Moss Vale Plastics Recycling and Reprocessing Facility

Technical Report 2 – Noise and Vibration

Plasrefine Recycling Pty Ltd

24 January 2022

→ The Power of Commitment

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File name	https://projectsportal.ghd.com/sites/pp15_05/recyclingplantfeasib/ProjectDocs/12524108-REP_Noise and Vibration Impact Assessment.docx
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Client name	Plasrefine Recycling Pty Ltd
Project name	Moss Vale Plastics Recycling and Reprocessing Facility
Document title	Moss Vale Plastics Recycling and Reprocessing Facility | Technical Report 2 – Noise and Vibration
Revision version	Rev 1
Project number	12524108

Document status

Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S4	0	R. Browell / M. Velasco	E. Milton		D Gamble		1/11/21
S3	1	R. Browell	M. Velasco		D. Gamble		24/01/22

Executive summary

The proposal

Plasrefine Recycling Pty Ltd (Plasrefine Recycling) ('the proponent') is seeking approval to construct and operate a plastics recycling and reprocessing facility in Moss Vale, NSW ('the proposal').

The proposal involves constructing and operating a plastics recycling and reprocessing facility with capacity to receive up to 120,000 tonnes per year of mixed plastics. The proposal also includes ancillary infrastructure to support the proposal.

The proposal would sort the plastics into different types, and convert the various plastics to flakes and pellets (in the first stage) and produce more advanced products (in the second stage). The combined outputs of both stages of the proposal would help fill the gap in local processing capacity for mixed plastics.

The proposal is State significant development and is subject to approval by the NSW Minister for Planning and Public Spaces under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

This report

This noise and vibration report has been prepared on behalf of Plasrefine Recycling for the proposal to support the environmental impact assessment (EIS) for the proposal and responds to the Secretary's Environmental Assessment Requirements (SEARs) for noise and vibration.

It describes the existing ambient and background noise and vibration and assesses the potential noise impacts associated with the construction and operational phases of the proposal and the increases in noise along the local transport network (during construction and operation) with respect to the following guidelines referred to in the SEARs:

– Operational phase - Noise Policy for Industry (NPfI) (EPA, 2017))
– Construction phase - Interim Construction Noise Guideline (ICNG) (DECC, 2009). The Draft Construction Noise Guideline (DCNG) (EPA, 2021) has also been considered for general guidance only.
– Road transport network - Road Noise Policy (DECCW, 2011)

Recommended mitigation and management measures were identified in response to the impact assessment findings.

Existing environment

The plastics recycling and reprocessing facility site is located approximately 2.8 km north west of the Moss Vale town centre at 74-76 Beaconsfield Road, within the Wingecarribee local government area. The plastics recycling and reprocessing facility site is zoned IN1 General Industrial, and is surrounded by areas zoned, E3 - Environmental Management, IN1 - General Industrial, RU2 - Rural Landscape, RU4 - Primary Production Small Lots and R2 - Low Density Residential.

A total of 164 receivers have been identified within 1.2 km of the proposal site, with 153 receivers classified as residential dwellings and 11 receivers classified as non-sensitive. Residential receivers have been classified into three noise catchment areas (NCAs) based on their proximity to dominant noise sources in the area. Non-residential receivers include the commercial premises of Australian BioResources at 7-9 Lackey Road. The remaining non-residential receivers are industrial sites in the area surrounding the proposal site.

Long-term noise monitoring was undertaken at three locations in the study area representative of the reasonably most affected residences within each NCA. The noise environment was characterised with low background noise levels dominated by natural sounds (wind, trees, birds etc.), the surrounding industry and noise from railway traffic.

Impacts from the proposal during construction

An assessment of potential noise impacts during the construction phase has been undertaken against the ICNG noise management levels (NMLs) during the recommended standards hours for construction work. Without

mitigation measures implemented, the assessment identified the potential for some community impacts from construction noise. These were as follows:

– Site establishment and enabling works - Up to 15 residential receivers are predicted to experience noise levels above the NML
– Ground works and excavation - Up to 19 residential receivers are predicted to experience noise levels above the NML.
– Road access construction - Up to 22 residential receivers are predicted to experience noise levels above the NML
– Construction of the main building - Up to 15 residential receivers are predicted to experience noise levels above NML
– Testing and commissioning - Up to 15 residential receivers are predicted to experience noise levels above NML

Since there is the potential for some community reaction to construction noise, reasonable and feasible work practices have been recommended and all potentially impacted residents will be consulted. It has been determined that mitigation at the source, including silences and mufflers on mobile equipment, is the most reasonable and effective form of mitigation during the construction of the proposal. With the incorporation of these mitigation measures it is expected that received noise levels would be reduced by 5 to 10 dBA. This would reduce the community reaction to construction noise.

No residents have been identified within the safe working distances for vibratory intensive work (e.g rollers, excavation). As such, no adverse (structural damage or human comfort) vibration impacts are anticipated during construction.

Road traffic noise levels during construction are predicted to increase by up to 3.1 dBA along Beaconsfield Road between 12 pm and 1 pm (quietest hour for existing road traffic noise levels). Noise levels are predicted to exceed the noise criteria at 19 m from Beaconsfield Road. Mitigation measures to reduce traffic generated noise during the construction period should be considered.

Impacts from the proposal during operation

An assessment of operational phase noise has been undertaken to predict noise levels at residences for assessment against the NPfI project noise trigger levels for each of the three NCAs. The predictions indicate compliance with the requirements of the NPfI, including compliance with the amenity criteria against which cumulative impacts are assessed, at all sensitive receiver locations.

The mitigation measures to reduce operational noise levels are recommended to be detailed during the design and a draft operational Noise Management Plan (NMP) has been provided to guide this design process.

