

## **Appendix 63 Noise Impact Assessment – Myara Mine Region**

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# Myara Mine Region

## Noise Impact Assessment

Alcoa of Australia Limited

18 September 2024

→ **The Power of Commitment**



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# Glossary and abbreviated terms

Term	Description
AS	Australian Standard
Alcoa	Alcoa of Australia Limited
CONCAWE	Conservation of Clean Air and Water in Europe
CEO	Chief Executive Officer
dB	Decibel, unit of sound pressure level
dB(A)	Decibel (A-weighted)
dB(L) <small>Linear peak</small>	Decibel (Linear), peak value of measurement period
EPA	Environmental Protection Authority
GHD	GHD Pty Ltd
ha	Hectare, unit of surface area
IF	Influencing factor
ISO	International Organisation for Standardization
km	Kilometre, unit of distance
L <sub>Aeq</sub>	Equivalent continuous sound level over A-weighted spectra
L <sub>A90</sub>	Noise level exceeded for 90 percent of the measurement period over A-weighted spectra
L <sub>A10</sub>	Noise level exceeded for 10 percent of the measurement period over A-weighted spectra
L <sub>A1</sub>	Noise level exceeded for one percent of the measurement period over A-weighted spectra
m	Metre, unit of distance
MMP	Mining Management Program
MMPLG	Mining and Management Program Liaison Group
ms	Millisecond, unit of time
NIA	Noise impact assessment
NMP	Noise Management Plan
NSR	Noise sensitive receptor
ROM	Run of Mine
RFI	Request for information
SPL	Sound pressure level
SWL	Sound power level
SSIA	Social Surrounds Impact Assessment
The Proposal	Construction and operation within Myara Mine Region five-year mine plan (2023-2027)
The Regulations	Western Australia's Environmental Protection (Noise) Regulations 1997

# Executive summary

Alcoa of Australia Limited (Alcoa) engaged GHD Pty Ltd (GHD) to prepare a Social Surrounds Impact Assessment (SSIA), including technical studies, as requested by the inter-departmental Mining and Management Program Liaison Group (MMPLG) in relation to the MMP for Huntly Mine, Myara Mine Region. A noise Impact Assessment (NIA, this report) is one such technical study required as part of the SSIA.

The NIA considers proposed mining within Myara Mine Region under the MMP 2023-2027 (the Proposal) and will be assessed by the Environmental Protection Authority (EPA) under Part IV of the WA *Environmental Protection Act 1986* (EP Act), and the *Environment Protection Biodiversity Conservation Act 1999* (EPBC Act) via the bilateral agreement.

The NIA investigates potential noise impacts that may arise from the construction and operation of mining activities proposed within Myara Mine Region throughout the duration of the 5-year mine plan. Blasting noise and vibration during construction of mining activities proposed within Myara Mine Region are expected to be relatively minor compared to the mining operation and therefore a qualitative construction assessment approach was adopted. A quantitative approach utilising noise modelling was adopted to assess the operation of mining activity within Myara Mine Region.

Operational noise modelling predicted noise emissions for 2024 to 2027 for Myara Mine Region. Pit clearing, mine development and mining will occur in a phased approach in adjacent zones to start in 2024 and end in 2027. Rehabilitation works will extend from 2027 to 2030.

Because there are Noise Sensitive Receptors (NSR)s in close proximity to the mining operation, for which standard mining operation are not expected to comply, noise sensitivity modelling has been undertaken. This informed the in-principal mitigation to aim for compliance with the assigned levels. The in-principal mitigation includes set-back distances and requirements for noise control of the fleet within the sensitive zones.

It is worth noting that the noise modelling methodology employed is worst-case both from an operational and meteoroidal point of view.

The following worst-case years of operation were selected to be modelled:

- Scenario A (Rehabilitation in 2021 and 2022 pits, Mining in 2024 pits, Mine development in 2025 pits).
- Scenario B (Rehabilitation in 2021 and 2022 pits, Mining in 2024 pits, Mine development in 2025 pits).
- Scenario C (Rehabilitation in 2023 and 2024 pits, Mining in 2025 and 2026 pits, Mine development in 2027 pits).
- Scenario D (Rehabilitation in 2023 and 2024 pits Mining in 2025 and 2026 pits Mine development in 2027 pits).

The worst-case condition was qualified by the following:

- Mining activities occur at pit locations closest to the NSR.
- Mining activities occur at the surface and not at lower depths inside pits.
- Full duty cycle and simultaneous operation of all mobile fleet.
- Wind direction is from source to receptor for each NSR.

The findings of the assessment for the Proposal are summarised as follows:

- Some NSRs (i.e. NSR2, NSR8, NSR10 and NSR17) have potential for operational noise exceedance under the worst-case conditions
- One NSR (i.e. NSR18) is also initially considered non-compliant if tonality is present in the mining noise
- Some noise sensitive receivers (i.e. NSR2, NSR8, NSR10, NSR17 and NSR18) may be subject to audible mining noise under the worst-case conditions during nighttime
- Under operational conditions, it is expected that the predicted potential risk of non-compliance is reduced considerably:

- Mining activities spread out over a larger number of pit locations in comparison with the worst-case scenarios which consider pits that are really close to the NSRs.
  - Mining activities occur at lower elevation than natural ground surface due to pit depths, thus introducing additional noise shielding and reducing projected noise levels.
  - Mobile fleet will not always be simultaneously operating under full load conditions.
  - Wind direction is based on meteorological conditions and varies (instead of defaulting to downwind conditions as have been considered in the worst-case noise modelling presented in this study).
- According to the results of sensitivity modelling, if only 1 working unit is used within 4 km from NSR2, NSR8, NSR10, NSR17 or NSR18, it is expected that predicted noise level will comply with the noise criteria at all NSRs during both nighttime and daytime periods.
  - Ground borne noise and vibration due to blasting is expected to be insignificant at all of the nearby NSRs except for the mine development pits close to NSR2, NSR8 and NSR10 (i.e. within the sensitivity zones). Therefore, smaller charge masses (less than 7kg) must be used along with careful Noise Management Plan (NMP) and monitoring.
  - Operational NMP and complaint handling practices are also provided in this report to maintain noise compliance under worst-case conditions and to ensure that any issues related to noise and/or vibration are addressed and appropriate corrective actions are identified.

This report is subject to, and must be read in conjunction with, the limitations set out in Section 1.4 and the assumptions and qualifications contained throughout the report.

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# 1. Introduction

## 1.1 Proposal description

Alcoa of Australia Limited (Alcoa) mining operations comprise the Huntly and Willowdale bauxite mines, which are located in Alcoa's Mining Lease 1SA within the Northern Jarrah Forest, interim biogeographical regionalisation for Australia subregion, within south-west Western Australia.

Alcoa's Huntly Mine supplies bauxite to the Pinjarra Alumina Refinery. It currently operates within Myara Mine Region that is located within the Shire of Serpentine-Jarrahdale and Shire of Murray, traditional lands of the Binjareb people. Located within the Metropolitan and Peel regions approximately 100 km south-east of Perth, Myara Mine Region is situated north-east of the townsite of Pinjarra, east of North Dandalup and Keysbrook, south-east of Serpentine, and south of Jarrahdale.

The NIA considers mining operations within Myara Mine Region under the Mining Management Program (MMP) 2023-2027 (the Proposal) approved under Alcoa's State Agreements. Required by the Mining and Management Program Liaison Group (MMPLG), Alcoa needs to undertake a Social Surrounds Impact Assessment (SSIA) which includes Noise Impact assessment (NIA) to support MMP approval of the Huntly Mine under Alcoa's State Agreements.

## 1.2 Purpose of this report

To provide Alcoa with the NIA required to support a SSIA for mining operations under the MMP 2023-2027 for Myara Mine Region, prepared in accordance with the following guidelines:

- Environmental Factor Guideline: Social Surroundings (EPA 2023)
- Draft Guideline: Assessment of environmental noise emissions (DWER 2021)
- Environmental Protection (Noise) Regulations 1997
- Australian Standard 2187-2:20006 Appendix J-Ground Vibration and Airblast Overpressure

## 1.3 Scope of works

The proposed scope of works for noise modelling and impact assessment for the Proposal are as follows:

- Desktop review of the available preliminary mine plan and nearby noise sensitive receptors (NSR).
- Identify assigned noise levels at selected sensitive receptors and specify relevant airblast criteria and ground vibration criteria.
- Based on available preliminary mine plan for the mine region, calculate noise sensitivity zones and establish typical worst-case mine operation scenarios for the NIA.
- Develop acoustic models under the established typical worst-case mining operation scenarios, to generate noise contour plots and predict noise levels at nearby sensitive receptors.
- Undertake modelling predictions for airblast levels and ground vibration levels at nearby sensitive receptors, under the corresponding worst-case scenarios, based on *AS 2187.2-2006 - Appendix J – Ground Vibration and Airblast Overpressure*.
- Assess the predicted noise levels, air-blast levels and ground vibration levels against relevant assessment criteria, as well as against baseline noise environment via audibility assessment.
- Provide practical mitigation and control recommendations if the exceedances are predicted.
- Prepare draft technical report documenting assessment methodology, modelling predictions, assessment results and relevant mitigation and control recommendations.
- Prepare final technical report based on Alcoa comments on draft report.

## 1.4 Limitations

This report has been prepared by GHD for Alcoa of Australia Limited and may only be used and relied on by Alcoa of Australia Limited for the purpose agreed between GHD and Alcoa of Australia Limited as set out in Section 1.2 of this report.

GHD otherwise disclaims responsibility to any person other than Alcoa of Australia Limited arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

## 2. Proposal background

### 2.1 Proposal overview

Alcoa operates the Huntly Mine within the Myara Mine Region within the Shire of Serpentine-Jarrahdale and Shire of Murray. The Proposal includes mining operations proposed within Myara Mine Region five-year mine plan under the MMP 2023-2027.

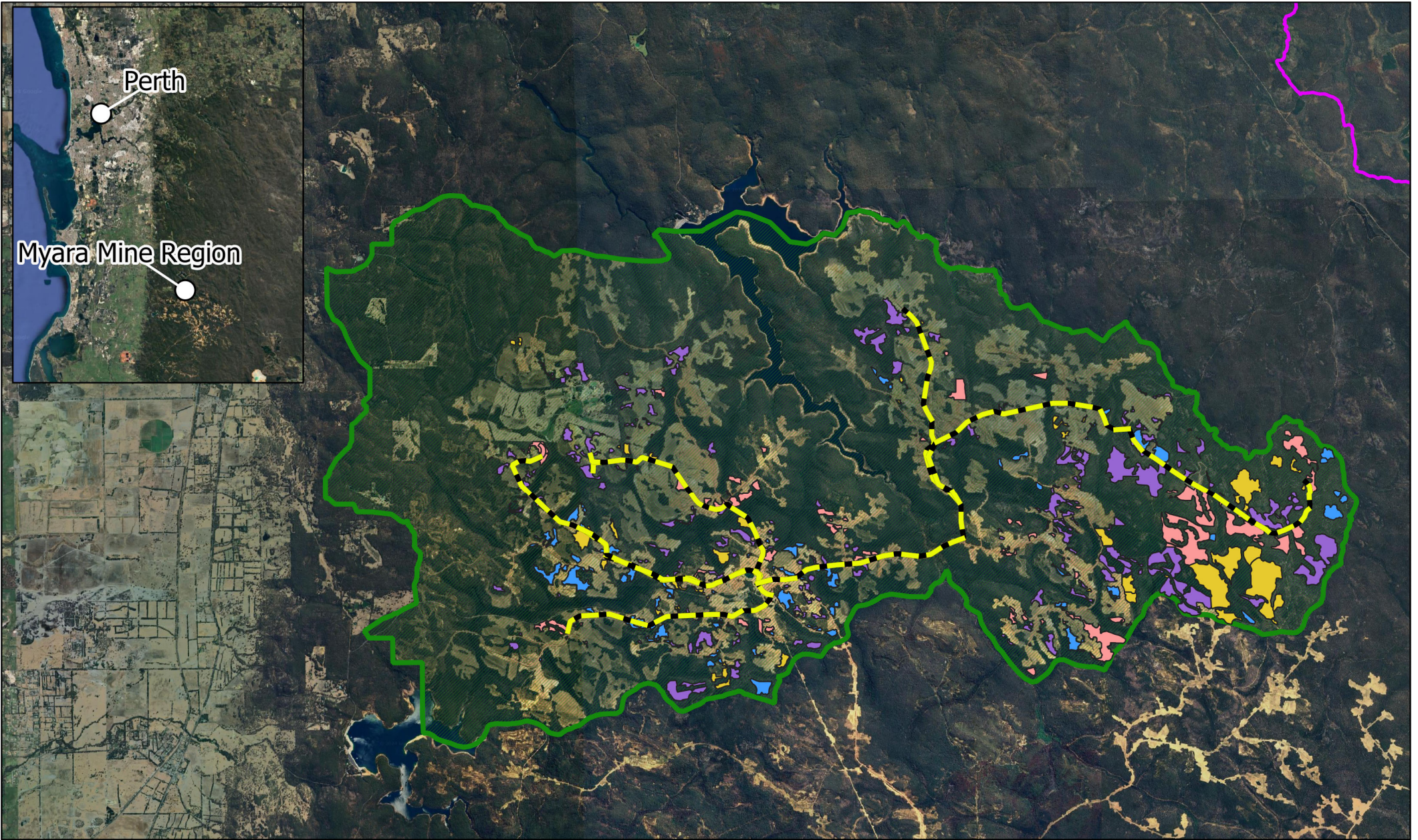
The Myara Mine Region is approximately 100 km south-east of Perth and comprises an area of approximately 20,843 ha. It lies within the Dwellingup State Forest and is surrounded by Karnet Nature Reserve to the northwest and Monadnocks Conservation Park to the east.

