

Noise Management Plan

Dubbo Quarry

Prepared for Holcim (Australia) Pty Ltd

October 2023

Noise Management Plan

Dubbo Quarry

Holcim (Australia) Pty Ltd

E211117 RP2

October 2023

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Approved by



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25 October 2023

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1 Introduction

This noise management plan (NMP) for Dubbo Quarry (the quarry) has been prepared by EMM Consulting Pty Limited (EMM) on behalf of Holcim (Australia) Pty Ltd (Holcim). The NMP has been prepared to comply with the requirements Schedule 2 Part B condition B5 of the quarry's development consent (SSD 10417).

1.1 The site

Holcim is the operator of the quarry. The quarry is within the Dubbo Regional Local Government Area (LGA) and is located approximately 1.9 km to the east of the city of Dubbo, New South Wales (NSW). The quarry is accessed via Sheraton Road which connects to the Mitchell Highway approximately 2 km north-west of the quarry.

The quarry has been in operation since 1980 under a development consent granted by Dubbo Regional Council (Council).

The quarry produces high quality aggregates for use in the construction industry, such as concrete and asphalt production, and for use as road base. Precoated sealing aggregates from crushed basalt are produced at the quarry.

1.2 Purpose and scope

The NMP has been prepared to provide a description of the measures to be implemented by Holcim to manage quarry noise emissions and detail noise monitoring requirements in accordance with the development consent (the consent).

The purpose of the NMP is to:

- provide the quarry's employees and contractors with a description of their responsibilities, regarding noise management
- address the relevant conditions/requirements in the consent and other guidelines relevant to this NMP
- describe the measures to be implemented to monitor quarry noise emissions against relevant regulatory limits
- provide a mechanism for assessing noise monitoring results against the relevant regulatory limits
- provide a mechanism for assessing the effectiveness of the noise monitoring program
- provide mechanisms for the establishment of best practice management with respect to minimising noise emissions/impacts.

In accordance with condition B6 of the consent, construction and quarry operations will not commence until this NMP is approved by the Planning Secretary. As required by condition B7, Holcim will implement the NMP once approved.

1.3 NMP preparation

This NMP was prepared by Teanuanua Villierme (associate acoustic consultant) and Rick Scully (senior acoustic consultant) and approved by Najah Ishac (technical lead acoustics) of EMM. All are members of the Australian Acoustical Society (AAS) of NSW and the firm's offices are members of the Association of Australasian Acoustical Consultants (AAAC).

Consultation on the development of this NMP has been undertaken with the EPA. The EPA was requested via the NSW Planning Portal to review this NMP. As part of the regulator process, the EPA encourages the preparation of strategies, programs, and plans as useful tools for industry to detail how they will meet their statutory obligations and environmental objectives. However, the EPA does not usually review management plans, as its role is to set conditions for environment protection and management, rather than be directly involved in the development of strategies to comply with those conditions.

The NMP was prepared based on the following documentation:

- *The Dubbo Quarry Continuation Project Environmental Impact Statement (EIS) (EMM 2021a).*
- *The Dubbo Quarry Continuation Project Noise and Vibration Impact Statement (NVIA) (EMM 2021b).*
- *The Dubbo Quarry Continuation Project Addendum Submissions Report (EMM 2022a).*
- *The Dubbo Quarry Continuation Project Amendment Report (EMM 2022b).*
- *The Dubbo Quarry Continuation Project Supplementary Noise and Vibration Impact Statement (Supplementary NVIA) (EMM 2021c).*
- the development consent for SSD 10417.

2 Environmental requirements

2.1 Legislation

The NMP provides recommended noise management measures for the quarry. The NMP has been prepared to address the requirements of the consent conditions, guided by the following guidelines and policies:

- Australian Standard (AS) 1055.1-2018 Acoustics – Description and Measurement of Environmental Noise – General Procedures.
- AS IEC 61672.1-2019 ‘Electroacoustics – Sound Level Meters – Specifications’.
- NSW Environment Protection Authority (EPA) 2017, *Noise Policy for Industry* (NPfI).
- EPA 2021, *Approved Methods for Measurement and Analysis of Environmental Noise in NSW* (EPA’s Approved Methods).

Several technical terms in this NMP are required for the discussion of noise. These are defined in the Glossary.

2.2 Development consent (SSD 10417)

This NMP has been prepared to address the requirements of the consent. Table 2.1 lists the requirements of the consent and references the section of this NMP where each of those has been addressed.

Table 2.1 Consent conditions and relevant sections of NMP

Condition number	Condition	Relevant section of NMP																																								
Noise																																										
Operational Noise Criteria																																										
B1	<p>Operational Noise Criteria</p> <p>The Applicant must ensure that the noise generated by the development does not exceed the criteria in Table 3 at any residence on privately-owned land.</p> <p>Table 3: Operational noise criteria dB(A)</p> <table border="1"> <thead> <tr> <th>Noise Assessment Location</th> <th>Daytime stripping L_{Aeq} (15 min)</th> <th>Daytime all other quarrying operations L_{Aeq} (15 min)</th> <th>Night L_{Aeq} (15 min)</th> <th>Night L_{Amax}</th> </tr> </thead> <tbody> <tr> <td>R1¹</td> <td>49</td> <td>49</td> <td>40</td> <td>52</td> </tr> <tr> <td>R2</td> <td>46</td> <td>44</td> <td>35</td> <td>52</td> </tr> <tr> <td>R3</td> <td>43</td> <td>43</td> <td>37</td> <td>52</td> </tr> <tr> <td>R4</td> <td>41</td> <td>41</td> <td>35</td> <td>52</td> </tr> <tr> <td>R5</td> <td>40</td> <td>41</td> <td>35</td> <td>52</td> </tr> <tr> <td>R23</td> <td>42</td> <td>42</td> <td>37</td> <td>52</td> </tr> <tr> <td>All other non-project related privately owned residences</td> <td>40</td> <td>40</td> <td>35</td> <td>52</td> </tr> </tbody> </table> <p>Notes:</p> <ul style="list-style-type: none"> • To identify the locations referred to in Table 3, refer to Appendix 3 • ¹Holcim currently has a negotiated agreement in place with the landowner of this residential property 	Noise Assessment Location	Daytime stripping L _{Aeq} (15 min)	Daytime all other quarrying operations L _{Aeq} (15 min)	Night L _{Aeq} (15 min)	Night L _{Amax}	R1 ¹	49	49	40	52	R2	46	44	35	52	R3	43	43	37	52	R4	41	41	35	52	R5	40	41	35	52	R23	42	42	37	52	All other non-project related privately owned residences	40	40	35	52	Section 3.3
Noise Assessment Location	Daytime stripping L _{Aeq} (15 min)	Daytime all other quarrying operations L _{Aeq} (15 min)	Night L _{Aeq} (15 min)	Night L _{Amax}																																						
R1 ¹	49	49	40	52																																						
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R5	40	41	35	52																																						
R23	42	42	37	52																																						
All other non-project related privately owned residences	40	40	35	52																																						
B2	Noise generated by the development must be measured in accordance with the requirements and exemptions (including certain meteorological conditions) of the NSW Noise Policy for Industry (EPA, 2017).	Section 5.3																																								