Operational traffic noise levels at the most-affected residential receivers along the new access road were assessed. The results indicate that operational road traffic noise levels are predicted to comply with the road traffic noise assessment criteria at the nearest residential receivers to the new access road. All other residential receivers further away are predicted to experience lower road traffic noise levels.

Recommended mitigation measures

The following measures are recommended to manage noise and vibration during construction:

– development of a construction noise and vibration management plan
– all feasible and reasonable work practices to minimise noise as listed in Table 6.1

The following measures a recommended to manage potential noise impacts during operation:

– further refinement as the design progresses to minimise the potential for operational impacts and ensure compliance with the requirements of the NPfI (Table 6.2 lists the design features that should be considered during detailed design
– during detailed design and once vendor noise data is made available, the operational noise model should be updated to include manufacturer noise data (third-octave band) for all significant items of plant associated with the plastics recycling and reprocessing facility. Noise modelling should be undertaken during detailed design, using the updated noise model, to ensure the final design complies with the relevant environment protection licence conditions and the requirements of the NPfI.

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Abbreviations and acronyms

Term	Definition
AADT	Annual Average Daily Traffic
AS	Australian Standards
BoM	Bureau of Meteorology
BS	British Standards
CEMP	Construction Environmental Management Plan
CNVG	Construction Noise and Vibration Guideline
CNVS	Construction Noise and Vibration Strategy
DCNG	Draft Construction Noise Guideline
DEC	Department of Environment and Conservation NSW
DECC	Department of Environment and Climate Change NSW
DECCW	Department of Environment and Climate Change and Water NSW
DIN	German Institute for Standardisation (Deutsches Institut für Normung)
EIS	Environmental Impact Assessment
EPA	Environment Protection Agency NSW
HNA	Highly Noise Affected
ICNG	Interim Construction Noise Guideline
NCA	Noise Catchment Area
NML	Noise Management Level
NPfI	Noise Policy for Industry
NSW	New South Wales
NVIA	Noise and Vibration Impact Assessment
OOHW	Out of (standard) Hours Work
RBL	Rating Background Level
RNP	Road Noise Policy
SEARs	Secretary's Environmental Assessment Requirements

Glossary of terms

Term	Definition
A weighting	The human ear responds more to frequencies between 500 Hz and 8 kHz and is less sensitive to very low-pitch or high-pitch noises. The frequency weightings used in sound level measurements are often related to the response of the human ear to ensure that the meter better responds to what you actually hear.
Adverse weather	Weather conditions affecting background noise monitoring. Periods in which precipitation is present or wind speeds are greater than 5 m/s at ground level should be excluded.
Noise-enhancing weather conditions	Weather effects that enhance noise (i.e. wind and temperature inversions) that occur at a site for a significant period of time (i.e. light winds, up to and including 3 m/s, occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment. It is the composite of sounds from many sources, both near and far. This is described using the Leq descriptor.
Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the L90 descriptor.
Compliance	The process of checking that source noise levels meet with the noise limits in a statutory context.
Extraneous noise	Noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
EIS	Environmental Impact Statement
Feasible and reasonable measures	Feasibility relates to engineering considerations and what is practical to build. reasonableness relates to the application of judgement in arriving at a decision, taking into account the following factors: – noise mitigation benefits (amount of noise reduction provided, number of people protected) – cost of mitigation (cost of mitigation versus benefit provided) – community views (aesthetic impacts and community wishes) – noise levels for affected land uses (existing and future levels, and changes in noise levels).
Ground-borne vibration	Vibration transmitted from a source to a receptor via the ground.
Hertz	The measure of frequency of sound wave oscillations per second. 1 oscillation per second equals 1 hertz.
Masking	The phenomenon of one sound interfering with the perception of another sound. For example, the interference of traffic noise with use of a public telephone on a busy street.
Maximum noise event	The loudest event or events within a given period of time. This is generally described using the L_{max} descriptor.
Meteorological conditions	Wind and temperature inversion conditions.
Minimum background level	Minimum background levels are threshold values for rating background levels used to avoid a situation where applying a very low background noise level would not improve the level of protection but may impose very strict requirements on a new development.
Most-affected location	Location(s) that experience (or will likely experience) the greatest noise impact from the construction works under consideration. In determining these locations, existing background noise levels, noise source location(s), distance and any shielding between the construction works (or proposed works) and the residences and other sensitive land uses need to be considered.
Noise management level	The Noise Management Level (NML) as defined as the EPA's ICNG. To be measured and assessed at the property boundary that is most exposed to construction noise, and

Term	Definition
	at a height of 1.5 m above ground level. If the residential property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most affected point within 30 m of the residence.
Noise sensitive receiver	An area or place potentially affected by noise which includes: – a residential dwelling – an educational institution, library, childcare centre or kindergarten – a hospital, surgery or other medical institution – an active (e.g. sports field, golf course) or passive (e.g. national park) recreational area – commercial or industrial premises – a place of worship.
Non-compliance	Development is deemed to be in non-compliance with its noise consent/ licence conditions if the monitored noise levels exceed its statutory noise limit (exceptions may be given if the noise level exceeds by less than 2 dB).
Octave	A division of the frequency range into bands, the upper frequency limit.
One third-octave	Single octave bands divided into three parts.
Project noise trigger level	Target noise levels for a particular noise generating facility. They are based on the most stringent of the intrusive criteria or amenity criteria. Which of the two criteria is the most stringent is determined by measuring the level and nature of existing noise in the area surrounding the actual or propose noise generating facility.
Proposal site	The immediate location of the proposal, which is the area that has the potential to be directly disturbed by construction and operation.
Rating background level	The Rating Background Level (RBL) is defined by the Noise Policy for Industry (NPfI) as the overall, single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period (as opposed to over each 24-hour period used for the assessment background level). This is the level used for assessment purposes
Resonance	Resonance describes the phenomenon of increased amplitude that occurs when the frequency of a periodically applied force is equal or close to a natural frequency of the system on which it acts.
Study area	Land in the vicinity of, and including, the proposal site. The ‘study area’ is the wider area surrounding the proposal site.
Temperature inversion	An atmospheric condition in which temperature increases with height above the ground.
Z-Weighting (or Linear-weighted)	Zero-weighting or Linear-weighting indicates no weighting filter has been applied and refers to a flat frequency response for sound level meters.