The Myara Mine Region is shown in Figure 2.1.

### 2.2 Mining operations

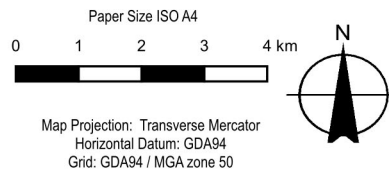
The proposed mining operations include:

- Development of haul roads for long haul ore trucking back to the crusher.
- Pre-mining (Mine development) activities including drill and blast operations and overburden removal using scrapers and excavators.
- Mine development (Mining) activities including drilling, logging, clearing and disposal of wood waste.
- Load and haul mining of bauxite ore involving a mobile equipment fleet of excavators, loaders, haul trucks and dozers.
- Rehabilitation activities using dozers and scrapers for landscaping, pre-ripping, soil return, contour ripping, followed by planting and fertilising.
- Construction of heavy and light vehicle access roads.



**Legend**

- Bibbulmun Track
- Myara Mine Region
- Haul Road
- Mining Zones**
- 2024
- 2025
- 2026
- 2027



Alcoa Myara Region Noise Impact Assessment  
Alcoa of Australia Limited

**Site Location**

Project No. 12609060  
Revision No. A  
Date. 16/09/2024

**FIGURE 2.1**

## 3. Assessment methodology

The NIA for the Proposal was undertaken in accordance with EPA and contemporary guidance to predict noise and vibration impact on surrounding NSRs. The modelling evaluates potential worst-case impacts from the Proposal and outlines how these impacts can be managed. The assessment was undertaken with consideration of the Regulations which is further referenced in Section 4.

### 3.1 Approach

#### 3.1.1 Blasting methodology

Blasting noise and vibration, is assessed qualitatively as outlined in Section 88 against the vibration noise and blasting criteria outlined in Sections 4.2 and 4.3.

#### 3.1.2 Operational methodology

The assessment adopted a quantitative approach using noise modelling to assess the operation (which encompasses mine development, mining and rehabilitation) of proposed mining activities within Myara Mine Region at multiple mining zones. Alcoa proposes the operation of mining activities within Myara Mine Region to be staged over several years where selected zones will be mined each year as shown in Figure 2.1. Once mining has concluded in a particular zone, operations will transition into a new zone. The mining location varies from year to year.

For assessment purposes, GHD focused on determining the worst-case noise impact to each of the NSRs for both day and night periods as well as under the worst-case meteorological conditions from a noise propagation perspective. These selections and parameters are outlined in Section 6.

# 4. Noise and vibration criteria

## 4.1 Operational noise

In Western Australia noise emissions are assessed on a premises-to-premises basis, where noise emitted by one premises is to be capped so it will not exceed the assigned level (i.e. noise limit) at the nearest premises.

For this purpose, the Regulations specify maximum allowable external noise levels at noise sensitive, commercial and industrial premises. The Regulations (Regulation 7) define prescribed standards for noise emissions as follows:

7. (1) Noise emitted from any premises or public place when received at other premises –

1. Must not cause or significantly contribute to a level of noise which exceeds the assigned level in respect of noise received at premises of that kind
2. Must be free of –
  - (i) Tonality (e.g. whining or droning)
  - (ii) Impulsiveness (e.g. sirens)
  - (iii) Modulation (e.g. banging or thumping)

Furthermore, a ...noise emission is taken to significantly contribute to a level of noise if the noise emission exceeds a value which is 5 dB below the assigned level...

The assigned levels (Regulation 8) are shown in Table 4.1.

Table 4.1 Assigned noise levels, dB(A)

Type of premise receiving noise	Time of day	Assigned level, dB(A)		
		LA10	LA1	L <sub>Amax</sub>
Noise sensitive premises: highly sensitive area <sup>[2]</sup>	7.00 am to 7.00 pm Monday to Saturday (Day)	45 + IF	55 + IF	65 + IF
	9.00 am to 7.00 pm Sunday and public holidays (Sunday)	40 + IF	50 + IF	65 + IF
	7.00 pm to 10.00 pm all days (Evening)	40 + IF	50 + IF	55 + IF
	10.00 pm on any day to 7.00 am Monday to Saturday and 9.00 am Sunday and public holidays (Night)	35 + IF	45 + IF	55 + IF
Noise sensitive premises <sup>[3]</sup>	All hours	60	75	80
Commercial premises	All hours	60	75	80
Industrial and utility premises other than those in the Kwinana Industrial Area	All hours	65	80	90

Notes:

1. IF = influencing factor
2. Noise sensitive areas that are classified as highly sensitive areas include a building, or a part of a building, on the premises that is used for a noise sensitive purpose and any other part of the premises within 15 metres of that building or that part of the building.
3. Any other areas located further than 15 metres from a building and directly associated with a noise sensitive use.

*Tonality, impulsiveness and modulation are defined in Regulation 9. Noise is to be taken to be free of these characteristics if:*

- (a) *The characteristics cannot be reasonably and practicably removed by techniques other than attenuating the overall level of noise emission.*

(b) The noise emission complies with the standard after the adjustments of Table 4.2 are made to the noise emission as measured at the point of reception.

Table 4.2 Adjustment for intrusive or dominant noise characteristics, dB<sup>[1]</sup>

Tonality <sup>[2]</sup>	Impulsiveness <sup>[3]</sup>	Modulation <sup>[3]</sup>
+5	+10	+5

Notes:

1. Adjustment applies where noise emission is not music
2. Adjustments are cumulative to a maximum of 15 dB
3. Any area other than highly sensitive area

Assigned noise levels in Table 4.1 have been set differently for noise sensitive, commercial and industrial and utility premises. For noise sensitive premises an influencing factor (IF) is incorporated into the assigned noise levels. IF depends on land use zonings within circles of 100 m and 450 m radius from the SNR, including:

- Proportion of industrial land use zoning
- Proportion of commercial zoning, and
- Presence of major (more than 15,000 vehicles per day) or secondary (6000 to 15,000 vehicles per day) roads.

For this assessment it has been assumed that the IF is zero for all noise sensitive premises surrounding the Myara Mine Region, as they are more than 450 m from any industrial or commercial premises or major road.

For noise sensitive residences, the time of day also affects the assigned levels. The Regulations define three types of assigned noise levels:

- L<sub>A10</sub> assigned noise level which is not to be exceeded for more than 10 percent of the time
- L<sub>A1</sub> assigned noise level which is not to be exceeded for more than one percent of the time, and
- L<sub>Amax</sub> assigned noise level means a noise level which is not to be exceeded at any time.

The L<sub>A10</sub> noise limit is the most significant for this assessment as this is most representative of continuous noise emissions.

An important impact on Regulation 7 assigned noise levels as per Table 4.1, is that when the noise sensitive receptor location is already affected by industrial noise from outside the Project. There is a requirement for new noise sources that are introduced to the area to comply with a noise limit that is set 5 dB(A) below the assigned noise levels at this noise sensitive receptor (DWER, 2021).

## 4.2 Blasting noise

The Regulations state that airblast levels resulting from blasting on any premises or public place received at any other premises must not exceed the following limits.

Table 4.3 Blasting noise guide values as per Regulation 11 in the Regulations

Time period	Time	Construction noise requirements
Daytime	7:00 am to 6:00 pm on any day which is not a Sunday or a public holiday	<ul style="list-style-type: none"> <li>– 125 dB(L)<sub>Linear, peak</sub> for any blast, and</li> <li>– 120 dB(L)<sub>Linear, peak</sub> for nine in any ten consecutive blasts, regardless of the interval between blasts.</li> </ul>
Sunday and public holidays	7:00 am to 6:00 pm on Sunday or a public holiday	<ul style="list-style-type: none"> <li>– 120 dB(L)<sub>Linear, peak</sub> for any blast, and</li> <li>– 115 dB(L)<sub>Linear, peak</sub> for nine in any ten consecutive blasts, regardless of the interval between blasts.</li> </ul>
Out of hours	6:00 pm to 7:00 am on any day which is not a Sunday or a public holiday	<ul style="list-style-type: none"> <li>– 90 dB(L)<sub>Linear, peak</sub> at any other premises, and</li> <li>– The only exception is that explosives which have previously been placed and primed may be fired if necessary to meet a safety requirement of the Department of Minerals and Energy (DME), in which case the levels must meet those given above for daytime and</li> </ul>

Time period	Time	Construction noise requirements
		weekend blasting, for the time when the blast was scheduled to be fired.

Furthermore, the Regulations give guidance on peak sound levels dB(L) <sub>Linear, peak</sub> for blasting noise, whereby:

- Monday to Friday daytime level: 125 dB(L) <sub>Linear, peak</sub>
- Sunday and public holiday daytime level: 120 dB(L) <sub>Linear, peak</sub>

### 4.3 Blasting vibration

For blasting vibration, the following limits minimise risk to any premises nearby.

Table 4.4 Blasting vibration guide values as per AS 2187.2-2006

Time period	Time	Blasting requirements
Daytime	7:00 am to 6:00 pm on any day which is not a Sunday or a public holiday	<ul style="list-style-type: none"> <li>– No vibration level resulting from blasting on any premises or public place, when received at any other premises, may exceed a peak particle velocity of 10 mm/s.</li> <li>– The vibration levels for 9 in any 10 consecutive blasts (regardless of the interval between blasts) on any premises or public place, when received at any other premises, must not exceed 5.0 mm/s.</li> </ul>
Out of hours	6:00 pm and 7:00 am on any day which is not a Sunday or a public holiday	<ul style="list-style-type: none"> <li>– No vibration level resulting from blasting on any premises or public place, when received at any other premises, may exceed a peak particle velocity of 1.0 mm/s.</li> <li>– The vibration levels for 9 in any 10 consecutive blasts (regardless of the interval between blasts) on any premises or public place, when received at any other premises, must not exceed 0.5 mm/s.</li> </ul>

## 5. Existing environment

### 5.1 Site description

Myara Mine Region is located within the shires of Murray, Serpentine-Jarrahdale and Wandering within the Metropolitan and Peel Region of Western Australia. The Myara Mine Region lies within the Dwellingup State Forest and is surrounded by Karnet Nature Reserve to the north-west and Monadnocks Conservation Park to the east.

### 5.2 Ambient noise environment

GHD reviewed the results of ambient noise monitoring conducted by Wood between 4 July 2020 and 10 September 2020 using eight loggers (Wood, 2023) within the Myara North region. The locations of two of the loggers used by Wood are relevant to the current NIA and have been summarised in Table 5.1. The main outcomes are detailed as follows:

- The ambient noise levels are typical of rural areas and are associated with community activities including dogs, livestock and noise from use of hand tools.
- Traffic noise associated with the community activities starts from approximately 4am and continue to feature prominently throughout the daylight hours.
- Recorded  $L_{A10}$  values during nighttime periods generally range from 20 to 50 dB(A). Occasionally during quiet periods, faint rumbling and revving characteristics of emissions from mobile equipment can be heard.

The baseline noise survey outcome suggests absence of industrial noise; thus, it is believed there is no requirement to use a noise criterion which is 5 dB below the assigned levels (Table 4.1).

Table 5.1 presents a summary of background noise for the noise loggers located at Myara North that are relevant to the current noise impact assessment.

