (whichever is adopted in the assessment) plus 5dB. In this way a development is subject to noise limits under all meteorological conditions.'

Essentially, this means a limiting criterion of PNTL +5dB is applicable for meteorological conditions outside that adopted in the assessment. In the context of the project, this means that the operation would need to comply with PNTL +5dB for any prevailing wind or temperature inversion conditions as presented in **Table 17**.

Table 17 Noise Enhancing Meteorological Parameters

Assessment Condition[1]	Temperature	Wind Speed[2]/ Direction	Relative Humidity	Stability Class[2]
Day	20°C	3m/s all directions	50%	D
Morning Shoulder	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.

[2] Meteorological conditions outside of the range of either standard or noise-enhancing meteorological conditions as adopted in the noise impact assessment following the procedures in Fact Sheet D.

The PNTLs for noise enhancing conditions are presented in **Table 18**.

Table 18 Project Noise Trigger Levels – Noise Enhancing Meteorological Conditions

Receiver Type	Noise Amenity Area	Assessment Period[1]	PNTL (Standard) dB $LA_{eq(15min)}$	PNTL (Enhancing) dB $LA_{eq(15min)}$
Residential	Rural	Day	40	45
		Evening	35	40
		Night	35	40
Commercial	All	When in Use	63	68

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.

7 Operational Noise Assessment

This assessment has quantified operational noise levels from the operation of all plant and equipment (refer **Table 19**) at the nearest identified receivers with the potential affectation area of the project. To present a concise representation of potential noise impacts, predicted noise levels for each operational scenario assumes that all equipment is operating simultaneously at maximum sound output for 100% of the assessment period. Hence, predicted noise levels represent an 'worst case scenario'.

7.1 Assessment Scenarios

The Project proposes to extract and process up to 1,000,000 tonnes per annum (tpa) and will be completed in the following indicative stages:

STAGE 1 – Years 1 – 4

Construction of Haul Road 1 from Springvale Road to the Processing Area including the construction of creek crossings, sediment basins and water storage dams. This stage will also include construction of the weighbridge, office, amenities and workshop and installation of weighbridge equipment.

The establishment of the Processing Area will involve drilling and blasting to achieve finished design levels for this area. The materials created from this area will be suitable for construction of roads and infrastructure for the Project and any surplus materials will be stockpiled and sold.

STAGE 2 – Years 4-5

Construction of Haul Road 2 from the Processing Area to the Pit Area, passing the proposed Stockpile and Laydown Area. Haul Road 2 will extend approximately 750m into the Pit Area to create access to the northern end of the pit to allow extraction in that area of the pit to 195m RL.

STAGE 3 – Years 5-30

Extraction of materials from the Pit Area to 165m RL using drilling and blasting and then loading and haulage of materials to the Processing Area where materials will be transported via road trucks to customers.

STAGE 4 – Years 30-35

Extraction of materials from the Pit Area to 110m RL using drilling and blasting and then loading and haulage of materials to the Processing Area where materials will be transported via road trucks to customers prior to Pit closure and rehabilitation.

Therefore, quarry operations (extraction, in pit crushing, haulage, processing and transportation) have been assessed for four stages over the proposed project life of 30 years.

7.2 Sound Power Levels

Table 19 presents the sound power level for each noise source modelled in this assessment. It is noted that sound power levels were sourced from manufacturer's specifications or from in-field measurements at similar project sites.

Table 19 Acoustically Significant Sources - Sound Power Levels dBA (re 10^{-12} Watts)

Item	Quantity/ Rate	Sound Power Level per Item dB LAeq(15min)	Source Height[1]	NPI Operating Period[2]
Extraction, in pit Crushing and Haulage				
Drill	1	113	1.5m	Daytime
Excavator (80t)	1	108	1.5m	Daytime
Excavator (40t)	2	106	1.5m	Daytime
CAT D9 Bulldozer	1	113	1.5m	Daytime
In Pit Crusher	1	117	1.5m	Daytime
CAT 775 Haul Truck to ROM[3]	12 movements per hour	118	1.5m	Daytime
CAT 775 Haul Truck to Soil Stockpile[3]	12 movements per hour	118	1.5m	Daytime
Processing				
Volvo L120 Front End Loader ROM x1; Processing x1;	2	106	1.5m	Daytime
Secondary Crusher	1	114	2.5m	Daytime
Secondary Screening	1	111	2.5m	Daytime
Tertiary Crusher	1	110	2.5m – 5m	Daytime
Tertiary Screening	1	108		Daytime
Conveyors	--	80dBA/m	Various	Daytime
Mining Support				
CAT 14M Grader[3]	1 circuit per hour	107	1.5m	Daytime
CAT 785 Water Cart[3]	1 circuit per hour	116	1.5m	Daytime
Transport				
Road Truck (32t) (20km/h)	22 movements per hour	100	1.5m	Daytime, MS, Evening
Volvo L120 Front End Loader	2	106	1.5m	Daytime, MS, Evening
Maximum Noise Level Assessment (L_{Amax}), Night time periods (5pm to 7am)				
Item		Sound Power Level, dBA	Source Height[1]	
Material loading into empty truck		112	1.5m	

Note 1: Height above the relative ground or building below source.

Note 2: 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. Morning Shoulder – the period from 5am to 7am.

Note 3: Modelled as a moving point source with adjustments for length of travelled path, velocity and number of movements in a 15-minute period.

7.3 Noise Modelling Assumptions and Mitigation Included in Project Design

The following aspects of the project design that have potential reduce noise impacts have been incorporated in the noise modelling.

- Establishment of the processing area at RL 130m and RL110m providing shielding to receivers south of the project;
- Establishment of the stockpile area at RL 85m to 95m providing shielding to receivers south of the project.
- 4m high earthen bund along southern boundary of the stockpile area.

7.4 Predicted Noise Levels

Noise predictions for each assessment scenario have been quantified at surrounding residential receivers and are presented in **Table 20** for standard meteorological conditions and **Table 21** for noise enhancing meteorological conditions; and as noise contours in **Appendix C.** It is noted that the night time PNTL has been adopted for the morning shoulder period (5am to 7am) as minimum applicable RBLs were used for the assessment.

Predicted noise levels from quarry operations satisfy the relevant PNTLs at all receivers for all assessment periods.

Table 20 Noise Predictions – All Receivers Standard Meteorological Conditions

Location	Predicted Noise Level, dB LAeq(15min)								PNTL dB LAeq(15min) MS/Day	Compliant
	Stage 1		Stage 2		Stage3		Stage 4			
	MS	Day	MS	Day	MS	Day	MS	Day		
R01	<30	40	<30	<30	<30	37	<30	37	35/40	✓
R02	<30	36	<30	34	<30	35	<30	34	35/40	✓
R03	<30	30	<30	30	<30	30	<30	<30	35/40	✓
R04	<30	32	<30	31	<30	32	<30	30	35/40	✓
R05	<30	31	<30	30	<30	<30	<30	30	35/40	✓
R06	<30	<30	<30	<30	<30	<30	<30	<30	35/40	✓
R07	<30	<30	<30	39	<30	37	<30	34	35/40	✓
R08	<30	<30	<30	<30	<30	23	<30	<30	35/40	✓
R09	<30	<30	<30	33	<30	31	<30	<30	35/40	✓
R10	<30	<30	<30	<30	<30	<30	<30	<30	35/40	✓
C01	<30	39	<30	37	<30	37	<30	37	63	✓

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. Morning shoulder ((MS) period is 5am to 7am.

Table 21 Noise Predictions – All Receivers Noise Enhancing Meteorological Conditions

Location	Predicted Noise Level, dB LAeq(15min)								PNTL dB LAeq(15min) MS/Day	Compliant
	Stage 1		Stage 2		Stage3		Stage 4			
	MS	Day	MS	Day	MS	Day	MS	Day		
R01	37	42	37	42	37	42	37	42	40/45	✓
R02	33	39	33	39	33	39	33	39	40/45	✓
R03	<30	34	<30	34	<30	35	<30	34	40/45	✓
R04	<30	34	<30	35	<30	35	<30	34	40/45	✓
R05	<30	34	<30	34	<30	34	<30	34	40/45	✓
R06	<30	32	<30	32	<30	33	<30	32	40/45	✓
R07	30	37	30	42	30	40	30	37	40/45	✓
R08	<30	23	<30	26	<30	<30	<30	<30	40/45	✓
R09	<30	32	<30	36	<30	34	25	32	40/45	✓
R10	<30	24	<30	29	<30	<30	<30	<30	40/45	✓
C01	36	41	36	41	36	41	36	41	40/45	✓

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. Morning shoulder period is 5am to 7am.

7.4.1 Modifying Factors and 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. The NPI states that where there is a difference of 15dB or more between the measured 'C' weighted (dBC) and measured 'A' weighted (dBA) levels indicates the potential for an unbalanced spectrum. A correction factor of +2dB or +5dB depending on the difference between the (measured or calculated) Z weighted spectra levels in comparison with those presented in **Table 22**.

Table 22 Low Frequency One Third Octave Threshold Levels

Frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dB $LZ_{eq(15min)}$	92	89	86	77	69	61	54	50	50	48	48	46	44

The analysis of predicted 1/3 octave noise levels for Stage 1 at receiver R01 during noise enhancing conditions (the highest predicted levels) for low frequency noise has been completed and is presented in **Table 23**.

Table 23 Low Frequency Noise Assessment

	Frequency (Hz)[1]													
Predicted Level	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160	Tot
dB $LA_{eq(15min)}$[2]	--	--	--	--	-63	-63	-63	19	19	19	23	23	23	40
dB $LC_{eq(15min)}$[2]	56	52	48	44	-23	-27	-30	48	44	41	42	39	36	59
dB $LZ_{eq(15min)}$[2]	70	63	57	51	-18	-24	-28	49	45	42	42	39	36	71
C - A	--	--	--	--	--	--	--	--	--	--	--	--	--	19
LFN Threshold dB $LZ_{eq(15min)}$	92	89	86	77	69	61	54	50	50	48	48	46	44	
Exceed by <5dB	N	N	N	N	N	N	N	Y	N	N	N	N	N	
Exceed by >5dB	N	N	N	N	N	N	N	N	N	N	N	N	N	

Note 1: Noise modelling cannot predict below 25Hz and hence, dBZ, dBC values are weighted based 0dBA in the bands 10Hz to 25Hz.

Note 2: Average level for receivers R1 to R5.

The resulting analysis shows that a LFN penalty is not applicable as the predicted levels do not exceed the LFN (50Hz) threshold. Furthermore, the detailed analysis (refer **Appendix D**) demonstrates that predicted noise levels do not exhibit tonal characteristics.

7.4.2 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 112dBA representative of material falling into an empty truck bed was adopted for maximum noise level (L_{Amax}) events during the night (morning shoulder) period.

Predicted noise levels from $L_{Aeq(15min)}$ and L_{Amax} events for assessed receivers are presented in **Table 24.** Results identify that the maximum noise trigger levels will be satisfied for all assessed receivers.

Table 24 Maximum Noise Level Assessment (Morning Shoulder)[1]

Receiver	Predicted Noise Level[2]		Maximum Noise Trigger Levels		Compliant
	dB $L_{Aeq(15min)}$	dB L_{Amax}	dB $L_{Aeq(15min)}$	dB L_{Amax}	
R01	37	<40	40	52	✓
R02	33	<40	40	52	✓
R03	<30	<40	40	52	✓
R04	<30	<40	40	52	✓
R05	<30	<40	40	52	✓
R06	<30	<40	40	52	✓
R07	30	<40	40	52	✓
R08	<30	<40	40	52	✓
R09	<30	<40	40	52	✓
R10	<30	<40	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.

Note 2: Maximum predicted level for noise enhancing meteorological conditions from all stages.

7.5 VLAMP Assessment

A review of noise contours demonstrates that predicted project noise levels do not exceed the VLAMP criteria (40dB $L_{Aeq(15min)}$ daytime or 35dB $L_{Aeq(15min)}$ evening and night time) at any receiver location. Additionally, predicted project noise levels do not exceed the VLAMP criteria (55dB $L_{Aeq(period)}$ 50dB $L_{Aeq(period)}$ evening and 45dB $L_{Aeq(period)}$ night time) on any privately owned vacant lands. Hence, mitigation and/or acquisition rights are not applicable.

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8 Road Traffic Noise Assessment

For this assessment, the 'local road' category, as specified in the RNP, has been adopted for Springvale Road and the 'sub arterial road' category for Stanhope Road and Elderslie Road. It is acknowledged that the functional classification of Stanhope Road and Elderslie Road are both a 'Collector Road' in accordance with the Roads and Maritime Noise Criteria Guideline (April 2015). However, the Road Noise Policy does not provide separate noise criteria for Collector Roads but applies the sub-arterial category to all roads that are not classified as local roads.