Table 2.1 Consent conditions and relevant sections of NMP

Condition number	Condition	Relevant section of NMP
B3	The noise criteria in Table 3 do not apply if the Applicant has an agreement with the owner/s of the relevant residence or land to exceed the noise criteria, and the Applicant has advised the Department in writing of the terms of this agreement.	Section 3.3
Noise Operating Conditions		
B4	The Applicant must: <ul style="list-style-type: none"> a) limit stripping activities to the daytime and to a maximum of 8 weeks per year, unless otherwise agreed by the Planning Secretary b) take all reasonable steps to minimise all noise from construction and operational activities, including low frequency noise and other audible characteristics, as well as road noise associated with the development 	Section 5.3 and Section 4.3
	<ul style="list-style-type: none"> c) operate a noise management system commensurate with the risk of impact, such as using a combination of predictive meteorological forecasting and noise monitoring data to: <ul style="list-style-type: none"> i) guide the day to day planning of quarrying operations, and the implementation of proactive and reactive noise mitigation measures to ensure compliance with the relevant conditions of this consent ii) modify or stop operations on the site to ensure compliance with the relevant conditions of this consent d) take all reasonable steps to minimise the noise impacts of the development during noise-enhancing meteorological conditions; when the noise criteria in this consent do not apply e) carry out regular attended noise monitoring on an at least annualised basis, unless otherwise agreed with or directed by the Planning Secretary, to determine whether the development is complying with the relevant conditions of this consent. 	Section 5.3
Noise Management Plan		
B5	The Applicant must prepare a Noise Management Plan for the development. This plan must: <ul style="list-style-type: none"> a) be prepared by a suitably qualified and experienced person/s b) be prepared in consultation with the EPA 	Section 1.3
	<ul style="list-style-type: none"> c) describe the measures to be implemented to ensure: <ul style="list-style-type: none"> i) compliance with the noise criteria and operating conditions in this consent ii) best practice management is being employed 	Section 4.1, Section 4.1.2 and Section 4.3
	<ul style="list-style-type: none"> d) include a monitoring program that: <ul style="list-style-type: none"> i) uses a combination of real-time and supplementary attended noise monitoring to evaluate the performance of the development ii) includes a program to calibrate and validate the real-time noise monitoring results with the attended noise monitoring results over time iii) monitors noise at the nearest and/or most affected residences iv) adequately supports the noise management system v) includes a protocol for identifying any noise-related exceedance, incident or non-compliance and for notifying the Department and relevant stakeholders of these events. 	Section 5.3
B6	The Applicant must not commence construction or quarrying operations until the Noise Management Plan is approved by the Planning Secretary.	Section 1.2
B7	The Applicant must implement the Approved Noise Management Plan.	Section 1.2

Table 2.1 Consent conditions and relevant sections of NMP

Condition number	Condition	Relevant section of NMP						
Additional mitigation upon request								
C1	<p>Upon receiving a written request for mitigation from the owner of any residence on the privately-owned land listed in Table 8, the Applicant must implement additional mitigation measures at or in the vicinity of the residence in consultation with the landowner. These measures must be consistent with the measures outlined in the Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Development (NSG Government, 2018). They must also be reasonable and feasible, proportionate to the level of predicted impact and directed towards reducing the noise impacts of the development. The Applicant must also be responsible for the reasonable costs of ongoing maintenance of these additional mitigation measures until the cessation of quarrying operations.</p> <p>Table 8: Land subject to mitigation upon request</p> <table border="1"> <thead> <tr> <th>Mitigation Basis</th> <th>Land</th> </tr> </thead> <tbody> <tr> <td>Noise</td> <td>Receiver R2, as shown on the figure in Appendix 3</td> </tr> <tr> <td>Noise</td> <td>Receiver R3, as shown on the figure in Appendix 3</td> </tr> </tbody> </table>	Mitigation Basis	Land	Noise	Receiver R2, as shown on the figure in Appendix 3	Noise	Receiver R3, as shown on the figure in Appendix 3	Section 4.1.2
Mitigation Basis	Land							
Noise	Receiver R2, as shown on the figure in Appendix 3							
Noise	Receiver R3, as shown on the figure in Appendix 3							
C2	If within 3 months of receiving a request for additional mitigation from the owner, the Applicant and the owner cannot agree on the measures to be implemented, or there is a dispute about the implementation of these measures, then either party may refer the matter to the Planning Secretary for resolution.	Section 4.1.2						
C3	For the life of the development, the Applicant must continue to contribute to reasonable maintenance and recurrent operating costs associated with the mitigation measures installed at privately-owned residences under the development.	Section 4.1.2						
Notification of landowners/tenants		Section 4.1.2						
Within one month of the date of this consent, the Applicant must notify in writing the owner of the residences on the land listed in Table 8 that they are entitled to ask the Applicant to install additional mitigation measures at the residence.								
Notification of exceedances								
C4	<p>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:</p> <ol style="list-style-type: none"> provide to any landowners and tenants publish on its website the full details of the exceedance. 	Section 5.3.1v						
Independent review								
C6	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 6.2						
C7	If the Planning Secretary is 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 6.2						

Table 2.1 Consent conditions and relevant sections of NMP

Condition number	Condition	Relevant section of NMP
C8	<p>If the Planning Secretary is satisfied that an independent review is warranted, within 3 months of the Planning Secretary’s decision, or as otherwise agreed by the Planning Secretary and the landowner, the Applicant must:</p> <ul style="list-style-type: none"> a) commission a suitably qualified, experienced and independent person, whose appointment has been approved by the Planning Secretary, to: <ul style="list-style-type: none"> 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 iii) if the development is not complying with any relevant criterion, identify measures that could be implemented to ensure compliance with that criterion b) give the Planning Secretary and landowner a copy of the independent review c) comply with any written requests made by the Planning Secretary to implement any findings of the review. 	Section 6.2
Management Plan Requirements		
D4	<p>Management plans required under this consent must be prepared in accordance with relevant guidelines, and include:</p>	
	a) a summary of relevant background or baseline data	Section 3.2
	b) details of: <ul style="list-style-type: none"> i) the relevant statutory requirements (including any relevant approval, licence or lease conditions) ii) any relevant limits or performance measures and criteria iii) the specific performance indicators that are proposed to be used to judge the performance of, or guide the implementation of, the development or any management measures 	Section 3.3
	c) a description of the measures to be implemented to comply with the relevant statutory requirements, limits, or performance measures and criteria	Section 4.1, Section 4.1.2, Section 4.3 and Section 5.3.1v
	d) a program to monitor and report on the: <ul style="list-style-type: none"> i) impacts and environmental performance of the development ii) effectiveness of the management measures set out pursuant to condition A2(c) 	Section 5.3
	e) 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 5.3
	f) a program to investigate and implement ways to improve the environmental performance of the development over time	Section 6.1 and Section 6.3
	g) a protocol for managing and reporting any: <ul style="list-style-type: none"> 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 4.4 and Section 6.1
	h) a protocol for periodic review of the plan.	Section 6.3

Table 2.1 Consent conditions and relevant sections of NMP

Condition number	Condition	Relevant section of NMP
Revision of strategies, plans and programs		
D14	Noise, blast and/or air quality monitoring under this consent may be undertaken at suitable representative monitoring locations instead of a privately-owned residences or other locations listed in PART B of this consent, providing that these representative monitoring locations are set out in the respective management plan/s.	Section 3.3
Access to information		
D15	<p>Before the commencement of construction until the completion of all rehabilitation required under this consent, the Applicant must:</p> <ul style="list-style-type: none"> 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: <ul style="list-style-type: none"> i) the document/s listed in A2 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 	Section 4.4
	<ul style="list-style-type: none"> b) keep such information up to date, to the satisfaction of the Planning Secretary. 	Section 4.4

3 Noise requirements

3.1 Hours of operation

In accordance with condition A12 of the consent, Holcim are required to comply with the hours of operation set out in Table 3.1.