Table 5.1 Overview of relevant background noise levels captured during Myara North noise monitoring program (Wood, 2023)

Logger ID	Description	Sound pressure level, dB(A)					
		Day $L_{A90}$ Range	Evening $L_{A90}$ Range	Night $L_{A90}$ Range	Day $L_{A10}$ Range	Evening $L_{A10}$ Range	Night $L_{A10}$ Range
RASL 16	Serpentine Dam recreational facilities	20 - 33	18 - 30	18 - 38	45 - 53	25 - 45	20 - 52
RASL 24	Mount Cooke Campsite (on the Bibbulmun Track)	20 - 34	18 - 38	18 - 30	38 - 50	21 - 57	28 - 45

### 5.3 Noise sensitive receptors

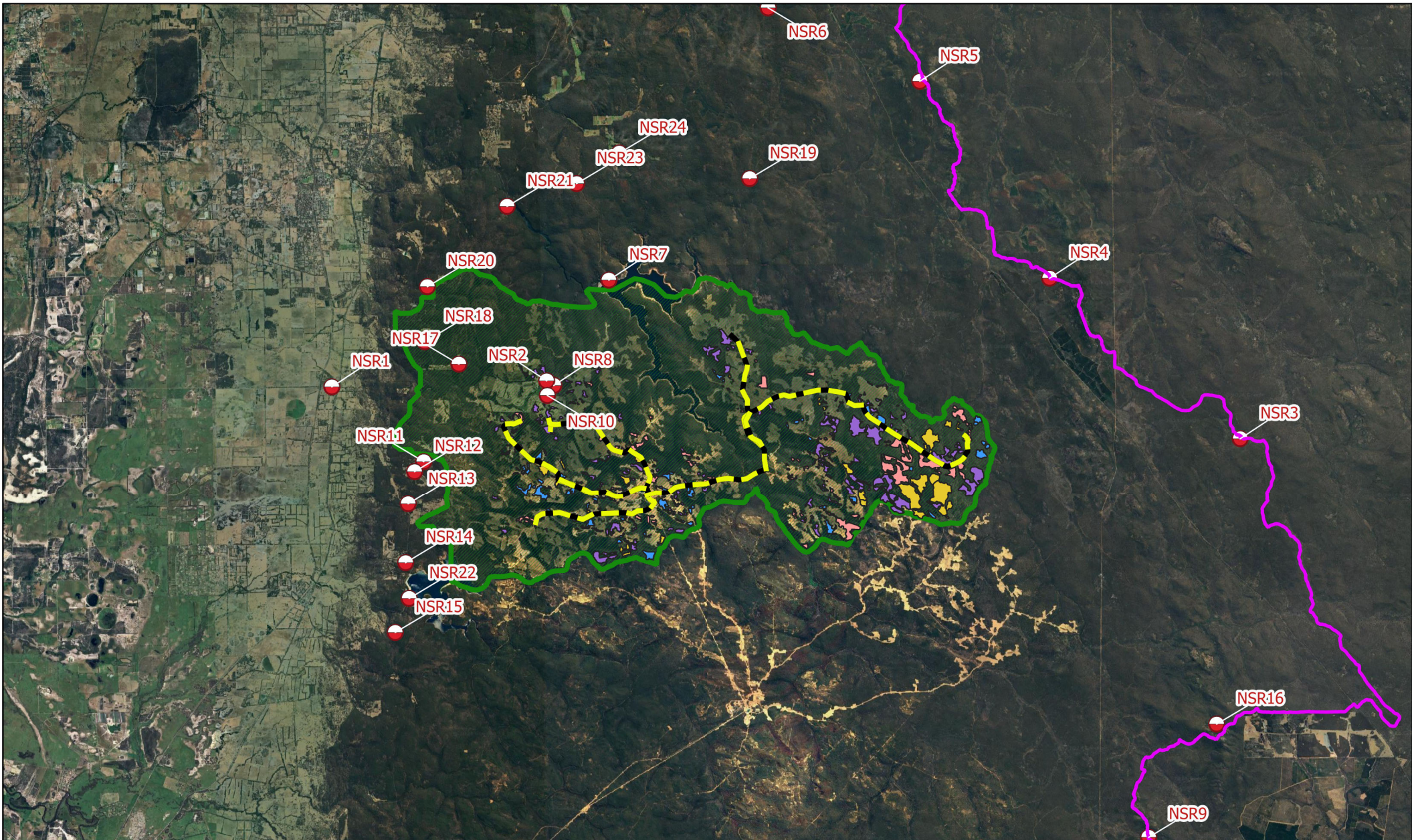
NSRs have been selected following a desktop review and have been confirmed by Alcoa. As the identified NSRs are remote, with no commercial or industrial zones as well as an absence of any major roads, the IF is equal to nought at all receivers as per the Regulations. Table 5.2 summarises the details on the NSRs, and Figure 5.1 illustrates their locations.

Table 5.2 Noise sensitive receptors and assigned noise levels

ID	Name	Description	Coordinates		Assigned noise levels L <sub>A10</sub>		
			Easting	Northing	Day	Out of hours / Sundays and Public Holidays	Night
R1	Keysbrook Fire station	Community Services	404189.8	6410150	45	40	35
R2	Karnet Prison Farm	Residential	412959.7	6410396	45	40	35
R3	Bibbulmun Nerang Campsite	Campground	441318.9	6408035	45	40	35
R4	Bibbulmun Track Mount Cooke Campsite	Campground	433535.7	6414586	45	40	35
R5	Bibbulmun Track Monadnocks Campsite	Campground	428236.8	6422624	45	40	35
R6	Wungong Campsite	Campground	422041	6425619	45	40	35
R7	Serpentine dam recreational facilities	Recreational	415500.8	6414509	45	40	- [1]
R8	Karnet Prison Farm	Residential	413252.8	6410208	45	40	35
R9	White Horse Hills Campsite	Campground	437579.9	6391733	45	40	35
R10	Karnet Prison Farm infrastructure	Residential	412988.3	6409799	45	40	35
R11	88 Yamba Drive, Keysbrook WA	Residential	407941.1	6407096	45	40	35
R12	105 Preece Road, Keysbrook	Residential	407568.5	6406689	45	40	35
R13	939 Scarp road	Residential	407303.8	6405346	45	40	35
R14	Lot 813 Hines Road, North Dandalup	Residential	407202.9	6402940	45	40	35
R15	Dandalup Campground (Munda Bidli Trail)	Campground	406777.6	6400093	45	40	35
R16	Boonering Hill	Recreational	440357.2	6396354	45	40	- [1]
R17	229 Scarp Road	Residential	409376	6411078	45	40	35
R18	168 Scarp Road, Keysbrook, WA	Residential	407985.1	6411993	45	40	35
R19	POW Ruins Campsite	Campground	421286.9	6418652	45	40	35

ID	Name	Description	Coordinates		Assigned noise levels L <sub>A10</sub>		
			Easting	Northing	Day	Out of hours / Sundays and Public Holidays	Night
R20	311 Firms Road	Residential	408089.1	6414241	45	40	35
R21	Serpentine pipehead dam	Recreational	411344.1	6417519	45	40	- [1]
R22	North Dandalup dam	Recreational	407344.5	6401481	45	40	- [1]
R23	2136 Kinsgbury Drive	Residential	414185.2	6418448	45	40	35
R24	341 Balmoral Road, Jarrahdale, WA	Residential	415925.1	6419693	45	40	35

[1] Receptor not being used overnight, noise level only needs to comply with the assigned noise levels for daytime, Sundays and Public holidays.

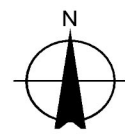
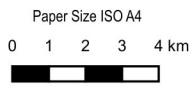


**Legend**

- Bibbulmun Track
- Haul Road
- Noise Sensitive Receptor
- Myara Mine Region

**Mining Zones**

- 2024
- 2025
- 2026
- 2027



Map Projection: Transverse Mercator  
 Horizontal Datum: GDA94  
 Grid: GDA94 / MGA zone 50

Alcoa Myara Region Noise Impact Assessment  
 Alcoa of Australia Limited

**Noise Sensitive Receptor**

Project No. 12609060  
 Revision No. A  
 Date. 16/09/2024

**FIGURE 5.1**

# 6. Operational noise modelling methodology

## 6.1 Modelling assumptions

Alcoa utilises operating units which are assigned to the exploitation of a group of pits. Each operating unit comprises of a combination of mobile equipment as described in Table 6.1. For assessment purposes, different mining operations have been assumed to take place at various pits according to the proposed MMP. As a result, mobile equipment (noise sources) were distributed among seven operating units which are summarised in Table 6.1.

There are operating units for mining (A, B and C), mine development (D and E) and rehabilitation operations (F and G) that run concurrently in separate pits (Table 6.1). Also mining operations were assumed to be completed over five years. As a result, for example when mine development is taking place at two separate zones in 2025 (units D and E), mining is occurring in three separate zones that have been developed during 2023 and 2024 (units A, B and C), and rehabilitation is occurring in two separate zones that have been developed in 2021 and 2022 (units F and G).

For conservatism, the following worst-case conditions were assumed:

- All mining operations occur simultaneously at full duty cycle.
- It is assumed that the terrain is on flat and open natural ground contours. Even though it is expected that mining pit depth could have varied average depth, it has been conservatively assumed that mining will occur at the surface level at all years.

Table 6.1 Myara mine operation equipment and locations

Equipment type	Total proposed existing fleet units	Total assumed operational units <sup>[1]</sup>	Number of equipment						
			Mining			Mine development		Rehabilitation	
			Unit A	Unit B	Unit C	Unit D	Unit E	Unit F	Unit G
<b>Mobile fleet</b>									
Excavators (250T)	4	3	1x in pit	1x in pit	1x in pit	-	-	-	-
Haul trucks moving (190T) <sup>[2]</sup>	14	12	4 to the crusher	4 to the crusher	4 to the crusher	-	-	-	-
Haul trucks idle (190T)	4	3	1x idle in pit	1x idle in pit	1x idle in pit	-	-	-	-
Dozer	12	10	1x in pit	-	1x in pit	2x	2x	2x	2x
Scrapers	8	8	-	-	-	2x	2x	2x	2x
Excavators for soil & overburden removal	4	4	-	-	-	1x	1x	1x	1x
Water carts <sup>[2]</sup>	3	3	1x to the crusher	1x to the crusher	1x to the crusher	-	-	-	-
Graders <sup>[2]</sup>	5	4	1x to the crusher	1x to the crusher	2x to the crusher	-	-	-	-
Loader 992	1	1	-	-	-	1x	-	-	-
Loader 993	1	1	-	-	-	-	-	1x	-
<b>Fixed plant</b>									
Crusher 160			1x close to the conveyer						
Crusher 260			1x close to the conveyer						

Notes:

1. Based on an assumed availability of ~75-100% (rounded to the next full unit)
2. Haul trucks, water carts and graders have been modelled as moving sources between the crusher and the tree mining pits where units A, B and C are operating.

Blast drills were not considered in the operational modelling as per RFI-003 (received 27 June 2024) but impact of blasting is taken into account in Section 8. Furthermore, the model does not include noise emissions from any other sources besides what has been highlighted in Table 6.1.

## 6.2 Operational noise sources

The operational noise source details for modelling are shown in Table 6.2.

**Table 6.2** Operational noise sources for Myara Mine Region

Equipment type	SWL, dB(A)	Octave band sound power level, (dB)									Height, m	Noise source type
		31.5Hz	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz		
Excavator (250T)	116	106	115	122	113	114	111	107	100	96	1.5	Point
Haul truck (190T) drive-by	120	110	112	119	118	119	115	111	106	99	1.5	Line
Haul truck (190T) idle	107	110	119	104	101	102	103	100	91	82	1.5	Point
Dozer	116	115	120	124	118	115	108	103	96	88	1.5	Point
Scraper	108	108	117	116	112	110	108	102	97	108	1.5	Point
Excavator for soil & overburden removal	115	116	108	117	116	112	110	108	102	97	1.5	Point
Water cart	122	112	118	124	121	121	115	113	106	100	1.5	Line
Grader	111	102	107	113	110	109	105	103	95	93	1.5	Line
Loader 992	113	100	111	122	109	110	108	105	95	90	1.5	Point
Loader 993	116	101	110	121	115	116	110	106	101	94	1.5	Point
Myara crusher (Diesel engine)	110	89	97	104	109	103	105	104	98	91	3	Point

## 6.3 Sensitivity modelling

Several modelling scenarios were investigated to determine noise sensitivity zones, due to the proximity of some mining pits to some NSRs. The results of sensitivity modelling are used to estimate the minimum distance (setback distance) and noise level requirement for the mobile equipment fleets to achieve Alcoa's noise objectives as mining activities approach the most affected NSRs. The noise sensitivity zones are defined in Table 6.3.

