

Cleanaway Operations Pty Ltd

Bromelton Energy and Resource Centre

Noise and Vibration Technical Report

Reference: BERC-ARU-BNE-ENNV-RPT-0001

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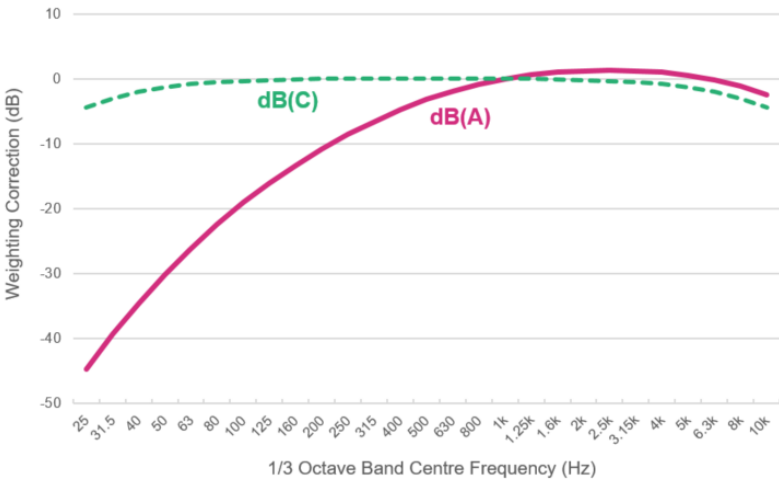
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Abbreviations and glossary

Abbreviation	Definition
AADT	Annual Average Daily Traffic
ACC	Air Cooled Condenser
APCr	Air Pollution Control Residue
AQO	Acoustic Quality Objectives
BERC	Bromelton Energy and Resource Centre
BCMF	Bromelton Compost Manufacturing Facility
BoM	Bureau of Meteorology
C&I	Commercial and Industrial
CEMP	Construction Environmental Management Plan
CNVIA	Construction Noise and Vibration Impact Assessment
CNVMP	Construction Noise and Vibration Management Plan
CoPV1	Queensland Department of Transport and Main Roads (TMR) Transport Noise Management Code of Practice: Volume 1 – Road Traffic Noise
CoPV2	Queensland Department of Transport and Main Roads (TMR) Transport Noise Management Code of Practice: Volume 2 - Construction Noise and Vibration
CMTF	Construction Traffic Management Plan
DCCEWW	Department of Climate Change, Energy, the Environment and Water
DEHP DES DESI DETSI	<u>Department of Environment and Heritage Protection</u> (DEHP): Established in April 2012. <u>Department of Environment and Science</u> (DES): Renamed from DEHP in December 2017. <u>Department of Environment, Science and Innovation</u> (DESI): Renamed from DES in December 2023. <u>Department of the Environment, Tourism, Science and Innovation</u> (DETSI): Renamed from DESI in November 2024.
DoEE	Department of Environment and Energy (now known as Department of Agriculture, Water and the Environment (DAWE))
DRDMW	Department of Regional Development, Manufacturing and Water
DSDILGP	Department of State Development, Infrastructure, Local Government and Planning
EA	Environmental Authority
EDG	Emergency diesel generator
EfW	Energy from waste
EIS	Environmental Impact Statement
ELV	Emission Limit Values
EMF	Environmental Management Framework
EMS	Environmental Management System
EP Act	<i>Environment Protection Act 1994</i> (Qld)
MCU	Material Change of Use
EP Regulation	Environmental Protection Regulation 2019
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
EPP Noise	Environmental Protection (Noise) Policy 2019
ERA	Environmentally Relevant Activity
EVOS	Environmental Values and Objectives

Abbreviation	Definition
FEED	Front End Engineering Design
FEL	Front End Loader
FGT	Flue Gas Treatment
HSE	Health, Safety and the Environment
IBAA	Incinerator Bottom Ash Aggregate
IBAC	Incinerator Bottom Ash Conveyor
IED	Industrial Emissions Directive
LGA	Local Government Area
m	Metres
m/s	Metres per second
m ²	Metres squared
m ³	Metres cubed
MCR	Maximum Continuous Rating
MERC	Melbourne Energy and Resource Centre
MVF	IBA extraction Mechanical Ventilation Fans
NMM	Noise measurement manual
NRC	Noise Reduction Coefficient
OEMP	Operational Environmental Management Plan
Planning Act	<i>Planning Act 2016</i>
PDB	Project Definition Brief
POEO	<i>Protection of the Environment Operations Act 1997</i>
PRSA	Preliminary Risk Screen Assessment
PSI	Preliminary Site Investigation
RBL	Rating Background Level
RPEQ	Registered Professional Engineer of Queensland
RZ	Rural Zone
RRZ	Rural Residential Zone
SARA	State Assessment and Referral Agency
SCRC	Scenic Rim Regional Council
SDA	State Development Area
SDAP	State Development Assessment Provisions
SDPWO Act	<i>State Development and Public Works Organisation Act 1971 (Qld)</i>
SPPF	State Planning Policy Framework
TEEP	Technically, Environmentally and Economically Practical
TMR	Department of Transport and Main Roads
VDV	Vibration dose value
WSERRC	Western Sydney Energy and Resource Recovery Centre
Noise and vibration specific terms	
Ambient noise level	The ambient noise level is the overall noise level measured at a location from multiple noise sources. When assessing noise from a particular development, the ambient noise level is defined as the remaining noise level in the absence of the specific noise source being investigated. For example, if a fan located on a building is being investigated, the ambient noise level is the noise level from all other sources without the fan operating, such as traffic, birds, people talking and noise from other buildings.

Abbreviation	Definition
Background noise level	The background noise level ($L_{A90,T}$) is the noise level that is generally present at a location all or most times. Although the background noise may change over the course of a day, over shorter time periods (e.g. 15 minutes) the background noise is almost-constant. Examples of background noise sources include steady traffic (e.g. motorways or arterial roads), constant mechanical or electrical plant and some natural noise sources such as wind, foliage, water and insects. <u>Ambient Background Level</u> A single-number figure used to characterise the background noise levels from a single day of a noise survey. Ambient background level is derived from the measured noise levels for the day, evening or night time period of a single day of background measurements. The ambient background level is calculated to be the order-statistic tenth percentile (picked by rank) of the background L_{A90} noise levels – i.e. the measured background noise is above the ambient background level 90% of the time. See Appendix B.1.1 for how this is applied. <u>Rating Background Level (RBL)</u> An overall single-number figure used to characterise the background noise levels from a complete noise survey, and to be used for assessment purposes. The RBL for a day, evening or night time period for the overall survey is calculated from the individual ambient background levels for each day of the measurement period, and is numerically equal to the median (middle value) of the ambient background levels values for the days in the noise survey. See Appendix B.1.1 for how this is applied.
Decibel (dB)	The logarithmic scale used to measure sound and vibration levels. Human hearing is not linear and involves hearing over a large range of sound pressures, which would be cumbersome if presented on a linear scale. Use of a logarithmic scale allows all sound levels to be expressed based on how loud they are relative to a reference sound (typically 20 μPa, which is the approximate human threshold of hearing). For sound in other media (e.g. underwater noise) a different reference level is used. An increase of approximately 10 dB corresponds to a subjective doubling of the loudness of a noise. The minimum increase or decrease in noise level that can be noticed is typically 2 to 3 dB.
dB weighting curves	The frequency of a sound affects its perceived loudness as human hearing is less sensitive at low and very high frequencies. When seeking to represent the summation of sound pressure levels across the frequency range of human hearing into a single number, weighting is typically applied. Most commonly, A-weighting, denoted as dB(A), is used for environmental noise assessment. This is often supplemented by the linear or C-weighting curves, where there is the potential for excess low-frequency sound at higher sound pressure levels. 

Abbreviation	Definition																														
dB(A)	dB(A) denotes a single-number sound pressure level that includes a frequency weighting ('A-weighting') to reflect the subjective loudness of the sound level. The frequency of a sound affects its perceived loudness. Human hearing is less sensitive at low and very high frequencies, and so the A-weighting is used to account for this effect. An A-weighted decibel level is written as dB(A). Some typical dB(A) levels are shown below. <table> <tr> <th>Sound Pressure Level dB(A)</th><th>Example</th></tr> <tr> <td>130</td><td>Human threshold of pain</td></tr> <tr> <td>120</td><td>Jet aircraft take-off at 100 m</td></tr> <tr> <td>110</td><td>Chain saw at 1 m</td></tr> <tr> <td>100</td><td>Inside nightclub</td></tr> <tr> <td>90</td><td>Heavy trucks at 5 m</td></tr> <tr> <td>80</td><td>Kerbside of busy street</td></tr> <tr> <td>70</td><td>Loud stereo in living room</td></tr> <tr> <td>60</td><td>Office or restaurant with people present</td></tr> <tr> <td>50</td><td>Domestic fan heater at 1 m</td></tr> <tr> <td>40</td><td>Living room (without TV, stereo, etc)</td></tr> <tr> <td>30</td><td>Background noise in a theatre</td></tr> <tr> <td>20</td><td>Remote rural area on still night</td></tr> <tr> <td>10</td><td>Acoustic laboratory test chamber</td></tr> <tr> <td>0</td><td>Threshold of hearing</td></tr> </table>	Sound Pressure Level dB(A)	Example	130	Human threshold of pain	120	Jet aircraft take-off at 100 m	110	Chain saw at 1 m	100	Inside nightclub	90	Heavy trucks at 5 m	80	Kerbside of busy street	70	Loud stereo in living room	60	Office or restaurant with people present	50	Domestic fan heater at 1 m	40	Living room (without TV, stereo, etc)	30	Background noise in a theatre	20	Remote rural area on still night	10	Acoustic laboratory test chamber	0	Threshold of hearing
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L ₁ (period)	The sound level exceeded for 1% of the measurement period. For example, 65 dB_{L_{A1,1min}} indicates that the A-weighted sound level would not exceed 65 dB for more than 0.6 seconds in the 1-minute measurement period.																														
L ₁₀ (period)	The sound level exceeded for 10% of the measurement period, or alternatively, the sound levels would be lower for 90% of the time. The L₁₀ is often defined as the 'average maximum' sound level, as in AS1055-1978 with the advent of statistical sound level meters.																														
L ₉₀ (period)	The sound level exceeded for 90% of the measurement period. The L₉₀ is often defined as the 'average minimum' or 'background' noise level for a period of measurement. For example, 45 dB_{L_{A90,15min}} indicates that the sound level is higher than 45 dB(A) for 90% of the 15-minute measurement period.																														
L _{eq} (period)	The equivalent ('eq') continuous sound level, used to describe the level of a time-varying sound or vibration measurement. The L_{eq} is often defined as the 'average' level, and mathematically, is the energy-average level over a measurement period – i.e. the level of a constant sound that contains the same sound energy as the measured sound.																														
L _{max}	The L_{max} is the 'absolute maximum' level of a sound or vibration recorded over the measurement period. As the L_{max} is often caused by an instantaneous event, it can vary significantly between measurements.																														
Peak Particle Velocity (PPV)	The highest velocity of a particle (such as part of a building structure) as it vibrates. PPV is commonly used as a vibration criterion for the assessment of cosmetic and structural damage.																														
Sound Power and Sound Pressure	The sound power level (L_w or SWL) of a source is a measure of the total acoustic power radiated by a source. The sound pressure level (L_p or SPL) varies as a function of the environment and distance from a source. The sound power level is an intrinsic characteristic of a source (analogous to its mass), which is not affected by the environment within which the source is located.																														

Abbreviation	Definition
Vibration	Waves in a solid material are called 'vibration', as opposed to similar waves in air, which are called 'sound' or 'noise'. If vibration levels are high enough, they can be felt; usually vibration levels must be much higher to cause structural damage. A vibrating structure (e.g. a wall) can cause airborne noise to be radiated, even if the vibration itself is too low to be felt. Structure borne vibration limits are sometimes set to control the noise level in a space. Vibration levels can be described using measurements of displacement, velocity and acceleration. Velocity and acceleration are commonly used for structure borne noise and human comfort. Vibration is described using either metric units (such as mm, mm/s and mm/s²) or else using a decibel scale.

Executive Summary

A Noise and Vibration assessment has been undertaken for the proposed Bromelton Energy and Resource Centre (BERC /the Project) which is an Energy from Waste (EfW) facility that will be owned and operated by Cleanaway Operations Pty Ltd (Cleanaway).

This report will identify potential noise and vibration impacts of the proposed facility on the nearest sensitive receptors and outline mitigation measures to minimise these risks as far as reasonably practicable. The report also demonstrates how the relevant noise and vibration criteria will be met and how the General Environmental Duty (GED) under Queensland legislation will be addressed.

This assessment is based on the design of the BERC available at the time of authoring. This study informs the project approvals including the State Development Area (SDA) Material Change of Use application and other planning approvals (including but not limited to Environmentally Relevant Activity applications).

This report is to be included as part of the Planning Report for the Project and will provide inputs into the Human Health Risk Assessment report.

Queensland Environmental Protection legislation and guidelines have been used to outline appropriate noise criteria for construction, operation, and maintenance of the BERC facility. As there are no clear legislative requirements or guidance for vibration assessment methodologies in Queensland that are applicable to this Project, vibration criteria from New South Wales EPA guidelines have been adopted.

The facility will operate 24 hours a day and will have truck deliveries 24 hours a day, 7 days a week, however majority of truck deliveries are expected between 6 am to 6 pm each day. Noise modelling of the BERC facility includes noise emissions from the facility during day, evening, and night periods.

This report does not include modelling of vibration emissions from operational equipment at the BERC due to the current level of Project development, however preliminary mitigation measures are included to address potential risks that may arise in detailed design.

Overall, there are no exceedances of the Environment Protection (Noise) Policy (2019) (EPP Noise) limits for noise at surrounding sensitive receptors expected, or of the other relevant noise and vibration criteria proposed for assessment of the Project.

The key outcomes of the noise and vibration assessment are as follows:

- Initial modelling has indicated there is not a significant risk of noise exceedances to sensitive receptors during the construction stage of the Project. It is recommended that a Construction Noise and Vibration Management Plan (CNVMP) be prepared (in future but prior to construction starting) to manage noise and vibration mitigation strategies, including monitoring during the construction stage.
- Compliance with vibration criteria at nearby sensitive receptors is expected during construction by incorporating the provided minimum safe working distances from construction equipment into the CNVMP, with consideration given to nearby industrial buildings, an underground telecom line running along the northern boundary of the Project area, and to the rail corridor along the eastern boundary.
- Dominant noise contributions to most sensitive receptors are generally from movements of heavy vehicles within the Project area. There are no exceedances expected of the EPP Noise limits for operational noise to surrounding sensitive receptors.
 - The initial ‘unmitigated’ assessment shows there is a risk of night-time background noise creep with a 3 dB(A) exceedance of the background noise emission criteria for one sensitive receptor, located at 140 Tilley Road, Bromelton (R19). Mitigation measures on fixed plant equipment and building envelopes must be put in place to minimise risk of environmental harm at this location. After applying mitigation measures (refer to NV05 in Table 28), the assessment shows there is no exceedance of the EPP Noise night-time limits predicted for normal operations. The prediction shows 2 dB of contingency exists (i.e. prediction is below the criteria) which provides further risk mitigation and is considered to help account for any modelling uncertainties.

- There is no significant risk of exceeding the relaxed EPP Noise limits (i.e. +5 dBA) applicable to sensitive receptors during testing of the emergency diesel generator or during other emergency/maintenance scenarios. Regular generator testing is assumed to be undertaken during daytime hours (7 am to 6 pm) to minimise risk of annoyance.
- Potential for increased operational traffic noise on public roads has been assessed, and it is not expected to be an issue or cause a significant increase above existing road traffic noise levels at sensitive receptors.
- It is also unlikely that structural damage to surrounding industrial buildings, the underground telecoms line along the northern boundary, the rail corridor along eastern boundary, or sensitive receptors (residential buildings) will occur from operational vibration. Nor is it expected that the operational vibrations will affect human comfort at those locations. This is due to the significant separation distances involved and the typical equipment vibration mitigation measures that will be provided to meet vibration criteria within the Project area to protect personnel and structures.

Acknowledgement of Country

Arup acknowledges the Traditional Owners across all lands, waters and skies our firm may reach; we acknowledge their wisdom, resilience, and rich cultural heritage. We pay our respects to the Elders, past and present, and to all Aboriginal and Torres Strait Islander peoples.

‘Continuing to Shift to shape an even better world’ original artwork by Tarni O’Shea of Gilimbaa and updated by David Williams of Gilimbaa.



1. Introduction

1.1 Purpose of this assessment

The purpose of this Noise and Vibration assessment is to demonstrate compliance with the various authority requirements, and to provide relevant information to the community and key stakeholders.

The Queensland *Environmental Protection Act 1994* (EP Act) lists obligations and duties to prevent environmental harm, nuisances, and contamination. One of the primary duties that applies is the General Environmental Duty (GED). This means a person must not carry out any activity that causes or is likely to cause, environmental harm unless all reasonable and practicable measures to prevent or minimise the harm have been taken.

This report provides an assessment of potential for environmental harm from noise and vibration and identifies mitigation measures to address such risks. This assessment is based on the design of BERC available at the time of the assessment. This study informs the project approvals including the State Development Area (SDA) Material Change of Use (MCU) application and other planning approvals (including but not limited to Environmentally Relevant Activity applications).

This report is to be included as part of the Planning Report for the Project and will provide inputs into the Human Health Risk Assessment report.

This Noise and Vibration assessment includes:

- Noise and vibration criteria based on the EP Act (Qld) with its subordinate legislation and related guidelines. In the absence of Queensland specific guidance, New South Wales vibration guidance has been referenced where appropriate
- Assessment of airborne noise emissions for construction and operation of the BERC to the nearest sensitive receptors outside the Project area boundary
- Assessment of vibration emissions for construction of the BERC to the nearest sensitive receptors outside the Project area boundary. This is in the form of expected safe working distances of vibration generating construction plant and equipment.
- A high-level desktop assessment of operational vibration risks

This report does not include:

- Vibration emissions from operational equipment at the BERC due to the current level of Project development, however possible risks and mitigation measures are included
- Noise and vibration assessment to receivers within the Project area boundary (within the BERC facility site) as indicated in red outline in Figure 2:
 - The operator of the BERC facility is responsible for managing (assessing and controlling) noise levels within the Project area in accordance with the *Work Health and Safety Act 2011*, the *Work Health and Safety Regulation 2011*, and associated codes of practice in Queensland.
- Internal noise and vibration design to *non-factory* spaces such as administration and visitor centre within the proposed development (this design will be undertaken during the detailed design stage of the facility)
 - Consideration of the *Australian Standard AS2107:2016 Acoustics – recommended design sound levels and reverberation times for building interiors* (AS2107) should be referenced for these cases and appropriate façade/partitions/floors/ceilings chosen to address sound reduction of airborne noise, structure-borne noise and vibration especially between *non-factory* and main factory spaces as part of the detailed design process.

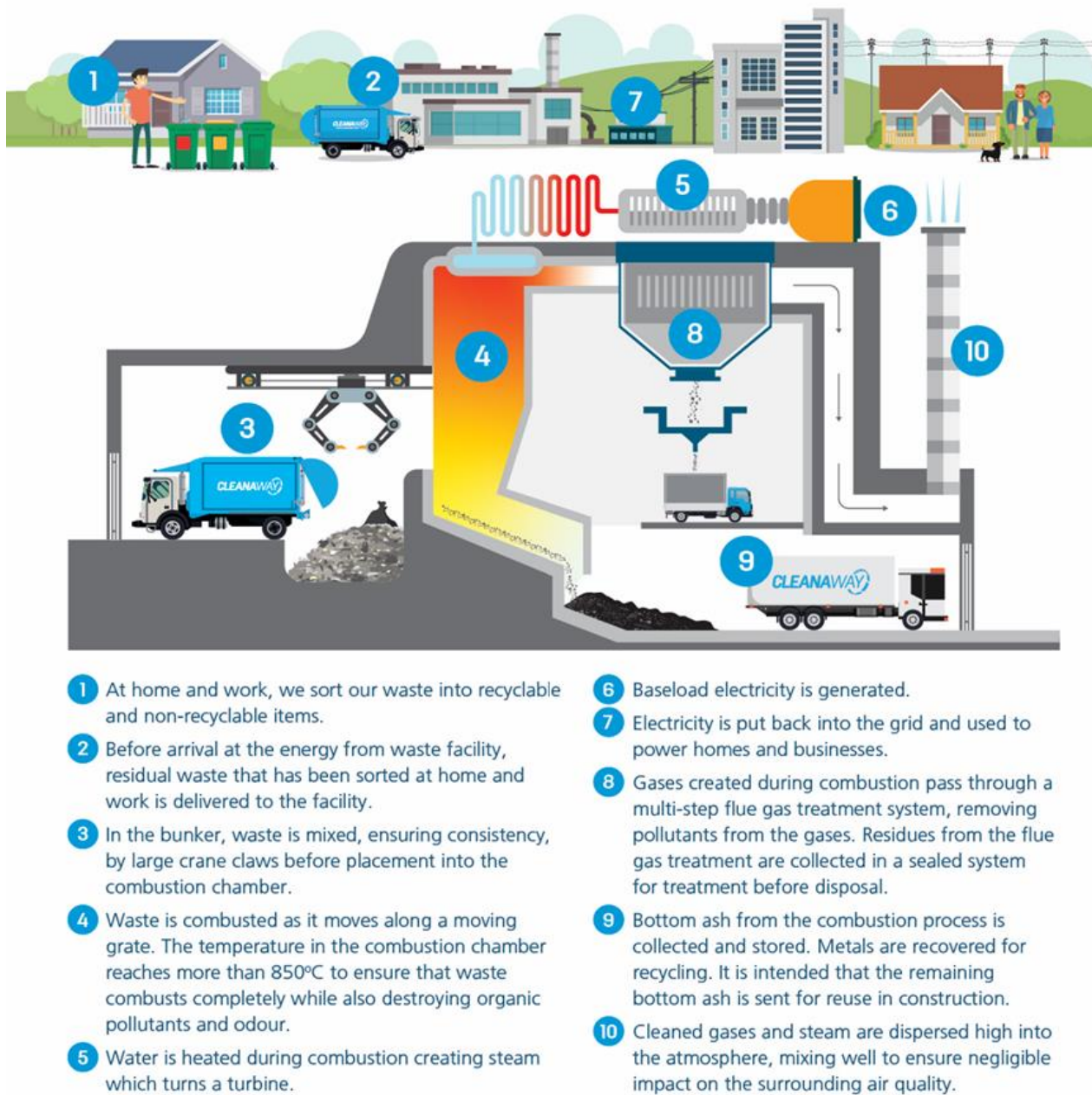
1.2 Project description

1.2.1 Project Overview

Cleanaway Operations Pty Ltd (Cleanaway) is developing an Energy from Waste (EfW) facility in Queensland known as the Bromelton Energy and Resource Centre (BERC / the Project). The Project will be located within the Special Industry Precinct of the Bromelton State Development Area (SDA), west of Beaudesert within the Scenic Rim Regional Council local government area.

The Project has been designed to thermally treat approximately 760,000 tonnes per annum (tpa) of waste feedstock, consisting of residual Municipal Solid Waste (MSW) and residual Commercial and Industrial (C&I) waste. Residual waste is waste that is not technically, environmentally and economically practical (TEEP) to reuse or recycle, which would otherwise be sent to landfill for disposal. The facility's actual annual throughput will vary depending on the calorific value of the feedstock and plant availability. To account for variability in feedstock energy content, the facility will be designed for a maximum processing capacity of up to 10% above the nominal figure (836,000 tpa). The EfW process is summarised in Figure 1.

Figure 1: Energy from Waste Process



1.2.2 Proponent

Cleanaway, an Australian owned company, has operated for more than 50 years, supporting industry, government, communities and households across Australia. Its mission is to make a sustainable future possible, achieved through action across all levels of the waste hierarchy. Waste generation is minimised through extensive education programs, with Cleanaway's 50 education officers reaching over 120 businesses, 30 councils, and almost 33,000 school participants in the last financial year.

Cleanaway invests heavily in recycling, operating several Material Recovery Facilities nationwide and has partnered with Pact Group, Asahi Beverages and Coca-Cola to deliver two large-scale PET (polyethylene terephthalate) recycling facilities and a HDPE (high density polyethylene) recycling facility with Pact Group. In addition, in collaboration with Viva Energy, Cleanaway is developing a soft plastics recycling plant. EfW is recognised by Cleanaway as an important part of the future waste management framework, enabling recovery of energy and other resources from residual waste that cannot otherwise be recycled.

1.2.3 Policy Alignment

The BERC aligns with the Queensland EfW Policy and the Queensland EfW Guideline (2021) by diverting residual waste from landfill and delivering economic and social benefits through employment and local business opportunities in South East Queensland.

In accordance with Policy outcome 7 of the Queensland EfW Policy, the BERC will be designed to meet the best practice emission standards and requirements of the European Industrial Emissions Directive (IED) (2010) and the associated Best Available Techniques Reference (BREF) Document for Waste Incineration (2019), which sets the European Union environmental standards for waste incineration.

The Project also supports the Queensland Waste Strategy contributing to its 2050 targets to reduce household waste by 25%, recycle 75% of all waste, and divert 90% from landfill. In doing so, the BERC will play a key role in advancing Queensland's transition to a circular economy and reducing long-term reliance on landfill.

1.2.4 Key Components

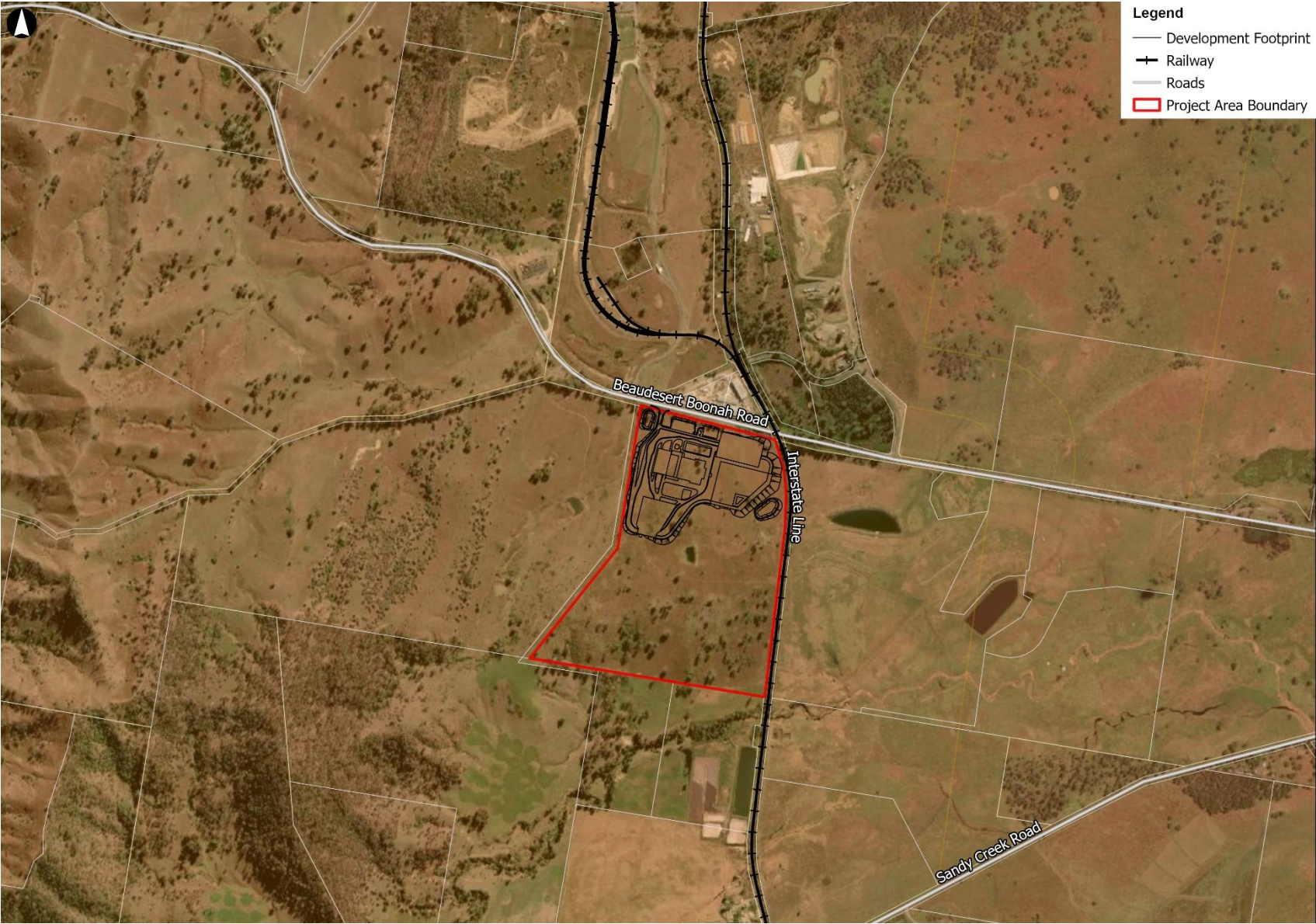
The key components of the Project are summarised in Table 1.

Table 1: Key Project Components

Project Component	Detail
Address	Lot 1 Beaudesert Boonah Road, Bromelton, Queensland, 4285 (Lot 1 on RP45234). Refer Figure 2.
Site Area	63 hectares
Summary of proposed works	The Project includes the construction of a main EfW facility for waste processing, incinerator bottom ash (IBA) maturation and processing facility and an air pollution control residue (APCr) facility. It also includes all onsite infrastructure needed for the EfW facility, such as site utilities, internal roads, weighbridges, parking and hardstand areas, stormwater infrastructure, fencing and landscaping. The Project will include a visitor centre to help educate and inform the community on circular economy principles, the waste hierarchy, including waste avoidance, recycling, resource recovery, the benefits of landfill diversion and the EfW process. The intent behind this education is to drive a shift in community awareness and attitudes toward waste management and resource recovery.
Technology Used	The proposed technology is moving grate combustion technology. This has been used globally for over 100 years and is common in many of the 500 similar operational examples across Europe.
Facility Outputs	Approximately 73.2 MW (577,600 MWh/year, corrected for ambient temperature) exported to the grid as baseload electricity. Potential to supply energy in the form of heat and/or process steam to local industrial users. Residual materials include IBA and APCr. It is intended that the IBA will be mechanically processed on site to create incinerator bottom ash aggregate (IBAA). During this process, both ferrous and non-ferrous metals are recovered for recycling and sale. It is intended that the remaining material is repurposed for use as an aggregate in construction. The Project includes a facility to stabilise APCr before removal and disposal at a licensed landfill.
Key infrastructure	EfW facility including administration and visitor's centre IBA maturation and processing facility (2 x pads and 2 x sheds) APCr facility (1 x pad, 1 x shed) Transformer yard and switchyard De-coupling area for trucks Weighbridges

Project Component	Detail
	Internal road network and carparking 2 x combined storm water treatment and detention basin 1 x lined retention basin Access from Beaudesert Boonah Road via a signalised intersection with Recycling Street
Hours of Operation	24 hours per day, seven days per week (365 days per year)
Operational Staff	Approximately 60 staff

Figure 2: Site Description



1.3 Information availability

This section identifies the information available to inform the Noise and Vibration assessment based on the current level of design and development of the Project.

- Information known:
 - Maximum internal noise levels of factory spaces during normal operation (supplied by Ramboll)
 - Emergency and maintenance modes of the factory (supplied by Ramboll)
 - Expected daily and peak hourly volumes of residual waste delivery trucks, and other heavy and light vehicles is based on capacity of factory operations (supplied by Ramboll¹)
 - Expected location of stationary noise sources, building locations and orientation, building envelope materiality, and roads/truck routes within the Project area based on information from the Front End Engineering Design (FEED).
- Information based on Arup database:
 - Noise level of external Incinerator Bottom Ash (IBA) conveyor belt system and drive motor
 - Noise levels of mobile plant and outdoor truck loading events
 - Noise levels of heavy and light vehicles
 - Building materiality transmission losses
- Information based on construction and operation of reference EfW facilities but needs confirmation as the BERC project develops:
 - Construction noise and vibration source level data, activities, locations on site and expected usage
 - Possible risks of operational equipment vibration
 - Expected noise levels of outdoor operational stationary plant (Air Cooled Condenser (ACC) fans, Radiator Cooler (RC) or Component Cooler fans, IBA extraction mechanical ventilation fans, stack flue, main transformer, auxiliary transformers in substation switchyard, generator)
 - Expected operational vehicular movements of heavy and light traffic on-site (used to predict overall vehicle noise levels)
 - Peak hourly percentage of daily heavy and light vehicle volumes (excluding waste delivery trucks)

1.4 Site description

The Project is located within the Scenic Rim Regional Council local government area, and more specifically, within the Bromelton State Development Area (SDA). It is situated approximately 8 km by road directly west from the nearest large settlement of Beaudesert.

The Project area is addressed as Lot 1 Beaudesert Boonah Road, Bromelton (Queensland) and formally described as Lot 1 on RP45234. The site measures approximately 63 ha in area and is generally regular in shape. Site dimensions are approximately 510 m to the northern boundary (road frontage), 965 m to the eastern boundary (adjacent rail corridor), 880 m to the southern boundary (adjacent private land) and 1,060 m to the western boundary in two parts being 535 m and 525 m (adjacent private land).

1.4.1 Bromelton State Development Area

In 2008 the Co-ordinator General of Queensland declared the Bromelton SDA in accordance with the *State Development and Public Works Organisation Act 1971* (SDPWO Act). The Bromelton SDA comprises an

¹ REN2021N00922-RAM-ME-00021 (11 June 2025)

area of approximately 15,610 ha of land located in the Scenic Rim Regional Council local government area, approximately 6 km west of the town of Beaudesert.

The purpose of the SDA is to promote and facilitate economic development in Queensland, and more specifically to support the growing demand for medium to large scale industries and difficult to locate industries. The Bromelton SDA Development Scheme² ('Development Scheme') was prepared, outlining a development assessment framework and processes for making, assessing and deciding SDA applications. The Development Scheme prevails over local and state government planning instruments for development.

SDA applications are made to, assessed, and determined by the Co-ordinator General. SDA applications are often referred to relevant state government agencies and local governments for comment, therefore other state and local legislation may also be considered as part of the referral process.

The Bromelton SDA is composed of six (6) precincts, with each precinct intended to service differing functions for the broader SDA. The precincts are as follows:

- Bromelton Local Service Centre Precinct
- Medium – High Impact Industry Precinct
- Rail Dependant Industry Precinct
- Rural Precinct
- Special Industry Precinct
- Transition Precinct.

The Project area is located within the Special Industry Precinct which provides an area for high-impact and difficult-to-locate industries that require separation from non-industrial uses due to the potential for off-site impacts. Refer to Appendix A for the Bromelton SDA precinct zoning map with overlay of the Project area within it.

The proposed BERC constitutes a Material Change of Use for Special Industry and is assessable development under the Development Scheme. The SDA application is assessed against the following parts of the Development Scheme to the extent relevant:

- Strategic vision for the Bromelton SDA
- Overall objectives for development in the Bromelton SDA
- Preferred development intent for the applicable development precinct
- SDA wide assessment criteria.

1.4.2 Surrounding land uses

The broader locality comprises primarily rural and agricultural land uses. Established and emerging industrial land uses are located within the Bromelton SDA.

The Project area is immediately surrounded by the following Bromelton SDA precincts:

- Special Industry Precinct to the west and south
- Rail Dependant Industry Precinct to the east and north
- Medium – High Impact Industry Precinct to the north.

There are Transition Precinct areas located further away in all directions (i.e. beyond the areas listed above) with the nearest being to the north-west.

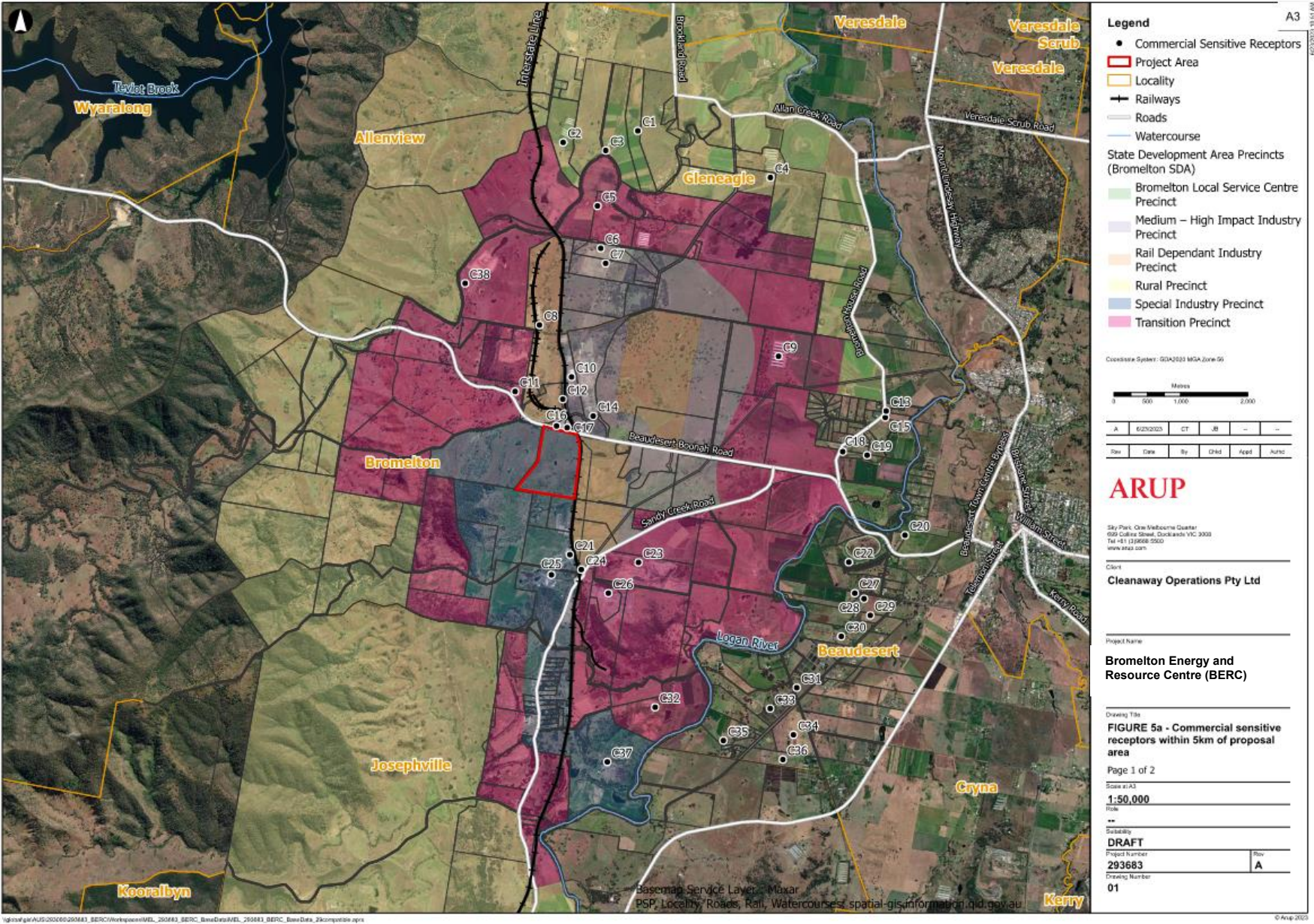
² https://www.statedevelopment.qld.gov.au/__data/assets/pdf_file/0027/33759/bromelton-sda-development-scheme-dec-2017.pdf

The Project area has existing noise emitting transport infrastructure and a variety of industrial facilities/receivers located around it, including:

- Beaudesert Boonah Road (number 212), running along the north boundary of the Project area. This is a state-controlled regional road and is signed as State Route 90
- Single track railway alignment for freight trains on the Sydney-Brisbane rail (interstate freight rail corridor) along the eastern boundary of the Project area
- Sandy Creek Road far to the east and running south of the Project area
- Various commercial facilities that are potential noise sources and which were all reviewed and classified as ‘Industrial’ type uses/noise receptors (i.e. not a sensitive receptor type per EPP Noise). The nearest industrial land uses to the Project area include:
 - North of the Project area boundary: C16 (Gemco Rail, manufacturer) and C17 (Quickcell Technology Products Pty Ltd, precast concrete manufacturer) at 86 m away, and C11 (SCT Logistics), C12, C14 (JJ’s Waste & Recycling) at 370 m to 673 m away, and C10 and C8 at 813 m and 1513 m away
 - South of the Project area boundary: C21, C24, and C25 (A J Bush & Sons (Manufactures) Pty Ltd, rendering plant) at 841m, 1066m, and 1180m away
 - South-east of the Project area boundary: C23 (Neilsen’s Quarry North Bromelton) and C26 (Bromelton Quarry) at 1353m and 1502m away

Locations of these industrial facilities and roads and rail noise emitting sources around the Project area are provided in Figure 3.

Figure 3: Existing industrial facilities and roads and rail noise sources surrounding the Project area



2. Regulatory context

This Chapter sets out the noise and vibration legislation, policy and guidelines applicable to Queensland. Together, these documents form the current regulatory context and ‘state of knowledge’ for noise and vibration in relation to the Project area.

2.1 State legislation overview

Noise and vibration from the BERC facility will be assessed with respect to the relevant state legislation and supporting guidelines including:

1. *Environmental Protection Act 1994* (EP Act)
 - a. Environmental Protection Regulation 2019 (EP Regulation)
 - b. Environmental Protection (Noise) Policy 2019 (EPP Noise)
 - Explanatory notes for EPP Noise (SL 2019 No. 154)
 - (former) Department of Environment and Science (DES), Noise measurement manual (NMM) (2020)
 - (former) Department of Environment and Science and Innovation (DESI), Noise and vibration – EIS information guideline (2024)
2. Department of State Development, The Bromelton State Development Area (SDA) Development Scheme (2017)
3. (former) DES, The Energy from Waste Policy (2021)
 - a. (former) DES, Energy from Waste Guideline (2022)
4. State Code 22: Environmentally Relevant Activities (ERA)
 - a. (former) DES, Guideline – State Development Assessment Provisions State Code 22: ERA (2019)
 - b. Department of the Environment, Tourism, Science and Innovation (DETSI), Guideline – EP Act, Application requirements for activities with noise impacts (2025)
5. State Code 2: Development in a Railway Environment
 - a. Department of Transport and Main Roads (TMR), Guide to Development in a Transport Environment: Rail (2015)
6. TMR, *Transport Noise Management Code of Practice: Volume 1 – Road Traffic Noise* (CoPV1) (2013)
7. TMR, *Transport Noise Management Code of Practice: Volume 2 – Construction Noise and Vibration* (CoPV2) (2023)

Compliance with the operational noise requirements contained within items 1 through 4 above is demonstrated through assessment against and compliance with EPP Noise. These requirements are described in Section 2.3. Requirements relating to item 6 for assessing risk of increased noise along state-controlled roads due to additional vehicles from BERC operations and construction are presented in Section 2.2.3 and 2.3.10.

Construction noise in relation to item 1 is presented in Section 2.2.1 and item 5 applies only to construction vibration and is described in Section 2.4.2.

EPP Noise includes provisions for preventing or minimising **background creep**, and a method to assess it is provided in the Noise and Vibration EIS Information Guideline (2024) published by the (former) Department of Environment, Science, and Innovation (DESI). Meeting background creep requirements helps mitigate the

risk so that noise levels do not gradually exceed existing ambient levels, thus preserving the acoustic environment and preventing long-term disturbances in surrounding areas.

Details regarding the EPP Noise AQOs and background creep are provided in Section 2.3.6 and Section 2.3.7 respectively. Background creep was determined with reference to the Rating Background Levels (RBL) and derived from long-term site noise monitoring summarised in Section 3.1. The AQOs and background creep targets are summarised in Table 18 for normal operations, and Table 19 for emergency testing/maintenance operations.

EPP Noise and the NMM do not provide any guidance with respect to methods for assessing low-frequency noise adjustment factors. In this circumstance, without other current guidance available from the DETSI, the following previously available guidelines are referred to:

- (former) DEHP, EcoAccess Guideline for the assessment of Low Frequency Noise (2004).