1 Introduction

1.1 Overview

1.1.1 Plasrefine Recycling and the proposal

For many years, recyclable plastics have been recovered from kerbside collections and it has been profitable to export mixed plastics to China and other countries. With the advent of the China National Sword policy (a policy in China which banned the importation of certain types of waste and set strict contamination limits on recyclable materials), as well as issues with contaminated loads of recyclables being sent to China and other countries, opportunities to send mixed plastics overseas for processing have diminished. Recently, the Council of Australian Governments (COAG) decided to ban exports of recyclable waste from Australia from July 2021.

Despite these difficulties, export markets still exist for clean, separated, pelletised plastics and resins. However, there is very little local capacity in NSW and within Australia to sort recovered plastics into different types and convert them into valuable products.

To help address this issue, Plasrefine Recycling Pty Ltd (Plasrefine Recycling) ('the proponent') proposes to construct and operate a plastics recycling and reprocessing facility in Moss Vale ('the proposal').

The proposal would sort the plastics into different types, and convert the various plastics to plastic flakes and pellets (in the first stage) and produce more advanced products (in the second stage). The combined outputs of both stages of the proposal would help fill the gap in local processing capacity for mixed plastics.

The proposal would have an ultimate capacity to receive up to 120,000 tonnes per year of mixed waste plastics.

1.1.2 Approval and assessment requirements

The proposal is State significant development and is subject to approval by the NSW Minister for Planning and Public Spaces under the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act).

This report has been prepared by GHD Pty Ltd (GHD) as part of the environmental impact statement (EIS) for the proposal. The EIS has been prepared to support the application for approval of the proposal and address the environmental assessment requirements of the Secretary of the NSW Department of Planning, Industry and Environment (SSD-9409987) dated 15 October 2020 (the SEARs).

1.2 The proposal

1.2.1 Location

The proposal would be located about 140 kilometres south west of the Sydney central business district and approximately 2.8 kilometres north west of the Moss Vale town centre within the Wingecarribee local government area.

The proposed plastics recycling and reprocessing facility and ancillary infrastructure would be located on the northern parcel of land in Lot 11 DP 1084421, with a current street address of 74-76 Beaconsfield Road, Moss Vale. This parcel of land is referred to as 'the plastics recycling and reprocessing facility site' for the purpose of the EIS. It has a total site area of about 7.7 hectares. The proposal would occupy a portion of the plastics recycling and reprocessing facility site.

The new access road which would extend from the plastics recycling and reprocessing facility to Lackey Road via:

– the currently unformed Braddon Road
– Lot 1 DP 26490 and Lot 10 DP 1084421 (the 'Braddon Road east extension').

The area that would be occupied by the proposal's permanent operational infrastructure, and/or directly disturbed during construction, is referred to as 'the proposal site' for the purposes of the EIS. The proposal site therefore comprises:

– The plastics recycling and reprocessing facility site (7.7 hectares)
– The new access road corridor (about 1.8 hectares)

It is noted that the areas that would be disturbed for construction of buildings, roads and water management would comprise about six hectares of the total 7.7 hectare plastics recycling and reprocessing facility site. Disturbance of the remaining 1.7 hectares would be limited to plantings as part of riparian vegetation management and landscaping.

The proposal would be located within the Moss Vale Enterprise Corridor (MVEC) catchment. The MVEC is a significant area of land between Moss Vale and New Berrima set aside for employment generating development under the Wingecarribee Shire Local Environmental Plan 2010.

The proposal site location is shown on Figure 1.1.