Table 6.3 Noise sensitivity zone definition

Zone	Sensitivity	Definition
Do Not Mine Zone	Severe	Zones adjacent to receivers. Compliance with Assigned Levels require no mining. Careful management and noise monitoring will be required.
Premium Mining Zone	High	Zones closest, but not necessarily adjacent to receivers. Mining noise emissions controllable through 'optimised mining' with a low noise fleet. Mining activities require evaluation through active modelling and customised noise control strategies.
Attenuated Mining Zone	Medium	Zones further away but still relatively close to receivers. Mining required with noise-controlled fleet. Mining activities require evaluation through active modelling and customised noise control strategies.
Standard Mining Zone	Low	Mining with Alcoa's standard fleet (Table 6.2) without requiring additional noise controls or management.

The fleet types used for the defined sensitivity zone are as follows:

- **Standard fleet:** current Alcoa Myara mining fleet with the operational noise levels provided in Table 6.2
- **Attenuated fleet:** based on the current Alcoa Myara Fleet but incorporating additional noise controls (e.g. engine bay treatments and upgraded exhaust silencers) providing a noise reduction of 5 dB compared to the standard fleet; and
- **Premium fleet:** based on the current Alcoa Myara Fleet but assuming a 10 dB reduction compared to the standard fleet. If the 10 dB reduction is not feasible by engineering noise control, smaller/ lower powered equipment models will need to be used.

The following assumptions were adopted for the development of the noise sensitivity zones:

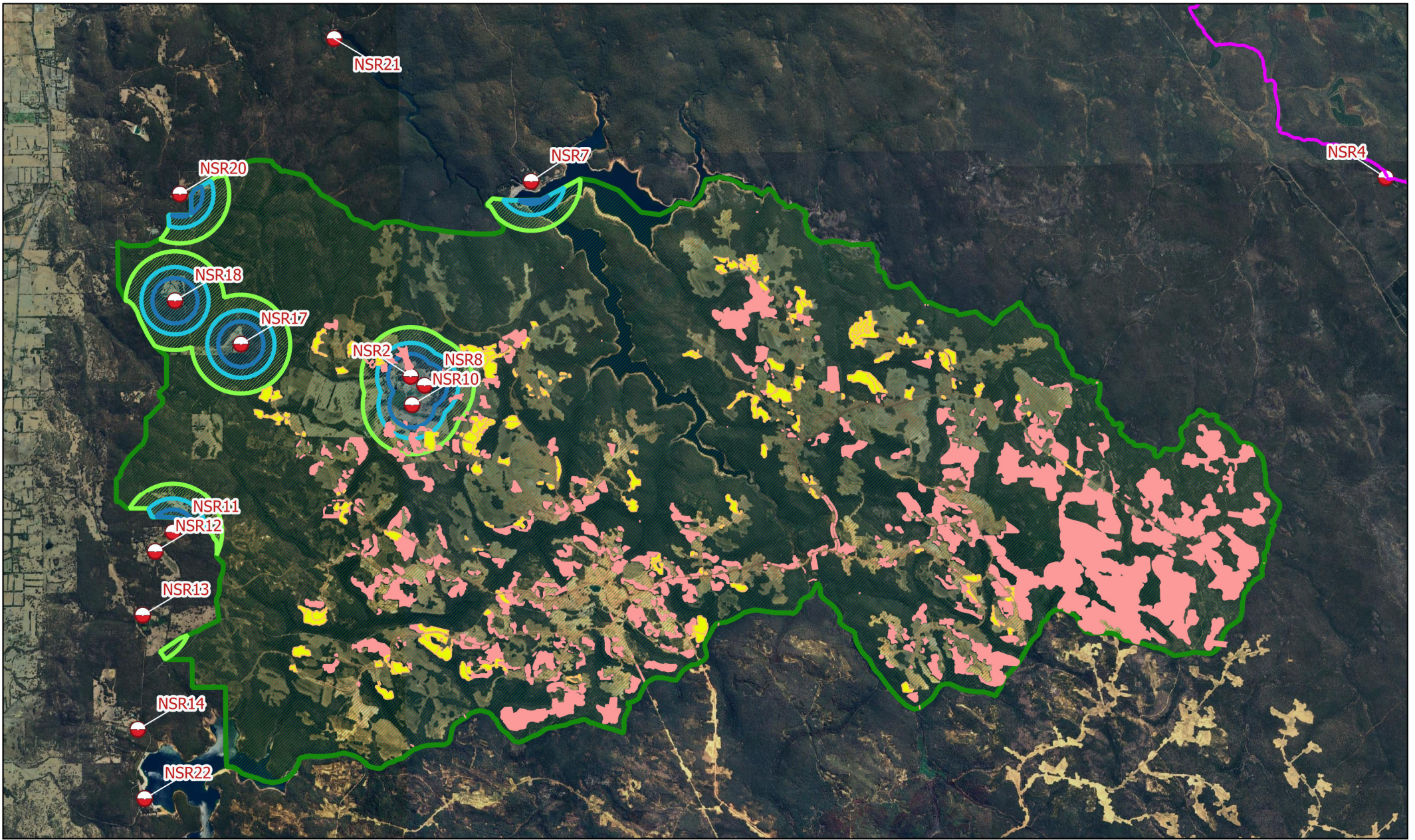
- Noise sensitivity modelling assumed 1 mining work unit composed of:
  - 1 x 250T excavator within the pit
  - 1 x 190T haul truck idling at the excavator location within the pit
  - 1 x dozer operating within the pit
  - 2 x haul trucks within the pit
- Mining operations have been assumed to be undertaken at the surface level.
- Only one work unit operating within a 4 km radius of the nearest NSR at any time. No simultaneous/ multiple operations in proximity have been considered. It is assumed that Alcoa mine planners will be able to simultaneously mine blocks outside of the 4 km radius to achieve Alcoa's mining goals.

### 6.3.1 Noise sensitivity zones

Figure 6.1 and Figure 6.2 present the noise sensitivity zones for the proposed Myara Mine Region for mining operations respectively during day and night. It should be noted that

- Some operational pits in the proposed 5-year mine plan are located within the "Do not mine zone", "Attenuated mining zone" and "Premium mining zone" during both day and night times.

The sensitivity modelling shown in Figure 6.1 and Figure 6.2 will be used to inform the noise modelling for NIA (Table 6.4). This means that inside sensitive zone, no fleet will be located as a source in the "Do not mine zone" areas, and noise-controlled fleet with 5 dB and 10 dB noise reduction will be used for the mine pits that are located within the "Attenuated" and "Premium" zones, respectively.

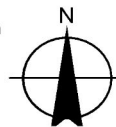


**Legend**

- Noise Sensitive Receptor (Day)
- Bibbulmun Track
- MMP 2024 - 2027
- MMP 2021 - 2023
- Day Do Not Mine Zone
- Day Premium Mining
- Day Attenuated Mining
- Day Standard Mining

Paper Size ISO A4  
0 1 2 3 km

Map Projection: Transverse Mercator  
Horizontal Datum: GDA94  
Grid: GDA94 / MGA zone 50

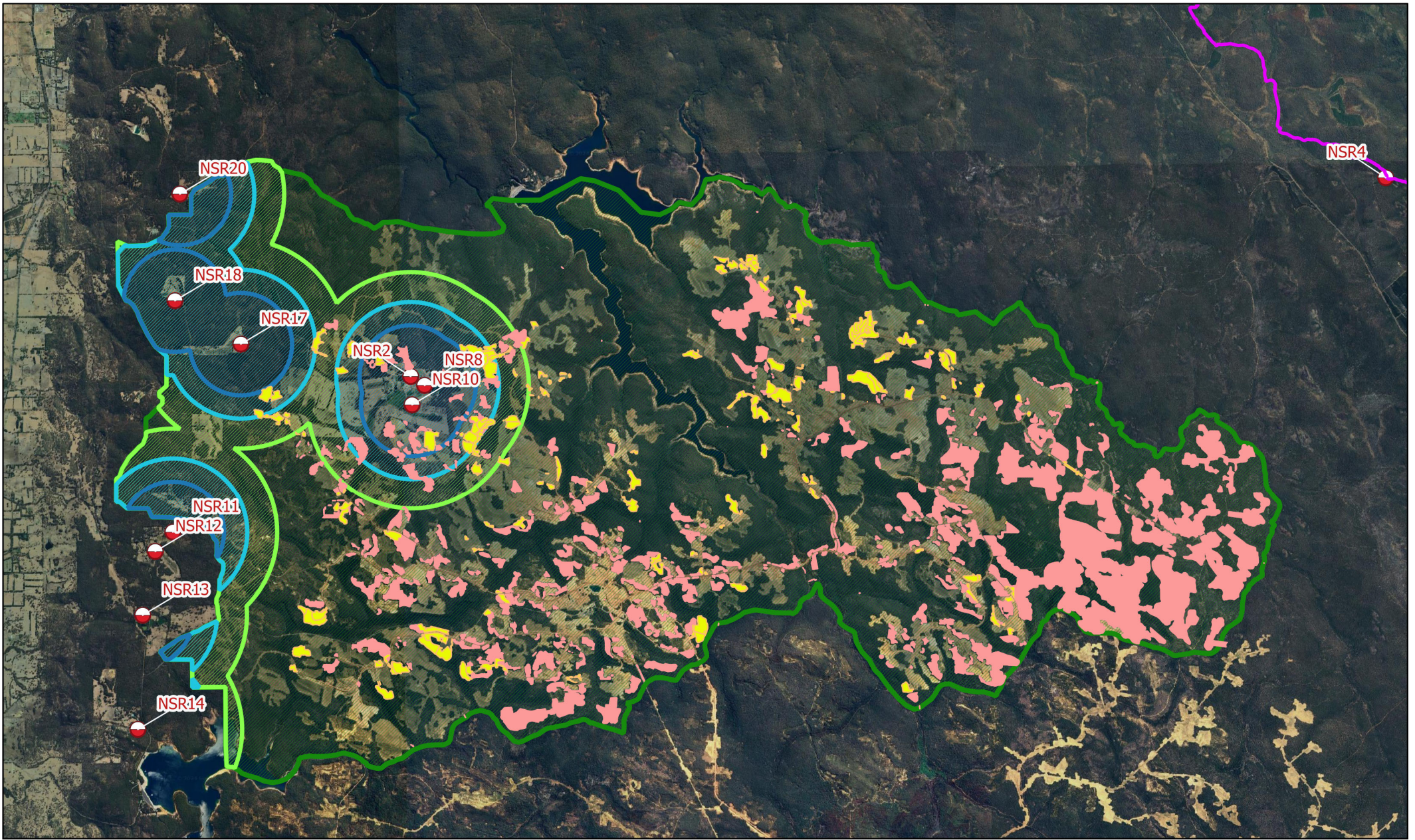


Alcoa Myara Region Noise Impact Assessment  
Alcoa of Australia Limited

**Daytime Mining Noise Sensitivity Zones  
Myara Region**

Project No. 12609060  
Revision No. A  
Date. 12/09/2024

**FIGURE 6.1**

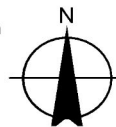


**Legend**

- Noise Sensitive Receptors (Night)
- Bibbulmun Track
- MMP 2024 - 2027
- MMP 2021 - 2023
- Night Do Not Mine Zone
- Night Premium Mining
- Night Attenuated Mining
- Night Standard Mining

Paper Size ISO A4  
0 1 2 3 km

Map Projection: Transverse Mercator  
Horizontal Datum: GDA94  
Grid: GDA94 / MGA zone 50



Alcoa Myara Region Noise Impact Assessment  
Alcoa of Australia Limited

**Nighttime Mining Noise Sensitivity Zones  
Myara Region**

Project No. 12609060  
Revision No. A  
Date. 16/09/2024

**FIGURE 6.2**

## 6.4 Noise modelling scenarios

The noise impact on each NSR depends on the geographic location of the NSR with respect to the mining activities. The worst-case scenarios, in terms of meteorological conditions and schedule of activities, were determined using the Alcoa-provided MMPs (RFI-002 received 15 April 2024) shown in Figure 6.1 and Figure 6.2. The results of sensitivity modelling have also been considered in the scenarios with the aim of meeting the noise criteria. This is summarised in Table 6.4.