Due to the low traffic volume generated by the project over a typical day, 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, project related road traffic noise levels noise has been calculated using the Traffic Noise Model (TNM) by the United States Department of Transport, Federal Highway Administration Low Volume Calculation Tool.

Road traffic noise levels attributable to the project have been calculated at the nearest receiver along the transportation for the proposed heavy vehicle traffic flows of 110 laden trucks per day (220 movements) or 15 laden trucks per hour (30 movements). **Table 25** presents the nearest receiver, offset from the road, speed, predicted noise level for the daytime period and night time period and the relevant RNP criteria. Predicted project related road traffic noise levels are substantially below the RNP criteria, satisfying the requirements of the RNP.

Table 25 Operational Road Traffic Noise Levels

Receiver ID	Offset, m	Speed Km/h	Period	Project Traffic Noise Level dB $LA_{eq(period)}$	RNP Criteria dB $LA_{eq(period)}$	Compliant
178 Springvale Road Elderslie	150	80[1]	Day (1hr)	49	55	Yes
			Night (1hr)	41	50	Yes
29 Stanhope Road Elderslie	24	80	Day (15hr)	55	60	Yes
			Night (9hr)	47	55	Yes
444 Elderslie Road Branxton	25	80	Day (15hr)	55	60	Yes
			Night (9hr)	47	55	Yes
21 Maitland Street, East Branxton	33	60	Day (15hr)	52	60	Yes
			Night (9hr)	43	55	Yes

Note 1: Springvale Road does not have a posted speed limit and hence it is assumed to be 100km/h. For safety reasons, trucks will be limited to 80km/h on Springvale Road.

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9 Construction Noise Assessment

9.1 Assessment Scenarios

Construction activities will predominantly consist of clearing and earthworks, which would be the most intense works undertaken using equipment of significant noise emission. Hence, the construction noise assessment has considered a worst case assessment of bulk earthworks occurring at various locations across the project site – weighbridge area, stockpile area, processing plant area and pit. All construction activities occur during standard construction hours 7am to 6pm.

9.2 Sound Power Levels

Table 26 presents the sound power level for each noise source modelled in the construction fleet. The assessment has assumed that all sources are operating simultaneously at their maximum noise emission. It is noted that sound power levels were sourced from manufacturer's specifications or from in-field measurements at similar project sites.

Table 26 Acoustically Significant Sources - Sound Power Levels dBA (re 10^{-12} Watts)

Item	Quantity/ Rate	Sound Power Level per Item dB LAeq(15min)	Source Height[1]
CAT D9 Bulldozer	1	113	1.5m
Excavator (40t)	1	110	1.5m
Dump Truck	2	110	1.5m
Total Fleet Lw		**116**	

Note 1: Height above the relative ground or building below source.

9.3 Noise Modelling Results

Noise predictions for worst case construction noise activities have been calculated at all identified receivers and are presented in **Table 27**. Predicted noise levels indicate that construction activities satisfy the construction NMLs.

Table 27 Predicted Construction Noise Levels – Standard Hours

Location	Predicted Noise Level dB LAeq(15min)	NML dB LAeq(15min)
R01	44	45
R02	36	
R03	<30	
R04	30	
R05	<30	
R06	<30	
R07	38	
R08	<30	
R09	32	
R10	<30	
C01	39	70

9.4 Construction Vibration Assessment

Department of Environment and Conservation (DEC) 2006, Assessing Vibration: A Technical Guideline (the 'Guideline') provides guidance on determining effects of vibration on buildings occupants. The guideline does not address vibration induced damage to structures, blast induced vibration effects or structure borne noise effects.

A qualitative assessment of potential vibration impacts has been completed. Due to the nature of the works proposed and distances to potential vibration sensitive receivers, vibration impacts from the project would be negligible.

The Construction Noise & Vibration Strategy (V4.2 Transport for NSW, 2020) sets out safe working distances to achieve the human response criteria for vibration. The key vibration generating source proposed to be used is a vibratory roller used for road construction. For a large vibratory roller, the Construction Noise Strategy sets a safe working distance of 100m to achieve the residential human response criteria for continuous vibration. Therefore, as the nearest receivers to the project are greater than 100m, human exposure to vibration is anticipated to be minimal. Furthermore, where the human response criteria are satisfied, the structural or cosmetic criteria for sensitive receivers will be achieved. Therefore, vibration impacts are not considered to be a significant issue and have not been considered further in this assessment.

10 Blasting Assessment

Blasting will occur no more than once per week and only within the hours of 9am to 5pm, Monday to Friday, in accordance with regulatory requirements. It is anticipated that up to 40 blasts per year will be required.

10.1 Blasting Criteria

The quarry would be expected to operate within the overpressure and ground vibration limits stipulated in ANZEC guidelines which are reproduced in **Table 28**.

Table 28 Blasting Emissions Criteria

Receiver	Airblast Overpressure (dBZ Peak)	Ground Vibration (mm/s)	Allowable Exceedance
Any Residences on privately owned land	120	10	0%
	115	5	5% of the total number of blasts over a period of 12 months

10.1.1 Other Blasting Criteria

Typically, infrastructure such as pipelines, power transmission lines, railways and roads are less sensitive to vibration than residential buildings due to the nature of their construction and purpose. Vibration criteria for this infrastructure range from 50mm/s to 100mm/s depending on the item and purpose as shown for pipelines in **Table 29**.

Table 29 Blasting Emissions Criteria

Line	Pipe Material	Guideline Values for the velocity measured on the pipe
1	Steel (including welded pipes)	100
2	Clay, concrete, reinforced concrete, pre stressed concrete, metal (with or without flange)	80
3	Masonry, plastic	50

10.2 Blasting Assessment Methodology

An estimation of air-blast overpressure and ground-borne vibration levels has been conducted in accordance with methods in AS2187.2. The estimation adopted a MIC of 250kg with blasting locations assumed to be at the extremities of the extraction areas, which is a worst case scenario.

10.2.1 Air-Blast Overpressure

Calculations of overpressure have been completed using the following AS2187.2 equation:

Where:

$$\mathrm{P} = K_a \left(\frac{R}{(Q^{1/3})} \right)^a$$

P = Pressure, in kilopascals;

Q = Effective explosives charge mass, in kilograms (MIC);

R = Distance from charge, in metres;

Ka = Site constant, a value of 20 was adopted; and

a = Site exponent, a value of -1.45 was adopted.

The conversion of 'P' to unweighted decibels (dBZ) is completed using the following formula:

$$\mathrm{SPL} = 10\ x \log \left(\frac{P}{P_0} \right)^2$$

10.2.2 Ground-Borne Vibration

Preliminary estimations for vibration have been completed using the following AS2187.2 equation:

$$\mathrm{V} = K_g \left(\frac{R}{(Q^{1/2})} \right)^{-B}$$

Where:

V = ground vibration as vector peak particle velocity, in mm/s;

R = distance between charge and point of measurement, in m;

Q = maximum instantaneous charge (effective charge mass per delay, MIC), in kg;

Kg = a constant related to site and rock properties, a value of 1140 was adopted; and

B = a constant related to site and rock properties for estimation purposes, a value of 1.6 was adopted.

10.3 Predicted Blasting Emissions

Airblast overpressure and ground vibration levels are predicted to meet the required blasting emission criteria at the closest receivers for blasts up to 250kg MIC and are presented in **Table 30**.

Table 30 Blasting Emissions

Receiver ID	Distance to Charge, m	Airblast Overpressure dBZ Peak	Ground Vibration mm/s
R01	2556	104	0.3
R02	2942	103	0.3
R03	3079	102	0.2
R04	3365	101	0.2
R05	3503	100	0.2
R06	3655	100	0.2
R07	967	117	1.6
R08	1998	107	0.5
R09	1719	109	0.6
R10	2405	105	0.4

There nearest existing infrastructure to the quarry is Springvale Road approximately 1.5km from the pit. Hence there are no significant vibration effects from blasting on infrastructure which are typically less sensitive to vibration than residential receivers.

The proposed Hunter Gas Pipeline will be within the vicinity of the quarry, but the final alignment is yet to be determined. The situation of an operating quarry in proximity to potentially sensitive infrastructure is common, and risks are mitigated through a blast management plan. At the time of writing, a Route Change Request has been presented to Hunter Gas Pipeline and is currently under consideration.

Preliminary calculations of blast related overpressure on the ridgelines of the Tangory Nature Reserve are below blasting criteria and impacts would be negligible.

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11 Discussion and Conclusion

Muller Acoustic Consulting Pty Ltd (MAC) has completed a Noise Impact Assessment (NIA) to quantify emissions from the proposed hard rock quarry to be established at Springvale Road, Elderslie, NSW (the 'Project').

The NIA has quantified project related noise emissions from construction activities and operations including extraction, haulage, processing and road traffic.

Predicted noise levels from the operations satisfy the relevant PNTLs at all receivers for all assessment periods. Additionally, predicted noise levels do not exceed the VLAMP criteria on privately owned vacant lands and hence mitigation and acquisition rights are not applicable.

Furthermore, sleep disturbance is not anticipated during the morning shoulder period between 6am and 7am, as emissions from maximum noise events are predicted to satisfy the NPIs maximum noise trigger levels.

Road noise emissions associated with the project are anticipated to satisfy the relevant RNP criteria at all receivers along the proposed transportation route.

Blasting emissions are predicted to meet the required blasting emission criteria at the closest receivers for blasts up to 250kg MIC. Preliminary calculations show that vibration from blasting would meet the relevant criteria for the Hunter Gas Pipeline at a 75m offset. However, as the alignment is yet to be finalised, additional assessment may be required to inform blasting techniques to mitigate any risks.

Predicted noise levels from construction activities satisfy the applicable construction noise management levels at all receivers for standard hours, based on typical construction activities occurring at several locations across the quarry site simultaneously.

Accordingly, the Noise Impact Assessment identifies that, project-related noise emissions would satisfy all relevant and applicable criteria resulting in negligible noise impacts at surrounding receivers.

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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

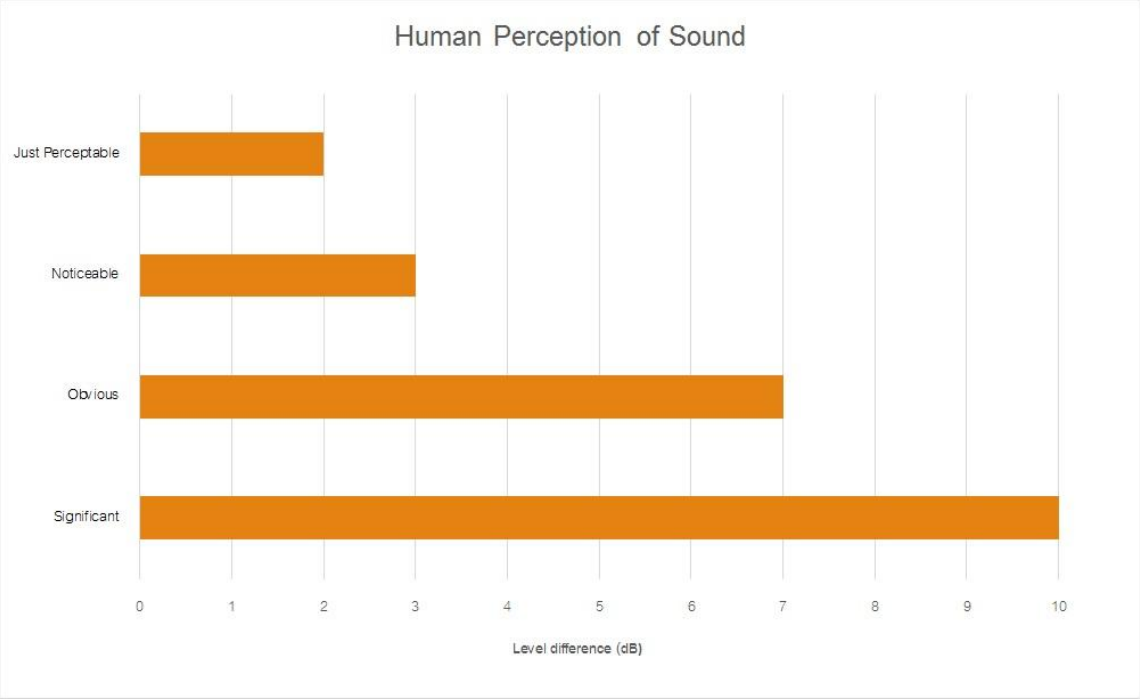
Term	Description
1/3 Octave	Single octave bands divided into three parts
Octave	A division of the frequency range into bands, the upper frequency limit of each band being twice the lower frequency limit.
ABL	Assessment Background Level (ABL) is defined in the NPI as a single figure background level for 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 – NEWA Meteorological Data