1.2.2 Key features

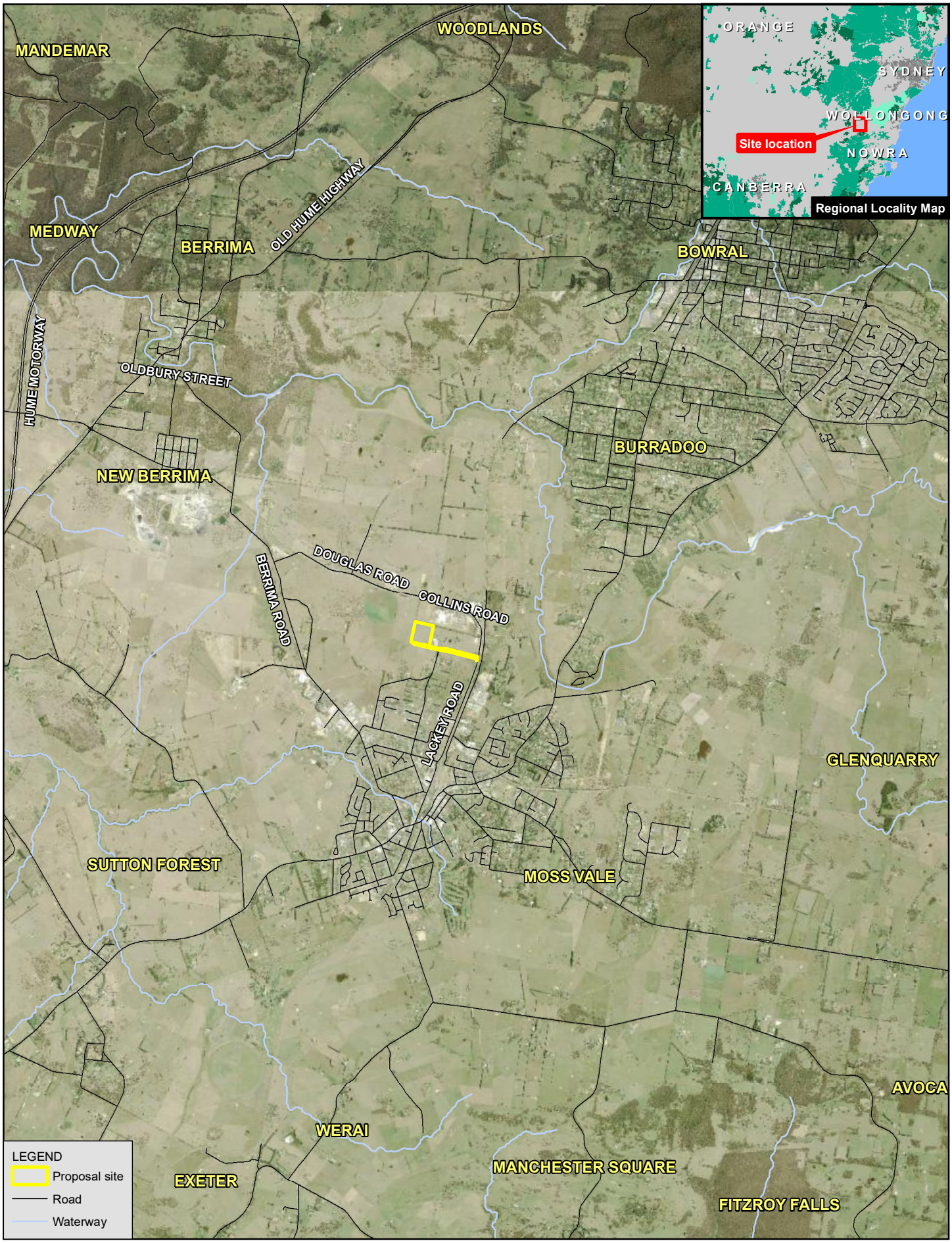
The proposal is defined as the construction and operation of a plastics recycling and reprocessing facility with capacity to receive up to 120,000 tonnes per year of mixed plastics, comprising:

– Two main buildings for waste receival, recycling and reprocessing and finished product storage
– Wastewater treatment plant
– Ancillary infrastructure including an office building, workshop, truck parking, staff and visitor parking, internal roadways, weighbridges, water management, fire management, landscaping, fencing, business identification signage and utility connection
– A new access road from the plastics recycling and reprocessing facility to Lackey Road via part of Braddon Road (currently unformed) and Lot 1 DP 26490 and Lot 10 DP 1084421 (the Braddon Road east extension).

The proposal would sort the plastics into different types and convert the various plastics to flakes and pellets (in the first stage) and produce more advanced products (in the second stage). The combined outputs of both stages of the proposal would help fill the gap in local processing capacity for mixed plastics.

Further information on the proposal is provided in the EIS.

The proposed site layout is shown in Figure 1.2.



Paper Size ISO A4

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Kilometres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Plasrefine Recycling Pty Ltd
Moss Vale Plastics Recycling and Reprocessing Facility

Proposal site location

Project No. **12524108**
Revision No. **A**
Date **22 Dec 2021**

FIGURE 1.1

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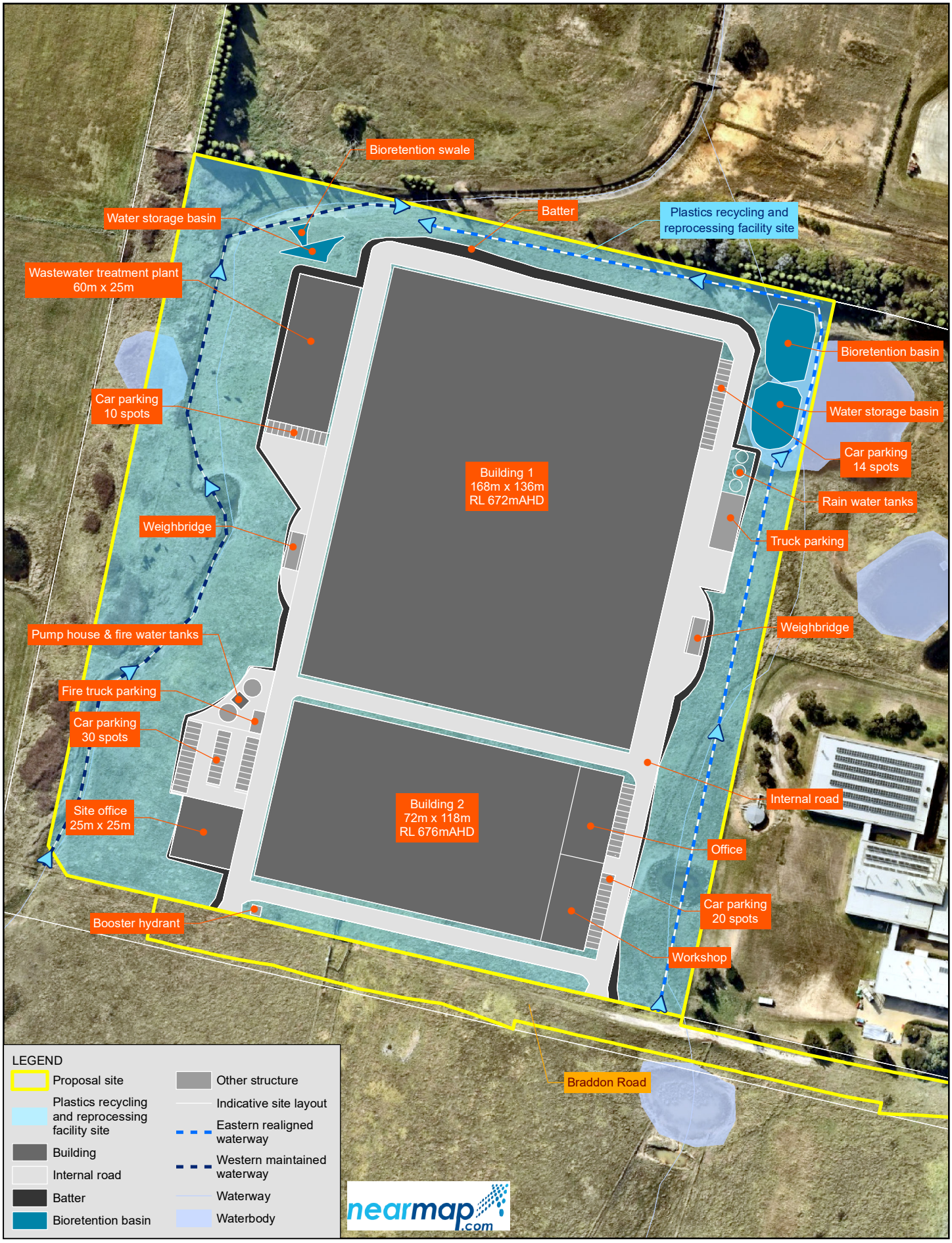

