Aluminium Dross Processing Facility

Construction Noise and Vibration Management Plan

Tomago Aluminium Company Pty Ltd

27 June 2023

→ **The Power of Commitment**

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Abbreviations and acronyms

Term	Definition
AGL	Above ground level
AS	Australian Standards
AWS	Automatic weather station
BS	British Standards
°C	Degrees Celsius
CEMP	Construction Environmental Management Plan
CNVG	Construction Noise and Vibration Guideline (TfNSW, 2016)
dB	Decibel is the unit used for expressing the sound pressure level (SPL) or power level (SWL) in acoustics.
dBA	Decibel expressed with the frequency weighting filter used to measure 'A-weighted' sound pressure levels, which conforms approximately to the human ear response, as our hearing is less sensitive at low and high frequencies.
DCNG	Draft Construction Noise Guideline (EPA, 2021)
DEC	Department of Environment and Conservation NSW
DECC	Department of Environment and Climate Change NSW
DECCW	Department of Environment and Climate Change and Water NSW
DIN	German Institute for Standardisation (Deutsches Institut für Normung)
DPIE	Department of Planning, Industry and Environment
EIS	Environmental Impact Statement
EPA	Environment Protection Authority NSW
GHD	GHD Pty Ltd
ICNG	Interim Construction Noise Guideline (DECC, 2009)
ISO	International Organization for Standardisation (Organisation internationale de normalisation)
km	Kilometre
$L_{A1(1min)}$	The noise level exceeded for 1 per cent of the time over a 1 minute period, used to denote maximum noise levels
m	Metre
m/s	Metres per second
NML	Noise Management Level
NPI	Noise Policy for Industry (EPA, 2017)
NSW	New South Wales
RBL	Rating Background Noise Level
RNP	Road Noise Policy (DECCW, 2011)
SEARs	Secretary's Environmental Assessment Requirements
SPL	Sound Pressure Level
SSD	State Significant Development
SWL	Sound Power Level
VDV	Vibration Dose Value

Glossary of terms

Term	Definition
A weighting	The human ear responds more to frequencies between 500 Hz and 8 kHz and is less sensitive to very low-pitch or high-pitch noises. The frequency weightings used in sound level measurements are often related to the response of the human ear to ensure that the meter better responds to what you actually hear.
Noise-enhancing weather conditions	Weather effects that enhance noise (i.e. wind and temperature inversions) that occur at a site for a significant period of time (i.e. light winds, up to and including 3 m/s, occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment. It is the composite of sounds from many sources, both near and far. This is described using the Leq descriptor.
Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the L90 descriptor.
Compliance	The process of checking that source noise levels meet with the noise limits in a statutory context.
Construction footprint	Defined as the area that will be directly affected by construction of the proposal. It includes: – The location of project infrastructure and immediate surrounds. – The area that will be directly disturbed by the movement of construction plant and machinery, and the location of the temporary, construction compounds and laydown areas that will be used during construction.
Feasible and reasonable measures	Feasibility relates to engineering considerations and what is practical to build. Reasonableness relates to the application of judgement in arriving at a decision, considering the following factors: – Noise mitigation benefits (amount of noise reduction provided, number of people protected) – Cost of mitigation (cost of mitigation versus benefit provided) – Community views (aesthetic impacts and community wishes) – Noise levels for affected land uses (existing and future levels, and changes in noise levels)
Most-affected location	Location(s) that experience (or will likely experience) the greatest noise impact from the construction works and operations under consideration. In determining these locations, existing background noise levels, noise source location(s), distance and any shielding between the construction works (or proposed works) and the residences and other sensitive land uses need to be considered.
Noise management level	The NML as defined by the ICNG. To be measured and assessed at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the residential property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most affected point within 30 m of the residence.
Noise sensitive land use	Land uses that are sensitive to noise, such as residential areas.
Non-compliance	Development is in non-compliance with its noise consent/ licence conditions if the monitored noise levels exceed its statutory noise limit (exceptions may be given if the noise level exceeds by less than 2 dB).
Proponent	Tomago Aluminium Co Ltd
Proposal site	Lot 104, Deposited Plan 1125747, 638 Tomago Road, Tomago
Rating Background Level	The RBL is defined by the Noise Policy for Industry (NPI) as the overall, single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period (as opposed to over each 24-hour period used for the assessment background level). This is the level used for assessment purposes.
Study area	Land in the vicinity of, and including, the proposal site. The ‘study area’ is the wider area surrounding the proposal site.

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1. Introduction

GHD Pty Ltd (GHD) has prepared a Construction Noise and Vibration Management Plan (CNVMP) for the construction of a new Aluminium Dross Processing Facility at the Tomago Aluminium Smelter located at 638 Tomago Road, Tomago. The site is located approximately 600 metres north of the Hunter River and seven kilometres north of the Newcastle central business district.

This management plan has been prepared to outline construction noise and vibration management controls to address Condition 60A of DA 391/80 Mod 9.

The requirements of Condition 60A together with a reference to where they are addressed in this management plan are summarised in Table 1.1.

Table 1.1 Condition 60A requirements

Requirement	Where addressed in this report
The Applicant must prepare a Construction Noise and Vibration Management Plan for the development to the satisfaction of the Planning Secretary. The Plan must:	
– Be prepared by a suitably qualified and experienced noise expert.	Section 1.5 – Author Details
– Be approved by the Planning Secretary prior to the commencement of construction 391/80 Mod 9.	N/A
– Describe procedures for achieving the noise management levels in the EPA's Interim Construction Noise Guideline (DECC, 2009) (as may be updated or replaced from time to time).	Section 4 – Impact assessment
– Describe the measured to be implemented to manage high noise generating works such as piling, in close proximity to sensitive receivers.	Section 5 – Mitigation measures
– Include strategies that have been developed with the community for managing high noise generating works.	Section 5 – Mitigation measures
– Include a complaints management system that would be implemented for the duration of the development.	Section 6 – Complaints response

1.1 Purpose of this CNVMP

This CNVMP is a mechanism to assist in the effective and appropriate management and control of noise and vibration effects of construction works upon nearby sensitive receivers. It is a tool to be used for the development and implementation of methodologies and practices on the construction site to appropriately avoid, remedy or mitigate adverse noise and vibration effects upon the health and amenity of the occupiers of nearby buildings and/or to protect against the cosmetic and structural damage to those buildings.