Table B1 NEWA Analysed Meteorological Conditions, Singleton Defence AWS 061430 NSW									
Direction ± 45°	Season	Day	Evening	Night	Direction	Season	Day	Evening	Night
		Percentage Occurrence %					Percentage Occurrence %		
0	Summer	11	2	3	180	Summer	12	15	40
0	Autumn	12	3	2	180	Autumn	15	25	35
0	Winter	14	7	4	180	Winter	11	23	18
0	Spring	12	6	3	180	Spring	7	15	36
22.5	Summer	11	2	2	202.5	Summer	12	13	37
22.5	Autumn	10	3	1	202.5	Autumn	15	21	35
22.5	Winter	9	5	2	202.5	Winter	12	20	22
22.5	Spring	13	5	2	202.5	Spring	7	12	33
45	Summer	13	4	2	225	Summer	11	8	31
45	Autumn	11	5	2	225	Autumn	14	19	41
45	Winter	7	4	1	225	Winter	14	22	43
45	Spring	12	5	2	225	Spring	7	10	35
67.5	Summer	14	11	6	247.5	Summer	9	6	18
67.5	Autumn	13	12	3	247.5	Autumn	15	14	32
67.5	Winter	8	7	1	247.5	Winter	19	23	49
67.5	Spring	13	15	4	247.5	Spring	8	9	28
90	Summer	12	15	14	270	Summer	10	4	12
90	Autumn	12	24	10	270	Autumn	17	11	25
90	Winter	8	16	3	270	Winter	24	22	44
90	Spring	12	22	8	270	Spring	10	10	23
112.5	Summer	12	17	18	292.5	Summer	11	4	9
112.5	Autumn	13	27	14	292.5	Autumn	19	9	20
112.5	Winter	7	19	4	292.5	Winter	27	21	40
112.5	Spring	11	23	14	292.5	Spring	12	12	20
135	Summer	12	20	24	315	Summer	11	3	6
135	Autumn	13	29	18	315	Autumn	18	9	12
135	Winter	9	22	5	315	Winter	26	21	31
135	Spring	10	25	20	315	Spring	13	10	15
157.5	Summer	8	18	28	337.5	Summer	12	3	3
157.5	Autumn	10	28	21	337.5	Autumn	16	4	3
157.5	Winter	7	20	6	337.5	Winter	20	12	10
157.5	Spring	6	21	23	337.5	Spring	14	7	5

Appendix C – Noise Contour Plots & Detailed Results

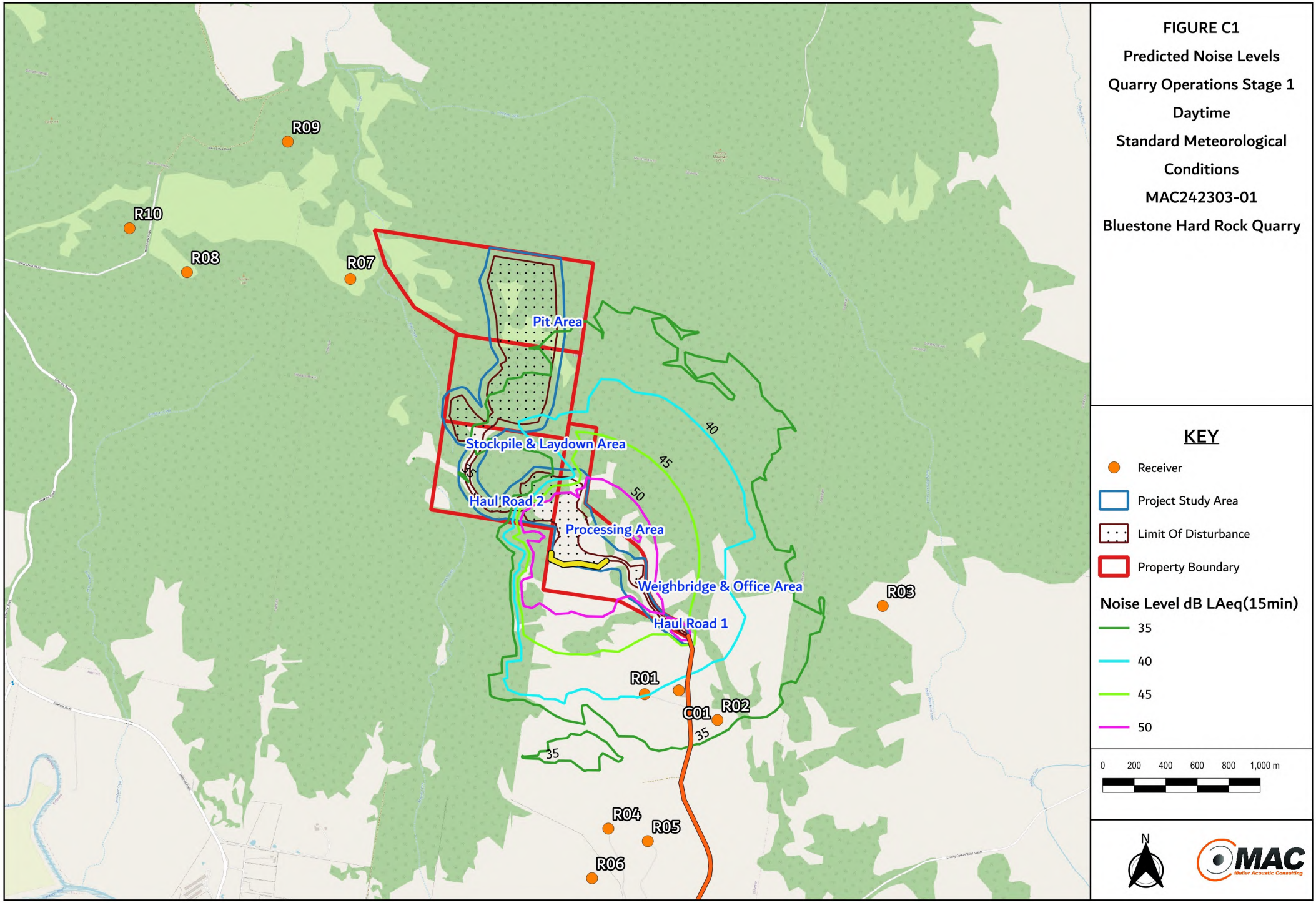


FIGURE C1

Predicted Noise Levels

Quarry Operations Stage 1

Daytime

Standard Meteorological Conditions

MAC242303-01

Bluestone Hard Rock Quarry

KEY

- Receiver
- Project Study Area
- Limit Of Disturbance
- Property Boundary

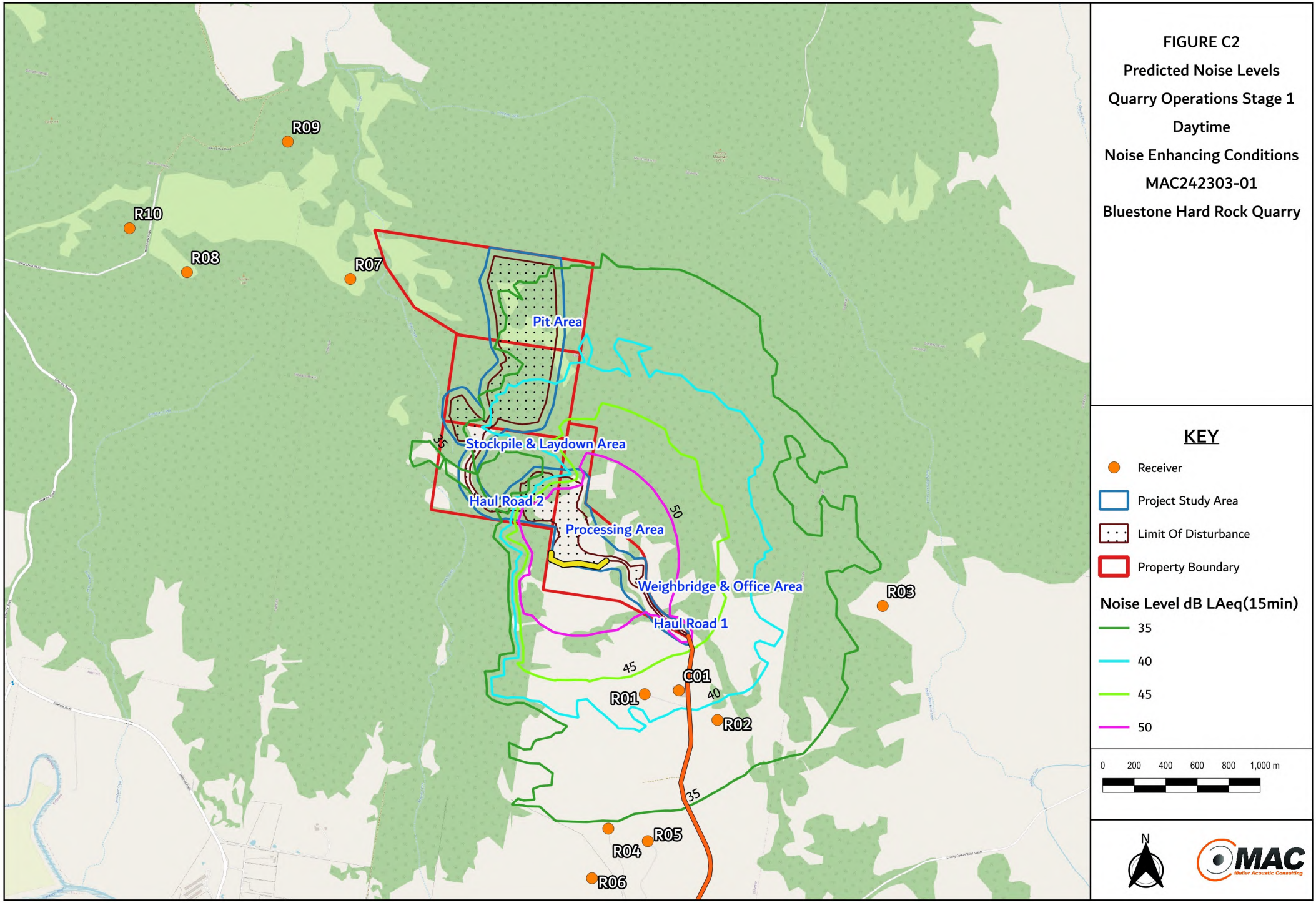
Noise Level dB LAeq(15min)

- 35
- 40
- 45
- 50

0 200 400 600 800 1,000 m

N

MAC Muller Acoustic Consulting


R09
R10
R08
R07
R03
R01
R02
R04
R05
R06
C01
Pit Area
Stockpile & Laydown Area
Haul Road 2
Processing Area
Weighbridge & Office Area
Haul Road 1
35
40
45
50
FIGURE C2
Predicted Noise Levels
Quarry Operations Stage 1
Daytime
Noise Enhancing Conditions
MAC242303-01
Bluestone Hard Rock Quarry
KEY
Receiver
Project Study Area
Limit Of Disturbance
Property Boundary
Noise Level dB LAeq(15min)
35
40
45
50
0 200 400 600 800 1,000 m
N
MAC
Muller Acoustic Consulting