Table 3.1 Hours of operation

Activity	Permissible Operating Hours
Construction work	<ul style="list-style-type: none">7:00 am to 6:00 pm Monday to Friday.8:00 am to 1:00 pm Saturday.At no time on Sundays or public holidays.
Quarrying operations	<ul style="list-style-type: none">7:00 am to 6:00 pm Monday to Saturday.At no time on Sundays or public holidays.
Blasting	<ul style="list-style-type: none">Once per week between 9:00 am to 5:00 pm Monday to Friday.
Heavy vehicle loading and road transportation	<ul style="list-style-type: none">4:00 am to 6:00 pm Monday to Saturday.At no time on Sundays or public holidays.No road haulage between 24 December and 1 January, inclusive.No product heavy vehicle haulage along Sheraton Road (from 8:30 am to 9:00 am and 2:45 pm to 3:30 pm during school days) between Boundary Road roundabout and Mitchell Highway.

In addition, condition A13 of the consent states:

The following activities may be carried out outside the hours specified in Table 3.1.

- a) delivery or dispatch of materials as requested by Police or other public authorities
- b) emergency work to avoid the loss of lives, property or to prevent environmental harm.

In such circumstances, Holcim will notify the Department and affected residents prior to undertaking the activities, or as soon as is practical thereafter.

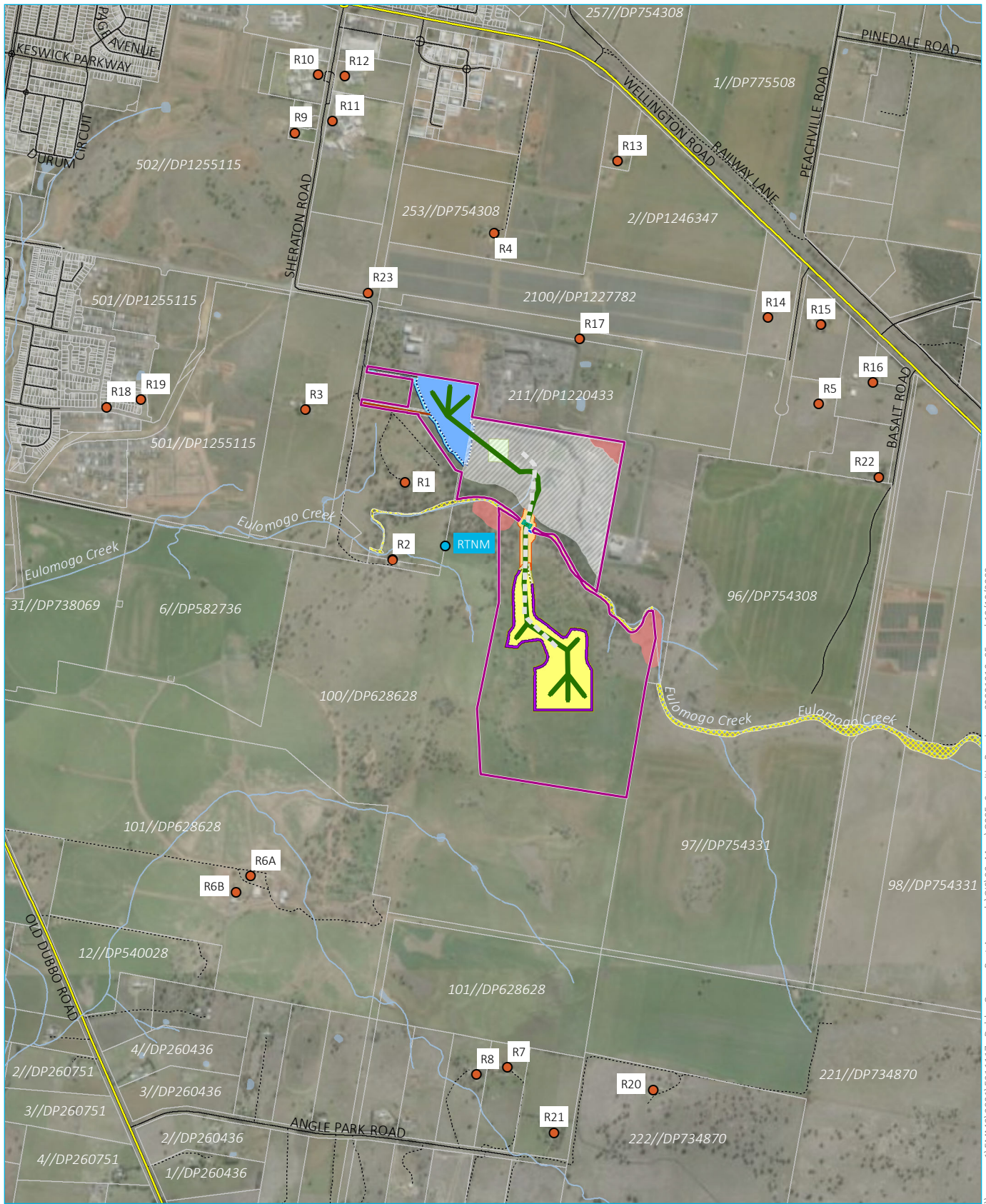
3.2 Assessment locations

There are residential receivers in all directions from the quarry, with the nearest residences located west and north of the quarry. It is noted that another quarry and concrete batching plant (both owned by Regional Group Australia) are located immediately north and east of the Holcim quarry, with additional commercial and educational facilities further to the north and north-west of the site.

The assessment locations are listed in Table 3.2 and their location shown in Figure 3.1.

Table 3.2 **Noise assessment locations used in previous assessments**

Assessment location	Receiver type	Easting	Northing
R1	Residential	655384	6427170
R2	Residential	655320	6426775
R3	Residential	654875	6427538
R4	Residential	655838	6428439
R5	Residential	657491	6427569
R6a	Residential	654596	6425165
R6b	Residential	654523	6425082
R7	Residential	655905	6424191
R8	Residential	655746	6424154
R9	Commercial	654823	6428948
R10	School	654942	6429244
R11	School	655013	6429009
R12	School	655075	6429237
R13	Residential	656466	6428804
R14	Residential	657233	6428009
R15	Residential	657502	6427973
R16	Residential	657768	6427678
R17	Industrial	656274	6427898
R18	Residential	653862	6427551
R19	Residential	654038	6427592
R20	Residential	656647	6424074
R21	Residential	656142	6423858
R22	Residential	657799	6427195
R23	Residential subdivision (approved)	655196	6428133



Source: EMM (2023); DCSSS (2023); DFSI (2017); GA (2011)

KEY			
	Real-time noise monitoring location		Proposed overland conveyer
	Receiver location		Major road
	Project area		Minor road
	Aboriginal protection zones		Vehicular track
	Indicative existing disturbance area		Watercourse/drainage line
	Existing access road		Waterbody
	Alternative access road		Cadastral boundary (data does not align with surveyed site boundary)
	Alternative truck tarping area		Crown land
	Bund wall		Sediment pond
			Indicative proposed water crossing
			Western extension area
			Western disturbance area
			Haul road disturbance area
			Southern extension area
			Southern disturbance area
			Processing plant
			Proposed haul road

Noise assessment locations

Dubbo Quarry Continuation Project
Noise Management Plan
Figure 3.1



\\emmsvr1\EMM3\2021\211117 - Dubbo Quarry Post Approvals\GIS\02_Maps\G005_SensitiveReceivers_20231019_05.mxd 19/10/2023

Background noise levels were surveyed at nearby residential receivers in 2016 as presented in the NVIA. Measured data showed that rating background levels or background noise levels were lower than the NPfI minimum thresholds of 35 dB for the day period and 30 dB for the evening and night periods. Therefore, the NPfI minimum background noise level thresholds were adopted in the NVIA.