The EP Act default noise standards do not include numerical criteria for periods where audible construction noise is permitted and there are no other legislative requirements for assessment of construction noise applicable to the Project. However, the following documents are referenced (refer to Section 2.2.2) to undertake an initial screening assessment to assess risks of construction noise having an adverse impact at sensitive receptors:

- TMR, *Transport Noise Management Code of Practice: Volume 2 - Construction Noise and Vibration* (CoPV2) (2023)
- TMR Specifications, Technical Specification, MRTS02 Provision for Traffic (2023).

In defining noise, the EP Act includes vibration of any frequency, whether emitted through air or another medium. Therefore, where noise impacts are to be considered, consideration of vibration impacts must also be undertaken. There are no clear legislative requirements or guidance for vibration assessment methodologies in Queensland that are applicable to this Project. The following additional documents and international standards have been referenced:

- NSW Environment Protection Authority, (former) Department of Environment and Conservation, *Assessing Vibration: A Technical Guideline* (2006) (which is based on BS 6472:1992)
- AS 2187:2006 Part 2³, BS 7385:1993 Part 2⁴, and DIN 4150-3:2016⁵.

2.2 Construction noise

The EP Act default noise standards do not include numerical criteria for periods where audible construction noise is permitted (Section 2.2.1).

Although not required to satisfy a numerical criterion during standard hours of operation, because the construction works are anticipated to emit noise, an initial quantitative and qualitative screening assessment has been undertaken to help assess risks of the construction noise having an adverse impact at sensitive receptors.

The screening assessment is compared against the construction noise criteria used by the Queensland TMR *Transport Noise Management Code of Practice: Volume 2 - Construction Noise and Vibration* (CoPV2) (2023) described in Section 2.2.2.

This initial screening assessment provides the anticipated construction activities, plant and equipment noise sources and recommended construction noise and vibration mitigation and management measures in Chapter 5.

³ Australian Standards, “AS2187:2006 Explosives - Storage and Use - Part 2: Use of Explosives”

⁴ British Standards Institute, “BS7385:1993 Evaluation and Measurement for Vibration in Buildings Part 2”

⁵ Deutsche Norm DIN 4150-3:2016 *Vibrations in buildings- part 3: Effects on structures*. DIN, Germany

Furthermore, a CNVMP will be prepared by the construction contractor in the future (prior to start of construction) when actual activities and construction equipment is known.

2.2.1 EP Act

Pursuant to the EP Act, all development involving the emission of noise from buildings and/or construction activities, must ensure that the emissions are in accordance with the requirements of the Act. The EP Act prescribes that:

1. A person must not carry out building work in a way that makes an audible noise -
 - on a business day or Saturday, before 6.30a.m. or after 6.30p.m; or
 - on any other day, at any time.
2. The reference in subsection (1) to a person carrying out building work -
 - includes a person carrying out building work under an owner-builder permit; and
 - otherwise, does not include a person carrying out building work at premises used by the person only for residential purposes.

Note: A request can be made to work outside of these hours by submitting an Environmental Management Plan for assessment and obtaining an endorsed decision from the Environmental Management delegate Development Assessment.

2.2.2 Construction noise criteria (TMR CoPV2)

Construction noise criteria in the CoPV2 are considered primarily aimed at dealing with nuisance. Where criteria are exceeded, all reasonable and practicable control measures are required to be implemented.

If all administrative and construction activity related control measures are applied and noise levels are still greater than the nominated criterion values, the Project and the Registered Professional Engineer of Queensland (RPEQ) (that is, Assessing RPEQ) shall determine any reasonable and practicable respite, temporary relocation and architectural treatment requirements. The construction contractor will need to consult with the affected person or community with regards to these measures, where determined by the Assessing RPEQ.

The basis used to establish noise criteria for general construction activities is provided in Table 2 and the criteria are defined as lower and upper limits which are assessed adjacent to external facades at the sensitive receptors. The noise criteria are defined for the following work periods:

- Standard hours – work within Standard hours shall be encouraged, where possible
- Non-Standard hours.

All reasonable and practicable measures shall be implemented to achieve the lower limit for Standard and Non-Standard hours.

Exceedance of the upper limit requires the Assessing RPEQ to determine any reasonable and practical respite, temporary relocation, and architectural treatment requirements.

Table 2: TMR CoPV2 external construction noise criteria

Work period		External noise level $L_{Aeq,adj,15min}^{[4, 5]}$, dB(A)	
		Lower limit	Upper limit
Standard hours	Monday – Friday 7am to 6pm, Saturday 8am to 1pm	RBL + 10 ^[1, 2, 3]	75 where: RBL > 55
			70 where: 40 < RBL ≤ 55
			65 where: RBL ≤ 40

Work period		External noise level $L_{Aeq,adj,15min}^{[4, 5]}$, dB(A)	
		Lower limit	Upper limit
Non-Standard hours – Day/Evening	Monday – Friday 6pm to 10pm, Saturday 7am to 8am, Saturday 1pm to 10pm, Sunday 7am to 10pm,	RBL + 5 ^[3]	RBL + 5 ^[3]
Non-standard hours – Night	Monday – Sunday 10pm to 7am	RBL + 5 ^[3]	RBL + 5 ^[3]
1. RBL + 5 dB(A) should be considered where a facility, equipment and long-term earthworks are required in an area for greater than six months. Where this occurs, the minimum lower limit is 45 dB(A) for Standard hours. 2. Where the lower limit value exceeds the upper limit value, the lower limit is taken to equal the upper limit value. 3. Minimum lower limit is 50 dB(A) for Standard hours and 45 dB(A) for Non-Standard hours. A maximum lower/upper limit of 75 dB(A) applies to Non-Standard hours. 4. Noise contribution from construction activity determined as the component level (that is, noise from construction activity only). 5. The noise level from construction includes adjustment factors from Table 2.1.2.1(b) of TMR CoPV2 (for example, low frequency noise, impulsivity, tonality, intermittency, and modulation).			

Based on the guidelines and process discussed above, the applicable numerical values for construction noise criteria on this Project can be derived, per Section 5.1, Table 14.

2.2.3 Construction traffic noise (TMR MRTS02)

Haulage/transportation associated with construction activities on public roads beyond the Project area has the potential to create traffic noise issues for existing sensitive receptors. The TMR CoPV2 criteria are not applicable to construction traffic noise on roads external to the Project area. The Code requires noise and vibration impacts and risk mitigation measures for supply chain haul routes to be specified by the construction contractor within a Supply Chain Haul Route Management Strategy as per TMR Technical Specification MRTS02 *Provision for Traffic*.

MRTS02 requires the contractor to undertake haul route assessment for the supply chain for major material movements to and from site for the Project, including earthworks, pavement materials, asphalt suppliers, pre-cast elements, concrete suppliers and so on. Such assessment shall include, at a minimum, the impact of additional haul traffic volume on local or low volume road infrastructure (annual average daily traffic < 10,000). The assessment shall include, but not be limited to the following:

- Details for the additional haul traffic volume on the local or low volume road infrastructure
- The safety of the other road user groups
- Impacts on the residents along the route, such as, noise, dust, vibrations, timing and duration for movements and so on, and
- The additional infrastructure maintenance regime, including structures and pavement.

If the haul route assessment identifies any increased risk associated with the infrastructure use, the Contractor shall include a Supply Chain Haul Route management strategy as a part of its Traffic Management Plan. Such strategy shall address risk mitigation measures the Contractor is proposing to undertake to maintain the network to the standard, without the impacts of the additional haul traffic volumes.

MRTS02 also requires that if any night work is to be undertaken, then only machinery fitted with reversing or other alarms which adjusts the alarm sound output to no more than 5 dB above the surrounding noise level and an alarm sound output range of 85 dB to 115 dB, will be used to work from midnight to 6 am.

2.2.4 Blasting

No blasting has been highlighted as a requirement to construct the BERC. As such, air-blast overpressure and vibration have not been considered within this assessment.

2.3 Operational noise legislation

Operational noise emissions for the Project are governed by the following requirements.

2.3.1 EP Act

In Queensland, noise is regulated under the EP Act and subordinate legislation including the EP Regulation and the EPP Noise.

The EP Act lists obligations and duties to prevent environmental harm, nuisances, and contamination. One of the primary duties that applies is the GED. This means a person must not carry out any activity that causes or is likely to cause, environmental harm unless all reasonable and practicable measures to prevent or minimise the harm have been taken.

Environmentally relevant activities are issued an Environmental Authority (EA) that includes conditions that stipulate how the project must be managed. One of the purposes of an environmental noise and vibration assessment is to help the administering authority decide an Environmental Authority application, and its conditions.

The EP Act includes noise in the list of 'contaminants' (see s. 11), and in the list of things that can cause 'environmental nuisance' (see s. 15). Chapter 8, Part 3B, of the EP Act regulates offences relating to noise standards, and in doing so provides several relevant definitions and sets several default standards for audible noise that should be considered when preparing an environmental noise and vibration assessment.

2.3.2 EP Regulation

The following 'Environmental Objective' for noise specified in Schedule 8, Part 3, Division 1 of the Queensland Environmental Protection Regulation 2019 (EP Regulation) is as follows:

- The activity will be operated in a way that protects the environmental values of the acoustic environment.

The environmental values for the acoustic environment are specified in EPP Noise and discussed in Section 2.3.6.

Chapter 5, Part 4, of the EP Regulation includes several regulations related to prescribed standards for noise (which are generally not relevant to this Project) and other standard methods for measuring noise.

2.3.3 Bromelton State Development Area

Regarding Project site noise emissions, Section 2.5.4 of the Bromelton SDA Development Scheme states:

- Development is designed to avoid or minimise:
 - Adverse impacts from noise that will affect the health and safety, wellbeing and amenity of communities and individuals
 - Conflicts arising from (but not limited to) noise emissions with sensitive and/or incompatible land uses.
- Development supports the achievement of the relevant acoustic quality objectives of the EPP Noise.

2.3.4 Environmentally Relevant Activities (State code 22)

The development will require assessment against objectives in the *Environmental Protection Act 1994* and State Development Assessment Provisions (SDAP) State code 22: Environmentally Relevant Activity.

For all ERAs, State code 22 requires compliance with 'performance outcome' PO1 as follows:

- Development is suitably located and designed to avoid or mitigate environmental harm to the acoustic environment.

Development complies with the code where it complies with the stated 'acceptable outcome' A01.1 for the PO1 as follows:

- Development meets the acoustic quality objectives for sensitive receptors identified in the EPP Noise.

There is also a guideline which sets out assessment requirements for ERA applications involving activities with noise impacts⁶ and this in turn requires demonstrating the Project will meet the requirements of EPP Noise.

2.3.5 Energy from Waste Policy

The Energy from Waste Policy and Guideline also require the Project to meet the requirements of EPP Noise.

2.3.6 EPP Noise

EPP Noise is subordinate legislation made under the EP Act. The purpose of the policy is to achieve the objective of the Act in relation to the acoustic environment. The environmental values to be enhanced or protected under the policy (in Section 6) are:

- The qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystems
- The qualities of the acoustic environment that are conducive to human health and wellbeing, including by ensuring a suitable acoustic environment for individuals to do any of the following: sleep, study or learn, be involved in recreation, including relaxation and conversation
- The qualities of the acoustic environment that are conducive to protecting the amenity of the community.

The environmental values are used to inform a range of decision making including under the EP Act. For example, the environmental values in the policy are used to inform whether environmental harm under the EP Act has been caused, as environmental harm is an adverse impact on an environmental value. The concept of environmental harm includes environmental nuisance.

To assist in determining noise levels consistent with the identified environmental values, EPP Noise contains Acoustic Quality Objectives (AQO) for receptors considered sensitive to noise. The AQOs for sensitive receptor types identified in the vicinity of the Project area are shown in Table 3. Where the overall level of noise at the sensitive receptors are within the AQO, the environmental values are considered to be achieved.

Table 3: EPP Noise acoustic quality objectives for residences

Sensitive receptor	Time of day	Acoustic quality objectives (measured at the receptor), dB(A)		
		L _{Aeq,adj,1hr}	L _{A10,adj,1hr}	L _{A1,adj,1hr}
Residence (for outdoors)	Daytime and evening	50	55	65
Residence (for indoors)	Daytime and evening	35	40	45
	Night-time	30	35	40

A review of the anticipated operational noise sources from the BERC indicates that, due to multiple sources operating simultaneously, the total noise emissions from BERC will generally be continuous in nature. Based on this and our experience of assessing industry noise it is considered that the L_{Aeq} AQO are more stringent than the L_{A1} and L_{A10} AQO's. The L_{A10} noise emissions are expected to be less than 5 dB(A) above the L_{Aeq} noise emissions and the L_{A1} noise emissions are expected to be less than 10 dB(A) above the L_{Aeq} noise emissions.

Furthermore, due to the distance between the Project area and the nearest sensitive receptors (over 1.4 km), it is expected that other local noise sources may drive the discrete noise levels at many of the sensitive receptors. This is also supported by the noise logger data which indicates the existing noise environment

⁶ Guideline EPA 1994

contains discrete events which elevate the L_{A1} (L_{Amax}) noise levels above the L_{Aeq} by around 20-25 dB(A), likely to be attributable to existing traffic movements and other extraneous noise sources.

- On this basis, the assessment moving forward focuses on the more stringent L_{Aeq} AQO.

To assess the AQO noise level for indoors of the residences, a conservative 7 dB façade noise reduction is allowed for and used to convert the indoor AQO values to approximate outdoor/external noise levels. The (former) DESI *Noise and vibration EIS information guideline* (2024, on page 3) recommends ‘an outdoor to indoor attenuation value of 7 dB, which is appropriate for typical Queensland buildings with open windows.’

This reveals that the indoor AQO values are more stringent than the standard outdoor AQO from Table 3. The 50 dB(A) $L_{Aeq,adj,1hr}$ outdoor AQO for the daytime and evening period is achieved at a residence if the adopted 42 dB(A) $L_{Aeq,adj,1hr}$ external level is satisfied to achieve the relevant indoor AQO with a partially open window.

In summary, the most stringent AQO to be **assessed external** to residential dwellings with open doors/windows to be adopted are:

Daytime and evening (7am to 10pm)

- **42 dB(A) $L_{Aeq,adj,1hr}$** (i.e. 35 internal + 7 indoor to outdoor allowance)

Night-time (10pm to 7am)

- **37 dB(A) $L_{Aeq,adj,1hr}$** (i.e. 30 internal + 7 indoor to outdoor allowance)

2.3.7 Background noise creep limits

Section 9 of the EPP Noise aims to prevent or minimise background noise creep to the extent it is reasonable to do so. Although it is worth noting that Queensland Government legislation document EPP Noise Explanatory notes (for SL 2019 No. 154) explains that:

“In some situations, it may be reasonable to allow a greater increase to the background noise in an area or place. That may be the case in an area or place with very low background noise where an activity will increase the background noise levels but only to the extent the environmental values of the area are still protected.”

Background creep means a gradual increase in the total amount of background noise in the area or place as measured under the (former) DES Noise measurement manual (NMM) (2020).

The EPP Noise does not provide methods for assessing background creep; however the Noise and Vibration EIS Information Guideline (2024), published by the (former) DESI, provides guidance on background creep which is as follows:

To the extent that it is reasonable to do so, noise from an activity much not be:

A_ For noise that is continuous noise from an activity measured by $L_{A90,T}$ – more than nil dBA greater than the existing acoustic environment measured by $L_{A90,T}$; or

B_ For noise that varies over time, noise from an activity measured by $L_{Aeq,adj,T}$ – more than 5 dBA greater than the existing acoustic environment measured by $L_{A90,T}$

The following table shows the derivation of the recommended background noise emission limit at the assessed sensitive receptors.

Establishment of these limits requires noise monitoring to determine existing ambient noise levels, and it was done based on the RBL values (i.e. $L_{A90,1hr}$) derived from long-term site noise monitoring summarised in Section 3. Time periods used for the derivation of the RBLs to assess background creep limits were selected as follows:

- Day: 07:00 – 18:00 Monday to Sunday

- Evening: 18:00 – 22:00 Monday to Sunday
- Night: 22:00 – 07:00 Monday to Sunday

Table 4: EPP Noise for background creep

Sensitive receptor ¹	ID	Time of day	Rating Background Level (RBL), L _{A90,1hr}	Background Creep dB(A)	
				(A)_For noise that is continuous, predicted L _{A90,1hr} no more than existing L _{A90,1hr}	(B)_For noise that varies over time, predicted L _{Aeq,1hr} no more than existing L _{A90,1hr} + 5 dBA
Residence	R16 and R19	Daytime	34	34	39
		Evening	29	29	34
		Night	29	29	34
Residence	R21	Daytime	35	35	40
		Evening	32	32	37
		Night	30	30	35
Residence	R56	Daytime	31	31	36
		Evening	29	29	34
		Night	29	29	34
Residence	R66	Daytime	39	39	44
		Evening	36	36	41
		Night	34	34	39

Notes:
1. All locations classified as ‘purely residential’ receiver land use with receiver area dominant land use as ‘rural residential’ except R66 classified as ‘industrial area’ receiver land use (A.J. Bush and Son's (Manufactures) Pty Ltd) with receiver area dominant land use as ‘residential’ (200m radius).

2.3.8 Assessing low frequency noise

Although EPP Noise does not explicitly require consideration of potential adjustments to AQO's due to low-frequency noise, screening criteria are proposed on this Project for assessing risk of annoyance from low frequency noise. The proposed consideration is sourced from the (former) DEHP EcoAccess *Guideline for the assessment of Low Frequency Noise* (2004). This guideline is no longer published by DETSI but the methodology is considered generally appropriate for the assessment of low frequency noise and it is listed as a document reference within the NMM. The guideline contains an initial screening assessment methodology and a more detailed assessment if the screening assessment indicates adverse impacts.

The detailed one-third octave assessment requires analysis that cannot reliably be completed with available noise source data and modelling methods. The initial screening assessment is considered an appropriate method for the assessment of low frequency noise impacts for the Project.

The criteria for the initial screening assessment are as follows:

- Overall sound pressure level inside residences should not exceed 50 dB(Linear) L_{eq} to minimise risk of complaints of low frequency noise annoyance
- If the dB(Linear) measurement exceeds the dB(A) measurement by more than 15 dB, a one-third octave band measurement in the frequency range 20 to 200Hz should be carried out.

To convert the internal noise criterion of 50 dB(Linear) to an external noise criterion, a 5 dB noise reduction through open windows has been used, resulting in an equivalent external noise criterion of 55 dB(Linear).

The 5 dB reduction is in accordance with the PFNC guideline for windows wide open, which is considered a conservative estimate of the façade reduction but appropriate for low frequency noise assessment.

Therefore, the resulting criteria adopted for assessment of low frequency noise on this Project are as follows:

- External noise criterion of 55 dB(Linear) L_{eq} at a sensitive receptor
- The difference between the A-weighted dB(A) and unweighted dB(Linear) levels should not be greater than 15 dB.

For initial assessment purposes and to conservatively identify potential risks, this screening criteria will not be relaxed by 5 dB for the emergency testing/maintenance operations scenario, although if potential exceedances are predicted, it is considered reasonable to allow for a higher risk of low frequency noise annoyance during these limited duration operations (i.e. in line with Section 2.3.9).

2.3.9 Noise limits for emergency/maintenance operations

The long-term EPP Noise AQO and background creep limiting operational noise targets are not considered reasonable to apply during emergency/maintenance operations, such as a during power failure or during scheduled testing/maintenance of associated emergency equipment.

The Project includes an emergency diesel generator (EDG) located inside the Boiler Hall that has air intake/discharge louvres and an engine exhaust flue located on the southern façade.

While a grid power failure emergency may happen at any time, it is considered rare and the duration of an outage is expected to be hours rather than days. On this basis, it is not typically assessed or considered further.

It is assumed that testing/maintenance of the EDG and any other emergency/maintenance equipment will be scheduled during the daytime period and be less than or equal to four (4) hours per month. It is considered unreasonable to implement noise treatment to meet the normal operations criteria due to the short duration and low occurrence of these scenarios.

Therefore, as typically applied in Queensland, emergency equipment operations noise planning criteria is set at +5 dB above the standard operations noise planning criteria for each time period.

2.3.10 Operational road traffic noise (TMR CoPV1)

TMR CoPV1 provides requirements for managing the impact of road traffic noise and sets criteria for state-controlled roads in Queensland. It also provides guidelines aimed at land developers for conducting private development assessments of new noise sensitive developments. This is applicable when developments may create new sensitive receptors located near to existing state-roads which may be impacted by existing/future road traffic noise. If road traffic noise is identified as an issue in the assessment for a Project, then a Road Traffic Noise Assessment is to be carried out.

The BERC is not a noise sensitive development but the increase in traffic (especially of heavy vehicles) relating to the BERC may potentially impact sensitive receptors (i.e. residents) along the route. As such, the potential risk of increased operational road traffic noise events directly related to delivery and collection of materials from the BERC along Beaudesert Boonah Road (State Route 90) was considered as part of this noise assessment.

Refer to Section 6.9 for a simplified/preliminary road traffic noise assessment in general accordance with the methodologies of TMR CoPV1 and making reference to the following Table 5 (reproduced from Table 2.4 within the code).

Table 5: Significance of environmental noise exposure changes (TMR CoPV1, Table 2.4)

Increase over existing noise level, dB(A)	Change in subjective loudness	Significant of change
< 3	Nil	Insignificant
3 – 5	Noticeable	Marginal
10	About double	Significant
15 or more	At least triple	Very significant
Notes: A change in noise level of 1 to 2 dB(A) is difficult for most people to detect. A 3 to 5 dB(A) change corresponds to a small but noticeable change in loudness when noise samples are presented without a significant time break between them.		

2.4 Vibration specific guidance

In defining noise, the EP Act includes vibration of any frequency, whether emitted through air or another medium. Therefore, where noise impacts are to be considered, consideration of vibration impacts must also be undertaken. There are no clear legislative requirements or guidance for vibration assessment methodologies in Queensland that are applicable to this Project.

It is proposed to adopt criteria from relevant standards as used on other similar projects, as well as reference to NSW EPA documentation. The standards and guidelines referenced in this section forms the state of knowledge with respect to vibration impact for construction and operation of the BERC.

The effects of vibration, and hence the criteria, can typically be split into three categories:

- **Effects of vibration on structures:** a level of vibration where the integrity of the building or the structure itself may be affected, ranging from cosmetic to major structural damage. The relevant criteria are considerably higher than the level of vibration which people are sensitive to. Guidance on relevant vibration criteria are commonly found in AS 2187:2006 Part 2⁷, BS 7385:1993 Part 2⁸ and DIN 4150-3:2016⁹ which also has criteria of particular reference for heritage structures and buried pipework.
- **Human perception of vibration:** when the occupants or users of the building are potentially disturbed by vibration. Relevant guidance is provided in NSW *Assessing Vibration: a technical guideline*¹⁰. This document is based on BS 6472:1992¹¹. Note that although a new version of BS 6472 has been published (BS 6472-1:2008¹²) which contains some considerable differences to the 1992 version of the Standard, the criteria from the 1992 version of the Standard will be adopted.
- **Effects on building contents:** people can perceive floor vibration at levels well below those likely to cause damage to typical building contents. However, some scientific equipment (e.g. electron microscopes and microelectronics manufacturing equipment) can require more stringent objectives than those applicable to human comfort. Where appropriate, objectives for the satisfactory operation of critical instruments or manufacturing processes should be sourced from manufacturer's data and/or other published objectives. There are no clinics or hospitals nearby requiring a vibration assessment, and therefore this has not been discussed further in this report.

2.4.1 Building structures

DIN 4150-3 provides vibration targets to protect nearby buildings from structural damage, due to short-term and long-term vibration exposure. These guideline targets, in terms of peak particle velocity (PPV), are presented in Table 6 and Table 7. Long term vibration is defined as vibration likely to induce a resonant structural response.

These vibration targets are commonly implemented in Queensland and are considered by Arup to represent conservative criteria for heritage 'sensitive' structure types in Australia.

⁷ Australian Standards, "AS2187:2006 Explosives - Storage and Use - Part 2: Use of Explosives,"

⁸ British Standards Institute, "BS7385:1993 Evaluation and Measurement for Vibration in Buildings Part 2"

⁹ Deutsche Norm DIN 4150-3:2016 *Vibrations in buildings- part 3: Effects on structures*. DIN, Germany

¹⁰ NSW Environment Protection Authority, (former) Department of Environment and Conservation, *Assessing Vibration: A Technical Guideline*, Sydney, 2006

¹¹ British Standards, *BS 6472-1992 Evaluation of human exposure to vibration in buildings (1-80Hz)*, British Standards

¹² British Standards, *BS 6472-1:2008 Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting*. British Standards

Table 6: Short-term vibration targets for building structures

Structure type	Vibration Velocity, PPV in mm/s				
	Foundation			Plane of floor of uppermost full storey	Floor slabs, vertical direction
	less than 10Hz	10–50Hz	50–100Hz	Frequency mixture	Frequency mixture
Commercial, industrial, or similar	20	20 to 40	40 to 50	40	20
Residential dwellings or similar	5	5 to 15	15 to 20	15	20
Particularly sensitive	3	3 to 8	8 to 10	8	20

Table 7: Long-term vibration targets for building structures

Type of structure	Vibration velocity, mm/s PPV in horizontal plane at all frequencies	Vibration velocity, mm/s PPV in vertical plane at all frequencies
Buildings used for commercial purposes, industrial buildings, and similar design	10	10
Dwellings and buildings of similar design and/or occupancy	5	10
Structures that have a particular sensitivity to vibration, e.g. heritage buildings	2.5	10

A maximum vibration velocity, PPV of 10 mm/s for commercial/industrial buildings, and 5 mm/s for residential dwellings are nominated as targets for structural damage for this assessment.

Due to the distance of 1.4 km between the Project area boundary and the nearest residential dwelling (R19 at 140 Tilley Road) and distance of 86 m to the nearest industrial receivers (C16, C17 at 2613 Beaudesert Boonah Road) it is unlikely that structural damage to buildings due to construction work within the Project area will be an issue.

2.4.2 Railway (SDAP State code 2)

The Sydney-Brisbane rail (interstate freight rail corridor) runs along the Project area eastern boundary.

The purpose of SDAP State code 2: Development in a railway environment is to protect railway corridors, future railway corridors, rail transport infrastructure and other rail infrastructure from adverse impacts of development. The purpose of this code is also to protect the safety of people using, and living and working near, railways.

It lists the following ‘performance outcome’ PO17 related to risk of vibration impacts during construction:

- Construction activities do not cause ground movement or vibration impacts in a railway corridor.

No ‘acceptable outcome’ is prescribed in the code. In this case, development complies with the code where it complies with the performance outcome; or where the development does not meet relevant performance outcome(s) and the State Assessment and Referral Agency (SARA) determines, on balance, that the development complies with the purpose statement.

2.4.3 Underground utilities

DIN4150-3:2016 provides vibration targets to avoid damage to buried pipework. These targets are shown in Table 8. These are general guideline values, and the asset owner should be consulted to establish limits for below-ground infrastructure.

Table 8: Vibration targets for buried pipework

Pipe material	Vibration velocity, mm/s PPV
Steel	100
Clay, concrete, reinforced concrete, pre-stressed concrete, metal	80
Masonry, plastic	50

Other services that may be encountered include electrical cables and telecommunication services such as fibre optic cables. While these may sustain vibration velocity levels from between 50 mm/s and 100 mm/s, the connected services such as transformers and switchgear, may not. Where encountered, site specific vibration assessment in consultation with the utility provider should be carried out.

A Before You Dig Australia (BYDA) enquiry along Beaudesert Boonah Road and for the general Project area identified an existing telecoms line running east/west beneath the site which is located about 5 m south of the northern site boundary. This is expected to be a copper cable inside either a clay or plastic pipe and the associated pipe vibration limits will apply to the Project.

2.4.4 Human comfort

Sources of vibration are defined in NSW Assessing Vibration: a technical guideline (the Guideline) as either ‘Continuous’, ‘Impulsive’ or ‘Intermittent’ as described in Table 9 below.

Table 9: Types of vibration – definitions

Type of vibration	Definition	Examples
Continuous vibration	Continues uninterrupted for a defined period (usually throughout the daytime and/or night-time).	Machinery, steady road traffic, continuous construction activity (such as tunnel boring machinery).
Impulsive vibration	A rapid build-up to a peak followed by a damped decay that may or may not involve several cycles of vibration (depending on frequency and damping). It can also consist of a sudden application of several cycles at approximately the same amplitude, providing that the duration is short, typically less than 2 seconds.	Infrequent: activities that create up to three distinct vibration events in an assessment period, e.g. occasional dropping of heavy equipment, occasional loading and unloading.
Intermittent vibration	Can be defined as interrupted periods of continuous or repeated periods of impulsive vibration that varies significantly in magnitude.	Trains, nearby intermittent construction activity, passing heavy vehicles, forging machines, impact pile driving, jack hammers. Where the number of vibration events in an assessment period is three or fewer, this would be assessed against impulsive vibration criteria.

Table 10 reproduces the ‘Preferred’ and ‘Maximum’ values for continuous and impulsive vibration from Table 2.2 of the Guideline.

Table 10: Preferred and maximum vibration acceleration levels for human comfort, m/s²

Location	Assessment period ¹	Preferred values		Maximum values	
		z-axis	x- and y-axes	z-axis	x- and y-axes
Continuous vibration (weighted RMS acceleration, m/s ² , 1-80Hz)					
Residences	Daytime	0.010	0.0071	0.020	0.014
	Night-time	0.007	0.005	0.014	0.010
Offices, schools, educational institutions and places of worship	Day- or night-time	0.020	0.014	0.040	0.028

Location	Assessment period ¹	Preferred values		Maximum values	
		z-axis	x- and y-axes	z-axis	x- and y-axes
Workshops	Day- or night-time	0.04	0.029	0.080	0.058
Impulsive vibration (weighted RMS acceleration, m/s ² , 1-80Hz)					
Residences	Daytime	0.30	0.21	0.60	0.42
	Night-time	0.10	0.071	0.20	0.14
Offices, schools, educational institutions and places of worship	Day- or night-time	0.64	0.46	1.28	0.92
1 – Daytime is 7:00am to 10:00pm and night-time is 10:00pm to 7:00am					

Table 11 reproduces the ‘Preferred’ and ‘Maximum’ values for intermittent vibration from Table 2.4 of the Guideline. The vibration dose value (VDV) is dependent upon the level and duration of the vibration episode and the number of vibration episodes occurring during the assessment period; a higher vibration level is permitted if the total duration of the vibration event(s) is small.

Table 11: Acceptable vibration dose values (VDV) for intermittent vibration (m/s^{1.75})

Location	Daytime ¹		Night-time ¹	
	Preferred value	Maximum value	Preferred value	Maximum value
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60
1 - Daytime is 7:00am to 10:00pm and night-time is 10:00pm to 7:00am				

Due to the distance from the Project area boundary (where construction works may occur) to the nearest residential and industrial receivers as illustrated later in Figure 4 of Section 3.1, it is not expected that construction vibration will be a significant issue.

Safe working distances from typical construction equipment with vibration emissions will be provided in Section 5.5.3 to address structural damage avoidance and human comfort criteria.

2.4.5 Ground-borne noise criteria

Ground-borne noise (structure-borne noise or regenerated noise) is the noise radiated into a room caused by structural vibration of building elements (e.g. floors, walls, etc.). It has significant low frequency components and tends to be more noticeable compared with airborne noise at the same A-weighted level.

Guidance for appropriate target criteria during construction are provided (i.e. when there is higher risk of vibration generating equipment/activities such as piling or compaction, versus during BERC operations). This guidance has been sought from TMR CoPV2, in the absence of applicable guidelines for construction of a development type such as BERC.

Where ground-borne noise is observed, the internal noise criteria presented in Table 12 shall be met, where reasonable and practicable.

Table 12: Construction ground-borne noise criteria

Location	Ground-borne Noise Limit (internal)	
	Work Period	Internal dB L _{Aeq} (15 min)
Accommodation activity	Standard hours	40
	Non-Standard hours – day/evening	35

Location	Ground-borne Noise Limit (internal)	
	Work Period	Internal dB L _{Aeq} (15 min)
(i.e. sensitive receptors identified for the Project)	Non-Standard hours – night	35

Ground-borne noise impact is considered highly unlikely to be a significant concern for the Project given the considerable distance to the nearest sensitive receptor, and therefore the associated limits are unlikely to be applicable to BERC.

2.4.6 Assessing vibration criteria

The assessment against construction vibration criteria to avoid damage to structures and remain under human comfort response levels is provided in Section 5.5.3 as safe working distances for key construction equipment expected to be sources of vibration. Qualitative assessment of operational vibration is provided in Section 6.10

3. Existing noise conditions

This section provides information relevant to the existing noise environment broadly across the study area of the BERC.

The study area of interest includes the nearest noise sensitive receptors (these are residential dwellings) which are considered the ‘worst case’ assessment points. The study area with assessed sensitive receptor locations are all within 2 km of the boundaries of the Project area, with the nearest being more than 1.4 km away. Refer to the map shown as Figure 4 in the following section. Achieving compliance with noise criteria at these locations provides confidence that compliance will also be achieved at other sensitive receptors located further away.

Baseline noise measurements were conducted by Arup within the Project area and at representative locations of the surrounding noise sensitive receptors to the Project. It is important to note that baseline noise monitoring within the study area will still measure noise contributions from rail, road, and industrial noises sources outside the study area as well as within.

3.1 Baseline noise monitoring

The definition of noise sensitive receptors is provided in the EPP Noise 2019.

The nearest noise sensitive receptors are residences and have been identified graphically in Figure 4 below, along with long-term unattended and short-term attended noise monitoring locations. Short-term attended noise measurements were also carried out at each unattended noise logger location.

A review of the Scenic Rim Regional Council DAP Online system was undertaken, and advice was also sought from the Office of Co-ordinator General regarding the development application activity. These sources establish there is one development application for Bromelton Compost Manufacturing Facility (by operators SOILCO Pty Ltd) located west of the BERC Project area that shares particular noise sensitive receptors. See Appendix H for further details.

A variety of non-residential properties are also indicated within the study area but these were reviewed and all determined to be industrial facilities/uses and these are not considered to be noise sensitive receptors per EPP Noise.

Baseline attended and unattended noise monitoring was conducted in general accordance with the Queensland (former) DES Noise Measurement Manual (2020) and the (former) DESI Noise and vibration EIS information guideline (2024) during June 2023 to understand the existing noise environment in study area and establish construction and operational noise limits at noise sensitive receptors. Details of the noise monitoring methodology is provided in Appendix B.

Figure 4: Project study area showing nearest sensitive receptors and noise monitoring locations



Table 13 summarises the nearest noise sensitive residential receptors, their distances from the nearest Project area boundary and their Rating Background Level (RBL) as determined from analysis of both attended and unattended noise measurements (refer to Appendix B). The RBL's are used to establish construction and operational noise limits for the Project as described in Section 2.

Table 13: Nearest noise sensitive receptors and their rating background levels

Sensitive receptor ID	Address	Distance to Project area boundary (m)	Rating Background Level (RBL), dB LA90,1hr		
			Day	Evening	Night
R16	356 Brabazon Road, Gleneagle	1994	34	29	29
R19	140 Tilley Road, Bromelton	1438	34	29	29
R21	2430 Beaudesert Boonah Road, Bromelton	1797	35	32	30
R56	149 Sandy Creek Road, Bromelton	1843	31	29	29
R66	358 Sandy Creek Road, Bromelton	1466	39	36	34

It is noted the noise environment around other sensitive receptors located further away (outside the 'worst case' study area) were also confirmed to be similar and well represented by the RBLs (and thus also the derived noise criteria) from the nearest sensitive receptors as presented above. The RBL for R19 is the same as that for R13 at 75 Tilley Road (2078 m away), the RBL for R21 is the same as that for R20 at 15 Tilley Road (1927 m away), and the RBL for R56 is the same as for the cluster of further away receptors R23-27, R29, R31-33, R35-37, R40-43, and R45 around Eversley Court and Ollie Court (with nearest being 3510 m away).

Based on the existing environment and the Project description, the potential environmental risks that are assessed in this report are:

- Noise and vibration impacts of nearest residential noise sensitive receptors.

The following sections of this assessment detail the noise and vibration risk assessment in relation to both construction and operational impacts.

4. Assessment methodology

The construction and operational airborne noise impact assessments have been undertaken using 3D computer acoustic modelling software SoundPLAN 9.1. Further details of the airborne noise modelling methodology including modelling parameter assumptions and inputs are provided in Appendix C. Results of the construction noise assessment are provided in Section 5 and results of the operational noise assessment are provided in Chapter 6.

Construction vibration assessment against criteria set out in Section 2.4 has been conducted as a desktop assessment. Typical construction equipment and plant expected during the construction phase of an EfW facility such as BERC are listed in Section 5.2. Typical safe working distances for construction equipment that are expected to be the most onerous sources of vibration are supplied in Section 5.5.3. These safe working distances are expected to meet vibration criteria for surrounding building structures and human comfort within residential building locations outside the Project area.

Based on the current level of development of the Project, vibration emissions from operational equipment at BERC are unknown and specific predictions have not been assessed, however they are generally considered low-risk due to the types of equipment anticipated and due to large separation distances between BERC equipment/Project area and the surrounding structures and residences. Section 6.10 includes details of potential risks and mitigation measures to consider during the equipment selection process.

5. Construction noise and vibration assessment

A detailed construction program is not yet known. A preliminary Noise and Vibration assessment has been undertaken based on the construction phases provided below. There is no blasting anticipated to be required as part of the construction works.

Construction works have been broadly broken down into four phases:

- Phase 1: Earthworks and piling (site establishment and enabling works including initial mobilisation works such as site clearing/tree removal, earthworks and piling)
- Phase 2: Main construction works
- Phase 3: Testing and commissioning
- Phase 4: Finishing and landscaping.

5.1 Construction noise criteria

General construction noise criteria for Standard and Non-Standard hours of work are determined by the process in Table 2 and are to be assessed adjacent to the external facade of the noise sensitive receptors.

Background noise levels were measured by Arup with further information provided in Appendix B. The construction noise criteria in this assessment have been based on the rating background level (RBL) measurements shown in Table 13.

All reasonable and practicable measures shall be implemented to achieve the lower limit for Standard and Non-Standard hours, and working within Standard hours is encouraged where possible. If any locations exceed the lower limit, those receptors may be considered as potentially being noise affected by the construction work.

Exceedance of the upper limit requires the Project and Assessing RPEQ to determine any reasonable and practical respite, temporary relocation, and architectural treatment requirements.

Based on the guidelines and process discussed in Section 2.2.2, construction noise criteria relevant to the nearest noise sensitive receptors are presented in Table 14.

Table 14: Construction noise criteria, dB re 20 µPa

Work period		Sensitive receptor ID ¹	External noise level $L_{Aeq,adj,15min}^{2,3}$, dB(A)	
			Lower limit	Upper limit
Standard hours	Monday – Friday 7am to 6pm Saturday 8am to 1pm	R16 R19 R21 R56	Depends on duration of construction noise required: 45 if > 6 months 50 if ≤ 6 months	65
		R66	Depends on duration of construction noise required: 49 if > 6 months 50 if ≤ 6 months	65
Non-Standard hours – Day/Evening	Monday – Friday 6pm to 10pm Saturday 7am to 8am Saturday 1pm to 10pm Sunday 7am to 10pm	All receptors (R16, R19, R21, R56, R66)	45	45

Work period		Sensitive receptor ID ¹	External noise level	
			L _{Aeq,adj,15min} ^{2,3} , dB(A)	
			Lower limit	Upper limit
Non-standard hours – Night	Monday – Sunday 10pm to 7am	All receptors (R16, R19, R21, R56, R66)	45	45

1. Refer to Figure 4 and Table 13 for locations of sensitive receptor IDs
2. Noise contribution from construction activity determined as the component level (that is, noise from construction activity only)
3. The noise level from construction includes adjustment factors from Table 2.1.2.1(b) of TMR CoPV2 (for example, low frequency noise, impulsivity, tonality, intermittency, and modulation)

5.2 Construction equipment source noise levels and usage

Details of the construction phases on the BERC project have not yet been finalised.

The types and quantities of expected plant and equipment to be used during each of the anticipated construction phases are provided in Appendix D, Table 32. These were determined based on input from the Project design team and general Arup experience with similar projects. This information is based on conservative assumptions for the construction of the BERC and is indicative only.

Some areas of localised compaction are anticipated during construction with up to 3 to 5 m of fill anticipated, which will need more compaction and proof rolling than other areas. It is expected that these compaction requirements for the Project can be achieved with a dead weight roller or a normal size vibratory roller of about 8 to 12 tonne. The location of the waste bunker is estimated to be 15 m deep and the base of this cut would require heavy compaction (> 12 tonne) to allow for a 1 m thick RC slab base, however it is expected that at this depth the ground is likely rock or more competent clay than at shallower depths. Anchoring works may be required to support the side walls of the waste bunker excavation; however these drilling works are expected to have less vibration impact than piling or vibratory rolling. The main EfW building is mostly slab on grade and piling is generally limited to locations below the point loads on the main EfW building and for the exhaust stack. Most of the other buildings in the Project are slab on grade portal frames without any piling.

Equipment sound power levels (L_w) for use within the noise modelling have been sourced from AS 2436 – 2010 (R2016)¹³, BS 5228-1:2009+A1:2014¹⁴, and the Transport for New South Wales ‘Construction Noise and Vibration Strategy’¹⁵ (CNVS). These values along with an assumed percentage of use per 15-minute interval are provided in Appendix D, Table 33. These values along with an assumed percentage of use per 15-minute interval are provided in Appendix D, Table 33.

It should be noted that during the different construction stages, it is unlikely that all machinery would be operating at the same time (like the modelling assumes). However, assuming a ‘worst-case’ scenario approach helps to identify where noise impacts could be a concern and assists in the design of mitigation measures.

The following details of construction plant and equipment assumed to be used on the BERC Project may require consideration by the construction contractor during their CNVMP if they select plant with higher noise emissions, or operate differently than assumed in this assessment to confirm the construction noise criteria outlined in Table 14 are met:

- Sound power levels of all equipment
- Number of equipment/plant type

¹³ Standards Australia, “AS 2436-2010 Guide to noise and vibration control on construction, demolition and maintenance sites (Reconfirmed 2016)”

¹⁴ British Standards Institution, “BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise”

¹⁵ Transport for New South Wales, Planning, Environment and Sustainability, “Construction Noise and Vibration Strategy” (ST-157/4.1, 2019)

- Duration of equipment use during each phase
- Location of equipment on the site.

5.3 Construction noise and vibration methodologies

Construction airborne noise predictive modelling has been undertaken using the 3D computer acoustic modelling software SoundPLAN 9.1. See Appendix C for further information on the modelling assumptions.

Construction vibration safe working distances for various construction equipment and plant are provided in Section 5.5.3.

5.4 Construction airborne noise predictions

The predicted noise levels for different phases of construction are provided in Table 15.

Based on the equipment type and usage assumptions described in Section 5.2 and Appendix D, the predicted noise levels at each sensitive receptor comply with the lower limit construction noise criteria during both Standard hours or any of the potential Non-Standard hours work periods should they be required.