This CNVMP is a 'living document' that is to be referred to and updated on an ongoing basis throughout the duration of the construction programme as works progress and site-specific information for the various works being undertaken becomes available.

The construction works are subject to compliance with conditions of consent presented DA 391/80 Mod 9 which refers to the noise limits in the Interim Construction Noise Guideline (ICNG) (NSW EPA, 2009). This CNVMP addresses both the requirements of ICNG and the consent condition 60A.

1.2 Ownership of this CNVMP

This CNVMP is to be referred to and updated by the site environmental or stakeholder manager / site manager / project manager / delegated party on an ongoing basis throughout the construction period.

A current copy of the CNVMP is to be always kept on the project site and made available upon request.

1.3 Limitations

This CNVMP: has been prepared by GHD for Tomago Aluminium Company Pty Ltd and may only be used and relied on by Tomago Aluminium Company Pty Ltd for the purpose agreed between GHD and Tomago Aluminium Company Pty Ltd as set out in section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Tomago Aluminium Company Pty Ltd 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 (refer section(s) 1.4 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

1.4 Assumptions

– This CNVMP is based upon the available information provided, including the current development layout shown in this report (or reference elsewhere).
– The acoustic mitigation options provided in this CNVMP are based on construction staging and equipment provided to GHD. Should alternative means of construction be proposed, they shall be reviewed and approved by a qualified Acoustic Specialist.
– Modelling assumptions can be found in Section 4.1.2.

1.5 Author details

This CNVMP has been prepared by GHD for Tomago Aluminium Company Pty Ltd. The qualifications of and experience of the author and reviewer are detailed in Table 1.2.

Table 1.2 Qualification and experience of authors

Staff	Qualification and experience
Bill Elder – Author	– Over 6 years' experience as an acoustic engineer. – Bachelor of Mechanical Engineering from University of Queensland. – Member of Engineers Australia (EA).
Chris Gordon – Review	– Over 11 years' experience as an acoustic engineer. – Bachelor of Mechanical Engineering from University Technology Sydney. – Member of Australian Acoustical Society (AAS).

2. Existing environment

2.1 Sensitive receptors

Noise sensitive receptors are defined in the Noise Policy for Industry (NPI) (NSW EPA, 2017) based on the type of occupancy and activities performed in the surrounding land uses. Sensitive noise and vibration receptors could include:

– Residences
– Educational facilities
– Hospitals and medical facilities
– Places of worship
– Passive and active recreational areas such as parks, sporting fields, golf courses (note that these recreational areas are only considered sensitive when they are in use or occupied)
– Commercial or industrial premises
– Community centres
– Hotels, motels, caretaker's quarters, holiday accommodation and permanent resident caravan parks.

Within the study area, 11 potential receivers have been selected to represent all sensitive receivers within the wider community. The sensitive receivers are shown in Figure 2.1.

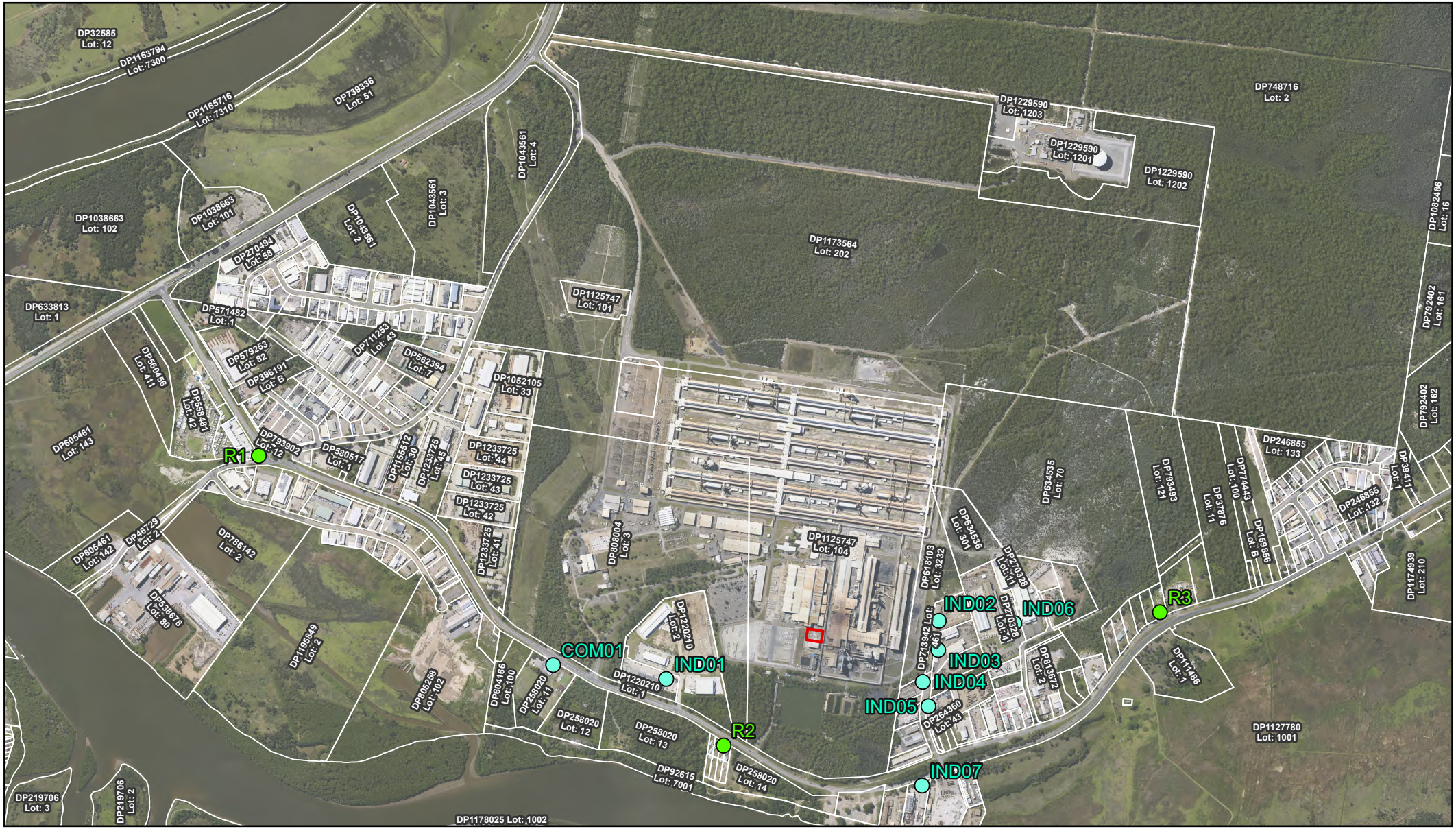
For the purposes of this noise assessment, the noise monitoring locations have been selected as being representative of the most affected residential receivers in the area. If compliance is achieved at these receivers, then compliance will be ensured for all other residential receivers further away. These key receivers are provided below in Table 2.1. There were eight non-residential receivers identified in the vicinity of the project, detailed in Table 2.2.

