Peppertree Quarry

Construction Noise Management Plan

14th March 2022

Project No.: 0392341RP18

The business of sustainability

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Signature page

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Peppertree Quarry Construction Noise Management Plan

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Abbreviations and Definitions

Term	Description
Ambient noise	The all-encompassing noise associated within a given environment. It is the composite of sounds from many sources, both near and far.
C-weighted	C-weighting is an adjustment made to sound-level measurements that takes account of low-frequency components of noise within the audibility range of humans.
Decibel (dB)	A measure of sound level. The decibel is a logarithmic way of describing a ratio. The ratio may be power, sound pressure, voltage, intensity or other parameters. In the case of sound pressure, it is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure squared to a reference sound pressure squared.
decibel (A-weighted; dB[A])	Unit used to measure 'A-weighted' sound pressure levels. A-weighting is an adjustment made to sound-level measurement to approximate the response of the human ear
L_{AF1}	The LA1 level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the LA1 level for 99% of the time.
L_{AF10}	The LA10 level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the LA10 level for 90% of the time. The LA10 is a common noise descriptor for environmental noise and road traffic noise.
$L_{AF90,15min}$ dB	The A-weighted sound pressure level measured using fast time weighting that is exceeded for 90% of the time over a 15-minute assessment period. This is a measure of background noise.
L_{Aeq}	The equivalent continuous sound level (LAeq) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.
L_{Amax}	The maximum sound pressure level of an event measured with a sound level meter satisfying AS IEC 61672.1-2004 set to 'A' frequency weighting and fast time weighting.
Low Frequency	Noise containing major components in the low-frequency range (10 hertz [Hz] to 160 Hz) of the frequency spectrum.
Tonality	Noise containing a prominent frequency and characterised by a definite pitch.

1. INTRODUCTION

This section provides an overview of the project, outlines the objectives of this management plan and describes the alignment of this plan with other management plans prepared for the project.

1.1 Background

Boral Resources (NSW) Pty Ltd (Boral) was granted project approval (06_0074) to establish and operate the Peppertree Quarry, a granodiorite hard rock quarry, formerly called the "Marulan South Quarry". The approval covers activities including all in-pit quarrying activities and supporting infrastructure such as a rail siding and loading facility, processing plant and water supply dams under Part 3A of the *Environmental Planning and Assessment Act, 1979* (EP&A Act) in February 2007.

The existing Quarry operations have been constructed and operated in accordance with the 06_0074 Project Approval (with modifications in 2009, 2011, 2012, 2016 and 2019) and an Environment Protection Licence (EPL No. 13088).

The 2007 approval required the preparation and implementation of a number of management plans detailing environmental commitment, controls and performance objectives at the Quarry throughout its operational life. In accordance with Schedule 3, Conditions 2, 3, and 10 of the original Project Approval, a Construction Noise Management Plan (CNMP) was first prepared by Environmental Resources Management (ERM) for Boral in 2012 to the satisfaction of the Director-General (now the Secretary).

In October 2019, the Project Approval was modified for the fifth time (hereafter referred to as Modification 5) to establish a new overburden emplacement area, to the southwest of the existing quarry (South-west Overburden Emplacement – SWOE) along with minor changes to the site to accommodate the proposed SWOE.

The Modification 5 project layout is shown in **Figure 1.1**. No changes are proposed with respect to approved methods of extraction, blasting frequency, processing or stockpiling activities. Transport activities are also largely unchanged. Rail operations continue to take product from site with no road transportation of products unless approved via the DPIE. Management of noise from ongoing operations and rail transport is outlined in the Noise and Blast Management Plan 2020.

Main changes of access to the emplacement area across Marulan south road are addressed separately in the Construction Traffic Management Plan (CTMP).

This was followed in April 2020, with the Project Approval modified for the sixth time (hereafter referred to as Modification 6) under Section 4.55 (1A) of the EP&A Act, to allow the replacement of the existing air filtration network with two baghouse air filtration units and associated ducting attached to the existing and approved secondary and tertiary processing facilities (i.e. crushing and screening plant). The baghouses are located within the current operating plant footprint and do not impact on traffic related to construction of the SWOE.

Modification 7 was assessed in August 2021 and approved for the realignment of the project footprint associated with the WOE sediment basin and removal of a specified tree.

This document is a revised version of the initial CNMP prepared in 2012 incorporating changes associated with Modification 5 and other new noise and vibration management practices associated with current Quarry activities.

The CNMP will continue to remain a dynamic document, as has been the case since 2012. It will be updated as required over the life of Quarry construction activities until the Project Approval end date of 31 December 2038.

1.2 Overview of Proposed Construction Activities

The proposed SWOE will be south of the WOE, south of Marulan South Road and in the northwestern corner of the Marulan South Limestone Mine (the Mine). This new overburden emplacement area will

be needed in late 2021 and will take approximately four years to establish. The emplacement will cover approximately 44 ha and will be RL650 m at completion.

A new haul road is proposed to be constructed from the southern extent of the pit to the SWOE, including a new intersection to allow haul trucks to cross Marulan South Road.

Part of the WOE is planned for a future shared road sales stockpile area for the Quarry and the adjacent Boral Limestone Mine, and will be a component of the Mine's State significant development application.

The proposed amendment to the WOE would involve replacing the 30 m high triangular section of the emplacement with approximately 2 m of emplaced overburden material, which once completed would serve as a foundation for the shared road sales stockpile area.

Two sediment dams will be constructed either end of the WOE to catch and treat dirty water until the batters are rehabilitated. Sediment dam P1 will be approximately 2.1 ML in volume and sediment dam P2 will be approximately 5.8 ML in volume.

The only ground disturbance associated with the modification will be for the SWOE, sediment dams P1 and P2, and new haul road.

1.3 Overview of Existing Operations

The Quarry has an identified resource area of approximately 250 million tonnes which, dependent upon extraction rates, would allow quarrying for 70 years or more over an area of approximately 104 hectares (ha), within a 650 ha parcel of land owned by Boral. The Quarry produces granodiorite aggregate products and manufactured sand. All Quarry products and materials are transported by rail to a number of Boral rail terminals for distribution by trucks into the Sydney metropolitan area.

Typical quarrying operations involve the stripping of overburden and the extraction of hard rock using open-cut drill and blast techniques. Overburden is stripped by dozer, loaded onto trucks using excavators and/or front end loaders and transported to the overburden emplacement areas, where it is spread and shaped by dozer. Traditional drill and blast methods are then used to break up the hard rock. A drill rig stationed on top of each production bench drills a series of holes that are later charged with explosives, detonators and delays. Boral apply standard practice of limiting the maximum instantaneous charge to stay within the relevant noise and vibration criteria.

Blasted rock is then processed on-site using various crushers and screens to obtain the desired product. Material is initially crushed in a primary mobile crusher located within the pit, directly fed by an excavator.

After passing through the primary crusher, the crushed material is taken from the pit along a series of conveyors to the first set of screens located to the northwest of the pit and material is stockpiled in a surge pile. Material in the surge pile is reclaimed and conveyed to the main processing area where it undergoes further crushing, screening and shaping. Product material is stored in the various covered storage bins prior to being dispatched off-site by train.

1.4 Scope and Objectives

The purpose of the CNMP is to:

- Fulfil the requirement of Schedule 3 of the Project Approval and Section 3 of the Statement of Commitments contained within the Part 3A Environmental Assessment.
- Fulfil the requirement of Schedule 2, Part B of Modification 5.
- Provide methods for managing noise emissions and procedures for monitoring and assessing noise emissions from construction activities associated with Peppertree Quarry. This revision of the CNMP is associated with the construction of the South Western Overburden Emplacement (SWOE), (modification 5) as outlined above in section 1.1. The development of the SWOE is structured as a specific campaign for the removal and emplacement of overburden from the pit. This campaign will include the establishment of drainage, ponds, and haul roads prior to the emplacement of overburden to a planned engineered design. Rehabilitation will occur progressively once stages of the emplacement are completed.
- Describe measures to be implemented to achieve the construction noise limits in the *Environmental Noise Control Manual 1994* and the operational noise criteria in condition B3 of Modification 5.
- Determine compliance with the construction noise limits for residential receivers determined in accordance with the *Environmental Noise Control Manual 1994* and as stated in the Environmental Assessment.
- Describe a community notification protocol for the proposed construction activities.
- Provide details of who is be responsible for monitoring, reviewing and implementing the plan.

In addition, the NSW Department of Environment and Climate Change (DECC) – *NSW Interim Construction Noise Guideline* (ICNG, 2009), July 2009 has been referenced to establish management levels and mitigation measures in line with current good construction management practices.

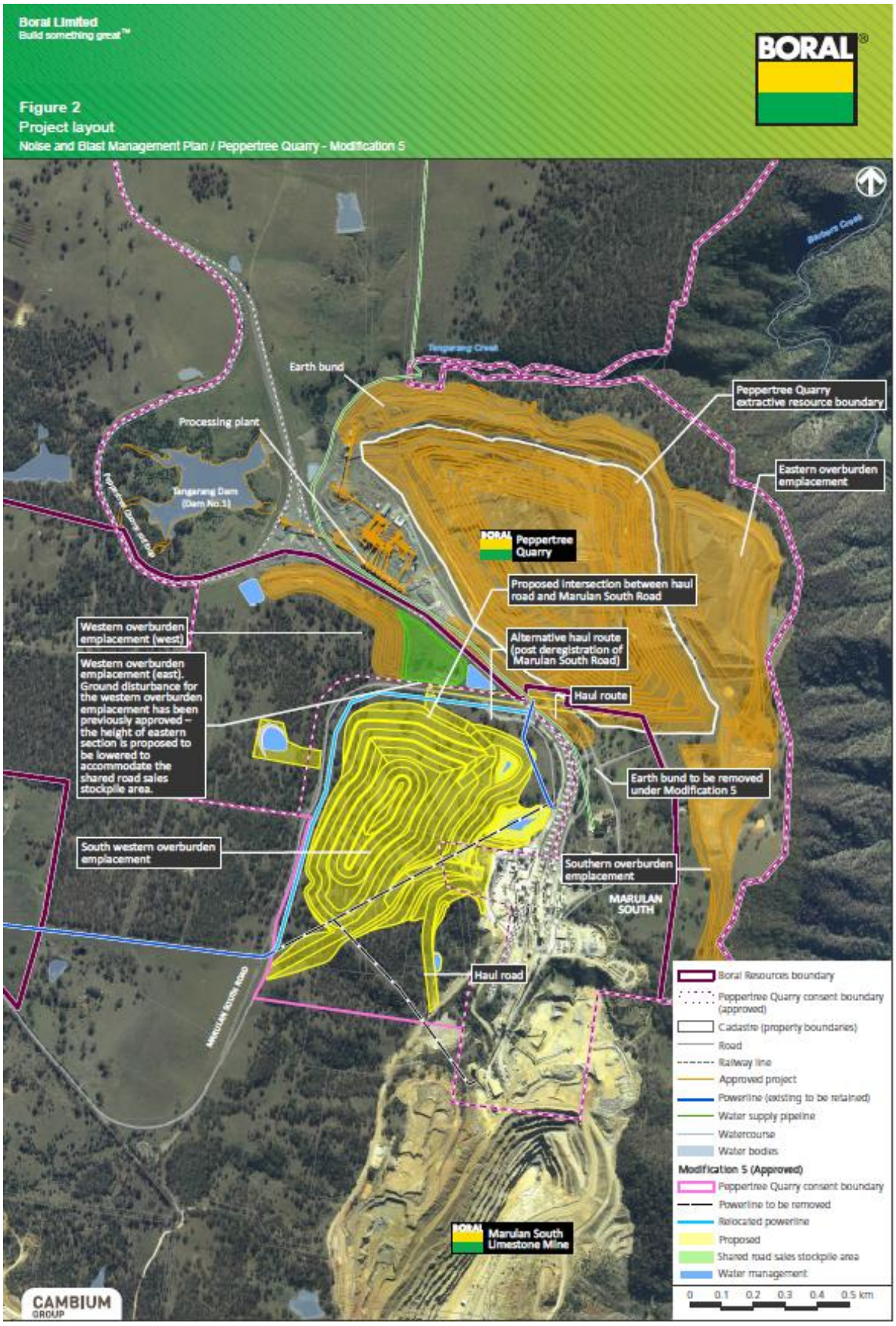
This CNMP should be read in conjunction with the Noise and Blast Management Plan (NBMP) for the Quarry, which has already been prepared in accordance the Project Approval and subsequent modifications, including Modification 5.

All construction noise levels in this document are expressed as A-Weighted decibels, dBA. C-Weighted decibels, dBC are referred to as applicable to the assessment of low frequency noise. A description of the relevant acoustic terms used throughout this NBMP is provided in the Definitions Section at the beginning of this document. A glossary of acoustic concepts and terminology relevant to this CNMP is then provided in **Appendix A.**

1.5 Responsibility for Plan Implementation

The Quarry Manager carries ultimate responsibility for the ongoing development and implementation of this CNMP, providing the necessary resources as required and ensuring that operations respond to the real time monitoring alerts. The ESA is responsible for carrying out and/or coordinating the monitoring and reporting requirements of this plan,and responding to any community concerns. The ESA, will provide guidance to the Operations personnel on the appropriate responses to the real time monitoring alert system. Operations personnel (Quarry Supervisors) are responsible for implementing noise mitigation measures to meet criteria, and responding to the real Time monitoring alerts, as required.

Figure 1.1 Project Layout



1.6 Document Structure

The structure of the Management plan is outlined in **Table 1.1** below.

Table 1.1 Structure of the Management Plan

Chapter	Content
1	Provides an overview of the project, and objectives of the plan
2	Details the statutory requirements as outlined in the Project Approval (Modification 5)
3	Describes the existing environment and background noise conditions
4	Describes the established noise and blast criteria for the site
5	Describes the noise mitigation and management actions currently in place, and to be implemented throughout the project
6	Noise and blast monitoring protocols
7	Outlines incident and non-compliance planning and responses
8	Outlines the management plan implementation (including reporting and review requirements)

1.7 Alignment with Other Plans

This document is a revised version of the CNMP initially prepared by ERM (2012). This plan has been developed to align with the *Peppertree Quarry – Noise and Blast Management Plan* (NBMP, 2020), dated January 2020 that was developed by Boral (and ERM subject matter experts) in response to Modification 5. It was also developed to align with the *Peppertree Quarry – Construction Traffic Management Plan* (CTMP, 2021).

CNMP 2012 will continue to apply, until the approval of CNMP 2022 by the DPIE.

The NBMP applies to all activities undertaken by the Quarry including quarrying, crushing, screening, stockpiling and transportation of Quarry products, maintenance activities, and associated service and support functions. It provides the framework and guidance for the Quarry activities to be conducted in a manner that appropriate control measures are implemented to minimise the potential for adverse impacts on the amenity, property and safety of Quarry neighbours and meet compliance requirements of the CoA of the Project Approval. This is important to acknowledge in the CNMP as construction works will occur concurrent to operational activities.

The NBMP also incorporated findings of the Noise Impact Assessment Report (Wilkinson Murray Pty Limited, 2018) that was undertaken as part of the Modification 5 application to the Department of Planning, Industry and Environment (DPI&E). The Noise Impact Assessment Report included the determination of new 'trigger levels' (criteria) for the Project, as per the NSW Environment Protection Authority's (EPA) (2017) Noise Policy for Industry (NPI, 2017).