Table 15: Predicted construction noise to sensitive receptors for different phases of construction, dB re 20 µPa

Work period	Sensitive receptor ID ¹	External noise level, lower limit $L_{Aeq,adj,15min}^{2,3}$, dB(A)	Predicted noise level for construction phase, $L_{Aeq,adj,15min}^{2,3}$, dB(A)		Complies with lower limit?
			Phase 1	Phase 2 to 4	
Standard hours Monday – Friday 7am to 6pm, Saturday 8am to 1pm	R16	45 ⁴	43	44	✓
	R19		38	40	✓
	R21		38	39	✓
	R56		38	39	✓
	R66	49 ⁴	37	38	✓
Non-Standard hours – Day/Evening Monday – Friday 6pm to 10pm, Saturday 7am to 8am, Saturday 1pm to 10pm, Sunday 7am to 10pm,	R16	45	43	44	✓
	R19		38	40	✓
	R21		38	39	✓
	R56		38	39	✓
	R66		37	38	✓
Non-standard hours – Night Monday – Sunday 10pm to 7am	R16	45	43	44	✓
	R19		38	40	✓
	R21		38	39	✓
	R56		38	39	✓
	R66		37	38	✓

1. Refer to Figure 4 and Table 13 for locations of sensitive receptor IDs

2. Noise contribution from construction activity determined as the component level (that is, noise from construction activity only)

3. The noise level from construction includes adjustment factors from TMR CoPV2

4. Lower limit depends on duration of construction noise required, the most onerous limit is shown for assessment purposes, assuming construction noise may be required greater than 6 months. If less than 6 months, then lower limit increases to 50 dB(A).

5.5 Construction risk mitigations proposed

Although the risk of noise exceedances is considered low based on this initial assessment, it is still recommended that typical ‘industry best practice’ construction noise mitigation measures be put in place to minimise noise during construction.

If the planned works differ significantly when compared to this assessment (e.g. louder activities, equipment types, and/or higher quantities of equipment are proposed to be used), and/or construction works occur in

parallel with other nearby facility construction activities (see Appendix H.2.1), then there may be potential for the noise limits to be exceeded. In such an instance, construction activities and scheduling may need to be revised, or additional noise mitigation measures implemented.

It is recommended that a CNVMP is developed by the contractor based on their final equipment selections, construction methodology and construction program to minimise risk of exceeding the 'lower limit' construction noise criteria at sensitive receptors and to ensure minimum safe working distances are maintained from vibration intensive plant.

Noise and vibration mitigation measures for each major construction activity are discussed in the following sections. These mitigation measures are considered to represent all 'reasonable and practicable measures' suitable for implementation during construction of the Project. As noted previously, this is a preliminary study, therefore selection of equipment and preparation of a CNVMP should be implemented by the successful contractor once further information is available (in the future, but prior to construction starting).

5.5.1 Construction Noise and Vibration Management Plan

For all construction works, the contractor would be expected to prepare a detailed CNVMP. A detailed CNVMP should include all works associated with the construction of the EfW facility including works required for site access.

A CNVMP should include, but not be limited to the following:

- Roles and responsibilities
- Noise sensitive receptor locations
- Areas of potential impact
- Mitigation strategy
- Monitoring methodology
- Community engagement strategy
- Minimum safe working distances for vibration intensive plant (to be planned and monitored as part of the CNVMP)
- Consultation with the utility provider of the telecoms line running near/along the northern boundary of the site to determine site specific vibration assessment requirements and whether any safe working or other recommended setback distances are required.

General guidance on the control of construction noise and vibration impacts relevant to this study are discussed in the following sections.

In general, practices to reduce construction noise impacts will be required, and may include:

- Adhering to the standard approved working hours as outlined in the application
- Managing noise from construction work that might be undertaken outside the recommended standard hours
- Locating stationary plant (concrete pumps, air-compressors, generators, etc.) as far away as possible from sensitive receptors
- Using site sheds and other temporary structures or screens to limit noise exposure where possible
- Appropriate choice of low-noise construction equipment and/or methods
- Modifications to construction equipment or the construction methodology or programme. This may entail programming activities to occur concurrently where a noisy activity will mask a less noisy activity, or, at different times where more than one noisy activity will significantly increase the noise. The programming should also consider the location of the activities due to occur concurrently

- Carry out consultation with the community and surrounding building owners/occupants during construction including, but not limited to; advance notification of planned activities and expected disruption/effects, as well as construction noise complaints handling procedures. This may include coordination with the potential adjacent developments such as Bromelton Compost Manufacturing Facility to understand their stage of construction/operations and the potential for cumulative impacts (see Appendix H).

5.5.2 Universal work practices

The following noise mitigation work practices are recommended to be adopted at all times on site:

- Regularly train workers and contractors (such as at toolbox talks) to use equipment in ways to minimise noise
- Site managers to periodically check the site and nearby residences for noise problems so that solutions can be quickly applied
- Avoid the use of radios or stereos outdoors
- Avoid the use of public address systems
- Avoid shouting and minimise talking loudly and slamming vehicle doors
- Avoid the use of tonal reverse beepers where possible, a possible alternative being broadband squawkers
- Turn off all plant and equipment when not in use

5.5.3 Vibration – minimum working distances

Recommended minimum working distances for vibration intensive plant, which are based on international standards and guidance, are reproduced in Table 16 for reference.

The minimum working distances are indicative only and will vary depending on the item of plant and local geotechnical conditions.

Table 16: Recommended minimum working distances for vibration intensive plant

Plant item	Rating / description	Minimum working distance (metres)			
		Cosmetic damage – screening criteria			Human response
		Reinforced or framed structures Industrial and heavy commercial buildings BS 7385, Line 1 - 25 mm/s ^[1]	Unreinforced or light framed structures Residential and light commercial buildings BS 7385, Line 2 - 7.5 mm/s ^[1]	Structures unsound DIN 4150 Line 3 - 3 mm/s	
Vibratory roller	< 50 kN (~ 1 to 2t)	2	5	11	15 to 20
	< 100 kN (~ 2 to 4t)	2	6	13	20
	< 200 kN (~ 4 to 6t)	5	12	26	40
	< 300 kN (~ 7 to 13t)	6	15	31	100
	> 300 kN (~ 13 to 18t)	8	20	40	100
	> 300 kN (> 18t)	10	25	50	100
Hydraulic hammer – Small	300 kg / 5 to 12t excavator	1	2	5	7
Hydraulic hammer – Medium	900 kg / 12 to 18t excavator	3	7	15	23
Hydraulic hammer – Large	1600 kg / 18 to 34t excavator	9	22	44	73
Piling – Vibratory	Sheet piles	2	6	13	20

Plant item	Rating / description	Minimum working distance (metres)			
		Cosmetic damage – screening criteria			Human response
		Reinforced or framed structures Industrial and heavy commercial buildings BS 7385, Line 1 - 25 mm/s ^[1]	Unreinforced or light framed structures Residential and light commercial buildings BS 7385, Line 2 - 7.5 mm/s ^[1]	Structures unsound DIN 4150 Line 3 - 3 mm/s	
Piling – Bored (small auger)	≤ 800 mm	1 (nominal)	2	5	4
Piling – Hammer	12t down force	6	15	30	50
Jackhammer	Hand-held	1 (nominal)	1 (nominal)	3	2

1. Where continuous vibration might give rise to resonant responses in structures

Due to the distance of 1.4 km between the Project area (construction site) boundary and the nearest residential dwelling (R19 at 140 Tilley Road) and distance of 86 m to the nearest industrial receivers (C16 and C17 at 2613 Beaudesert Boonah Road) compliance is expected with both the cosmetic damage and human comfort criteria at all building structures and sensitive receptors within the study area.

Telecoms line

It is also considered unlikely that damage to the telecoms line during BERC operations or due to construction work within the Project area will be an issue since piling locations are limited to the EfW building and the stack near the middle of the development area, located far from the site northern boundary where the telecoms line is located. Any significant compaction activities will also be a reasonable distance away (>15 m, other than at its intersection with main site entry road crossing) and the detailed CNVMP in the future will consult with the utility provide and consider if limits are required to the size of vibratory rollers and/or to only use dead-weight rollers if any works are to be required near to the telecoms line. Potential heavy vibratory compaction at the base of the waste bunker and/or anchoring works in the waste bunker walls are both located greater than 100 m from the Telecoms line at the northern boundary and therefore is not expected to exceed vibration requirements at the Telecoms line.

Rail corridor

Construction piling locations are limited to the EfW building and the stack near the middle of the development area, located far from the Project area eastern boundary and railway corridor. Any compaction activities will also be a reasonable distance away (>30 m) and so are not anticipated to be a vibration problem or cause significant impacts at the railway corridor. As such, construction activities are expected to reasonably comply with the ‘performance outcome’ PO17 of State code 2.

Furthermore, the vibration levels due to the trains themselves is high and vibration from construction is not expected to exceed the existing rail vibration at the rail corridor, and so rail vibration is not discussed further in this assessment.

5.6 Construction traffic noise assessment

It is recommended that a Supply Chain Haul Route Management Strategy is prepared by the construction contractor as per TMR MRTS02 for the Project. This will be included within the Construction Traffic Management Plan (CTMP) and will form part of the Construction Environmental Management Plan (CEMP).

In general, construction transport routes / access to the site will be directed away from residential areas and sensitive receptors. Optimal construction access routes will be identified with TMR. Timing of deliveries will also be considered to avoid impacts, and where possible, the number of construction vehicles will be limited.

It is understood that the annual average daily traffic (AADT) for the Beaudesert Boonah Road segment along the Project area northern boundary is 4,023 vehicles per day (vpd) with an average of 18.7% heavy vehicles in both directions based on 2024 TMR supplied data.

To increase road traffic noise levels by more than 3 dB(A) would typically require road traffic volumes to at least double, assuming the same mix of passenger and heavy vehicles. It is acknowledged that construction traffic would have a different mix, being dominated by heavy vehicles; however, thousands of construction vehicles would likely be required to elevate noise levels by more than 3 dB(A), given the 2024 TMR AADT data exceeds 4,000 vpd.

TMR CoPV1 states that increases up to 3 dB(A) over existing road traffic noise levels result in no change in subjective loudness and are thus considered an insignificant change in noise exposure (refer to Table 5). On this basis, it is expected that construction traffic external to the Project area will have a minimal impact on the existing road traffic noise levels and therefore, construction traffic has not been considered further in this assessment.

5.7 Summary of construction risk mitigation

This section outlines proposed mitigation and management measures that have been developed to mitigate the potential noise and vibration impacts of the Project during construction.

Table 17: Construction mitigation measures for noise and vibration

ID	Mitigation measure	Timing
Construction Noise and Vibration		
NV01 Construction noise and vibration management plan	A detailed Construction Noise and Vibration Management Plan (CNVMP) will be prepared by the selected construction contractor prior to commencement of work on site. This plan will include: - Roles and responsibilities - Noise sensitive receptor locations - Noise mitigation strategy - Monitoring methods - Community engagement strategy - Minimum safe working distances for vibration intensive plant (to be planned and monitored as part of the CNVMP) - Safe working distances and equipment selections / mitigated work methods to prevent vibration impacts to rail corridor - Consultation with the utility provider of the telecoms line running near/along the northern boundary of the site to determine site specific vibration assessment requirements and whether any safe working or other recommended setback distances are required This will form part of the CEMP. Note that a Construction Traffic Management Plan (including a Supply Chain Haul Route Management Strategy) will be prepared by the construction contractor as per TMR MRTS02) to outline mitigation measures to avoid noise and vibration impacts from construction vehicles. This will also feed into the CEMP. Potential simultaneous construction works of the nearby proposed Bromelton Compost Manufacturing Facility (BCMF) should be considered when forming mitigation measures to comply with the relevant noise and vibration criteria at each noise sensitive receptor. See Appendix H for more information regarding the potential BCMF development. Construction noise and vibration criteria are to comply with: • TMR, Transport Noise Management Code of Practice: Volume 2 – Construction Noise and Vibration (2023) • State Code 2: Development in a Railway Environment, PO17 • NSW Environment Protection Authority, (former) Department of Environment and Conservation, Assessing Vibration: a technical guideline (2006) • AS 2187:2006 Part 2, BS 7385:1993 Part 2, and DIN 4150-3:2016	Construction
TT01 Construction traffic management plan	A Construction Traffic Management Plan (CTMP) will be prepared to include measures to reduce construction traffic such as adjusting shift patterns and encouraging car sharing. It will contain a Supply Chain Haul Route Management Strategy by the construction contractor as per TMR MRTS02 Provision for Traffic (2023) that outlines mitigation measures to avoid noise and vibration impacts from construction vehicles. The CTMP will form part of the CEMP and will be updated once a contractor is appointed. Construction transport routes / access to the site will be directed away from residential areas and sensitive receptors. Optimal construction access routes will be identified with TMR. Timing of deliveries will also be considered to avoid impacts, and where possible, the number of construction vehicles will be limited.	Construction

6. Operational noise and vibration assessment

This Chapter details the noise assessment in relation to operational noise impacts.

6.1 Operational noise criteria summary

The following tables provide a summary of the Project specific operational noise criteria adopted for this assessment. These have been calculated from the various requirements as described in Section 2.3 and based on site noise measurements presented in Section 3 and Appendix B.

To comply with EPP Noise, relevant noise emissions due to operations within the EfW facility must not exceed these noise limits at each noise sensitive receptor.

Table 18: Project noise criteria summary for normal operations

Sensitive Receptor ID	Daytime (7am – 6pm)			Evening (6pm – 10pm)			Night (10pm – 7am)		
	Leq,adj,1hr	Background Creep Type A L _{90,1hr}	Leq,1hr	Leq,adj,1hr	Background Creep Type A L _{90,1hr}	Leq,1hr	Leq,adj,1hr	Background Creep Type A L _{90,1hr}	Leq,1hr
	dB(A)	dB(A)	dB(linear) ¹	dB(A)	dB(A)	dB(linear) ¹	dB(A)	dB(A)	dB(linear) ¹
R16	42	34	55	42	29	55	37	29	55
R19	42	34	55	42	29	55	37	29	55
R21	42	35	55	42	32	55	37	30	55
R56	42	31	55	42	29	55	37	29	55
R66	42	39	55	42	36	55	37	34	55

1. This is not a set limit but is a threshold level for an initial screening assessment that may indicate potential risk of annoyance due to low frequencies, if exceeded (refer to Section 2.3.8)

Table 19: Project noise criteria summary for emergency testing/maintenance operations

Sensitive Receptor ID	Daytime (7am – 6pm)			Evening (6pm – 10pm)			Night (10pm – 7am)		
	L _{eq,adj,1hr}	Background Creep L _{90,1hr}	L _{eq,1hr}	L _{eq,adj,1hr}	Background Creep L _{90,1hr}	L _{eq,1hr}	L _{eq,adj,1hr}	Background Creep L _{90,1hr}	L _{eq,1hr}
	dB(A)	dB(A)	dB(linear) ¹	dB(A)	dB(A)	dB(linear) ¹	dB(A)	dB(A)	dB(linear) ¹
R16	47	39	55	47	34	55	42	34	55
R19	47	39	55	47	34	55	42	34	55
R21	47	40	55	47	37	55	42	35	55
R56	47	36	55	47	34	55	42	34	55
R66	47	44	55	47	41	55	42	39	55

1. This is not a set limit but is a threshold level for an initial screening assessment that may indicate potential risk of annoyance due to low frequencies, if exceeded (refer to Section 2.3.8)

It is our current understanding that compliance with EPP Noise AQOs does not guarantee compliance with the GED within the EP Act but it is generally considered to be indicative of it. The EPP Noise AQOs are considered consistent with the identified environmental values, and assessment against them is used to inform whether environmental harm under the EP Act has been caused, as environmental harm is an adverse impact on an environmental value. The concept of environmental harm includes environmental nuisance.

Noise management measures will be included as part of the Operational Environmental Management Plan (OEMP) for the BERC to ensure adverse noise impacts to sensitive receptors are minimised as far as reasonably practicable.

A noise emission risk assessment and consideration of practicable mitigation and operational controls have been addressed in this report in Section 6.11.

6.2 Site layout

The proposed site layout is shown in Figure 5. No dedicated bunds or earth mounds (i.e. designed for the purpose of noise mitigation) have been assumed around the boundary of the site within the noise model.

The Administration Centre (for control room, staff offices, visitors) and APCr shelter shed are not considered significant noise emission sources.

Identification of the key noise emitting buildings and stationary (non-vehicular) noise sources are shown in Figure 6.

Details are not available at this stage for other minor mechanical ventilation systems. However, these are considered insignificant to the overall site noise emissions, for anticipated systems such as toilet exhaust fans, IBA processing building dust extraction fan, etc. As design progresses, they will be selected to be quiet and/or incorporate standard noise control measures (such as duct lining, silencers, etc) where required.

Stationary and moving vehicular noise sources are further discussed in Section 6.4.

Figure 5: Overall site layout

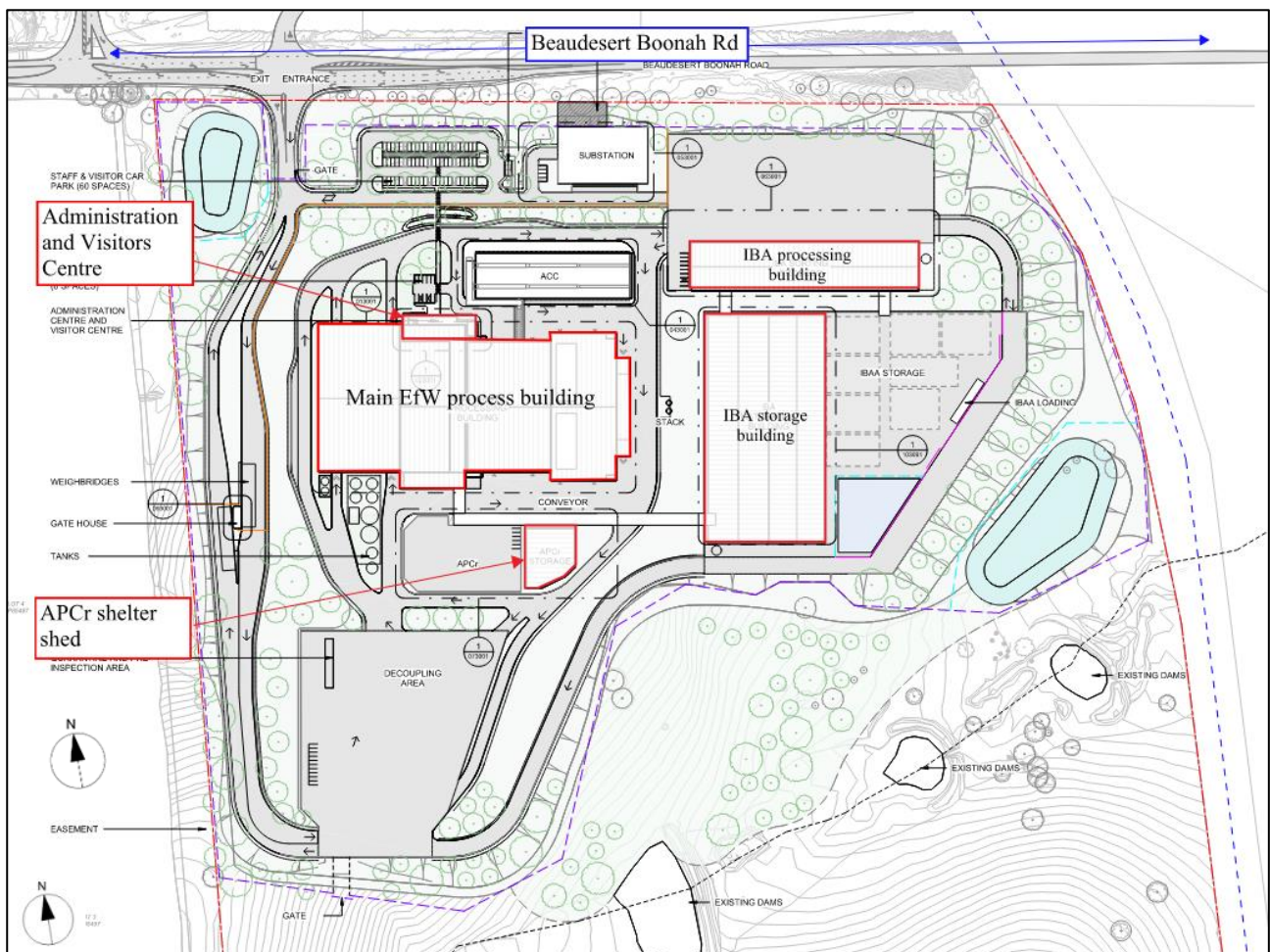
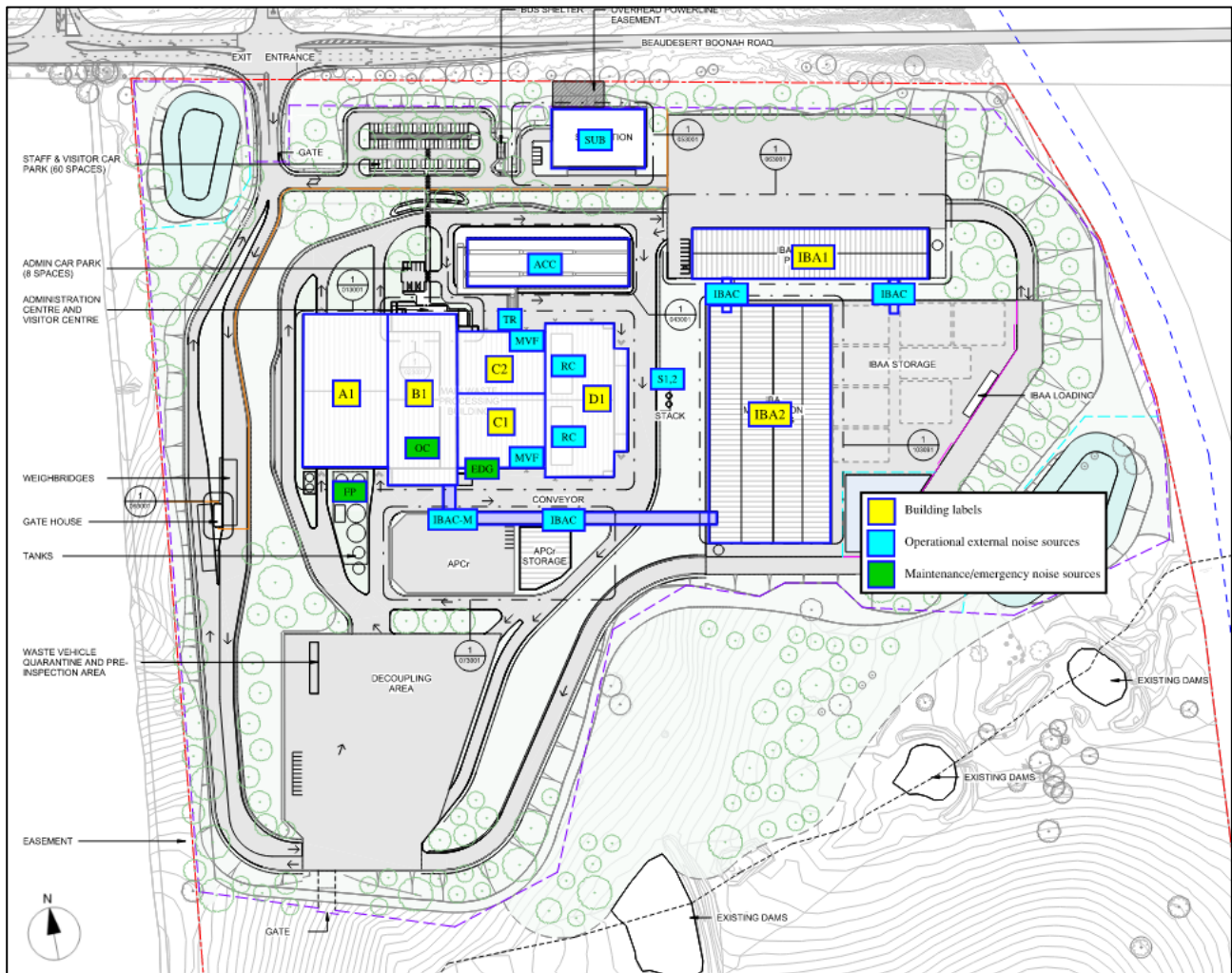


Figure 6: Identification of key noise source buildings and stationary (non-vehicular) outdoor noise sources



6.3 Primary noise sources

The primary operational noise sources associated with the proposed development are listed below and identified in Figure 6.

Buildings

- A1 – Waste Reception Hall (Tipping Hall)
- B1 – Waste Bunker
- C1– Boiler Hall
- C2 – Boiler Hall (including turbine and pumps for ACC)
- D1 – Flue Gas Treatment Halls (FGT)
- IBA1 – Incinerator Bottom Ash (IBA) Sorting Process Building
- IBA2 – IBA Storage and Maturing Building
- Various internal processes and equipment operating within the buildings such as generators, turbine, shredder, ID fans, pumps and emergency diesel generators.

Outdoor plant and equipment

- ACC – Air Cooled Condensers (with associated pumps located inside of boiler hall building C2)
- SUB – Substation with Auxiliary Transformers

- TR – Main Transformer on northside of C2 (i.e. north side of Main EfW Process Building)
- IBAC – IBA Conveyor (enclosed) to transport ash from the boiler halls to the IBA storage and maturing building, from the IBA storage and maturing building to the IBA sorting building, then lastly back to the IBA storage area (it is assumed conveyor motor(s) are located inside buildings and so only noise associated with the conveyor belt has been modelled)
- IBAC-M – this is the IBA conveyor motor housed adjacent to the 90-degree transition between the south moving conveyor from waste bunker, and east moving conveyor to the IBA storage and maturing shed.
- S1, 2 – Exhaust Stack (with two separate internal flues)
- RC – Radiator Cooler fans / component cooler fans (banks of fans on roof of the Flue Gas Treatment Hall)
- MVF - IBA extraction mechanical ventilation fans, one per boiler hall C1 and C2.

Emergency and maintenance equipment

- EDG – Emergency Diesel Generator (testing done once a month), generators located inside building with air intake/discharge louvres and engine exhaust flue on south facade
- OC – Odour Control system (for maintaining air pressure and controlling odour during boiler maintenance)
- FP – Fire Pump.

Vehicular traffic

- Heavy vehicles (trucks) travelling within the site (refer to Section 6.4 and Appendix E.3) for a description of the truck movements):
 - To deliver waste to the waste reception hall (tipping hall)
 - To deliver/pick up consumables/residues
- Light vehicles travelling to/from the staff/visitor carpark, and maintenance vehicles travelling around the internal site ring road to the car parking areas next to various buildings

6.4 Vehicular movement

Anticipated vehicle types and daily volumes for trucks and light vehicles were provided by Ramboll. This information has been summarised in Appendix E.1.

Cleanaway previously provided Arup with typical 12-hour daily traffic profiles of operational vehicles for Erskine Park Transfer Facility as a guide for the BERC noise impact assessment because of its anticipated similarity. Arup have used this daily traffic profile assumption to predict ‘worst-case’ hourly peaks for the evening and night noise assessment periods of different vehicles for the BERC Project. The Erskine Park facility documented truck visits are typically between 4 am to 4 pm, so the profile has been shifted back 2 hours to align with 6 am to 6 pm which is the period that the majority of truck deliveries are expected to occur during the 24 hour delivery cycle at the BERC facility.

The worst-case day-time hourly peak vehicle numbers were provided by Ramboll as shown in Table 20. The peak hour used as part of the day noise assessment period is estimated to occur at 2 pm to 3 pm.

The daily volume time profile/percentage is provided in Appendix E.2 and was used along with the predicted peak daily vehicle numbers shown in Appendix E.1 to determine the estimated vehicle quantities during the peak hour for the evening and night noise assessment time period as shown in Table 20.

As it is expected that the majority a truck traffic movements will occur during the 6 am – 6 pm period each day, the worst-case peak hour for truck deliveries during the night-time period is assumed to occur in the last hour of the EPP night period (10 pm – 7 am) between 6 am and 7 am. The peak hour used for the evening noise assessment is assumed to occur between 6 pm to 7 pm as this is the end of the typical 12-hour truck

delivery/collection period that overlaps with the EPP Noise evening period. The evening period between 6 pm and 7 pm also includes the expected peak light vehicle movements from staff leaving the facility.

The Type 1A (A-double) road trains are currently not permitted to operate along the Beaudesert Boonah Road (public access road to the BERC facility) as indicated on the Queensland Government website¹⁶. The Ramboll Traffic Memo¹⁷ provides information regarding two operational scenarios:

- both A-double and B-double road trains accessing the BERC facility site (potential future scenario), and
- only B-double road trains accessing the BERC facility site (current scenario).

Table 22-23 of Ramboll's Traffic Memo provides the worst-case daily and peak hour Type 1B (B-double) truck numbers in lieu of Type 1A trucks. Based on this, the noise assessment in this report will consider that the largest trucks operating on the site are Type 1B trucks. A sensitivity analysis has also been undertaken for the potential future scenario in which A-double trucks are approved for use on Beaudesert Boonah Road. The findings of this sensitivity analysis are presented in Section 6.8.3, and further details of the analysis are provided in Appendix I.

Type 1B trucks are not expected to require decoupling prior to entering the Reception Hall at the BERC facility and therefore Terberg dolly prime movers are also not included in the unmitigated or mitigated scenario noise assessments in this report.

There is a visitor bus that operates on the BERC facility site during normal working hours. It has been discussed with Cleanaway that it is unlikely that the visitor bus will operate during the daytime noise assessment peak traffic hour of 2 – 3 pm due to conflicts with the end of the school day and is more likely to operate during a weekday lunchtime period. For this reason, the visitor bus has not been modelled in the day, evening or night period noise assessment.

The peak hour vehicle movement volumes modelled for the noise assessment are provided in Table 20.

¹⁶ <https://qldglobe.information.qld.gov.au/>

¹⁷ REN2021N00922-RAM-ME-00021 (11 June 2025)

Table 20: Number of moving vehicles modelled

Vehicle type	Number of vehicles		
	Worst-case hour in noise assessment period		
	Night ¹ (6am - 7am)	Day ² (incl. Day EDG testing) (2pm – 3pm)	Evening ¹ (6pm-7pm)
Residual waste delivery – Type 1A (A-double rear-eject articulated truck, ~42t total)	N/A ³	N/A ³	N/A ³
Residual waste delivery – Terberg dolly / tug truck (to move 2 nd trailer from Type 1 delivery noted above, modelled as semi-trailer truck, ~21t total)	N/A ⁴	N/A ⁴	N/A ⁴
Residual waste delivery – Type 1B (B-double side-tipping articulated truck, ~35t total)	2	12	2
Residual waste delivery – Type 2 (semi-trailer rear eject truck, ~21t)	1	6	1
Residual waste delivery – Type 3 (direct delivery council compactor truck or front load, ~9t)	2	10	2
Quicklime/PAC/Urea/Cement consumables delivery (Type 1B truck as ‘worst case’, 33t B-double)	1	3	1
IBAA collections – Type 1B (33t B-double)	1	3	1
Scrap metals collection (semi-trailer)	0	1	0
APCr collections – Type 1B (33t B-double)	0	1	0
APCr transport - light transport truck or forklift (10 round trips per hour between APCr area and EfW building)	1	1	1
EfW Facility Staff (light vehicles)	0	5	5
IBA treatment car	0	1	0
EfW Maintenance (light vehicles)	0	1	0
Visitors - Cars	0	2	0
Visitor bus	0	0	0
Notes: 1. Estimated based on Erskine Park Transfer Facility daily traffic volume profiles and daily truck numbers provided in REN2021N00922-RAM-ME-00021 Table 22. 2. As provided by REN2021N00922-RAM-ME-00021 Table 23 worst case Traffic Assessment peak hour. 3. Type 1A trucks currently not permitted on Beaudesert Boonah Road (public access road to the BERC facility). 4. Only Type 1A truck types require decoupling with the aid of a Terberg dolly. Due to no Type 1A truck types modelled, Terberg dolly prime movers are not included in the base scenario noise assessment.			

Appendix E.3 shows the expected traffic movements/routes throughout the EfW facility which have been incorporated into the noise model. The expected locations of idling heavy and light vehicles including front load and forklift mobile plant used for loading/unloading residual materials in outdoor areas are also provided in Appendix E.3.

6.5 Noise source data and building materiality

A summary of the noise level (sound power) data used in the model is given in Table 21 for individual source types. The quantities of each noise source used within the model vary depending on the period/scenario being assessed and this is summarised in Table 23.

Noise levels used in this assessment were sourced from:

- Ramboll (the Technical Advisor)
- Dublin Waste to Energy Project, Environmental Impact Statement report, Chapter 9 Noise and vibration, dated June 2006
- Noise Database from His Majesty's Government (England), Department for Environment, Food and Rural Affairs (DEFRA) 2009.

Information regarding time adjustments to noise sources have been provided in Table 21 and typically affect vehicle movement and idling events. Based on the slowest truck speed of 10 km/h and a BERC facility circuit distance of between 1.5 km to 2.5 km depending on truck type, trucks are expected to only be *outdoors and moving* for 10 – 15 minutes (i.e. excluding outdoor idling/loading events which are treated separately as stationary noise sources). However, the noise assessment considers a more conservative 20 minutes duration spent outdoors and moving around the site for each collection and delivery truck.

Note that information regarding plant and equipment and building design will be reviewed at detailed design to ensure that criteria are met. Detailed inputs used in the SoundPLAN noise model for this assessment are provided in Appendix F.

Table 21: Noise modelling source level data

Equipment	Metric	Sound Power or Sound Pressure Levels, dB(A) (L _w dB re 1 pW, L _p dB re 20 µPa)
Moving vehicle sources (modelled as stationary line sources)		
Truck Type 1B + Type 2 (i.e. 33t B-double, 21t semi-trailer) - L _w 10 km/h (20 min outdoor moving time through facility per truck)	L _{eq} (1hour)/m	65
Truck Type 3 (i.e. 9t Compactor/front loader or APCr transport truck/forklift) - L _w 10 km/h (20 min outdoor moving time through facility per truck)	L _{eq} (1hour)/m	60
Light vehicle (car/ute) 10 km/h - L _w 10 km/h (30 min outdoor moving time through facility per hour)	L _{eq} (1hour)/m	38
Light rigid maintenance vehicles - L _w 10 km/h (30 min maximum outdoor moving time through facility per peak hour)	L _{eq} (1hour)/m	61
Light APCr vehicle/forklifts - L _w 10 km/h (assume 10x 2min trips per hour)	L _{eq} (1hour)/m	60
Stationary sources		
ACC - L _w	L _{eq} (1hour)	88 (per fan) ¹
Main Transformer - L _w	L _{eq} (1hour)	99
Auxiliary Transformers ² (2x units, located in substation area) - L _w	L _{eq} (1hour)	69 (66 per transformer)
Exhaust stack (2 flues) - L _w	L _{eq} (1hour)	101 (98 per flue)
Exhaust stack ³ mitigated (2 flues) - L _w	L _{eq} (1hour)	96 (93 per flue)
Radiator coolers (bank of 8 fans) - L _w	L _{eq} (1hour)	89 (per bank) ⁴ - 80 (per fan)
IBA extraction mechanical ventilation fan (non-mitigated) ⁵ - L _w	L _{eq} (1hour)	109

Equipment	Metric	Sound Power or Sound Pressure Levels, dB(A) (L _w dB re 1 pW, L _p dB re 20 µPa)
IBA extraction mechanical ventilation fan (mitigated with 1.2 m long attenuator) ⁵ - L _w	L _{eq} (1hour)	83
IBA conveyor ⁶ (enclosed and mitigated) - L _w	L _{eq} (1hour)/m	83
IBA conveyor motor ⁷ exposed (non-mitigated) - L _w	L _{eq} (1hour)/m	96
IBA conveyor motor ⁷ enclosed (mitigated) - L _w	L _{eq} (1hour)/m	85
Truck braking - L _w (note: based on airbrake event with L _{max} 106 dBA)	L _{eq} (1hour)	65
Truck idling (constant) - L _w	L _{eq} (1hour)	95
Type 1B and 2 with a 10 min time correction for loading event	L _{eq} (1hour)	88
Type 1B, 2 and 3 with a 2 min time correction (weighbridges)	L _{eq} (1hour)	81
Car door slam (at parking areas) - L _w	L _{eq} (1hour)	75
Front loader mobile plant ⁸ (IBAA sorting/loading events, ACPr delivery events) - L _w - 3x impulsive loading noise events per hour	L _{eq} (1hour)	89
Emergency diesel generator (total from attenuated air-intake/discharge and attenuated exhaust flue) - L _w	L _{eq} (1hour)	115
Buildings⁹		
A1 - Reception hall - Internal L _p	L _{eq} (1hour)	85
Waste Bunker - Internal L _p B1 - Waste Bunker (including shredder)	L _{eq} (1hour)	91
IBA1 - IBA sorting building - Internal L _p	L _{eq} (1hour)	85
Boiler hall - Internal L _p C1 - Boiler hall - Emergency Diesel Generator room near south façade (i.e. with attenuated air intake / air discharge louvres) ¹⁰ C2 - Boiler hall (includes turbine, condensation pumps for ACC fans)	L _{eq} (1hour) L _{eq} (1hour) L _{eq} (1hour)	80 85 85
D1 - Flue Gas Treatment hall - Internal L _p	L _{eq} (1hour)	85

Equipment	Metric	Sound Power or Sound Pressure Levels, dB(A) (L _w dB re 1 pW, L _p dB re 20 µPa)
Notes: 1. Based on discussions with Ramboll and data supplied on previous Melbourne Energy and Resource Centre (MERC) project for A-frame fan configuration. There are 14x ACC fans proposed in A-frame configuration on the BERC project. 2. Noise levels for auxiliary transformers in the substation switchyard area conservatively include noise from corona discharge during damp conditions. Transformer noise spectrum shape based on empirical Arup database. 3. Requires silencer applied to the ID fan to ensure mitigated sound power levels are achieved at stack termination. Note that the stacks have been modelled assuming spherical radiation from point sources with a sound pressure level of 85 dB(A) at 1m away from the 2 flues operating simultaneously and is considered to be conservative for off-axis propagation toward the receptors. During future detailed design, potential impacts of any stack directivity should be considered to further refine the L_w limit and mitigation required. 4. Each boiler hall (C1, C2) has 48 radiator cooler fans on the roof (i.e. 6 banks of 8), for total of 96 fans (i.e. 12 banks of 8) running simultaneously in the noise assessment. 5. IBA extraction MVF outlet terminates on both the north and south facades of the boiler hall (C1, C2), one per side, at roughly 3 metres above ground. For the mitigated option, the attenuator is located internally to the boiler hall building prior to termination at each facade. 6. Enclosed conveyor noise data from Arup database. This applies to the main IBA conveyor belt transporting ash from the waste bunker to the IBA storage building, and the shorter conveyors between the IBA maturing building to the IBA sorting building (see Figure 6 for IBA conveyor locations). The penetration in the north waste bunker façade is assumed fully enclosed by the outer metal casing of the IBA conveyor. Resilient connections between the metal enclosure and conveyor system are recommended to minimise radiated noise. Arup recommends that measurements of existing enclosed conveyors are conducted during future detailed design stages at similar operational facilities to understand if mitigation is required. 7. The conveyor belt motors are assumed to be located within enclosed buildings (waste bunker and IBA sorting building) and contributes to the specific internal noise level of these buildings. The only exception to this is an expected conveyor motor located adjacent to the 90-degree conveyor transition just south of the waste bunker. Noise data for an exposed conveyor drive motor is based on measurements in the Arup database, and the mitigated and enclosed option based on expected achievable levels from an acoustically rated enclosure. 8. Based on DEFRA database for Item C33 Front End Loader 190 kW 25 t (loading lorry event), but with a +2 dBA 'just noticeable' impulsive noise adjustment/penalty applied per EP Noise and NMM. Overall activities on site are generally not expected to contain impulsive noise however for conservative purposes of assessment we have assumed there may be some 'just detectable' for the truck loading events. 9. Max sound pressure levels (dBA) of each space provided by Ramboll. These are considered as the reverberant sound pressure level in each space. 10. The assumed internal L_p of 85 dBA will require refinement during detailed design when intake/discharge paths, EDG room layout and generator selection is confirmed. Upgraded attenuators / acoustic louvres might be required if internal L_p of the space containing the EDG is determined to be higher than assumed and is subject to further design development.		

Facades of the primary noise source buildings will be constructed from either concrete or metal cladding. In general, the bottom 6 m around each façade of the main EfW process building is concrete and above it is metal wall cladding. The IBA sorting and processing building and the truck maintenance shed are assumed to have predominantly metal clad facades. All building roofs are insulated metal roof panels. The assumed sound transmission loss for each of these materials used in this assessment are given in Table 22 and octave transmission loss spectra used in noise modelling is provided in Appendix F.1.

Table 22: Transmission loss of building envelope

Item	Weighted sound reduction index (R_w)
Composite metal cladding system <i>For eg. 0.8 mm thick steel with mass loaded vinyl¹, 1.2 mm thick steel¹ or similar</i>	29
200 mm concrete wall, density 1700 kg per cubic metre (typically up to a 5-6m datum height) ¹	54
Insulated metal roof panel (non-mitigated) <i>For eg. Kingspan KS1000 RW/30 with no additional acoustic lining² or similar</i>	24
Insulated metal roof panel (mitigated) <i>For eg. Kingspan KS1000 RW/80 - Insulated Rooftile Panel with 50 mm thick acoustic lining (40 – 60 kg/m³ density)² or similar performing product</i>	32
Polycarbonate 70 mm semi-transparent <i>For eg. Danpatherm systems or similar with acoustic attenuation rating of 33 dB^{1,3}</i>	33
Facade openings (i.e. truck entrance or louvre) (<i>untreated / no attenuation, assumes roller doors are open</i>)	1
Treated acoustic louvres, <i>for eg. Soundbar Louvres SBL1² or similar</i>	14
Closed shutter doors (not used for truck entrance/exits) ⁴	18 ⁴
1. Thickness and build-up is indicative. Performance based on Strutt spectral transmission loss prediction software. 2. Based on manufacturer data. 3. Based on nominal available products such as Danpatherm systems with a minimum broadband acoustic attenuation rating of 33 dB and Strutt spectral transmission loss prediction software. 4. A roller shutter door product with acoustic rating of R_w 24 is required to be specified and installed. R_w 18 rating modelled is based on Arup's experience with realistic performance of shutter doors (installation defects, flanking noise paths, general wear and tear).	

Openings due to louvres and truck entrances/exits (all assumed to be fully open for the hour period of the noise assessments) are conservatively assumed to have no transmission loss. Openings that are not used for truck entrances/exits are assumed typically closed with roller shutter doors for the noise assessment.

See Appendix F.2 for further details of location and extents of openings on the building façade used in noise modelling.

6.6 Operational scenarios

Operational noise levels have been predicted in the noise model for the following scenarios described in Table 23.

It is understood from Ramboll that an emergency situation may occur if there is a trip of electricity from the grid and the Power Island mode is unsuccessful. In this case the emergency diesel generator (EDG) is used to safely shut down the boiler(s) and will provide support for limited equipment such as feed water pumps and component cooling pumps but not for radiator cooler fans, boiler roof extraction fans, turbine generator ancillaries, and other noise generating equipment. It is expected that the operation of this equipment will generally not be running at full capacity and therefore the modelled 'EDG testing' scenario (which includes other equipment and trucks running at full day capacity) as described in Table 23 is also considered representative of a worst-case noise scenario for the beginning moments of an emergency factory shutdown scenario (i.e. before/as various equipment starts ramping down in capacity or turning off).

Similarly for boiler maintenance, where both boilers are being repaired/serviced, odour control unit fans may be utilised to provide odour control in the tipping hall and waste bunker areas. In this case it is expected that noise emissions from the main factory building boiler halls and turbine room will be at a minimum, and it is

not expected that the outlet of the odour control fans (located on the south side near the EDG exhaust) will be noisier than the EDG exhaust during an EDG testing/maintenance scenario. As such, the EDG testing/maintenance scenario in Table 23 is considered a more onerous noise emission scenario than noise emissions during boiler maintenance.