Table 2.1 Key residential sensitive receivers

ID	MGA2020 Z56 coordinates		Type	Distance from project (m)	Direction	Description
	x	y				
R1	378315.8	6367710	Noise monitoring location - residential	2 km	West	Old Punt Road (rear of Tomago Caravan Park)
R2	379959.5	6366686	Noise monitoring location - residential	500	South	Tomago Correctional Services Training Facility
R3	381502.5	6367157	Noise monitoring location - residential	1200	East	47 School Drive (unoccupied TAC owned property)

Table 2.2 Non-residential sensitive receivers

ID	MGA2020 Z56 coordinates		Type	Distance from project (m)	Direction	Description
	x	y				
IND01	379756.4	6366921	Industrial	500	Southwest	Cummins Sales and Service
IND02	380720.3	6367127	Industrial	400	East	EMC Electric Vehicles
IND03	380718.3	6367024	Industrial	400	East	Setco Australia
IND04	380663.6	6366911	Industrial	400	Southeast	Ventico Pty Ltd
IND05	380683.6	6366825	Industrial	450	Southeast	Wheeler Cranes
IND06	380987.7	6367118	Industrial	700	East	Remondis Tomago
IND07	380661	6366545	Industrial	600	Southeast	Tank Solutions
COM01	379356.5	6366971	Commercial	900	Southwest	Tomago Bowling & Sporting Club



Legend

- Residential Receptors
- Non-residential Receptors
- Proposed facility
- Tomago Aluminium Site
- Cadastre

Paper Size ISO A4

0 0.1 0.2 0.3 0.4

Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Tomago Aluminium Company Pty Ltd
Tomago Dross Processing Modification
Noise Impact Assessment

Project No. **12583275**
Revision No. **-**
Date **2/11/2022**

Site location plan

FIGURE 2-1

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Print date: 01 Jun 2023 - 16:57

Data source: Land zoning - DPE 2016. Cadastre - LPI 2017. MetroMap - Imagery (date extracted: 1/06/2023) Metromap Tile Service: . Created by: dbbanatin

3. Noise Criteria

3.1 Construction Noise

Point c. of Consent Condition 60A states that the CNVMP must describe procedures to achieve noise management levels in the EPA's Interim Construction Noise Guideline (ICNG)(DECC, 2009).

The EPA has released the Draft Construction Noise Guideline (DCNG) in 2020 for public consultation purposes only and once public consultation is complete, the feedback will be used to provide a final guideline to replace the ICNG.

However, the DCNG still provides useful guidance and includes the following changes:

– Emphasis on the need to engage with the community, to ensure that the community's views are considered when planning how to manage construction noise impacts.
– Improved guidance for managing noise from construction activities taking place outside the recommended standard hours of work.
– Alignment of the level of assessment required with risk of noise impact.
– A simplified assessment path for routine activities undertaken by public authorities on public infrastructure through industry management procedures.
– Increased emphasis on the need for proponents to justify the selection of noise mitigation measures to improve transparency.

These changes were considered in the noise and vibration impact assessment prepared for the new facility however construction noise associated with the project was assessed against the requirements of the ICNG.

3.1.1 ICNG construction hours

The ICNG provides guidance for assessment and management of construction noise. The guideline recommends standard hours for construction activities as follows:

– Monday to Friday: 7:00 am to 6:00 pm
– Saturday: 8:00 am to 1:00 pm
– No work on Sundays or Public Holidays

Where practical, and subject to the final construction timetable, it is assumed that construction will be carried out during the standard construction hours only.

3.1.2 Noise management levels

The construction noise management levels represent a noise level that, if exceeded, will require management measures including:

– Reasonable and feasible work practices
– Contact with the residences to inform them of the nature or works to be carried out, the expected noise levels, and durations and contact details

The management measures are aimed at reducing noise impacts at the residential receivers. However, it may not be reasonable and feasible to reduce noise levels to below the noise affected management level at all times. The noise affected construction noise management levels are not intended as a noise limit but rather a level at which noise management is required.

Table 2 in the ICNG provides recommended noise management levels (NML) for residences, which are detailed in Table 3.1.

Table 3.1 Residential construction noise management levels, dBA (ICNG, 2009)

Time of day	Noise management level, $L_{Aeq(15\ min)}$	Application notes
Recommended standard hours	Noise affected: RBL + 10 dBA	The noise affected level represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq(15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected: 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: – Times identified by the community when they are less sensitive to noise (such as before and after school, or mid-morning or mid-afternoon for works near residences). – If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours	Noise affected: RBL + 5 dBA	A strong justification will typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable measures have been applied and noise is more than 5 dBA above the noise affected level, the proponent should negotiate with the community.

3.1.3 Sleep disturbance

No construction works are proposed during the night period (10:00 pm to 7:00 am Monday to Saturday and 10:00 pm on Saturday to 8:00 am on Sunday). If activities are required to be undertaken during these times it will be limited to activities which are not audible at the nearest sensitive receiver, or discreet events which need to be undertaken outside standard hours for safety reasons.

As such, no sleep disturbance impacts are anticipated during the construction phase of the project.

3.1.4 Construction noise management levels

Rating background noise levels (RBLs) have been obtained from the *Tomago Aluminium Company Annual Environment Report 2021* to set NMLs. RBL are presented in Table 3.2. It should be noted that only night-time criteria was available from the annual environmental report, as such, night time criteria has also been used for both day and evening periods to ensure a conservative assessment.