The existing noise environment at other residential properties would be very similar to the areas where background noise surveys were undertaken. Therefore, it was concluded in the NVIA that the NPfI minimum background noise level thresholds also applied at other residential receivers surrounding the site.

3.3 Operational noise limits

Operational noise limits for the quarry are stipulated in Table 3 in condition B1 of the consent. The noise limits are specified for the day and night periods and apply at all privately-owned residences (refer to Table 3.2 and Figure 3.1). The noise limits for the quarry are reproduced in Table 3.3.

Table 3.3 Noise limits

Residential assessment location	Day – stripping activities	Day – all other quarrying operations	Night	
	L _{Aeq,15min} dB	L _{Aeq,15min} dB	L _{Aeq,15min} dB	L _{Amax} dB
R1 ¹	49	49	40	52
R2	46	44	35	52
R3	43	43	37	52
R4	41	41	35	52
R5	40	41	35	52
R23 ²	42	42	37	52
All other non-project related privately owned residences	40	40	35	52

- Notes:
1. Holcim currently has a negotiated agreement in place with the landowner of this residential property.
 2. No residence currently exist at this location (i.e. vacant land).
 3. Day period is 7 am to 6 pm Monday to Saturday; night period is 10:00 pm to 7:00 am Monday to Saturday.

Noise generated by the quarry will be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the NPfI.

The noise limits in Table 3.3 do not apply if Holcim has an agreement with the owner/s of the relevant residence or land to exceed the relevant limits. This is the case for R1 and, hence, the noise limits in Table 3.3 do not apply at this location. As of the date of this plan, Holcim have not negotiated any agreements with other landowners or residents since the more recent project approval.

Furthermore, no residence currently exists at location R23 and, hence, the noise limits in Table 3.3 will only apply if a residence exists in future.

4 Mitigation and management

4.1 Operational noise mitigation

4.1.1 Noise mitigation measures

To manage site noise emissions and mitigate any potential noise impacts from the quarry, where required, proactive and reactive noise mitigation measures will be implemented at the quarry as far as practicable.

Mitigation measures are outlined in:

- the EIS
- the NIVA
- the Supplementary NVIA
- the relevant consent conditions (conditions B4 and C1, C2 and C3)
- this plan.

In accordance with condition B4 of the consent, Holcim will implement the following:

- Limit stripping activities to the day period and to a maximum of eight weeks per year, unless otherwise agreed by the Planning Secretary.
- Take all reasonable steps to minimise all noise from construction and operational activities, including low frequency noise and other audible characteristics, as well as road noise associated with quarry operations.
- Operate a noise management system commensurate with the risk of impact, such as using a combination of predictive meteorological forecasting and noise monitoring data to:
 - guide the day-to-day planning of quarrying operations, and the implementation of proactive and reactive noise mitigation measures to ensure compliance with the relevant noise limits
 - modify or stop operations on the site to ensure compliance with the relevant noise limits.
- Take all reasonable steps to minimise the noise impacts during noise-enhancing meteorological conditions, when the noise limits do not apply.
- Carry out regular attended noise monitoring on an annual basis (as a minimum), unless otherwise agreed with or directed by the Planning Secretary, to review the noise performance of the quarry and determine compliance with the relevant noise limits.

The main operational noise sources at the quarry likely to contribute to offsite noise levels are those associated with processing activities, material haulage (haul trucks) and stripping (refer to Section 4.1.2). Feasible and reasonable mitigation options targeting these noise sources adopted in the NVIA are summarised in Table 4.1. These will be implemented by Holcim, noting that additional investigations will be undertaken during the initial stages of the project.

Table 4.1 Feasible and reasonable mitigation measures

Plant/equipment or activity	Mitigation option
At-source controls	
Existing mobile plant	<ul style="list-style-type: none"> • Use of noise barrier (screening) targeting nearest residence (R2).
Proposed modular plant	<ul style="list-style-type: none"> • Locate in the west pit (shielding). • Enclose crusher equipment. • Use of polyurethane and rubber deck for screens.
Proposed tracked mobile plant	<ul style="list-style-type: none"> • Locate in the west pit (shielding). • Use of noise barrier (screening). • Use of polyurethane and rubber deck for screens.
Jaw crusher	<ul style="list-style-type: none"> • Use of noise barrier (screening) targeting nearest residence (R2). • Locate near quarry face (shielding).
Stripping	<ul style="list-style-type: none"> • Use of Komatsu D375 dozer (or equivalent in sound power level).
Overland conveyor	<ul style="list-style-type: none"> • Use of covers and ‘quieter’ systems (e.g. varied rollers). • If required, a further assessment of noise impacts will be undertaken during the overland conveyor construction design process to provide Holcim with noise mitigation inputs. Additional factors to be considered during this process will be the practicality of attenuation measures and potential operational issues (e.g. access and safety) that could arise. Control options such as the use of covers and ‘quieter’ systems (e.g. varied rollers) will be considered.
Control transmission of noise	
Quarrying activities in southern extraction area (SEA)	<ul style="list-style-type: none"> • Construction of a 4 m high bund on the boundaries of the SEA. If the construction of the full SEA bund is not warranted (i.e. it is reduced in size/scale) for the purpose of mitigating noise impacts, this will be determined with additional noise modelling/monitoring assessment.
At-receiver mitigation	
Installation and maintenance of mechanical ventilation to allow for closed windows.	<ul style="list-style-type: none"> • Refer to Section 4.2.

4.1.2 Stripping approach

Stripping activities in the WEA (from Year 1) and stripping in the SEA (from Year 3) are anticipated to occur on a progressive basis for a total duration of up to eight weeks per year as per the consent.

An initial stripping campaign of up to eight weeks in total will take place in the southern portion of the WEA up to the existing quarry access road. Thereafter, that is after the removal of the existing quarry access road, stripping in the remaining portion of the WEA, and SEA (from Year 3), will be completed on a progressive basis. Stripping would typically occur over a two-week campaign for a maximum of four campaigns per year (total of eight weeks per year).