Paper Size ISO A4

0 20 40

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

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Plasrefine Recycling Pty Ltd
Moss Vale Plastics Recycling and Reprocessing Facility

Project No. **12524108**
Revision No. **A**
Date **06 Oct 2021**

Proposed site layout

FIGURE 1.2

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Data source: Aerial imagery - nearmap 2021 (image date 24/04/2021, image extracted 30/06/2021); General topo - NSW LPI DTDB 2020, 2015. Created by: jrprice

1.3 Secretary's Environmental Assessment Requirements

The specific SEARs addressed in this report are summarised in Table 1.1.

Table 1.1 SEARs relevant to this assessment

Requirement	Where addressed in this report
A quantitative noise and vibration impact assessment undertaken by a suitably qualified person in accordance with the relevant Environment Protection Authority guidelines and including an assessment of nearby sensitive receivers	Section 5.1 (Operational –NPfI) Section 5.3 (Construction – ICNG) Section 5.4 (Traffic noise – RNP)
Cumulative impacts of other developments	Section 4.1.7
Details and justification of the proposed noise mitigation, management and monitoring measures	Section 6.1 (Construction) Section 6.2 (Operational mitigation) Section 6.3 (Draft Operational Noise Management Plan)

The following legislation and guidelines are referenced by the SEARs and have been used to inform this assessment:

– Assessing Vibration: A Technical Guide (DEC, 2006)
– Noise Poilicy for Industry (EPA, 2017)
– Environmental Criteria for Road Traffic Noise (EPA, 1999)
– Noise Guide for Local Government (EPA, 2013)
– Interim Construction Noise Guideline (DECC, 2009)

1.4 Purpose and scope of this report

The purpose of this report is to assess the potential noise and vibration impacts from constructing and operating the proposal. The report:

– Addresses the SEARs and agency requirements listed in Table 1.1
– Describes the existing environment with respect to noise and vibration
– Assesses the impacts of constructing and operating the proposal on sensitive receivers
– Recommends measures to mitigate and manage the impacts identified

1.5 Structure of this report

The structure of the report is outlined below.

– Chapter 1 – provides an introduction to the report
– Chapter 2 – provides a description of the proposal during the operational and construction phases
– Chapter 3 – describes the existing noise environment and the sensitive receivers in the study area
– Chapter 4 – details the regulatory framework used to assess the potential noise and vibration impacts
– Chapter 5 – describes the methodology, assumptions for the noise assessment (operational, construction and road traffic noise). This section also summarises the outcomes of the assessment and a discussion of the potential impacts
– Chapter 6 – provides the mitigation measures recommended to reduce the potential noise and vibration impacts
– Chapter 7 – Summarises the outcomes of the noise and vibration impact assessment and the key mitigation measures to reduce the risks of impacts at sensitive receivers
– Chapter 8 – Lists the references used in this report

2 Proposal description

2.1 Operation of the proposal

2.1.1 Operational process

The proposal includes the construction and operation of a waste plastics sorting and plastics recycling facility with operations across two buildings. In the first building (building 1), the facility would receive mixed plastics such as containers and bottles from recycling collections and mixed plastics from other sources such as recycling centres. The facility would have the potential to reprocess the following plastic types:

– Polyethylene terephthalate (PET) bottles
– High-density polyethylene (HDPE) bottles
– Polypropylene (PP) bottles
– Acrylonitrile butadiene styrene (ABS)
– Low-density polyethylene (LDPE) recycled films
– Unplasticized polyvinyl chloride (UPVC) recycled pipes

The raw incoming material would be unloaded and transferred to one of the two automatic sorting lines. Unwanted materials such as glass pieces, metal wire, aluminium, copper, caps and other recyclables would then be removed by screening, optical sorters and magnetic separators. Oversized materials would be picked out manually via manual sorting platforms. The recyclable materials not suitable for further processing on site would be sent offsite to recycling facilities. The remaining non-recyclable materials would be disposed to EPA licenced facilities.

The PET, PP and PE bottles would be sorted by plastic type and colour using optical, smart arm methods and cleaned using steam comprising a heated alkaline water solution at 193 degrees Celsius. The condensed steam would be recirculated following treatment at the wastewater treatment plant. The PET, PE, and PP bottles and PE film would be crushed and mixed in batches and sterilised and deodorised using the patented disinfectant solution. The sorted material would be pelletised or shredded into flakes suitable for sale at this point or transferred to building 2 for further processing.