Table 3.2 Project noise trigger levels for residential receivers

Location	Assessment period	RBL $L_{A90(15min)}$, dBA	TAC criteria (whole site) $L_{Aeq(15min)}$ dBA	Project noise trigger level, Discrete process (proposal) $L_{Aeq(15min)}$ dBA
R1 – Old Punt Road	Day[1]	45	50	40
	Evening[1]	45	50	40
	Night	45	50	40
R2 – Corrective services	Day[1]	45	50	40
	Evening[1]	45	50	40
	Night	45	50	40
R3 – School Drive	Day[1]	45	50	40
	Evening[1]	45	50	40
	Night	45	50	40

Notes:

1. Only night-time criteria was available from the TAC annual environmental report, as such, night time criteria has also been used for both day and evening periods to ensure a conservative assessment.

The noise management levels at sensitive receivers in the study area are summarised in Table 3.3 and have been determined from the RBLs presented in Table 3.2.

Table 3.3 Project specific construction noise management levels

Sensitive receiver type	Construction Noise Management Levels, $L_{Aeq(15min)}$	
	Standard construction hours	
	Noise affected	Highly noise affected
R1	55	75
R2	55	75
R3	55	75
Industrial	75 (external)	
Commercial	70 (external)	

3.2 Construction vibration

3.2.1 Human comfort

Vibration is assessed based on the criteria in *Assessing Vibration: A Technical Guideline* (DEC, 2006). *BS6472: Guide to Evaluation of Human Exposure to Vibration in Buildings* (1 Hz to 80 Hz) (British Standards, 2008) is recognised as the preferred standard for assessing the 'human comfort criteria'. Intermittent vibration, such as construction work, is assessed using the vibration dose value (VDV).

Whilst the assessment of response to vibration in BS 6472-1:2008 is based on vibration dose value and weighted acceleration, for construction related vibration it is considered more appropriate to provide guidance in terms of a peak particle velocity (PPV), since this parameter is likely to be more routinely measured based on the more usual concern over potential building damage. Table 3.4 provides guidance on the effect of vibration levels for human comfort in terms of peak particle velocity.

Table 3.4 Acceptable PPV Values for Human Comfort (BS 6472-2008)

Receiver	Period	Continuous and impulsive vibration guide goals	
		Preferred value	Maximum value
Residential	Day	0.28 (8.6)	0.56 (17.0)
Offices, schools, educational institutes and places of worship	When in use	0.56 (18.0)	1.1 (36.0)
Workshops	When in use	1.1 (18.0)	2.2 (36.0)

Notes:

1. Impulsive goals are shown in brackets – These are most relevant to activities that create up to 3 distinct vibration events in an assessment period, e.g. occasional dropping of heavy equipment, occasional loading and unloading.

Humans are capable of detecting vibration at levels which are well below those causing risk of damage to a building. The degrees of perception for humans are suggested by the vibration level categories given in *BS5228.2 – 2009, Code of Practice Part 2 Vibration for noise and vibration on construction and open sites – Part 2: Vibration* (British Standards, 2009), as shown below in Table 3.5.

Table 3.5 Guidance on effect of vibration levels for human comfort (BS 5228.2 – 2009)

Vibration level	Effect
0.14 mm/s	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction.
0.3 mm/s	Vibration might be just perceptible in residential environments.
1.0 mm/s	It is likely that vibration at this level in residential environments will cause complaints, but can be tolerated if prior warning and explanation has been given to residents.
10 mm/s	Vibration is likely to be intolerable for any more than a very brief exposure.

3.2.2 Structural damage to standard structures

The minimum working distances for structural (cosmetic) damage used for this assessment have been based on *BS 7385-2:1993 Evaluation and measurement for vibration in buildings Part 2 – Guide to damage* (British Standards, 1993) levels from ground borne vibration which enables the likelihood of building damage from ground vibration to be assessed. The use of BS7385 is the preferred standard in NSW to assess potential vibration impacts to standard structures.

The vibration levels in this standard are adopted as cosmetic damage criteria and are presented in Table 3.6.

Table 3.6 Transient vibration guide values - minimal risk of cosmetic damage

Type of building	Peak component particle velocity in frequency range of predominant pulse[1]	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures industrial and heavy commercial building	50 mm/s at 4 Hz and above	
Unreinforced or light framed structures residential or light commercial type buildings [2]	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Notes:

1. Values referred to are at the base of the building.
2. At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) should not be exceeded.

3.2.3 Structural damage to heritage structures

The German Standard DIN 4150-3: 1999 *Structural Vibration – Part 3: Effects of vibration* on structures provides guideline values for the maximum absolute value of the velocity ‘at the foundation of various types of buildings. Experience has shown that if these values are complied with, damage that reduces the serviceability of the building will not occur. If damage nevertheless occurs, it is to be assumed that other causes are responsible.’ These values are provided in Table 3.7.

Measured values exceeding those listed in Table 3.7 do not necessarily lead to damage; should they be significantly exceeded however, further investigations are necessary. No heritage structures have been identified within 250 metres of the construction footprint and as such, no vibration impacts to heritage impacts are anticipated.

Table 3.7 Guideline values for short term vibration on structures

Line	Type of building	Guideline values for velocity, (mm/s)		
		1 Hz to 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz
3	Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 and are of great intrinsic value (e.g. listed buildings under preservation order)	3	3 to 8	8 to 10

Notes:

1. Values referred to are at the base of the building.
2. At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) should not be exceeded.

3.3 Construction traffic noise

The RNP provides traffic noise target levels for residential receivers in the vicinity of existing roads and are applied to road upgrades. These levels are applied to construction works to identify potential construction traffic impacts and the potential for reasonable and feasible mitigation measures. The RNP road types are based on the functional roles shown in Table 3.8.

Due to the number of vehicles using Tomago Road every day, the additional traffic during construction is anticipated to have a negligible effect on the existing traffic volumes (and traffic noise) on the local road network.

Table 3.8 Road Categories from RNP

Road category	Functional role	Public roads used by project
Sub-arterial road or collector road	Provide connection between arterial roads and local roads. May support arterial roads during peak period. May have been designed as local streets but can serve major traffic generating developments or support non-local traffic.	– Tomago Road

The application notes for the RNP state that "*for existing residences and other sensitive land uses affected by additional traffic on existing roads generated by land use developments, any increase in the total traffic noise level as a result of the development should be limited to 2 dB above that of the noise level without the development. This limit applies wherever the noise level without the development is within 2 dB of, or exceeds, the relevant day or night noise assessment criterion*."