In support of the NBMP, an Air Quality Management Plan (2020) has been prepared for the Quarry. This associated plan has aspects of managing noise and blasts and will be applied in combination with the NBMP and this CNMP where relevant.

2. STATUTORY REQUIREMENTS

This section details the statutory requirements relevant to the project, and summarises compliance with the relevant conditions of approval stipulated throughout the Project Approval (specifically for Modification 5).

2.1 Environmental Planning and Assessment Act 1979 (EP&A Act)

The project was originally approved under Part 3A of the EP&A Act. The project is a transitional Part 3A project under Schedule 2 of the EP&A *(Savings, Transitional and Other Provisions) Regulation 2017*.

As the modification request was made before the 'cut-off date' of 1 March 2018, the provisions of clause 3 of Schedule 2 continue to apply. Consequently, the project modification was assessed in accordance with the requirements of Part 3A and associated Regulations, and the Minister (or delegate) may approve or disapprove the carrying out of the project under section 75W of the EP&A Act.

Since the original Project Approval was granted in 2007, there have been seven approved modifications (with conditions), as detailed below:

- Modification 1 (2009) approved for exploratory blasting and test pitting in order to verify the design of the processing plant. (complete)
- Modification 2 (2011) approved for the construction of a new rail line rather than use the existing rail facilities to the Limestone Mine. (compete)
- Modification 3 (2012) approved the construction of a high voltage power line from an existing substation to the processing plant and to provide a rail siding near the junction with the Main Southern Railway Line. (complete)
- Modification 4 (2016) approved for the extension of daily in-pit operating hours and Establishment of a new overburden emplacement area. (complete)
- Modification 5 (2019) approved for development of a new overburden emplacement (South-west Overburden Emplacement – SWOE) among other minor amendments to the site. (not commenced – waiting approval of management plans)
- Modification 6 (2020) approved for the installation and operation of dust collectors within the existing operating plant footprint, (complete)
- Modification 7 (2021) approved for the relocation of a sediment pond P2 for safety reasons. (complete)

The quarrying construction and operation will continue to be subject to the provisions of the EP&A Act for any subsequent changes or modifications to the operations. Additionally, the Quarry will need to be able to demonstrate compliance against the current Conditions of Approval (CoA) relevant to construction noise issued under the provisions of the EP&A Act. A consolidated set of relevant construction noise conditions (from Modification 5) are presented in **Table 2.1** below.

Table 2.1 Construction Noise Conditions of Approval (06_0074 – Modification 5)

<table>
<tr><th>CoA</th><th>Condition of Project Approval</th><th>Addressed in Section</th></tr>
<tr><td>A12</td><td>Hours of Operation
The Proponent must comply with the operating hours set out in Table 1 of the Project Approval (Modification 5).
Table 1: Operating Hours (from Modification 5)
<table>
<tr><th>Activity</th><th>Day</th><th>Time</th></tr>
<tr><td>Construction works</td><td>Monday-Friday</td><td>7.00am to 6.00pm</td></tr>
<tr><td></td><td>Saturday</td><td>8.00am to 1.00pm</td></tr>
<tr><td></td><td>Sunday and public holidays</td><td>None</td></tr>
<tr><td>Topsoil/overburden removal/emplacement and transportation of quarry products by road</td><td>Any day</td><td>7.00am to 7.00pm</td></tr>
<tr><td>Blasting</td><td>Monday-Saturday</td><td>9.00am to 5.00pm</td></tr>
<tr><td></td><td>Sunday and public holidays</td><td>None</td></tr>
<tr><td>In-pit activities (including drilling, extraction, processing, and transfer of material out of the pit)</td><td>Any day</td><td>5.00am to 11.00pm</td></tr>
<tr><td>Out-of-pit activities (including processing, stockpiling,
train loading and distribution, and maintenance)</td><td>Any day</td><td>24 hours</td></tr>
</table>
---</td><td rowspan="3">section 5.4</td></tr>
<tr><td>A13</td><td>Between the hours of 5:00am to 7:00am and 7:00pm to 11:00pm the:
(a) in-pit crusher must not operate above RL 555; and
(b) mobile plant in the pit, including excavators, front-end loaders and trucks, must not operate above RL 570.</td></tr>
<tr><td>A14</td><td>The following activities may be carried out outside the hours specified in Table 1.
(a) delivery or dispatch of materials as requested by Police or other public authorities; and
(b) emergency work to avoid the loss of lives, property or to prevent environmental harm.
In such circumstances, the Proponent must notify the Department and affected residents prior to undertaking the activities, or as soon as is practical thereafter.</td></tr>
</table>

<table>
<tr><th>CoA</th><th>Condition of Project Approval</th><th>Addressed in Section</th></tr>
<tr><td>A26</td><td>The Applicant must ensure that all of its employees, contractors (and their sub-contractors) are made aware of, and are instructed to comply with, the conditions of this consent relevant to activities they carry out in respect of the development</td><td>8.1.1.1</td></tr>
<tr><td>B1</td><td>Noise Bund Construction
In carrying out the construction of the noise bunds, the Proponent must:
(a) comply with the construction noise criteria in the Environmental Noise Control Manual 1994 for the first three months of the construction work;
(b) thereafter comply with daytime operational noise criteria in condition B3; and
(c) ensure bunds do not exceed 10 meters in height.</td><td>Not applicable – noise bund construction is complete</td></tr>
<tr><td rowspan="5">B2</td><td>Construction Noise Management Plan
The Proponent must prepare and implement a Construction Noise Management Plan for the project to the satisfaction of the Secretary. This plan must be submitted to the Secretary for approval prior to the commencement of construction, and include:</td><td>This CNMP</td></tr>
<tr><td>(a) a detailed description of the measures that would be implemented to achieve the construction noise limits in the Environmental Noise Control Manual 1994 and the operational noise criteria in condition B3;</td><td>Section 5.33</td></tr>
<tr><td>(b) a community notification protocol for the proposed construction activities;</td><td>Section 7.4, Section 8.2.2</td></tr>
<tr><td>(c) a description of the measures that would be implemented where the construction noise limits and/or operational noise limits are unlikely to be achieved or are not being achieved; and</td><td>Section 7</td></tr>
<tr><td>(d) details of who would be responsible for monitoring, reviewing and implementing the plan.</td><td>Section 1.5
Section 8.3.8</td></tr>
<tr><td>B3</td><td>Except during noise bund construction, the Proponent must ensure that the noise generated by the project does not exceed the criteria in Table 2 at any residence on privately-owned land. For the table below, a) residential receiver locations are shown on the plan in Appendix 3 of the Project Approval and b) receiver numbers in parentheses are those identified in the approval prior to the approval of Modification 4 in August 2016.
Table 2. Operational noise criteria dB(A) (from Modification 5)
<table>
<tr><th rowspan="2">Noise Assessment Location</th><th>Day</th><th>Evening</th><th colspan="2">Night</th></tr>
<tr><th>LAeq (15 min)</th><th>LAeq (15 min)</th><th>LAeq (15 min)</th><th>LA1 (1 min)</th></tr>
<tr><td>R3 (5) – 113 Green Hills Road Marulan (Lot 2, DP 1060897)</td><td>40</td><td>35</td><td>35</td><td>52</td></tr>
<tr><td>R2 (6) – 90 Green Hills Road Marulan (Lot 11, DP 881240)</td><td>40</td><td>35</td><td>35</td><td>52</td></tr>
</table></td><td>Section 4.1</td></tr>
</table>

CoA	Condition of Project Approval					Addressed in Section
	R8 (16) – 381 Marulan South Road, Marulan (Lot 1, DP 1190667)	40	35	35	52	
	Any other noise sensitive location	40	35	35	52	

B4	For the purposes of condition B3: (a) day means the period from 7am to 7pm Monday to Saturday and the period from 8am to 6pm Sunday and public holidays; (b) evening means the period from 7pm to 10pm; and (c) night means the period from 10pm to 7am Monday to Saturday and the period from 10pm to 8am Sunday and public holidays.					*Approved construction hours supersede these for SWOE works*
B5	Noise generated by the development must be monitored and measured in accordance with the relevant procedures and exemptions (including certain meteorological conditions) of the *NSW Noise Policy for Industry* (EPA, 2017).					Section 6.1
B7	If the noise generated by the development exceeds the criteria in Table 3, the Applicant must, upon receiving a written request for acquisition from the landowner, acquire the land in accordance with the procedures in conditions C8 and C9.					Section 7.4
B8	**Noise Operating Conditions** The Proponent must: (a) take all reasonable steps to minimise all noise from construction and operational activities, including low frequency noise and other audible characteristics, as well as rail and road noise associated with the project;					Section 5.3 Section 1.1
	(b) operate a noise management system to guide day to day planning of quarrying operations and implementation of both proactive and reactive noise mitigation measures to ensure compliance with the relevant conditions of this approval;					Section 5.3.3
	(c) take all reasonable steps to minimise the noise impacts of the project during noise-enhancing meteorological conditions when the noise criteria in this approval do not apply;					Section 5.3.5
	(d) take all reasonable steps to minimise the cumulative noise impacts generated by the project and the Marulan South Limestone Mine; and					Section 5.1
	(e) regularly assess the noise monitoring data, and modify or stop operations on the site to ensure compliance with the relevant conditions of this approval.					Section 6.1.6 Section 6.1.8
	(f) report on the implementation and effectiveness of these measures in the Annual Review, to the satisfaction of the Secretary.					Section 8.3

CoA	Condition of Project Approval	Addressed in Section
B26	**Meteorological Monitoring** Prior to the commencement of construction and for the life of the project, the Proponent must ensure that there is a suitable meteorological station operating in close proximity to the site that: (a) complies with the requirements in the *Approved Methods for Sampling and Analysis of Air Pollutants in New South Wales* (DEC, 2007); and	*Section 5.3.5*
	(b) is capable of measuring meteorological conditions in accordance with the NSW Noise Policy for Industry (EPA, 2017), unless a suitable alternative is approved by the Secretary following consultation with the EPA.	
C1	**Notification of Exceedances** As soon as practicable and no longer than 7 days after obtaining monitoring results showing an exceedance of any noise, blasting or air quality criterion in PART B of this consent, the Applicant must provide the details of the exceedance to any affected landowners and/or tenants. For any exceedance of any air quality criterion in PART B of this consent, the Applicant must also provide to any affected land owners and tenants a copy of the fact sheet entitled "Mine Dust and You" (NSW Health, 2017).	Section 7.4
C2	. If a landowner considers the development to be exceeding any noise, blasting or air quality criterion in PART B of this consent, they may ask the Planning Secretary in writing for an independent review of the impacts of the development on their land.	Section 7.4
C3	If the Planning Secretary is not satisfied that an independent review is warranted, the Planning Secretary will notify the landowner in writing of that decision, and the reasons for that decision, within 21 days of the request for a review.	Section 7.4
C4	If the Planning Secretary is satisfied that an independent review is warranted, within 3 months, or as otherwise agreed by the Planning Secretary and the landowner, of the Planning Secretary's decision, the Applicant must: (a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Planning Secretary, to: — (i) consult with the landowner to determine their concerns; — (ii) conduct monitoring to determine whether the development is complying with the relevant criteria in PART B of this consent; and — (iii) if the development is not complying with that criteria, identify measures that could be implemented to ensure compliance with the relevant criteria; and (b) give the Planning Secretary and landowner a copy of the independent review; and (c) comply with any written requests made by the Planning Secretary to implement any findings of the review.	Section 7.4
D4	**Management Plan Requirements** Management plans required under this approval must be prepared in accordance with relevant guidelines, and include: (a) a summary of relevant background or baseline data;	Section 3

CoA	Condition of Project Approval	Addressed in Section
	(b) details of: (i) the relevant statutory requirements (including any relevant approval, licence or lease conditions); (ii) any relevant limits or performance measures and criteria; and (iii) the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the project or any management measures;	Section 2.1, Section 2.2
	(c) any relevant commitments or recommendations identified in the document/s listed in condition A2(c);	Section 2.2
	(d) a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria;	Section 5
	(e) a program to monitor and report on the: (i) impacts and environmental performance of the project; and (ii) effectiveness of the management measures set out pursuant to condition D4(d);	Section 6.1.8Section 8.3.1 and 8.3.3
	(f) a contingency plan to manage any unpredicted impacts and their consequences and to ensure that ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible;	Section 7.5
	(g) a program to investigate and implement ways to improve the environmental performance of the project over time;	Section 8.3.7
	(h) a protocol for managing and reporting any: (i) incident, non-compliance or exceedance of the impact assessment criteria or performance criteria; (ii) complaint; or (iii) failure to comply with statutory requirements;	Section 7.2, Section 7.3
	(i) public sources of information and data to assist stakeholders in understanding environmental impacts of the development;	Section 8.2.2
	(j) a protocol for periodic review of the plan; and	Section 8.3.7
	(k) a document control table that includes version numbers, dates when the management plan was prepared and reviewed, names and positions of people who prepared and reviewed the management plan, a description of any revisions made and the date of the Secretary's approval. *Note: The Secretary may waive some of these requirements if they are unnecessary or unwarranted for particular management plans.*	Document Control Page
D6	Within three months of: (a) the submission of an incident report under condition D9; (b) the submission of an Annual Review under condition D11; (c) the submission of an Independent Environmental Audit under condition D13; (d) the approval of any modification of the conditions of this approval (unless the conditions require otherwise);	Section 8.3.8

CoA	Condition of Project Approval	Addressed in Section
	(e) notification of a change in project stage under condition A15; or (f) the issue of a direction of the Secretary under condition A2(b) which requires a review, the suitability of existing strategies, plans and programs required under this approval must be reviewed by the Proponent.	
D7	If necessary, to either improve the environmental performance of the project, cater for a modification or comply with a direction, the strategies, plans and programs required under this approval must be revised, to the satisfaction of the Secretary and submitted to the Secretary for approval within six weeks of the review. Note: This is to ensure strategies, plans and programs are updated on a regular basis and to incorporate any recommended measures to improve the environmental performance of the project.	Section 8.3.8
D8	The Proponent must continue to apply existing management plans, strategies or monitoring programs approved prior to the determination of Modification 5, until the approval of a similar plan, strategy or program following the determination of Modification 5.	Section 1.7
D9	**Reporting and Auditing – Incident Notification** The Proponent must immediately notify the Department and any other relevant agencies immediately after it becomes aware of an incident. The notification must be in writing to compliance@planning.nsw.gov.au and identify the project (including the project application number and name) and set out the location and nature of the incident.	Section 7.3
D10	**Non-Compliance Notification** Within seven days of becoming aware of a non-compliance, the Proponent must notify the Department of the noncompliance. The notification must be in writing to compliance@planning.nsw.gov.au and identify the project (including the project application number and name), set out the condition of this approval that the project is noncompliant with, the way in which it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance. *Note: A non-compliance which has been notified as an incident does not need to also be notified as a non-compliance.*	Section 7.2
D11	**Annual Review** By the end of March in each year after the commencement of project, or other timeframe agreed by the Secretary, a report must be submitted to the Department reviewing the environmental performance of the project, to the satisfaction of the Secretary. This review must: (a) describe the project (including any rehabilitation) that was carried out in the previous calendar year, and the project that is proposed to be carried out over the current calendar year;	*Section 8.3.1*
	(b) include a comprehensive review of the monitoring results and complaints records of the project over the previous calendar year, including a comparison of these results against the: (i) relevant statutory requirements, limits or performance measures/criteria; (ii) requirements of any plan or program required under this approval; (iii) monitoring results of previous years; and	