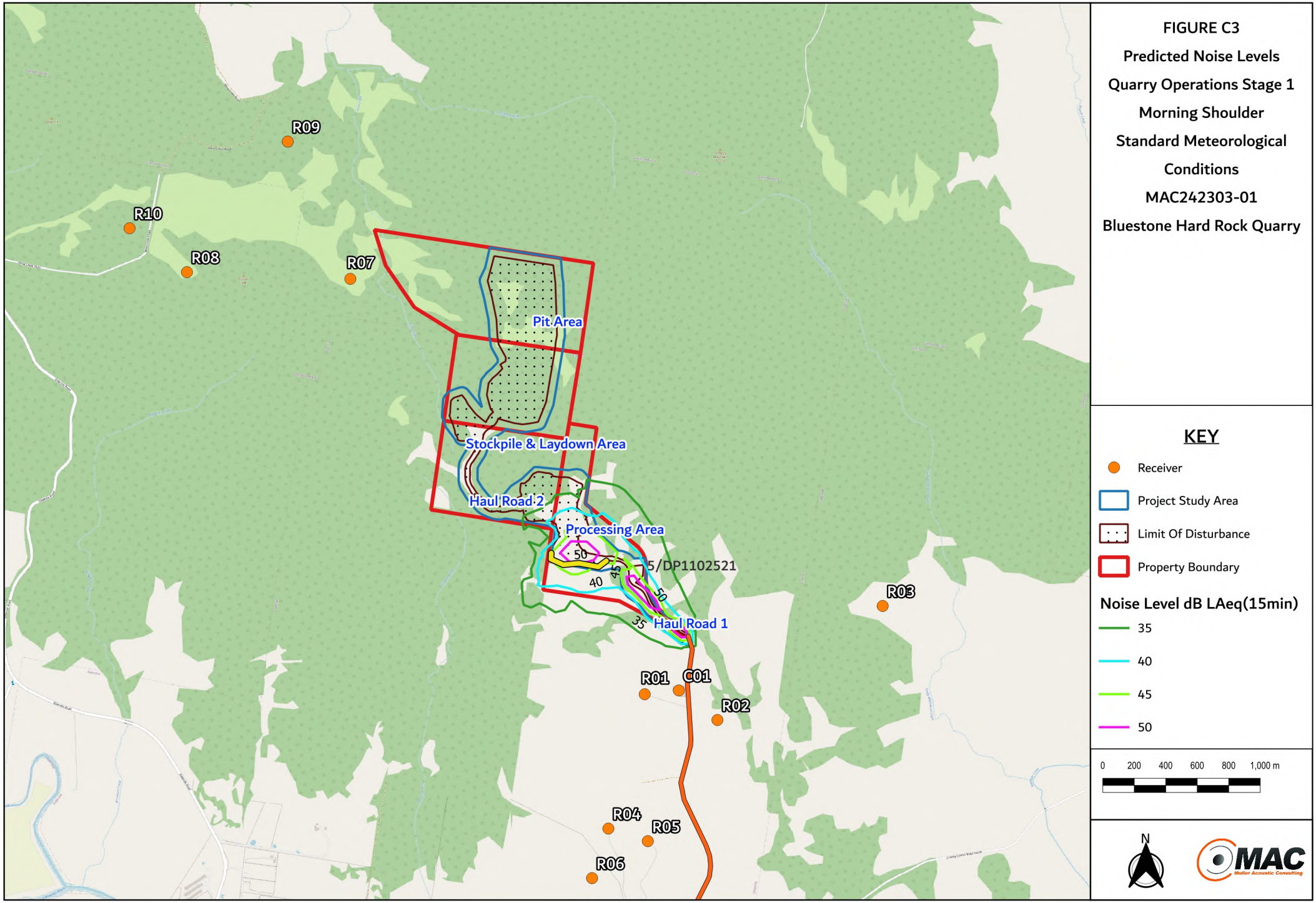


FIGURE C3

Predicted Noise Levels

Quarry Operations Stage 1

Morning Shoulder

Standard Meteorological Conditions

MAC242303-01

Bluestone Hard Rock Quarry

KEY

- Receiver
- Project Study Area
- Limit Of Disturbance
- Property Boundary

Noise Level dB LAeq(15min)

- 35
- 40
- 45
- 50

0 200 400 600 800 1,000 m

N

MAC Muller Acoustic Consulting

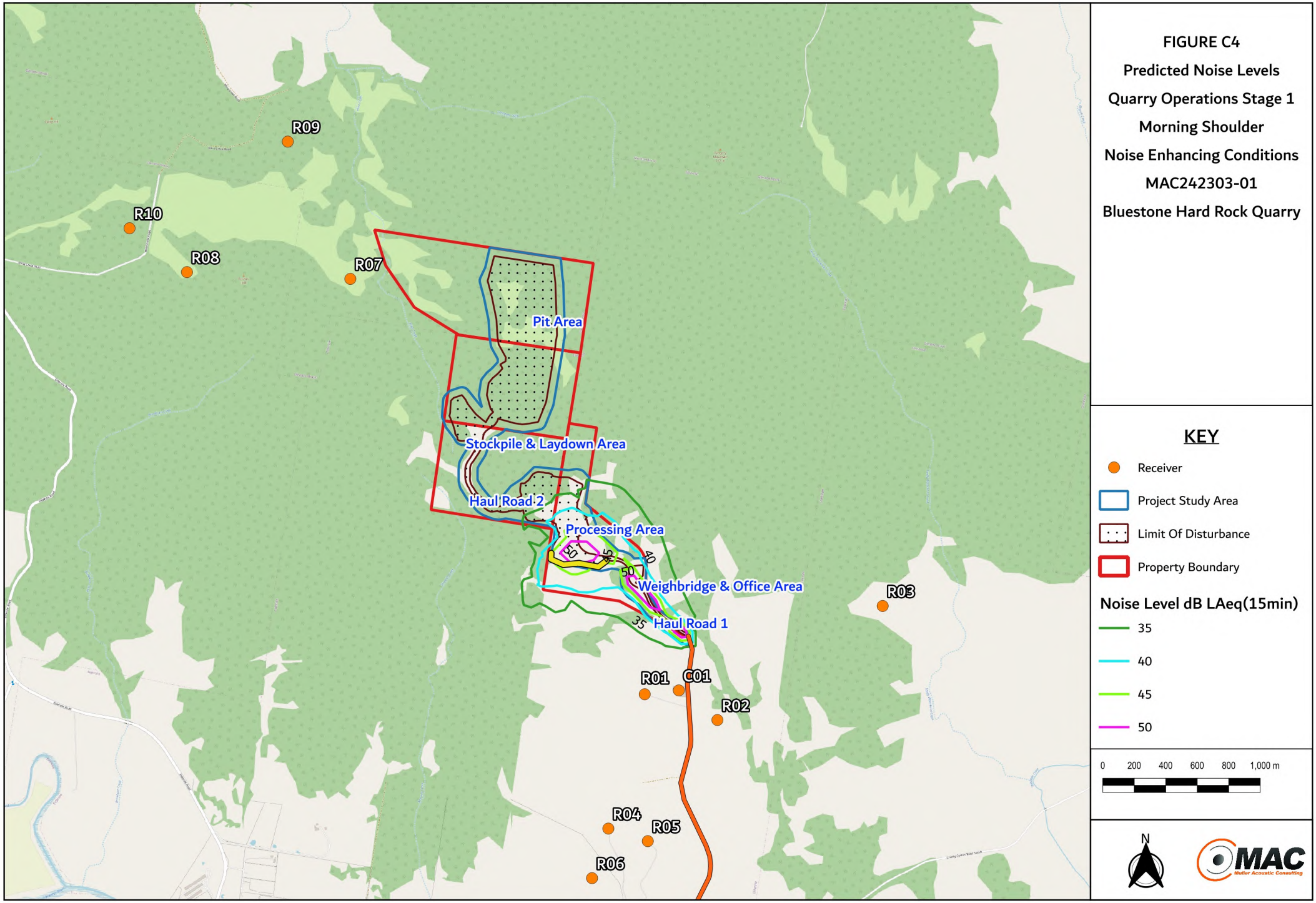


FIGURE C4

Predicted Noise Levels

Quarry Operations Stage 1

Morning Shoulder

Noise Enhancing Conditions

MAC242303-01

Bluestone Hard Rock Quarry

KEY

- Receiver
- Project Study Area
- Limit Of Disturbance
- Property Boundary

Noise Level dB LAeq(15min)