If the road traffic noise increase from the construction work is within 2 dB of current levels then the objectives of the RNP are met and no specific mitigation measures are required. Mitigation should be applied when road traffic noise levels increase by 2 dB *and* the controlling noise criterion in Table 3.9 are exceeded at the façade of the residence.

Table 3.9 Road traffic noise criteria, dBA

Development type	Applicability to assessment	Day 7:00 am to 10:00 pm	Night 10:00 pm to 7:00 am
Existing residence affected by additional traffic on arterial / sub-arterial / collector roads generated by land use developments	– Tomago Road	60 $L_{eq(15hr)}$	55 $L_{eq(9hr)}$

4. Impact assessment

Information was provided by TAC regarding the proposed construction activities associated with the proposal. The most significant impacts are expected to occur during earthworks across the site. It has been assumed that all construction activities associated with the proposal would be conducted during the recommended standard construction hours. The main construction scenarios envisaged and assessed are as follows:

– Construction Scenario 1 – Site establishment, which includes, clearing of existing vegetation, installation of erosion and sediment controls, and preparatory works
– Construction Scenario 2 – Ground works and excavation, which includes bulk earthworks and civil works
– Construction Scenario 3a and 3b – Construction of main structures, which includes construction of dross facility building (3a) and installation of processing equipment (3b)

4.1.1 Construction equipment

The noise levels for the construction equipment have been sourced from the following sources:

– Australian Standard AS2436 – *Guide to Noise Control on Construction, Maintenance and Demolition Site* (2010)
– NSW Roads and Maritimes Services – *Construction Noise and Vibration Guideline* (2016)
– GHD measurements of similar equipment

The anticipated plant and equipment to be used for each construction scenario is shown in Table 4.1 with the corresponding sound power levels and source of the noise level as well as activity sound power levels used in the noise model.

Table 4.1 Construction equipment sound power levels

Equipment	SWL, dBA	Source	CS1	CS2	CS3a	CS3b
Activity SWL, dBA			**108**	**116**	**114**	**114**
Bobcat	106	AS2436			✓	
Boom lift	105	AS2436			✓	
Bulldozer	108	AS2436		✓		
Compactor	113	AS2436		✓		
Excavator	107	AS2436		✓	✓	
Forklift	106	AS2436			✓	✓
Hand tools	102	AS2436	✓			
Light vehicles	85	GHD database	✓	✓	✓	✓
Mini-loader	110	AS2436				✓
Mobile crane	104	AS2436			✓	✓
Scissor lift	105	AS2436				✓
Trucks	107	AS2436	✓	✓	✓	✓

In addition, the indicative traffic generation associated with the proposal during construction are summarised as:

– Four inbound and four outbound heavy vehicle trips per hour modelled representing delivery of products and equipment.
– 30 construction staff vehicles modelled per hour during peak periods (arriving on site).

4.1.2 Noise modelling assumptions and parameters

Acoustic modelling was undertaken using CadnaA noise modelling software to predict the effects of construction noise generated by the proposed works. General parameters used in the model are listed in Table 4.2.

Table 4.2 Noise modelling parameters

Variable	Parameter used
Calculation method	ISO 9613- 2:1996
Meteorology	ISO 9613 considers the presence of a well-developed moderate ground-based temperature inversion, such as commonly occurs on clear, calm nights or 'downwind' conditions which are favourable to sound propagation
Topography	Flat ground model used due to absence of significant terrain in the area
Receiver heights	1.5 m above building ground level
Ground absorption	G = 0.75

4.1.3 Predicted noise levels

Construction noise levels have been predicted at the sensitive receivers within the study area with consideration to the acoustic requirements of the ICNG. The predicted $L_{Aeq(15min)}$ noise levels at the most-affected sensitive receivers are presented in Table 4.3. The noise modelling assumes that all pieces of equipment in the scenario are operating at maximum capacity simultaneously at the closest distance between the construction works and the receiver. As such, the predicted noise levels are often highly conservative and actual noise levels are likely to be lower than those the levels presented below for the majority of the time.

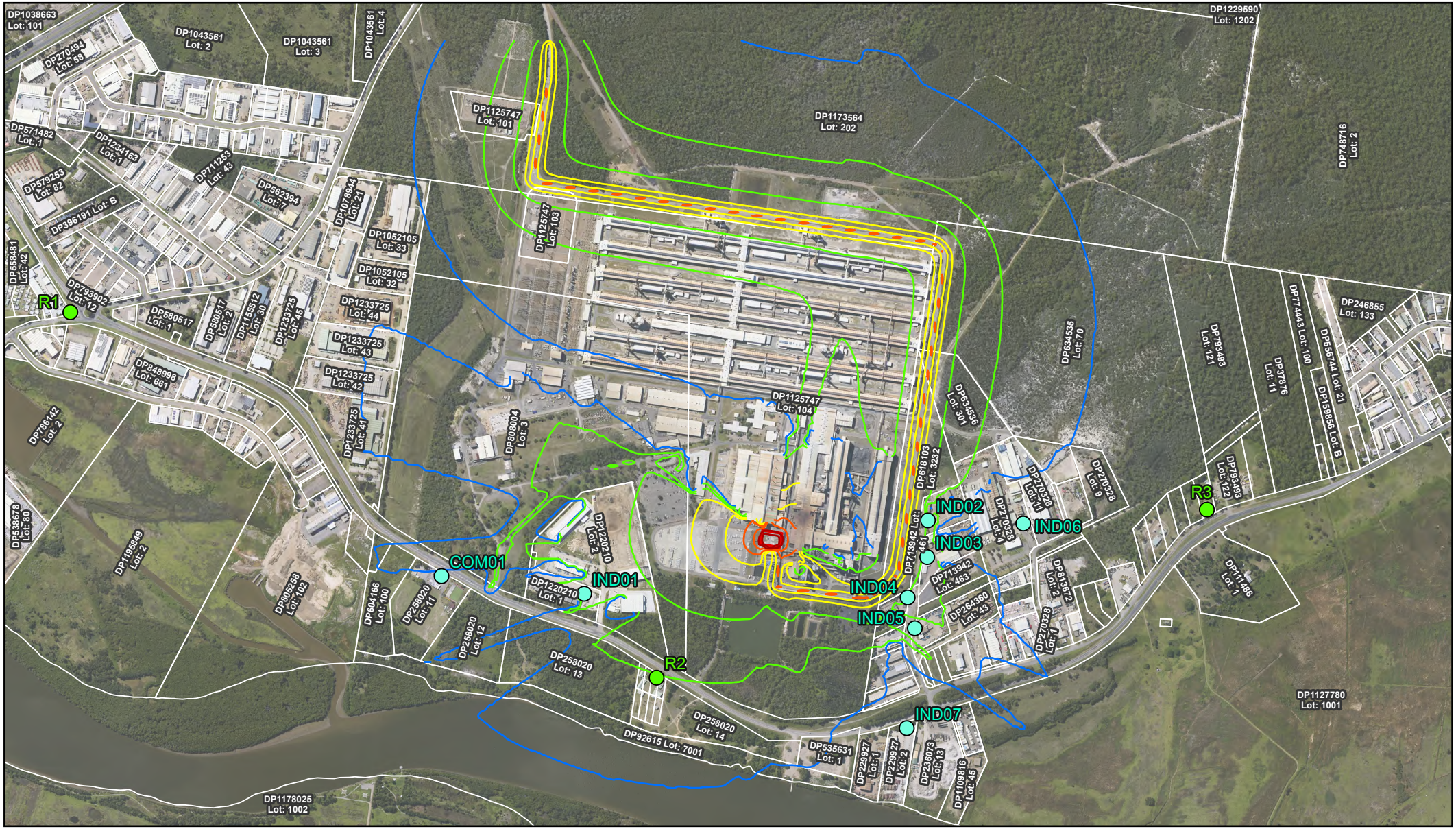
Reasonable and feasible mitigation measures are recommended in Section 5 to reduce any potential noise impacts at sensitive receivers with consideration to the following:

– The effectiveness of the mitigation measures
– Whether the measures are considered reasonable and feasible

Construction noise contours for each scenario are shown in Figure 4.1 to Figure 4.3.

Table 4.3 Summary of construction noise levels – Standard construction hours (day)

RID	Receiver Type	NML, $L_{Aeq(15min)}$ dBA Standard hours	Predicted $L_{Aeq(15min)}$ noise level, dBA				Complies?
			CS1	CS2	CS3a	CS3b	
R1	Residential	55	<20	<20	<20	<20	Yes
R2	Residential	55	36	44	42	42	Yes
R3	Residential	55	28	32	31	31	Yes
IND01	Industrial	75	38	46	44	44	Yes
IND02	Industrial	75	41	41	41	41	Yes
IND03	Industrial	75	41	42	41	41	Yes
IND04	Industrial	75	42	45	44	44	Yes
IND05	Industrial	75	36	40	39	39	Yes
IND06	Industrial	75	29	31	31	31	Yes
IND07	Industrial	75	32	37	36	36	Yes
COM01	Commercial	70	32	39	38	38	Yes



Legend

- Residential Receptors
- Non-residential Receptors

CS1 Decibels

- 35.000
- 35.001 - 45.000
- 45.001 - 55.000
- 55.001 - 65.000
- 65.001 - 75.000

- Proposed facility
- Tomago Aluminium Site
- Cadastre

Paper Size ISO A4

0 100 200 300 400

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

Tomago Aluminium Company Pty Ltd
Tomago Dross Processing Modification
Noise Impact Assessment

Predicted construction noise contours -CS1 Site establishment

Project No. **12583275**
Revision No. **-**
Date **2/11/2022**

FIGURE 4-1

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Print date: 01 Jun 2023 - 16:56

Data source: Land zoning - DPE 2016. Cadastre - LPI 2017. MetroMap - Imagery (date extracted: 1/06/2023) Metromap Tile Service: . Created by: dbbanatin

Legend

- Residential Receptors
- Non-residential Receptors

CS2 Decibels

- 35.000 - 40.000
- 40.001 - 50.000
- 50.001 - 60.000
- 60.001 - 70.000
- 70.001 - 85.000

- Proposed facility
- Tomago Aluminium Site
- Cadastre

Paper Size ISO A4

0 110 220 330 440

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Tomago Aluminium Company Pty Ltd
Tomago Dross Processing Modification
Noise Impact Assessment

Predicted construction noise contours -CS2 Ground works and excavation

Project No. **12583275**
Revision No. **-**
Date **1/06/2023**

FIGURE 4-2

\\ghdnet\ghd\AU\Newcastle\Projects\22\12583275\GIS\Maps\Deliverables\12583275_NoiseImpactAssessment2.aprx
Print date: 02 Jun 2023 - 13:00

Data source: Land zoning - DPE 2016. Cadastre - LPI 2017. MetroMap - Imagery (date extracted: 2/06/2023) Metromap Tile Service: . Created by: dbbanatin

Legend

- Residential Receptors
- Non-residential Receptors

CS3 Decibels

- 35.000 - 40.000
- 40.001 - 50.000
- 50.001 - 60.000
- 60.001 - 70.000
- 70.001 - 80.000

- Proposed facility
- Tomago Aluminium Site
- Cadastre

Paper Size ISO A4

0 110 220 330 440

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 56

N

GHD

Tomago Aluminium Company Pty Ltd
Tomago Dross Processing Modification
Noise Impact Assessment

Predicted construction noise contours -CS3a and CS3b Construction of main structures and installation of equipment

Project No. **12583275**
Revision No. **-**
Date **1/06/2023**

FIGURE 4-3

\\ghdnet\ghd\AU\Newcastle\Projects\22\12583275\GIS\Maps\Deliverables\12583275_NoiseImpactAssessment2.aprx
Print date: 02 Jun 2023 - 13:00

Data source: Land zoning - DPE 2016. Cadastre - LPI 2017. MetroMap - Imagery (date extracted: 2/06/2023) Metromap Tile Service: . Created by: dbbanatin

4.1.4 Construction works during standard hours

Predictive modelling indicates that at all receivers in the study area, construction noise levels are predicted to be below NML during worst case construction conditions with all equipment operating simultaneously. Notwithstanding this, the application of reasonable and feasible mitigation measures at the source is considered best practice and should be implemented where reasonable and feasible. Mitigation measures are discussed further in Section 5.