Table 23: Modelling scenarios

Noise sources	Number of sources/equipment during worst-case hour for each period			
	Operational			Maintenance / Emergency
	Night (6 - 7am)	Day (2 - 3pm)	Evening (6 - 7pm)	EDG testing ¹ Day (2 - 3pm)
Operational vehicle movements (total two way)				
Residual waste delivery - Type 1B (B-double articulated truck, 33t)	2	12	2	12
Residual waste delivery - Type 2 (semi-trailer rear eject truck, 21t)	1	6	1	6
Residual waste delivery - Type 3 (compactor truck or front load, 9t)	2	10	2	10
IBAA collections - Type 1B (B-double articulated truck, 33t)	1	3	1	3
Scrap metals (semi-trailer)	0	1	0	1
APCr collections - Type 1B (B-double articulated truck, 33t)	0	1	0	1
Quicklime/PAC/Urea consumables delivery - Type 1B (B-double articulated truck, 33t)	1	3	1	3
Total Trucks	7	36	7	36
Light vehicle movements (total two way)				
EfW facility - cars	0	5	5	5
APCr transport - light transport truck/forklift (10 round trips per hour)	1	1	1	1
IBA treatment - cars	0	1	0	1
Maintenance vehicle - light truck	0	1	0	1
Visitor - cars	0	2	0	2
Total Light Vehicles	1	10	6	10
Stationary vehicle noise sources (occurring outdoors only)				
Trucks idling (various locations, e.g. weighbridge, IBAA and ACPr loading areas)	8	36	8	4
Trucks braking	8	36	8	4
Front loader mobile plant - outdoor in IBAA conveyor sorting	1	1	1	1
Front loader mobile plant - outdoor in IBAA truck loading area	1	1	1	1
Forklift/front loader mobile plant - outdoor in APCr truck load area	0	1	0	1
Car door slams at parking areas	1	10	6	10
Plant, equipment and internal activities				
ACC unit (1 fan per unit)	14	14	14	14
Main transformer	1	1	1	1
Auxiliary transformers (substation switchyard)	2	2	2	2
Exhaust stack (2 flues included)	1	1	1	1

Noise sources	Number of sources/equipment during worst-case hour for each period			
	Operational			Maintenance / Emergency
	Night (6 - 7am)	Day (2 - 3pm)	Evening (6 - 7pm)	EDG testing ¹ Day (2 - 3pm)
Radiator cooler fan banks (on top of waste bunker), one bank has 8 fans	12	12	12	12
IBA extraction mechanical ventilation fan (i.e. one on boiler hall north and south façade)	2	2	2	2
IBA conveyors (main and secondary)	3	3	3	3
Waste reception hall	1	1	1	1
Waste bunker	1	1	1	1
IBA sorting and processing building ¹	1	1	1	1
Boiler halls (i.e. C1 and C2)	1	1	1	1
Flue gas treatment hall	1	1	1	1
EDG running ²	0	0	0	1
1. Ash from the IBA conveyor will continue to be dumped outside the IBA sorting building and a mound will build-up throughout the night-time period of 10 pm – 7 am. It has been assumed that the IBA sorting and processing building and its associated machinery will be operating and producing noise during the night-time period, with a single front-end loader moving IBA mound build-up between IBA conveyor and IBAA stockpiles for IBAA aging. 2. Emergency diesel generator expected to be tested once a month as per Ramboll documentation.				

6.7 Operational noise modelling methodology

Operational airborne noise predictive modelling has been undertaken using the 3D computer acoustic modelling software SoundPLAN 9.1. See Appendix C for further information on the modelling assumptions.

6.7.1 Background noise emission prediction methodology

There are multiple individual noise sources that make up the total overall noise emitted from the Project. The individual sources have been modelled based on their anticipated equivalent continuous sound power levels (L_{eq}) and assuming they are operating concurrently, as relevant for each day, evening, and night period. Prediction results output from the model as L_{eq} values are assessed against the L_{eq} AQO criteria from EPP Noise.

To assess risk of ‘background creep’ and to minimise it per EPP Noise requirements, a prediction of the background noise level emitted from the Project is made to compare against the corresponding $L_{A90,1hr}$ background noise emission criteria (see Section 2.3.7).

In practice, due to the differences in types of noise sources (i.e. different equipment, truck types/routes) and from the diversity of their individual operating intervals and locations, the overall noise level emitted from the BERC to sensitive receptors is anticipated to have some variance with time. As such, the predicted noise levels (which are modelled as $L_{Aeq,1hr}$, effectively assuming a ‘worst case’ that all sources emit noise simultaneously and continuously) are expected to be higher than the background noise ($L_{A90,1hr}$) emitted from the Project.

Based on this reasoning and our general experience in assessment of sites with mixed/multiple industrial noise sources, it is conservatively estimated that the background noise level ($L_{A90,1hr}$) emitted from the Project will be about 5 dB(A) below the predicted equivalent continuous noise level $L_{Aeq,1hr}$.

As such, the following conversion factor has been applied to the model predicted L_{eq} noise levels to predict $L_{A90,1hr}$ values:

- $L_{A90,1hr} \approx L_{Aeq,1hr} - 5 \text{ dB(A)}$

Note that this 5 dB(A) adjustment also aligns with how the (former) DESI Noise and Vibration EIS Information Guideline (2024) defines background noise creep criteria $L_{Aeq,adj,T}$ for noise that varies over time (see Section 2.3.7). These predictions are used to assess compliance with the background noise emission limits/criteria in Table 4 (and as shown in criteria summary tables in Section 6.1).

6.8 Operational noise predictions

This section provides the results of the operational noise modelling, with predicted levels at each of the nearest sensitive receptors. The prediction tables include comparison against the project criteria as determined per Section 2.3 and summarised in Section 6.1.

Corresponding operational noise prediction contours/maps are provided in Appendix G.

6.8.1 Initial unmitigated condition

The initial unmitigated noise level predictions for normal operations during day, evening and night periods are provided in Table 24.

The initial unmitigated noise level predictions for the daytime worst-case emergency/maintenance scenario (i.e. EDG testing) are provided in Table 25.

These results are based on modelling using the ‘unmitigated’ sound power level source for equipment including IBA Conveyor motor, IBA extraction mechanical ventilation fans, stack flue, main transformer (per Table 21), as well as untreated building louvres, basic insulated roof panels (per Table 22) and thus are referred to overall as initial modelling for a predominantly ‘unmitigated’ condition. Note that standard noise control elements are assumed to be included to the EDG in this unmitigated noise assessment (for eg. silencers to exhaust flue, acoustic louvres and/or attenuators to air intake/discharge paths) to achieve the total sound power level modelled in Table 21.

The only instance where initial worst-case unmitigated condition predictions exceed the project criteria is during the night period at sensitive receptor R19. This is a 3 dB(A) exceedance of background noise emission criteria ($L_{A90,1hr}$) predominantly due to unmitigated fixed plant, unmitigated buildings and truck noise.

Table 24: Predicted 'unmitigated' normal operational noise levels during worst-case hour of each period

Sensitive Receptor ID		Daytime (7am – 6pm)			Evening (6pm – 10pm)			Night (10pm – 7am)		
		L _{eq,adj,1hr}	L _{90,1hr}	L _{eq,1hr}	L _{eq,adj,1hr}	L _{90,1hr}	L _{eq,1hr}	L _{eq,adj,1hr}	L _{90,1hr}	L _{eq,1hr}
		dB(A)	dB(A)	dB(linear)	dB(A)	dB(A)	dB(linear)	dB(A)	dB(A)	dB(linear)
R16	Criteria	42	34	55	42	29	55	37	29	55
	Prediction	35	30	50	34	29	50	34	29	50
	Complies?	✓	✓	✓	✓	✓	✓	✓	✓	✓
R19	Criteria	42	34	55	42	29	55	37	29	55
	Prediction	39	34	53	37	32	52	37	32	52
	Complies?	✓	✓	✓	✓	✗	✓	✓	✗	✓
R21	Criteria	42	35	55	42	32	55	37	30	55
	Prediction	35	30	51	33	28	50	33	28	50
	Complies?	✓	✓	✓	✓	✓	✓	✓	✓	✓
R56	Criteria	42	31	55	42	29	55	37	29	55
	Prediction	35	30	50	34	29	49	34	29	49
	Complies?	✓	✓	✓	✓	✓	✓	✓	✓	✓
R66	Criteria	42	39	55	42	36	55	37	34	55
	Prediction	35	30	50	34	29	49	34	29	49
	Complies?	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 25: Predicted 'unmitigated' emergency/maintenance operational noise levels for worst-case hour of day period

Sensitive Receptor ID		Daytime (7am – 6pm)		
		L _{eq,adj,1hr}	L _{90,1hr}	L _{eq,1hr}
		dB(A)	dB(A)	dB(linear)
R16	Criteria	47	39	55
	Prediction	35	30	49
	Complies?	✓	✓	✓
R19	Criteria	47	39	55
	Prediction	39	34	53
	Complies?	✓	✓	✓
R21	Criteria	47	40	55
	Prediction	35	30	51
	Complies?	✓	✓	✓
R56	Criteria	47	36	55
	Prediction	36	31	50
	Complies?	✓	✓	✓
R66	Criteria	47	44	55
	Prediction	36	31	50
	Complies?	✓	✓	✓

Note that modelling of the unmitigated emergency/maintenance scenario (i.e. EDG testing) has not been undertaken for the evening and night periods because the testing is only expected to occur during the day period.

6.8.2 Proposed mitigated condition

To address the unmitigated night exceedance predicted at R19, additional mitigation measures are incorporated into the model including the following:

- Buildings (all – excluding IBA maturation shed and APCr storage shelter)
 - Roof upgrade from base case R_w 25 to R_w 32 performance (for eg. Kingspan roofing system with a higher surface density build-up).
 - Louvre openings increased to acoustically rated R_w 13 louvres, including roof vents at top of boiler hall
- IBA conveyor motor
 - The exposed conveyor belt motor located adjacent to the 90-degree transition south of the waste bunker is to be attenuated a further 11 dB via an enclosure
- Stack flue exhaust
 - Mitigate noise levels with an upgraded silencer providing an additional 5 dB attenuation
- Main Transformer:
 - A noise barrier applied to the west, north and east sides of the main transformer with a barrier height extending to 2.5 metres above the top side of the transformer. The south side of the transformer backs onto the northern façade of the C2 boiler hall. Current dimensions of the transformer show an approximate height of 4 metres, and so a 6.5 metre tall barrier has been applied.

- Sound absorptive material with rating NRC 0.90 (such as 63 mm Reapor by Pyrotek or similar performing material design for exposure to weather) is applied to all four inner sides of the enclosing walls (including on the portion of EfW main building external façade facing the southern side of transformer designated area).
- IBA extraction mechanical ventilation fans (IBA MVF)
 - Include an attenuator on IBA MVF prior to termination on the boiler hall (C1, C2) facades. Attenuator with a nominal length of 1.2 metres.

Refer to the mitigation measures described in ID NV05 in Table 28, to be used to achieve the ‘mitigated’ sound power level provided in Table 21.

This modelling condition is referred to overall as the ‘mitigated’ condition and it is to be considered the basis for the Project planning application and the results used for noise assessment of the Project. Note that standard noise control elements are assumed to be included to the EDG in this mitigated noise assessment (for eg. silencers to exhaust flue, acoustic louvres and/or attenuators to air intake/discharge paths) to achieve the total sound power level modelled in Table 21.

The final predicted ‘mitigated’ normal operations noise levels are provided in Table 26 with the resolved exceedances at R19 for the worst-case hour of the evening and night periods highlighted in bold green text. It is noted during these worst-case hours that the worst-case receptor R19 is predicted 2dB below the criteria. All other receptors are greater than 2 dB below their corresponding criteria for all assessment periods. This is in addition to conservative modelling assumptions as outlined in Section 6.7 and Appendix C.

The final predicted ‘mitigated’ worst-case daytime emergency/maintenance scenario noise levels (i.e. EDG testing) are provided in Table 27.

Compliance with project noise criteria is predicted for each noise sensitive receptor in this mitigated condition.

Table 26: Predicted 'mitigated' operational noise levels during worst-case hour of each period/scenario

Sensitive Receptor ID		Daytime (7am – 6pm)			Evening (6pm – 10pm)			Night (10pm – 7am)		
		L _{eq,adj,1hr}	L _{90,1hr}	L _{eq,1hr}	L _{eq,adj,1hr}	L _{90,1hr}	L _{eq,1hr}	L _{eq,adj,1hr}	L _{90,1hr}	L _{eq,1hr}
		dB(A)	dB(A)	dB(linear)	dB(A)	dB(A)	dB(linear)	dB(A)	dB(A)	dB(linear)
R16	Criteria	42	34	55	42	29	55	37	29	55
	Prediction	31	26	49	29	24	47	29	24	47
	Complies?	✓	✓	✓	✓	✓	✓	✓	✓	✓
R19	Criteria	42	34	55	42	29	55	37	29	55
	Prediction	36	31	52	32	27	50	32	27	50
	Complies?	✓	✓	✓	✓	✓	✓	✓	✓	✓
R21	Criteria	42	35	55	42	32	55	37	30	55
	Prediction	33	28	50	28	23	48	28	23	48
	Complies?	✓	✓	✓	✓	✓	✓	✓	✓	✓
R56	Criteria	42	31	55	42	29	55	37	29	55
	Prediction	32	27	48	29	24	47	29	24	47
	Complies?	✓	✓	✓	✓	✓	✓	✓	✓	✓
R66	Criteria	42	39	55	42	36	55	37	34	55
	Prediction	33	28	49	30	25	47	30	25	47
	Complies?	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 27: Predicted 'mitigated' emergency/maintenance operational noise levels for worst-case hour of day period

Sensitive Receptor ID		Daytime (7am – 6pm)		
		L _{eq,adj,1hr}	L _{90,1hr}	L _{eq,1hr}
		dB(A)	dB(A)	dB(linear)
R16	Criteria	47	39	55
	Prediction	31	26	49
	Complies?	✓	✓	✓
R19	Criteria	47	39	55
	Prediction	36	31	52
	Complies?	✓	✓	✓
R21	Criteria	47	40	55
	Prediction	33	28	50
	Complies?	✓	✓	✓
R56	Criteria	47	36	55
	Prediction	34	29	48
	Complies?	✓	✓	✓
R66	Criteria	47	44	55
	Prediction	35	30	49
	Complies?	✓	✓	✓

Note that modelling of the mitigated emergency/maintenance scenario (i.e. EDG testing) has not been undertaken for the evening and night periods because the testing is only expected to occur during the day period.

6.8.3 A-double (Type 1A) Sensitivity Analysis

A sensitivity analysis has been undertaken to understand the potential change to the noise assessment outcomes if Type 1A trucks were to be approved for use on Beaudesert Boonah Road and implemented for BERC EfW facility operations. Details of the sensitivity analysis is provided in Appendix I.

The summary of the findings if Type 1A trucks were to be used are as follows:

- There may be an increase of 1 dB to the R19 results provided in Table 26 that reduces the predicted 2 dB margin below noise criteria to 1 dB below criteria for evening and night periods, however compliance with project criteria at R19 is still expected during all periods.
- All other predicted results including at R16 and R56 will still maintain at least a 3 dB margin below the noise criteria for day, evening and night assessments.

6.8.4 Low frequency noise impact

The low frequency screening assessment requires both the noise level to be above 55 dB(Linear) Leq and the difference between the A-weighted and Linear values to be greater than 15 dB for there to be an increased likelihood of annoyance due to low frequency noise.

The predicted mitigated dB(Linear) Leq noise levels are all below the threshold of 55 dB and thus comply with the low frequency screening assessment at all sensitive receptors.

The highest dB(Linear) Leq prediction occurs at sensitive receptor R19 during the daytime with a level of 52 dB(Linear) Leq, which is 3 dB(A) below the primary screening threshold. It is also noted the difference between the A-weighted and Linear predicted mitigated noise level at R19 during daytime is 14 dB, and this complies with the second (≤ 15 dB) measure of the screening assessment. While this is not required (since the predicted level is below 55 dB(Linear) Leq), it provides further confidence that annoyance due to low frequency noise emission is not expected to be a concern for the Project.

6.9 Operational road traffic noise

The BERC is not a noise sensitive development but the increase in traffic (especially of heavy vehicles) relating to the BERC may potentially impact sensitive receptors (i.e. residents) along the route. As such, the potential risk of increased operational road traffic noise events directly related to delivery and collection of materials from the BERC along Beaudesert Boonah Road (State Route 90) was considered as part of this noise assessment.

A simplified, preliminary desktop noise assessment was undertaken based on the Calculation of Road Traffic Noise algorithm¹⁸ (CoRTN) in general accordance with TMR CoPV1.

It is understood the AADT for the Beaudesert Boonah Road segment along the Project area northern boundary in 4,023 vehicles per day (vpd) with average 18.7% heavy vehicles in both directions based on 2024 TMR supplied data. For a conservative initial screening assessment, the lower of the two daily flow directions (1,974 vehicles) was used as a baseline to compare with the potential increase of total vehicles along the road due to BERC operations. Both traffic flow directions had reasonably high percentages of heavy vehicles (about 18-19%), due to existing industry in the Bromelton SDA.

Ramboll estimates an additional 472 trips (236 arrivals and 236 departures)¹⁹ per weekday associated with the operation of BERC (total for heavy (77%) and light (23%) vehicles) and for a worst-case noise screening assessment the entire flow was assumed to travel to/from the west of the Project area, where it would generate the highest percentage increase in traffic flow along Beaudesert Boonah Road.

¹⁸ Department of Transport, United Kingdom (Welsh Office), "Calculation of Road Traffic Noise" (1988), ISBN 0 11 550847 3

¹⁹ Based on total daily vehicle movements in Table 22, Ramboll Traffic Memo REN2021N00922-RAM-ME-00021 (11 June 2025)

The predicted increase in road traffic noise under these worst-case assumptions was less than 1.0 dB. As such, no significant increase in traffic noise impacts to sensitive receptors is predicted for road traffic associated with the Project.

To increase road traffic noise levels by more than 3 dB(A) would typically require road traffic volumes to at least double, assuming the same mix of passenger and heavy vehicles. It is acknowledged that operational traffic will have a different mix, with the majority of traffic associated with BERC being heavy vehicles (~77%); however, thousands of vehicles would likely be required to elevate noise levels by more than 3 dB(A), given the 2024 TMR AADT data exceeds 4,000 vpd.

TMR CoPV1 states that increases up to 3 dB(A) over existing road traffic noise levels result in no change in subjective loudness and are thus considered an insignificant change in noise exposure (refer to Table 5). On this basis, it is expected that traffic due to BERC operations on public roads will have an insignificant impact on the existing road traffic noise levels and therefore, operational road traffic noise has not been considered further in this assessment.

6.10 Operational vibration impact

Several vibration generating items such as the turbine, EDG and the ACCs are likely to be installed at the end of the construction phase. Vibration impact can occur during the startup/shutdown sequence of these types of equipment and during typical operating speed. Appropriate vibration isolation measures (such as isolated rubber/spring floor mounts or concrete inertia bases) will need to be carefully selected based on equipment selection and location. The ACC fans may be selected with variable speed drives to help mitigate vibration during startup/shutdown.

While details regarding the exact equipment selections are not yet known, vibration mitigation measures must be implemented to limit vibration transmission through the ground and building structures to meet project vibration criteria. Mitigation measures will include undertaking a detailed structural dynamics assessment of natural frequencies of the systems. This is to protect surrounding building structures on the EfW facility site and human comfort levels within the main building, nearby administration buildings, and for personnel working near the equipment.

- The mitigation measures for potential operational vibration are summarised in Table 28 in Section 6.11.

These mitigation measures must be put in place before commissioning phase and should be tested to satisfy the operator that vibration levels are not a risk to operation / use of the facility.

Appropriate mitigation measures provided to protect on-site personnel and on-site structures will likely result in low vibration levels outside the Project area.

It is unlikely that structural damage to surrounding industrial buildings, the telecoms line along northern boundary, the rail corridor along eastern boundary, or sensitive receptors (residential buildings), or affects to human comfort at those locations will occur from operational vibration for the following reasons:

- The equipment will include typical vibration mitigation measures (e.g. isolators) and there is significant distance of 1.4 km between the Project area boundary and the nearest sensitive receptor (residential dwelling R19 at 140 Tilley Road) and distance of about 86 m to the nearest industrial receptors (C16, C17 at 2613 Beaudesert Boonah Road). There is also considerable separation distance between main EfW building equipment and the telecoms line run along northern Project area boundary and rail corridor along the eastern boundary.

6.11 Summary of operational risk mitigation

This section outlines proposed mitigation and management measures that have been developed to mitigate the potential noise and vibration impacts of the project during operation.

Operational noise mitigation measures are summarised in Table 28.

Table 28: Operational mitigation measures for noise and vibration

ID	Mitigation measure	Timing
NV02 Environmental Authority - noise conditions	An Environmental Authority will be issued by the Coordinator General for the Environmentally Relevant Activities which will include relevant conditions around noise compliance.	Operation
NV03 Operational Environmental Management Plan - noise measures	Noise emissions from the EfW facility must be managed so that the ongoing operation adheres to noise criteria and mitigates noise impacts to sensitive receptors. As part of the OEMP, specific noise management measures will be included so that the ongoing operation of the EfW facility adheres to noise criteria and mitigates adverse noise impacts on sensitive receivers. A six-month post-commissioning report will be prepared as part of this OEMP. Operational noise criteria is to comply with: • <i>Environmental Protection Act 1994</i> • Environmental Protection Regulation 2019 • Environmental Protection (Noise) Policy 2019 and consider the following: • (former) Department of Environment and Science, Noise measurement manual (2020) • Explanatory notes for EPP Noise (SL 2019 No. 154) • (former) Department of Environment and Science and Innovation (DESI), Noise and vibration – EIS information guideline (2024) for assessment method and procedure for control and prevention of background creep (refer to page 4 within) • (former) Department of Environment and Heritage Protection, EcoAccess Guideline for the assessment of Low Frequency Noise (2004) This will include consideration of operations during emergency/maintenance scenarios such as testing of the emergency diesel generator (whereby a 5 dB(A) increase of normal operational noise levels is allowed). Generator testing is expected to occur up to once per month and be within daytime hours (7am to 6pm). See measures NV04 to NV07 below for identification of some key noise emitting aspects from the EfW facility. These items must be assessed at noise sensitive receptors in combination with each other and the noise from vehicular traffic and mobile plant activities within the Project boundary. This will be based on expected scheduled operation and determination of appropriate noise mitigation measures will be identified and implemented.	Operation
NV04 Acoustic enclosure of buildings	The main building/facade design will mitigate noise impacts by being an almost fully enclosed building. Internal noise sources include but are not limited to tipping of waste in reception hall, movement of waste, combustion of waste and associated processes. Auxiliary buildings such as those for IBA sorting must also mitigate noise via the building envelope design for equipment/activity noise sources within them. Further opportunities will be recognised in the future detailed design stage so the proposal mitigates against any non-compliances with the EPP Noise limits (in accordance with the Environmental Protection Regulations). Acoustically rated louvres are required to all louvre openings on the façade and roof of the main EfW facility building. Minimum performance requirements for the mitigated options of the building envelopes for all buildings includes an R_w 29 cladding façade and R_w 32 factory roof. See Appendix F.1 for required minimum transmission loss spectra.	Design, Commissioning, and Operation

ID	Mitigation measure	Timing
NV05 Operational noise - stationary plant	Noise control of non-vehicular, stationary plant external to the enclosed main EfW facility and auxiliary buildings to be selected and mitigated for any non-compliances with the EPP Noise limits (in accordance with the Environmental Protection Regulations). This includes items such as, but not limited to, the IBA conveyor, stack exhausts, ACC fans, RC fans, Transformer, IBA sorting and processing building dust extraction fans, mechanical ventilation systems for buildings. <u>IBA Conveyor</u> Limit line-source sound power level of IBA conveyor to 83 dBL_{Aeq,1hr} /m. The following detailed design interventions may be required to achieve this noise level: • Dampen idlers (conveyor rollers) • Install motor of the IBA conveyor within the main factory building where possible, and provide an enclosure around exposed IBA conveyor motor to limit to 74 dBL_{Aeq,1hr} at 1 m • Reduce structure-borne noise of the metal enclosure by isolating the conveyor from the enclosure with rubber pads or similar • Providing a solid barrier on the north side and underneath the IBA conveyor enclosure It is recommended that future measurement of an enclosed conveyor system with similar context/application is conducted to improve accuracy of noise source data used in predictive modelling. <u>Stack flue exhaust</u> Requires silencer applied to the ID fan to ensure mitigated sound power levels of 93 dBA per flue are achieved at stack termination. Note that the stacks have been modelled assuming spherical radiation from point sources with a sound pressure level of 85dB(A) at 1m away from the two flues operating simultaneously and is considered to be conservative for off-axis propagation toward the receptors. During future detailed design, potential impacts of any stack directivity should be considered to further refine the Lw limit and mitigation required. <u>Main Transformer</u> Provide a noise barrier around the west, north and east sides of the transformer with a height extending to a minimum of 2.5 m above the top side of the transformer. Sound absorptive material applied to all four inner sides of the enclosing walls around the transformer, i.e. three inner sides of free-standing noise barrier and one additional side being the portion of EfW external façade south of transformer area. Sound absorptive material with minimum rating NRC 0.90 such as 63 mm Reapor by Pyrotek (or similar performing material designed for exposure to weather). <u>IBA extraction mechanical ventilation fans</u> The ventilation fans to include an attenuator prior to termination at the boiler hall facades C1 and C2. Attenuator nominal length of 1.2 metres. <u>Emergency Diesel Generator</u> Apply attenuation to air-intake/discharge and to generator exhaust flue to achieve a maximum total sound power emission of 115 dBA. Note that these standard noise control elements are assumed to be included to the EDG in the unmitigated and mitigated noise assessments.	Design, Commissioning, and Operation

ID	Mitigation measure	Timing
NV06 Operational vibration – stationary plant	Vibration impact can occur during the startup/shutdown sequence of equipment and during typical operating speed. Appropriate vibration isolation measures (such as isolated rubber/spring floor mounts or concrete inertia bases, and potential variable speed drives for ACC fans) will need to be carefully selected based on equipment selection and location for several vibration generating items such as the turbine, EDG, and the ACCs to limit vibration transmission through the ground and building structures to meet project vibration criteria. Consideration of DIN 4150-3 vibration targets should be referenced to protect nearby buildings from structural damage, and NSW EPA <i>Assessing Vibration: a technical guideline</i> referenced for vibration design for human comfort. Mitigation measures will also include undertaking a detailed structural dynamics assessment of natural frequencies of the systems. This is to protect surrounding building structures on the EfW facility site and human comfort levels within the main EfW building, nearby administration buildings, and for personnel working near the equipment. Final design of the structural system is to ensure resonant response does not occur during ramp up, operation and ramp down of the generator turbines and ACC fans. The turbine will be founded on a piled raft which will incorporate a spring damper system with isolation bearings to reduce the vibration effect of the equipment. These mitigation measures must be put in place during construction before commissioning phase and should be tested as part of the Project commissioning phase.	Design, Commissioning, and Operation
NV07 Operational noise and vibration control to administration buildings	Consideration of Australian Standard AS2107:2016 <i>Acoustics – recommended design sound levels and reverberation times for building interiors</i> should be referenced for internal noise design to non-factory spaces such as administration buildings. Consideration of DIN 4150-3 vibration targets should be referenced to protect nearby non-factory spaces from structural damage, and NSW <i>Assessing Vibration: a technical guideline</i> referenced for vibration design for human comfort. Appropriate partitions/floors/ceilings are to be chosen to address sound reduction of airborne noise, structure-borne noise, and vibration especially between non-factory and main factory spaces.	Design, Commissioning, and Operation

7. Conclusions and proposed controls

Arup has undertaken a Noise and Vibration assessment for the BERC that is proposed to be located within the Special Industry Precinct of the Bromelton SDA, west of Beaudesert, Queensland. The purpose of this assessment is to demonstrate compliance with the various authority requirements, and to provide relevant information to the community and key stakeholders.

Noise and vibration criteria based on Queensland Environmental Protection (EP) legislation and guidelines has been established. In the absence of Queensland specific guidelines, NSW vibration guidance has been referenced.

The key assessment criteria include:

- Construction noise criteria (which will be considered further in the future CNVMP by the construction contractor, along with a Supply Chain Haul Route Management Strategy)
- Operational noise criteria in accordance with EPP Noise limits and including control of background creep, plus consideration of risk of operational road traffic noise increase per TMR CoPV1
- Construction and operational vibration criteria for building structures and human comfort per relevant international standards and NSW EPA guidance.

The following assessments have been conducted:

- Assessment of airborne noise emissions for construction and operation of the BERC EfW facility to the nearest sensitive receptors outside the Project area boundary
- Assessment of vibration emissions for construction of the Project to the nearest sensitive receptors outside the Project area boundary. This is in the form of expected safe working distances of vibration generating construction plant and equipment. Typical vibration mitigation measures (e.g. isolators) are to be provided to operational equipment to meet criteria to protect on-site personnel and on-site structures. A detailed structural dynamics assessment of natural frequencies of the systems will occur in a future design stage.

Noise and vibration expected from the BERC that pose potential risks of harm to human health and the environment has been identified, and mitigation measures have been stated to minimise those risks in worst case scenarios. This information provides inputs into the Human Health Risk Assessment report as part of the BERC project.

A summary of the assessment results and applicable mitigation measures are provided in the following Table 29. The mitigation measure IDs listed (e.g. NV01) are defined in Section 5.7 for construction noise and vibration and Section 6.11 for operational noise and vibration.

With mitigation measures applied, during all stages of the project (construction and operation), there are no exceedances expected of the EPP Noise limits for surrounding sensitive receptors, or of the other noise and vibration criteria relevant for assessment of the Project. The Project is considered noise and vibration compliant.

Table 29: Summary of noise and vibration assessment results and recommended mitigation measures

Assessment	Brief description of assessment	Results	Mitigation measures
Construction			
Airborne Noise	Chapter 5 provides a conservative assessment of typical construction equipment types and usages running simultaneously in different construction phases.	Construction noise predictions in Section 5.4 and 5.6 do not indicate a significant risk of exceeding construction noise criteria or significantly increasing existing road traffic noise due to construction vehicles at sensitive receptors based on the conservative scenarios assessed for each construction phase. However, it is recommended that construction scenarios should be planned and managed to minimise likelihood to cause environmental harm.	NV01 – Construction Noise and Vibration Management Plan (CNVMP) to be formed before construction to ensure scheduling of activities and equipment usage are controlled during construction activities. TT01 – Construction Traffic Management Plan (CTMP) will be prepared to include measures to reduce construction traffic. It will contain a Supply Chain Haul Route Management Strategy that outlines mitigation measures to avoid noise and vibration impacts from construction vehicles.
Vibration	Based on the level of development, exact locations of vibration generating equipment during construction is not known, however typical safe working distances to meet construction vibration criteria are provided.	It is not expected that construction vibration will be a critical issue to building structures and human comfort to sensitive receptors within the study area. The distance between the Project development area boundary and the nearest sensitive receptor and other industrial buildings are greater than typical minimum safe working distances of expected vibration generating sources. Similarly, there is reasonable distance from an existing underground telecoms line along the northern boundary and railway corridor at the eastern boundary. The most vibration generating construction activity expected is piling and the anticipated locations are near the middle of the development area and far from the boundaries.	
Operation			

Assessment	Brief description of assessment	Results	Mitigation measures
Day period – airborne noise	Predictive noise modelling in Chapter 6 has been conducted based on the anticipated worst-case daytime hour (2pm) heavy and light vehicle movement, stationary vehicle noise, plant noise, and noise breakout from factory buildings. Separate modelling has also been carried out for additional noise during daytime from monthly testing of the EDG (and representative of emergency/maintenance scenarios, such as an emergency shutdown when factory is running at lower load capacity).	The assessments show there are no exceedances of the EPP Noise daytime limits anticipated for normal operations, nor exceedances of the relaxed criteria applicable to operations during an emergency / maintenance scenario. Consideration of increased operational traffic noise on public roads has been included, and this is not expected to cause a significant increase of existing road traffic noise levels at sensitive receptors.	NV03 – Operational Environmental Management Plan - noise measures NV04 – Acoustic enclosure of buildings NV05 – Operational noise - stationary plant, most notably including: - Enclosure around IBA conveyor drive motor - Requires silencer applied to the ID fan to ensure mitigated sound power levels of 93 dBA per flue are achieved at stack termination¹. - A noise barrier around the main transformer just north of the C2 boiler hall, with a barrier height extending to at least 2.5 m taller than the transformer, and with sound absorptive material (min. rating NRC 0.90) on the inner barrier faces and EfW facility north wall portion. - Apply an attenuator to the outlet of both IBA extraction mechanical ventilation fans with a nominal length of 1.2 m. - Apply attenuation to air-intake/discharge and to generator exhaust flue to achieve a maximum total sound power emission of 115 dBA. Note that these standard noise control elements are assumed to be included to the EDG in the unmitigated and mitigated noise assessments. NV07 – Operational noise and vibration control to administration buildings

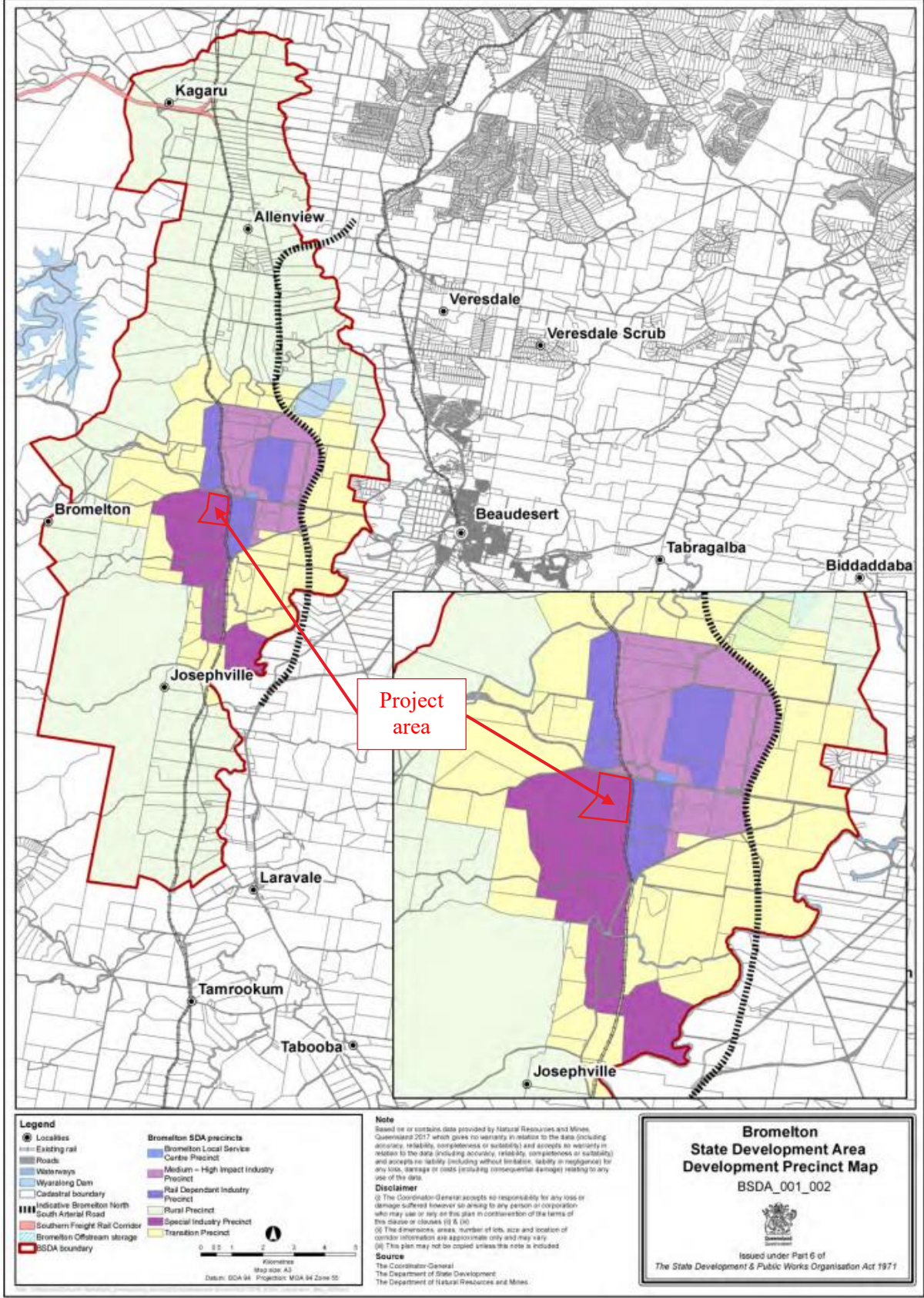
Assessment	Brief description of assessment	Results	Mitigation measures
Night and Evening period – airborne noise	Predictive noise modelling in Chapter 6 has been conducted based on the anticipated worst-case night-time hour (6am) and evening hour (6pm) regarding regarding heavy and light vehicle movement, stationary vehicle noise, plant noise, and noise breakout from factory buildings.	The initial ‘unmitigated’ assessment shows there is a risk of evening and night-time background noise creep with a minor exceedance of the background noise emission criteria for one sensitive receptor, located at 140 Tilley Road, Bromelton (R19). Mitigation measures on the stack flue exhaust system, main transformer, IBA conveyor belt and drive motor, and IBA extraction fan equipment must be put in place to minimise risk of environmental harm at this location. After applying mitigation measures (refer to NV05 in Table 28), the assessment shows there is no exceedance of the EPP Noise evening and night-time limits for normal operations. Consideration of increased operational traffic noise on public roads has been included and this is not expected to cause a significant increase of existing road traffic noise levels at sensitive receptors.	NV03 – Operational Environmental Management Plan - noise measures NV04 – Acoustic enclosure of buildings NV05 – Operational noise - stationary plant, including notable items as summarised in the daytime row above NV07 – Operational noise and vibration control to administration buildings
Vibration	Several vibration generating equipment items such as the turbine, EDG, and the ACCs have been identified as having potential for vibration impact to occur during the startup/shutdown sequence or while operating at typical speed. Appropriate vibration isolation measures (such as isolated rubber/spring floor mounts or concrete inertia bases, and potential variable speed drives on ACC fans) will need to be carefully selected based on equipment selection and location.	It is unlikely that structural damage to surrounding industrial buildings, the telecoms line along the northern boundary, the rail corridor along eastern boundary, or sensitive receptors (residential buildings), or affects to human comfort at those locations will occur from operational vibration. This is due to the significant separation distances involved and due to the vibration mitigation measures to be provided to meet vibration criteria to protect on-site personnel and on-site structures.	NV06 – Operational vibration – stationary plant, which notably includes undertaking a detailed structural dynamics assessment of natural frequencies of the systems in a future design stage.
Notes: 1. Note that the stacks have been modelled assuming spherical radiation from point sources with a sound pressure level of 85dB(A) at 1m away from the 2 flues operating simultaneously and is considered to be conservative for off-axis propagation toward the receptors. During future detailed design, potential impacts of any stack directivity should be considered to further refine the Lw limit and mitigation required.			

Appendix A

Bromelton SDA

A.1 Bromelton SDA land use precincts

Table 30: Bromelton SDA and proposed Project location
(source: Bromelton SDA Development Scheme)



Appendix B

Noise monitoring methodology

B.1 Baseline Noise Monitoring

B.1.1 Unattended noise monitoring

On-site unattended noise monitoring was undertaken by Arup between Thursday 15 June 2023 and Thursday 22 June 2023.

Unattended noise measuring instruments measured continuous sound pressure levels to accumulate dB_{LA90} , dB_{LAeq} and dB_{LA10} noise descriptors over 15-minute and 1-hour sampling intervals throughout the monitoring duration. Table 31 outlines the equipment used.

Table 31: Noise logging equipment

Measurement Location	Equipment/Model	Serial No.	SLM Type
L1 - Logger 1 149 Sandy Creek Rd ¹ 	ARL Ngara	878 0D1	Type 1
L2 - Logger 2 Project Site – North boundary ¹ 	ARL Ngara	878 0D0	Type 1
L3 - Logger 3 Project Site – South boundary ¹ 	ARL Ngara	878 07F	Type 1

1. See Figure 4 for unattended noise monitoring locations

The equipment was calibrated before and after the measurement period using a Brüel & Kjær 4231 calibrator. No significant drift in the calibration was observed. Data collected using the unattended noise monitors was downloaded and analysed.

An anomaly is noted within the Logger 1 (L1) data, whereby the background noise level ($L_{A90,1hr}$) values are at their lowest during the daytime, and then increase for the evening and night periods. Listening to audio recordings from this location during the late evening and night period indicated a quasi-steady-state equipment noise source with a low-frequency rumble sound was typically dominating the background noise environment and causing the increase to the levels (versus day and early evening periods). It is suspected this may have been from air conditioning plant or a generator or similar equipment located on the adjacent residential dwelling (R56) since there were no other industrial or residential developments nearby and since this noise source was not detected in the Logger 3 (L3) night data (which was located to west of L1).

The background noise measurements (L_{A90}) for L1 were generally unaffected by significant heavy vehicle movements along Sandy Creek Road. The road was observed to serve as the primary route for these vehicles to access the nearby quarries to the south off the main highway.

In addition to establishing daytime background levels at sensitive receptor R56 (adjacent to L1), the daytime L1 data is considered representative and appropriate for use to establish background noise levels at the other receptors around Eversley Court, in the absence of vehicle pass-by events.

Due to the anomalies in the logger L1 evening and night background data, the data from L3 is to be adopted as more appropriate (and conservative) to represent sensitive receptor R56 when determining its ‘corrected’ RBL.

Logger 2 (L2) was heavily affected by proximity to significant traffic volumes along Beaudesert Boonah Road generally between 6am – 7pm as can be seen in the charts that follow. It is proposed that sensitive receptors where road traffic noise was noted to define the noise environment such as R20 and R21 to the west (which are in proximity to Beaudesert Boonah Road) and R66 located to the south (near to Sandy Creek Road and the quarries, etc.) adopt the criteria derived from this logger location. For locations R20 and R21 a -4 dB correction is applied to better represent the attended background levels measured during the day at these sensitive receptor locations and considering their increased setback from the road.

L3 was located along the rear boundary of the Project site and was subjected to bird activity during the day and faint noise from Bromelton Quarry (C26) and Neilsen’s Quarry North Bromelton (C23), both south-east of the site. The local topography which slopes down towards the southern boundary shields this location from traffic along Beaudesert Boonah Road. The environment is instead influenced by trucks approaching the quarry via Sandy Creek Road and activity from the quarry itself. This logger location is considered as representative and appropriate to use for establishing background noise levels at more isolated sensitive receptors located far from busy roads, such as receivers to the north including the northern section of Tilley Road (R13 and R19) and along Brabazon Road (R16) which experience similar ambient noise conditions as determined during attended measurements taken near those locations. The L3 evening and night data is also considered more appropriate for use as ‘corrected’ data to represent sensitive receptor location R56 and others to the northeast around Eversley Court (instead of using L1 evening and night data due to anomalies in it).

The following pages show the unattended noise monitoring measurements for all three ARL Ngara logger locations over 7 full days for 1hr time intervals.

The $L_{A90,1\text{hour}}$ background noise level data has been processed as Rating Background Levels (RBL) based on the methodology provided in Section 5.1.3.1 of TMR CoPV2 (2023). The RBL for an assessment period (e.g. Day, 7am – 6pm) is calculated by taking the median of the corresponding ambient background levels over each day of monitoring for that period. The ambient background level for an assessment period was determined using the tenth percentile order-statistic method for the measured $L_{A90,1\text{hour}}$ values.

Invalid data was removed during the data processing to determine daily ambient background level. Invalid data generally refers to periods of time where average hourly wind speeds were greater than 3m/s, hourly weather station data was not recorded, or when hourly rainfall exceeded 0.3mm/hr as outlined in the *(former) DESI Noise and vibration EIS information guideline (2024)*. Periods which were uncharacteristic of the typical background (10th percentile L_{A90}) were also excluded. The nearest BOM weather station was identified as Beaudesert and weather data for the survey period was reviewed for adverse weather periods.