- 35
- 40
- 45
- 50

0 200 400 600 800 1,000 m

N

MAC Muller Acoustic Consulting

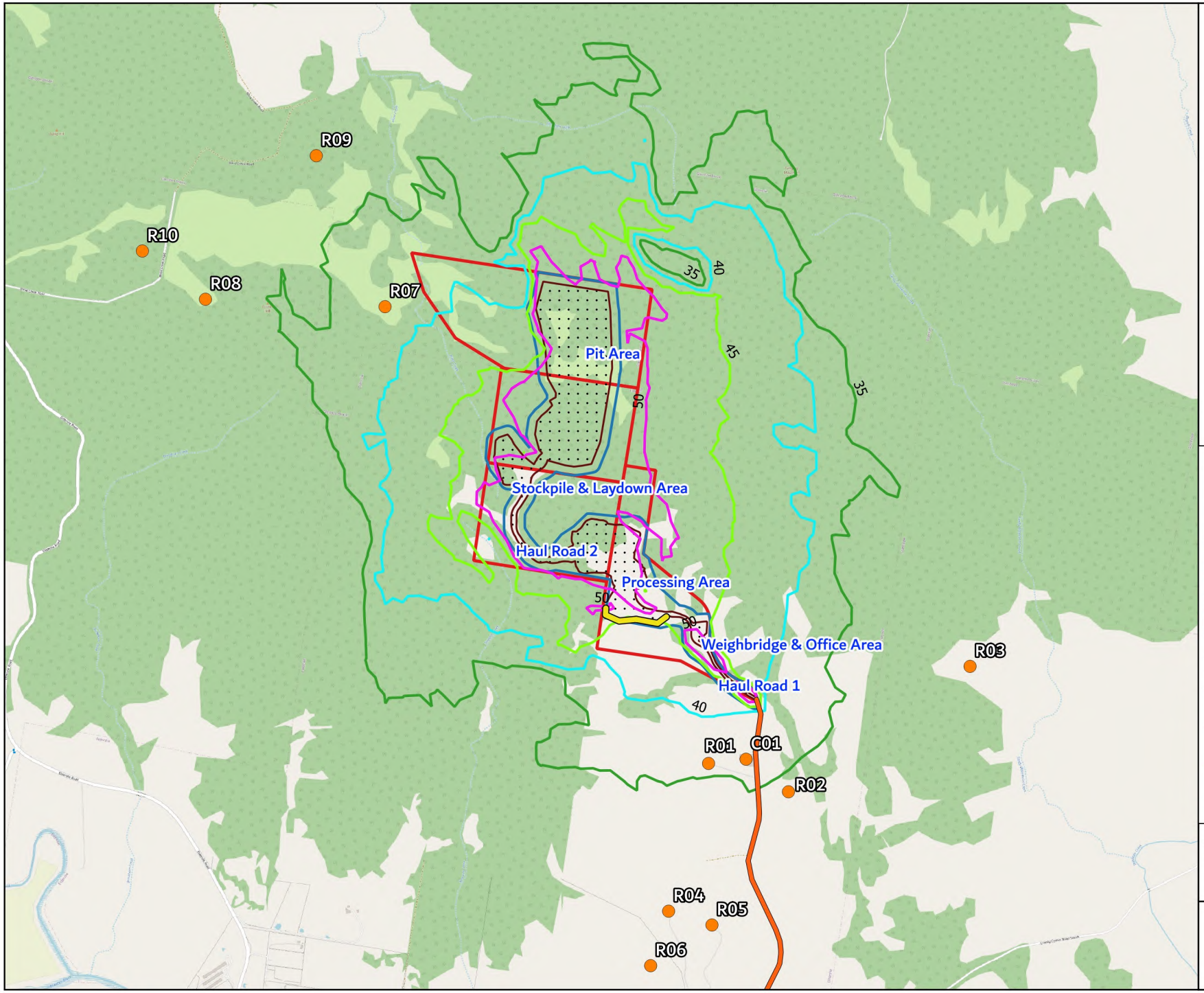


FIGURE C5

Predicted Noise Levels

Quarry Operations Stage 2

Daytime

Standard Meteorological Conditions

MAC242303-01

Bluestone Hard Rock Quarry

KEY

- Receiver
- Project Study Area
- Limit Of Disturbance
- Property Boundary

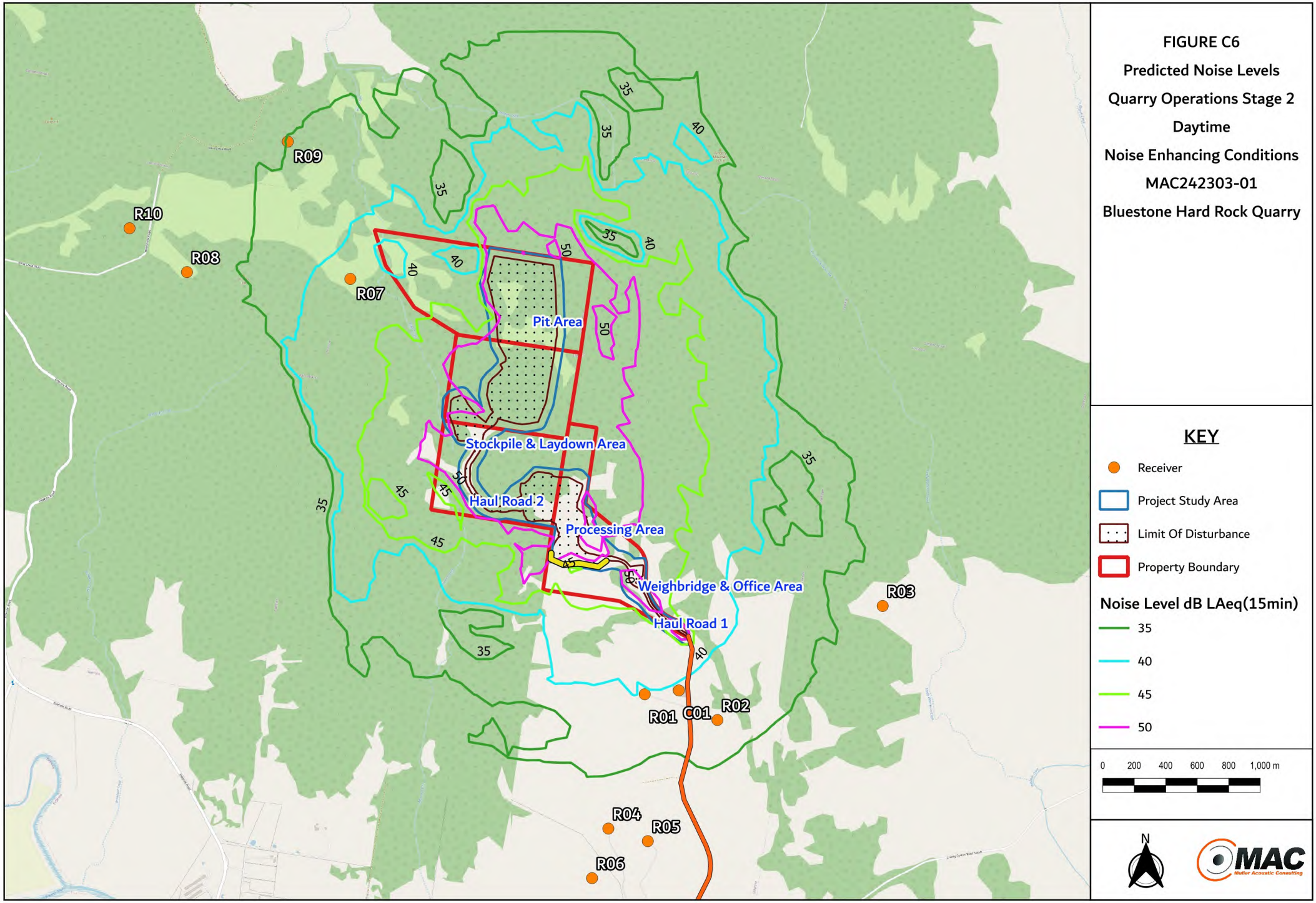
Noise Level dB LAeq(15min)

- 35
- 40
- 45
- 50

0 200 400 600 800 1,000 m

N

MAC Muller Acoustic Consulting


R09
R10
R08
R07
R03
R01
C01
R02
R04
R05
R06
Pit Area
Stockpile & Laydown Area
Haul Road 2
Processing Area
Weighbridge & Office Area
Haul Road 1
35
40
45
50
FIGURE C6
Predicted Noise Levels
Quarry Operations Stage 2
Daytime
Noise Enhancing Conditions
MAC242303-01
Bluestone Hard Rock Quarry
KEY
Receiver
Project Study Area
Limit Of Disturbance
Property Boundary
Noise Level dB LAeq(15min)
35
40
45
50
0 200 400 600 800 1,000 m
N
MAC
Muller Acoustic Consulting

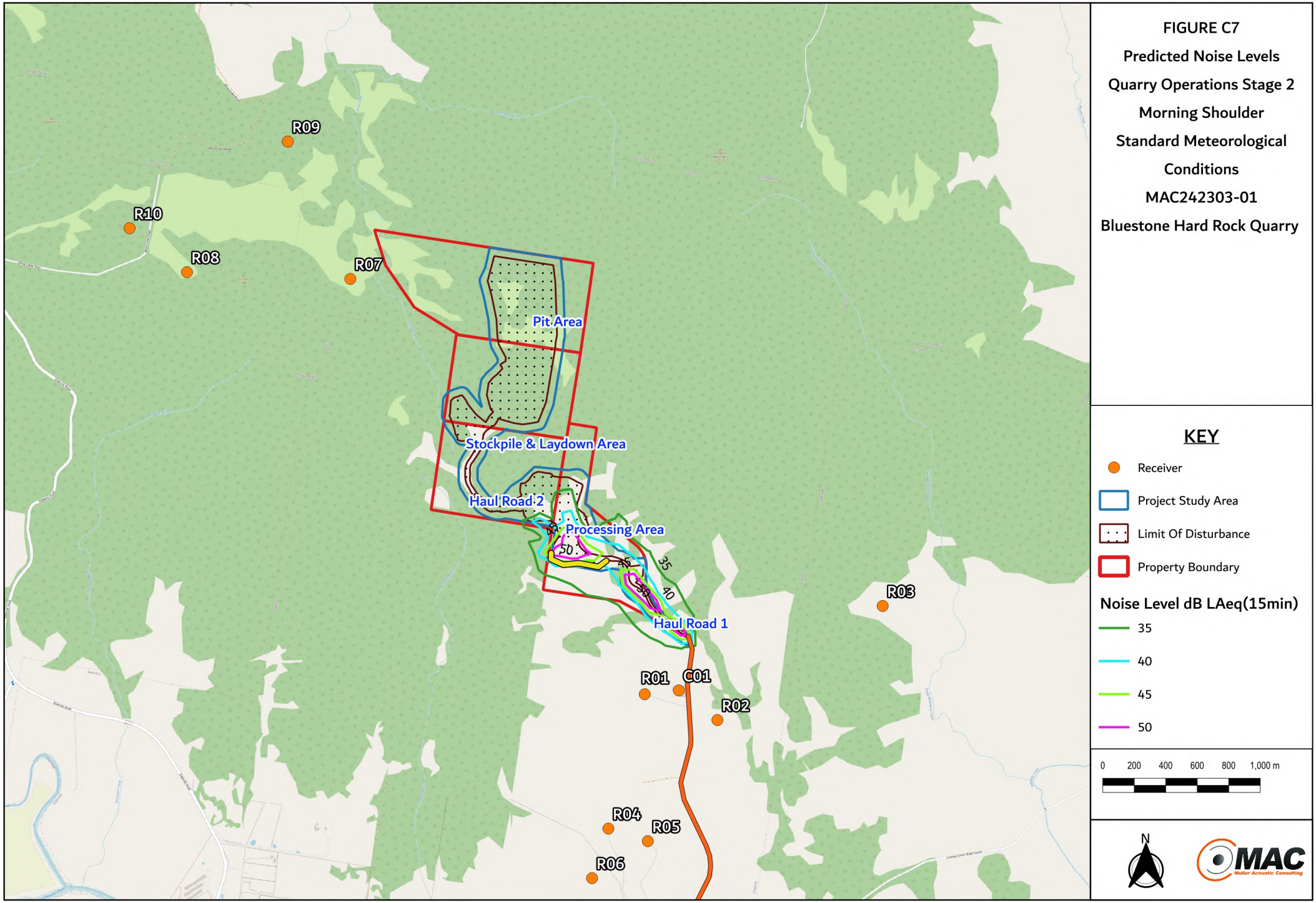


FIGURE C7

Predicted Noise Levels

Quarry Operations Stage 2

Morning Shoulder

Standard Meteorological Conditions

MAC242303-01

Bluestone Hard Rock Quarry

KEY

- Receiver
- Project Study Area
- Limit Of Disturbance
- Property Boundary

Noise Level dB LAeq(15min)

- 35
- 40
- 45
- 50

0 200 400 600 800 1,000 m

N

MAC Muller Acoustic Consulting

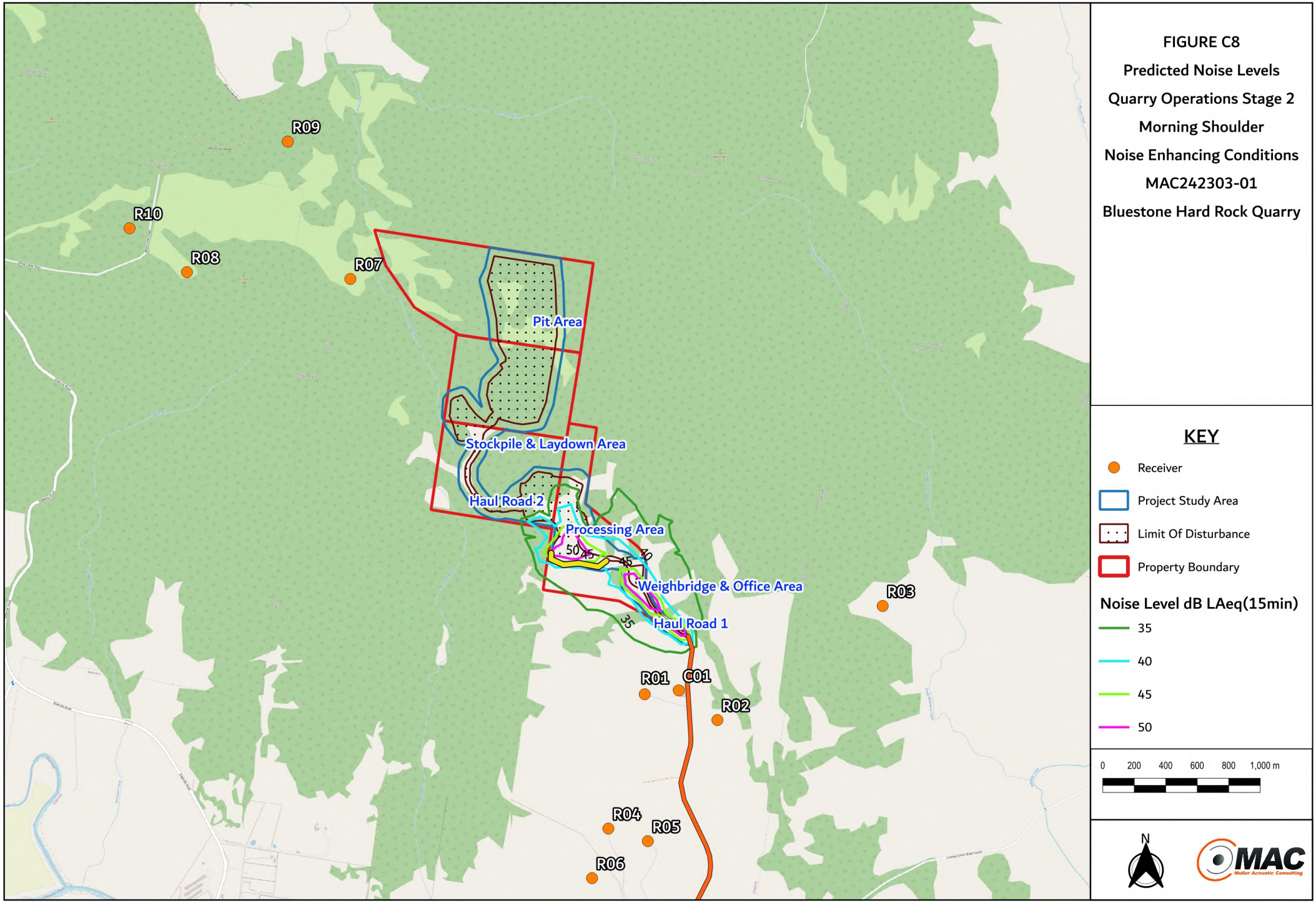


FIGURE C8

Predicted Noise Levels

Quarry Operations Stage 2

Morning Shoulder

Noise Enhancing Conditions

MAC242303-01

Bluestone Hard Rock Quarry

KEY

- Receiver
- Project Study Area
- Limit Of Disturbance
- Property Boundary

Noise Level dB LAeq(15min)