4.2 Construction vibration impacts

4.2.1 Vibration modelling methodology

The method for the construction vibration assessment included:

– Identifying safe working distances to comply with the human comfort and the cosmetic damage criteria. These buffer distances have been adopted from *Construction Noise and Vibration Strategy* (CNVS) (TfNSW 2019).
– Safe working distances for vibration intensive equipment are shown in Table 4.4. The vibratory equipment associated with the project include compactors and excavators with rock breaking attachment.
– Buildings within the safe working distances have been identified for consideration of management measures.

4.2.2 Vibration safe working distances

Safe working distances for vibratory intensive equipment has been sourced from the TfNSW CNVS and are shown in Table 4.4.

Table 4.4 Vibration safe working distances

Equipment	Human comfort (OH&E Vibration guideline)	Cosmetic damage (BS 7385)
Piling rig – Bored <800 mm	N/A	2 m (nominal)
Piling rig–Hammer (12 t down force)	50 m	15 m
Piling rig – Vibratory (sheet piles)	20 m	2 m to 20 m
Vibratory roller (>18 tonnes)	100 m	25 m
Vibratory roller (13-18 tonnes)	100 m	20 m
Vibratory roller (7-13 tonnes)	100 m	15 m
Vibratory roller (4-6 tonnes)	40 m	12 m
Vibratory roller (2-4 tonnes)	20 m	6 m
Vibratory roller (1-2 tonnes)	15 m	5 m
Small hydraulic hammer 300 kg (5-12t excavator)	7 m	2 m
Medium hydraulic hammer 900 kg (12-18t excavator)	23 m	7 m
Large hydraulic hammer 1600 kg (18-34t excavator)	73 m	22 m
Jackhammer (handheld)	Avoid contact with structure	1 m (nominal)

4.2.3 Human comfort

The most vibration intensive activities associated with the construction works are anticipated to be excavation works and vibratory rolling (compacting) during bulk earthworks.

Excavation activities have the potential to exceed the human comfort vibration criteria should these works occur within 73 metres of residences (assuming a large excavator is used), while rolling works have the potential to exceed human comfort levels within 100 metres (assuming a vibratory roller >18 tonnes is used). No residences have been identified within 100 metres of these vibration intensive works and as such, no adverse human comfort vibration impacts are anticipated as a result of the project.

4.2.4 Structural damage

Excavation or rolling works have the potential to exceed the cosmetic damage criteria should these works occur within 22 metres or 25 metres of a sensitive receiver building respectively (unreinforced or light framed structures, i.e. residential). There are no residential buildings within 25 metres of the site works.

There are number of industrial and heavy commercial buildings in the vicinity of the works, including the existing dross processing building. Based on the criteria in Table 4.4, it is expected that cosmetic damage criteria would be exceeded if any rolling works (using a vibratory roller >18 tonnes) or rock breaking (using a 18-34 tonne excavator) occur within approximately 6.5 metres of an industrial or heavy commercial building. As such, it is recommended to limit the size of any vibratory roller working in close proximity to existing buildings to no larger than 4-6 tonnes as well as excavators with rock breaking attachments to 12-18 tonnes.

4.2.5 Utilities

The location of underground utilities is known. TAC has processes in place (Excavation permit system that includes services location expertise and sign off by civil and electrical engineers) that ensures services locations are known and appropriate controls are put in place.

4.3 Traffic noise impacts along public roads

4.3.1 Existing traffic conditions

There is minimal information on current traffic conditions along Tomago Road, however a noise impact assessment for the Northbank Enterprise Hub Tomago, NSW (Spectrum Acoustics, 2012) outlines some indicative traffic numbers along Tomago Road due to approved developments in the area. For the purposes of this road noise assessment, traffic numbers from the Spectrum Acoustics report have been used and assumes an 80% to 20% LV to HV ratio.

4.3.2 Construction traffic

4.3.2.1 Construction traffic generation

Traffic generated during construction would be associated with trucks delivering concrete and building components as well as construction staff travelling to and from the site.

Access routes for staff vehicles would be from Tomago Road (from either the east or west) and then onto the private access road to TAC. Exit routes would be the opposite.

The indicative traffic generation associated with the proposal during construction are summarised as:

– An average of four inbound and four outbound heavy vehicles per hour over the full day.
– Staff 30 full time equivalents resulting in approximately 30 vehicles arriving during the AM peak and 30 vehicles leaving during PM peak.

4.3.2.2 Construction traffic modelling methodology

Noise modelling was undertaken using the Transport for NSW construction noise estimator model utilising the CoRTN method to assess the noise level from the construction traffic generation. The parameters used in this noise model are presented in Table 4.5.

Table 4.5 Noise modelling parameters – RMS construction noise estimator model

Variable	Parameter used
Calculation method	CoRTN
Pavement surface	Dense Graded Asphalt (DGA)
Road type	Local road
Traffic speeds	80 km/hr
Ground type	Developed settlements (urban and suburban areas)

4.3.2.3 Construction traffic noise impacts

Table 4.6 below outlines the results of the noise predictions for additional construction traffic during the worst case 1-hour day (AM peak period) along Tomago Road.

Table 4.6 Construction traffic noise impacts along Tomago Road, 1-hour day (AM peak period)

Vehicle category	Existing Vehicles	Additional vehicles	Overall change in noise levels	Require consideration of additional mitigation measures?
	Both directions	Both directions		
Light vehicles	1638	30	+0.1	No
Heavy vehicles	410	8		
Total	2048	38		

Noise predictions show that construction traffic noise impacts are anticipated to remain within 2 dB of current levels, and therefore additional mitigation measures are not required.

5. Mitigation measures

Point d. of Consent Condition 60A states that the CNVMP must describe measures to be implemented to manage high noise generating works such as piling, in close proximity to sensitive receivers. Point e. states that the CNVMP must include strategies that have been developed with the community for managing high noise generating works.

No high noise generating activities are proposed to be undertaken near sensitive receivers and construction activities are not predicted to exceed the construction noise management levels at nearby sensitive receivers. However, the standard noise and vibration mitigation measures outlined in Table 5.1 below are recommended to be implemented to minimise potential construction noise and vibration impacts as this is best practice.