The processed material would be used to produced more advanced plastic products such as PET sheets, PET packing belts, wood plastic composites, plastic logistic pallets, furniture or turnover boxes. The plastic flakes, pellets or plastic derived products would be sold to domestic or international markets. Filter residue from extrusion and granulation would be transferred off site and disposed at an EPA licenced facility.

Material testing associated with manufacturing and processing would also be undertaken at the laboratories located in building 2.

2.1.2 Operational workforce

The proposal would require up to 140 full time equivalent staff during full scale operation. This would comprise approximately 40 staff per shift (three shifts) within the receival and processing buildings and up to 20 staff for maintenance, administration, management, engineering and technical support.

2.1.3 Plant and equipment

The following plant and equipment is expected (but not limited) to be used within the processing buildings during operation of the proposal. Waste plastic sorting and cleaning as well as crushing and cleaning lines would be housed in Building 1 while granulation and extraction would occur within Building 2.

– Waste plastics sorting production line
    - 2 bale openers
    - 2 trommels
    - 12 manual sorting platforms

    - 2 magnetic separators
    - 2 eddy current sorters
    - 9 screens
    - 9 optoelectronic sorters
    - 4 smart manipulators
    - 2 bottle label removers
    - 1 packing machine
    - 8 crushers
    - 8 mixing silos
- Crushing and cleaning units
    - 3 PET crushing and cleaning units
    - 5 miscellaneous plastic crushing and cleaning units
    - 2 PE film crushing and cleaning units
    - 1 PVC pipe crushing and cleaning unit
- Granulation and extrusion
    - 8 PE extrusion granulation production units
    - 6 PP extrusion granulation production units
    - 2 ABS extrusion granulation production units
    - 3 PE film extrusion granulation production units
    - 4 PVC mill production units
    - 22 batch mixing units
    - 6 PET sheet extrusion moulding unit
    - 4 PET packing belt moulding unit
    - 4 cone double extrusion unit
    - 8 Injection moulding machines

2.1.4 Hours of operation

The proposal would operate year round, 24 hours per day, seven days per week. However, waste acceptance would only occur Monday to Friday between 7 am and 6 pm.

2.1.5 Traffic and access

The new access road, would be constructed over a new road easement from south of the plastics recycling and reprocessing facility site east to Lackey Road. Access to the plastics recycling and reprocessing facility site would be via the following roads:

- Hume Highway
- Medway Road
- Taylor Avenue
- Berrima Road
- Douglas Road
- Collins Road
- Lackey Road
- The new access road (Braddon Road and Braddon Road east extension)

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

- Up to 100 truck movements between 7 am and 6 pm, with a maximum of 5 trucks in a peak hour period

– Staff 140 full time equivalents with up to 50 staff arriving and leaving at a change-over period.

The estimated average and peak daily construction traffic movements are summarised in Table 2.1.

Table 2.1 Indicative operational traffic

Vehicle type	Estimated average daily vehicle movements	Estimated peak daily vehicle movements
Light vehicles	280	120
Heavy vehicles	100	10

2.2 Construction of the proposal

2.2.1 Overview

The construction period would commence in 2022 with an estimated duration of about 12 months and an additional three months for commissioning.

Construction activities would be undertaken in three stages and include:

– Early works and site establishment (1 month):
  - Construction of site access road
  - Utilities connection
  - Establishment of construction compound including construction staff amenities
  - Installation of temporary fencing
– Main site works (11 months):
  - Clearance of vegetation within the construction footprint, stripping and stockpiling of topsoil for reuse
  - Bulk earthworks for site shaping and surface water drainage and the bioretention pond
  - Pouring concrete foundation slab, footings, hardstand and slabs for the buildings
  - Construction of pavement areas for the truck and car park, internal roads and the site entrance/egress points
  - Installation of steel truss framework for structures
  - Erection of pre-cast concrete panels for external and internal partition walls and metal roof sheets for site buildings
  - Installation of processing equipment
  - Building finishing works including fit out
  - Installation of firewater and other tanks
  - Installation of weighbridges
  - Installation of permanent fencing and signage
  - Restoration works including removal of temporary construction compound, general site clean up and landscaping following construction
– Testing and commissioning (3 months)

2.2.2 Construction workforce

The construction workforce is likely to include a maximum of 200 staff working across the entire span of the proposal construction. The peak workforce is expected during major concrete pours up to 30 people.

2.2.3 Construction hours

Construction working hours would be undertaken during the periods specified in the *Interim Construction Noise Guidelines* (EPA 2020). Those are:

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

2.2.4 Construction scenarios

The construction period would commence in 2022 with an estimated duration 15 months, including three months for commissioning, and would follow the method outlined in Table 2.2, as provided by Plasrefine Recycling.