- 35
- 40
- 45
- 50

0 200 400 600 800 1,000 m

N

MAC Muller Acoustic Consulting

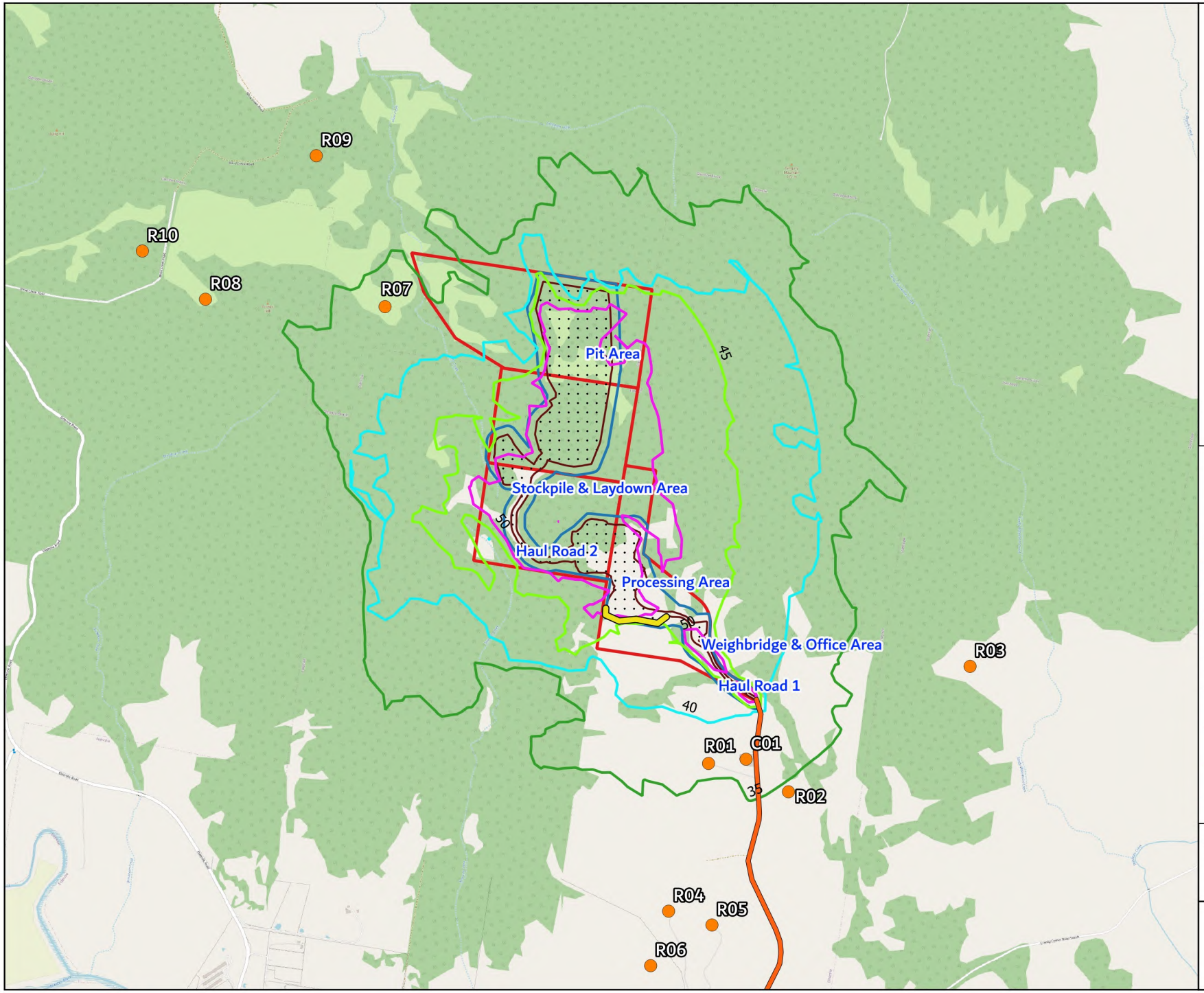


FIGURE C9

Predicted Noise Levels

Quarry Operations Stage 3

Daytime

Standard Meteorological Conditions

MAC242303-01

Bluestone Hard Rock Quarry

KEY

- Receiver
- Project Study Area
- Limit Of Disturbance
- Property Boundary

Noise Level dB LAeq(15min)

- 35
- 40
- 45
- 50

0 200 400 600 800 1,000 m

N

MAC Muller Acoustic Consulting

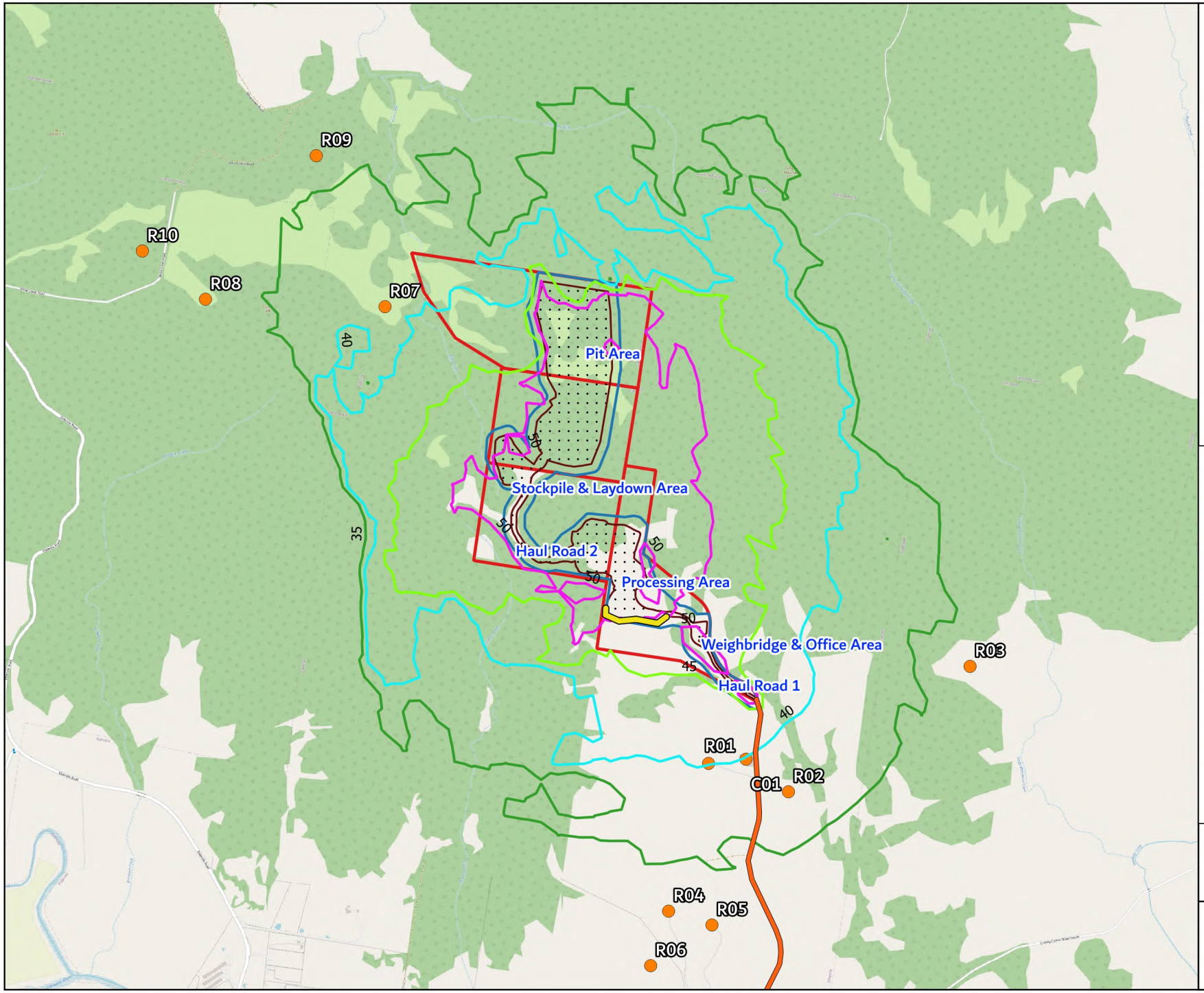


FIGURE C10

Predicted Noise Levels

Quarry Operations Stage 3

Daytime

Noise Enhancing Conditions

MAC242303-01

Bluestone Hard Rock Quarry

KEY

- Receiver
- Project Study Area
- Limit Of Disturbance
- Property Boundary

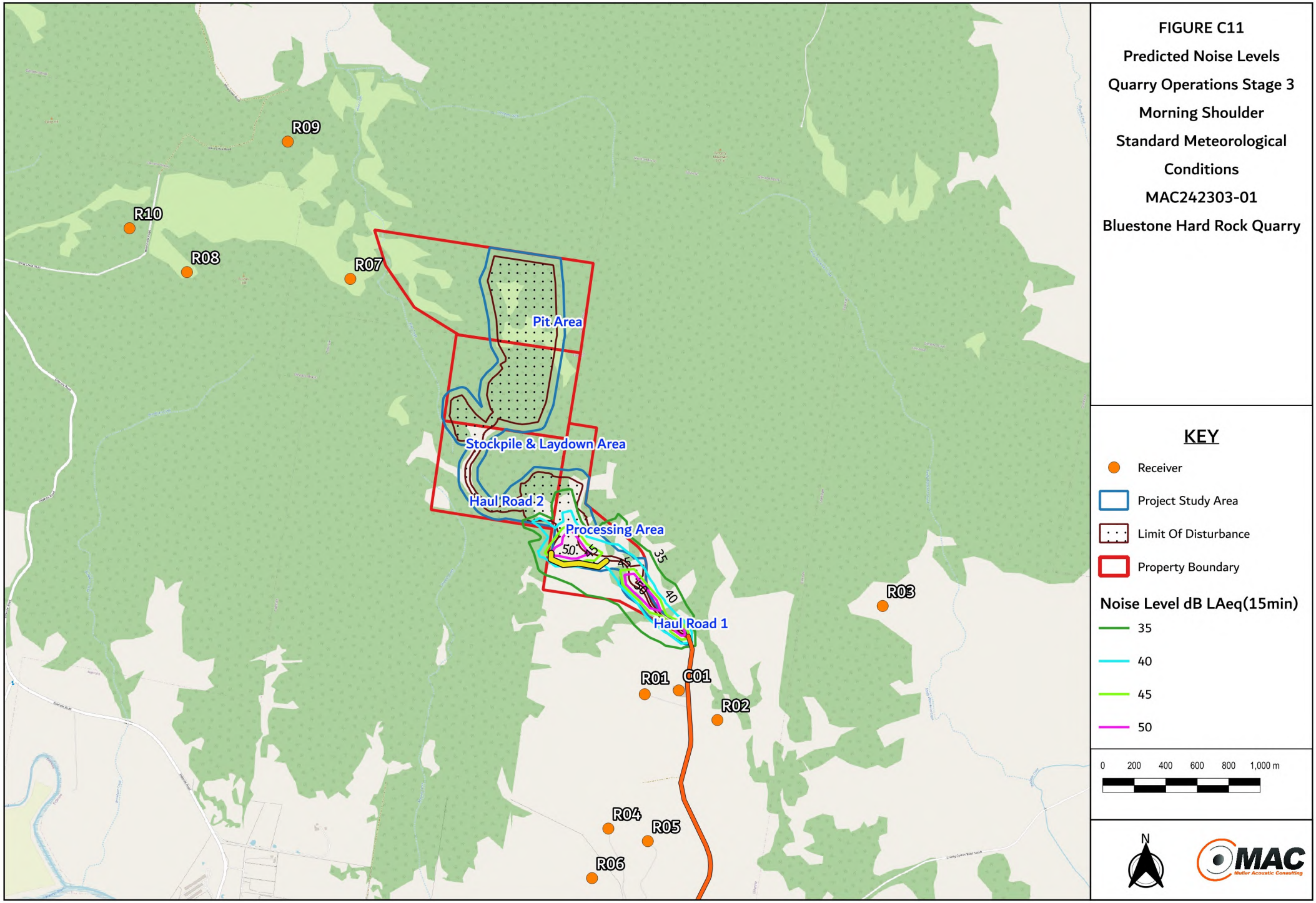
Noise Level dB LAeq(15min)