Table 5.1 Standard mitigation measures for construction noise and vibration

Action required	Details	Timing	Responsibility
Management measures			
Implement community consultation measures	Nearby receptors shall be notified of the works prior to commencement. Notification will include expected noise levels, duration of the works and a method of contact.	Pre-construction	Contractor
Site inductions	All employees, contractors and subcontractors will receive an environmental induction. The induction would include: – All relevant proposal specific and standard noise and vibration mitigation measures – Relevant license and approval conditions – Permissible hours of work – Any limitations on high noise generating activities – Location of nearest sensitive receptors – Employee parking areas – Designated loading/unloading areas and procedures – Construction works traffic routes – Site opening/closing times (including deliveries) – Environmental incident procedures	Pre-construction, Construction	Contractor
Behavioural practices	No swearing or unnecessary shouting or loud stereos/radios on site. No dropping of materials from height, throwing of metal items and slamming of doors.	Construction	Contractor
Source controls			
Construction hours and scheduling	Where feasible and reasonable, construction will be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods. Standard daytime construction hours: – Monday to Friday: 7.00 am to 6.00 pm – Saturday: 8.00 am to 1.00 pm – Sundays and public holidays: no work	Construction	Contractor
Equipment selection	Use quieter and less noise and vibration emitting construction methods where feasible and reasonable. Ensure plant including silencer is well maintained.	Construction	Contractor
Plant noise levels	The noise levels of plant and equipment must have operating sound pressure levels compliant with the criteria in Table 4.1.		

Action required	Details	Timing	Responsibility
Use and siting of plant	The offset distance between noisy plant and adjacent sensitive receivers is to be maximised. Plant used intermittently is to be throttled down or shut down. Noise-emitting plant is to be directed away from sensitive receptors. Only necessary equipment will be onsite.	Construction	Contractor
Plan worksites and activities to minimise noise and vibration	Plan traffic flow, parking and loading/unloading areas to minimise reversing movements within the site. Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible.	Construction	Contractor
Reduced equipment power	Use only the necessary size and power.	Construction	Contractor
Non-tonal and ambient sensitive reversing alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out-of-hours work. Consider the use of ambient sensitive alarms that adjust output relative to the ambient noise level.	Construction	Contractor
Minimise disturbance arising from delivery of goods to construction sites	Loading of materials would occur as far as practical from sensitive receivers. Site access points and roads would be located as far as possible away from sensitive receptors. Dedicated loading/unloading areas would be shielded if close to sensitive receptors. Delivery vehicles would be fitted with straps rather than chains for unloading, wherever possible. Avoid or minimise these out-of-hours movements where possible.	Construction	Contractor
Engine compression brakes	Limit the use of engine compression brakes at night and in residential areas. Ensure vehicles are fitted with a maintained original equipment manufacturer exhaust silencer or a silencer that complies with the National Transport Commission's National Stationary Exhaust Noise Test Procedures for In-service Motor Vehicles and any relevant reference standards.	Construction	Contractor
Path controls			
Shield stationary noise sources such as pumps, compressors, generators, fans etc.	Stationary noise sources should be enclosed or shielded whilst ensuring that the occupational health and safety of workers is maintained.	Construction	Contractor
Shield sensitive receptors from noisy activities	Use structures to shield residential receivers from noise such as site shed placement, earth bunds, fencing, erection of operational stage noise barriers (where practicable), and consideration of site topography when situating plant.	Pre-construction/Construction	Contractor

6. Complaints response

Point f. of Consent Condition 60A states that the CNVMP must include a complaints management system that would be implemented for the duration of the development. A complaints management system for the project is outlined below.

A project phone number and project email address will be clearly included in any written notifications and on project signage located in proximity to the construction works area.

Should a complaint be received an entry is to be made in the complaints/communications register by the Contractor. TAC is also to be informed as soon as possible but no later than 24 hours from when received.

Further to receiving a complaint the following information is to be recorded in the complaints register:

– Name of the person who received the complaint
– Time and date of complaint
– The nature of the complaint (e.g., noise or vibration)
– The activity leading to complaint (e.g., grinding or hammering)
– Mitigation strategies put in place

The complaint should be dealt with on-site by the Contractor in the first instance, and then by the TAC Environment Superintendent.

The complainant should be kept informed as to how the matter is being resolved to help prevent the matter escalating. The register must be updated with the action taken to resolve the complaint and the date this action was taken. The register should be reviewed monthly to check that all complaints have been adequately addressed.

The noise and vibration complaint protocol is presented in Table 6.1.

Table 6.1 Noise and vibration complaint protocol

Noise and vibration complaint protocol	
Step 1	– Record name, address and contact number of complainant, time and date. – Record what kind of noise or vibration is causing the complaint. – Identify the location of the alleged event. – Record if the noise or vibration is still occurring.
Step 2	– Call the Site Manager in charge of the works that led to the complaint. – Determine what activity is causing the noise or vibration and how long it is expected to occur. – Discuss options for mitigation measures if possible. – Respond to the complainant.
Step 3	If the noise or vibration issue can't be resolved, additional complaints are received or deviation from the CNVMP is required. The issue should be escalated. – Escalation – Level 1 • Call Site Manager. • Call Consulting Construction Noise and Vibration Engineer to undertake noise or vibration monitoring. – Escalation – Level 2 • Call the TAC Environment Superintendent. • Call the Project Manager. Note: Environment Superintendent and the Project Manager have the authority to stop work if required until an alternative solution can be provided to mitigate the noise concern.
Step 4	Close out – Enter the incident into the register – identifying the measures taken to respond to the complaint and note any other activities or events in the area unrelated to the project which may have contributed to the complaint. – Record the decision made on mitigation required if works are to proceed.

7. Conclusion

Construction noise and vibration impacts associated with the construction of a new Aluminium Dross Processing Facility at the Tomago Aluminium Smelter

No exceedances of the noise management levels have been predicted at nearby sensitive receivers. Reasonable and feasible construction noise and vibration mitigation measures have been recommended, which would minimise noise and vibration impacts at nearby sensitive receivers.

Compliance with the Road Noise Policy is predicted for the construction traffic associate with construction of the facility.

Standard best practice mitigation measures have been recommended in Section 5.

With the implementation of the procedures and recommendations outlined in this CNVMP Condition 60A of the conditions of consent presented in DA 390/81 Mod 9 will be considered satisfied.

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