Table 2.2 Construction method

Stage	Activity	Equipment	Estimated duration
Stage 1 – Site establishment	– Site establishment	– Trucks – Hand tools	1 month
Stage 2 – Ground works and excavation	– Bulk earthworks for site shaping and surface water drainage and the bioretention pond – Pouring concrete foundation slab, footings, hardstand and slabs for the buildings – Construction of pavement areas for the truck and car park, internal roads and the site entrance/egress points	– Excavators – Bulldozer – Compactors – Tippers – Trucks	1.5 months
Stage 3 – Road access construction	– Excavation for placement of road base layers – Installation of concrete kerb and gutters – Paving of access road – Construction of retaining walls and batters	– Excavators – Bulldozer – Grader – Compactor – Tippers – Smooth drum roller – Concrete truck and pump – Trucks	1 month
Stage 4 – Construction of the main structures	– Installation of steel truss framework for structures – Erection of pre-cast concrete panels for external and internal partition walls and metal roof for site buildings – Installation of firewater and other tanks – Installation of weighbridges	– Excavator – Bobcat – Forklift – Mobile crane – Boom lift – Tippers – Trucks	7.5 months
	– Installation of processing equipment	– Forklift – Mobile crane – Scissor lift (cherry picker) – Mini loader – Trucks	1 months
Stage 5 – Testing and commissioning	– Testing and commissioning	– Truck – welder	3 months

2.2.5 Construction traffic and access

Vehicles associated with construction of the proposal would include staff light vehicles and heavy vehicles delivering construction plant, equipment and materials to site. The estimated average and peak daily construction traffic movements are summarised in Table 2.3.

Table 2.3 Indicative construction traffic

Vehicle type	Estimated average daily vehicle movements	Estimated peak daily vehicle movements
Light vehicles	40	60
Heavy vehicles	15	40

The new access road, via Lackey Road, would be used to access the plastics recycling and reprocessing facility site once constructed. Until the new access road is constructed, access to the facility would be via the following roads:

- Hume Highway
- Medway Road
- Taylor Avenue
- Berrima Road
- Lytton Road
- Beaconsfield Road

2.2.6 Construction environmental management

The construction of the proposal would be undertaken in accordance with the construction environmental management plan to be developed for the proposal. The plan would detail mitigation measures to manage risks associated with generation of noise and vibration impacts during construction as identified in the EIS and conditions of approval.

3 Existing environment

3.1 Noise sensitive land uses

Noise and vibration sensitive receivers are defined based on the type of occupancy and the activities performed in the land use. Sensitive noise and vibration receivers could include:

– Residential dwellings
– Classrooms
– Hospitals
– Places of worship
– Passive and active recreational areas such as parks, sporting fields, golf courses. Note that these recreational areas are only considered sensitive when they are in use or occupied
– Commercial or industrial premises
– Hotels, motels, caretaker's quarters, holiday accommodation and permanent resident caravan parks

The study area has been defined as approximately 1.2 km from the plastics recycling and reprocessing facility site as noise impacts are not anticipated beyond this distance. Within this distance, residential, commercial and industrial sensitive receivers have been identified.

The sensitive receivers, land uses and planning zones are listed in Appendix B and shown on Figure 3.1.

Noise catchment areas (NCAs) are used to classify areas of different noise environments. For this assessment the residential receivers have been categorised into three discrete noise catchment areas. The dominant noise sources surrounding the the plastics recycling and reprocessing facility site include the railway line and other industrial premises along Collins Road and Lackey Road. Residential receptors have been classified into the three NCAs based upon their proximity to these noise sources. Details of each NCA are provided in Table 3.1.

Noise monitoring has been undertaken as described in Section 3.2 to determine background noise levels in each of these NCAs.

Table 3.1 Residential Noise Catchment Areas

Noise Catchment Area	Location description	Land use zones	Number of identified lots with dwellings
NCA1	Residential dwellings within approx. 300 m of Lackey / Collins Road and the railway line	E3 - Environmental Management	1
		IN1 - General Industrial	1
		RU2 - Rural Landscape	1
		RU4 - Primary Production Small Lots	3
NCA2	Residential dwellings between approx. 300 m and 800 m of Lackey / Collins Road and the railway line	R2 - Low Density Residential	47
		RU2 - Rural Landscape	8
		RU4 - Primary Production Small Lots	10
NCA3	Residential dwellings beyond 800 m of Lackey / Collins Road and the railway line	IN1 - General Industrial	3
		R2 - Low Density Residential	72
		RU2 - Rural Landscape	1
		RU4 - Primary Production Small Lots	6

1.3 Secretary's Environmental Assessment Requirements

The specific SEARs addressed in this report are summarised in Table 1.1.

Table 1.1 SEARs relevant to this assessment

Requirement	Where addressed in this report
A quantitative noise and vibration impact assessment undertaken by a suitably qualified person in accordance with the relevant Environment Protection Authority guidelines and including an assessment of nearby sensitive receivers	Section 5.1 (Operational –NPfI) Section 5.3 (Construction – ICNG) Section 5.4 (Traffic noise – RNP)
Cumulative impacts of other developments	Section 4.1.7
Details and justification of the proposed noise mitigation, management and monitoring measures	Section 6.1 (Construction) Section 6.2 (Operational mitigation) Section 6.3 (Draft Operational Noise Management Plan)

The following legislation and guidelines are referenced by the SEARs and have been used to inform this assessment:

- Assessing Vibration: A Technical Guide (DEC, 2006)
- Noise Poilicy for Industry (EPA, 2017)
- Environmental Criteria for Road Traffic Noise (EPA, 1999)
- Noise Guide for Local Government (EPA, 2013)
- Interim Construction Noise Guideline (DECC, 2009)