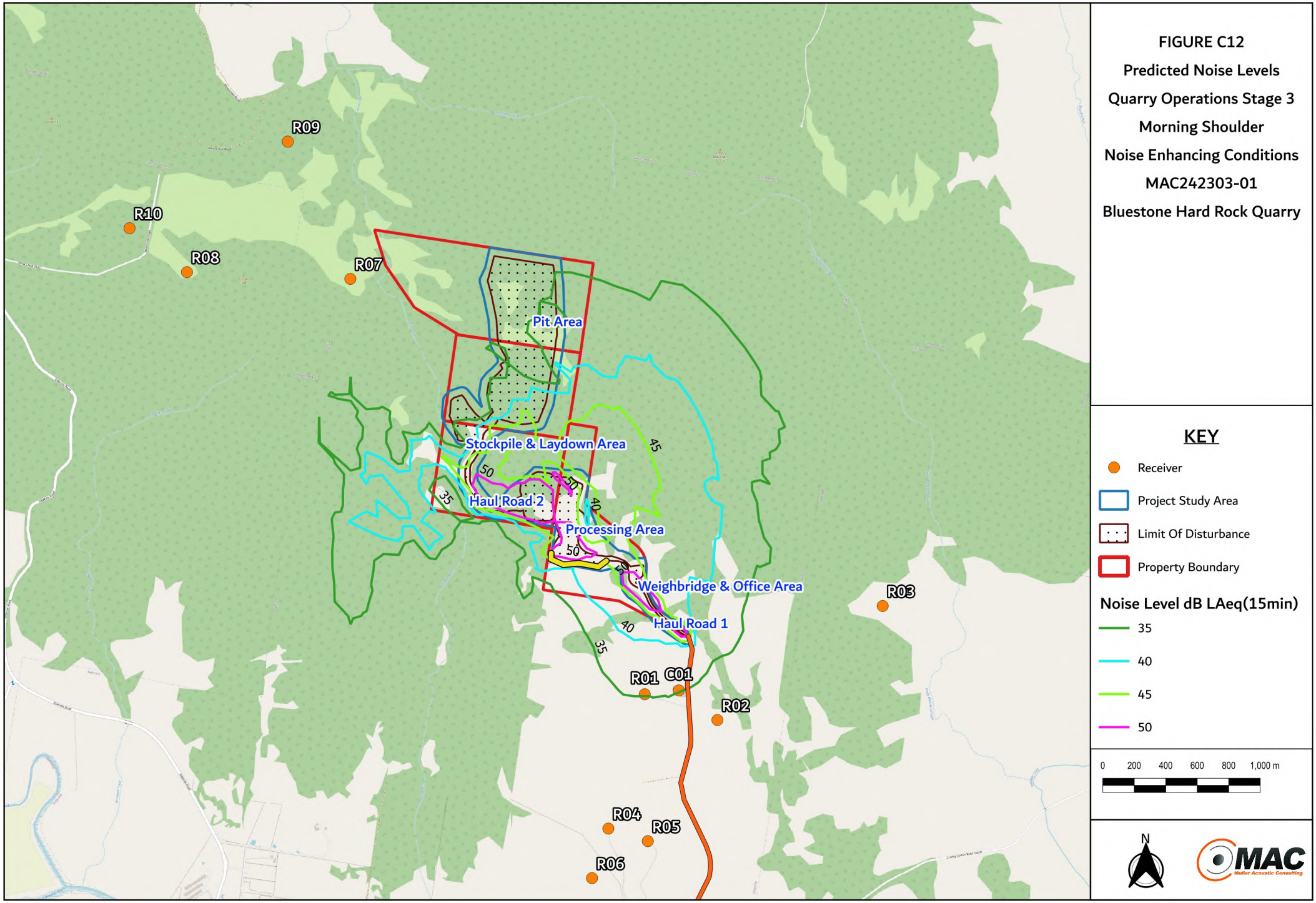
- 35
- 40
- 45
- 50

0 200 400 600 800 1,000 m

N

MAC Muller Acoustic Consulting


R09
R10
R08
R07
R03
R01
C01
R02
R04
R05
R06
Pit Area
Stockpile & Laydown Area
Haul Road 2
Processing Area
Haul Road 1
50
45
40
35
FIGURE C11
Predicted Noise Levels
Quarry Operations Stage 3
Morning Shoulder
Standard Meteorological
Conditions
MAC242303-01
Bluestone Hard Rock Quarry
KEY
Receiver
Project Study Area
Limit Of Disturbance
Property Boundary
Noise Level dB LAeq(15min)
35
40
45
50
0 200 400 600 800 1,000 m
N
MAC
Muller Acoustic Consulting


R09
R10
R08
R07
R03
R02
R01
C01
R04
R05
R06
Pit Area
Stockpile & Laydown Area
Haul Road 2
Processing Area
Weighbridge & Office Area
Haul Road 1
35
40
45
50
FIGURE C12
Predicted Noise Levels
Quarry Operations Stage 3
Morning Shoulder
Noise Enhancing Conditions
MAC242303-01
Bluestone Hard Rock Quarry
KEY
Receiver
Project Study Area
Limit Of Disturbance
Property Boundary
Noise Level dB LAeq(15min)
35
40
45
50
0 200 400 600 800 1,000 m
N
MAC
Muller Acoustic Consulting

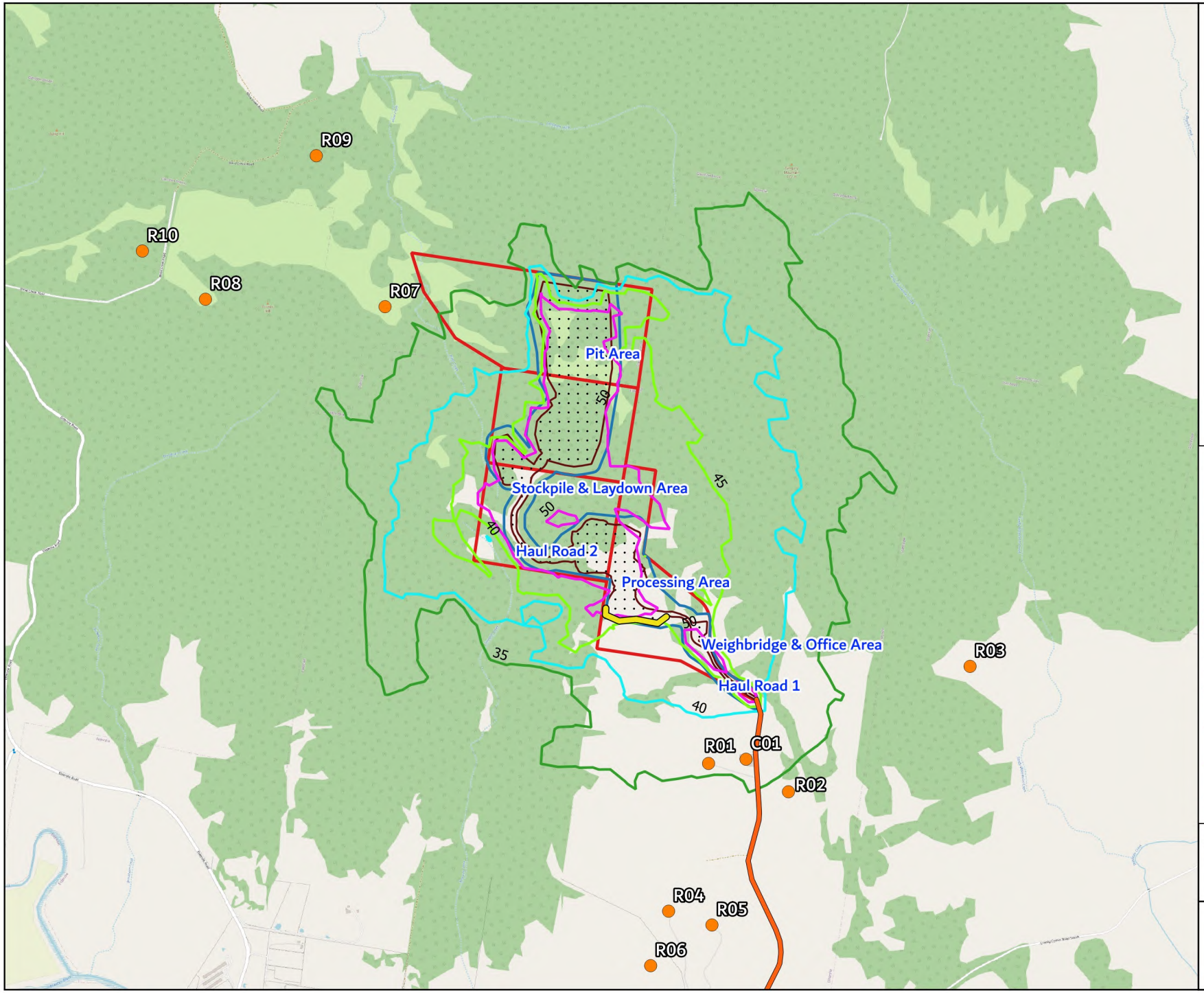


FIGURE C13

Predicted Noise Levels

Quarry Operations Stage 4

Daytime

Standard Meteorological Conditions

MAC242303-01

Bluestone Hard Rock Quarry

KEY

- Receiver
- Project Study Area
- Limit Of Disturbance
- Property Boundary

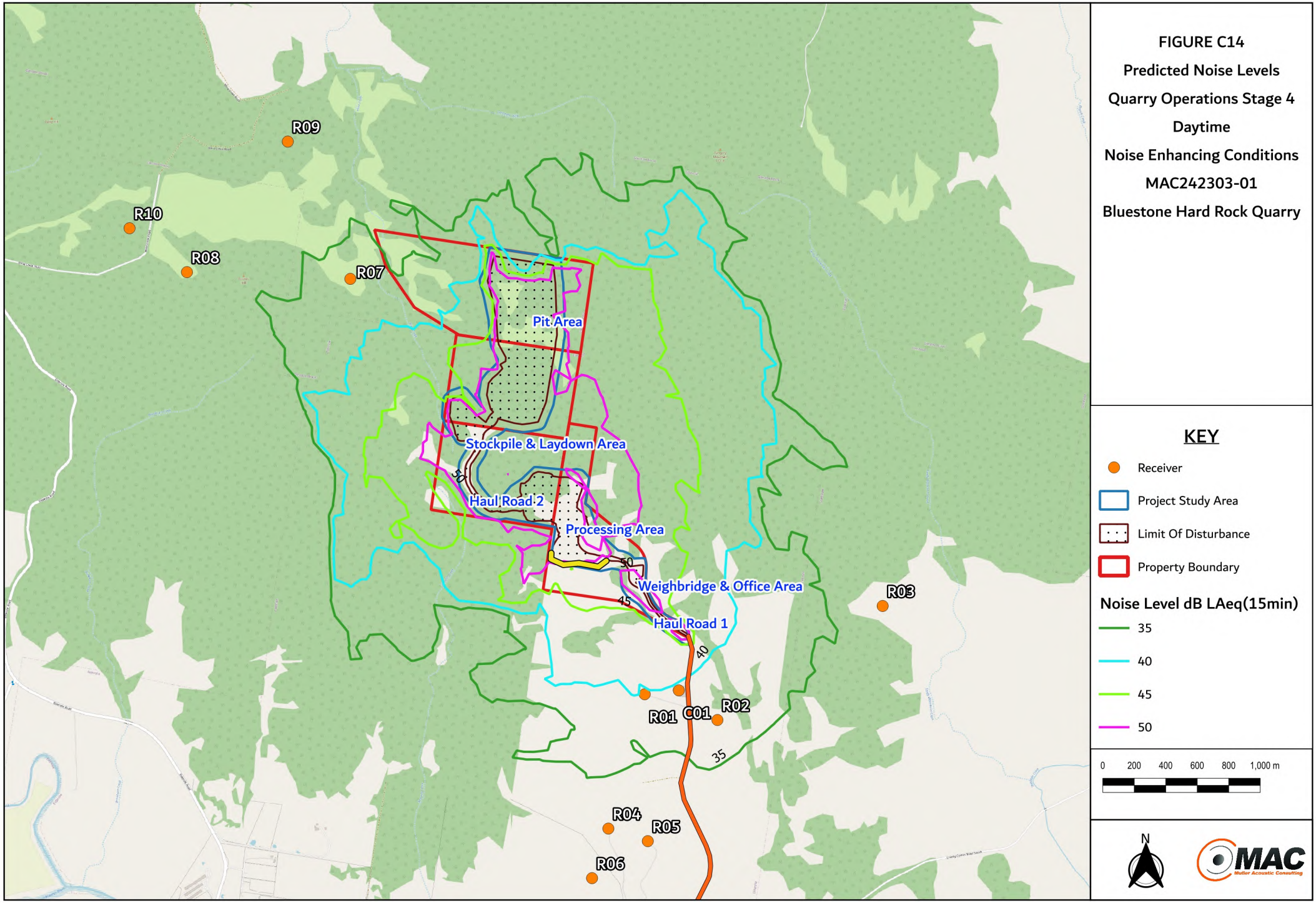
Noise Level dB LAeq(15min)

- 35
- 40
- 45
- 50

0 200 400 600 800 1,000 m

N

MAC Muller Acoustic Consulting


R09
R10
R08
R07
R03
R01
C01
R02
R04
R05
R06
Pit Area
Stockpile & Laydown Area
Haul Road 2
Processing Area
Weighbridge & Office Area
Haul Road 1
35
40
45
50
FIGURE C14
Predicted Noise Levels
Quarry Operations Stage 4
Daytime
Noise Enhancing Conditions
MAC242303-01
Bluestone Hard Rock Quarry
KEY
Receiver
Project Study Area
Limit Of Disturbance
Property Boundary
Noise Level dB LAeq(15min)
35
40
45
50
0 200 400 600 800 1,000 m
N
MAC
Muller Acoustic Consulting