4.2 Additional mitigation upon request

In accordance with condition C1 of the consent, upon receiving a written request for mitigation from the owner of any privately-owned residence listed in Table 4.2, Holcim will implement additional mitigation measures at or in the vicinity of the residence in consultation with the landowner. These measures will be consistent with the measures outlined in the Voluntary Land Acquisition and Mitigation Policy for State Significant Mining, Petroleum and Extractive Industry Development (NSW Government 2018). They will be feasible and reasonable, proportionate to the level of predicted impact and directed towards reducing the potential noise impacts from the quarry. Holcim will be responsible for the reasonable costs of ongoing maintenance of these additional mitigation measures until the cessation of quarrying operations or the need for their presence.

Table 4.2 Residence subject to mitigation upon request

Mitigation basis	Residence
Noise	Receiver R2 (refer to Figure 3.1)
Noise	Receiver R3 (refer to Figure 3.1)

In accordance with condition C2 of the consent, if within three months of receiving a request for additional noise mitigation from the owner, an agreement between Holcim and the landowner on the measures to be implemented cannot be reached, or there is a dispute about the implementation of these measures, then Holcim and/or the landowner may refer the matter to the Planning Secretary for resolution.

In accordance with condition C3 of the consent, for the life of the quarry, Holcim will continue to contribute to reasonable maintenance and recurrent operating costs associated with the mitigation measures installed at privately-owned residences.

Holcim has notified in writing the owner of the residences on the land listed in Table 4.2 that they are entitled to additional noise mitigation measures at the residence.

4.3 Best practice management measures

4.3.1 Operations

Best practice noise management measures that are implemented by Holcim during quarry operations include (but are not limited to) the following:

- strict compliance with the approved hours of operations
- ensuring plant and equipment are properly maintained and serviced in accordance with original equipment manufacturer requirements to ensure rated noise emission levels are not exceeded
- installing frequency modulated reversing alarms to all mobile plant and equipment
- ensuring that all truck drivers are trained properly to minimise road traffic noise impacts during transportation on-site and offsite
- meteorological forecasts are considered and discussed at daily pre-start meetings. The Quarry Manager considers this information when planning activities for the day
- ensuring noise awareness information is provided to Holcim employees and contractors during inductions

- maintaining an open dialogue with the surrounding community and neighbours to ensure any concerns related to noise are addressed.

If necessary, alternative engineered noise controls (e.g. substitution, elimination, management, or mitigation) will be implemented during operations, including but not limited to constructing or purchasing enclosures or barriers around 'noisy' equipment to minimise emissions. Contractors are required to provide suitable and well-maintained equipment for use at the quarry that complies with original manufacturers specifications. Holcim controls the type of plant and equipment supplied and will review any relevant documentation.

4.3.2 Construction

Practical recommendations to assist in managing construction noise emissions are provided in AS 2436-2010 – *Guide to noise and vibration control on construction, maintenance and demolition sites*. The recommendations in AS 2436-201 include operational strategies, source noise control strategies, noise barrier controls, and community consultation. Examples of noise management strategies that will be considered during construction at the quarry include the following:

- regular reinforcement (such as at toolbox talks) of the need to minimise noise
- regular identification of 'noisy' activities and adoption of improvement techniques
- use of broadband audible reverse alarms on vehicles
- minimising the movement of materials and plant and equipment, and avoiding unnecessary metal-on-metal contact
- mobile plant and equipment will be driven in a conservative manner (no over-revving)
- where possible, mobile plant and equipment will be located/orientated to direct noise away from the nearest sensitive receivers
- where practicable, mobile barriers/screens will be used to shield potentially affected neighbouring receivers
- where possible, mobile plant and equipment will have efficient low noise muffler design and be well-maintained
- maximising the offset distance between noisy mobile plant and equipment and nearby sensitive receivers
- where practicable, avoiding the coincidence of 'noisy' mobile plant and equipment working simultaneously in close proximity to sensitive receivers
- planning deliveries and access to work areas to occur quietly and efficiently
- where possible, optimising the number of deliveries by amalgamating loads.

Detailed noise management and mitigation measures will be reviewed once the construction activities are clearly defined and contractors for the work have been engaged.

4.4 Noise complaint management system

A noise complaint management system to engage in active community consultation and maintain positive relations with local residents in relation to quarry noise will be implemented. The purpose of this system is to minimise noise complaints during quarry operations by addressing their concerns upfront and evaluate the noise performance of the quarry.

4.4.1 Registering noise complaints

Any enquiries or complaints made by a member of the public to site personnel in relation to quarry noise will be directed to the Quarry Manager.

Noise complaints may be made to the quarry's complaints hotline during business hours (or) or to the Quarry Manager's mobile phone outside of business hours or for emergencies. These numbers will be provided on a sign at the site entrance and on the quarry website.

4.4.2 Noise complaint response

Any noise complaint received regarding quarry noise will be acted on (initial response within 24-hours) in the following manner:

- details of the complaint (date, time, specifics, complainants contact details) will be recorded
- activities that occurred at the time of the complaint will be investigated (for example via review of real-time noise monitoring data)
- findings of the complaint investigation will be recorded in a complaints register (refer to Section 4.4.3)
- relevant mitigation measures and management practices will be reviewed where necessary
- findings of the review will be communicated to the complainant.

4.4.3 Complaints register

Details of a noise complaint will be recorded in a complaints register, as well as investigation findings and actions taken to manage the complaint. Records will be kept for at least four years after the complaint was made/received. Records will be provided to any authorised officer of the EPA upon request.

A summary of the complaints register will be made available on the quarry website and will be updated monthly.

Should the complaint be relevant to any of the conditions of the consent, it will be handled as per the consent conditions where relevant.

5 Noise monitoring program

5.1 Overview

The objective of the noise monitoring program is to quantify quarry noise contributions and determine compliance with the relevant noise limits at all privately-owned residences in accordance with conditions B1 to B3 of the consent.

The conditions related to noise monitoring included in the consent are as follows:

B4. The Applicant must:

- e) carry out regular attended noise monitoring on an at least annualised basis, unless otherwise agreed with or directed by the Planning Secretary, to determine whether the development is complying with the relevant conditions of this consent.

B5. The Applicant must prepare a Noise Management Plan for the development. This plan must:

- d) include a monitoring program that:
 - i) uses a combination of real-time and supplementary attended noise monitoring to evaluate the performance of the development;
 - ii) includes a program to calibrate and validate the real-time noise monitoring results with the attended noise monitoring results over time;
 - iii) monitors noise at the nearest and/or most affected residences;
 - iv) adequately supports the noise management system; and
 - v) includes a protocol for identifying any noise-related exceedance, incident or non-compliance and for notifying the Department and relevant stakeholders of these events.

5.2 Noise monitoring standards

Noise monitoring is undertaken in accordance with the relevant Australian standards and EPA guidelines including:

- AS 1055.1-2018
- AS IEC 61672.1-2019
- NPfl
- EPA's Approved Methods.

All acoustic instrumentation used for monitoring under the noise monitoring program shall have current NATA or manufacturer calibration certificates.

5.3 Noise monitoring program

The noise monitoring program consists of a combination of attended noise monitoring and unattended real-time noise monitoring to evaluate the performance of the quarry. The noise monitoring program is to be reviewed at a minimum every three years to evaluate its efficacy and to ensure it remains adequate to fully assess noise from current quarry activities.

5.3.1 Attended noise monitoring

Attended noise monitoring is to be completed on an annual basis at a minimum to verify that noise emissions from the facility satisfy the relevant noise limits at all privately-owned residences.