CoA	Condition of Project Approval	Addressed in Section
	(iv) relevant predictions in the documents listed condition A2(c).	
	(c) identify any non-compliance or incident which occurred in the previous calendar year, and describe what actions were (or are being) taken to rectify the non-compliance and avoid reoccurrence;	
	(d) evaluate and report on: (i) the effectiveness of the noise and air quality management systems; and (ii) compliance with the performance measures, criteria and operating conditions in this approval;	
	(e) identify any trends in the monitoring data over the life of the project;	
D11	(f) identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and	*See D11 note above*
	(g) describe what measures will be implemented over the next calendar year to improve the environmental performance of the project.	
D12	Copies of the Annual Review must be submitted to Council and made available to the CCC and any interested person upon request.	
D13	**Independent Environmental Audit** Within three years of the date of the commencement of construction, and every three years after, unless the Secretary directs otherwise, the Proponent must commission and pay the full cost of an Independent Environmental Audit of the project. The audit must: (a) be led by a suitably qualified, experienced and independent auditor whose appointment has been endorsed by the Secretary;	*Section 8.3.6* *Relates specifically to operations that will continue to occur as per this CoA. SWOE construction activities will be considered in the next audit*
	(b) be conducted by a suitably qualified, experienced and independent team of experts (including any expert in field/s specified by the Secretary) whose appointment has been endorsed by the Secretary;	
	(c) be carried out in consultation with the relevant agencies and the CCC;	
	(d) assess the environmental performance of the project and whether it is complying with the relevant requirements in this approval, any relevant EPL, water licences and mining leases for the project (including any assessment, strategy, plan or program required under these approvals);	
	(e) review the adequacy of any approved strategy, plan or program required under the abovementioned approvals and this approval;	
	(f) recommend appropriate measures or actions to improve the environmental performance of the project and any assessment, strategy, plan or program required under the abovementioned approvals and this approval; and	
	(g) be conducted and reported to the satisfaction of the Secretary.	

CoA	Condition of Project Approval	Addressed in Section
	Within three months of commencing an Independent Environmental Audit, or within another timeframe agreed by the Secretary, the Proponent must submit a copy of the audit report to the Secretary, and any other NSW agency that requests it, together with its response to any recommendations contained in the audit report, and a timetable for the implementation of the recommendations. The recommendations must be implemented to the satisfaction of the Secretary.	
D16	Before the commencement of construction until the completion of all rehabilitation required under this consent, the Applicant must: *NSW Government 23 Department of Planning, Industry and Environment* (a) make the following information and documents (as they are obtained, approved or as otherwise stipulated within the conditions of this consent) publicly available on its website: — (i) the document/s listed in condition A2(c); — (ii) all current statutory approvals for the development; — (iii) all approved strategies, plans and programs required under the conditions of this consent; — (iv) minutes of CCC meetings; — (v) regular reporting on the environmental performance of the development in accordance with the reporting requirements in any plans or programs approved under the conditions of this consent; — (vi) a comprehensive summary of the monitoring results of the development, reported in accordance with the specifications in any conditions of this consent, or any approved plans and programs; — (vii) a summary of the current stage and progress of the development; — (viii) contact details to enquire about the development or to make a complaint; — (ix) a complaints register, updated monthly; — (x) the Annual Reviews of the development; — (xi) audit reports prepared as part of any Independent Environmental Audit of the development and the Applicant's response to the recommendations in any audit report; — (xii) any other matter required by the Planning Secretary; and (b) keep such information up to date, to the satisfaction of the Planning Secretary.	Section 8.2.2

2.2 Statement of Commitments

The EA for Peppertree Quarry recommends a range of measures to avoid, manage, mitigate, offset and/or monitor the environmental impacts of the project, as set out in the Statement of Commitments. Commitments that relate to construction noise management are set out in **Table 2.2** below.

Table 2.2: Statement of Commitments

EA 2006	**Referenced in CNMP**
The overburden stripping fleet will be limited to an excavator, trucks and a dozer	Section 5.3
Noise limits will be maintained at the closest residential receivers are outlined in Table 17.1.s	Section 4.1
Mod 1 test pit work)– nil in relation to CNMP	NA
Mod 2 (June 2011) Noise monitoring to continued onsite and within the community Consideration of acoustical mitigation at receivers if necessary Consideration of negotiated agreements with property holders proactive management of overburden fleet operations	 Section 6.1 Section 5 Section 5 Section 5
Mod 3 (installation of HV power line)– nil in relation to CNMP	NA
Mod 4 Southern Overburden emplacement Continue implementation of the Noise and Blast management plan Quarterly compliance monitoring currently identified in the Peppertree Quarry Noise and Blast Management Plan must be amended to include additional noise monitoring locations R4 and R17 and a more detailed low frequency noise assessment and reporting regime.	 Section 1.7 Section 8.3.8
Mod 5 review and update Noise Management plan	Section
Mod 6 (installation of Dust Collectors) – nil in relation to CNMP	NA
Mod 7 (relocation of Sediment pond P2) – nil in relation to CNMP	NA

2.3 Integrated Management System

The Quarry operates under a Boral integrated Health, Safety, Environment and Quality Management System (HSEQMS). The HSEQMS has commitments to the Boral Environmental Policy through established standards and procedures, which require internal conformance to high levels of environmental performance with continual improvement objectives.

Boral have an established corporate and divisional risk-based audit program that periodically assess operational sites for conformance with HSEQMS requirements. In addition, the Quarry must be the subject of an Independent Audit every three years. An Independent Audit of the Quarry was most recently conducted in 2018 and the next Audit is due in 2021.

2.3.1 Relevant Documents, Standards & Guidelines

This document been prepared with due regard to and in accordance with the following documents, standards and guidelines:

- International Organisation for Standardisation (ISO) 9613-2:1996 (ISO9613:2) – *Acoustics – Attenuation of Sound during Propagation Outdoors - Part 2: General Method of Calculation*.
- NSW Department of Environment and Climate Change (DECC) – NSW *Interim Construction Noise Guideline* (ICNG, 2009), July 2009.
- NSW Environment Protection Authority (EPA) – *NSW Noise Policy for Industry* (NPI, 2017), October 2017
- NSW Environment Protection Authority (EPA) – *Environmental Noise Control Manual 1994*.
- Standards Australia AS1055–1997 (AS1055) – *Description and Measurement of Environmental Noise*, Parts 1, 2 and 3.
- Standards Australia AS1055–2018 (AS1055, 2018) – *Description and Measurement of Environmental Noise*.
- Standards Australia AS IEC 61672.1-2004 (AS61672) – *Electro Acoustics – Sound Level Meters Specifications Monitoring* or Standards Australia AS1259.2-1990 (AS1259) – *Acoustics – Sound Level Meters – Integrating Averaging*, as applicable to the device
- Standards Australia AS 2436–2010 (AS2436) – *Guide to Noise and Vibration Control on Construction, Demolition And Maintenance Sites*, reconfirmed 2016.
- The *Marulan South Quarry – Environmental Assessment Report* prepared by ERM, dated October 2006 (EA 2006).
- The Project Approval (06_0074) and subsequent modifications, including Modification 5.
- Other relevant project information provided by Boral.

2.3.2 Roles and Responsibilities

The HSEQMS Noise Standard has a roles and responsibilities protocol for the management of noise and vibration actions for specific personnel at the Quarry. These are documented and have been expanded upon as outlined in **Table 2.** below.

Table 2.3 Roles and Responsibilities

Role	Responsibility
Environment and stakeholder advisor (ESA)	■ Assist in the development of the CNMP. ■ Undertake review of the CNMP as required ■ Co-ordinate all noise monitoring. ■ Liaison with specialists to understand compliance. ■ Implementation of the noise response plan. ■ Key point of contact for all CNMP related communications and reporting. ■ Assist implementing training, auditing and review of the CNMP.
Quarry Manager and Production Manager	■ Implement the CNMP. ■ Accountability for compliance. ■ Assist in implementing the CNMP noise management controls. ■ Notify ESA of any noise complaints or concerns from community and staff. ■ Ensure all monitoring required under regulatory and environmental licences is undertaken.

3. BACKGROUND NOISE CONDITIONS

This section describes the existing noise environment within areas surrounding the project and outlines existing and current compliance settings.

3.1 Pre-project Conditions

The Quarry is located within a rural area, which is generally characterised by low background noise levels. Existing conditions in the local area include mostly natural sources e.g. birdsong, insects, road noise and livestock.

Existing commercial operations such as fireworks manufacturing and turkey farming, industrial operations including the agricultural lime manufacturing facility, Marulan South Road, the Limestone Mine and the Quarry are present.

The Quarry is on approximately 650 ha of Boral owned land, which includes the Quarry (occupying approximately 70 ha), additional granodiorite resources to the south and surrounding land. The site is zoned RU1 –- Primary Production under the Goulburn Mulwaree Local Environmental Plan (LEP) 2009. Mining and extractive industries are permissible in this zone with consent.

Image 1 The Quarry and Nearby Rural Area

3.2 Local climate

The nearest long-term climatic data are available from the Bureau of Meteorology (BoM) weather station at Goulburn Airport Automatic Weather Station (AWS) (Site No. 070330). Analysis of the data indicates:

that January is the hottest month with a mean maximum temperature of 27.8 degrees Celsius (ºC) and July is the coldest month with a mean minimum temperature of 0.3ºC.

Rainfall peaks during the summer and the month of June. June is the wettest month with an average rainfall of 58.6 millimetres (mm) over 7.3 days and April is the driest month with an average rainfall of 26.5mm over 4.0 days.

Humidity levels exhibit variability and seasonal flux across the year. Mean 9am humidity levels range from 65% in October and December to 88% in June. Mean 3pm humidity levels range from 39% in December to 63% in June.

Wind speeds have a generally similar spread between the 9am and 3pm conditions. Mean 9am wind speeds range from 12.2 kilometres per hour (km/h) in March to 19.8km/h in September. Mean 3pm wind speeds range from 19.8km/h in March to 26.5km/h in August.

3.3 Historic Compliance Setting – MOD 1 to 4

The Quarry has successfully operated in a noise context since its approval, construction and subsequent operation. Compliance monitoring has occurred as per previous CoA requirements and as per the existing NBMP.

During this time the Quarry site has been compliant with relevant construction (when applicable) and operational criteria, at the majority of the receptors and for most of the time. Exceedances of the noise level criteria have however been identified and reported following the approved procedures and in consultation with all relevant stakeholders. Exceedances have generally been associated with increased noise levels from noise enhancing or very noise enhancing conditions i.e. temperature inversions.

The noise sources (validated by two independent acoustics specialists) triggered a review of controls resulting in:

- Physical mitigation (to the primary bin).
- Alternate material transportation methods (from in-pit to primary, and the surge stockpile).
- A sophisticated real-time web-accessible noise/weather monitoring system.

These actions were informed by the management plan and have reduced noise levels and minimised impacts for the most affected receptors but also for the broader rural community within the area of influence of the Quarry.

3.4 Current Compliance Setting – MOD 5

As part of the Modification 5 approval application, a Noise Impact Assessment (NIA) was prepared which assessed the potential noise impacts associated of the Project on nearby sensitive residential, commercial and industrial receivers, in accordance with the Noise Policy for Industry (NPI, 2017). The NIA establishes new Project Noise Trigger Levels (PNTLs), consistent with the NPI, 2017.

Rating background levels have been established for the Peppertree operation from an analysis of monitoring undertaken over 2014 Christmas 2014 shut down, ongoing quarterly monitoring for Peppertree Quarry, and other previously published RBLs in Peppertree Quarry Environmental Assessments.

Combining these results, the RBL at each receiver are shown in **Table 3.1**.

However, the Noise Policy for Industry states that where the daytime RBL are measured at less than 35 dBA, then a minimum daytime RBL of 35 dBA must be used. Therefore, the daytime RBL for all sensitive receivers has been adjusted to 35 dBA as the measured RBL at all receivers was 35 dBA or lower.

Table 3.1 Rating Background Levels – L_{A90}

Receiver	Daytime Measured	Daytime Adjusted	Evening	Night
R1	**34**	**35**	**34**	**34**
R2	**34**	**35**	**34**	**34**
R3	**34**	**35**	**34**	**34**
R4	**34**	**35**	**33**	**33**
R5	**34**	**35**	**33**	**33**
R6	**34**	**35**	**33**	**33**
R7	**34**	**35**	**33**	**33**
R8	**35**	**35**	**34**	**33**
R0	**35**	**35**	**34**	**33**
R10	**35**	**35**	**34**	**33**
R11	**35**	**35**	**34**	**33**
R12	**35**	**35**	**34**	**33**
R13	**31**	**35**	**31**	**30**
R14	**31**	**35**	**31**	**30**
R15	**31**	**35**	**31**	**30**
R16	**31**	**35**	**31**	**30**
R17	**31**	**35**	**31**	**30**

The NIA modelled noise levels resulting from the modified operation to identify impacts at sensitive receivers. The modelled scenarios incorporated the worst-case noise impacts of current operations for both the day and night periods, in conjunction with:

- early overburden emplacement activities at the SWOE, with equipment and haul trucks at ground level; and
- overburden emplacement activities nearing completion, where haul trucks would be partially shielded by the SWOE.

The modelled noise levels were compared to the new PNTLs to determine if operations, as proposed to be modified, would comply with the revised criteria. The NIA noted that predicted noise levels were found to be lower than previously recorded during attended monitoring at some locations, as noise mitigation measures (including dozer noise reduction, haul truck noise reduction, enclosure of overhead bins, enclosure of the rail loading facility and processing plants, and noise mitigation of the in-pit primary crusher) were incorporated into the modelling.

Overall, the NIA indicated that noise emissions from the Quarry would remain significantly below the revised noise criteria presented in the NIA. Given that construction activities would be undertaken concurrently with operations, continued compliance with all relevant criteria is still expected

4. ASSESSMENT CRITERIA

This chapter presents the construction and operational noise levels that will be adopted for assessing compliance at the Quarry. For construction aspects, the *Noise Control Manual 1994* is referenced, as well as the ICNG, 2009, that has largely superseded the *Noise Control Manual 1994* in the assessment and management of construction noise emissions.

Although there is no specific assessment of construction noise within the NIA prepared as part of the Modification 5 approval application, the predicted noise levels for proposed daytime, evening and night time operations, including the proposed SWOE, comply with the Project Approval criteria at all locations. Given that construction activities would be undertaken concurrently with operations, it is anticipated that the project would continue to comply with all relevant construction and operational criteria.

4.1 Construction Noise Management Levels

The Project Approval requires that the *Noise Control Manual 1994* construction noise limits are complied with for the first three months of construction of noise bunds and thereafter, meet the operational criteria, this is as per CoA B1

The *Noise Control Manual 1994* criteria and the ICNG, 2009 management levels are presented in **Table 4.1** and **4.2** respectively. The operational criteria is presented in **Table 4.3** below.