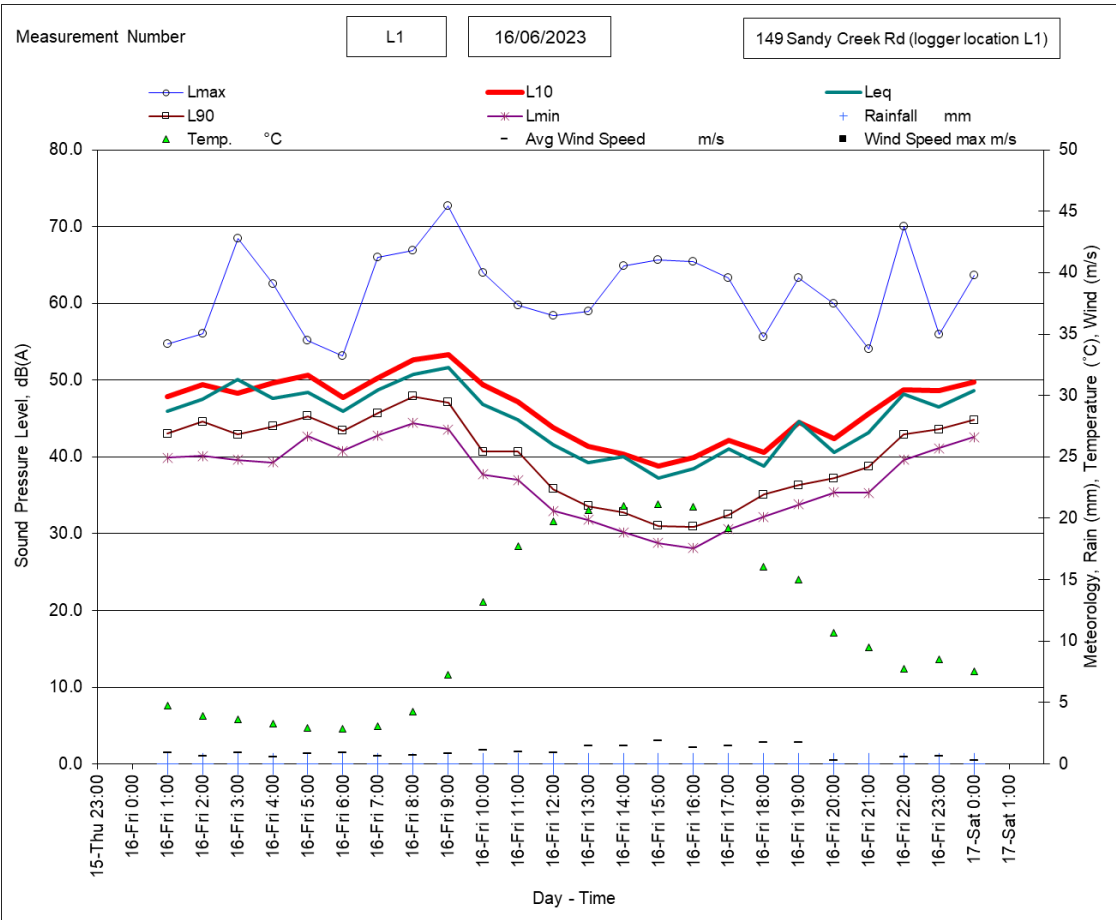
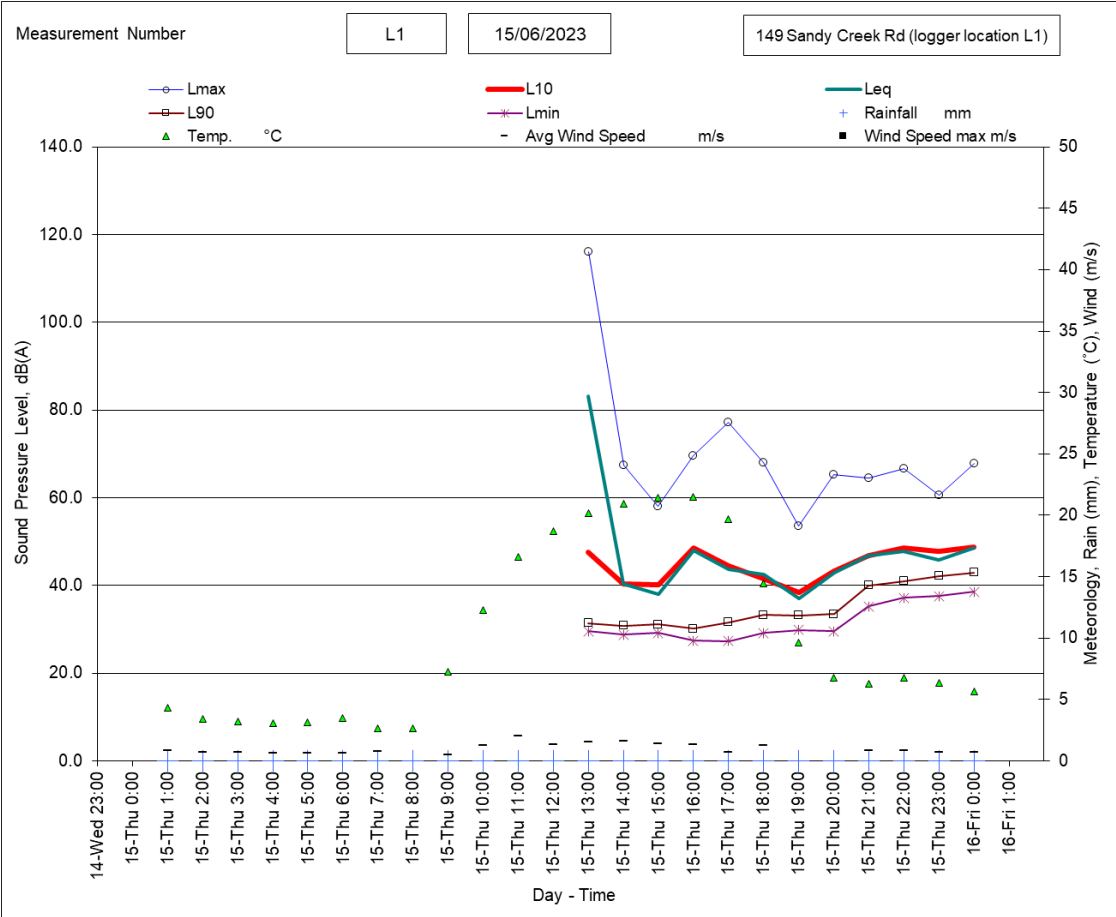
The calculated RBLs are presented for each noise logger location in Table B-1. The RBLs determined for each noise sensitive receptor as used within the assessment are shown in Table 13.

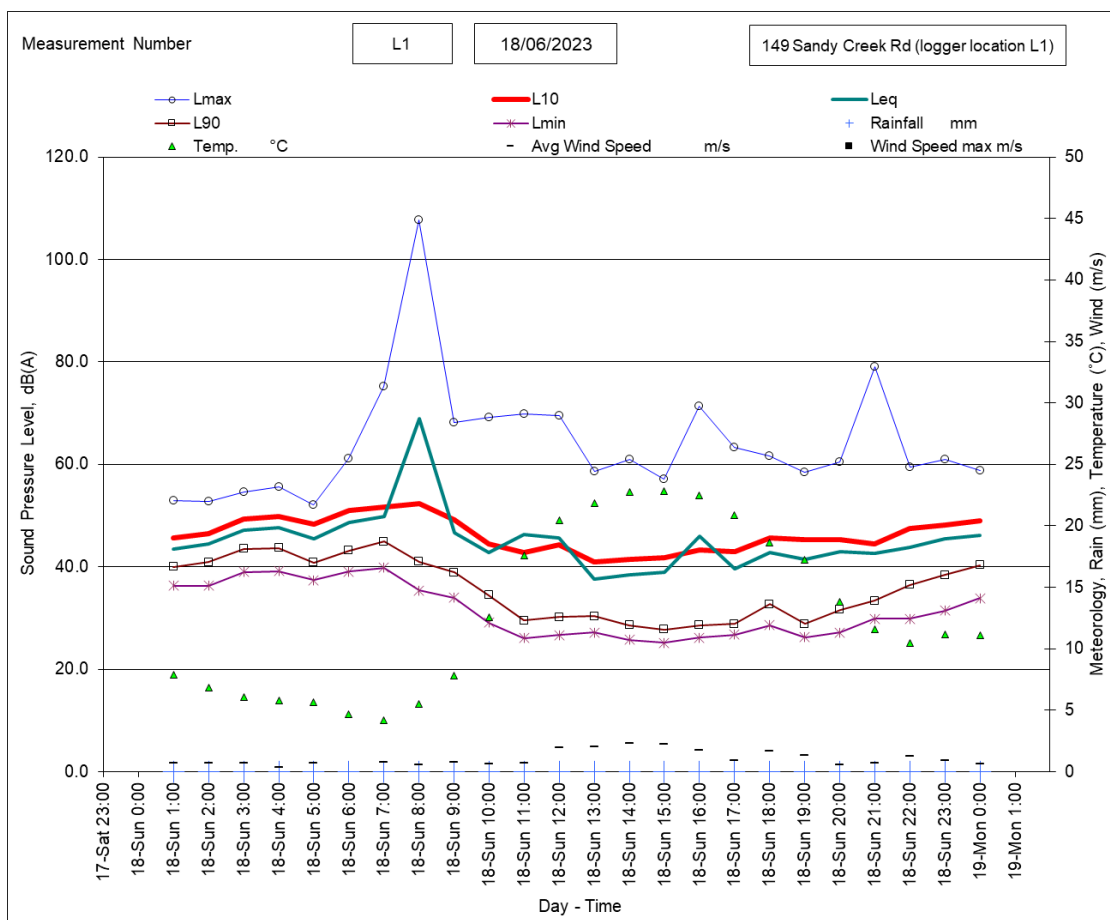
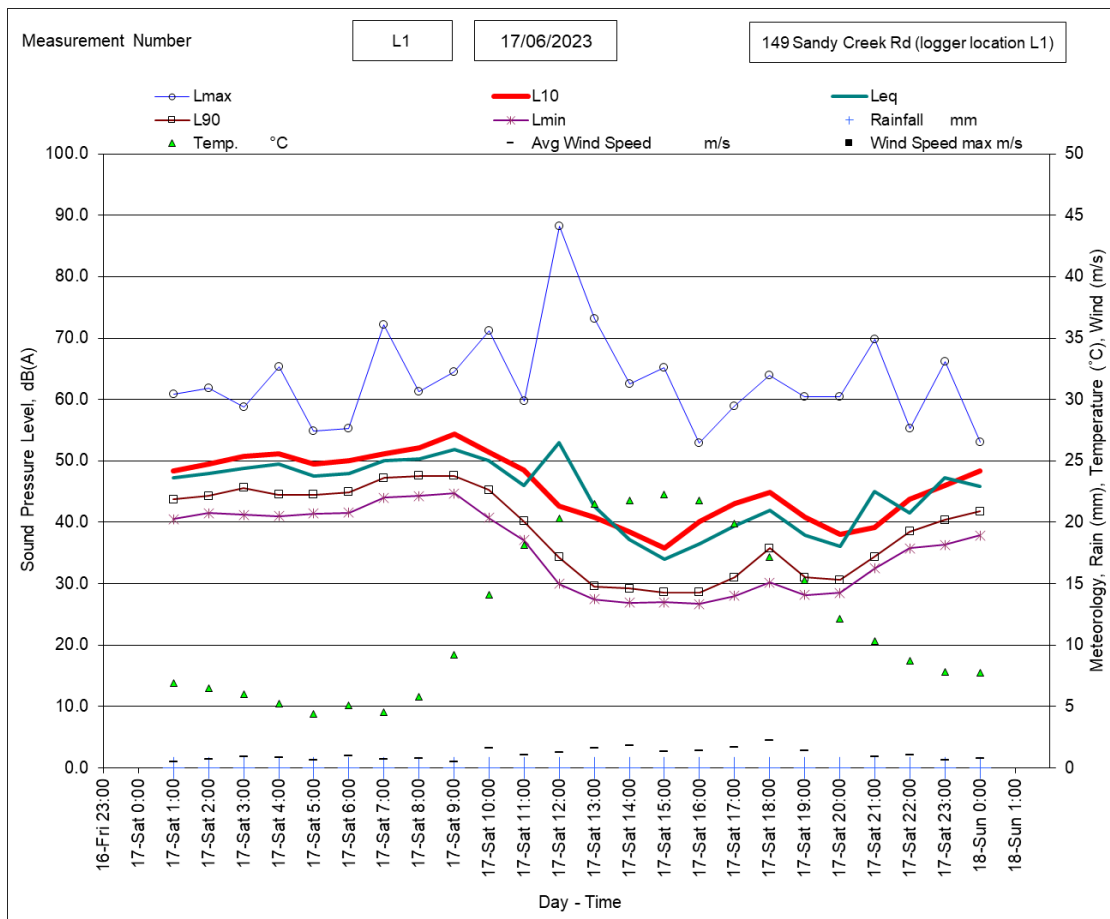
Table B-2: Rating background levels (RBL)

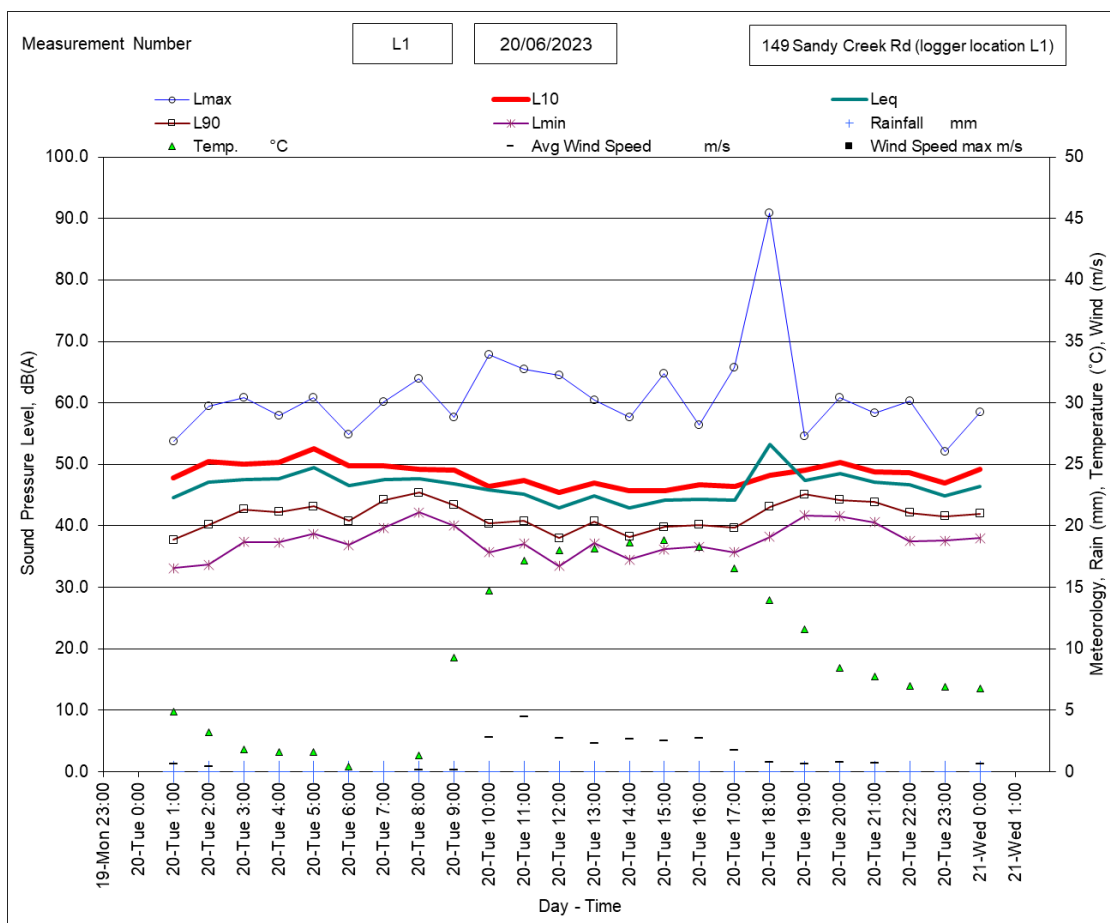
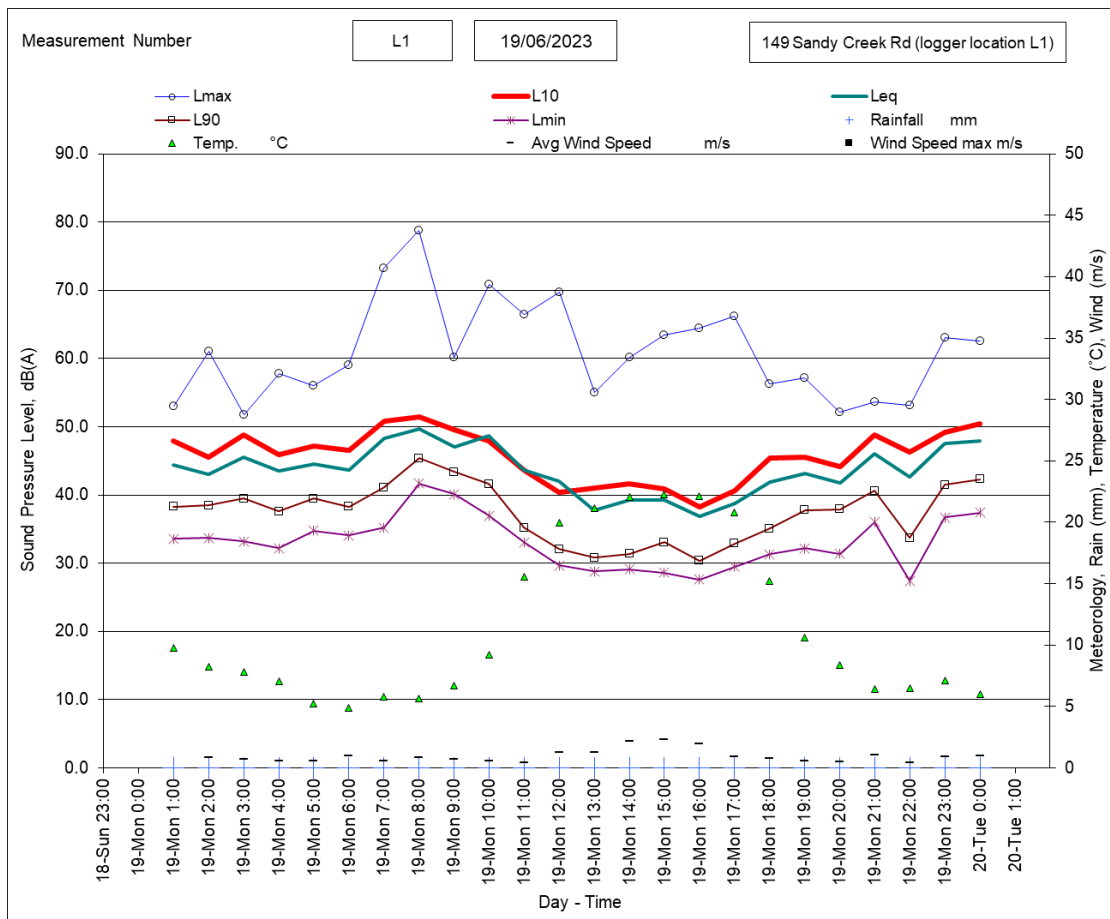
Logger ID – Location	Rating Background Level, dB(A)		
	Day (7am – 6pm)	Evening (6pm – 10pm)	Night (10pm – 7am)
L1 - 149 Sandy Creek Rd (across road from R56)	31	29 ¹ (raw measurement: 36)	29 ¹ (raw measurement: 42)
L2 - Project area Northern boundary	39	36	34
L3 - Project area Southern boundary	34	29	29

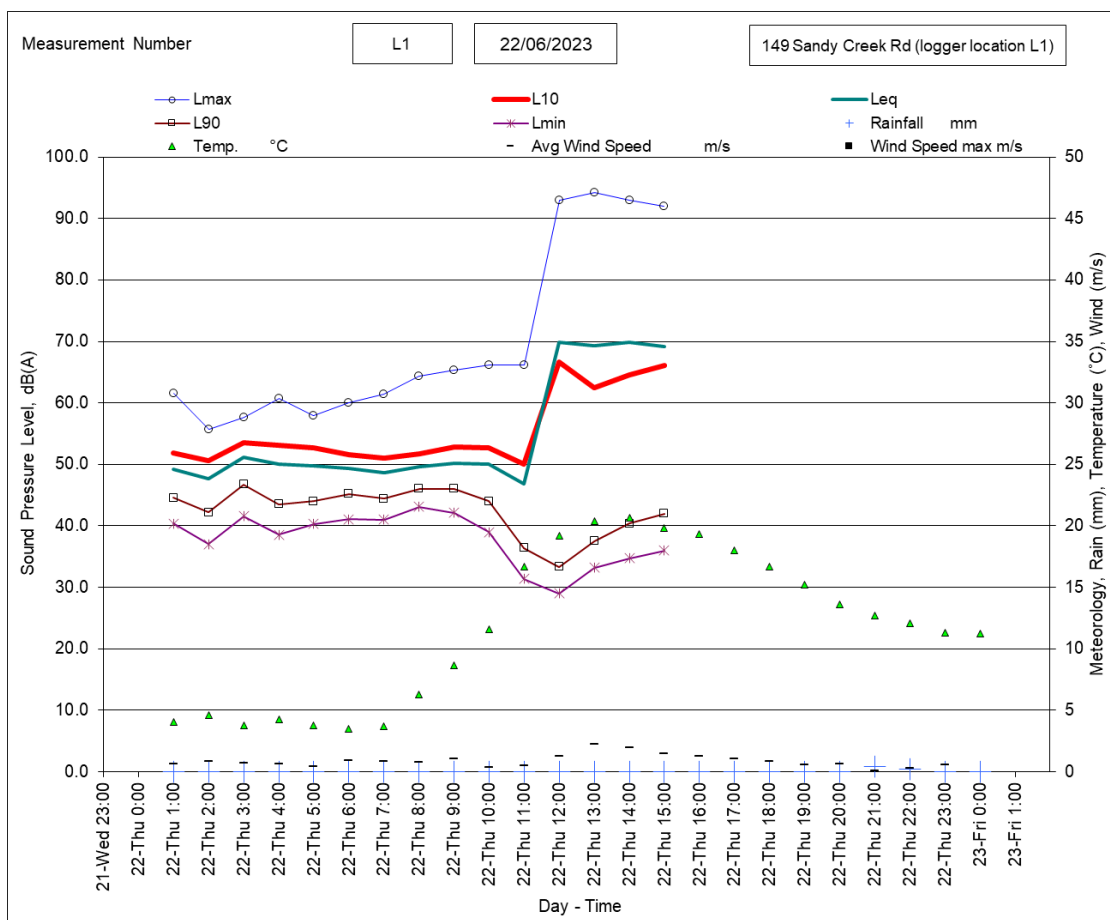
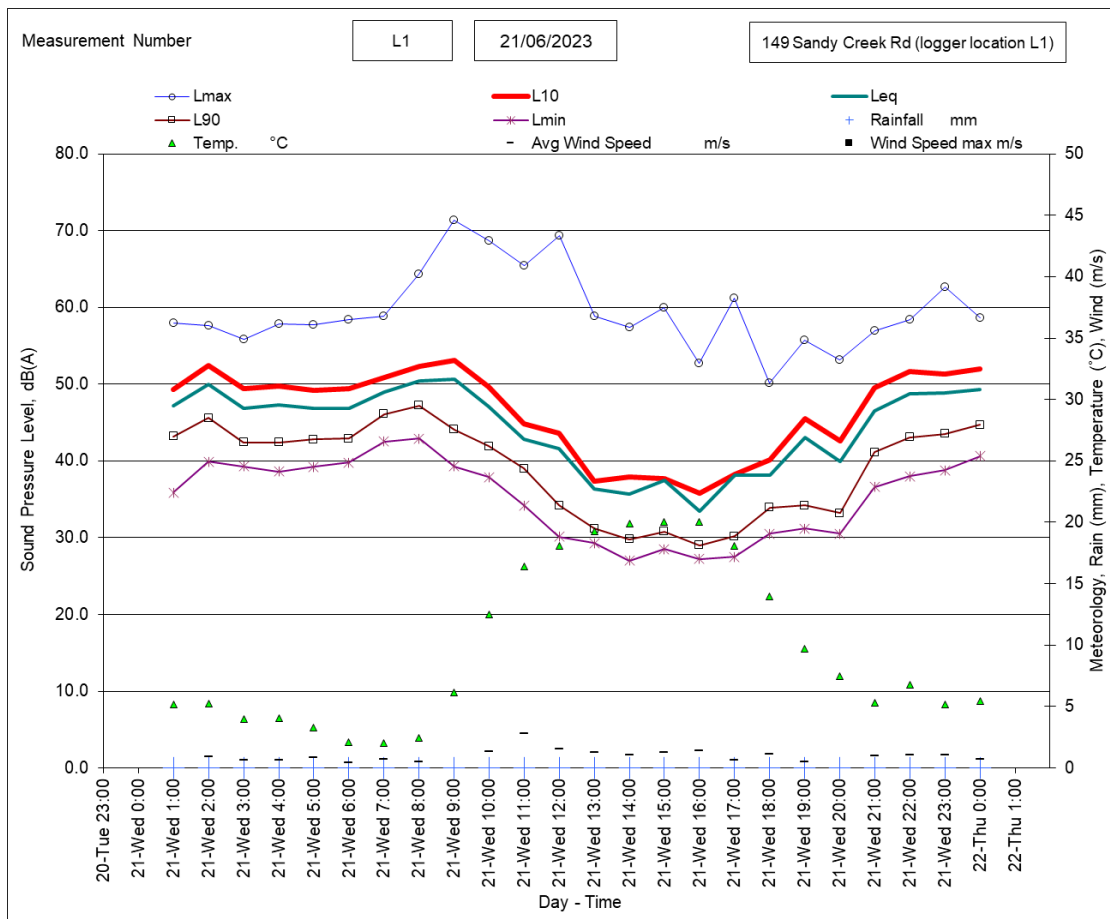
1. ‘Corrected’ values appropriate for use at adjacent sensitive receptor (R56) based on logger location L3 due to anomalies in measured data at L1

B.1.1.1 Logger location L1

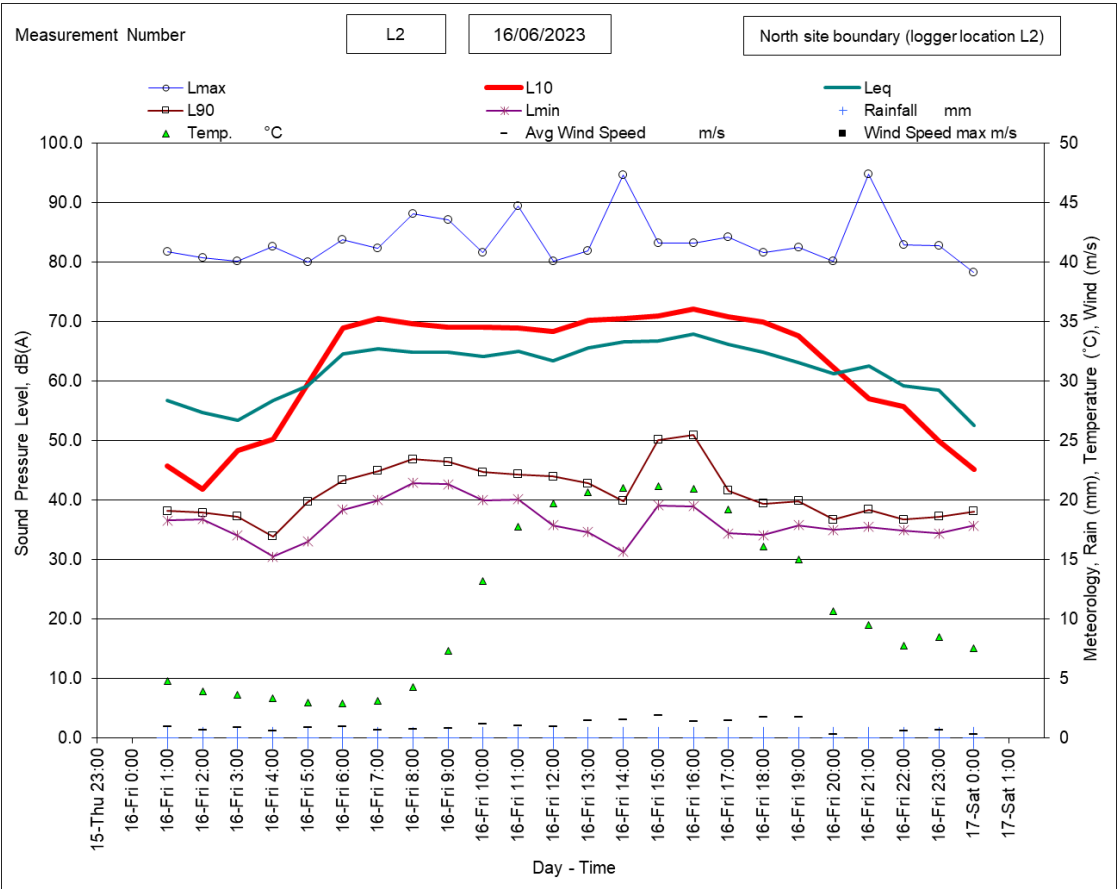
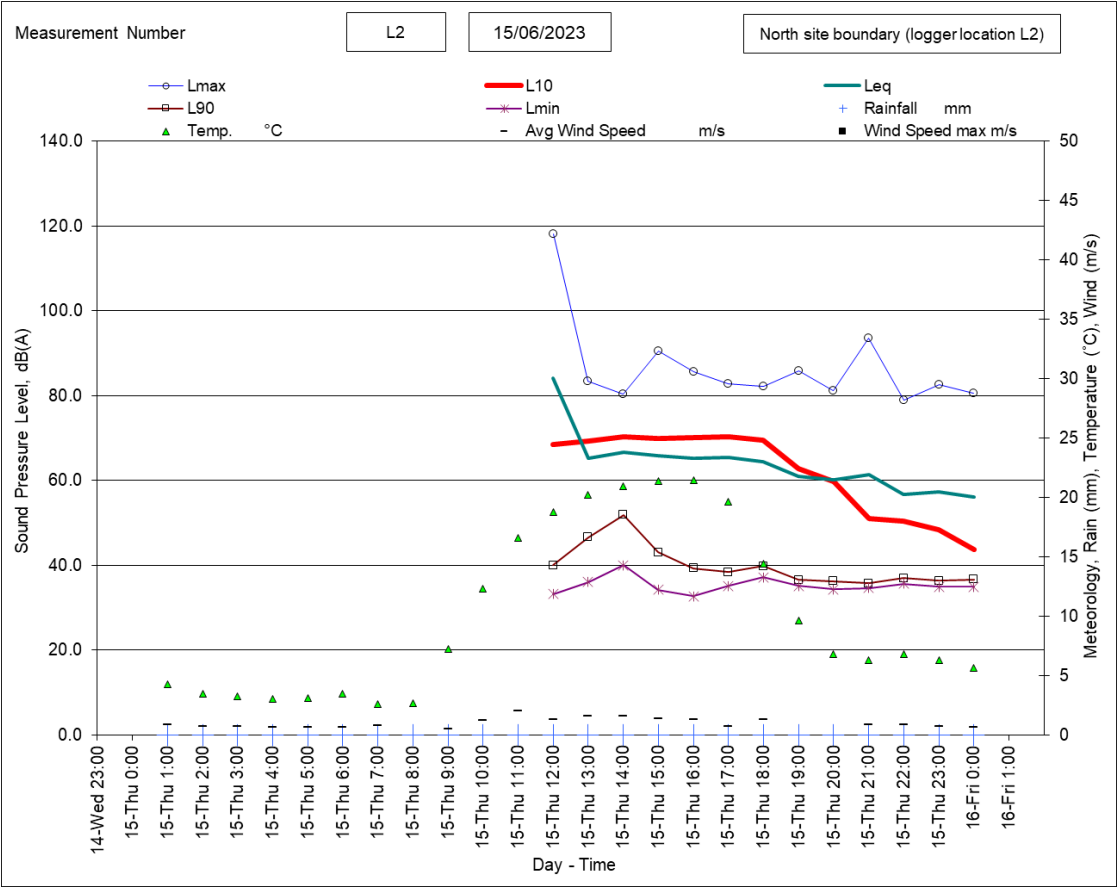


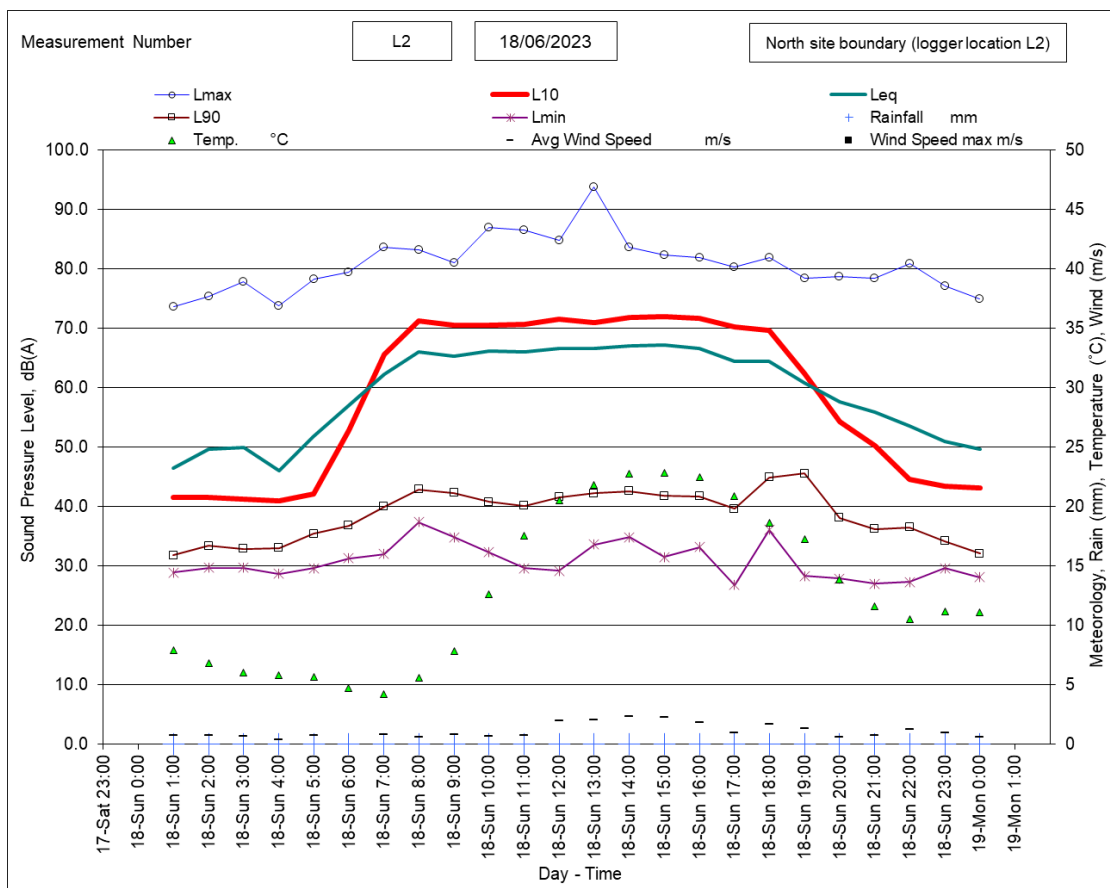
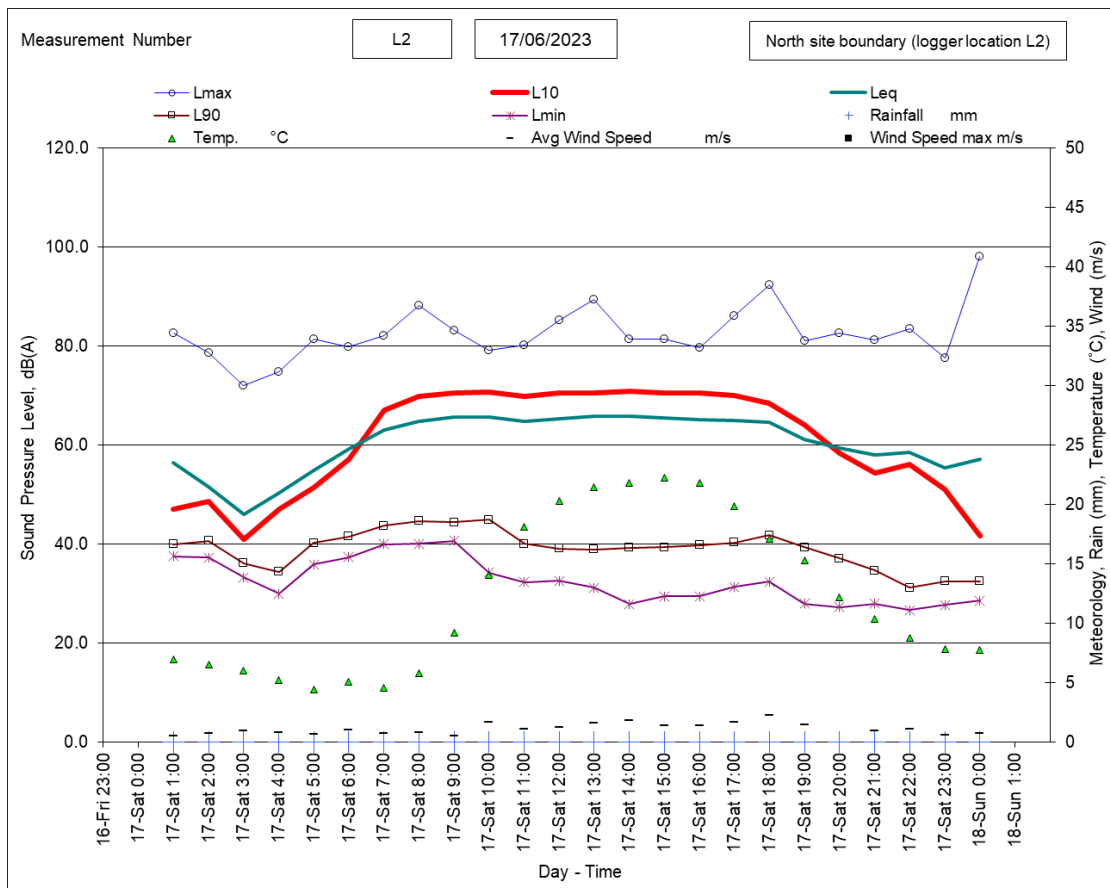


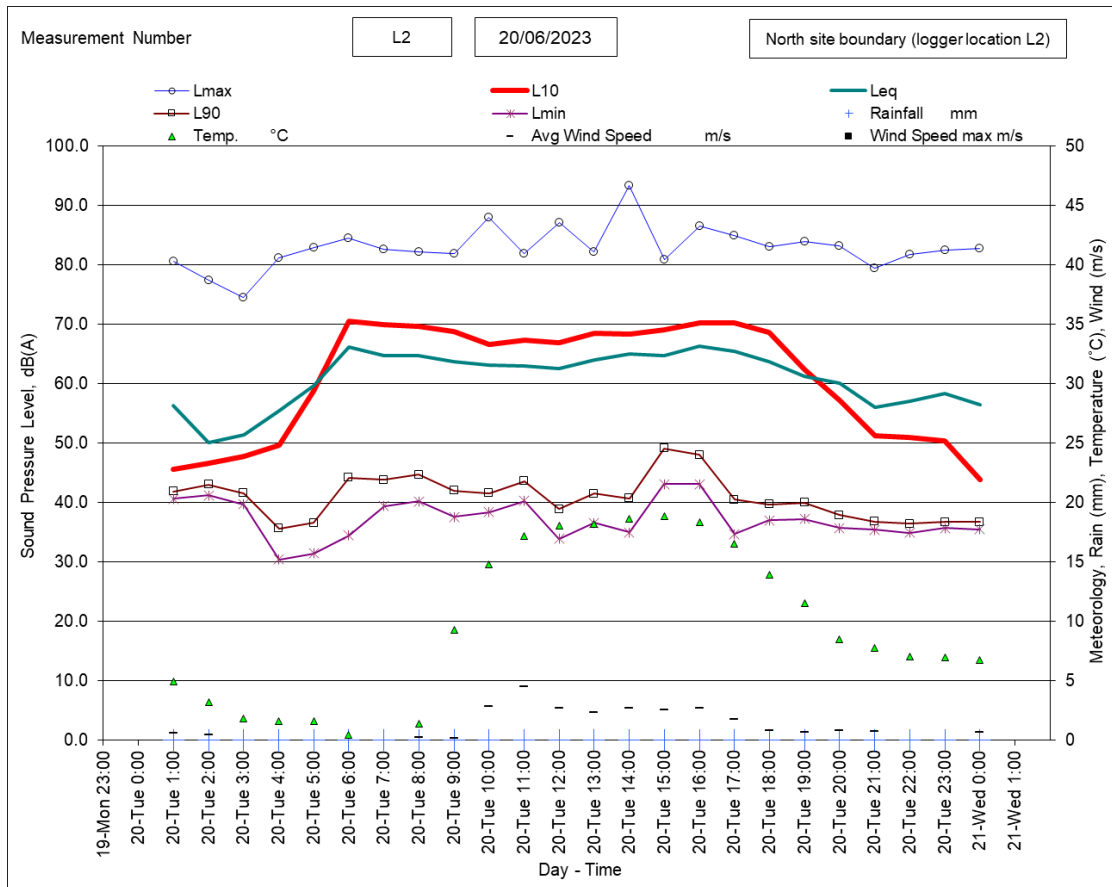
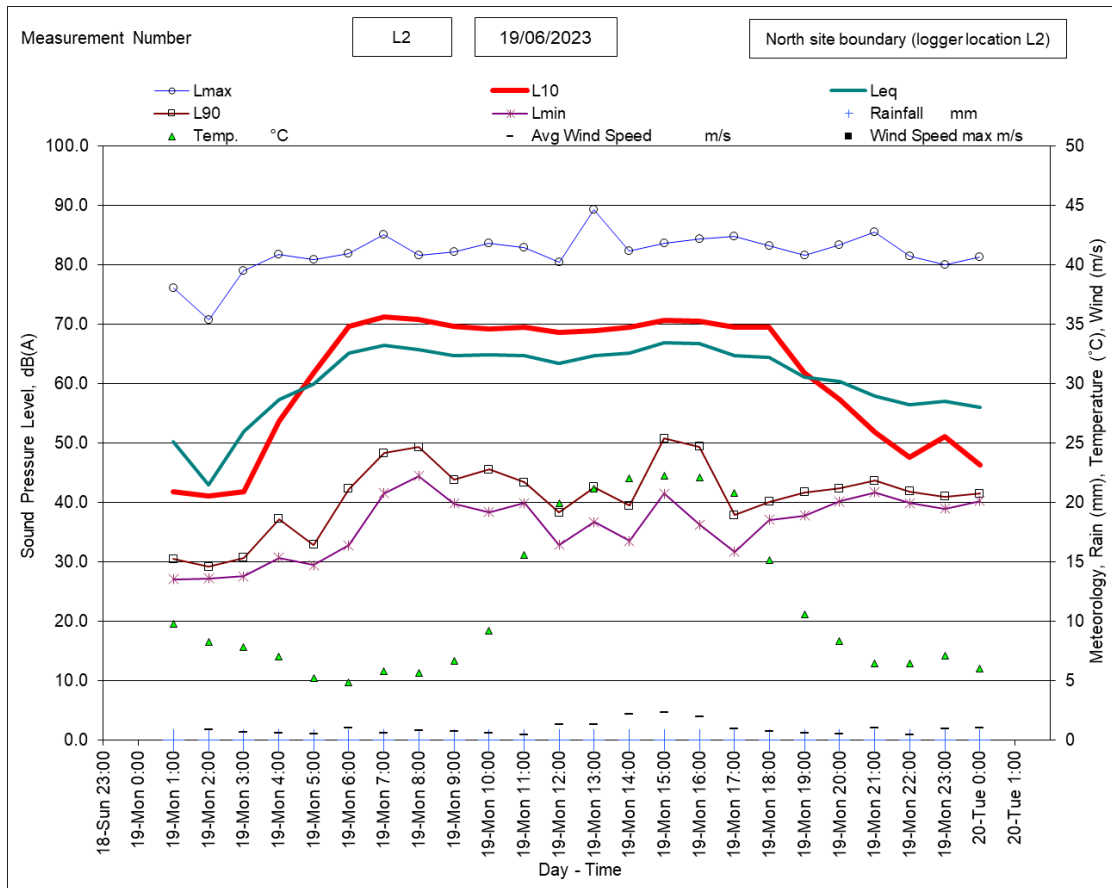