Attended monitoring may be undertaken more frequently, in the initial stages of the project and in response to community feedback or similar. The attended noise monitoring program is used to:

- quantify the quarry noise contribution from the measured noise levels
- determine the individual noise sources contributing to the ambient noise environment wherever possible
- determine whether modifying factor corrections for annoying noise characteristics (such low frequency noise or tonal noise) are applicable to quarry noise level before comparison to the relevant noise limits in accordance with the NPfl
- gain an understanding of the effects of meteorological conditions on the noise propagation to surrounding residential receivers.

The attended noise monitoring will be undertaken by a competent person as defined in the EPA's Approved Methods; that is a person appropriately qualified and experienced in acoustics to a standard sufficient to accurately interpret and apply the advice set out in acoustics standards, guidelines and policies. In accordance with the EPA's Approved Methods, a competent person must satisfy one or more of the following:

- Have qualifications and/or experience sufficient to fulfil the requirements of 'member' grade of the Australian Acoustical Society (AAS).
- Undertake the duties of an acoustic consultant on behalf of a consultancy firm that is a member of the Association of Australasian Acoustical Consultants (AAAC).
- Have a recognised tertiary qualification in a discipline pertinent to acoustics.
- Be able to demonstrate competence through professional experience and/or technical expertise to the satisfaction of the EPA.

Attended monitoring locations are representative of the nearest and/or most affected privately owned residences to active operations. The privately-owned residences where attended noise monitoring will be undertaken are those listed in Table 5.1 (refer to Figure 3.1).

Table 5.1 Attended noise monitoring locations

Location ID ¹	Description	Easting (MGA)	Northing (MGA)
R2	Off Sheraton Road – nearest and/or most affected residence to the south-west of the site	655320	6426775
R3	Off Sheraton Road – nearest and/or most affected residence to the west of the site	654875	6427538
R4	Off Wellington Road – nearest and/or most affected residence to the north of the site	655838	6428439
R5	Lidscomb Road – nearest and/or most affected residence to the north-east of the site	657491	6427569

Notes: 1. These locations are consistent with those presented in Table 3 of the consent and adopted in the NVIA (EMM 2021).

It is noted that another privately-owned residence, R1, is also listed in Table 3 of the consent. However, Holcim currently has a negotiated agreement in place with the landowner of this property and hence noise limits do not apply at this location (refer to Section 3.3). Therefore, attended noise monitoring will not be conducted at this location.

Furthermore, no residence currently exists at location R23 (refer to Section 3.3). Therefore, attended noise monitoring will not be conducted at this location.

Attended noise monitoring will be undertaken at other non-project related privately-owned residences on an as-needed basis, such as following multiple noise complaints from a particular resident.

The attended noise monitoring will be completed during the day (7:00 am–6:00 pm) and night (4:00 am–6:00 am) periods. Attended noise monitoring will consist of a 15-minute measurement at each monitoring location. All information required under the EPA's Approved Methods will be recorded.

i Instrumentation

All attended noise monitoring instrumentation will meet the requirements of AS IEC 61672.1-2019 and carry current NATA or manufacturer calibration certificates. Instrument in-field calibration will be checked before and after each survey. NATA calibration of all instrumentation is undertaken every two years in accordance with AS IEC 61672 and the EPA's Approved Methods.

The sound level meter(s) will be programmed to record statistical noise level indices continuously for each 15 minute interval, including L_{A1} , L_{A10} , L_{A90} , L_{Amin} , L_{Aeq} and L_{Amax} , using 'fast' time response.

ii Meteorological conditions

Condition B2 of the consent states:

Noise generated by the development must be measured in accordance with the relevant requirements and exemptions (including certain meteorological conditions) of the NSW Noise Policy for Industry (EPA, 2017).

Fact Sheet D of the NPfI describes 'standard' and 'noise-enhancing' meteorological conditions under which the noise limits apply. The NPfI defines these as follows:

- Standard meteorological conditions: defined by stability categories A through to D with wind speeds up to 0.5 m/s at 10 m above ground level (AGL) for day, evening and night periods.
- Noise-enhancing meteorological condition: defined by stability categories A through to D with light winds (up to 3 m/s at 10 m AGL) for the day and evening periods; and stability categories A through to D with light winds (up to 3 m/s at 10 m AGL) and/or stability category F with winds up to 2 m/s at 10 m AGL.

Further, Section 5.2 of the NPfI states that noise limits applicable under 'very noise-enhancing' conditions should be the limits that apply under 'standard' or 'noise-enhancing' conditions plus 5 dB. This implies that there will be no periods when noise limits do not apply due to meteorological conditions.

As per the consent, and in accordance with the NPfI, a +5 dB adjustment to the operational limits shown in Table 3.3 is adopted when attended noise monitoring is undertaken during 'very noise-enhancing' conditions. The NPfI defines 'very noise-enhancing' conditions as 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.

When monitoring has been undertaken during 'very noise-enhancing' conditions and a +5 dB adjustment to the operational limits (refer to Table 3.3) has been adopted.

The meteorological conditions will be used to determine if the standard operational noise limits (refer to Table 3.3) apply in accordance with the NPfl.

The meteorological conditions during the noise monitoring (i.e. wind speed, wind direction, sigma-theta and rainfall) will be measured using the quarry Automatic Weather Station (AWS) (at 10 m above ground level). Handheld devices will be used by the operator during the noise monitoring to measure wind speed, wind direction, temperature and humidity at microphone height. The presence of cloud cover (okta), fog and rain will also be recorded by the operator during the noise monitoring, if any.

iii Modifying factors for annoying noise characteristics

Modifying factors outlined in Fact Sheet C of the NPfl are to be used when assessing the characteristics of a noise source. The NPfl specifies modifying factor corrections for noise with annoying characteristics such as tonal noise and low frequency noise, as well as methodology for determining their applicability. During attended noise monitoring and through post-analysis of measured data, the operator will assess if any modifying factor corrections are applicable.

iv Data analysis

Quarry noise levels as well as the overall ambient noise levels (including other non-quarry related sources) and meteorological conditions will be reported for each monitoring round.

Quarry noise emissions during operations will be evaluated and assessed against the noise limits in Table 3.3 during each attended noise monitoring event. Compliance will be determined by, where relevant:

- direct measurement against the $L_{Aeq,15min}$ and L_{Amax} (night period only) limits, wherever possible
- operator estimated site $L_{Aeq,15min}$ level
- post analysis of data (including through the review of audio recordings)
- measurement at a representative location
- calculation from near field measurements, or
- a combination of any or all of the above methods as approved by the EPA and in accordance with the NPfl as relevant.

v Attended noise monitoring exceedance protocol

Holcim has developed the following noise exceedance protocol that is followed if attended noise measurements show that quarry noise levels are above the relevant noise limits. The person conducting the attended noise monitoring shall follow the noise exceedance protocol, as follows:

1. Noise monitoring personnel to notify the Quarry Manager and advise of quarry noise level and applicable limits. The Quarry Manager to confirm if operational activities can be modified relatively efficiently.
2. Operational changes are to be made as soon as practicable (target within 30 minutes) of receiving notification. The Quarry Manager is responsible for conveying a response back to the person conducting the attended noise monitoring.
3. The person conducting the attended noise monitoring re-monitors (additional 15 minute measurement) and contacts Quarry Manager with follow-up results as soon as practicable.