Construction of the South West Overburden Emplacement will be managed in line with the requirements of CoA B1.

Table 4.1 Construction Noise Criteria (Noise Control Manual, 1994)

Noise Assessment Location	**Construction ≤ 4 weeks**			**Construction > 4 weeks but ≤ 26 weeks**		
	LA10 (15 min)			**LA10 (15 min)**		
	Daytime	**Evening**	**Night-time**	**Daytime**	**Evening**	**Night-time**
R3 (5) – 113 Green Hills Road Marulan (Lot 2, DP 1060897)	55	50	50	45	40	40
R2 (6) – 90 Green Hills Road Marulan (Lot 11, DP 881240)	55	50	50	45	40	40
R8 (16) – 381 Marulan South Road, Marulan (Lot 1, DP 1190667)	55	50	50	45	40	40
Any other noise sensitive location	55	50	50	45	40	40

Table 4.2 Construction Noise Criteria (ICNG, 2009)

Noise Assessment Location	Daytime standard	Daytime non-standard	Highly Noise Affected (Day Only)	Evening	Night	Sleep Disturbance	
	LAeq (15min)	LAeq (15min)	LAeq (15min)	LAeq (15min)	LAeq (15min)	LAeq (15min)	LAmax
R3 (5) – 113 Green Hills Road Marulan (Lot 2, DP 1060897)	45	40	75	40	40	40	52
R2 (6) – 90 Green Hills Road Marulan (Lot 11, DP 881240)	45	40	75	40	40	40	52
R8 (16) – 381 Marulan South Road, Marulan (Lot 1, DP 1190667)	45	40	75	40	40	40	52
Any other noise sensitive location	45	40	75	40	40	40	52

Table 4.3 Operational Noise Impacts Assessment Criteria

Noise Assessment Location	Day	Evening	Night	
	LAeq (15 min)	LAeq (15 min)	LAeq (15 min)	LA1 (1 min)
R3 (5) – 113 Green Hills Road Marulan (Lot 2, DP 1060897)	40	35	35	52
R2 (6) – 90 Green Hills Road Marulan (Lot 11, DP 881240)	40	35	35	52
R8 (16) – 381 Marulan South Road, Marulan (Lot 1, DP 1190667)	40	35	35	52
Any other noise sensitive location	40	35	35	52

In the tables above the residential receiver locations are shown on the plan in Appendix 3 of the Project Approval. Receiver numbers in parentheses are those identified in the approval prior to the approval of Modification 4 in August 2016.

Noise generated by the development will be measured in accordance with the relevant requirements of the NPI, 2017 and the NBMP as outlined in **Section 6.1** below. It should also be noted that the noise criteria outlined above does not apply if the Proponent has an agreement with the owner/s of the relevant residence or land to exceed the noise criteria, and the Proponent has advised the Department in writing of the terms of this agreement.

5. NOISE MANAGEMENT CONTROLS

This section describes the noise mitigation and management actions currently in place, and to be implemented during construction and ongoing operation of the project.

5.1 Construction Noise Management Objectives and Performance Criteria

The CNMP provides the framework and guidance for the Quarry activities to be conducted in a manner that appropriate control measures are implemented to minimise the potential for adverse construction noise impacts on the amenity, property and safety of quarry neighbours and meet compliance requirements of the CoA of the Project Approval.

The performance criteria will be used to assess the success of the management actions and are outlined in **Table 5.1** below.

Table 5.1 Management Objectives and Performance Criteria

Objective	Performance Criteria
Compliance with regulatory requirements including Project Approval and EPA Environment Protection Licence	No avoidable non compliances
Implement best reasonable and feasible management practices to minimise noise levels emitted during construction	Management controls in the CNMP in place
Identify potential noise sources and their relative contribution to noise impacts from the development	Quarterly review of noise monitoring data
Provided data suitable to demonstrate compliance with the CoA of the Project Approval and subsequent modifications.	Monitoring undertaken as per the Management Plan
Ensure construction noise levels remain below relevant criteria at the nearest residences	Monthly review of monitoring data including complaints Management controls in the CNMP in place

To reasonably manage and minimise cumulative noise impacts generated by the quarry and the Marulan South Limestone Mine, Peppertree Quarry's environment advisor liaises across both operations. This role communicates regularly with both operational teams to reduce operational occurrences of simultaneously loud activities that would otherwise, and if left unmanaged, generate more significant cumulative impacts.

5.2 Construction Noise Management Controls

The primary objective of the following noise management controls is to minimise impacts on the surrounding community. The following hierarchical approach is used to ensure that works comply with the relevant conditions of the Project Approval:

- Quarry operations will be managed to meet the Project Approval and EPL noise criteria, through operational practices and the implementation of reasonable and feasible environmental controls as outlined in **Section 5.3** below**.**
- Where noise levels exceed noise criteria, ensure all controls are in place or determine the need to reduce operations and point of source noise.

- Liaise with the local community regarding scheduled works which are predicted to have increased impacts.

Noise measures to be employed are detailed in Section 5.3 but will include

- Assessment and monitoring of Equipment sound power levels
- Limitation of operating hours restricted to the hours between 7am and 6pm Monday to Friday, and between 8am and 1pm on Saturdays
- Use of weather zone predictive weather forecast dashboard to respond and mange operations where possible noise impacts are identified
- Maintenance of equipment – prestart checks to ensure equipment continues to be fit for purpose.

5.2.1 Best Practice Noise Management

The Independent Audit undertaken in 2018 recommended that the NBMP includes a section on best practice management in the industry and the application at the quarry if relevant. The relevant best practise methodologies have been extrapolated from Australian Government Department of Industry, Innovation and Science Leading Practice - *Sustainable Development Program for the Mining Industry Handbook for Airborne Contaminants, Noise and Vibration* (Commonwealth of Australia 2009).

Table 5.2 outlines the best practice methodologies, the section in which each methodology is addressed in the NBMP, and its application at Peppertree Quarry.

Table 5.2 Peppertree Quarry - Best Practice Methodologies

Best Practice	Addressed in Section	Peppertree Quarry application
Selecting lower noise plant and equipment incorporating available noise control kits.	Section 5.3.4	Implemented, during procurement.
Optimise mine layout to shield noise-generating plant and haul roads.	Section 5.3.4	Implemented, during design.
Apply additional silencing measures for fixed and mobile plant and ventilation fans.	Section 5.3.4	Implemented, during design.
Install acoustic enclosures around process plant.	Section 5.3.2 Section 5.3.4	Implemented, during design.
Utilize ‘smart alarms’ to minimise complaints regarding vehicle reversing alarms.	Section 5.3.3	Implemented, broadband alarms only permitted on site.
Minimise tonal components or impulsive or intermittent characteristics of noise.	Section 6.1.9	Implemented, during design and compliance monitoring
Strategically design bund walls for acoustical screening.	Section 5.3.2 Section 5.3.4	Implemented, during design
Incorporate buffer zones and landscaped setbacks.	Section 5.3.4	Implemented, during design and project planning.

5.3 Noise Management and Mitigation

A range of noise management and mitigation measures will be employed to achieve the construction noise limits and the Conditions of Consent. These measures are detailed below.

5.3.1 Equipment Noise Levels

A comprehensive equipment noise testing program is already implemented at the Quarry. Any new equipment that will be a) used on the Peppertree construction site for more than seven days, and b) is expected to be louder than other similar equipment/activities will be tested respective to the Sound Power Level (Lw) and/or Sound Pressure Level (L_P) limits shown in **Table 5.3** below.

Table 5.3 Sound Power Levels – Construction Equipment

Plant Item	LW, dB(A)	LP at 7m, dB(A)
Komatsu WA800 FEL	114	89
CAT 988 FEL	114	89
Overburden Haul Truck (CAT 773/ 775 or similar)	116	91
Dozer (CAT D8 or equivalent)	118	93
Dozer (CAT D9 or equivalent)	120	95
Dozer (CAT D10 or equivalent)	121	96
Excavator (~3T)	90	65
Excavator (~6T)	95	70
Excavator (~10T)	100	75
Excavator (~20T)	105	80
Excavator (~30T)	110	85
Excavator (~40T)	115	90
Skidsteer Loaders (~1/2 tonne)	107	82
Skidsteer Loaders (~1 tonne)	110	85
Concrete Truck	112	87
Concrete Pump	109	84
Concrete Vibrator	105	80
Bored Piling Rig	110	85
Scraper	110	85
Grader	110	85
Vibratory Roller	114	89
Vibratory Pile Driver	121	96
Impact Piling Rig	134	109
Compressor 600 CFM	100	75
Compressor 1500 CFM	105	80
Concrete Saw	118	93
Jackhammer	113	88
Generator	104	79
Lighting Tower	80	55
Flood Lights	90	65
Cherry Picker	102	77
Mobile Crane	110	85

Where an item of plant is not listed in the table above, a representative sound power level limit may be selected (based on similar plant) and the item is assessed with regard to that limit.

5.3.2 Construction Mitigation

A series of construction-related noise and vibration management measures will be implemented on site (refer section 5.3.3, 5.3.4, 5.3.5, 5.3.6)to ensure construction activities associated with Modification 5 are managed to reduce impacts to nearby sensitive receptors, and to comply with the relevant CoA. These measures will be implemented in conjunction with the Construction mitigation measures outlined below.

- Construction works, including heavy vehicle movements into and out of the site, will be restricted to the hours between 7am and 6pm Monday to Friday, and between 8am and 1pm on Saturdays.
- Provide acoustic enclosures for site compressors and generators, and other noisy plant and equipment used on site during construction.
- Select and locate centralised site activities and material stores as far from noise sensitive receivers as possible.
- plant and equipment will be selected and maintained with due regard to the management measures provided in **Section 5.3.4** below.
- During construction of noise bunds, comply with the construction noise criteria presented in **Section 4.1** in accordance with the *Environmental Noise Control Manual 1994* for the first three months of the construction work. After three months, comply with the daytime operational noise criteria presented in **Section 4** above.

5.3.3 General Management Measures

The Quarry is committed to minimising impact on neighbour's amenity from noise with the following management controls being implemented throughout the life of the operation:

- Implement a combination of predictive meteorological forecasting and noise monitoring data to guide the day to day planning of quarrying operations and the implementation of both proactive and reactive noise mitigation measures to ensure compliance with the relevant conditions of the Project Approval – refer **Sections 5.3.5** and **5.3.6.**
- Minimise noise impacts during adverse weather conditions. Where it is deemed necessary due to offsite disturbances, operations will be restricted. This may include ceasing the loading of trucks or changing start and finish times of crushing operations. This will need to be assessed on an individual basis depending on the weather conditions and the activities occurring at the time.
- From time to time, operations and activities vary onsite. These changes in activities can result in unplanned noise. Examples include loading from stockpiles from different locations, movement of surge materials with excavators, maintenance and/or construction activities. A Change management system is in place to assist in identifying the potential for environmental impacts including noise. This allows the change in activity to be planned to minimise any possible impacts. Should excessive noise be generated the activity is to cease until neighbours can be notified and or the noise mitigated.
- During site inductions outline the site culture of best operational practice including:
  - Avoid dropping materials from height, where practicable
  - Avoid metal-to-metal contact on equipment.
  - Avoid mobile plant clustering near residences.
  - Close openings where appropriate on processing plant.
  - Ensure all covers are in place and closed at all times when fixed and mobile plant is in operation.
  - Inform all potentially impacted residents of the nature of potentially high noise generating works to be carried out, the expected noise levels and duration, as well as contact details.

5.3.4 Management of Plant and Equipment

The Aspects and Impacts Register has identified Quarry plant and equipment have the highest potential for noise impacts and the following controls have been adopted to minimise the potential of Project Approval and EPL exceeding noise criteria:

- Select the most effective mufflers, enclosures and low-noise tool bits and blades for all equipment.
- Select equipment (dozers, drill rigs) with suitable sound power level emissions
- Less annoying alternatives to audible reversing alarms (such as broadband noise emitting models i.e. 'squashed duck', or 'smart' alarms) that provide a safe system of work are used on site, at all times.
- Use alternatives to diesel and petrol engines and pneumatic units, such as hydraulic or electric-controlled units, where feasible and reasonable.
- Reduce throttle settings and turn off equipment and plant when not being used.
- Regularly inspect and maintain equipment to ensure it is in good working order, also check the condition of mufflers. Equipment must not be operated until it is maintained or repaired, where maintenance or repair would address the annoying character of noise identified. This is in line with Site requirements for pre start checks
- Fit for purpose and Pre-start checks are required on all mobile equipment which ensures effective mufflers and reversing alarms are installed.
- For machines with fitted enclosures, check that doors and door seals are in good working order and that the doors close properly against the seals.
- Utilise site topographic detail or structures to shield noise emission sources from the affected receivers, where practicable.
- Incorporate adequate buffer zones and setback distances from noise plant and equipment (or activities on site) and nearby potentially sensitive receptors
- Train loading to be undertaken in the designed train loading facility or via front end loader. Trains to be regularly maintained to reduce track and engine noise. Train engines to be covered.

5.3.5 Monitoring of Meteorological Conditions

Weather conditions have the potential to increase noise levels at the residential receptors in the vicinity of the quarry. Routine monitoring of meteorological conditions (including predictive meteorological forecasting) is conducted, with reference to the on-site meteorological station.

This noise management strategy is of particular importance during overburden (east and west) emplacement works where plant and equipment are elevated when compared to the quarry pit, are more exposed compared to other noise sources on site and as such are more susceptible to the effects of prevailing winds and temperature inversions.

Meteorological data is evaluated to plan on site activities potentially associated with high noise level generating activities, prior to the work being undertaken, and as close as practical to the work. The expected weather conditions and their effect on the noise generated, is considered and plans and/or timing altered if necessary. Meteorological conditions considered are:

- prevailing wind direction and velocity;
- temperature inversions;
- time of day;
- seasonal effects on weather patterns; and
- cloud cover.

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A solar-powered weather station is maintained at Peppertree Quarry. The station is located in the vicinity of Receiver R3 (refer Figure 6.1).

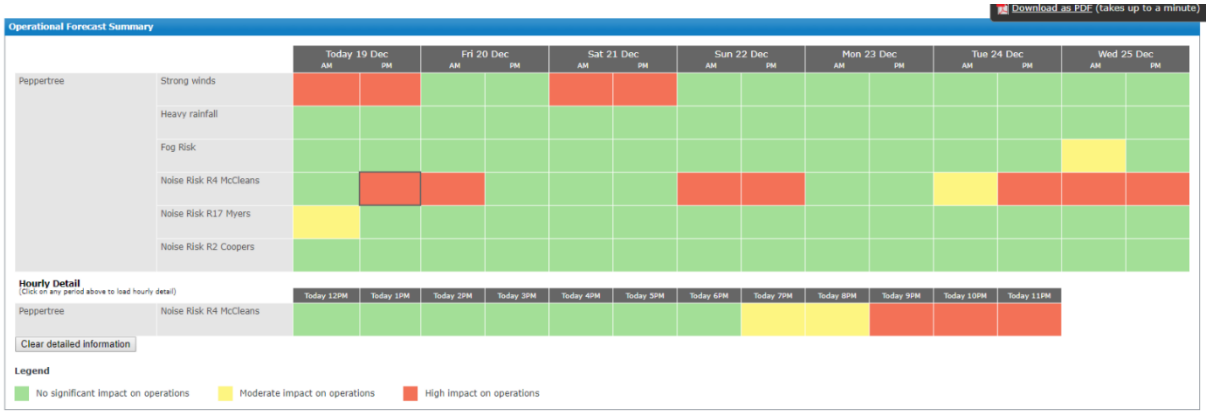
This station consists of solar panels, a weatherproof enclosure which contains a data logger (which reads the sensors) and power supply, and sensors which continuously measure:

- rainfall;
- wind speed and direction (measured at three metres above ground level);
- relative humidity;
- temperature; and
- solar radiation.