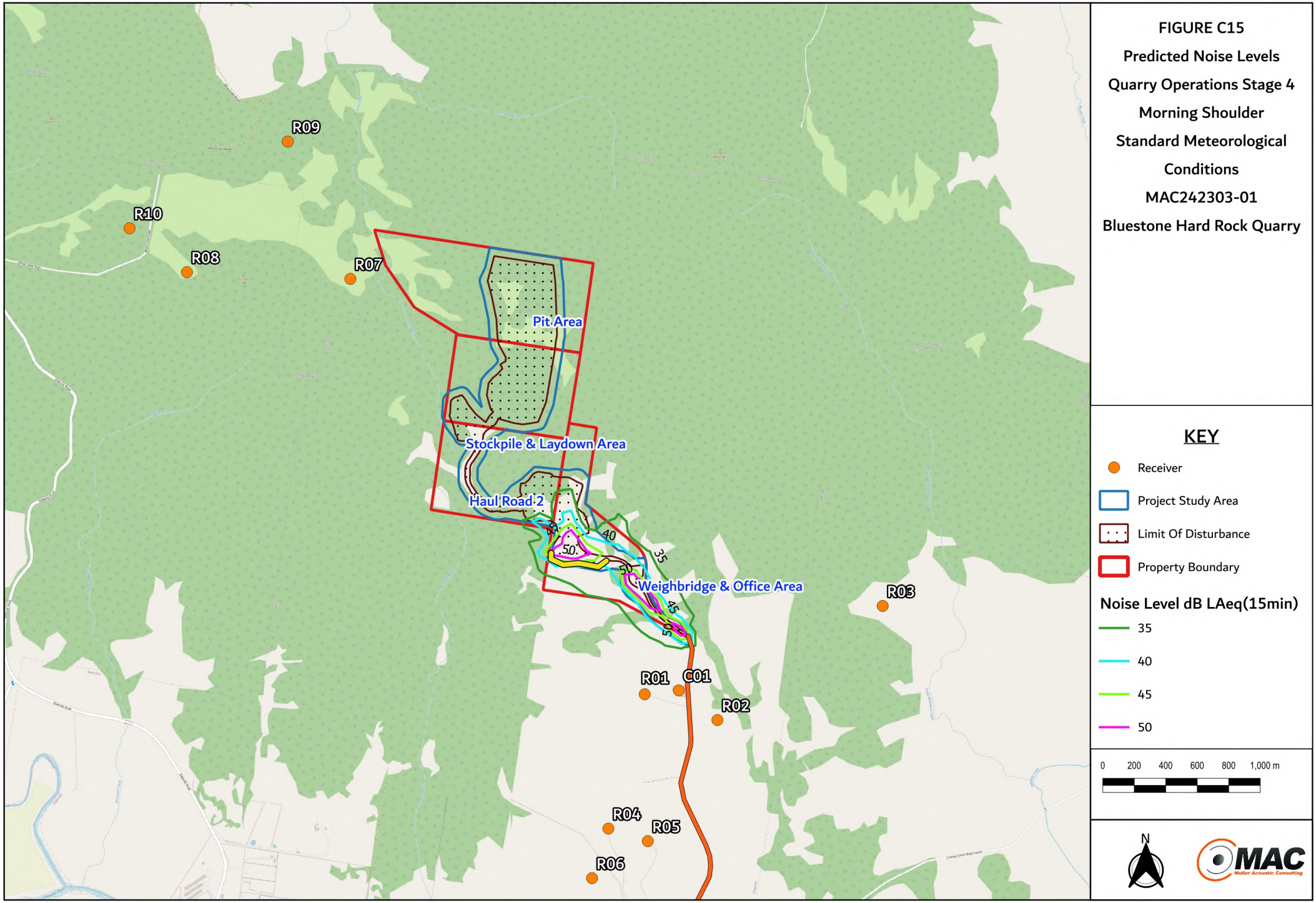


FIGURE C15

Predicted Noise Levels

Quarry Operations Stage 4

Morning Shoulder

Standard Meteorological Conditions

MAC242303-01

Bluestone Hard Rock Quarry

KEY

- Receiver
- Project Study Area
- Limit Of Disturbance
- Property Boundary

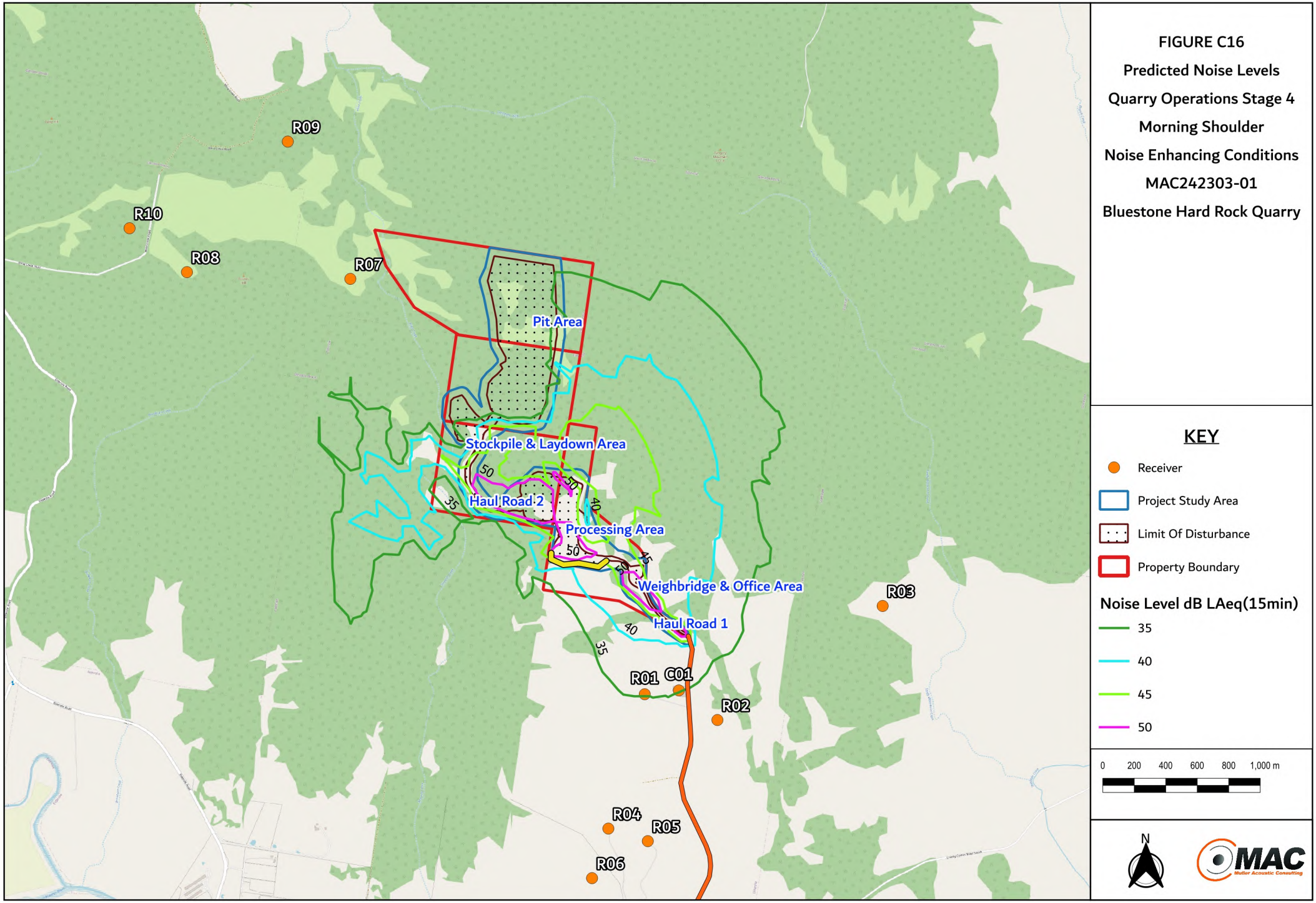
Noise Level dB LAeq(15min)

- 35
- 40
- 45
- 50

0 200 400 600 800 1,000 m

N

MAC Muller Acoustic Consulting


R09
R10
R08
R07
R03
R02
R01
C01
R04
R05
R06
Pit Area
Stockpile & Laydown Area
Haul Road 2
Processing Area
Weighbridge & Office Area
Haul Road 1
35
40
45
50
FIGURE C16
Predicted Noise Levels
Quarry Operations Stage 4
Morning Shoulder
Noise Enhancing Conditions
MAC242303-01
Bluestone Hard Rock Quarry
KEY
Receiver
Project Study Area
Limit Of Disturbance
Property Boundary
Noise Level dB LAeq(15min)
35
40
45
50
0 200 400 600 800 1,000 m
N
MAC
Muller Acoustic Consulting

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Appendix D – Modifying Factors

Table APP-D1 Tonality & Low Frequency Noise Assessment - Daytime Period During Noise Enhancing Conditions																																					
Frequency (Hz)	**10**	**12.5**	**16**	**20**	**25**	**31.5**	**40**	**50**	**63**	**80**	**100**	**125**	**160**	**200**	**250**	**315**	**400**	**500**	**630**	**800**	**1k**	**1.25k**	**1.6k**	**2k**	**2.5k**	**3.15k**	**4k**	**5k**	**6.3k**	**8k**	**10k**	**12.5k**	**16k**	**20k**	**Total**
R1 A-wt 1/3 Octave Values					**-63**	**-63**	**-63**	**19**	**19**	**19**	**23**	**23**	**23**	**22**	**22**	**21**	**30**	**30**	**29**	**32**	**32**	**31**	**29**	**27**	**24**	**14**	**7**	**-3**	**-26**	**-41**	**-63**				**40**
dBZ	70	63	57	51	-18	-24	-28	49	45	42	42	39	36	33	31	28	34	33	31	33	32	30	28	26	23	13	6	-4	-26	-40	-61	4	7	9	71
dBA	0	0	0	0	-63	-63	-63	19	19	19	23	23	23	22	22	21	30	30	29	32	32	31	29	27	24	14	7	-3	-26	-41	-63	0	0	0	40
dBC	56	52	48	44	-23	-27	-30	48	44	41	42	39	36	33	31	28	34	33	31	33	32	30	28	26	22	12	5	-5	-28	-43	-65	-2	-2	-2	59
1/3 Octave Tonality Test		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE		
1/1 Octave Tonality Test						FALSE			FALSE			FALSE			FALSE			FALSE			FALSE			FALSE			FALSE			FALSE						
LFN Penalty Exceed by <5dB	No	No	No	No	No	No	No	No	No	No	No	No	No																							
LFN Penalty Exceed by >5dB	No	No	No	No	No	No	No	No	No	No	No	No	No																							
LFN Present (Table C1 -NPI 2017)	No	No	No	No	No	No	No	No	No	No	No	No	No																							
NPI LFN Criteria (dBZ)	92	89	86	77	69	61	54	50	50	48	48	46	44																							
Assessment																																				
C - A			**19.1**																																	
Low Frequency Noise Present			**No**																																	
Tonal Noise Present			**No**																																	

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.

Table APP-D2 Tonality & Low Frequency Noise Assessment - Morning Shoulder Period During Noise Enhancing Conditions																																					
Frequency (Hz)	**10**	**12.5**	**16**	**20**	**25**	**31.5**	**40**	**50**	**63**	**80**	**100**	**125**	**160**	**200**	**250**	**315**	**400**	**500**	**630**	**800**	**1k**	**1.25k**	**1.6k**	**2k**	**2.5k**	**3.15k**	**4k**	**5k**	**6.3k**	**8k**	**10k**	**12.5k**	**16k**	**20k**	**Total**
R1 A-wt 1/3 Octave Values					**-66**	**-66**	**-66**	**19**	**19**	**19**	**23**	**23**	**23**	**22**	**22**	**22**	**31**	**30**	**29**	**32**	**32**	**31**	**29**	**27**	**24**	**13**	**5**	**-7**	**-37**	**-67**					**40**
dBZ	70	63	57	51	-21	-27	-31	49	45	42	42	39	36	33	31	29	35	33	31	33	32	30	28	26	23	12	4	-8	-37	-66	3	4	7	9	71
dBA	0	0	0	0	-66	-66	-66	19	19	19	23	23	23	22	22	22	31	30	29	32	32	31	29	27	24	13	5	-7	-37	-67	0	0	0	0	40
dBC	56	52	48	44	-26	-30	-33	48	44	41	42	39	36	33	31	29	35	33	31	33	32	30	28	26	22	11	3	-9	-39	-69	-2	-2	-2	-2	59
1/3 Octave Tonality Test		FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE	FALSE		
1/1 Octave Tonality Test						FALSE			FALSE			FALSE			FALSE			FALSE			FALSE			FALSE			FALSE			FALSE						
LFN Penalty Exceed by <5dB	No	No	No	No	No	No	No	No	No	No	No	No	No																							
LFN Penalty Exceed by >5dB	No	No	No	No	No	No	No	No	No	No	No	No	No																							
LFN Present (Table C1 -NPI 2017)	No	No	No	No	No	No	No	No	No	No	No	No	No																							
NPI LFN Criteria (dBZ)	92	89	86	77	69	61	54	50	50	48	48	46	44																							

Assessment	
C - A	**19**
Low Frequency Noise Present	**No**
Tonal Noise Present	**No**

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.

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