4. If measured quarry noise remains above the relevant limit, additional re-monitoring (following steps 1 to 3) is to be conducted on two more occasions for a total of up to three follow-up 15 minute measurements.
5. If necessary, stop operations or the activity causing the exceedance to ensure compliance with the relevant noise limits.

The Quarry Manager is to document any actions implemented following the notification of the noise exceedance. The exceedance is required to be reported to DPE and EPA by the Quarry Manager (or delegate) as soon as practicably possible upon Holcim becoming aware of the exceedance. An additional attended noise monitoring survey shall be completed within one week if quarry noise could not be effectively reduced to achieve the relevant limits at the time of the survey.

As required by conditions C4 and D8 of the consent, within seven days of becoming aware of a non-compliance (i.e. noise exceedance of the limits), Holcim will submit a report to DPE through the Department's Major Projects website detailing the non-compliance. This report will:

- identify the quarry application number and name
- describe the date, time, and nature of the exceedance/incident
- identify the cause (or likely cause) of the exceedance/incident
- describe what actions have been taken to date to address the exceedance/incident
- describe the proposed measures to address the exceedance/incident.

Attended noise monitoring reports will be made available upon request.

vi [Attended noise monitoring report](#)

All routine attended noise monitoring results are documented and reported initially on an annual basis.

The report will consist of the following information:

- summary of attended noise monitoring methodology and results
- measured, calculated and/or operator-estimated site $L_{Aeq,15min}$ and L_{Amax} noise levels for each monitoring location
- statement of compliance/non-compliance.

The noise monitoring contractor undertaking the monitoring on behalf of Holcim will provide the Quarry Manager with a monitoring report outlining the results and outcome of the survey.

The Quarry Manager will review the monitoring report provided by the contractor to assess compliance with the relevant noise limits. A summary of noise monitoring results will be published on the quarry website, as per condition D15 of the consent.

5.3.2 [Real-time noise monitoring](#)

A real-time noise monitoring (RTNM) system is used to aid in identifying potential noise exceedances of the noise limits at surrounding residences. RTNM is utilised for noise management purposes only (not for compliance). It is used as a noise management tool, and where required, as an additional investigation tool in the event of a community complaint regarding quarry noise.

RTNM consists of using one noise monitor to measure ambient noise and estimate quarry noise contribution. The noise monitor is located immediately to the east of the R2 property as shown in Figure 3.1. The RTNM location has been selected in consideration of several factors such as the location of the nearest and/or potentially most affected residence (based on assessed noise predictions) and the potential influence of extraneous sources (e.g. other industrial operations nearby and road traffic noise). The primary focus being the suitability of the RTNM location to represent noise impacts that would be experienced at potentially the most affected residences.

The RTNM system provides 24-hour continuous data, including L_{A1} , L_{A10} , L_{A90} , L_{Amin} , L_{Aeq} , L_{Amax} recorded at 15-minute intervals. The RTNM unit has one-third octave frequency bands and audio recording capabilities to help qualify the acoustic environment (identify source characteristics). A filtered (low-pass) L_{Aeq} has been included to exclude data influenced by insects, birds and other noise sources above 1000 Hz. The RTNM unit has directional capabilities, which will aid in excluding extraneous sources (unrelated to operational sources from site) outside the angle of interest set for the site.

The RTNM system will be configured so that when the trigger levels have been reached, alarm notifications are sent to the Quarry Manager. Alarm trigger levels will be based on noise limits at the relevant residence(s) and modelled site noise levels at the RTNM location, as established during the validation process.

The RTNM Trigger Action Response Plan (TARP) presented in Table 5.2 will be implemented.

Table 5.2 RTNM TARP

Alarm trigger level	Action
Level 1 – measured directional low-pass L_{Aeq} is at a level that is predicted to exceeds the relevant limit by up to 2 dB at the nearest residence to the RTNM location.	Review of the RTNM data (including audio) and current operations will be undertaken as soon as practicable. If the responsible noise source(s) can be identified and are attributable to the site, and where appropriate, management and mitigation measures will be implemented within a practicable timeframe with the aim to reduce quarry noise
Level 2 – measured directional low-pass L_{Aeq} is at a level that is predicted to exceeds the relevant limit by more than 2 dB at the nearest residence to the RTNM location.	Review of the RTNM data (including audio) and current operations will be undertaken as soon as practicable. If the responsible noise source(s) can be identified and are attributable to the site, the relevant equipment and/or operations will either cease or be modified within a practicable timeframe with the aim to reduce quarry noise

It is noted that the alarm trigger levels provided in Table 5.2 are in recognition of daytime ambient noise environment at potentially most affected residences and human perceptions to changes in noise levels and daytime ambient noise environment.

The RTNM system will be calibrated and validated with the attended noise monitoring results over time to ensure the effectiveness of site noise controls is maintained. The RTNM location may change in the future, such as in the event of on-going community complaints related to noise from quarry operations. The effectiveness of the RTNM system will be reviewed every three years when updates to the plan are required (refer to Section 6.3), or earlier if necessary.

Meteorological data (wind speed, wind direction, sigma-theta and rainfall) from the quarry AWS is used to understand the meteorological influence on the propagation of site noise, exclude invalid data where relevant (e.g. during rainfall or wind speed above 5 m/s at microphone height) and/or review whether limits (and alarm trigger levels) require a + 5 dB adjustment under 'very noise-enhancing' meteorological conditions in accordance with the NPfI.

6 Review and improvement

6.1 Annual review

A comprehensive review of quarry operations and its environmental performance, including complaint and incident (e.g. non-compliance) records, is completed as part of the Annual Review, as required under condition D9 of the consent. Copies of the Annual Review report are submitted to Council, DPE and any other interested person upon request.

6.2 Independent review

In accordance with condition C6 of the consent, if a landowner considers that quarry noise is exceeding any relevant noise limits, they may ask the Planning Secretary in writing for an independent review of the noise impacts of quarry operations on their residence or land.

As required by condition C7 of the consent, 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 it, within 21 days of the request for a review.

If the Planning Secretary is satisfied that an independent review is warranted, within three months of the Planning Secretary's decision, or another timeframe agreed by the Planning Secretary, Holcim will implement an independent review as per condition C8 of the consent.

6.3 NMP review

The NMP (including the noise monitoring program) is to be reviewed at least every three years, when updates to the plan are required, or as directed by the Planning Secretary in consultation with other agencies. The review process is to evaluate the effectiveness of the quarry noise management system and the performance, as well as reflect changes in environmental legislation, guidelines, technology, or operational procedures.

As required by condition D5 of the consent, a review of this NMP will take place within three months of any of the following:

- the submission of an incident report under condition D7 of the consent
- the submission of an Annual Review under condition D9 of the consent
- the submission of an Independent Environmental Audit under condition D11 of the consent
- the approval of any modification of the conditions of the consent, or
- the issue of a direction by the Planning Secretary under condition A2(b) which requires a review.

As required by condition D6 of the consent, where necessary to either improve the environmental performance of the quarry, cater for a modification or comply with a direction from the Planning Secretary, this NMP will be revised to the satisfaction of the Planning Secretary. Updates will be submitted to the Planning Secretary for approval within six weeks of the review.

Any modifications to the NMP will be undertaken in consultation with the appropriate government agencies.