The station is equipped with a digital cell phone kit which retrieves data from the logger and transmits it directly to a computer at the site office. The equipment facilitates real-time monitoring of weather conditions.

The weather station is calibrated and serviced on a 2 monthly basis with its data reviewed monthly by an independent consultant to ensure the station is operating in accordance with the *NSW Noise Policy for Industry (EPA 2017)* and *Approved methods for Sampling and Analysis of Air pollutants in NSW (DEC 2007).*

In 2015, the Quarry commenced the utilisation of a commercially available weather forecasting dashboard which uses local weather data in providing predictions of meteorological conditions that may generate extreme noise events at nominated sensitive receivers (refer below).



Forecasts of the potential for noise impacts are emailed to the Peppertree Quarry operations team to allow planning of activities accordingly. This may include the stopping or timetabling of operations outside of the identified potential noise impacts. The Pit Supervisor responsible for the SWOE construction will advise contractors of any required changes of operation based upon the forecast.

5.3.6 Proactive Noise Management – Real Time Noise Monitoring

An omni directional Real time noise monitor has been installed at one sensitive receiver (R3, Greenhills Road, Marulan – refer Figure 6.1) to enable proactive noise management. The real time noise monitor, known as a Barn Owl records LAmax, LA10, LA90 and LAeq, over a 15minute time period. The data is displayed both in graphical and tabular form. This data and local meteorological information are streamed in real time to a website online at the quarry. It was initially proposed that this monitor would alarm in the control room when noise levels at the receiver had the potential to exceed criteria.

However, the real time noise monitor is currently unable to accurately determine the contribution the quarry makes to noise levels in the area due to the complex noise environment. Extraneous noise sources include road traffic, rail noise, an adjacent mining operation and rural activities. Instead, noise levels and local meteorological data available in real time are reviewed by quarry personnel once a day in the mornings (usually associated with temperature inversions) and in response to complaints. Local prevailing weather conditions, particularly temperature inversions in the early mornings and evenings

in winter, contribute to enhanced noise levels. Quarry personnel are aware of this, and checks of equipment for excessive noise are part of the daily morning inspection process

If activities at the quarry are found to be contributing to elevated noise levels, mitigation measures are immediately implemented including relocating operations temporarily, reducing the number of plant or stopping the operation. Checks are made to ensure that noise levels are well below the relevant criteria prior to bringing the quarry back up to full operation

A review is currently underway to relocate the real time noise monitor closer to the quarry. The monitor will be programmed to use the measured levels and weather to calculate received noise levels at the sensitive receiver. Following relocation of the monitor, a more detailed protocol will be developed which takes into account the following:

- Data exclusion rules such as a low pass filter to minimise extraneous noise and low frequency will be considered.
- Live stream of the noise level graph to the Control Room, including trigger alert level(s). A traffic light system will be considered to assist in preparing for/avoiding a potential exceedance.
- The monitor will be programmed to notify the Control Room and relevant personnel when each trigger level is reached. An alarm will be sent via email and text to relevant personnel, including the Quarry Manager and Environmental Officer
- If an alarm is received, quarry personnel will immediately review the relevant audio file(s) to confirm the quarry as the primary noise source and the levels being received.
- Weather data (wind speed, wind direction and sigma theta/stability class as a minimum) from the onsite weather station will be downloaded and reviewed for the period of elevated noise levels to confirm that the noise event has not been triggered by weather conditions such as rainfall or elevated wind speeds. Met data will be used in accordance with the relevant procedures and exemptions (including certain meteorological conditions) as detailed in the NSW Noise Policy for Industry, 2017.
- If activities at the quarry are contributing to elevated noise levels, mitigation measures will be immediately implemented such as relocating operations temporarily, reducing the number of plant or stopping the operation.
- If operations have been stopped or modified, they will recommence when conditions are more favourable. Checks will be made when bringing the operation back online to ensure that noise levels are well below the relevant criteria.
- • If two consecutive predicted levels at the sensitive receiver exceed the relevant criteria, attended monitoring by a qualified acoustic consultant will be conducted within the following 7 days”

A contract with RWDI is in place for the maintenance and calibration of the equipment in accordance with manufacturers specifications and Australian Standards.

5.4 Operational Hours

Boral will comply with the approved construction hours outlined in the Project Approval, reproduced in **Table 5.4** below.

Table 5.4 Hours of Operations

Activity	Day	Time
Construction Works	Monday-Friday	7:00 AM to 6:00 PM
	Saturday	8:00 AM to 1:00 PM
	Sunday and public holidays	None
Topsoil/overburden removal/emplacement and transportation of Quarry products by road	Any day	7:00 AM to 7:00 PM
Blasting	Monday-Saturday	9:00 AM to 5:00 PM
	Sunday and public holidays	None
In-pit activities (including drilling, extraction, processing, and transfer or material out of the pit)	Any day	5:00 AM to 11:00 PM
Out-of-pit activities (including processing, stockpiling, train loading and distribution, and maintenance)	Any day	24 hours

Additionally, between the hours of 5:00am to 7:00am and 7:00pm to 11:00pm the:

- in-pit crusher must not operate above RL 555; and
- mobile plant in the pit, including excavators, front-end loaders and trucks, must not operate above RL 570.

The following activities may be carried out outside the hours specified in Table 1 of the project approval (MOD 5).

- delivery or dispatch of materials as requested by Police or other public authorities; and
- emergency work to avoid the loss of lives, property or to prevent environmental harm.
- In such circumstances, the Proponent must notify the Department and affected residents prior to undertaking the activities, or as soon as is practical thereafter.

5.5 Additional Mitigation Measures

If after the application of standard noise mitigation measures there is still potential for construction noise to exceed the limits, additional noise management measures outlined in **Table 5.5** will be implemented.

Table 5.5 Additional Noise Management Measures

Management Measure	Description
Negotiated agreement	Agreements may be negotiated with residents close to construction works that are likely to incur unreasonably high impacts over an extended period of time.
Monitoring	Where specific construction activities are likely to exceed the relevant noise or vibration goals, monitoring may be conducted at the affected receiver(s) or a nominated representative location (typically the nearest receiver where more than one receiver have been identified). Monitoring can be in the form of either

	unattended logging or operator attended surveys. The purpose of monitoring is to inform the relevant personnel when the noise or vibration goal has been exceeded so that additional management measures may be implemented.
Individual Briefings	Individual briefings are used to inform stakeholders about the impacts of high noise activities and mitigation measures that will be implemented. Communications representatives from the contractor would visit identified stakeholders at least 48 hours ahead of potentially disturbing construction activities. Individual briefings provide affected stakeholders with personalised contact and tailored advice, with the opportunity to comment on the project.
Phone calls and emails	Phone calls and/or emails detailing relevant information would be made to identified/affected stakeholders within 7 days of proposed work. Phone calls and/or emails provide affected stakeholders with personalised contact and tailored advice, with the opportunity to provide comments on the proposed work and specific needs etc.

6. NOISE MONITORING PROCEDURES

This section details the noise monitoring program, including the monitoring sites, equipment and frequency of monitoring.

The Quarry monitors levels of noise associated with construction and operations in accordance with the Project Approval CoAs and EPL requirements.

A program for low frequency noise has been developed and implemented. Monitoring will occur on a quarterly basis in line with the existing noise monitoring program with the results reported in the quarterly noise report.

Five sites associated with identified sensitive receivers are monitored quarterly for noise.

An on-site weather station has been installed to provide real-time monitoring of meteorological conditions throughout the quarry operations. In addition, the Quarry utilises a commercially available weather forecasting dashboard which uses local weather data in providing predictions of meteorological conditions that may generate extreme noise events.

A real time noise monitor is in place at one sensitive receiver.

A summary of noise monitoring to be conducted is provided in **Table 6.1** below.

Table 6.1 Summary of Monitoring Program

Site	Location	Parameter	Monitoring Period[1]	Monitoring Collection	Equipment
R2	Greenhills Road	Noise	48 hours for unattended, three to four attended events.	Quarterly	Type 1 or Type 2 Sound Level Meter / noise logger.
R3	Greenhills Road	Noise	48 hours for unattended, three to four attended events. Online real time noise monitoring	Quarterly ongoing	Type 1 or Type 2 Sound Level Meter / noise logger. RION NL-52 sound level meter / logger
R8	Marulan South Road	Noise	48 hours for unattended, three to four attended events.	Quarterly	Type 1 or Type 2 Sound Level Meter / noise logger.
R4	Marulan Creek Road	Noise	48 hours for unattended, three to four attended events.	Quarterly	Type 1 or Type 2 Sound Level Meter / noise logger.
R17	Long Point Road	Noise	48 hours for unattended, three to four attended events.	Quarterly	Type 1 or Type 2 Sound Level Meter / noise logger.
WS1	Quarry east	Meteorological Conditions	Continuous	N/A – automatic download to PC	Weather Station

1. *Continuous monitoring excludes periods for instrument calibrations/ maintenance and extended periods of data downloads.*

6.1 Noise Monitoring

6.1.1 Introduction

Noise monitoring shall be undertaken with due regard to and in accordance with the procedures presented below. The findings of noise monitoring will guide the day to day planning of quarrying operations and the implementation of both proactive and reactive noise mitigation and management measures to ensure compliance with the relevant CoA.

Noise monitoring is undertaken by independent expert noise consultants. All monitoring is undertaken and assessed in accordance with NSW Noise Policy for Industry (EPA, 2017).

If directed by the Secretary, Boral will ensure real-time unattended noise monitoring is implemented and/or supplementary attended noise measurements are conducted. At the time this CNMP was prepared Boral had implemented a sophisticated real-time web-accessible noise/weather monitoring system. The specification and requirements of any additional noise monitoring or measurement shall be as per those presented below.

6.1.2 Monitoring Equipment

All acoustic instrumentation shall meet with the requirements of Standards Australia AS IEC 61672.1–2004 (AS61672) – *Electro Acoustics - Sound Level Meters Specifications Monitoring* or Standards Australia AS1259.2-1990 (AS1259) – *Acoustics – Sound Level Meters – Integrating Averaging*, as applicable to the device.

Noise measurements will be taken using a Type 1 or Type 2 'integrating-averaging' Sound Level Meter (SLM) and used for operator attended noise monitoring. The SLM will be capable of conducting third octave analysis and shall be set to frequency weighting 'A', a 'fast' time weighting will apply in all cases. Measurements shall be completed at the receiver locations identified in **Figure 6.1** and be at least 3.5m from any reflecting structure other than the ground, with the SLM microphone placed between 1.2 and 1.5 metres above the ground. Noise loggers shall be programmed to continuously record statistical noise level indices in 15 minute intervals which may include the L_{Amax}, L_{A1}, L_{A10}, L_{A90}, L_{Amin} and the L_{Aeq}.

Instrument calibration (all devices) shall be checked before and after each measurement survey, with the variation in calibrated levels not exceeding ±0.5 dB(A). A hand held calibrator will be used to do these field checks, it will comply meet with the requirements of Standards Australia AS/IEC 60942:2004/IEC 60942:2003 (IEC60942) – Australian Standard – *Electroacoustics – Sound Calibrators*, or similar.

All noise measurements shall be accompanied by both qualitative description (including cloud cover) and quantitative measurements of local weather conditions throughout the survey period.

6.1.3 Site Noise Level Audits

As part of the noise management strategy, quarterly noise monitoring will provide for a regular review of noise generating plant and equipment, with noise measurements of new or noisy plant being conducted if they are considered to be acoustically significant.

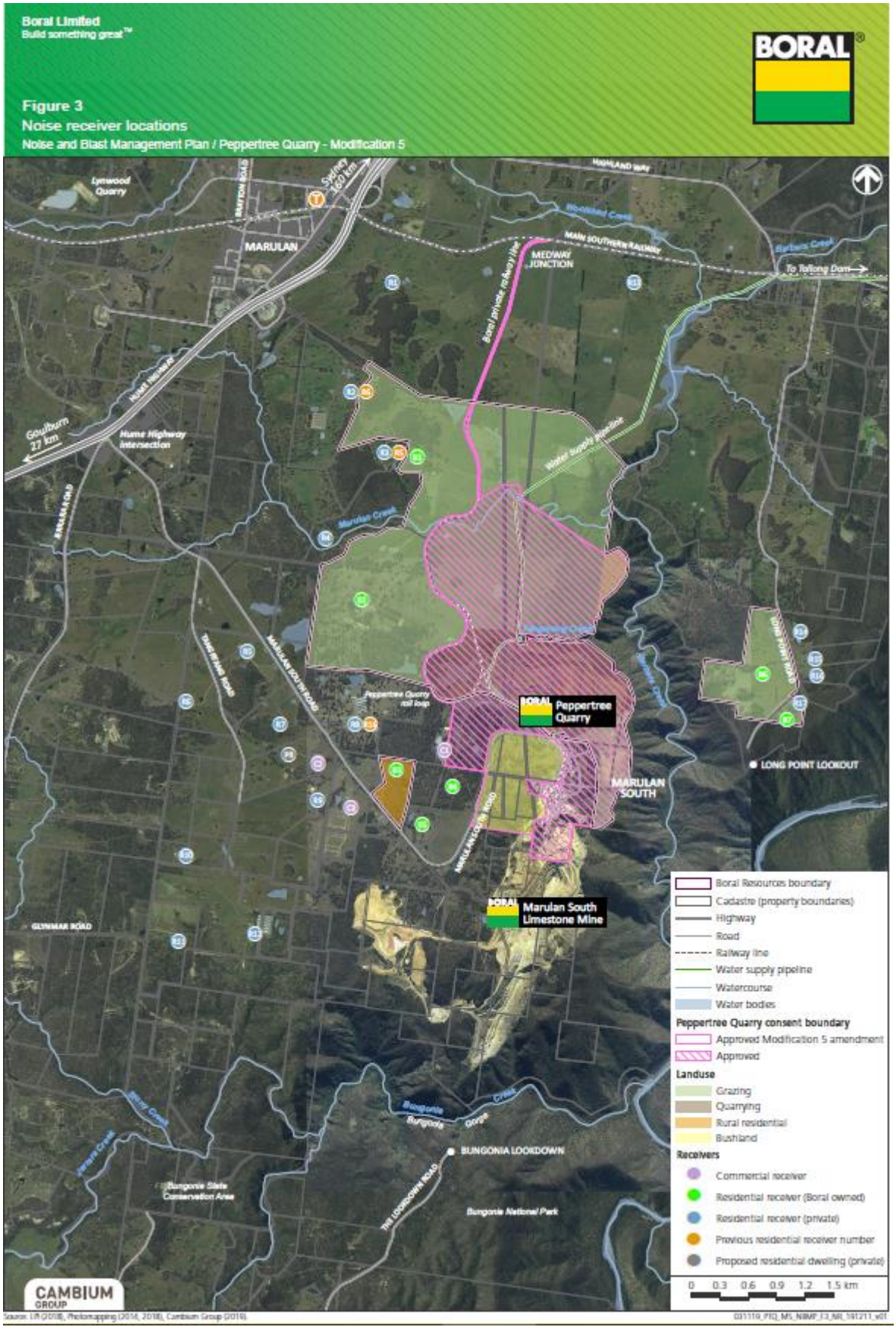
6.1.4 Frequency of Noise Monitoring

Noise is monitored quarterly and consists of continuous unattended and operator attended noise monitoring.