Table 6.4 Operational modelling noise scenarios

Scenario ID	Representative year	Mining activities	Fixed plant and long haul activities	Most affected receptor(s)	Mitigation required based on sensitivity modelling
A	2025	Rehabilitation in 2021 and 2022 pits, Mining in 2024 pits, Mine development in 2025 pits	Fixed plant, mobile plant, long haul ore trucking activities	NSRs located in the centre of the Myara Mine Region, NSRs located to the west and southwest of the Myara mine pits, NSRs on the Bibbulmun Track	Set-back distances and attenuated and premium fleet will be used according to the Daytime sensitivity
B	2025	Rehabilitation in 2021 and 2022 pits, Mining in 2024 pits, Mine development in 2025 pits		NSRs located in the centre of the Myara Mine Region, NSRs located to the west and southwest of the Myara mine pits, NSRs on the Bibbulmun Track	Set-back distances and attenuated and premium fleet will be used according to the Nighttime sensitivity
1-	2026	Rehabilitation in 2022 and 2023 pits, Mining in 2024 and 2025 pits, Mine development in 2026 pits		-	
C	2027	Rehabilitation in 2023 and 2024 pits, Mining in 2025 and 2026 pits, Mine development in 2027 pits		NSRs located in the centre of the Myara Mine Region, NSRs located to the west, southwest and North of the Myara mine pits	Set-back distances and attenuated and premium fleet will be used according to the Daytime sensitivity
D	2027	Rehabilitation in 2023 and 2024 pits Mining in 2025 and 2026 pits Mine development in 2027 pits		NSRs located in the centre of the Myara Mine Region, NSRs located to the west, southwest and North of the Myara mine pits	Set-back distances and attenuated and premium fleet will be used according to the Nighttime sensitivity

Notes:

- Scenario marked with "1-" has been considered but has not been presented in this report as it does not represent worst-case from a noise emissions perspective.

For noise modelling, there are several acoustic parameters to base the assessment upon, considering the nature, type and duration of noise sources present.

- $L_{Amax}$  is the (A-weighted) maximum root-mean squared (RMS) noise level predicted.
- $L_{A1}$  is the (A-weighted) noise level exceeded for one percent of the operational period.
- $L_{A10}$  is the (A-weighted) noise level exceeded for 10 percent of the operational period.

$L_{A10}$  will be the acoustic parameter chosen for this assessment because complying with  $L_{A10}$  implies complying with  $L_{A1}$  and  $L_{Amax}$  parameters due to it being the most conservative parameter over the range of noise sources present.

## 6.5 Software package

SoundPLAN 8.2 is a computer program for the calculation, assessment, and prognosis of noise propagation. SoundPLAN calculates environmental noise propagation according to CONCAWE and other algorithms. Propagation calculations consider sound intensity losses due to geometrical spreading, terrain effects, atmospheric absorption and ground absorption. The CONCAWE algorithm also takes into account the presence of wind conditions, such as 'downwind' conditions, which are favourable to sound propagation. As a result, predicted received noise levels are expected to represent a worst-case scenario, due to the distances involved between source and receptors, enhancement of noise due to weather is expected to influence the closest sensitive receptor locations.

The algorithms used in this model account for the following physical features:

- Geometrical divergence
- Atmospheric absorption
- Ground effect
- Screening by obstacles
- Reflections

## 6.6 Meteorological and geographical conditions

In assessing meteorological conditions, the CONCAWE method has been in accordance with WA DWER Draft Guidelines 2021. Modelling results are based on available information provided and should only be used as a guide for comparative purposes. The noise model inputs and assumptions for the operational assessment of the Project are worst-case default (according to the WA DWER Draft Guidelines 2021) and provided in Table 6.5.

Table 6.5 Noise modelling parameters

Variable	Parameter used	
Prediction algorithm	CONCAWE prediction algorithm	
Ground absorption coefficient	G = 0.6 (based on vegetated land or sand)	
– G = 0 is for hard, reflective ground		
– G = 1 is for soft, porous ground		
Receptor heights	1.5 m above ground.	
Terrain	<ul style="list-style-type: none"> <li>– Three-dimensional terrain has been used in the model.</li> <li>– Ground contours were used based on the dataset provided by Alcoa:</li> <li>– For the remainder of the area 5 m ground contours were sourced from: 5 m data – retrieved from Elvis Elevation.</li> </ul>	
Order of reflection	2	
Proposed layout	The noise model developed for this assessment was based on the mine pit shape files provided by Alcoa. 'HUN_36MTHPLAN2024_2027_PIT_HR_INFRA_20240415.shp' (April 2024)	
Meteorological Scenario	Day	Night
Temperature	20°C	15°C
Relative Humidity	50%	50%
Wind Speed <sup>[1]</sup>	4 m/s	3 m/s
Pascqual Stability	E	F

Notes: The wind direction considered in the noise model is from source to receptor as this constitutes worst-case form a noise emissions perspective.

# 7. Noise modelling results

For daytime activities, the most stringent assigned level will be during Sundays and public holidays. The most stringent criteria overall; however, is the night-time assigned level.

The predicted noise levels are presented for the NSRs for daytime and night-time scenarios in Table 7.1, and have been compared with the noise criteria to determine compliance.

As can be seen from Table 7.1, the predicted noise levels are expected to comply with the noise criteria at all receptors except NSR2, NSR8, NSR10 and NSR17 (only for Scenario D). The highest predicted noise level is 50 dB LA10 at NSR10 during the daytime. Results in red denote a risk of non-compliance with a maximum of 10 dB(A) exceedance. Results in blue present a risk of non-compliance only when tonality is considered (tonality attracts a 5 dB correction as per Regulation 9).

Table 7.1 Noise modelling results

ID	Noise sensitive receptors	Daytime (Sunday and Public Holidays) <sup>[1]</sup>			Nighttime		
		Noise Criteria dB(A)	Predicted noise level, dB LA10		Noise Criteria dB(A)	Predicted noise level, dB LA10	
			A (2025)	C (2027)		B (2025)	D (2027)
NSR1	Keysbrook Fire Station	40	24	21	35	21	20
NSR2	Karnet Prison Farm	40	48	46	35	38	38
NSR3	Bibbulmun Nerang Campsite	40	18	15	35	18	14
NSR4	Bibbulmun Track Mount Cooke Campsite	40	26	20	35	26	19
NSR5	Bibbulmun Track Monadnocks Campsite	40	21	20	35	20	19
NSR6	Wungong Campsite	40	19	20	35	18	18
NSR7	Serpentine Dam recreational facilities	40	28	31	- [2]		
NSR8	Karnet Prison Farm	40	46	46	35	38	38
NSR9	White Horse Hills Campsite	40	15	15	35	14	13
NSR10	Karnet Prison Farm infrastructure	40	47	50	35	40	40
NSR11	88 Yamba Drive	40	25	23	35	24	22
NSR12	105 Preece Road	40	31	29	35	30	29
NSR13	939 Scarp Road	40	26	25	35	27	26
NSR14	Lot 813 Hines Road, North Dandalup	40	27	26	35	26	26
NSR15	Dandalup Campground (Munda Biddi Trail)	40	7	10	35	5	9
NSR16	Boonering Hill	40	17	15	- [2]		
NSR17	229 Scarp Road	40	44	35	35	40	29
NSR18	168 Scarp Road	40	36	30	35	31	25
NSR19	POW Ruins Campsite	40	23	25	35	22	25
NSR20	311 Firms Road	40	26	26	35	23	22
NSR21	Serpentine Pipehead Dam	40	8	8	- [2]		
NSR22	North Dandalup Dam	40	7	9	- [2]		

ID	Noise sensitive receptors	Daytime (Sunday and Public Holidays) <sup>[1]</sup>			Nighttime		
		Noise Criteria dB(A)	Predicted noise level, dB L <sub>A10</sub>		Noise Criteria dB(A)	Predicted noise level, dB L <sub>A10</sub>	
			A (2025)	C (2027)		B (2025)	D (2027)
NSR23	2136 Kingsbury Drive	40	16	18	35	15	17
NSR24	341 Balmoral Road	40	23	24	35	20	23

Notes:

1. Sunday and Public Holiday daytime is used as it is the worst-case condition.
2. The receptors are occupied only during day-time, they are assessed against the day-time criterion only.

The modelled noise contours for each scenario are presented in Appendix A:

- Figure A-1: Scenario A L<sub>A10</sub> daytime noise contours
- Figure A-2: Scenario B L<sub>A10</sub> nighttime noise contours
- Figure A-3: Scenario C L<sub>A10</sub> daytime noise contours
- Figure A-4: Scenario D L<sub>A10</sub> nighttime noise contours

## 7.1 Noise impact compliance assessment

The modelling results presented in Table 7.1 show that the predicted noise levels are expected to comply with the noise criteria under worst-case weather conditions during day and night, including during Sundays and public holidays at all NSRs except for NSR2, NSR8, NSR10 and NSR17. The maximum forecast exceedances are 8 dB(A) at NSR2, 6 dB(A) at NSR8 and 10 dB(A) at NSR10 all during Sunday day-time, and 5 dB(A) at NSR17 during night. There is also a risk of non-compliance for NSR18 (+1 dB) during both Sunday day-time and night (Scenarios A and B) should tonality be evident in the received noise (i.e. compliance is expected for this receptor if tonality is not evident).

As can be seen from Figure 6.1 and Figure 6.2, the highlighted receptors for which there is a risk of non-compliance under worst-case considerations are located within the “Do not mine sensitivity zone” and need careful Noise Management Plan (NMP) and noise monitoring which is explained in detail in Section 10. The following sections outline how compliance can be achieved.

### 7.1.1 Tonality assessment

It is possible that some of the mobile equipment may exhibit tonality at some of the receptors. However, this tonality may not always be evident at the receptor for the following reasons:

- Tonality may not always exceed the ambient noise at the NSRS.
- Overall tonality will be reduced via masking of specific tonal components from one equipment to another.
- The level of noise emissions and tonality from items of mobile equipment will vary depending on their locations (i.e. changing heights, depths and lateral position to NSRs).
- The severity and pitch of the tonality from mobile equipment depend on operating conditions (i.e. heat, operating load etc.).

With consideration of the abovementioned reasons prediction of tonality at the NSRs from the mobile equipment fleet is difficult, especially when the mining operations are several kms from the NSRs.

The predicted noise levels in Table 7.1 show that the potential of non-compliance due to tonality ranges between +1 dB L<sub>A10</sub> at NSR18 (during the night-time for Scenario B) and +10 dB L<sub>A10</sub> at NSR10 which is the most affected NSR that is at risk of non-compliance regardless of tonality (due to worst-case conservatism).

### 7.1.2 Conservatism of the worst-case noise model

The worst-case modelling considerations in terms of weather conditions and mining and mine development activities are expected to provide a significant conservative margin (cumulatively could be up to 6 – 10 dB based on Wood, 2023) for predicted noise levels at adjacent NSRs.

### 7.1.2.1 Weather conditions

The worst-case weather conditions are the default meteorological conditions stipulated in the WA DWER Draft Guidelines 2021. It is expected that the most frequent occurrence of default weather conditions will occur in the cooler periods of the year.

### 7.1.2.2 Mining activities

The worst-case considerations in terms of schedule of activities (RFI-002 received 15 April 2024) requires modelling simultaneous working units in the vicinity of some NSRs. The results of sensitivity modelling were used in the modelling of the worst-case scenarios by indicating locations of noise-controlled fleet within the sensitive zones. However, the worst-case consideration of the schedule of activities is against the sensitivity modelling assumption which is to use only one working unit within 4 kms radius from the NSRs. This is the main reason for the non-compliance at NSR2, NSR8, NSR10 and NSR17 because they are inside the “Do Not Mine” sensitivity zones and receive noise simultaneously from more than one working unit within 4 km from the NSRs (refer to noise contours in Appendix A).

It should also be considered that, the modelling scenarios assessed assume that all noise-generating activities occur simultaneously at full duty cycle, and that all mining activities occur at the pit surface. Hence, it is expected that these worst-case assumptions have additional significant margins of conservatism in terms of noise modelling predictions compared with realistic activities within the pit areas.