References

Australian Standard, AS 1055.1-2018 Acoustics – Description and Measurement of Environmental Noise – General Procedures.

Australian Standard, AS IEC 61672.1-2019 Electroacoustics – Sound Level Meters – Specifications.

DPE, The development consent for SSD 10417.

EMM 2021a, The Dubbo Quarry Continuation Project Environmental Impact Statement.

EMM 2021b, The Dubbo Quarry Continuation Project Noise and Vibration Impact Statement.

EMM 2021c, The Dubbo Quarry Continuation Project Supplementary Noise and Vibration Impact Statement.

EMM 2022a, The Dubbo Quarry Continuation Project Addendum Submissions Report.

EMM 2022b, The Dubbo Quarry Continuation Project Amendment Report.

EPA 2017, *Noise Policy for Industry* (NPfI).

EPA 2021, *Approved Methods for Measurement and Analysis of Environmental Noise in NSW* (EPA's Approved Methods).

Glossary

A number of technical terms are required for the discussion of noise. These are explained in Table G.1.

Table G.1 Glossary of acoustic terms

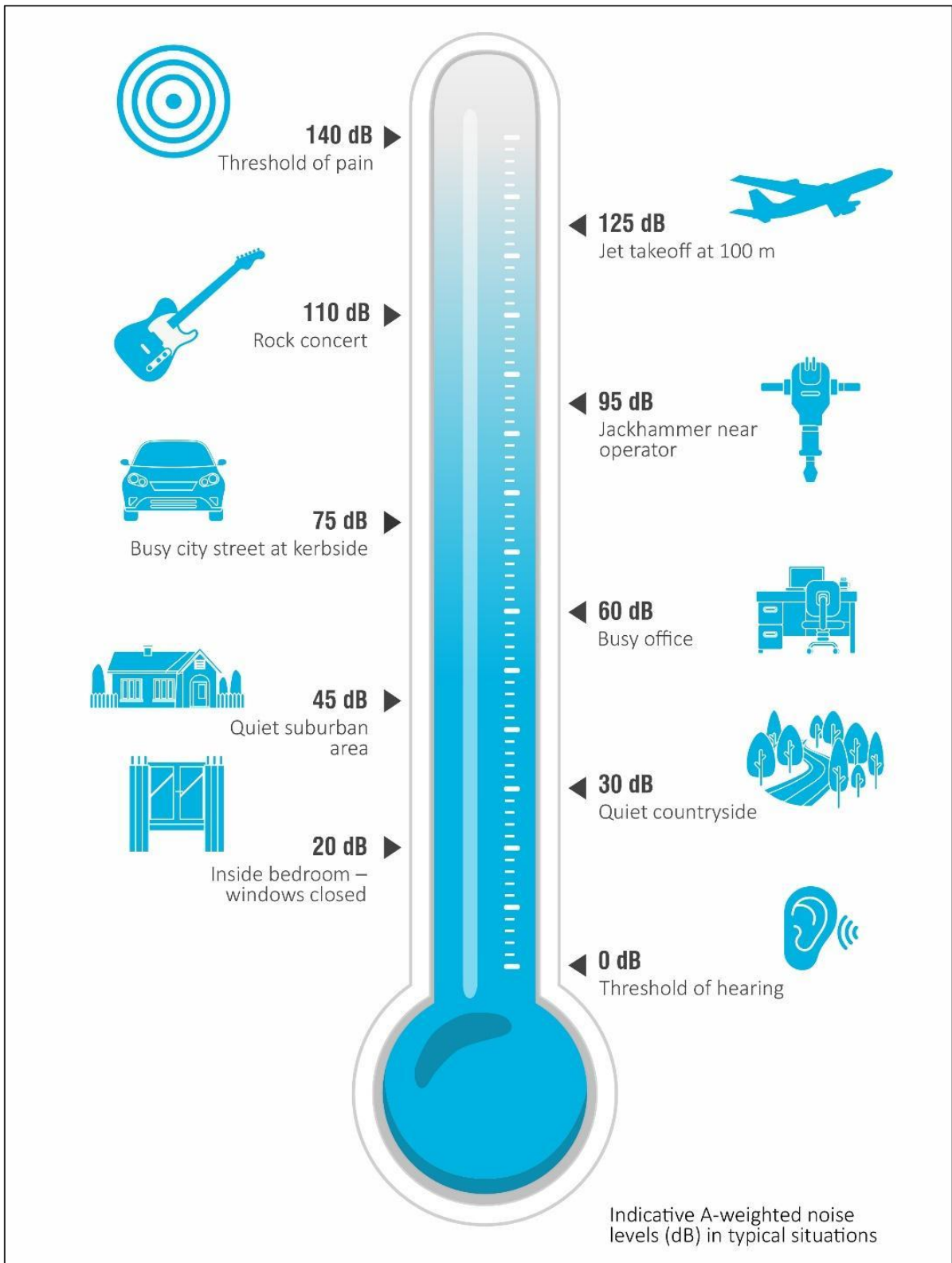
Term	Description
dB	Noise is measured in units called decibels (dB). There are several scales for describing noise, the most common being the 'A-weighted' scale. This attempts to closely approximate the frequency response of the human ear.
DEC	The NSW Department of Environment and Conservation
DPE	The NSW Department of Planning and Environment
EPA	The NSW Environment Protection Authority
L _{A1}	The A-weighted noise level exceeded for 1% of the time.
L _{A10}	The noise level which is exceeded 10% of the time.
L _{A90}	The noise level that is exceeded 90% of the time. Commonly referred to as the background noise level.
L _{Aeq}	The energy average noise from a source. This is the equivalent continuous sound pressure level over a given period. The L _{Aeq,15min} descriptor refers to an L _{Aeq} noise level measured over a 15-minute period.
L _{Amax}	The maximum root mean squared sound pressure level received at the microphone during a measuring interval.
NPfI	The NSW Noise Policy for Industry

It is useful to have an appreciation of decibels, the unit of noise measurement. Table G.2 gives an indication as to what an average person perceives about changes in noise levels:

Table G.2 Perceived change in noise

Change in sound pressure level (dB)	Perceived change in noise
1 to 2	typically indiscernible
3	just perceptible
5	noticeable difference
10	twice (or half) as loud
15	large change
20	four times as loud

Examples of common noise levels are provided in Figure G.1.



Source: Road Noise Policy (Department of Environment, Climate Change and Water 2011).

Figure G.1 Common noise levels

Australia

SYDNEY

Ground floor, 20 Chandos Street
St Leonards NSW 2065
T 02 9493 9500

NEWCASTLE

Level 3, 175 Scott Street
Newcastle NSW 2300
T 02 4907 4800

BRISBANE

Level 1, 87 Wickham Terrace
Spring Hill QLD 4000
T 07 3648 1200

CANBERRA

Level 2, Suite 2.04
15 London Circuit
Canberra City ACT 2601

ADELAIDE

Level 4, 74 Pirie Street
Adelaide SA 5000
T 08 8232 2253

MELBOURNE

188 Normanby Road
Southbank VIC 3006

PERTH

Level 9, Suite 9.02
109 St Georges Terrace
Perth WA 6831

Canada

TORONTO

2345 Yonge Street, Suite 300
Toronto ON M4P 2E5

VANCOUVER

60 W 6th Ave Suite 200
Vancouver BC V5Y 1K1



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