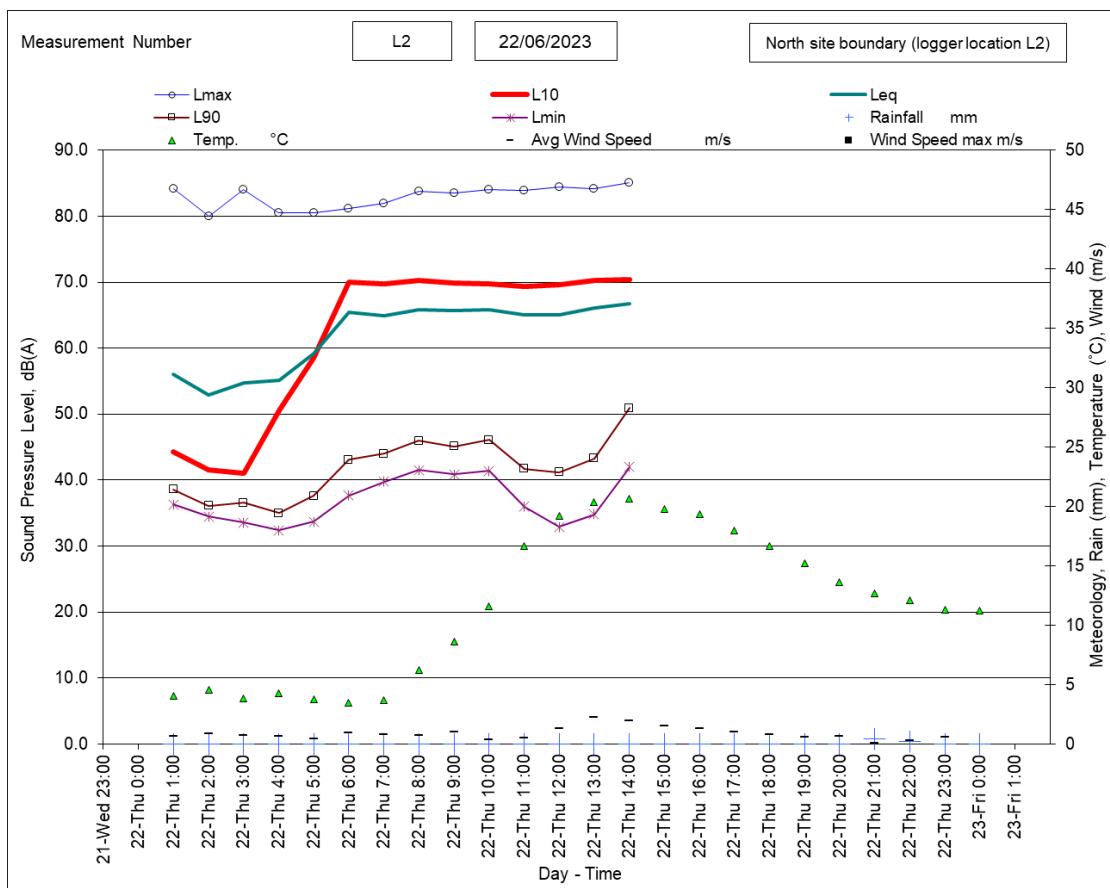
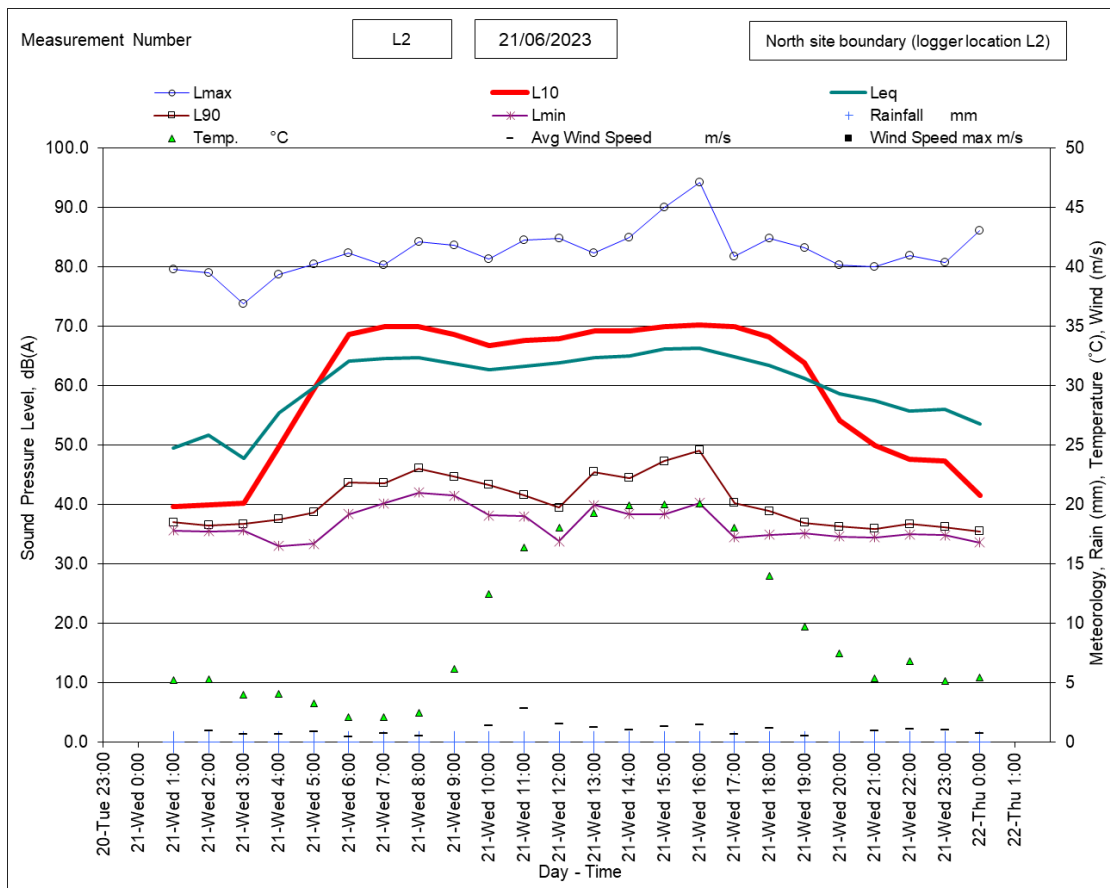


B.1.1.2 **Logger location L2**

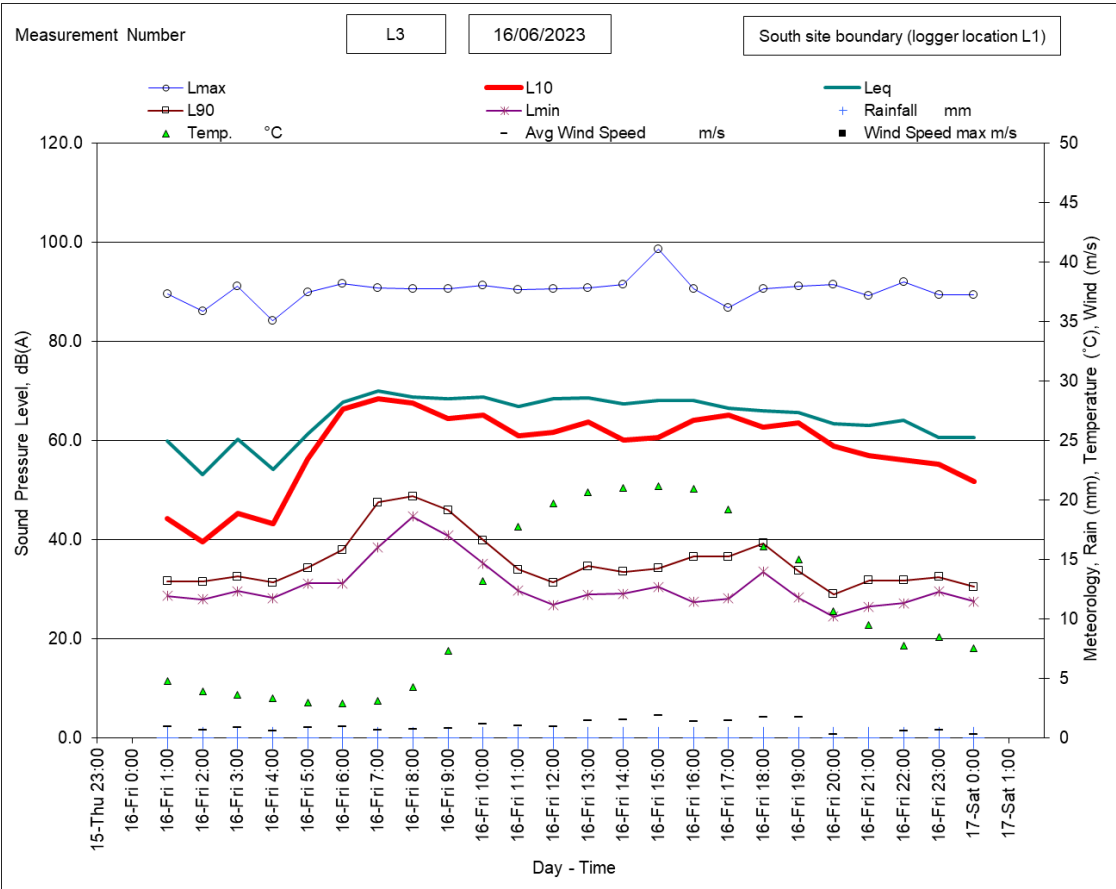
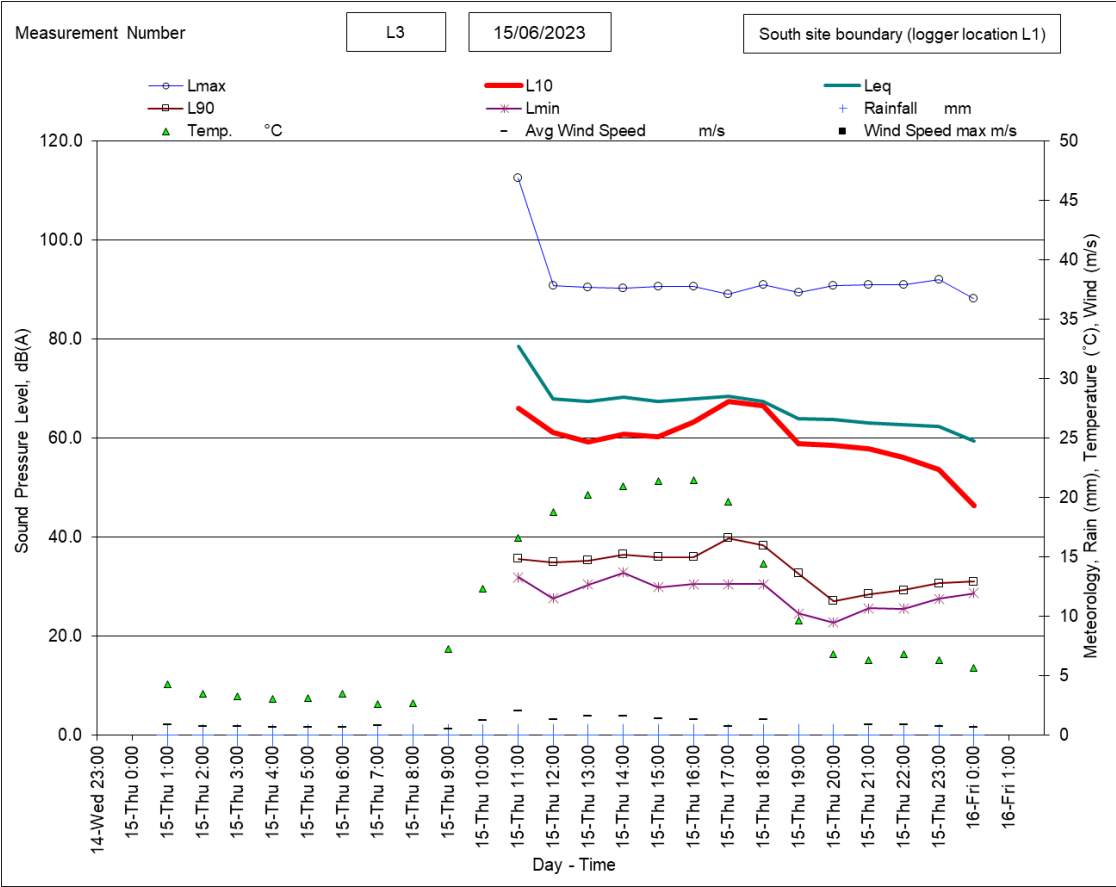


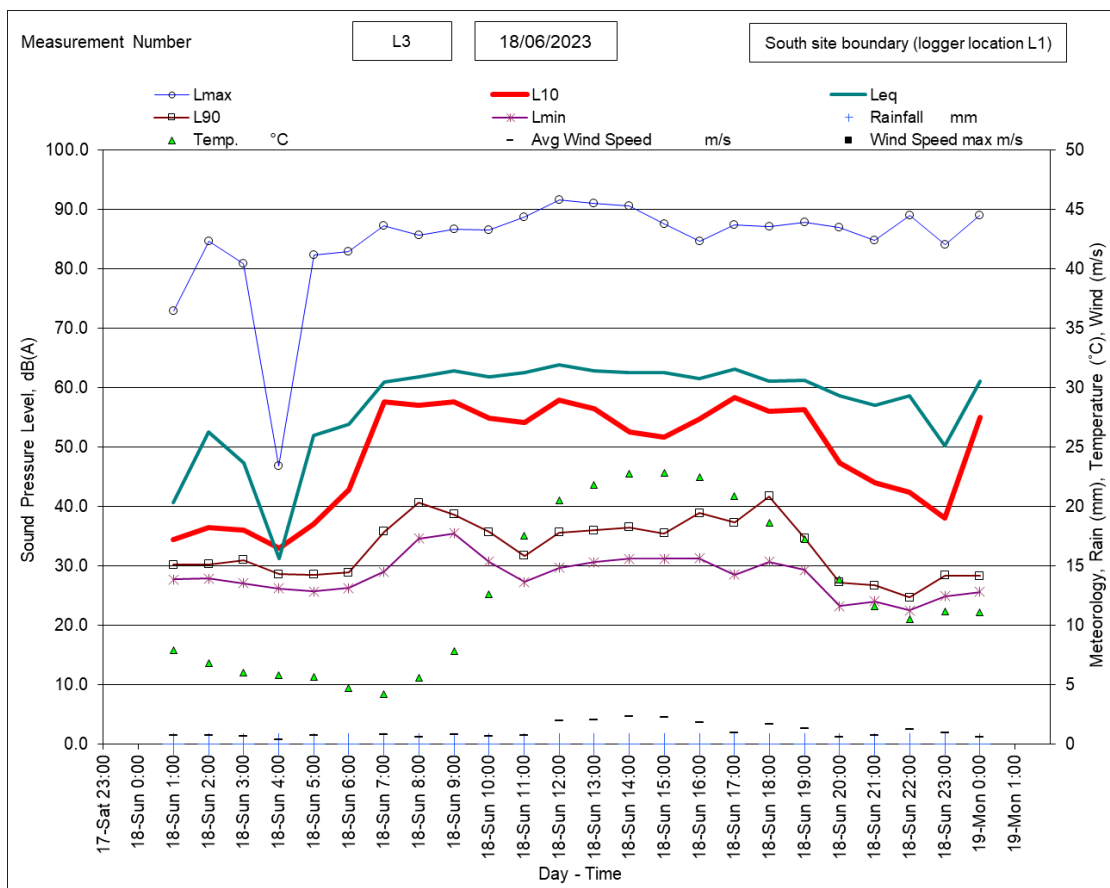
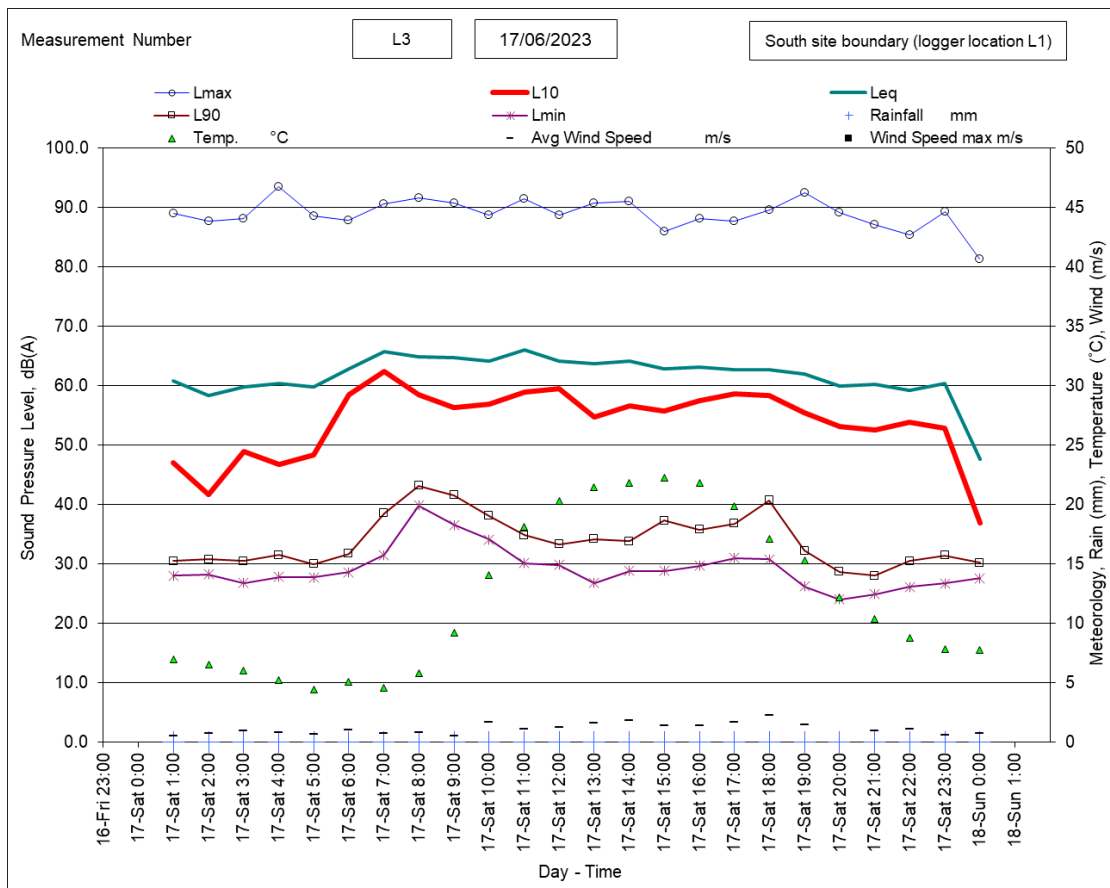


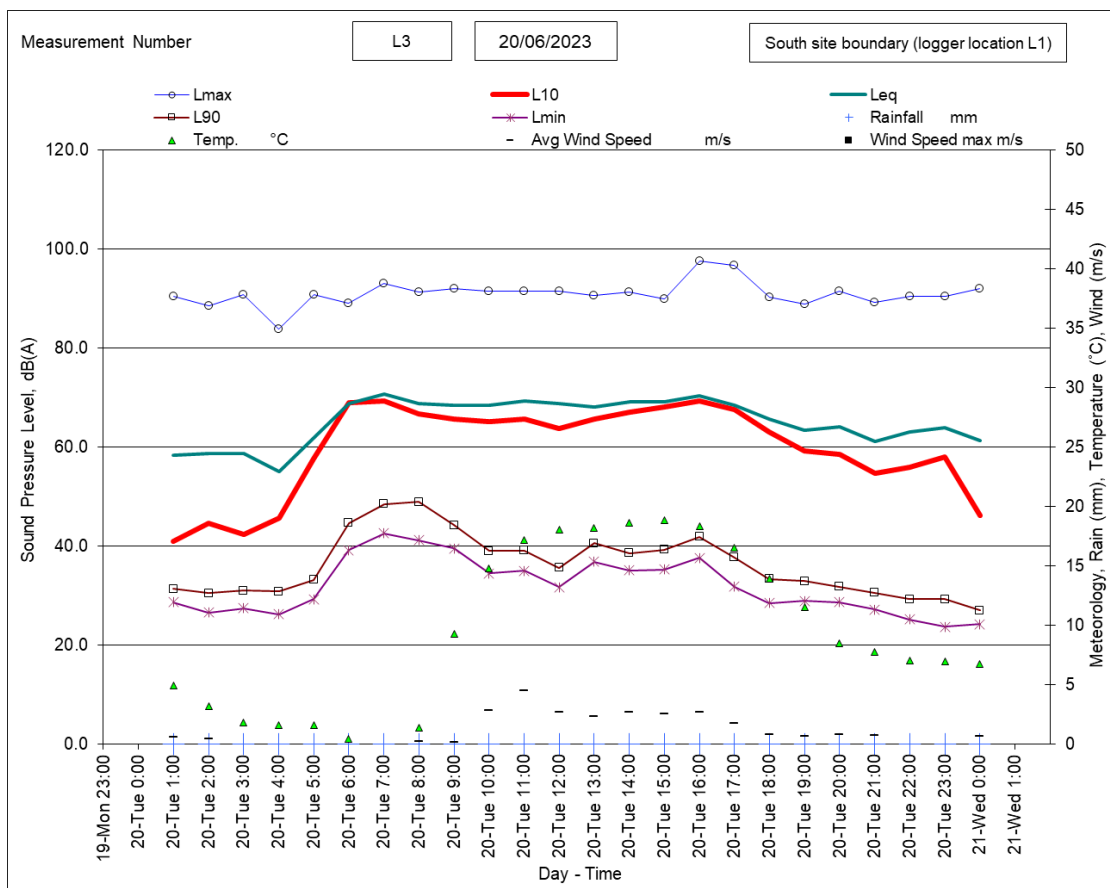
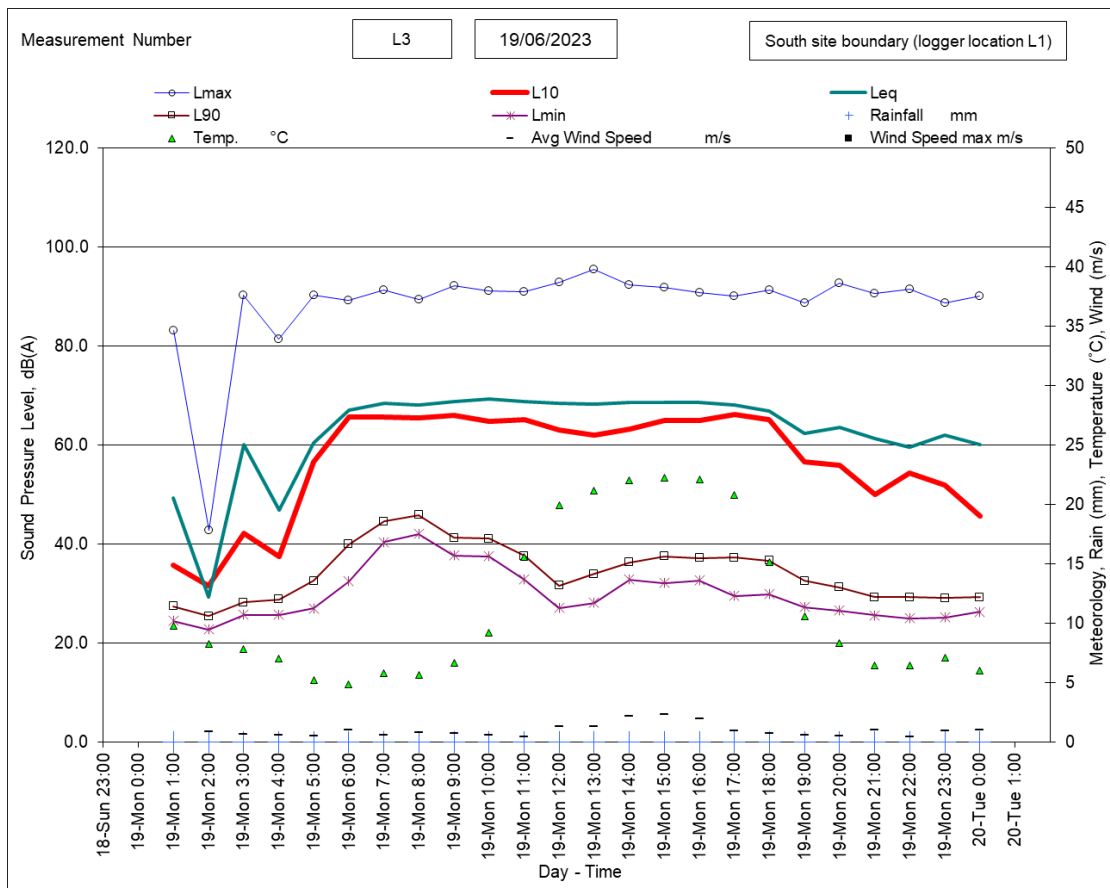


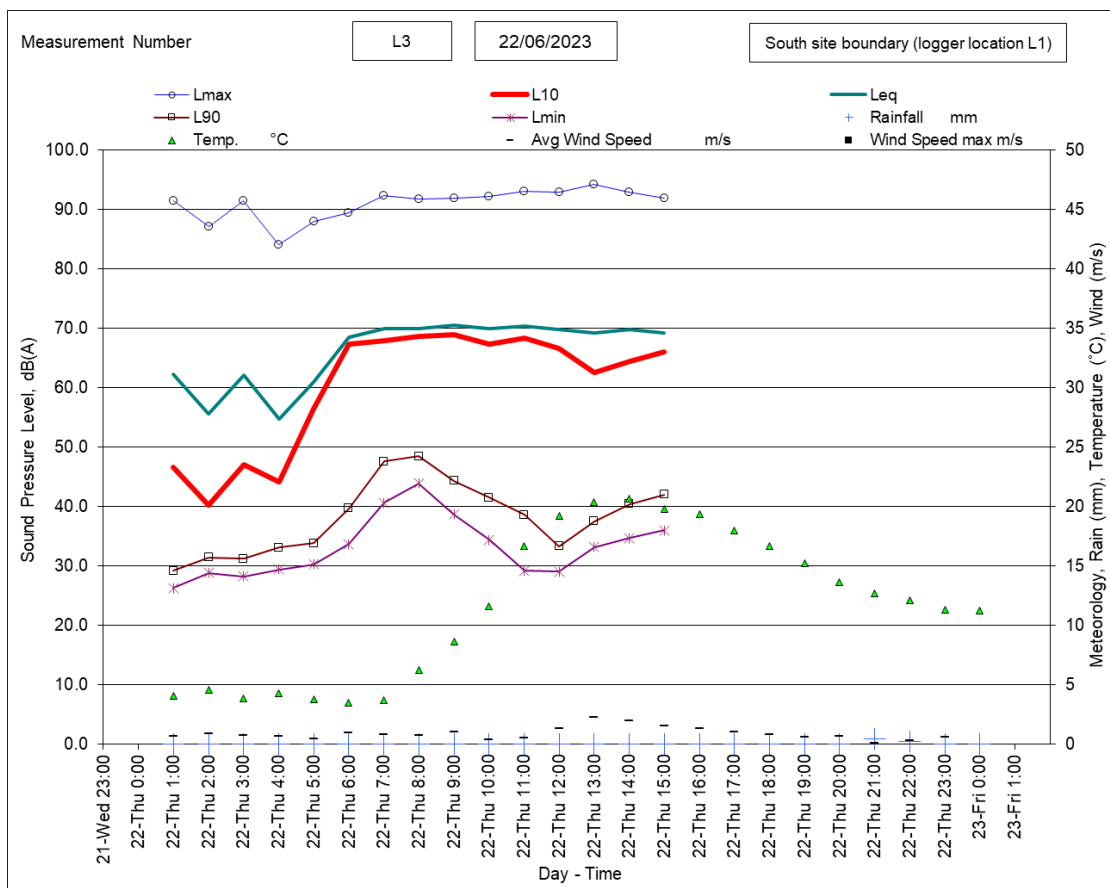
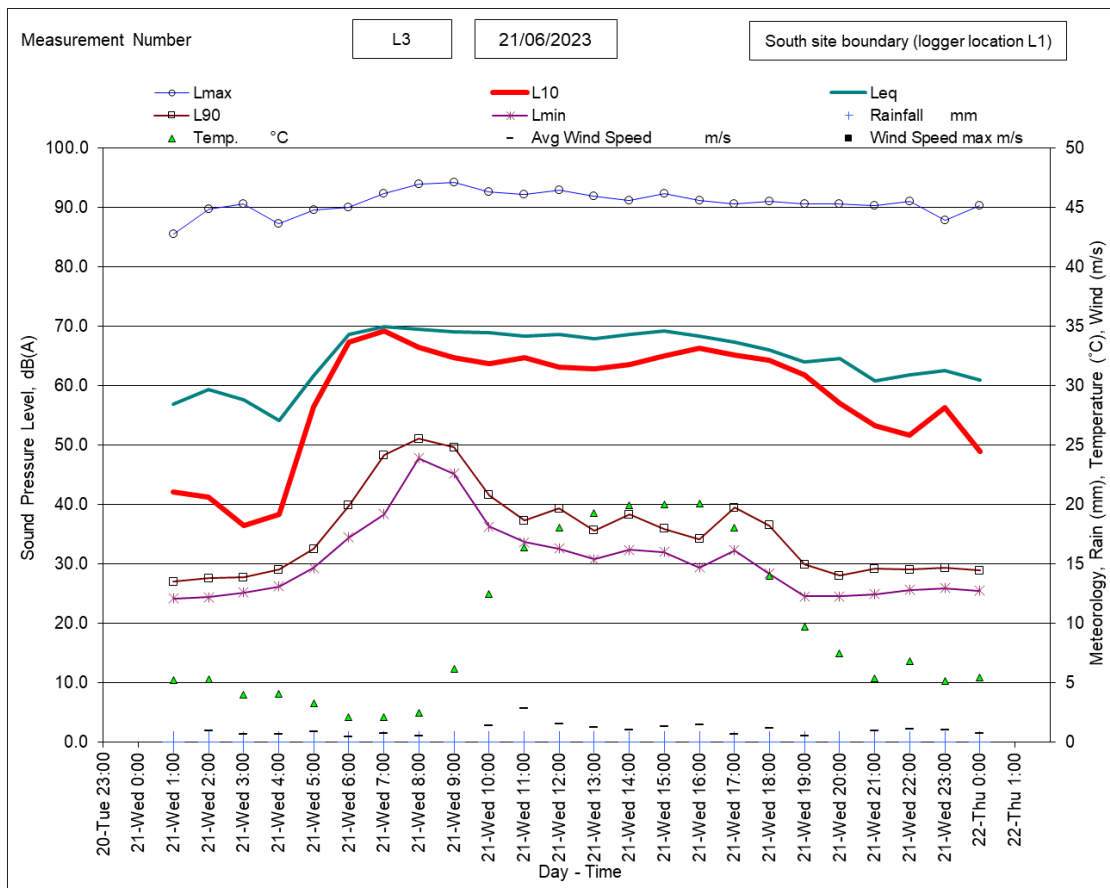


B.1.1.3 Logger location L3









B.1.2 Attended noise monitoring

Attended daytime noise monitoring was undertaken on Monday 12 June 2023, Thursday 15 June 2023 and Thursday 22 June 2023 generally between 10:00 hrs – 16:00 hrs. Attended measurements generally consist of two 15-minute measurements taken at each location, with each of the measurements taken on separate days. There were no adverse weather conditions during the time of measurements. Plane and train pass-bys did not significantly affect the $L_{A90,15min}$ measurements. Table B-3 outlines the equipment used.

Table B-3: Noise monitoring equipment

Measurement location	Equipment / Model	Serial No.	SLM type
In the vicinity of residential receivers	Brüel & Kjær 2250 Sound Level Meter	3000004	Type 1

The sound level meter was calibrated before and after the measurement period using a Brüel & Kjær 4231 calibrator. No significant drift in the calibration was observed.

Attended background noise levels and ambient noise levels measured in the vicinity of each location as illustrated in Figure 4 of Section 3.1 are provided in Table B-4.

Table B-4: Short-term noise monitoring results, dB(A)

Location	Start time	Background noise level, dB L_{A90} (15min)	Ambient noise level, dB L_{Aeq} (15min)	Observed noise source contributions
A6 - Project site Top of hill	12/6/23 14:17	39	49	Traffic along Beaudesert Boonah Rd controlling noise environment. Insects and light breeze establish background.
L2 - Project site Northern boundary	15/6/23 15:27	44	67	Local highway traffic elevating L_{Aeq} . Car tire road surface noise audible upon approach and departure from measurement location over great distances defining background noise environment.
	22/6/23 14:12	51	67	Background controlled by industrial activity within the maintenance workshop across the road. Traffic and industrial activity elevating L_{Aeq}
L3 - Project site Southern boundary	15/6/23 12:40	31	36	Significant bird activity elevating L_{Aeq} . Rustling foliage establishing background.
	22/6/23 13:18	37	43	Background noise environment is defined by rustling foliage and crushing activity from nearby Bromelton quarry. Bird activity elevates L_{Aeq}
L1 149 Sandy Creek Rd (across road from R56)	12/6/23 12:32	37	65	Local traffic defining noise environment. Background comprising of predominately rustling grass and distant traffic.
	15/6/23 10:34	35	69	Local traffic defining noise environment. Background comprising of predominately rustling grass and distant traffic.
	22/6/23 14:56	42	74	Ambient noise levels elevated by frequent local traffic pass-by events. Distant traffic along Beaudesert Boonah Rd set background levels.
A4 Ollie Ct (also R40)	15/6/23 14:07	29	44	Bird activity and overhead light plane define noise environment. Background established in the absence of all audible sources and still weather conditions.
	22/6/23 10:58	30	38	Distant traffic along Beaudesert Boonah Rd defines background noise environment. Local residential activities, bird calls and overhead light plane elevated L_{Aeq}
A5 Sandy Creek Rd (also R66)	15/6/23 13:52	45	48	Background and ambient environment defined by consistent crushing activity at nearby (Bromelton) Quarry. Local traffic pass-by events excluded (infrequent in nature).

Location	Start time	Background noise level, dB L _{A90} (15min)	Ambient noise level, dB L _{Aeq} (15min)	Observed noise source contributions
	22/6/23 15:38	39	60	Local traffic along Sandy Creek Rd elevating L _{Aeq} . Background controlled by reversing alarms from nearby Bromelton Quarry and distant traffic.
A2 Tilley Rd (near to R13)	15/6/23 16:17*	32	41	*Short term measurement near R13 residence (4mins due to interference) Light plane and bird calls define noise environment. Feed trucks establish higher background levels whilst operating over extended periods.
	22/6/23 11:58	28	36	Bird activity and distant traffic establish ambient noise environment. Background defined by brief absence of these sources. Measurement at R13 property boundary.
A3 Brabazon Rd (near to R16)	22/6/23 10:17	33	45	Ambient environment defined by bird activity and overhead light plane. Background defined by the absence of these sources.
A1 Tilley Rd (near to R20, R21)	22/6/23 11:29	35	44	Highway traffic along Beaudesert Boonah Rd defines noise environment at this location. Bird activity establishes background during brief absences in highway traffic.

The dominant source of noise in the environment at each location was generally road traffic, bird activity, and an overhead light plane present in most of the attended measurements. Activity from Bromelton quarry was noticeable along Sandy Creek Rd (south of the southern roundabout) which was faintly audible along the rear (southern) boundary of the subject site. Sandy Creek Rd was observed to contain a significant percentage of heavy vehicle through traffic to service the local quarries and heavy industry in the region while Beaudesert Boonah Rd sustained high traffic volumes throughout the day period when attended measurements were taken. The ambient noise environment was noted to be exceedingly low, as is typical for rural areas, in places sufficiently removed from major roads and industrial activities as noted at receivers north of the site (e.g. R16).

Appendix C

Airborne noise modelling methodology

C.1 Airborne noise modelling

The airborne noise impact assessments have been undertaken using 3D computer acoustic modelling software SoundPLAN 9.1. The model was prepared to match the geometry of the site and the nearby sensitive receptors with the noise sources based on the construction and operational activities assessed based on available data and information provided at the time of the assessment. Noise levels were predicted at the nearest noise sensitive receptors.

Acoustic models have been built using the environmental noise modelling software package SoundPLAN including the following inputs:

- Topography
- Building structures (operational)
- Noise sources
- Noise sensitive receptors
- Ground and air absorption
- ISO 9613-2:1996²⁰ has been used to predict noise levels at the receivers for typical scenarios of operational and construction activity.

Propagation calculations account for sound intensity losses due to hemispherical spreading, atmospheric absorption, and ground absorption. The ISO 9613-2 algorithm also takes into account the presence of a well-developed moderate ground-based temperature inversion, such as that which commonly occurs on clear, calm nights or during ‘downwind’ conditions, which are favourable to sound propagation. As a result, predicted noise levels at receptors are expected to represent a worst-case scenario.

C.2 Assumptions and inputs

The following assumptions and input conditions have been used in the construction and operational assessment:

- Buildings and the Digital Ground Model are based on Arup’s internal project reference library
- Sound reflections off all building facades are modelled to incur a 1 dB loss for the reflected sound energy/ray component
- Hard ground effect ($G = 0$) has been assumed for the Project development area ground (factory site)
- Normal uncompacted ground ($G = 0.6$) has been assumed for the grassland surrounding the Project area
- Reflection order of 2
- All sensitive receptors and noise maps are modelled at a height of 1.5 m relative to the ground level.

Operational specific:

- Operational stationary activities, stationary sources and mobile sources operating in small areas have been modelled as fixed-point noise sources including:
 - Idling trucks during unloading/loading, trailer decoupling and weighbridge events
 - Front loader, forklift, and light truck mobile plant loading activities
 - Car door slams

²⁰ISO 9613-2:1996 *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation*.

- Two stack flue openings (95 m above ground)
- Main and auxiliary transformers
- Conveyor belt drive motor (located at the conveyor belt 90-degree transition)
- RC fan banks (per bank of 8 fans)
- Heavy, medium and light trucks and other vehicles that move around the site have been modelled as line noise sources
- The IBA conveyor has been modelled as a line noise source
- The ACC fans are modelled as two area noise sources, with total cumulative fan noise applied to the bottom (inlet), and fan noise slightly attenuated via heat exchange coils to the top (discharge).
- All plant for each scenario is operating concurrently throughout the modelling period (i.e. representing a ‘worst-case’).

Construction specific:

- Typical construction scenarios and the locations of expected noise related activities are yet to be determined. In lieu of this information for the BERC Project, a preliminary assessment has been completed based on the construction phases and expected noise emitting plant and equipment from a reference EfW facility. See Section 5.2 for more details.

Appendix D

Construction equipment

D.1 Construction noise source levels and usage

Details of the construction phases on the BERC Project have not yet been finalised.

The types and quantities of expected plant and equipment to be used during each of the anticipated construction phases are provided in Table 32. These were determined based on input from the Project design team and general Arup experience with similar projects. This information is based on conservative assumptions for the construction of the BERC and is indicative only.

Compaction is expected to be required in limited areas in the Project area, predominantly in the zones where buildings and internal access roads are required, limited areas will require 3 to 5 m of fill which will need more compaction and proof rolling than other areas. Typically, a dead weight roller or a normal size vibratory roller would be used (about 8 to 12 t). The main EfW building is mostly slab on grade and piling is generally limited to locations below the point loads on the main EfW building and for the exhaust stack. Most of the other buildings in the Project are slab on grade portal frames without any piling.

The following details of construction plant and equipment assumed to be used on the BERC project may require consideration by the construction contractor during their CNVMP if they select plant with higher noise emissions or operate differently than assumed in this assessment to confirm the construction noise criteria outlined in Table 14 are met:

- Sound power levels of all equipment
- Number of equipment/plant type
- Duration of equipment use during each phase
- Location of equipment on the site.

Table 32: Construction stages and corresponding plant and equipment

Plant description	Construction phase, (with quantity used for each equipment type)	
	Phase 1 - Earthworks & Piling	Phase 2 to Phase 4 - Construction (including roads & landscaping)
Backhoe loader	2	1
Backhoe with auger	-	1
Bulldozer (CATD8 to CATD10 or similar)	2	-
Chain saw	2	-
Compactor (CAT835 or similar)	2	2
Concrete Boom Pump	1	2
Concrete saw	-	1
Concrete truck	2	2
Concrete vibrator	2	4
Crawler Crane >200t	-	1
Delivery Truck	2	-
Delivery Truck (incl low loader)	-	2
Diesel generator	2	4
Dump truck	3	2
Excavator (>25t)	3	1
Excavator (<25t)	-	1
Forklift	-	2
Front end loader (FEL)	2	2

Plant description	Construction phase, (with quantity used for each equipment type)	
	Phase 1 - Earthworks & Piling	Phase 2 to Phase 4 - Construction (including roads & landscaping)
Grader (CAT14G to CAT16G or similar)	2	1
Hand tools	2	4
Manitou	-	2
Mobile crane (<50t)	-	1
Mobile crane (50t to 200t)	-	2
Padfoot roller	2	2
Piling rig (bored pile)	2	-
Pump	2	4
Road profiler	-	2
Roller	2	3
Scraper	2	-
Semi-trailer	2	-
Truck and dog (trailer)	-	2
Trucks (water cart)	2	1
Vibration roller	2	2

Equipment sound power levels (L_w) for use within the noise modelling have been sourced from AS 2436 – 2010 (R2016), BS 5228-1:2009+A1:2014, and the Transport for New South Wales ‘Construction Noise and Vibration Strategy’ (CNVS). These values along with an assumed percentage of use per 15-minute interval are provided in Table 33.

It should be noted that during the different construction stages, it is unlikely that all machinery would be operating at the same time (like the modelling assumes). However, assuming a ‘worst-case’ scenario approach helps to identify where noise impacts could be a concern and assists in the design of mitigation measures.

Table 33: Construction equipment sound power levels (L_w) and percentage use

Equipment	Assumed percentage of use per 15 minutes	Sound power level (per unit), L _{Aeq,adj,15min} , dB(A) ²
Asphalt paver	100%	112
Backhoe loader	100%	108
Backhoe with auger	100%	111
Bulldozer (CATD8 to CATD10 or similar)	100%	114
Chain saw	25%	119 ¹
Compactor (CAT835 or similar)	100%	120 ¹
Concrete Boom Pump	100%	106
Concrete saw	50%	127 ¹
Concrete truck	100%	113
Concrete vibrator	100%	110 ¹
Crawler Crane >200t	100%	113
Delivery Truck	100%	107
Delivery Truck (incl low loader)	100%	108
Diesel generator	100%	113
Dump truck	100%	117

Equipment	Assumed percentage of use per 15 minutes	Sound power level (per unit), L _{Aeq,adj,15min} , dB(A) ²
Excavator (>25t)	100%	106
Excavator (<25t)	100%	95
Forklift	100%	106
Front end loader (FEL)	100%	115
Grader (CAT14G to CAT16G or similar)	100%	115
Hand tools (pneumatic)	100%	117
Manitou	100%	106
Mobile crane (<50t)	100%	113
Mobile crane (50t to 200t)	100%	113
Padfoot roller	100%	109
Piling rig (bored pile)	100%	111
Pump (water)	100%	100
Road profiler	100%	117
Roller	100%	99
Scraper	100%	116
Semi-trailer	100%	108
Truck and dog (trailer)	100%	108
Trucks (water cart)	100%	108
Vibration roller	100%	117 ¹
Notes: 1. Includes 5 dB penalty in general accordance with adjustment factors in TMR CoPV2 2. Sound power level shown has not yet been adjusted for percentage use / duration		

Appendix E

Operational traffic information

E.1 Vehicular numbers

The daily truck volumes for the noise assessment are based on a 10% mechanical overload scenario capacity for the facility (836,000 tonnes/year) or 110% maximum continuous rating (MCR). This is considered conservative relative to the nominal operating capacity (760,000 tonnes/year).