### 7.1.2.3 Impact of conservatism to predicted results

Table 7.1 presents the predicted noise levels incorporating the following worst-case conditions:

- For each scenario, noise sources were located at the pit closest to the nearest NSR for each mining area under consideration, which is a very conservative approach from a noise propagation perspective.
- There are simultaneous working units within 4 kms radius from the NSRs which is very conservative approach from noise propagation perspective and disregards the assumption made for the sensitivity modelling.
- Full duty cycle and simultaneous operation of all mobile fleet. In reality, the equipment load will fluctuate through the day and instances of all equipment being under full load simultaneously are highly unlikely.
- Mining activities occur at the surface and not at lower depths inside pits. This is quite conservative, because mining equipment, relative position to nearby ground contours, will fluctuate throughout the day with equipment being shielded at times and exposed at other times.
- Wind direction from source to receptor for each NSR (i.e. downwind conditions). This constitutes worst-case from a noise propagation point of view. In reality, there will be times when the wind conditions are not downwind, and there could be significant period of times when downwind conditions are not present.

Under operational conditions which constitute more realistic conditions, it is predicted that:

- If simultaneous working units are not used within 4 km radius from the relevant NSRs, the predicted noise will reduce by 5 dB or more for both day and night scenarios.
- Outside of downwind conditions, modelling shows a 2 dB or more reduction in noise levels for both day and night scenarios.

Hence, for realistic operational conditions, it is expected that predicted noise level will comply with the noise criteria at all NSRs at all times.

At times when worst-case conditions may be present, it is expected that with the implementation of the operational NMP discussed in Section 10), noise compliance can be achieved at all NSRs at all periods of the day even where mining activity may occur closest to the pit edges of NSRs.

## 7.1.3 Audibility assessment

The audibility of mining noise at the NSRs depends on the ambient baseline levels, the weather conditions and the tonal content of the noise. These are factors that are difficult to predict given the range of distances involved.

A conservative and simplified approach to assess the audibility is proposed based on 30 dB(A) (i.e. 5 dB below nighttime noise criteria). The audibility contour lines have been illustrated in Figure A-2 and Figure A-4.

Based on the worst-case noise modelling results in Table 7.1 , NSR2, NSR8, NSR10 and NSR17 and NSR18 are predicted to have the potential to be audible under the worst-case conditions at nighttime (Scenarios B and D).

However, audibility is reduced when weather conditions are expected to be less conducive for noise propagation (i.e. other than worst-case weather conditions). Furthermore, mining noise is assessed as audible if the predicted noise level values protrude above the ambient monitoring data by more than 3 dB as a person typically does not detect a change in noise levels below 2 to 3 dB (David Bies, 2018). Recorded  $L_{A10}$  values during night-time periods generally range from 20 to 50 dB(A) (Table 5.1). This suggests that the audibility of mining noise is likely to be masked by typical ambient noise levels, so even under the worst-case condition, audibility will not always be a potential risk.



## 8. Blasting noise and vibration assessment

### 8.1 Blasting noise

Blast noise data from Alcoa's existing mine operations in the Myara North Mine Region was collected by Wood in a previous assessment (Wood, 2023) to derive an empirical assessment criterion based on current operational practices. Table 8.1 summarises the blast methodology and the incurred noise emission currently practiced in Myara North Mine Region.

Table 8.1 *Blast noise at distances from Alcoa's existing mine operations in Myara North Mine Region (Wood, 2023)*

Monitor	Distance from blast centre, m	Maximum instantaneous charge mass, kg	Measured peak noise level dB(L) <sub>Linear, peak</sub>
Blast 1			
1	1390	9 kg per hole, 762 holes	117
2	2780		107
3	5560		92
Blast 2			
1	1090	7 kg per hole, 40 holes	116
2	2180		107
3	4360		99

Based on this data, the noise criteria of 120 dB(L)<sub>Linear, peak</sub> is expected to be at approximately 1,200 m from the blast centre. Except for NSR2, NSR8 and NSR10 which are the three NSRs very close to the mine development pits (from about 200m to 1000m within the sensitivity zones), it is not expected that there will be any exceedances at other NSR locations due to their large distances from the mine development pits (>2000 m). This has been visualised in Figure 8.1 by calculating the buffer distance for blasts taking place at mine development pits with respect to the location of the NSRs. The daytime sensitivity zones have been overlaid for comparison purposes only. It can be seen from the figure that, some of the NSRs that require careful noise control for operational mining activities, also require careful noise control for the air-blast noise. Other NSRs will not be impacted by blasting noise even when three simultaneous blasts take place at different mine development sites.

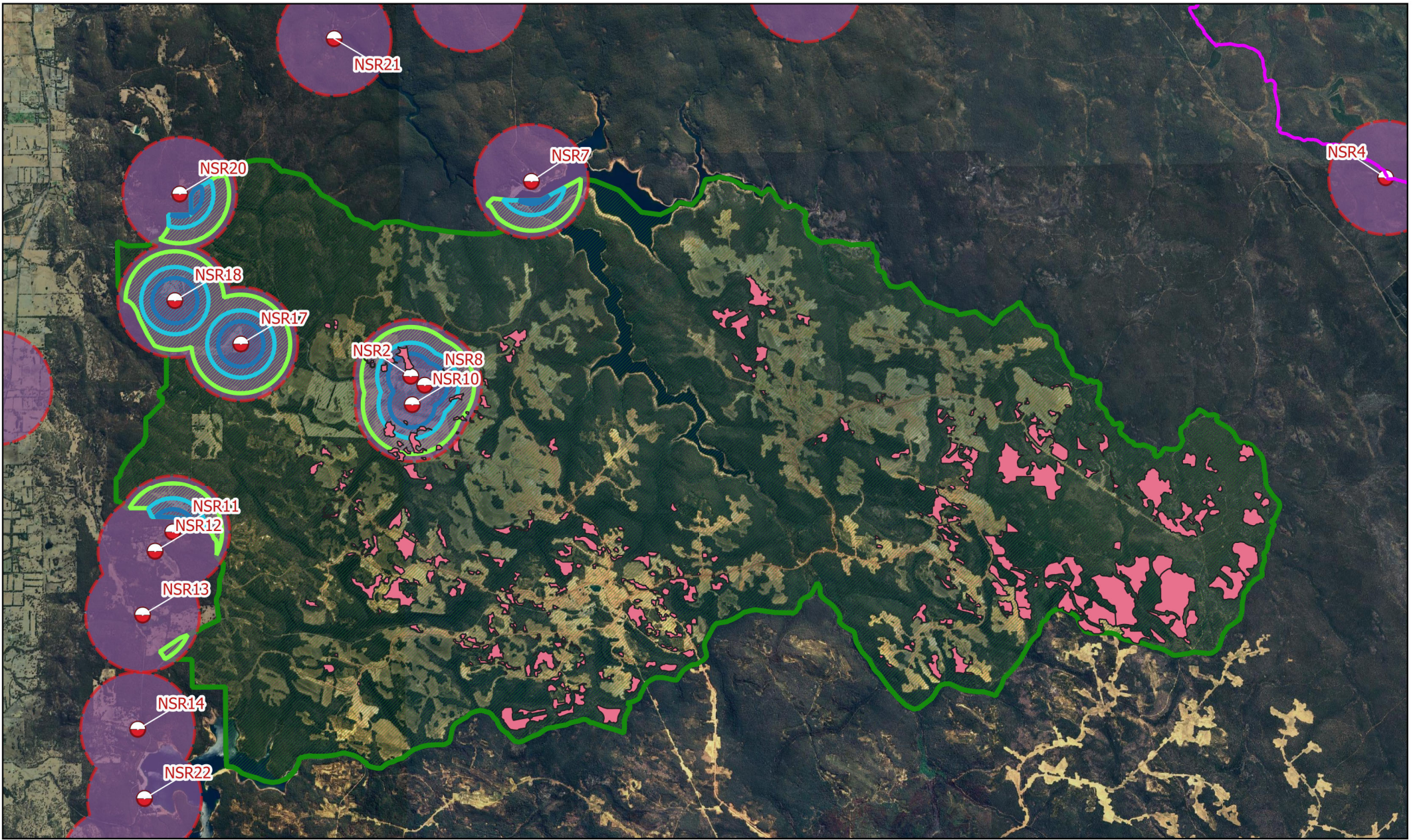
As a result, for the mine development pits close to NSR2, NSR8 and NSR10 (i.e. within the sensitivity zones), smaller charge masses must be used along with careful noise management plan and monitoring.

### 8.2 Blasting vibration

The calculated distances for ground-borne vibration levels to attenuate to below 5 mm/s are 212 m and 188 m for a 9 kg and 7 kg charge masses, respectively. It is not likely the safety exclusion zone for a blasting event will exceed these distances from the blast centre. Therefore, ground borne vibration is expected to be insignificant at all the nearby NSRs for the proposed region.

Table 8.2 *Calculated distance for ground vibration to attenuate levels below 5 mm/s criteria.*

Blast ID	Maximum instantaneous charge mass (8 ms detonation window)	Distance to attenuate below 5 mm/s (Safety exclusion zone)
Blast 1	9 kg	212 m
Blast 2	7 kg	188 m

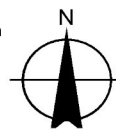


**Legend**

- Noise Sensitive Receptor (Day)
- Bibbulmun Track
- Mine Development 2025 - 2027
- 1200m Blasting Noise Radius
- Day Do Not Mine Zone
- Day Premium Mining
- Day Attenuated Mining
- Myara Mine Region

Paper Size ISO A4  
0 1 2 3 km

Map Projection: Transverse Mercator  
Horizontal Datum: GDA94  
Grid: GDA94 / MGA zone 50



Alcoa Myara Region Noise Impact Assessment  
Alcoa of Australia Limited

**Blast Zones Peak Noise Level  
Assessment**

Project No. 12609060  
Revision No. A  
Date. 12/09/2024

**FIGURE 8.1**

## 9. Construction noise management

Construction activities should be performed in accordance with the Regulations. Under the Regulations, various construction noise requirements apply for daytime construction and out of hours construction as outlined in the table below.

Table 9.1 Construction noise criteria

Time period	Time	Construction noise requirements
Daytime construction	7:00 am and 7:00 pm on any day which is not a Sunday or a public holiday	<p>No specific construction noise criteria. However, construction noise should be kept as low as practicable. This is provided that:</p> <ul style="list-style-type: none"> <li>– The construction work is carried out with respect to control of noise as outlined in Section 6 of AS 2436-1981 “Guide to Noise Control on Construction, Maintenance and Demolition Sites”.</li> <li>– The equipment used for the construction works is the quietest that is reasonably available.</li> <li>– The CEO may request a construction noise management plan to be submitted for the construction work at any point of time.</li> </ul>
Out of hours construction	7:00 pm and 7:00 am on any day which is not a Sunday or a public holiday	<p>Construction noise should, as far as practicable, meet the assigned noise levels outlined in Regulation 8 in the Regulations. This is provided that:</p> <ul style="list-style-type: none"> <li>– The construction work is carried out with respect to control of noise as outlined in Section 6 of AS 2436-1981 “Guide to Noise Control on Construction, Maintenance and Demolition Sites”.</li> <li>– The equipment used for the construction works is the quietest that is reasonably available.</li> </ul> <p>Furthermore, out of hours construction works may require the following are undertaken if excessive noise is expected:</p> <ul style="list-style-type: none"> <li>– The contractor must advise all nearby occupants of the work to be done at least 24 hours before it commences.</li> <li>– The contractor must show that it was reasonably necessary for the work to be done out of hours.</li> <li>– The contractor must submit to the CEO a noise management plan at least seven days before the work starts, and the plan must be approved by the CEO.</li> <li>– The noise management plan must include details of: <ul style="list-style-type: none"> <li>• Need for the work to be done out of hours</li> <li>• Types of activity which could be noisy</li> <li>• Predictions of noise levels</li> <li>• Control measures for noise and vibration</li> <li>• Monitoring of noise and vibration</li> <li>• Complaint response</li> </ul> </li> </ul>

# 10. Operational noise management plan

Worst-case operational conditions may be present due to the factors below, which are further elaborated in Section 7.1.2.3.

- Mining activities occur simultaneously at pit locations closest to the NSRs.
- Mining activities occur at the surface and not at lower depths inside pits.
- Full duty cycle and simultaneous operation of all mobile fleet.
- Wind direction from source to receptor for each NSR (i.e. downwind conditions).

Whilst these conditions are unlikely to occur simultaneously, it is still a possibility. Hence, operation noise management strategies should be in place to achieve compliance of noise level at all receptors. This is especially true for NSR2, NSR8, NSR10, NSR17 and NSR18, where both the worst-case operational conditions mentioned above, and presence of tonality will cause risk of non-compliance.

The noise mitigation and management measures outlined in Table 10.1 will be implemented to reduce the disturbance to the nearby receivers and the likelihood of non-compliance during mining activities within the noise sensitivity zones where non-compliances have been predicted in the noise impact assessment (Table 7.1).