6.1.5 Noise Monitoring Locations

The key monitoring locations representative of the surrounding receivers, and identified in the Project Approval, are to be used for evaluating and assessing noise emissions from the project. Boral will ensure that the noise generated by the project does not exceed the noise impact assessment criteria (refer **Section 4**) at these residential receiver locations. Details of these receiver locations are summarised in **Table 6.1** above and visually presented in **Figure 6.1** below.

Figure 6.1 Sensitive Receptor Locations



6.1.6 Operator Attended Noise Surveys

The SLM shall be programmed to record statistical noise levels including the LAmax, LA1, LA10, LA90, LAmin and the LAeq parameters, for each measurement conducted.

Operator-attended noise measurements shall be conducted at each of the five locations to quantify and characterise the maximum (LAmax or LA1, 1minute) and energy equivalent (LAeq) noise levels from quarry operations over a 15 minute measurement period. Noise levels from extraneous, ambient and background noise sources and emissions should be quantified and reported upon where necessary.

The operator shall quantify site noise emissions and estimate the LAeq, Period noise contribution from the operation for the day and night time periods, as well as the overall level of ambient noise

During the attended noise measurements, the operator shall record any significant noise sources (i.e. haul trucks, dozers, etc.). In addition, the operator shall obtain copies of the relevant fixed plant and mobile equipment operating shift logs that could be included in the noise monitoring report, if relevant.

Should it be identified at the time of monitoring that there is concern with compliance with the noise criteria, the operator is to advise the Environment and Stakeholder advisor and identified operations will cease to determine the issue.

6.1.7 Unattended Noise Monitoring

To supplement the operator-attended measurements, unattended continuous noise monitoring will be undertaken to quantify overall ambient noise levels resulting from quarry operations as well as other industrial noise sources in the area. Data from unattended continuous noise logging will allow trends to be identified in ambient noise levels surrounding the quarry and the assessment of cumulative noise impacts from all industrial related noise sources in the area.

Unattended noise monitoring is undertaken on a quarterly basis at the same five identified sensitive receiver sites. Unattended monitoring is conducted over a 48 hour period where possible in line with operator attended noise surveys.

6.1.8 Data Analysis and Determining Compliance

The noise measurements shall be guided by the requirements of AS1055 and NSW Noise Policy for Industry (EPA, 2017). The site noise level contribution (LAeq, 15min and/or LA1, 1min) for the quarry shall be determined in the absence of any influential, extraneous or erroneous sound that is audibly distinguishable to that of the quarry, and compared the operational noise assessment criteria to determine compliance.

The LAeq, Period cumulative noise level contributions from the operations as well as the overall ambient noise levels together with the weather and quarry operating conditions shall be compiled on a quarterly basis and reported as per the EPL requirements on the nominated Peppertree Quarry website

It should be noted that in instances where monitoring may not be conducted at residential receivers due to access limitations, noise levels may be measured at the nearest accessible point and extrapolated via calculation to the nearest residential receiver location for comparison to noise assessment criteria.

The unattended ambient noise logger data from each monitoring location, together with the weather shall be presented in the quarterly noise monitoring report. Prior to further analysis, the ambient noise level data from each monitoring location which correlate with periods of unstable weather (i.e. rainfall greater than 0.5 mm or wind speed greater than 5 m/s) at the microphone shall be discarded.

It should be noted that the ambient noise levels do not necessarily reflect the contributed level of noise emissions from the quarry operations. The ambient noise level data quantifies the overall noise level

at a given location independent of its source or character. The ambient noise monitoring data will provide indications of the cumulative noise emissions from all industrial noise sources and amenity levels.

Should the report, once received identify concerns of noncompliance, identified sources of the noise will be investigated in line with Section 7.2.

6.1.9 Accounting for Annoying Noise Characteristics – Low-frequency Noise

The NPI, 2017 states that a noise source may exhibit a range of particular characteristics that increase annoyance, such as tones, irregularity, low frequency noise and intermittent noise. Where this is the case, an adjustment ("modifying factor" penalty) is applied to the source noise level received at an assessment point before it is compared with criteria to account for the additional annoyance caused by the particular characteristic.

Application of these modifying factors is described in Fact Sheet C of the NPI, 2017. It also provides the following definitions to support the modifying factor corrections:

- Tonal Noise – containing a prominent frequency and characterised by a definite pitch.
- Low Frequency Noise – noise with an unbalanced spectrum and containing major components within the low-frequency range (10–160 Hz) of the frequency spectrum.
- Intermittent Noise – noise where the level suddenly drops/increases several times during the assessment period, with a noticeable change in source noise level of at least 5 dB(A); for example, equipment cycling on and off.

Table C1 of Fact Sheet C (NPI, 2017) sets out the corrections to be applied and is reproduced below as **Table 6.2.** The corrections specified for tonal, intermittent and low-frequency noise are to be added to the measured or predicted noise levels at the receiver before comparison with the project noise trigger levels. The adjustments for duration are to be applied to the criterion.

All noise levels generated by the Quarry will be assessed with due regard to these modifying factor penalties, and in accordance with the requirements presented in the CoA and EPL. Tonal noise and low frequency noise (LFN) are most relevant to the Quarry and those modifying corrections are reproduced in **Table 6.3** below.

In accordance with the NPI, 2017 a maximum correction (considering other factors of intermittent noise and duration) of up to 10 dBA will be applied where two or more modifying factors are present. Where a source emits tonal and low frequency noise, only one 5 dBA correction will be applied if the tone is in the low frequency range.

One-third octave low-frequency noise thresholds referenced in Table C2 of the NPI, 2017 and **Table 6.3** of this report are identified in **Table 6.2**.

Table 6.2 One-third octave low-frequency noise thresholds

Hz/dB(Z)	**One-third octave LZeq,15min threshold level**												
Frequency (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
dB(Z)	92	89	86	77	69	61	54	50	50	48	48	46	44

Table 6.3 Modifying Factors (NPI, 2017)

Factor	Assessment / Measurement	When to Apply	Correction	Comments
Tonal Noise	One-third octave band analysis using the objective method for assessing the audibility of tones in noise – simplified method (ISO1996.2-2007 – Annex D).	Level of one-third octave band exceeds the level of the adjacent bands on both sides by: • 5 dB or more if the centre frequency of the band containing the tone is in the range 500–10,000 Hz • 8 dB or more if the centre frequency of the band containing the tone is in the range 160–400 Hz • 15 dB or more if the centre frequency of the band containing the tone is in the range 25–125 Hz.	5 dB[2,3]	Third octave measurements should be undertaken using unweighted or Z-weighted measurements. Note: Narrow-band analysis using the reference method in ISO1996-2:2007, Annex C may be required by the consent/regulatory authority where it appears that a tone is not being adequately identified, e.g. where it appears that the tonal energy is at or close to the third octave band limits of contiguous bands.
Low-frequency Noise	Measurement of source contribution C-weighted and A-weighted level and one-third octave measurements in the range 10 – 160 Hz	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 2-dB(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 5-dB(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.	2 or 5 dB[2]	A difference of 15 dB or more between C-and A-weighted measurements identifies the potential for an unbalance spectrum and potential increased annoyance. The values in Table C2 are derived from Moorhouse (2011) for DEFRA fluctuating low-frequency noise criteria with corrections to reflect external assessment locations.

1. *Corrections to be added to the measured or predicted levels, except in the case of duration where the adjustment is to be made to the criterion.*
2. *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.*
3. *Where narrow-band analysis using the reference method is required, as outlined in column 5, the correction will be determined by the ISO1996-2:2007 standard.*

7. CONSTRUCTION NOISE RESPONSE PLAN

This section outlines the non-compliance and incident planning and response mechanisms in place for the project.

7.1 Introduction

The objective of this section is to provide procedures for responding to impacts identified by the monitoring program and by routine monitoring of the noise and blast management controls. It is also designed to act as a response plan for taking action in the unlikely event that an unforeseen incident occurs at the site (e.g. failure of noise control equipment or procedures).

An incident as defined in the Project Approval as “an occurrence or set of circumstances that causes or threatens to cause material harm and which may or may not be or cause a non-compliance.” Responding to identified impacts will be the responsibility of the Quarry Manager.

Schedule 2, Condition D9 and D10 of the Project Approval details the reporting requirements for identified incidents/non-compliances as a result of activities being undertaken on site (construction and operations). These conditions state that upon becoming aware any incident or non-compliance, the Proponent must notify the Department (and other relevant agencies) with details of the incident or non-compliance.

The response plans for incidents are detailed below.

7.2 Noise Monitoring - Operational Criteria Exceedance / Non Compliance Response

Noise monitoring exceedances / non-compliance may result due to activities at the Quarry or due to the surrounding environmental conditions and other activities. Exceedances are notified once the results have been supplied by the consultant undertaking the monitoring or identified at the time of attended operator monitoring.

Should low frequency noise (as outlined in **Section 6.1.9** above) be identified as an area of concern during monitoring or identified through a complaint, it will be treated as an operational noise exceedance.

A non-compliance is defined in the Project Approval, Definitions as “An occurrence or set of circumstances or development that is a breach of this approval”

Initial notification of a noncompliance and reporting will be conducted In accordance with Condition D10, Part D, where by

“ Within seven days of becoming aware of a non-compliance, the Applicant must notify the Department of the non-compliance. The notification must be in writing via the Major Projects Website and identify the development (including the development application number and name), set out the condition of this consent that the development is non-compliant with, the way in which it does not comply and the reasons for the non-compliance (if known) and what actions have been, or will be, undertaken to address the non-compliance. “

Should an exceedance / noncompliance be identified the following actions will be taken:

- An investigation will be undertaken to establish the root cause of the exceedance / non-compliance. This will include checking weather conditions at the time of the exceedance / non-compliance, Peppertree Quarry operations and other possible impacts.
- Subject to the findings of the investigation actions will be taken to minimise any reoccurrence of the exceedance / non-compliance.
- The identified cause of the impact and the selected response will be formally documented in an incident response report.

- The EPA, DPE and affected residents will be notified of the non-compliance/potential impact within seven days of its identification.

7.3 Noise Incident Response

Adverse noise impacts are likely to be associated with extensive construction activities, malfunction of the site's engineering controls, or operational procedures. This would potentially include:

- Noise from train movements.
- Vehicle movements.
- Failure of equipment due to lack of maintenance.

An incident may include a noise complaint.

Incident notification and reporting will be conducted In accordance with Condition D9, Part D, where by

"*The Proponent must immediately notify the Secretary and any other relevant agencies of any incident*".

The notification must be in writing to compliance@planning.nsw.gov.au identifying the project (application number and name) along with the location and nature of the incident.

Once it is identified that a noise incident has occurred, the following actions will be taken:

- Impacted operations to be stopped if necessary, until appropriate control systems can be implemented or repaired.
- An investigation will be undertaken to establish the root cause.

Subject to the findings of the investigation actions will be taken to repair, replace or change the identified cause of the incident. These actions will be completed by appropriately qualified personnel or consultants. At all times, operations will ensure that any ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible.

- The identified cause of the incident and the selected response will be formally documented in an incident response report.
- The EPA and DPE will be notified of the incident/impact/potential impact once an incident has been identified

Training will be undertaken, if changes are required to procedures or operations.

7.4 Noise monitoring - Land Acquisition Criteria Exceedance Response

7.4.1 Notification of Exceedances

As soon as practicable and no longer than seven days after obtaining monitoring results showing an exceedance of any noise criterion, Boral must provide the details of the exceedance to any affected landowners and/or tenants.

7.4.2 Independent Review

An Independent Review process as outlined in Conditions C2 to 7 will be implemented.

7.4.3 Land Acquisition

Should a written request from a land owner be received in regards to noise, Boral will initiate the process that is outlined in CoA C8 and C9 of the Conditions of Approval.

7.5 Community Complaints

An Environmental hotline is provided to the local community to make contact directly with the Environment and Stakeholder Advisor of the Peppertree Quarry. This hotline is advised to the community via the monthly newsletter and on the website.

In the first instance, after receiving a complaint, the ESA will attend the location of the complaint to confirm the noise source, Quarry operations and the weather conditions. Investigations into the complaint will be undertaken and findings reported to the complainant.

It may be identified that additional noise monitoring may be required. Depending on the type of complaint, and location, several measurement methods and techniques can be utilised to identify the noise source causing the complaint. Such methods may include:

- operator attended measurement at the affected location combined with audio recordings or at an alternate representative location;
- unattended noise monitoring;
- real-time noise monitoring combined with audio recordings;
- calculation from near field measurements; and
- a combination of any or all the methods shown.

If monitoring is required, findings will be made available to the complainant.

In terms of complaints, Boral will record details of all complaints received in the organisation's Safety and Environment System and ensure that a response is provided to the complainant as soon as practicable.

Further, Boral will make available a report on complaints received to the Community Consultative Committee (CCC) and include a summary in the Annual Review. A complaints register is also available on the Peppertree Quarry website.

7.6 Contingency Plan

Peppertree Quarry has in place an Aspects and Impacts Register which is reviewed every two years, by the ESA. This risk register identifies potential sources of noise impacts from operations and equipment and identifies controls to manage the potential for noise.

This plan allows the quarry to assess risks and have controls either in place or at least to understand what may be needed, in the event of an unforeseen issue.

An Emergency response plan and a Pollution Incident Response Management Plan are also in place, providing guidance on general management of unforeseen incidents.

Should a complaint be received, the site will address the source of the noise, by the most reasonable and feasible mitigation measure available. In relation to the SWOE construction, this may include modifying HME operations, dumping operations or hauling operations.

Should an exceedance be registered attributable to the SWOE construction during independent noise monitoring, HME operations may cease, with dumping and hauling operations being altered.

At all times, operations will ensure that any ongoing impacts reduce to levels below relevant impact assessment criteria as quickly as possible.

8. Management Plan Implementation and Improvement

This section outlines the actions needed to ensure the effective implementation of this management plan (including reporting and review requirements).

8.1 Training and Awareness

8.1.1 Induction

Every employee and contractors working onsite must be inducted. The Peppertree Quarry induction covers the controls associated with managing potential impacts from noise, particularly during construction activities.

8.1.1.1 Site Specific Training

Where identified by management representatives, additional site specific training will be developed, implemented and delivered to relevant personnel and contractors. Tool box talks will be undertaken with all staff and contractors associated with construction works outlining the requirements of the relevant Consent and its conditions of consent. They will be made aware that they must comply with the conditions of consent.