Anticipated daily volumes and worst-case peak hour numbers for trucks (excluding Type 1A trucks) and light vehicles were provided in Table 22 and Table 23 respectively of Ramboll's Traffic Memo²¹. Truck numbers are provided in the last two columns of Table 34 below and inform the worst-case peak hour of the day scenario for the noise assessment. Similarly, light staff vehicle truck numbers are provided in Table 35 and inform the worst-case peak hour of the day scenario for the noise assessment.

Cleanaway has previously provided Arup with typical 12-hour daily traffic profiles of operational and light staff vehicles for Erskine Park Transfer Facility (EPT Facility) as a guide for the noise impact assessment. Arup have used the EPT Facility daily traffic profile assumption to determine the 'worst-case' hour times for vehicle movement in the day, evening and night periods. The Erskine Park facility documented truck visits are typically between 4 am to 4 pm, so the profile has been shifted back 2 hours to align with the proposed BERC delivery periods of 6 am to 6 pm during the 24 hour delivery cycle. The daily volume time profile/percentage is provided in Appendix E.2 (Table 37) and was used along with the predicted daily vehicle numbers shown in Table 34 and Table 35 below to determine the estimated vehicle quantities during the peak hour for the evening and night noise assessment time periods. The total daily truck arrivals and the worst-case day-time peak hour truck arrivals were provided by Ramboll as shown in the last two columns of Table 34 below. The final assessed night-time, daytime and evening hourly traffic peak numbers is summarised in Table 20.

Table 34: Truck volumes (110% MCR)

Type	Assumption	Truck payload (tonnes)	Total daily truck arrivals ¹	Worst-case day-time peak hour truck arrivals
Residual waste	Type 1A (A-double rear-eject articulated truck)	40	0	0
	Type 1B (B-double side-tipping articulated truck)	33	54	12
	Type 2 (semi-trailer rear eject truck)	20	26	6
	Type 3 (direct delivery council compactor truck or front load, ~9t)	9	39	10
Quicklime	Type 1B (B-double tanker truck)	33	4	1
Powdered Activated Carbon	Type 1B (B-double truck)	7	1	0
Urea (40%)	Type 1B (B-double tanker truck)	33	4	1
Cement (delivery for APCr stabilisation)	Type 1B (B-double tanker truck)	33	11	1
IBAA	Type 1B (B-double tanker truck)	33	30	3
Stabilised APCr (concrete pickup)	Type 1B (B-double truck)	32	10	1

²¹ REN2021N00922-RAM-ME-00021

Type	Assumption	Truck payload (tonnes)	Total daily truck arrivals ¹	Worst-case day-time peak hour truck arrivals
Recycled materials / scrap metals	Type 2 (single trailer semi-trailer)	19	3	1

1. Assuming trucks coming in and out within the hour

Table 35: Light staff vehicle volumes (110% MCR)

Type	Total daily light vehicles ¹	Worst-case day-time peak hour light vehicle arrivals
Maintenance vehicles – light trucks	2	1
EfW facility area – cars	45	5
APCr stabilisation area – cars	2	0
IBA treatment area – cars	5	1
Total Vehicles	54	7

1. Assuming employees arrive in the morning and leave during the late afternoon

Table 36: Light visitor vehicle volumes (110% MCR)

Type	Total daily light vehicles ¹	Worst-case day-time peak hour light vehicle arrivals
Visitor cars ¹	8	1

1. Visitor vehicle daily and peak hour arrivals is based on EPT Facility data provided to Arup, with approximately 1 visitor vehicle per hour between 9am – 5pm.

E.2 Operational traffic data time profile from Erskine Park Transfer Facility

Table 37: Indicative time profile / breakdown of heavy and light vehicles throughout the day

Hour starting	Erskine Park daily operational heavy vehicle / truck profile in % (shifted back by two hours)	Erskine Park light vehicle daily traffic profile in % (shifted back by two hours)
0:00	0%	0%
1:00	0%	0%
2:00	0%	0%
3:00	0%	0%
4:00	0%	0%
5:00	0%	0%
6:00	4%	0%
7:00	10%	10%

Hour starting	Erskine Park daily operational heavy vehicle / truck profile in % (shifted back by two hours)	Erskine Park light vehicle daily traffic profile in % (shifted back by two hours)
8:00	7%	19%
9:00	4%	12%
10:00	1%	3%
11:00	12%	3%
12:00	10%	3%
13:00	7%	3%
14:00	15%	3%
15:00	11%	3%
16:00	10%	12%
17:00	7%	22%
18:00	0%	10%
19:00	0%	0%
20:00	0%	0%
21:00	0%	0%
22:00	0%	0%
23:00	0%	0%
Total	100%	100%

Notes:

Blue – night-time, Orange – daytime, Green – evening

In **bold, red** text – peak hour of each time period for noise assessment

E.3 Vehicular movements

Figure E-1 and Figure E-2 show the travel path of trucks within the site along with an estimated time spent at key locations such as weighbridges and within buildings (either dumping or collecting).

Table 38 provides a description of the travel paths of trucks.

Figure E-1: Origins and destinations of trucks within the site – arriving Uploaded

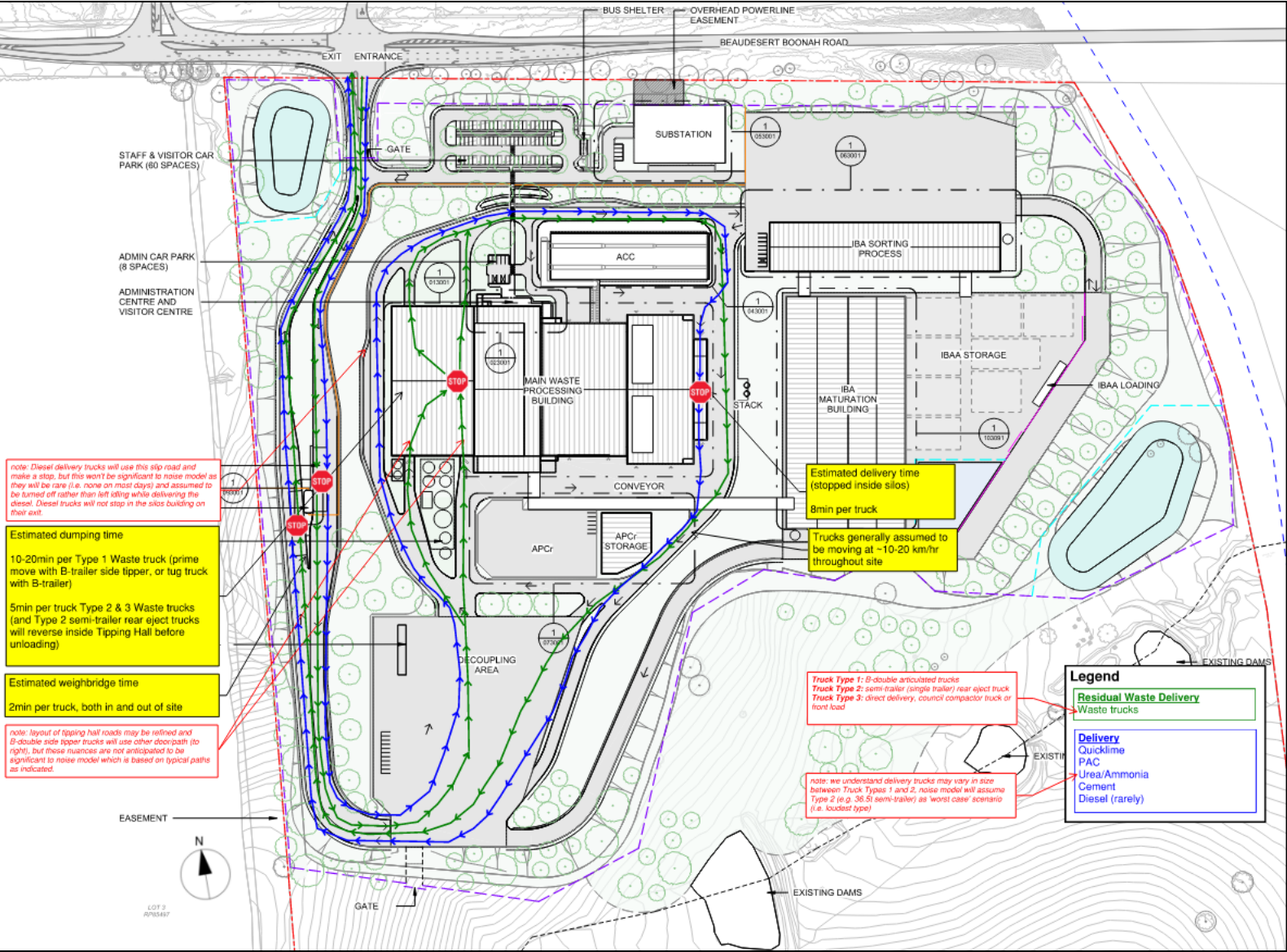


Figure E-2: Origins and destinations of trucks within the site – arriving empty

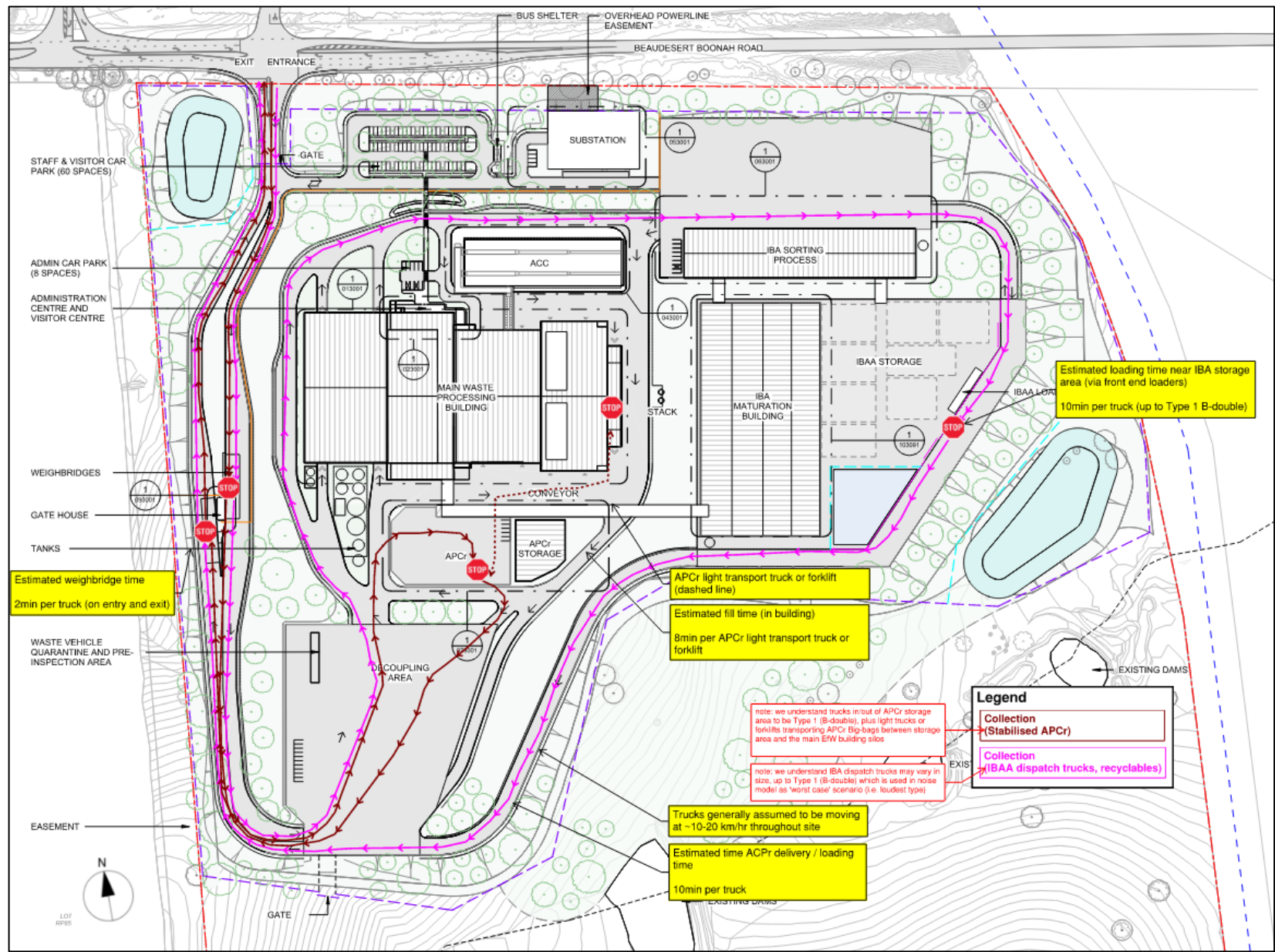


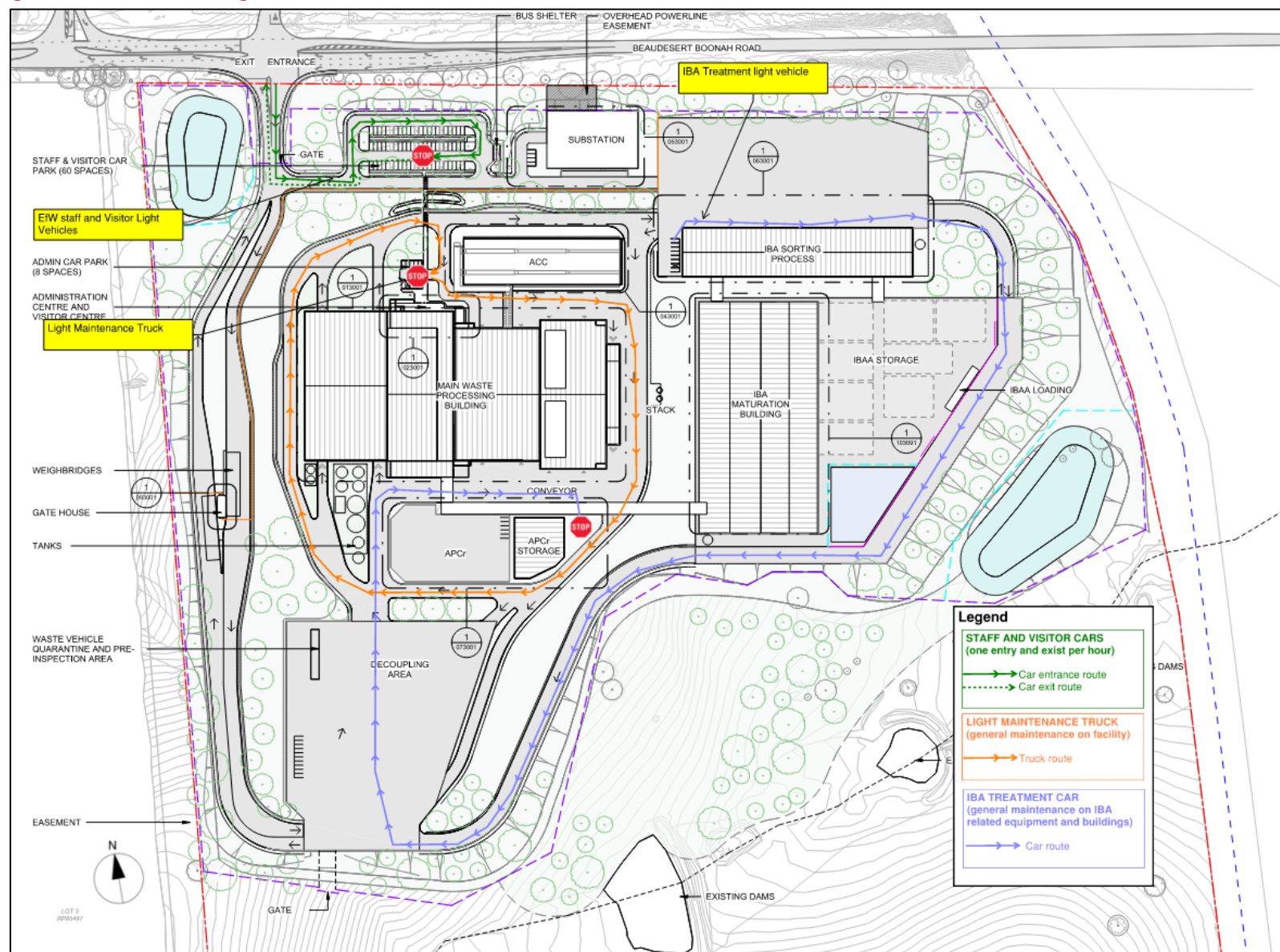
Table 38: Origins and destinations of trucks within the site

Trucks	Travel path (indicative)
Types 1B, 2 and 3 Waste trucks ¹	Step 1: Truck loaded – Travel from site entrance to weighbridge Step 2: Travel through the designated decoupling area into the Reception Hall Step 3: Truck empty – Type 1B trucks are side tippers, Type 2 and 3 are rear ejecting tippers Step 4: Exit Reception Hall Step 5: Trucks exit via weighbridge
Type 3 Delivery trucks - Quicklime/Activated Carbon/Ammonia / Diesel / Sodium Hydroxide ²	Step 1: Truck loaded – Travel from site entrance to weighbridge Step 2: Travel from weighbridge to Flue Gas Treatment (FGT) hall for delivery of consumables Step 3: Travel from FGT hall all the way around the site to the exit via weighbridge
Air Pollution Control residue (APCr) ⁴	Step 1: Truck loaded – Travel from site entrance to weighbridge Step 2: Drive to APCr outdoor area ~ 2 minutes Step 3: Unload residuals ~ 5 minutes Step 4: Travel from APCr outdoor area to exit via weighbridge
Air Pollution Control residue (APCr) ⁴ -light vehicle/forklift ⁵	Step 1: Truck empty – Travel from site entrance to weighbridge then to APCr outdoor area for collection of residues Step 2: Truck loaded – Travel from APCr outdoor area to the weighbridge Step 3: Truck loaded – Travel from weighbridge to site exit
IBAA/ recycled material ³	Step 1: Truck empty – Travel from site entrance to weighbridge, circulating around complete site to IBA sorting area for collection of ash Step 2: Truck loaded – travel from IBA sorting area to weighbridge Step 3: Truck loaded – Travel from weighbridge to site exit
Staff and Visitor Vehicles	Step 1: Staff and visitor vehicles arrive in the visitor carpark Step 2: Staff and visitors walk via designated path to the administration and visitor building Step 3: Staff and visitors return to visitor carpark and exit the facility

Trucks	Travel path (indicative)
Notes: 1. Waste Type 1B, 2 and 3 truck route shown in green in Figure E-1. 2. Consumables truck route shown in blue in Figure E-1. 3. IBAA and recycled materials truck route shown as pink in Figure E-2. 4. APCr semi-trailer path shown in brown in shown in Figure E-2. Dashed brown line shows the transport truck between the FGT Hall and the APCr outdoor area. 5. For modelling purposes it is assumed that the APCr light transport truck/fork-lift will make a return trip between the FGT hall and APCr outdoor area 10 times per hour	

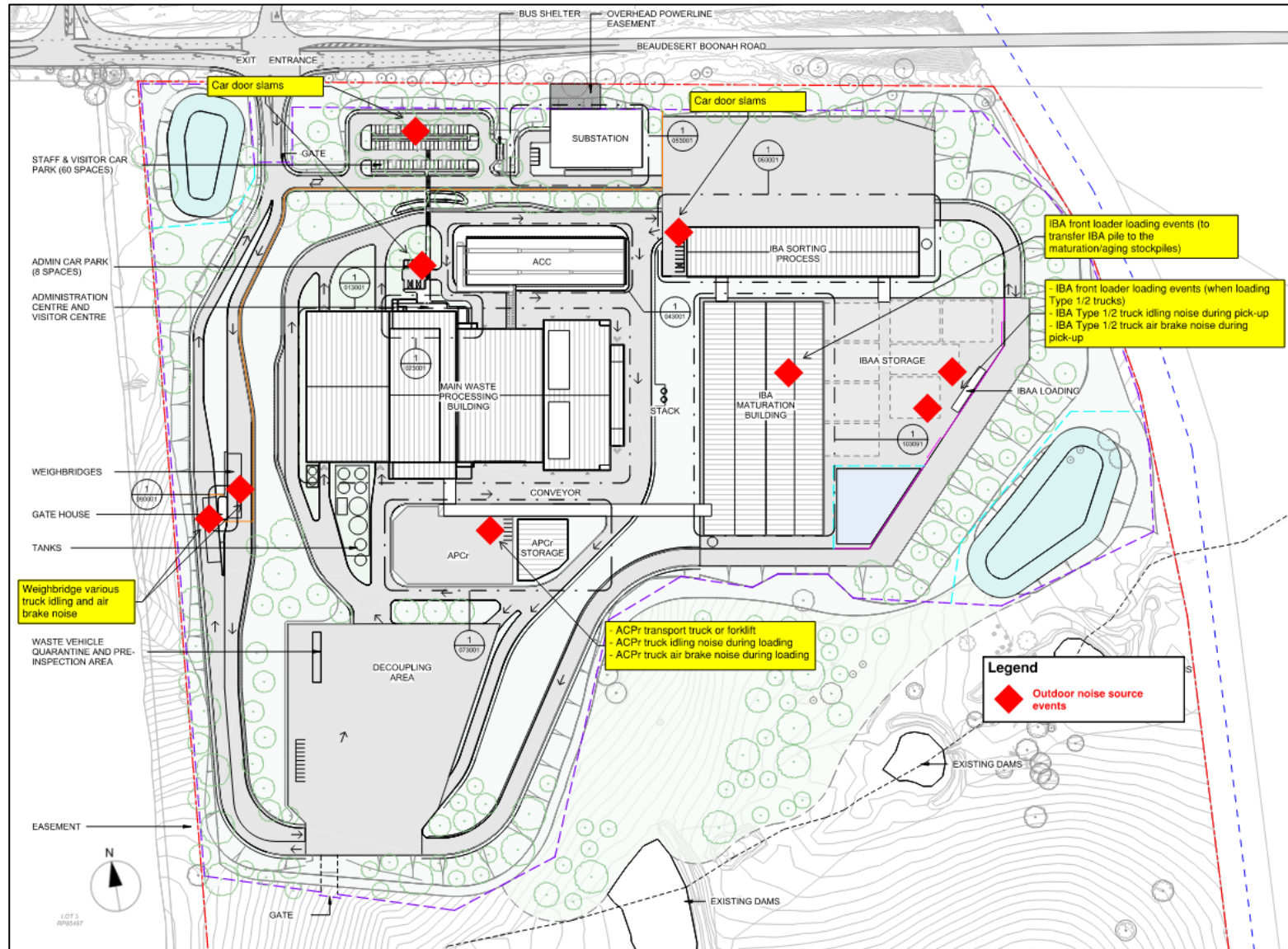
The expected travel routes for the light vehicles/trucks is provided in Figure E-3.

Figure E-3: Travel route of light vehicles and trucks



An overview of assumed locations of stationary vehicular noise sources/events are illustrated in Figure E-4 below.

Figure E-4: Identification of key stationary vehicular outdoor noise sources/events



Appendix F

Sound power levels and transmission losses

F.1 Sound transmission losses used in noise modelling

The octave band transmission loss data is shown below in Table F-1 and is supplementary data to Table 22 of this report.

Table F-1: Transmission loss spectrum estimated for noise modelling

Item	Weighted sound reduction index (R_w)	Octave band transmission losses (dB)							
		Octave band centre frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Composite metal cladding system <i>For eg. 0.8 mm thick steel with mass loaded vinyl¹, 1.2 mm thick steel¹ or similar</i>	29	8	12	16	21	25	30	33	35
200 mm concrete wall, 1700 kg per cubic metre (typically up to 5-6m datum) ¹	54	42	41	41	50	58	66	72	77
Insulated metal roof panel (non-mitigated) <i>For eg. Kingspan KS1000 RW/30 with no additional acoustic lining² or similar</i>	24	14	17	20	23	23	23	41	41
Insulated metal roof panel (mitigated) <i>For eg. Kingspan KS1000 RW/80 - Insulated Rooftile Panel with 50 mm thick acoustic lining (40 – 60 kg/m³ density)² or similar performing product</i>	32	18	19	22	29	31	40	58	49
Polycarbonate 70 mm semi-transparent <i>For eg. Danpatherm systems or similar with acoustic attenuation rating of 33 dB^{1,3}</i>	33	27	32	36	30	31	41	48	54
Facade openings (i.e. truck entrance or louvre) (<i>untreated / no attenuation, assumes roller doors are open</i>)	1	0	0	0	0	0	0	0	0
Treated acoustic louvres, <i>for eg. Soundbar Louvres SBL1² or similar</i>	14	4	7	9	13	14	12	12	8
Closed shutter doors (not used for truck entrance/exits) ⁴	18	5	7	13	18	21	17	16	20
Notes: 1. Thickness and build-up is indicative. Performance based on Strutt spectral transmission loss prediction software. 2. Based on manufacturer data 3. Based on nominal available products such as Danpatherm systems with a minimum broadband acoustic attenuation rating of 33 dB and Strutt spectral transmission loss prediction software 4. A roller shutter door product with acoustic rating of R_w 24 is required to be installed. R_w 18 rating modelled is based on Arup's experience with realistic performance of shutter doors (installation defects, flanking noise paths, general wear and tear).									

F.2 Façade openings in noise modelling

The following openings (truck access and louvres) have been identified based on discussion with the design team and review of the architectural building elevation and roof drawings:

- A1 Reception hall:
 - 4x open roller shutter doors for truck arrival and departure (2x located on south façade and 2x located on north façade)
 - 57 m wide by 75 cm tall louvre running above the 6 m high concrete façade datum of west facade
- B1 Waste bunker:
 - No openings modelled
 - Note that the south façade penetration for the IBA conveyor to pass through is assumed sealed by the IBA metal enclosure.
- C1/C2 Boiler Halls:
 - Multiple small louvres approximately 3% of the C1 south metal cladding façade area
 - Multiple small louvres approximately 3% of the C2 north metal cladding façade area
 - Roof exhaust louvres on both C1 and C2
- D1 Flue Gas Treatment Hall:
 - Multiple small louvres approximately 0.5% of the metal cladding north façade area
 - Multiple small louvres approximately 0.5% of the metal cladding south façade area
- D1 Flue Gas Treatment Hall (Silo extension)
 - 2x open roller shutter doors for truck arrival and departure (1x located on south façade and 1x located on north façade)
 - Multiple small louvres approximately 3% of the metal cladding north façade area
 - Multiple small louvres approximately 3% of the metal cladding south façade area
- IBA – Incinerator Bottom Ash sorting process building:
 - No openings modelled
 - Note that the south façade penetration for two secondary IBA conveyor to pass through is assumed sealed by the IBA metal enclosures.
- IBA – Incinerator Bottom Ash storage building
 - Assumed fully open on the east side
 - Note that the west façade penetration for the main IBA conveyor to pass through is assumed sealed by the IBA metal enclosure
 - Note that the north façade penetration for the secondary IBA conveyor to pass through is assumed sealed by the IBA metal enclosure

Generally, the lower façade of all buildings is a 5-6 m tall concrete wall. The visually semi-transparent cladding is a solid and continuous polycarbonate material and not acoustically transparent. Locations of semi-transparent cladding have been identified based on discussion with the architect and review of the architectural drawings:

- B1 Waste bunker:
 - Semi-transparent cladding wrapping around the north-west corner of the façade
- C1/C2 Boiler Halls:
 - Semi-transparent cladding on the C1 south façade
 - Semi-transparent cladding on the C2 north façade just above the ACC condensation pipe façade penetrations
- D1 Flue Gas Treatment Hall:
 - Semi-transparent cladding on the north façade
 - Semi-transparent cladding on the south façade

For clarity, **closed** roller shutter access doors have been applied in the noise model for the following buildings:

- C1/C2 Boiler Halls:
 - 2x closed shutter doors on the C1 south façade
 - 2x closed shutter doors on the C2 north façade
- D1 Flue Gas Treatment hall:
 - 2x closed shutter doors on north façade
 - 2x closed shutter doors on south façade
- D1 Flue Gas Treatment hall (Silo extension):
 - 1x closed shutter door on east façade
- IBA – Incinerator Bottom Ash sorting process building:
 - 3x closed shutter doors for truck access on north façade

F.3 Sound levels used in operational noise modelling

Table F-2: Sound levels in octaves from 63 Hz – 8 kHz for noise modelling, dB re 20µPa

Equipment	Metric	Broadband sound levels, dBA	Sound Power or Sound Pressure Levels, dB(A)							
			(L _w dB re 1 pW, L _p dB re 20 µPa)							
			63	125	250	500	1k	2k	4k	8k
Moving Sources (modelled as stationary line sources)										
Truck Type 1B + Type 2 (i.e. 33t B-double, 21t semi-trailer) - L _w 10 km/h (20 min outdoor moving time through facility per truck)	L _{eq} (1hour)/m	65	68	64	61	60	62	57	53	47
Truck Type 3 (i.e. 9t Compactor/front loader or APCr transport truck/forklift) - L _w 10 km/h (20 min outdoor moving time through facility per truck)	L _{eq} (1hour)/m	60	66	57	58	55	54	53	47	41

Equipment	Metric	Broadband sound levels, dBA	Sound Power or Sound Pressure Levels, dB(A)							
			(L _w dB re 1 pW, L _p dB re 20 µPa)							
			63	125	250	500	1k	2k	4k	8k
Light vehicle (car/ute) 10 km/h - L _w 10 km/h (30 min outdoor moving time through facility per hour)	L _{eq} (1hour)/m	38	54	42	39	33	32	31	27	22
Light rigid maintenance vehicles - L _w 10 km/h (30 min maximum outdoor moving time through facility per peak hour)	L _{eq} (1hour)/m	61	68	59	60	57	56	55	49	43
Light APCr vehicle/forklifts - L _w 10 km/h (total assuming 10x 2min trips per hour)	L _{eq} (1hour)/m	60	66	57	58	55	54	53	47	41
Stationary Sources										
ACC - L _w	L _{eq} (1hour)	88 (per fan) ¹	92	92	88	85	82	75	70	66
Main Transformer - L _w	L _{eq} (1hour)	99	102	104	99	99	93	88	83	76
Auxiliary Transformers ² (incl. 2x units, located in substation area) - L _w	L _{eq} (1hour)	69	72	74	69	69	63	58	53	46
Exhaust stack (incl. 2x flue) - L _w	L _{eq} (1hour)	101	119	111	96	79	74	76	87	88
Exhaust stack ³ mitigated (incl. 2x flue) - L _w	L _{eq} (1hour)	96	114	106	91	74	69	71	82	83
Radiator coolers (incl. bank of 8 fans) - L _w	L _{eq} (1hour)	89 (per bank)	89	92	89	88	83	79	73	70
IBA extraction mechanical ventilation fan (non-mitigated) ⁵ - L _w	L _{eq} (1hour)	109	101	100	108	107	105	101	96	90
IBA extraction mechanical ventilation fan (mitigated) ⁵ - L _w	L _{eq} (1hour)	83	96	90	88	73	67	70	74	74
IBA conveyor ⁶ (enclosed and mitigated) - L _w	L _{eq} (1hour)/m	83	87	88	85	81	78	72	67	58
IBA conveyor motor ⁷ exposed (non-mitigated) - L _w	L _{eq} (1hour)/m	96	86	92	93	93	93	86	80	75
IBA conveyor motor ⁷ enclosed (mitigated) - L _w	L _{eq} (1hour)/m	85	81	87	88	88	88	81	75	70
Truck braking - L _w (note: based on airbrake event with L _{max} 106 dBA)	L _{eq} (1hour)	65	67	63	58	54	55	61	57	57
Truck idling (constant) - L _w	L _{eq} (1hour)	95	98	96	88	90	91	90	81	73
	L _{eq} (1hour)	81	83	81	73	75	76	75	66	58

Equipment	Metric	Broadband sound levels, dBA	Sound Power or Sound Pressure Levels, dB(A)							
			(Lw dB re 1 pW, Lp dB re 20 µPa)							
			63	125	250	500	1k	2k	4k	8k
<i>Type 1B, 2 and 3 with a 2 min time correction (weighbridges)</i> <i>Type 1B and 2 with a 10 min time correction for loading event</i>	L _{eq} (1hour)	88	90	88	80	82	83	82	73	65
Car door slam (at parking areas) – L _w	L _{eq} (1hour)	75	69	70	71	74	69	67	63	63
Front loader mobile plant ⁸ (IBAA sorting/loading events, ACPr delivery events) – L _w – 3x impulsive loading noise events per hour	L _{eq} (1hour)	89	99	91	90	84	83	81	78	69
Emergency diesel generator (total from attenuated air-intake/discharge and attenuated exhaust flue) – L _w	L _{eq} (1hour)	115	98	100	107	107	107	107	105	113
Building sources⁹										
A1 - Reception Hall	Internal Lp	85	92	84	83	81	81	77	71	65
B1 - Waste Bunker	Internal Lp	91	98	90	89	87	87	83	77	71
C1 - Boiler hall	Internal Lp	80	83	80	81	77	74	71	68	63
C1 - EDG room along south façade (i.e. with attenuated air intake / discharge louvres) ¹⁰	Internal Lp	85	76	76	76	85	81	74	67	54
C2 - Boiler hall (including turbine)	Internal Lp	85	88	85	86	82	79	76	73	68
D1 – Flue Gas Treatment hall	Internal Lp	85	84	81	81	78	82	77	75	66
IBA1 – Incinerator Bottom Ash sorting process building	Internal Lp	85	92	89	80	80	81	79	68	60
Notes: 1. Based on discussions with Ramboll and data supplied on previous Melbourne Energy and Resource Centre (MERC) project for A-frame fan configuration. There are 14x ACC fans proposed in A-frame configuration on the BERC project. 2. Noise levels for auxiliary transformers in the substation switchyard area conservatively include noise from corona discharge during damp conditions. Transformer noise spectrum shape based on empirical Arup database. 3. Requires silencer applied to the ID fan to ensure mitigated sound power levels are achieved at stack termination. Note that the stacks have been modelled assuming spherical radiation from point sources with a sound pressure level of 85 dB(A) at 1m away from the 2 flues operating simultaneously and is considered to be conservative for off-axis propagation toward the receptors. During future detailed design, potential impacts of any stack directivity should be considered to further refine the Lw limit and mitigation required. 4. Each boiler hall (C1, C2) has 48 radiator cooler fans on the roof (i.e. 6 banks of 8), for total of 96 fans (i.e. 12 banks of 8) running simultaneously in the noise assessment. 5. IBA extraction MVF outlet terminates on both the north and south facades of the boiler hall (C1, C2), one per side, at roughly 3 metres above ground. For the mitigated option, the attenuator is located internally to the boiler hall building prior to termination at each facade. 6. Enclosed conveyor noise data from Arup database. This applies to the main IBA conveyor belt transporting ash from the waste bunker to the IBA storage building, and the shorter conveyors between the IBA maturing building to the IBA sorting building (see										

Equipment	Metric	Broadband sound levels, dBA	Sound Power or Sound Pressure Levels, dB(A)							
			(Lw dB re 1 pW, Lp dB re 20 µPa)							
			63	125	250	500	1k	2k	4k	8k

Figure 4 for IBA conveyor locations). The penetration in the north waste bunker façade is assumed fully enclosed by the outer metal casing of the IBA conveyor. Resilient connections between the metal enclosure and conveyor system are recommended to minimise radiated noise. Arup recommends that measurements of existing enclosed conveyors are conducted during future detailed design stages at similar operational facilities to understand if mitigation is required.

7. The conveyor belt motors are assumed to be located within enclosed buildings (waste bunker and IBA sorting building) and contributes to the specific internal noise level of these buildings. The only exception to this is an expected conveyor motor located adjacent to the 90-degree conveyor transition just south of the waste bunker. Noise data for an exposed conveyor drive motor is based on measurements in the Arup database, and the mitigated and enclosed option based on expected achievable levels from an acoustically rated enclosure.

8. Based on DEFRA database for Item C33 Front End Loader 190 kW 25 t (loading lorry event), but with a +2 dBA 'just noticeable' impulsive noise adjustment/penalty applied per EP Noise and NMM. Overall activities on site are generally not expected to contain impulsive noise however for conservative purposes of assessment we have assumed there may be some 'just detectable' for the truck loading events.

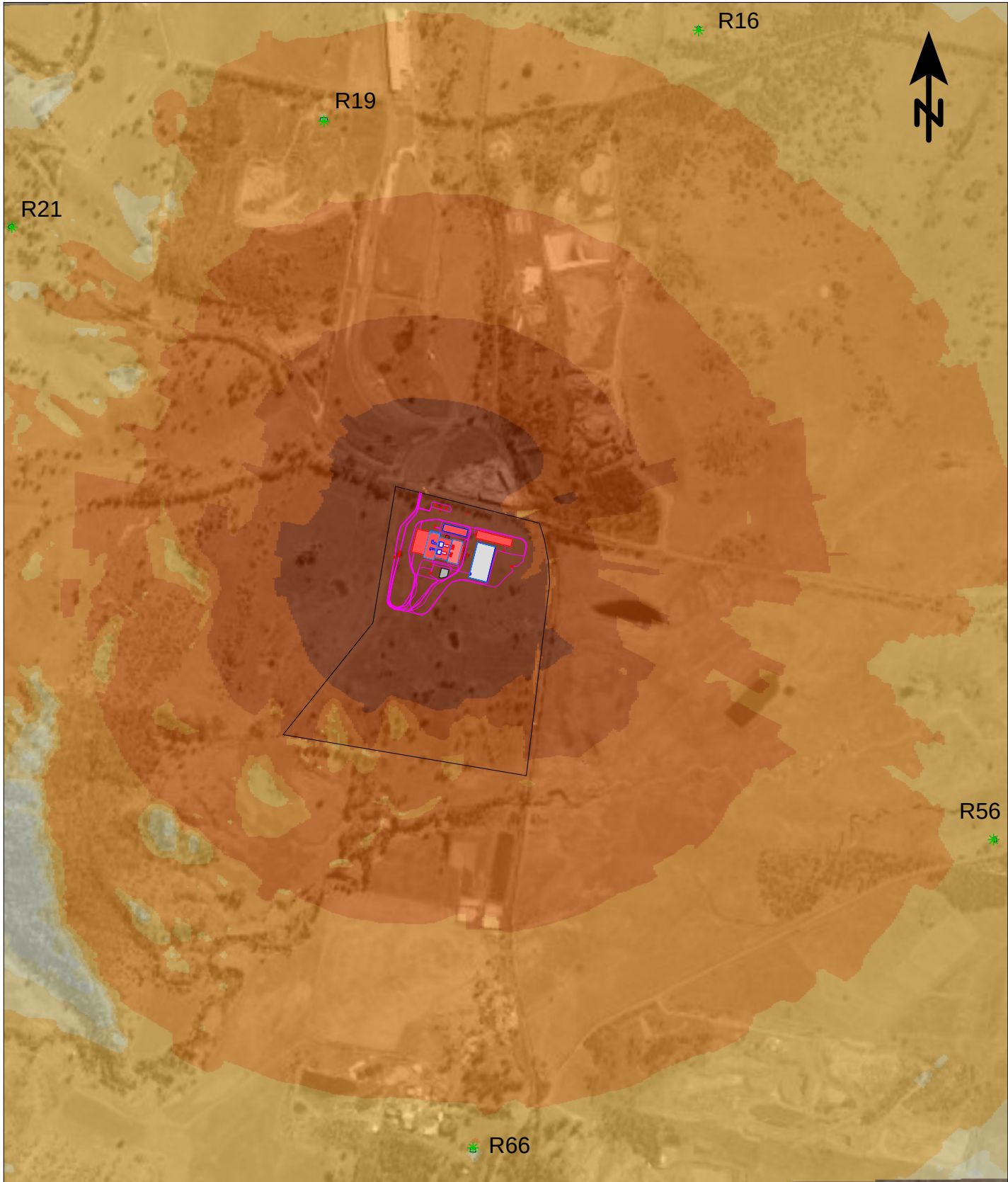
9. Max sound pressure levels (dBA) of each space provided by Ramboll. These are considered as the reverberant sound pressure level in each space.

10. The assumed internal Lp of 85 dBA will require refinement during detailed design when intake/discharge paths, EDG room layout and generator selection is confirmed. Upgraded attenuators / acoustic louvres might be required if internal Lp of the space containing the EDG is determined to be higher than assumed and is subject to further design development.