Table 10.1 Operational Noise Management Plan (NMP)

Action required	Noise or vibration?	Details
Mining operation management	Noise	<ul style="list-style-type: none"> <li>– No simultaneous working group should be operating within 4 km radius from NSR2, NSR8, NSR10 and NSR17.</li> <li>– Attenuated and Premium fleet should be used within the relevant sensitivity zones as outlined in Figure 6.1 and Figure 6.2.</li> <li>– For the mine development pits close to NSR2, NSR8 and NSR10, smaller charge masses must be used for blasting.</li> </ul>
Implement community consultation measures (refer to Section 9 for further details of each measure).	Noise and vibration	Letter box drop to potentially affected receivers located within sensitivity zone by Alcoa to indicate days / nights and expected hours of mining activities that have the potential to exceed assigned noise levels (i.e. NSR.2, 8 10 and 17)
Site inductions	Noise and vibration	<ul style="list-style-type: none"> <li>– All employees, contractors and subcontractors expected to work within the sensitivity zones that are forecast to exceed assigned levels (i.e. NSR.2, 8 10 and 17) are to receive a noise specific induction as part of their site induction. The induction must at least include: <ul style="list-style-type: none"> <li>• All relevant project specific and standard noise and vibration mitigation measures.</li> <li>• Permissible hours of work.</li> <li>• Any limitations on high noise generating activities.</li> <li>• Location of nearest sensitive receivers.</li> </ul> </li> </ul>
Monitoring	Noise and vibration	Noise monitoring at the boundary of the noise sensitive receivers where assigned noise levels are predicted to be exceeded (i.e NSR.2, 8 10 and 17) is to be carried out for the duration of the works within the noise sensitivity zone.
Complaint handling	Noise and vibration	A complaint handling procedure as specified in Section 10.1 is to be carried out.

## 10.1 Complaint handling

Alcoa will adopt the following protocol for handling complaints. This protocol is intended to ensure that the issues are addressed and that appropriate corrective actions are identified and implemented as necessary:

- Alcoa will record all verbal and telephone complaints in writing within a noise complaint register and will forward all complaints to the Superintendent, together with details of the circumstance leading to the complaint and all subsequent actions. Details to be recorded should include:
  - Time of the event.
  - Location of the event.
  - What was felt / heard (can they identify the plant or process).
  - If it was felt / heard outside or inside.
  - If inside, were windows / doors open.
  - Impact of the event on person affected (e.g. awakening etc.).
  - Weather conditions at time (if known).
- Complaints received will, as an initial step, be referred to Alcoa. Alcoa will respond as described above.
- Alcoa environmental officers, assigned to the site, will investigate the complaint to determine whether noise has occurred unnecessarily.
- If excessive or unnecessary noise has been caused, corrective action will be planned and implemented by the Contractor.
- Complainants will be informed by the Alcoa environmental officers assigned to the site that their complaints are being addressed, and (if appropriate) that corrective action is being taken.
- Follow up monitoring or other investigations will be carried out by Alcoa to confirm the effectiveness of the corrective action.
- Complainants will be informed of the implementation of the corrective action that has been taken to mitigate the adverse effects.
- The notification letter will advise the residents of the appointed person and their contact details for any queries or complaints.
- Alcoa's complaint response line will be attended at all times during out of hours works.

## 10.2 Community consultation

Community consultation will be undertaken via Alcoa, including:

- Advising the community of work to be undertaken as per the notification letter. Notification will occur at least 14 days prior to commencement of the works as per Regulation 13(3)(d) of the Regulations.
- Recording and managing any complaints in accordance with procedure as set out in Section 10.1.

These and other elements of the community consultation will be addressed under the relevant procedures for the subject works.

# 11. Conclusion

The NIA provided in in this report summarised the results of investigating potential noise impacts from the construction and operation of the proposed expansion of the Huntly Mine within the Myara Mine Region as stipulated in the 5-year mine plan (2023-2027) under the MMP. Construction noise, including blasting noise and vibration, was deemed minor compared to operational noise, leading to a qualitative assessment approach for construction and a quantitative noise modelling approach for operation.

Preliminary noise modelling was undertaken based on the mining plans assuming use of Alcoa's standard mining fleet. Assuming worst-case operational conditions, the following four scenarios have been considered:

- Scenario A (Rehabilitation in 2021 and 2022 pits, Mining in 2024 pits, Mine development in 2025 pits).
- Scenario B (Rehabilitation in 2021 and 2022 pits, Mining in 2024 pits, Mine development in 2025 pits).
- Scenario C (Rehabilitation in 2023 and 2024 pits, Mining in 2025 and 2026 pits, Mine development in 2027 pits).
- Scenario D (Rehabilitation in 2023 and 2024 pits Mining in 2025 and 2026 pits Mine development in 2027 pits).

Because there are NSRs extremely close to the mining operation, for which standard mining operation are not expected to comply, noise sensitivity modelling has been undertaken. This informed the in-principal mitigation to achieve compliance with the assigned levels. The in-principal mitigation include set-back distances and requirements for noise control of the fleet within the sensitive zones.

The NIA modelling results indicate potential risk of operational noise exceedance at NSR2, NSR8, NSR10 and NSR17 under worse-case consideration for the four scenarios. The results also show a risk of non-compliance by +1 dB for NSR18 for Scenario B (during Night) if tonality is present in the mining noise.

Notwithstanding the above, under realistic operational conditions, all NSRs are expected to comply with noise criteria at all periods of the day. With operational noise management planning practices such as those detailed in Section 10 of this report, noise compliance can be achieved.

The modelling results and contour maps show a potential risk of audibility for NSR2, NSR8, NSR10, NSR17 and NSR18 under worst-case considerations. However, mining noise is unlikely to be audible if it is lower than 3 dB below the existing levels of ambient noise in the area.

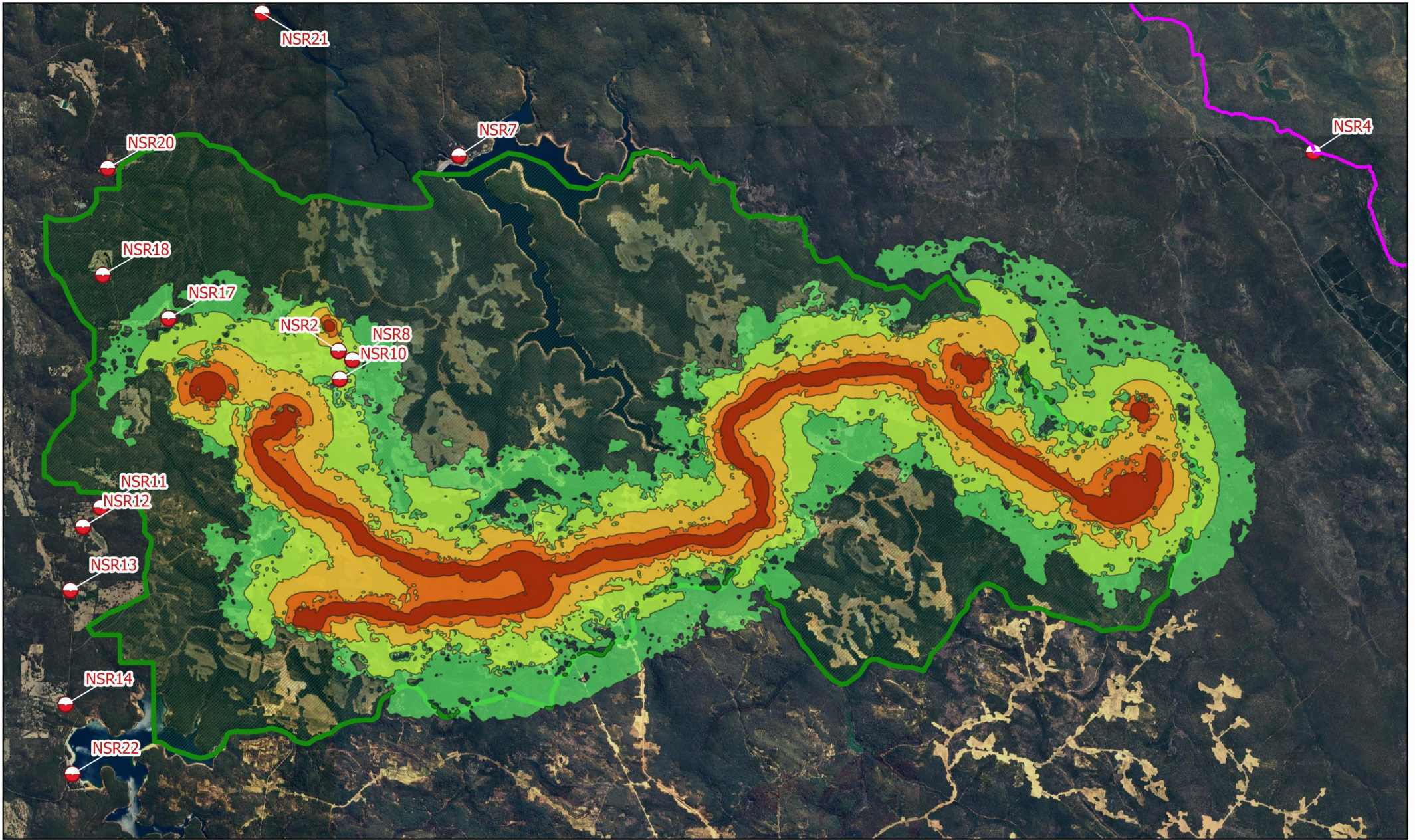
Ground borne noise and vibration are expected to be insignificant at all nearby NSRs for the proposed Myara Mine Region except for NSR2, NSR8 and NSR10. Therefore, smaller charge masses (compared to 7 and 9 kg currently used by Alcoa at Myara North) must be used along with careful noise management plan and monitoring such as those detailed in Section 10 of this report.

## 12. References

- CONCAWE. (1981). *the propagation of noise from petroleum and petrochemical complexes to neighbouring communities* .
- David Bies, C. H. (2018). *Engineering Noise Control*. CRC Press.
- DWER. (2021). *Draft Guideline Assessment of Environmental Noise Emissions*.
- EPA. (1997). *Environmental Protection (Noise) Regulation*.
- GHD. (2024). *12565572-00000-EN-RPT-010\_1*.
- ISO 9613-2. (1996). *Attenuation of sound during propagation outdoors*.
- Wood. (2023). *Pinjarra Alumina Refinery Revised Proposal Noise Assessment for Huntly Mine and Holyoake*.

# **Appendix A**

**Noise contour maps**

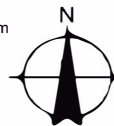


**Legend**

- |                             |         |                          |
|-----------------------------|---------|--------------------------|
| Predicted Noise Level dB(A) | 50 - 55 | Noise Sensitive Receptor |
| 40 - 45                     | 55 - 60 | Bibbulmun Track          |
| 45 - 50                     | 60 - 65 | Myara Mine Region        |

Paper Size ISO A4

Map Projection: Transverse Mercator  
Horizontal Datum: GDA94  
Grid: GDA94 / MGA zone 50