8.2 Reporting and Review

8.2.1 Regulatory Compliance

The site and all staff members will be aware of regulatory noise limits to ensure the necessary controls and monitoring is carried out for the purpose of verifying compliance.

Regulatory documents should be periodically reviewed for site compliance with noise management obligations, and should include (but not be limited to) the following:

- environmental licences; and
- planning consents.

Compliance with relevant criteria will be managed by appropriate operational management, which includes:

- maintenance and inspection of pollution controls associated with noise management; and
- application of relevant procedures and protocols.

8.2.2 Community Communication

Boral will ensure that the local community is kept informed by way of periodic newsletters, leaflets, local newspaper advertisements and the Quarry web page of the progress of the Quarry, including details of the environmental hotline. A monthly Boral newsletter will be prepared by the Peppertree Quarry Environment and Stakeholder Advisor. This Newsletter will be included in the Discover Marulan local community newspaper. The Boral newsletter provides updates on operations and provides details of the environmental hotline.

A copy of the newsletter is maintained on the Boral Peppertree Quarry website.

Community Consultative Committee meetings are used to inform the committee of the general progress of noise monitoring and to advise of any variation to the monitoring programs. These meetings are held quarterly with community and local government representatives. Minutes of the meetings are provided on the Boral Peppertree Quarry website.

The Boral Peppertree Quarry website is reviewed annually and updated quarterly with minutes, newsletters, and other supporting documents required as per CoA D16.

As per Condition D 16, the following documents are also reported on the Boral websites.
Before the commencement of construction until the completion of all rehabilitation required under this consent, the Applicant must:

a) make the following information and documents (as they are obtained, approved or as otherwise stipulated within the conditions of this consent) publicly available on its website:

(i) the document/s listed in condition A2(c);

(ii) all current statutory approvals for the development;

(iii) all approved strategies, plans and programs required under the conditions of this consent;

(iv) minutes of CCC meetings;

(v) regular reporting on the environmental performance of the development in accordance with the reporting requirements in any plans or programs approved under the conditions of this consent;

(vi) a comprehensive summary of the monitoring results of the development, reported in accordance with the specifications in any conditions of this consent, or any approved plans and programs;

(vii) a summary of the current stage and progress of the development;

(viii) contact details to enquire about the development or to make a complaint;

(ix) a complaints register, updated monthly;

(x) the Annual Reviews of the development;

(xi) audit reports prepared as part of any Independent Environmental Audit of the development and the Applicant's response to the recommendations in any audit report;

(xii) any other matter required by the Planning Secretary; and

b) keep such information up to date, to the satisfaction of the Planning Secretary.

Community Communication is the responsibility of the Environment and Stakeholder Advisor for Peppertree Quarry.

Quarterly report noise data is presented at the CCC meetings and made publicly available on the website. This is an Environment Protection Licence requirement under the Protection of the Environment Operations (POEO) regulations.

The Annual review, also available on the website has annual and historical reporting of the noise data.

8.3 Reporting

8.3.1 Annual Review (AR)

The ESA is responsible for managing the environmental reporting program and arranging specialist consultants to prepare reports, as required. The activities and performance outcomes of the CNMP will be presented in the Annual Review (AR).

This will include detailed assessment of monitoring results collected over the course of the CNMP, an evaluation of any trends occurring across the site, any community/stakeholder complaints or non-conformances with licences/criteria and recommendations for management actions.

By the end of March in each year after the commencement of project, or other timeframe agreed by the Secretary, a report must be submitted to the Department reviewing the environmental performance of the project, to the satisfaction of the Secretary. This review must:

- describe the project (including rehabilitation) that were carried out in the previous calendar year, and the project that are proposed to be carried out over the current calendar year;

- include a comprehensive review of the monitoring results and complaints records of the project over the previous calendar year, which includes a comparison of these results against the:
  - relevant statutory requirements, limits or performance measures/criteria;
  - requirements of any plan or program required under this approval;
  - monitoring results of previous years; and
  - relevant predictions in MOD5;
- identify any non-compliance over the past calendar year, and describe what actions were (or are being) taken to rectify the non-compliance and avoid reoccurrence;
- evaluate and report on:
  - the effectiveness of noise management systems; and
  - compliance with the performance measures, criteria and operating conditions in this approval;
- identify any trends in the monitoring data over the life of the project;
- identify any discrepancies between the predicted and actual impacts of the project, and analyse the potential cause of any significant discrepancies; and
- describe what measures will be implemented over the next calendar year to improve the environmental performance of the project.

Copies of the Annual Review are submitted to Council and made available to the CCC and any interested person upon request. A copy of the Annual Review will also be submitted to the EPA.

8.3.2 EPL Data and Annual Return

In accordance with EPL No. 13088, all data associated with monitoring of dust, noise and blasting events is posted onto the following dedicated website for the Quarry:

https://www.boral.com.au/locations/boral-marulan-south-operations

In addition, an EPL Annual Return, which provides a statement of compliance with the licence conditions within 60-days after the anniversary date, is issued to the EPA.

8.3.3 Noise Monitoring Report

All routine monitoring results are documented and reported on a quarterly basis.

Quarterly reports consist of the following information:

- Summary of all attended and unattended noise monitoring results;
- Contributed noise levels from the Quarry operation;
- Statement of compliance/ non-compliance; and
- Meteorological conditions reported in accordance with the NSW NPI, 2017.

This information shall form the basis of the data included in the Annual Review, which shall also report on any mitigation investigation and the implementation and effectiveness of these measures, to the satisfaction of the Secretary.

The data from the monitoring reports is compiled and presented online as a requirement of the Protection of the Environment Operations (POEO) Environment Protection licence reporting.

8.3.4 Internal Reporting

In accordance with the HSEQMS and corporate divisional requirements a regular report on environmental compliance and performance is prepared by the ESA which is distributed to senior divisional managers for review for provision of additional resources that may be required to mitigate a significant environmental issue. The Boral Group Environmental Advisor is also provided with an overview of any significant matters, which may be escalated to Board level.

8.3.5 Incident Reporting

Incident notification and reporting will be conducted In accordance with Condition D9, , where by "*The Proponent must immediately notify the Secretary and any other relevant agencies of any incident*".

The notification must be in writing to compliance@planning.nsw.gov.au identifying the project (application number and name) along with the location and nature of the incident.

An incident as defined in the Project Approval, Schedule A is deemed to be

"An occurrence or set of circumstances that causes or threatens to cause material harm and which may or may not be or cause a non-compliance"

Incident reporting will also be undertaken in accordance with Condition R2 of the EPA Environment Protection Licence which states "*The licensee or its employees must notify all relevant authorities of incidents causing or threatening material harm to the environment immediately after the person becomes aware of the incident in accordance with the requirements of Part 5.7 of the Act."*

In accordance with Appendix 8 of the Approval and Condition R3 of the EPA EPL,

A written incident notification addressing the requirements set out below must be submitted via the Major Projects Website within seven days after the Applicant becomes aware of an incident. Notification is required to be given under this condition even if the Applicant fails to give the notification required under condition D9 or, having given such notification, subsequently forms the view that an incident has not occurred.

2. Written notification of an incident must:

a. identify the development and application number;

b. provide details of the incident (date, time, location, a brief description of what occurred and why it is classified as an incident);

c. identify how the incident was detected;

d. identify when the Applicant became aware of the incident;

e. identify any actual or potential non-compliance with conditions of consent;

f. describe what immediate steps were taken in relation to the incident;

g. identify further action(s) that will be taken in relation to the incident; and

h. identify a development contact for further communication regarding the incident.

3. Within 30 days of the date on which the incident occurred or as otherwise agreed to by the Planning Secretary, the Applicant must provide the Planning Secretary and any relevant public authorities (as determined by the Planning Secretary) with a detailed report on the incident addressing all requirements below, and such further reports as may be requested.

4. The Incident Report must include:

a. a summary of the incident;

b. outcomes of an incident investigation, including identification of the cause of the incident;

c. details of the corrective and preventative actions that have been, or will be, implemented to address the incident and prevent recurrence; and

d. details of any communication with other stakeholders regarding the incident.

8.3.6 Auditing

Boral has an established corporate and divisional risk-based audit program that periodically assess operational sites for conformance with HSEQMS requirements.

In accordance with the requirements of Condition D13 of Schedule 2 (Part D), within 3 years of the date of the commencement of construction and every 3 years thereafter, unless the Secretary directs otherwise, Boral will commission and pay the full cost of an Independent Environmental Audit of the project. The adequacy of this CNMP will be included in the Independent Environmental Audit. An Independent Audit of the Quarry was conducted in 2018 and the next Audit is due in 2021.

Within three months of commencing the Independent Environmental Audit, Boral will submit a copy of the audit report to the Secretary (and any other NSW agency that requests it), together with its response to any recommendations contained in the audit report, and a timetable for the implementation of the recommendations. The recommendations must be implemented to the satisfaction of the Secretary.

8.3.7 Continual Improvement

Opportunities for improvement of noise-related impacts will be discussed internally at toolbox and WHS meetings, in conjunction with Quarry personnel and contractors. These opportunities would be presented to the Quarry Manager for consideration. Any changes to operations as a result will be reported on as part of the Annual Review or, where relevant, reflected in an updated Plan.

In addition, general compliance, noise monitoring outcomes and the number of complaints would be used as an indication of the effectiveness of the Site's management of noise. Incidents, Audit findings and issues identified via quarterly monitoring would be triggers for the review of the operations noise management.

8.3.8 Review of this Management Plan

This CNMP will be reviewed periodically by the Environment and Stakeholder Advisor to determine the efficacy of the Plan and ensure it continues to fulfil its intended purpose. This will allow for and promote adaptive management through progressive stages of future quarry operations. Reviews will be undertaken as a result of any of the following:

- major changes in site conditions or work methods.
- as a result of changes in environmental legislation applicable and relevant to the quarry operations.
- In response to the requirements of CoA D6 (Part D) of the Project Approval which requires a review of the CNMP within 3 months of:
    - The submission of an incident report under condition D9
    - The submission of an Annual review under condition D11
    - The submission of an Independent Environmental Audit under condition D13
    - The approval of any modification of the conditions of this approval (unless the conditions require otherwise)
    - Notification of a change in project stage under condition A15 or
    - The issue of a direction of the Secretary under Condition A2(b) which require a review.

If any of the above reviews result in any revisions of the CNMP, the CNMP will be provided to the Secretary within 6 weeks for approval, as required by Condition D7

Noise performance will be measured through regular environmental performance reviews. These will be based on the measurable outcomes identified in this management plan and key performance criteria outlined in **Section 5.1** of this CNMP. The reviews will be used to assess progress in meeting CNMP objectives and performance criteria and will be undertaken by the ESA.

References

International Organisation for Standardisation (ISO) 9613-2:1996 (ISO9613:2) – **Acoustics – Attenuation of Sound during Propagation Outdoors - Part 2: General Method of Calculation**

NSW Department of Environment and Climate Change (DECC) – **NSW Interim Construction Noise Guideline** (ICNG), July 2009

NSW Environment Protection Authority (EPA) – **NSW Noise Policy for Industry** (NPI, 2017), October 2017

NSW Environment Protection Authority (EPA) – **Environmental Noise Control Manual 1994**

Standards Australia AS1055–1997 (AS1055) – **Description and Measurement of Environmental Noise**, Parts 1, 2 and 3

Standards Australia AS1055–2018 (AS1055, 2018) – **Description and Measurement of Environmental Noise**

Standards Australia AS IEC 61672.1-2004 (AS61672) – **Electro Acoustics – Sound Level Meters Specifications Monitoring** or Standards Australia AS1259.2-1990 (AS1259) – **Acoustics – Sound Level Meters – Integrating Averaging**, as applicable to the device

Standards Australia AS 2436-2010 (AS2436) – **Guide to Noise and Vibration Control on Construction, Demolition And Maintenance Sites**, reconfirmed 2016

The **Marulan South Quarry – Environmental Assessment Report** prepared by ERM, dated October 2006 (EA 2006)

Element Environment - **Peppertree Quarry Modification Environmental Assessment**. October 2018

The **Project Approval (06_0074)** and subsequent modifications, and other relevant project information provided by Boral, importantly the Project Approval modified for the fifth time under Section 75W of the EP&A Act

Other relevant project information provided by Boral

APPENDIX A ACOUSTICS GLOSSARY

Glossary – Acoustical Concepts and Terminology

What Is Noise And Vibration?

Noise

Noise is often defined as a sound, especially one that is loud, unpleasant or that causes disturbance or simply as unwanted sound, but technically, noise is the perception of a series of compressions and rarefactions above and below normal atmospheric pressure.

Vibration

Vibration refers to the oscillating movement of any object. In a sense noise is the movement of air particles and is essentially vibration, though in regards to an environmental assessment vibration is typically taken to refer to the oscillation of a solid object(s). The impact of noise on objects can lead to vibration of the object, or vibration can be experienced by direct transmission through the ground, this is known as ground-borne vibration.

Essentially, noise can be described as what a person hears, and vibration as what they feel.

What Factors Contribute To Environmental Noise?

The noise from an activity, like construction works, at any location can be affected by a number of factors, the most significant being:

- How loud the activity is?
- How far away the activity is from the receptor?
- What type of ground is between the activity and the receptor e.g. concrete, grass, water or sand?
- How the ground topography varies between the activity and the receptor, for example, is it flat, hilly, mountainous? Blocking the line of sight to a noise source will generally reduce the level of noise at the receptor.
- Are there any other obstacles that block the line of sight between the source and the receptor e.g. buildings or purpose built noise walls?

How to Measure and Describe Noise?

Noise is measured using a specially designed “sound level meter” which must meet internationally recognised performance standards. Audible sound pressure levels vary across a range of 10^7 Pascals (Pa), from the threshold of hearing at 20μPa to the threshold of pain at 200Pa. Scientists have defined a statistically described logarithmic scale called Decibels (dB) describe noise more manageably.

To demonstrate how this scale works, the following points give an indication of how an average person perceives the noise levels and differences:

- 0 dB - represents the threshold of human hearing (for a young person with ears in good condition).
- 50 dB – represents average conversation.
- 70 dB – represents average street noise, local traffic etc.
- 90 dB – represents the noise inside an industrial premises or factory.
- 140 dB - represents the threshold of pain – the point at which permanent hearing damage may occur.

Unless otherwise stated in this report, all sound pressure levels (predicted or measured noise levels at a location or point) are expressed in decibels (dB, re: 2 x 10^{-5} Pascals, Pa) with the “A-weighting” curve

applied and adopting the relevant acoustical or statistical noise level parameter e.g. $L_{eq,\ 15\ minute}$, $L_{eq,\ 1hour}$ or $L_{90,\ 9\ Hour}$.

All sound power levels (source noise emission values) are expressed in decibels (dB, re: 10^{-12} Watts, W) with the "A-weighting" curve applied (represents human hearing) and adopting the relevant acoustical or statistical noise level parameter.