Appendix G

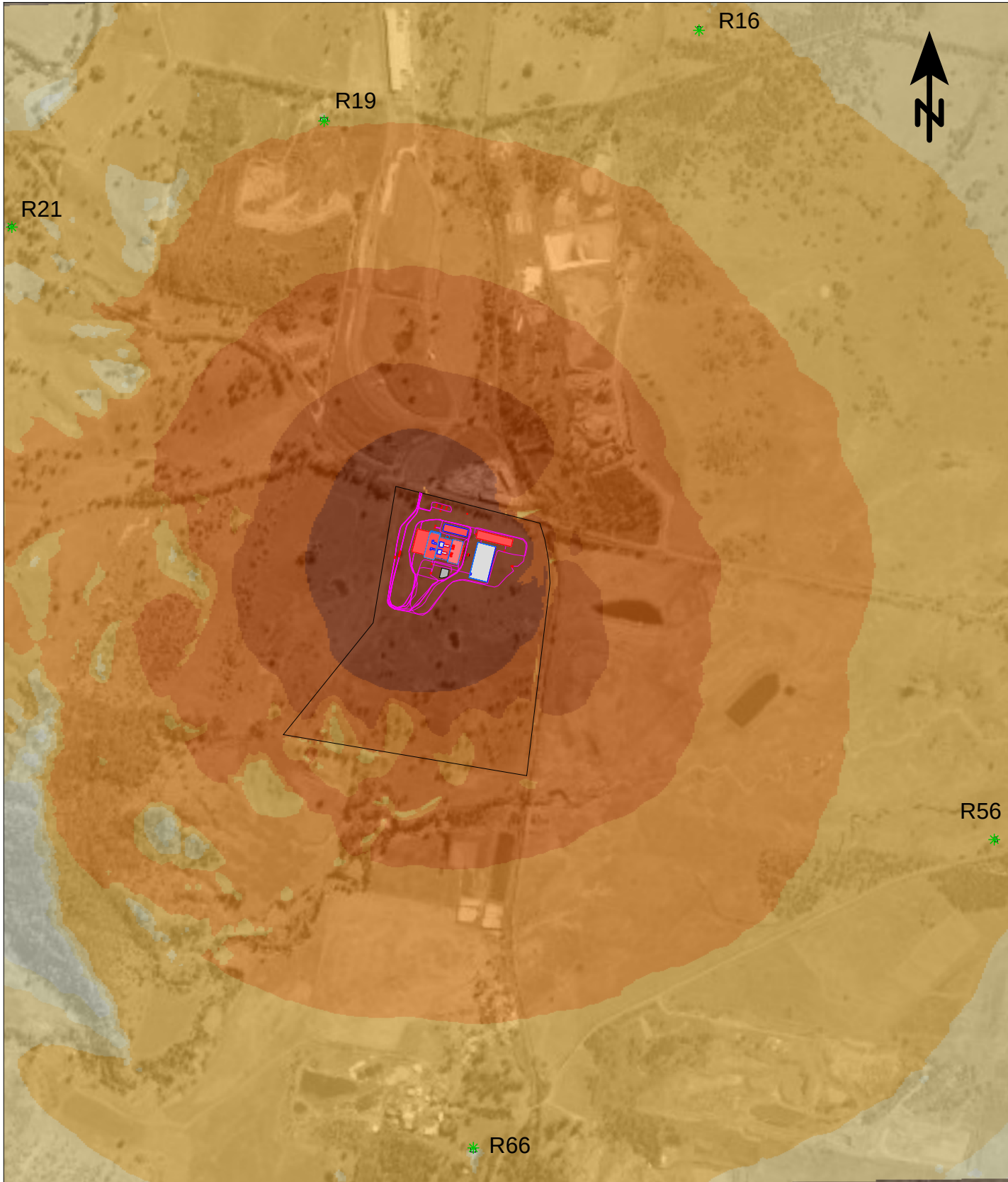
Noise contours

G.1 Day – operational noise contours (no mitigation measures)



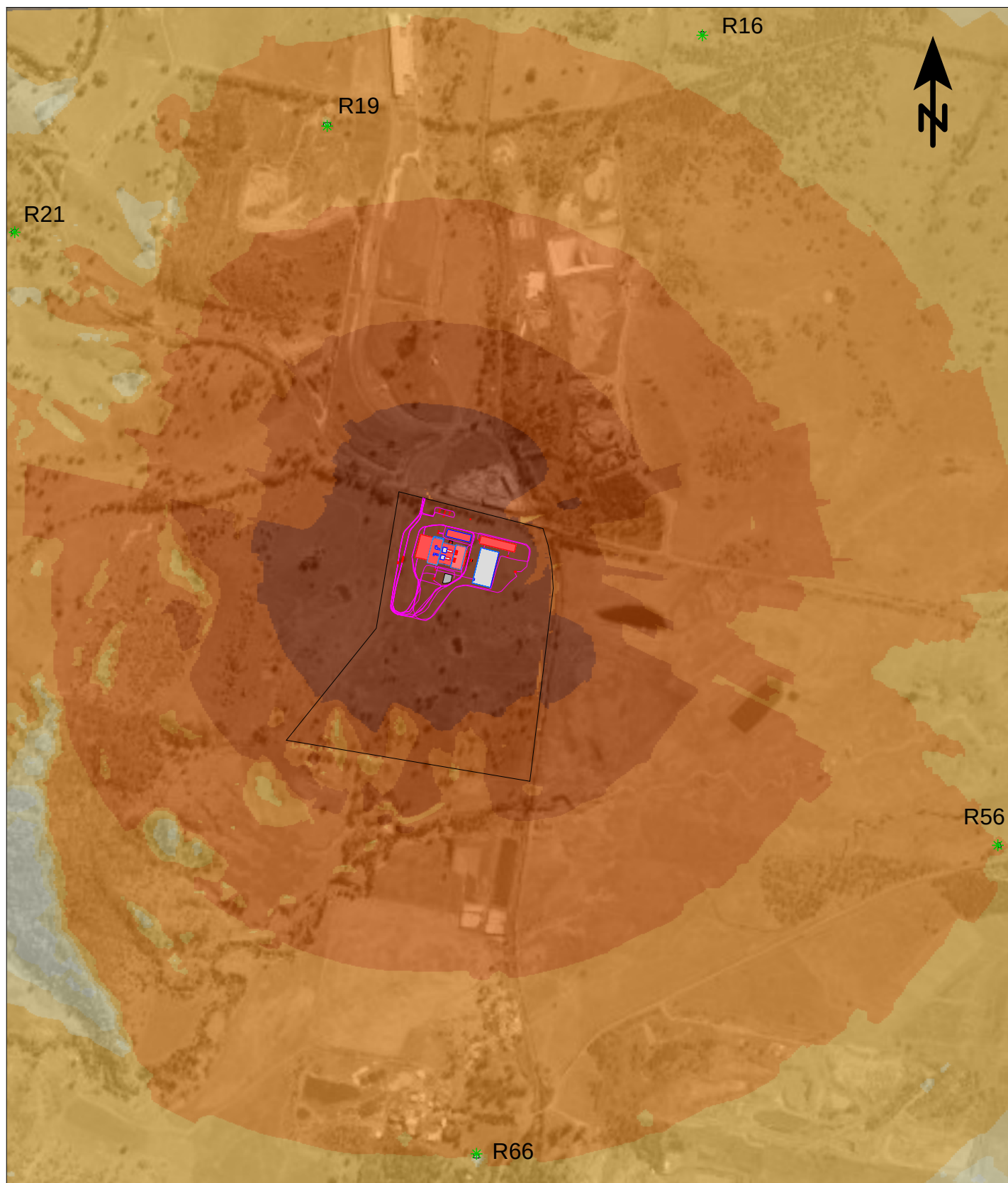
Signs and symbols - Site area - Roof parapet/shed wall - Industrial building - Outdoor line source - Outdoor area source - Point receiver - Point Source	Noise Levels Leq,adj,1hr dB(A) >= 50 45 - 50 40 - 45 35 - 40 30 - 35 25 - 30 20 - 25 < 20	ARUP Cleanaway	BERC Facility Noise Contour Map Non-mitigated (Day) Project No. 29368305 Length scale 1:20564 0 200 400 800 1200 1600 m Date: 19/08/2025 Project engineer: Brook Stringer
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G.2 Day – operational noise contours (with mitigation measures)



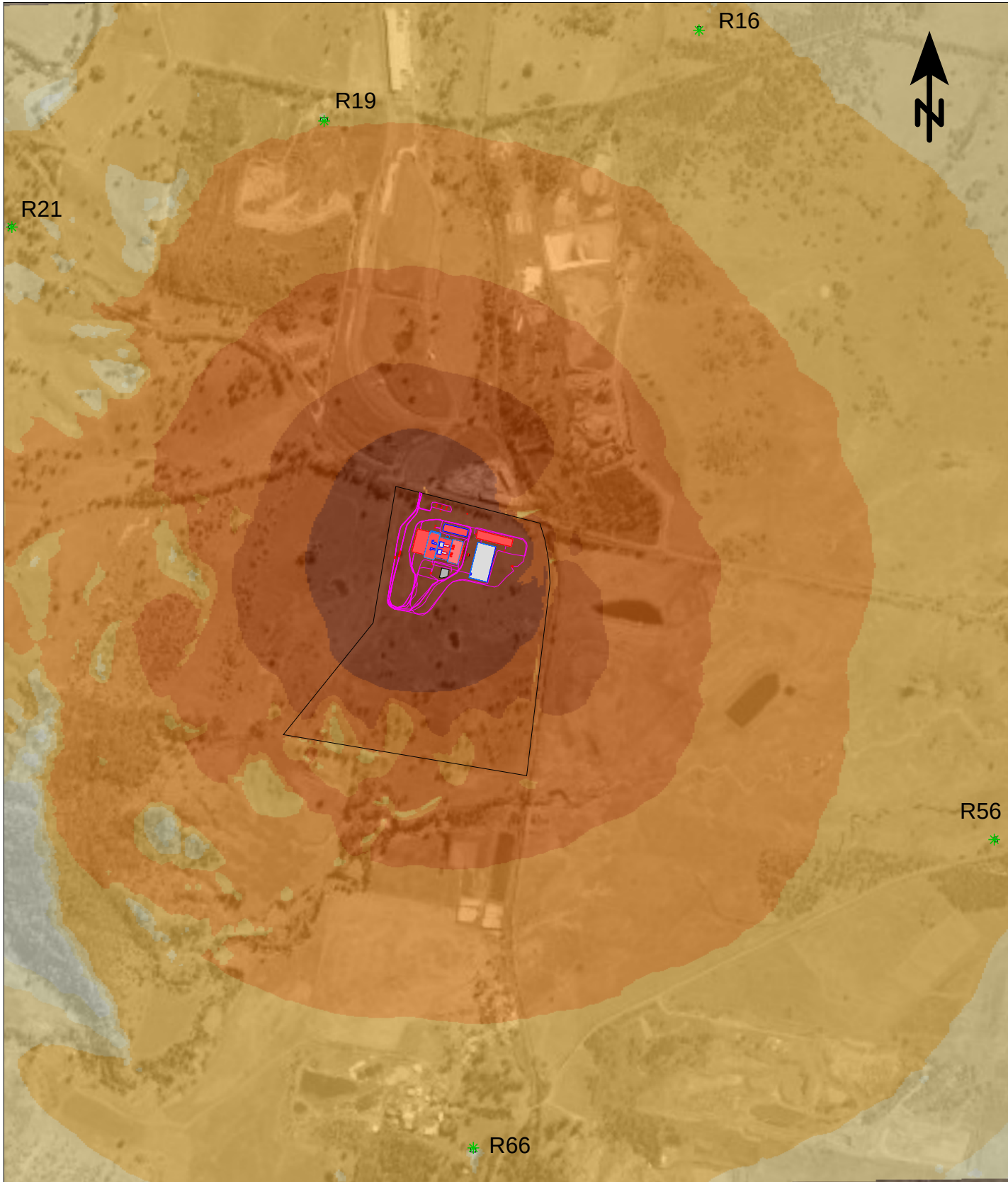
Signs and symbols Site area Roof parapet/shed wall Industrial building Outdoor line source Outdoor area source * Point receiver Point Source	Noise Levels Leq,adj,1hr dB(A) >= 50 45 - 50 40 - 45 35 - 40 30 - 35 25 - 30 20 - 25 < 20	ARUP Cleanaway	BERC Facility Noise Contour Map Mitigated (Day) Project No. 29368305
			Length scale 1:20564 020040080012001600 m
			Date: 19/08/2025 Project engineer: Brook Stringer

G.3 Day with EDG testing – operational noise contours (no mitigation measures)



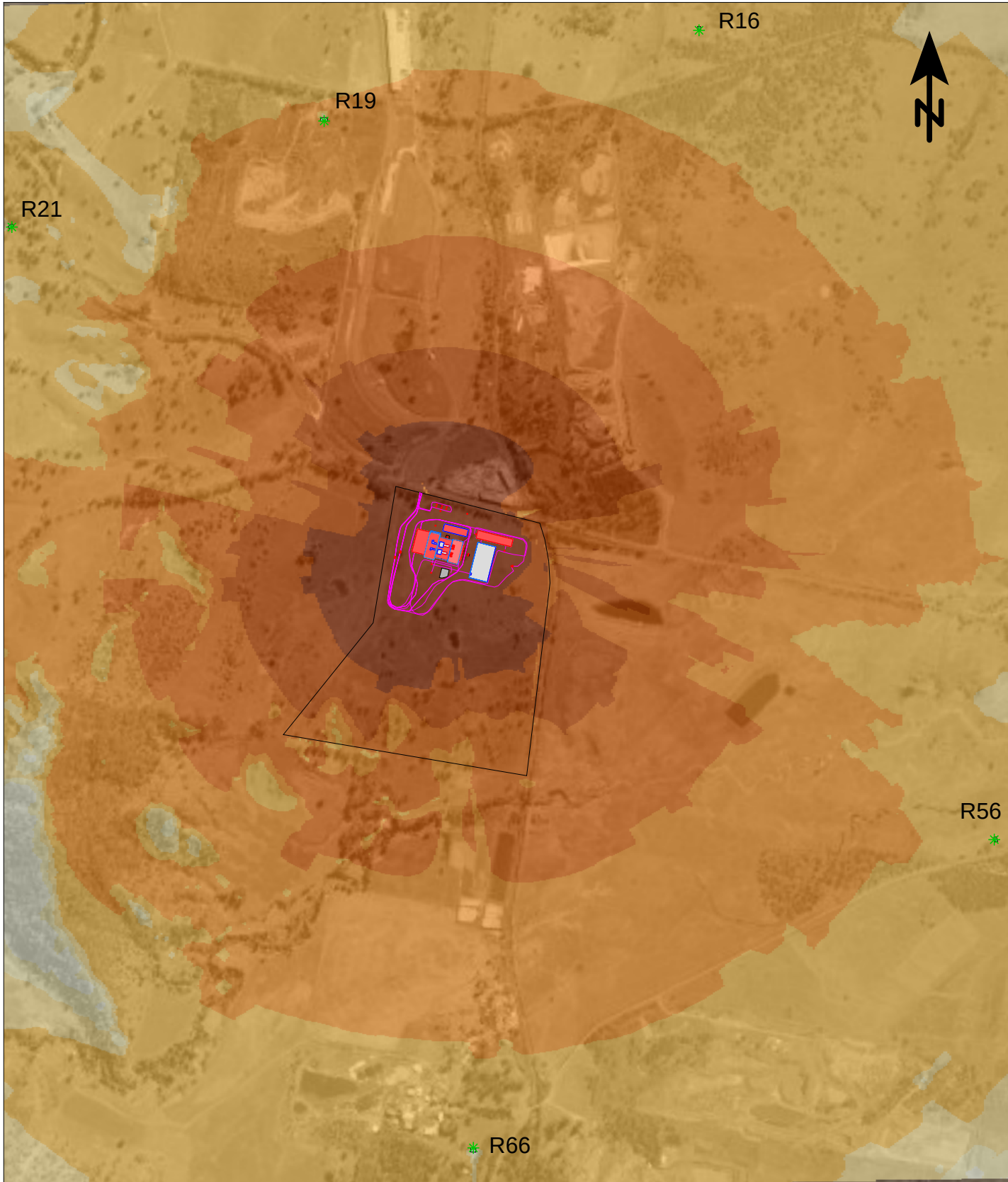
Signs and symbols - Site area - Roof parapet/shed wall - Industrial building - Outdoor line source - Outdoor area source - Point receiver - Point Source	Noise Levels Leq,adj,1hr dB(A) >= 50 45 - 50 40 - 45 35 - 40 30 - 35 25 - 30 20 - 25 < 20	ARUP Cleanaway	BERC Facility Noise Contour Map Non-mitigated (Day with EDG Testing) Project No. 29368305 Length scale 1:20564 0 200 400 800 1200 1600 m Date: 19/08/2025 Project engineer: Brook Stringer
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G.4 Day with EDG testing – operational noise contours (with mitigation measures)



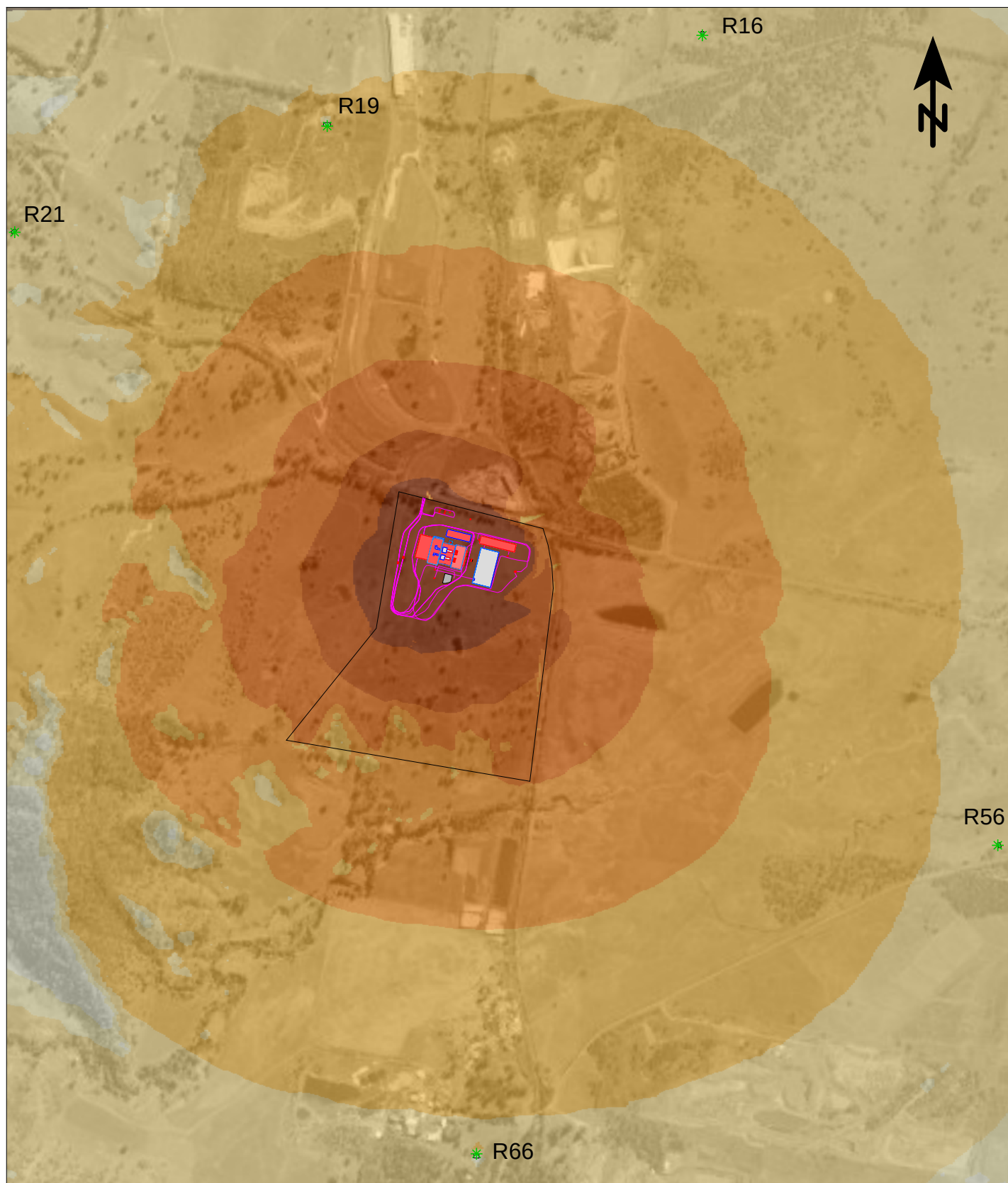
Signs and symbols Site area Roof parapet/shed wall Industrial building Outdoor line source Outdoor area source Point receiver Point Source	Noise Levels Leq,adj,1hr dB(A) >= 50 45 - 50 40 - 45 35 - 40 30 - 35 25 - 30 20 - 25 < 20	BERC Facility Noise Contour Map Mitigated (Day with EDG Testing) Project No. 29368305	
ARUP			
Cleanaway	Length scale 1:20564 0 200 400 800 1200 1600 m		
	Date: 19/08/2025 Project engineer: Brook Stringer		

G.5 Evening – operational noise contours (no mitigation measures)



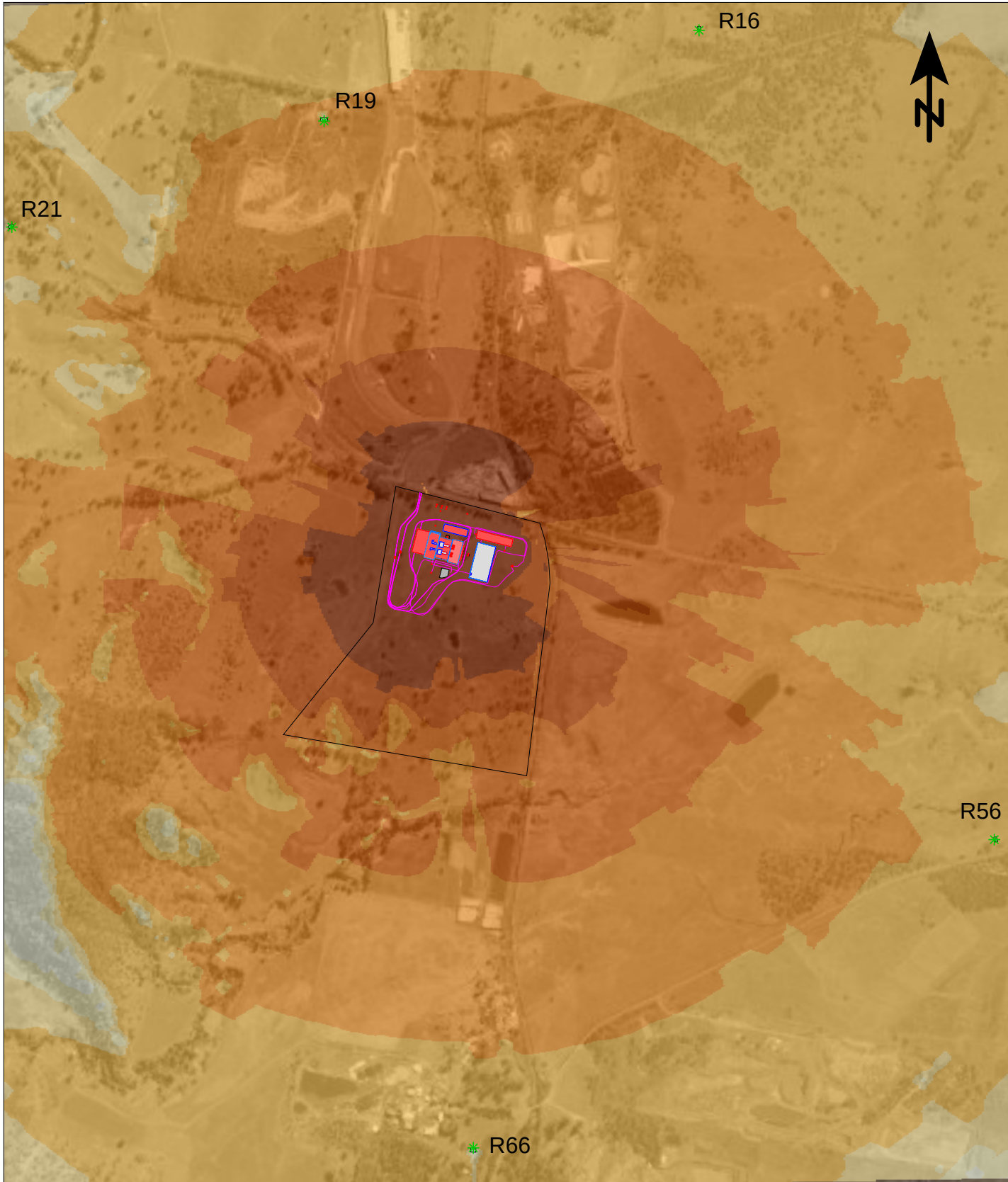
Signs and symbols Site area Roof parapet/shed wall Industrial building Outdoor line source Outdoor area source Point receiver Point Source	Noise Levels Leq,adj,1hr dB(A) >= 50 45 - 50 40 - 45 35 - 40 30 - 35 25 - 30 20 - 25 < 20	BERC Facility Noise Contour Map Non-mitigated (Evening) Project No. 29368305	
		ARUP Cleanaway	Length scale 1:20564 0 200 400 800 1200 1600 m
			Date: 19/08/2025 Project engineer: Brook Stringer

G.6 Evening – operational noise contours (with mitigation measures)



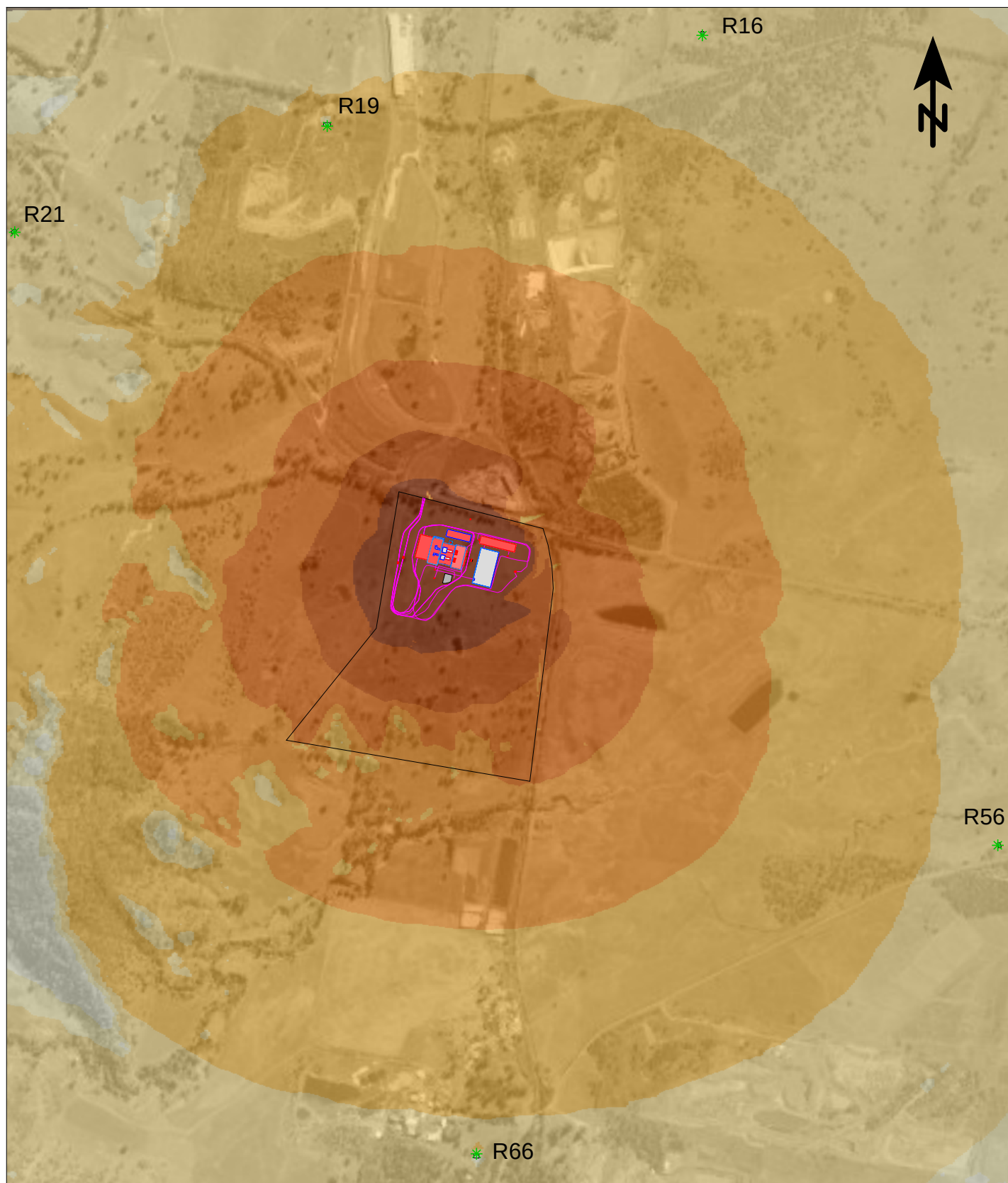
Signs and symbols - Site area - Roof parapet/shed wall - Industrial building - Outdoor line source - Outdoor area source - Point receiver - Point Source	Noise Levels Leq,adj,1hr dB(A) >= 50 45 - 50 40 - 45 35 - 40 30 - 35 25 - 30 20 - 25 < 20	ARUP Cleanaway	BERC Facility Noise Contour Map Mitigated (Evening) Project No. 29368305 Length scale 1:20564 0 200 400 800 1200 1600 m Date: 19/08/2025 Project engineer: Brook Stringer
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G.7 Night – operational noise contours (no mitigation measures)



Signs and symbols Site area Roof parapet/shed wall Industrial building Outdoor line source Outdoor area source Point receiver Point Source	Noise Levels Leq,adj,1hr dB(A) >= 50 45 - 50 40 - 45 35 - 40 30 - 35 25 - 30 20 - 25 < 20	ARUP Cleanaway	BERC Facility Noise Contour Map Non-mitigated (Night) Project No. 29368305 Length scale 1:20564 020040080012001600 m Date: 19/08/2025 Project engineer: Brook Stringer
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G.8 Night – operational noise contours (with mitigation measures)



Signs and symbols - Site area - Roof parapet/shed wall - Industrial building - Outdoor line source - Outdoor area source - Point receiver - Point Source	Noise Levels Leq,adj,1hr dB(A) >= 50 45 - 50 40 - 45 35 - 40 30 - 35 25 - 30 20 - 25 < 20	ARUP Cleanaway	BERC Facility Noise Contour Map Mitigated (Night) Project No. 29368305 Length scale 1:20564 0 200 400 800 1200 1600 m Date: 19/08/2025 Project engineer: Brook Stringer
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Appendix H

Bromelton Compost Manufacturing Facility

H.1 Summary

The Bromelton Compost Manufacturing Facility (BCMF) by operators SOILCO Pty Ltd is a newly proposed organics facility located west of the proposed BERC EfW facility site at 260 Mitchell Road, Bromelton. The material change of use development application for BCMF under the Bromelton State Development Area (SDA) Planning Scheme has been submitted and open for public review as of 4 September 2025.

Appendix O of the SDA application contains the BCMF Acoustic Assessment undertaken by GHD Pty Ltd dated 28 August 2024 and includes noise impact assessment of construction and operational related activities of the facility. Figure 3.1 of the BCMF Acoustic Assessment report outlines the project boundary of the facility (see Figure 7 below in context with BERC EfW facility project boundary in blue).

Figure 7: BCMF facility project boundary (purple) and project boundary of BERC facility (blue)

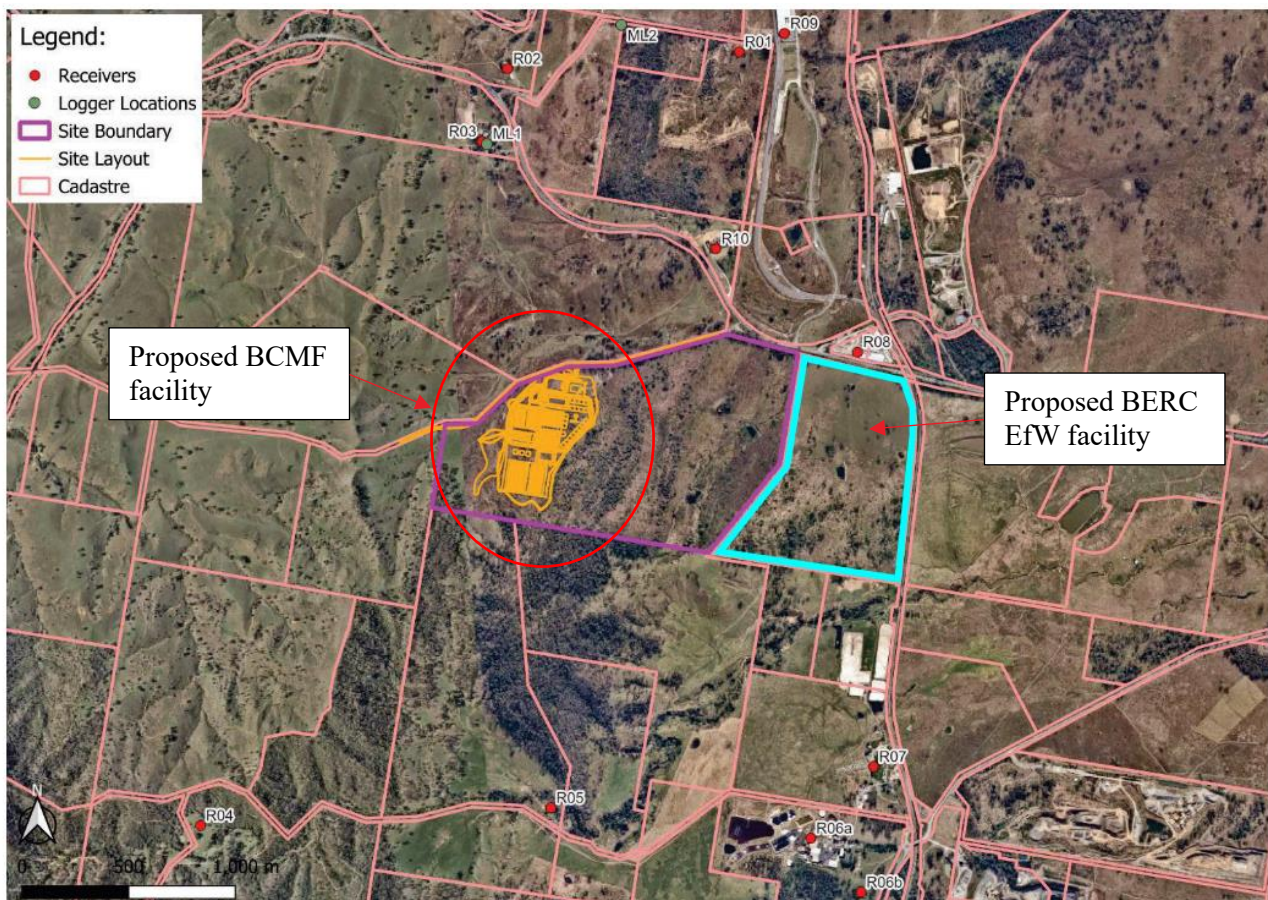


Figure 3.1 Identified receivers and noise logging locations

A summary of BCMF acoustic assessment assumptions are as follows:

- Proposed project includes six construction phases, including the main facility pad/ground slab and building constructions, and construction works related to Mitchell Road
- Proposed operational works include receipt, processing, composting and storage of up to 250,000 tpa of garden, food, wood and manure. Key daily operational noise sources include front loaders, excavators, dump trucks, conveyors, Aerated Static Pile (ASP) fans, pumps, and various plant equipment to prepare, process and sort food / garden organics
- Hours of operation:
 - Staff attended activities: Monday to Friday 6 am – 6 pm, Saturday 6 am – 4 pm, and Sunday/public holidays 9 am – 4 pm.
 - It is noted that two Aerated Static Pile fans will be running 24 hours / 7 days a week.

H.2 Cumulative noise considerations

The following residential noise sensitive receptors have been identified in both the BCMF and BERC EfW noise assessments:

- 140 Tilley Road, Bromelton (R01 BCMF, R19 BERC)
- 2430 Beaudesert Boonah Road Bromelton (R03 BCMF, R21 BERC)²²
- 358 Sandy Creek Road, Bromelton (R06b BCMF, R66 BERC)

The following subsections outline the findings of Arup's review of the BCMF noise assessment with regards to the noise sensitive receptors listed above (referred to herein as *shared receptors*). BERC noise assessment receivers R16 (356 Brabazon Road, Gleneagle) and R56 (149 Sandy Creek Road, Bromelton) were not considered in the BCMF noise assessment.

H.2.1 Construction noise

Due to the early planning stage of both BCMF and BERC EfW facility, it is not possible to predict whether construction noise impacts on the shared receptors will occur from both facilities simultaneously. However, based on preliminary construction phase/equipment assumptions (Section 5.1.2 BCMF acoustic report, and Appendix D.1 in this BERC report), and worst-case construction activity noise predictions from both facilities (Section 5.1.3 BCMF acoustic report, and Section 5.4 in this BERC report), it is unlikely that construction noise criteria established in Table 15 will be exceeded at the shared receptors in the event of simultaneous construction occurring.

Similarly for construction traffic, the BCMF daily construction vehicle numbers of 12 light vehicles and 2 heavy vehicles provided (Section 5.1.4 of the BCMF acoustic report) will not significantly increase existing road traffic noise generated along Beaudesert Boonah Road compared to the thousands of existing vehicles per day and therefore does not change the outcomes discussed in Section 5.6 of this BERC report.

The timing of the construction phases of both facilities should be considered in the future by the selected contractor when developing the detailed construction noise and vibration management plan (CNVMP). See NV01 in Table 17 for further CNVMP considerations.

H.2.2 Operational noise

A preliminary assessment has been undertaken considering operational noise predictions outlined in Section 5.2.4 of the BCMF acoustic report and Section 6.8.2 of this BERC report. The following is a summary of the findings:

- Simultaneous noise contributions from the BCMF have the potential to increase the total predicted noise levels for the following shared receptors (i.e. for BCMF + BERC, versus BERC alone):
 - Night assessment (worst-case 6am – 7am): BERC predictions for R19 and R66 may increase by 1 dBA, and R21 increases by 5 dBA due to cumulative noise contributions from BCMF.
 - Daytime assessment (worst -case 2pm – 3pm): BERC predictions for R21 may increase by 3 dBA due to cumulative noise contributions from BCMF.
 - Periods outside the above worst-case hour noise assessments are anticipated to have a lower cumulative impact on the shared receptors.
- Despite the potential for noise increases as listed above, cumulative noise from BCMF and BERC EfW facility are unlikely to exceed the AQO derived external noise limits of 42 dBA day/evening periods, and

²² Noting that the BERC EfW noise assessment considers receiver R21 as representative worst-case for receiver R20 (15 Tilley Road), and so corresponding R02 BCMF receiver is not further discussed here and does not affect the findings in this appendix.

37 dBA night period (see Table 18) at the shared receptors by a comfortable margin of approximately 3 dBA.

- Background creep noise criteria established in Table 4 of this BERC assessment may be affected only if the BCMF begins to operate prior to the operation of the BERC EfW facility; background levels at the shared receptors would likely increase but may stay the same. A future increase in background levels due to the operation of the BCMF would increase (relax) background creep noise criteria for BERC EfW facility (i.e. if they were to be re-assessed at that point in the future).
 - The development programme of the proposed BCMF is unknown and there is potential the facility might not be built, or could be delayed and built after BERC, or could change its design in other ways. As such, the current BERC noise assessment is considered an appropriate and conservative approach at this point in time (i.e. with background creep criteria derived from existing background levels without the BCMF in operation).
 - If BCMF becomes operational prior to BERC, then it is recommended that Cleanaway reassess/re-measure background noise levels at shared receiver locations *prior to* BERC beginning operations. This revised baseline data will help protect Cleanaway in the future when assessing their sole impact and assist in demonstrating their future compliance with project noise criteria. If BCMF begins operations while BERC is still in a design stage, there may be potential for increased BERC project ‘background creep’ noise criteria to provide value engineering opportunities to reduce some noise mitigation measures.
- Operational road traffic noise guidelines in TMR CoPV1 are aimed at individual land developers for conducting private development assessments of new noise sensitive developments. It is not intended or required for assessment of potential cumulative impacts from separate private developments such as BERC and BCMF. However, a preliminary review of the potential for cumulative noise impact from both BERC and BCMF is estimated to be a combined road noise increase < 1.5 dBA, which is insignificant and Arup consider the outcomes discussed in Section 6.9 of this BERC report to remain valid.

H.3 Conclusion

Worst-case cumulative noise contributions from BCMF and BERC may potentially increase versus the BERC-only predicted noise levels at shared receptors during construction and/or operational scenarios if both facilities are developed and operational at the same time. However, the increased noise levels do not change the BERC mitigation requirements as outlined for construction scenarios (Table 17) and operational scenarios (Table 28) based on reasonable assumptions and information currently available.

Background creep noise criteria may increase (relax) for the BERC noise assessment if BCMF is operational prior to the operation of the BERC EfW facility. It is recommended that background noise levels are reassessed if this occurs.

Appendix I

A-double (Type 1A) Sensitivity Analysis

I.1 Introduction

Type 1 A-double road train trucks (Type 1A trucks) are currently not permitted to operate along the Beaudesert Boonah Road (public access road to the BERC EfW facility) as indicated on the Queensland Government website²³ and therefore have not been assessed in the BERC noise assessment. If Type 1A trucks are eventually permitted to operate along Beaudesert Boonah Road and Cleanaway plan to implement Type 1A trucks for BERC EfW operations, this will likely introduce additional Terberg dolly prime movers and associated Type 1A trailer coupling/decoupling events to the BERC noise assessment.

The purpose of this appendix is to provide a supplementary sensitivity analysis and outline the potential change to the noise assessment if Type 1A trucks were to also be used for BERC EfW facility operations.

I.2 Current assessment

The noise assessment has been undertaken assuming that the largest operational truck type will be Type 1 B-double road trains (Type 1B trucks) as outlined in Section 6.4 and Table 20.

Proposed mitigations provided in Section 6.8.2 and Table 28 are predicted to provide a 2 dB margin below the criteria at the worst-case noise impacted sensitive receptor 140 Tilley Road, Bromelton (otherwise known as receptor R19) during evening and night periods.

I.3 Sensitivity analysis – change to noise assessment with A-double trucks

I.3.1 Changes in on-site traffic movement

The Ramboll Traffic Memo²⁴ provides information regarding two operational scenario options:

1. Only B-double road trains accessing the BERC facility site (current scenario assessed by Arup), and
2. Both A-double and B-double road trains accessing the BERC facility site (potential future scenario).

The 110% maximum continuous rating (MCR) peak hour vehicle arrival numbers for Scenarios 1 and 2 above are provided in Table 23 and Table 21 of the Ramboll Traffic Memo respectively. These numbers for Type 1A and Type 1B trucks are summarised in Table 39 below. Terberg dolly prime movers used for towing decoupled A-double rear trailers have also been included in Table 39 below with assumptions in the table notes. All other heavy and light vehicles numbers that do not change between the scenarios have been omitted from Table 39 below for clarity.

²³ <https://qldglobe.information.qld.gov.au/>

²⁴ REN2021N00922-RAM-ME-00021 (11 June 2025)

Table 39: Difference in truck numbers between two operational scenario options

Vehicle Type	Scenario 1 (currently assessed in noise assessment Table 20) Type 1B			Scenario 2 (Type 1A sensitivity analysis) Type 1A + Type 1B		
	Worst-case hour in noise assessment period			Worst-case hour in noise assessment period		
	Night (6am - 7am)	Day (incl. Day EDG testing) (2pm – 3pm)	Evening (6pm-7pm)	Night (6am - 7am)	Day (incl. Day EDG testing) (2pm – 3pm)	Evening (6pm-7pm)
Residual waste delivery – Type 1A ² (A-double rear-eject articulated truck, ~42t total)	N/A	N/A	N/A	1	4	1
Residual waste delivery – Terberg dolly / tug truck ² (to move 2 nd trailer from Type 1 delivery noted above)	N/A	N/A	N/A	1 ¹	4 ¹	1 ¹
Residual waste delivery – Type 1B ² (B-double side-tipping articulated truck, ~35t total)	2	12	2	1	8	1
Notes: 1. Only Type 1A truck types require decoupling with the aid of a Terberg dolly. The number of Terberg dolly towing events starting and ending at the decoupling zone is based on the number of A-doubles in this scenario, even if undertaken by one Terberg dolly prime mover. 2. For the purposes of noise modelling, Type 1A, Type 1B and Terberg dolly prime movers are all assumed to have the same sound power level and travel at the same speed.						

In addition to the difference in truck numbers indicated in the table above, Scenario 2 modelling also includes 5-minute decoupling and recoupling events where both Type 1A and Terberg dolly prime movers are idling in the decoupling area and produce momentary air brake noise when initially arriving in the decoupling area. This adds stationary noise source events to the overall day, evening and night-time noise assessments in the decoupling area compared to Scenario 1.

I.3.2 Changes in noise assessment

The inclusion of A-double trucks (and associated Terberg dolly prime movers) will result in the following:

- Increase in truck line noise source emissions due to:
 - One additional Terberg dolly prime mover event going to and from decoupling zone for evening and night scenarios, and
 - Four additional Terberg dolly prime mover events going to and from decoupling zone for the day scenario
- Increase of stationary truck noise events including:
 - Additional 5-minute idling events for both Type 1A and Terberg dolly prime movers for each decoupling/recoupling event (i.e. two times the truck numbers provided in Table 39 above)
 - Additional air break noise events for both Type 1A and Terberg dolly prime movers when arriving at the decoupling zone
- Same total number of Type 1 trucks with the same noise source levels and similar routes

The estimated impacts on the noise assessment (mitigated scenario) due to the inclusion of Type 1A and Terberg dolly prime movers is provided in Table 40 below.

Table 40: Estimated impact on noise assessment for mitigated scenario with A-double trucks included

Receiver	Scenario 2 (Type 1A sensitivity analysis)		
	Type 1A + Type 1B		
	Change in predicted (mitigated) noise levels compared to mitigated noise assessment Table 26, dB		
	Night (6am - 7am)	Day (incl. Day EDG testing) (2pm – 3pm)	Evening (6pm-7pm)
R16 - 356 Brabazon Road Gleneagle QLD - GF	0	+1	0
R19 - 140 Tilley Rd, Bromelton QLD 4285 - GF	+1 ¹	0	+1 ¹
R56 - 149 Sandy Creek Rd, Bromelton QLD 4285 - GF	+1	0	+1
Notes:			
1. Increase of 1 dB results reduces the 2 dB margin below noise criteria to 1 dB.			

I.4 Conclusion

With Type 1A trucks incorporated into the assessment, a predicted potential increase of 1 dB to the R19 results (versus base assessment Table 26) reduces the predicted 2 dB margin below noise criteria to 1 dB. However, noise levels would still be predicted to comply with R19 noise criteria during all periods. All other predicted results including at R16 and R56 would still maintain at least a 3 dB margin below the noise criteria for day, evening and night assessments. Subjectively, an increase of 1 dB at a receptor is considered insignificant and is not typically audible as a perceived increase in loudness.

No changes would be required to the proposed noise mitigations as provided in Section 6.8.2.