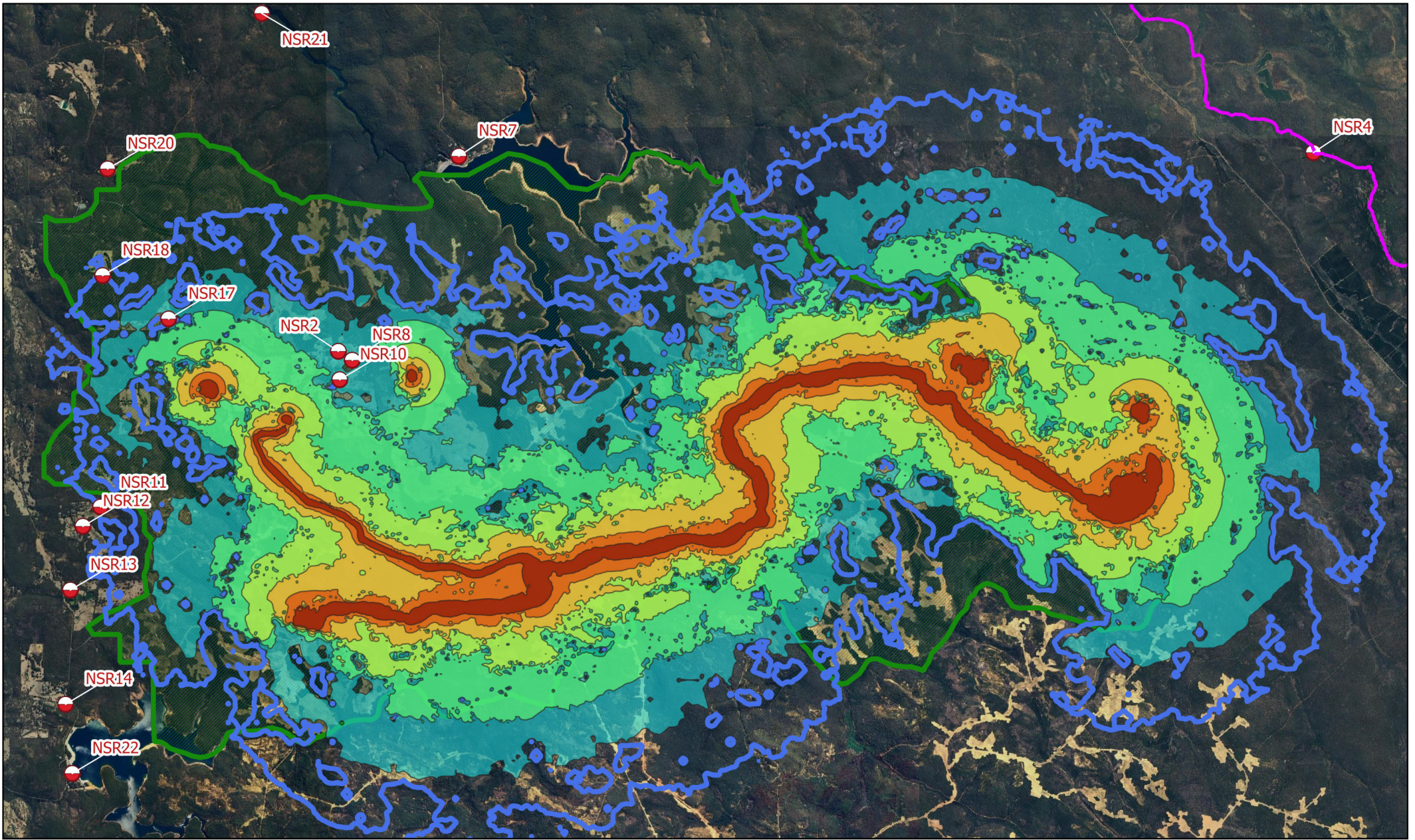


Alcoa Myara Region Noise Impact Assessment  
Alcoa of Australia Limited

**Scenario A (2025), LA<sub>10</sub>  
Daytime Noise Contours**

Project No. 12609060  
Revision No. A  
Date. 16/09/2024

**FIGURE A.1**

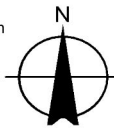


**Legend**

- Predicted Noise Level dB(A)
  - 45 - 50
  - 50 - 55
  - 55 - 60
  - 60 - 65
- 30 (Audibility contour line)
- Myara Mine Region
- Bibbulmun Track
- Noise Sensitive Receptor

Paper Size ISO A4

Map Projection: Transverse Mercator  
Horizontal Datum: GDA94  
Grid: GDA94 / MGA zone 50

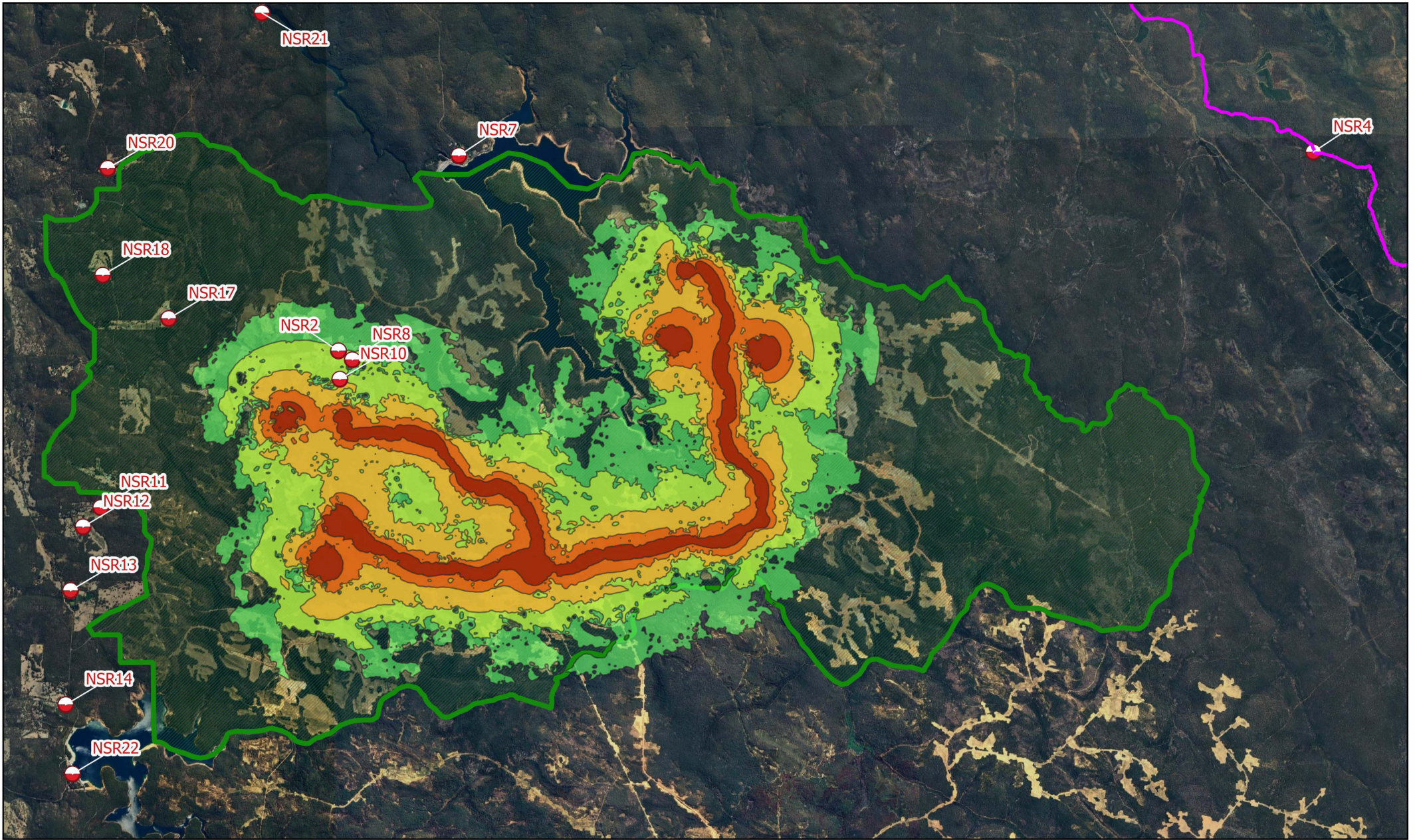


**Alcoa Myara Region Noise Impact Assessment**  
Alcoa of Australia Limited

**Scenario B (2025), LA<sub>10</sub>**  
**Nighttime Noise Contours**

Project No. 12609060  
Revision No. A  
Date. 12/09/2024

**FIGURE A.2**



**Legend**

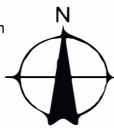
Predicted Noise Level dB(A)

- 40 - 45
- 45 - 50

- 50 - 55
- 55 - 60
- 60 - 65
- Noise Sensitive Receptor
- Bibbulmun Track
- Myara Mine Region

Paper Size ISO A4

Map Projection: Transverse Mercator  
Horizontal Datum: GDA94  
Grid: GDA94 / MGA zone 50

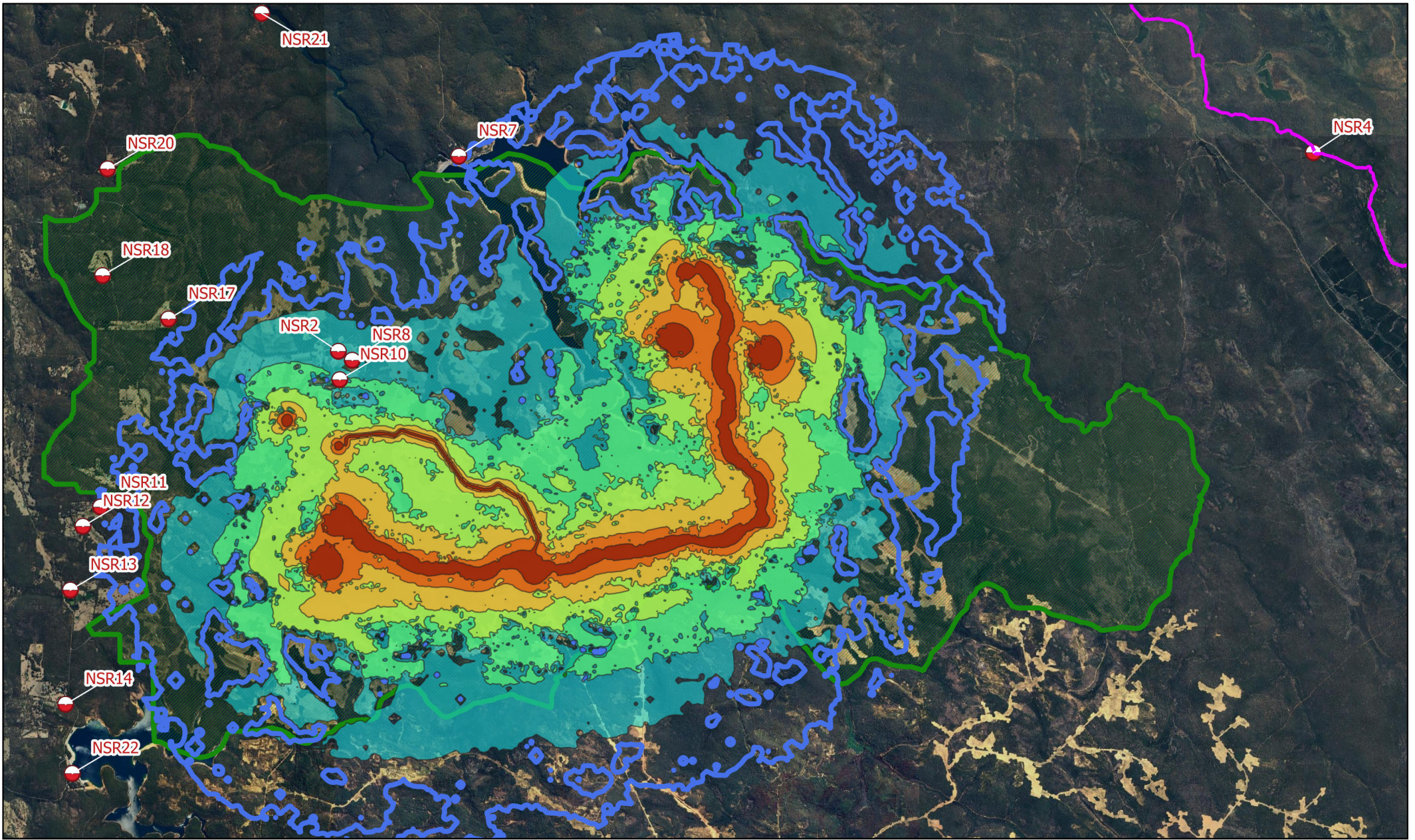


Alcoa Myara Region Noise Impact Assessment  
Alcoa of Australia Limited

**Scenario C (2027), LA<sub>10</sub>**  
**Daytime Noise Contours**

Project No. 12609060  
Revision No. A  
Date. 16/09/2024

**FIGURE A.3**

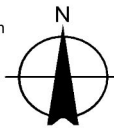


**Legend**

- Predicted Noise Level dB(A)
  - 45 - 50
  - 50 - 55
  - 55 - 60
  - 60 - 65
- 30 (Audibility contour line)
- 35 - 40
- 40 - 45
- Noise Sensitive Receptor
- Bibbulmun Track
- Myara Mine Region

Paper Size ISO A4

Map Projection: Transverse Mercator  
Horizontal Datum: GDA94  
Grid: GDA94 / MGA zone 50



Alcoa Myara Region Noise Impact Assessment  
Alcoa of Australia Limited

**Scenario D (2027), LA<sub>10</sub>**  
**Nighttime Noise Contours**

Project No. 12609060  
Revision No. A  
Date. 12/09/2024

**FIGURE A.4**



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