Human Response to Changes in Noise Levels

The following concepts offer qualitative guidance in respect of the average response to changes in noise levels:

- Differences in noise levels of less than approximately 2 dBA are generally imperceptible in practice, an increase of 2 dBA is hardly perceivable.
- Differences in noise levels of around 5 dBA are considered to be significant.
- Differences in noise levels of around 10 dBA are generally perceived to be a doubling (or halving) of the perceived loudness of the noise. An increase of 10 dBA is perceived as twice as loud. Therefore an increase of 20 dBA is four times as loud and an increase of 30 dBA is eight times as loud etc.
- The addition of two identical noise levels will increase the dBA level by about 3 dBA. For example, if one car is idling at 40 dBA and then another identical car starts idling next to it, the total dB level will be about 43 dBA.
- The addition of a second noise level of similar character which is at least 8 dBA lower than the existing noise level will not add significantly to the overall dBA level.
- A doubling of the distance between a noise source and a receptor results approximately in a 3 dBA decrease for a line source (for example, vehicles travelling on a road) and a 6 dBA decrease for a point source (for example, the idling car discussed above).
- A doubling of traffic volume for a line source results approximately in a 3 dBA increase in noise, halving the traffic volume for a line source results approximately in a 3 dBA decrease in noise.

Terms to Describe the Perception of Noise

The following terms offer quantitative and qualitative guidance in respect of the audibility of a noise source:

- **Inaudible / Not Audible** - the noise source and/or event could not be heard by the operator, masked by extraneous noise sources not associated with the source. If a noise source is 'inaudible' its noise level may be quantified as being less than the measured L_{A90} background noise level, potentially by 10 dB or greater.
- **Barely Audible** – the noise source and/or event are difficult to define by the operator, typically masked by extraneous noise sources not associated with the source. If a source is 'barely audible' its noise level may be quantified as being 5 - 7 dB below the measured L_{A90} or L_{Aeq} noise level, depending on the nature of the source e.g. constant or intermittent.
- **Just Audible** – the noise source and/or event may be defined by the operator. However, there are a number of extraneous noise sources contributing to the measurement. The noise level should be quantified based on instantaneous noise level contributions, noted by the operator.
- **Audible** - the noise source and/or event may be easily defined by the operator. There may be a number of extraneous noise sources contributing to the measurement. The noise level should be quantified based on instantaneous noise level contributions, noted by the operator.

- **Dominant** – the noise source and/or event are noted by the operator to be significantly 'louder' than all other noise sources. The noise level should be quantified based on instantaneous noise level contributions, noted by the operator.

The following terms offer qualitative guidance in respect of acoustic terms used to describe the frequency of occurrence of a noise source during an operator attended environmental noise measurements:

- **Constant** – this indicates that the operator has noted the noise source(s) and/or event to be constantly audible for the duration of the noise measurement e.g. an air-conditioner that runs constantly during the measurement.
- **Intermittent** – this indicates that the operator has noted the noise source(s) and/or event to be audible, stopping and starting intervals for the duration of the noise measurement, e.g. cars passing by.
- **Infrequent** – this indicates that the operator has noted the noise source(s) and/or event to be constantly audible, however; not occurring regularly or at intervals for the duration of the noise measurement e.g. a small number of aircraft are noted during the measurement.

How to Calculate or Model Noise Levels

There are two recognised methods which are commonly adopted to determine the noise at a particular location from a proposed activity. The first is to undertake noise measurements while the activity is in progress and measures the noise, the second is to calculate the noise based on known noise emission data for the activity in question.

The second option is preferred as the first option is largely impractical regarding cost and time constraints, notwithstanding the meteorological factors that may also influence its quantification. Furthermore, it is also generally considered unacceptable to create an environmental impact simply to measure it. In addition, the most effective mitigation measures are determined and implemented during the design phase and often cannot be readily applied during or after the implementation phase of a project.

Because a number of factors can affect how 'loud' a noise is at a certain location, the calculations can be very complex. The influence of other ambient sources and the contribution from a particular source in question can be difficult to ascertain. To avoid these issues, and to quantify the direct noise contribution from a source/site in question, the noise level is often calculated using noise modelling software packages. The noise emission data used in may be obtained from the manufacturer or from ERM's database of measured noise emissions.

Acoustic Terminology & Statistical Noise Descriptors

Environmental noise levels such as noise generated by industry, construction and road traffic are commonly expressed in dBA. The A-weighting scale follows the average human hearing response and enables comparison of the intensity of noise with different frequency characteristics. Time-varying noise sources are often described in terms of statistical noise descriptors. The following descriptors are commonly used when assessing noise and are referred to throughout this acoustic assessment:

- **Ambient noise** – the all-encompassing noise associated within a given environment. It is the composite of sounds from many sources, both near and far.
- **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 described using the L_{A90} descriptor.
- **Cognitive noise** – noise in which the source is recognised as being annoying.
- **Decibel** (dB is the adopted abbreviation for the decibel) – A measure of sound level. The decibel is a logarithmic way of describing a ratio. The ratio may be power, sound pressure, voltage, intensity

or other parameters. In the case of sound pressure, it is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure squared to a reference sound pressure squared.

- **dBA** -Unit used to measure 'A-weighted' sound pressure levels. A-weighting is an adjustment made to sound-level measurement to approximate the response of the human ear.
- **dBC** – unit used to measure 'C-weighted' sound pressure levels. C-weighting is an adjustment made to sound-level measurements which takes account of low-frequency components of noise within the audibility range of humans.
- **dBZ or dBL** – unit used to measure 'Z-weighted' sound pressure levels with no weighting applied, linear.
- **Hertz (Hz)** - the measure of frequency of sound wave oscillations per second. 1 oscillation per second equals 1 hertz.
- **Octave** – a division of the frequency range into bands, the upper frequency limit.
- 1**/3 Octave** – single octave bands divided into three parts.
- **Leq** - this level represents the equivalent or average noise energy during a measurement period. The $L_{eq,\ 15\ min}$ noise descriptor simply refers to the Leq noise level calculated over a 15 minute period. Indeed, any of the below noise descriptors may be defined in this way, with an accompanying time period (e.g. $L_{10,\ 15\ minute}$) as required.
- **$L_{AF90,\ 15\ min}$** - The A-weighted sound pressure level measured using fast time weighting that is exceeded for 90% of the time over a 15-minute assessment period. This is a measure of background noise.
- **$L_{AF90,\ period\ (day/evening/night)}$** – The A-weighted sound pressure level, obtained by using fast time weighting that is equal to or exceeded for 90% of the day, evening and night periods (as defined in this policy) for each 24-hour period.
- **$L_{AF90,\ (shoulder\ period)}$** - The A-weighted sound pressure level measured using fast time weighting that is exceeded for 90% of aggregate sound pressure level data for the equivalent of one week's worth of valid data taken over the shoulder period.
- **$L_{Aeq,\ T}$** - The time-averaged sound pressure level. The value of the A-weighted sound pressure level of a continuous steady sound that, with a measurement time interval T, has the same mean square sound pressure level as a sound under consideration with a level that varies with time (AS1055.1-1997).
- **L_{Amax}** - The maximum sound pressure level of an event measured with a sound level meter satisfying AS IEC 61672.1-2004 set to 'A' frequency weighting and fast time weighting.
- **L_N** - the percentile sound pressure level exceeded for N% of the measurement period calculated by statistical analysis.
- **L_{10}** - the noise level exceeded for 10 per cent of the time and is approximately the average of the maximum noise levels.
- **L_{90}** - the noise level exceeded for 90 per cent of the time and is approximately the average of the minimum noise levels. The L_{90} level is often referred to as the "background" noise level and is commonly used as a basis for determining noise criteria for assessment purposes.
- **Low frequency** - Noise containing major components in the low-frequency range (10 hertz [Hz] to 160 Hz) of the frequency spectrum.
- **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 (Bies and Hansen, 1996).

- **Sound Power Level (Lw)** - this is a measure of the total power radiated by a source. The Sound Power of a source is a fundamental property of the source and is independent of the surrounding environment.
- **Sound Pressure Level (LP)** - the level of sound pressure; as measured at a distance by a standard sound level meter with a microphone. This differs from Lw in that this is the received sound as opposed to the sound 'intensity' at the source.
- **Spectral characteristics** - The frequency content of noise.
- **Tonal noise (tonality)**: noise containing a prominent frequency and characterised by a definite pitch.

ICNG, 2009 and NPI, 2017 Specific Terminology

The following terminology is from the NSW Department of Environment and Climate Change – *NSW Interim Construction Noise Guideline* (ICNG, 2009), July 2009 and NSW Environment Protection Authority – *Noise Policy for Industry* (NPI, 2017), October 2017.

- **Annoyance** - An emotional state connected to feelings of discomfort, anger, depression and helplessness. It is generally measured by means of the ISO15666 defined questionnaire (EEA, 2010).
- **Assessment period** - The period in a day over which assessments are made: day (7 am to 6 pm); evening (6 pm to 10 pm); or night (10 pm to 7 am).
- **Best available technology economically achievable (BATEA)** - Equipment, plant and machinery incorporating the most advanced and affordable technology available to minimise noise output.
- **Best management practice (BMP)** - Adoption of particular operational procedures that minimise noise while retaining productive efficiency.
- **Cluster of industry** - An industrial/port estate, area, zone, or proposed area or zone where more than three separate industrial uses are co-located in a contiguous fashion and are operating or proposed to operate.
- **Construction activities** - Activities that are related to the establishment phase of a development and that will occur on a site for only a limited period of time.
- **Correction for duration**: this is applied where a single-event noise is continuous for a period of less than two and a half hours in any assessment period. The allowable exceedance of the $L_{Aeq,\ 15\ min}$ equivalent noise criterion for the duration of the event is shown in Table C3 of the NPI. This adjustment is designed to account for unusual and one-off events, and does not apply to regular and/or routine high-noise level events.
- **Cumulative industrial noise level** - The total level of noise from all industrial sources.
- **Greenfield site** - Undeveloped land.
- **High traffic amenity level** - The level of transport noise, road traffic noise in particular, may be high enough to make noise from an industrial source effectively inaudible, even though the L_{Aeq} noise level from that industrial noise source may exceed the project amenity noise level. In such cases the project amenity noise level may be derived from the $L_{Aeq,\ period\ (traffic)}$ minus 15 dBA. Refer to Section 2.4.1 of the NPI for additional details.
- **Impulsive noise** - Noise with a high peak of short duration, or a sequence of such peaks.
- **Industrial noise sources** - As defined in Section 1.4 of the NPI, noise from mechanical plant and equipment; industrial and commercial processes; mobile sources confined to a particular location (for example, drag lines, haul trucks, intermodal facilities and rail shunting yards); and vehicle movements within the premises and/or on private roads.

- **Intrusive noise** - Refers to noise that intrudes above the background level by more than 5 dB. The intrusiveness noise level is set out in further detail throughout Section 2.3 of the NPI.
- **Intermittent noise**: noise where the level suddenly drops/increases several times during the assessment period, with a noticeable change in source noise level of at least 5 dBA; for example, equipment cycling on and off. The intermittency correction is not intended to be applied to changes in noise level due to meteorology.
- **Maximum correction**: the maximum correction to be applied to the predicted or the measured level where two or more modifying factors are present. The maximum adjustment is 10 dBA where the noise contains two or more modifying factors (excluding the duration correction).
- **Noise impact assessment (NIA)** - The component of an Environmental Impact Statement, Environmental Assessment, Statement of Environmental Effects, or licence application that considers the impacts of noise resulting from a development or activity.
- **Noise-sensitive land uses** - Land uses that are sensitive to noise, such as residential areas, churches, schools and recreation areas.
- **Non-compliance** - Any exceedance of a consent/licence limit is considered a non-compliance. However, the type of regulatory action taken by a regulatory authority will depend on a number of factors, in accordance with the authority's prosecution policies and guidelines.
- **Non-mandatory** - In this policy this means not required by legislation. The policy specifies project noise trigger levels to be strived for, but the legislation does not make these levels compulsory. However, the policy will be used as a guide to setting statutory (legally enforceable) limits for licences and consents.
- **Performance-based goals** - Goals specified in terms of the outcomes/performance to be achieved, but not in terms of the means of achieving them.
- **Premises** - includes: (a) a building or structure, or (b) land or a place (whether enclosed or built on or not), or (c) a mobile plant, vehicle, vessel or aircraft, as defined in the Protection of the Environment Operations Act 1997.
- **Proponent** - The developer of the industrial noise source.
- **Residence** - A lawful and permanent structure erected in a land-use zone that permits residential use (or for which existing use rights under the EP&A Act apply) where a person/s permanently reside and is not, nor associated with, a commercial undertaking such as caretakers' quarters, hotel, motel, transient holiday accommodation or caravan park.
- **Receiver** - The noise-sensitive land use at which noise from a development can be heard.
- **Significant meteorological effects** - In relation to temperature inversions, this means at least 30% of the total night time during the winter months. In relation to wind speeds this means at least 30% of the time or more in any assessment period (day, evening, night) in any season.
- **Sleep disturbance** - Awakenings and disturbance to sleep stages.
- **Temperature inversion** - An atmospheric condition in which temperature increases with height above the ground.
- **Very noise enhancing meteorological conditions** – 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 of the NPI.

Operator Attended Measurements

The table below presents typical abbreviations that are used to describe common noise sources that may be noted during environmental noise measurements.

General Field Note Abbreviations

Abbreviation	Noise Source
ANML (B-I-D-L)	Animals (birds – insects – domestic - livestock)
ACF T	Aircraft
CPBY	Car pass by
DLCN	Dialogue, conversations e.g. with passers-by
DTRF	Distant traffic
LTRF	Local traffic
OIND	Other industry/industrial sites
OPTR	Operator
RDOC	Residential/occupants
RHUM	Rural harm
SHUM	Suburban harm
UHUM	Urban harm
WBVG	Windblown vegetation

During operator attended noise measurements, the sound level meter will present the instantaneous noise level and record acoustical and statistical parameters. In certain acoustical environments, where a range of noise sources are audible and detectable, the sound level meter cannot measure a direct source noise level, and it is often necessary to account for the contribution and duration of the sources.

Noted Percentile Contribution – the first table below presents noise level deductions that are typically applied based on the percentage contribution of a noise source(s).

Noted Time Contribution – the second table below presents noise level deductions that may be applied based on the percentage of time that a noise source(s) is audible during a 15-minute measurement. Where the noise emission from a source is clearly detectable, and the contribution can be measured, these deductions are not necessary.

Noise Level Deductions – Noted Percentile Contribution

Percentage Contribution	Noise Adjustment Level, dBA
5%	-13.0
10%	-10.0
15%	-8.2
20%	-7.0
25%	-6.0
30%	-5.2
35%	-4.6
40%	-4.0
45%	-3.5
50%	-3.0
55%	-2.6
60%	-2.2
65%	-1.9
70%	-1.5
75%	-1.2
80%	-1.0
85%	-0.7
90%	-0.5
95%	-0.2
100%	0.0

Noise Level Deductions – Noted Time Contribution

Event Duration (Minutes)	Noise Level Adjustment, dBA
1	-11.8
2	-8.8
3	-7.0
4	-5.7
5	-4.8
6	-4.0
7	-3.3
8	-2.7
9	-2.2
10	-1.8
11	-1.3
12	-1.0
13	-0.6
14	-0.3
15	0.0

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