1.4 Purpose and scope of this report

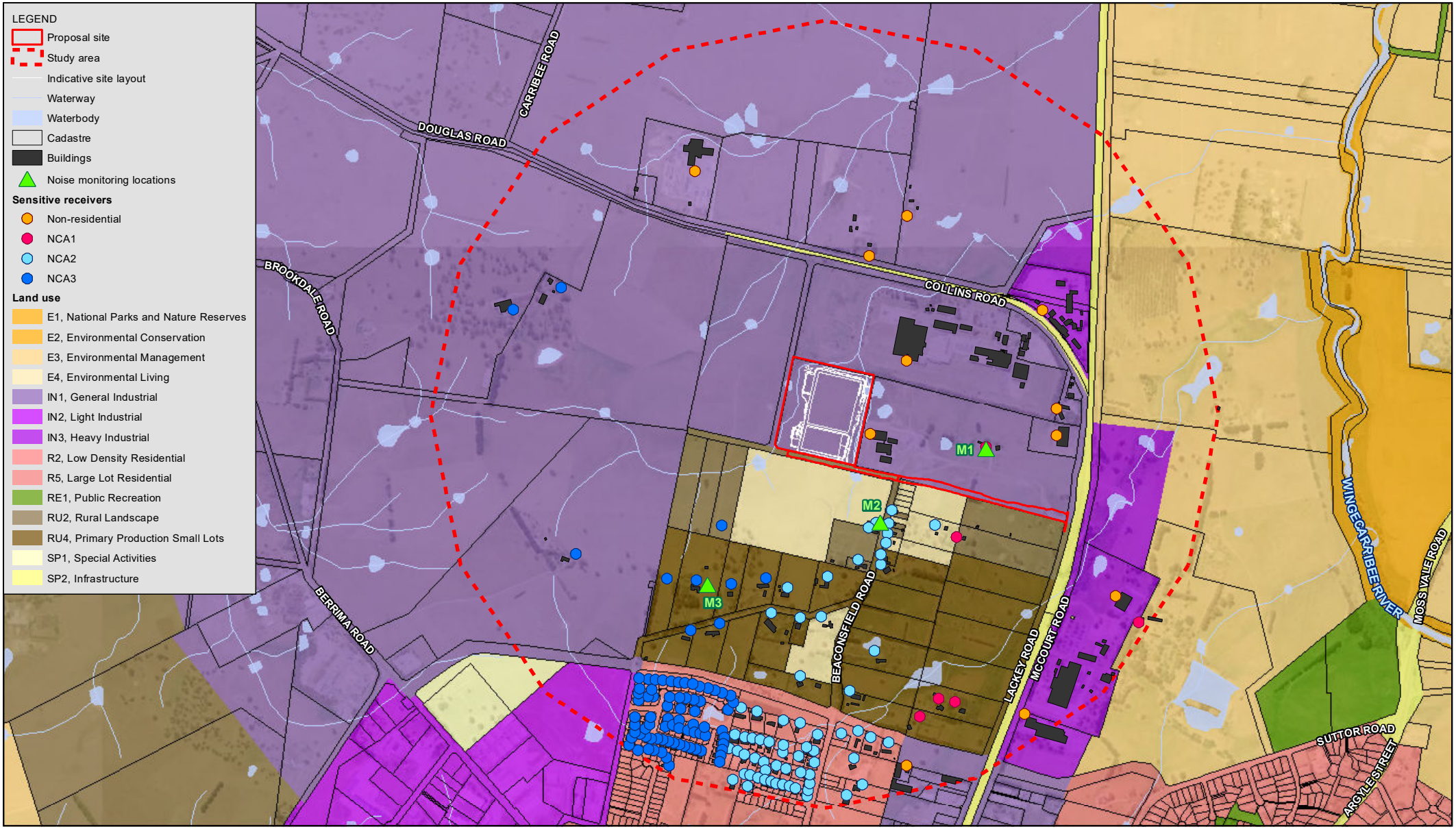
The purpose of this report is to assess the potential noise and vibration impacts from constructing and operating the proposal. The report:

- Addresses the SEARs and agency requirements listed in Table 1.1
- Describes the existing environment with respect to noise and vibration
- Assesses the impacts of constructing and operating the proposal on sensitive receivers
- Recommends measures to mitigate and manage the impacts identified

1.5 Structure of this report

The structure of the report is outlined below.

- Chapter 1 – provides an introduction to the report
- Chapter 2 – provides a description of the proposal during the operational and construction phases
- Chapter 3 – describes the existing noise environment and the sensitive receivers in the study area
- Chapter 4 – details the regulatory framework used to assess the potential noise and vibration impacts
- Chapter 5 – describes the methodology, assumptions for the noise assessment (operational, construction and road traffic noise). This section also summarises the outcomes of the assessment and a discussion of the potential impacts
- Chapter 6 – provides the mitigation measures recommended to reduce the potential noise and vibration impacts
- Chapter 7 – Summarises the outcomes of the noise and vibration impact assessment and the key mitigation measures to reduce the risks of impacts at sensitive receivers
- Chapter 8 – Lists the references used in this report



Paper Size ISO A4

0 200 400

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

Plasrefine Pty Ltd
Moss Vale Plastics Recycling Facility
Noise Assessment

Proposal site, sensitive receivers, NCAs and noise monitoring locations

Project No. **12524108**
Revision No. **A**
Date **25 Jan 2022**

FIGURE 3-1

\\ghdnet\ghd\AU\Sydney\Projects\21\12524108\GIS\Maps\Deliverables\Noise\12524108_NOISE003_SensitiveReceivers_NCAs_MonitoringLocations.mxd

Data source: Aerial imagery - sixmaps 2022© Department of Customer Service 2020; General topo - NSW LPI DTDB 2020, 2015; Land zoning - DPE 2020/2018. Created by: eibbertson

3.2 Noise monitoring methodology

Background noise monitoring (long term method in accordance with the NPfI was undertaken at three residential locations within the study area to quantify the existing background and ambient noise levels in the surrounding environment. The measured L_{A90} background noise levels have been used to establish the rating background noise levels (RBLs) for each the relevant periods of the day in accordance with Fact Sheet A and Fact Sheet B of the NPfI. The RBLs have been used to establish the construction noise management levels (NMLs) in accordance with the ICNG and the intrusiveness noise levels in accordance with the NPfI.

Attended noise monitoring was also undertaken at each residential logger location to characterize the existing noise environment and describe typical noise sources in the area. L_{Amax}, L_{Aeq}, L_{A10} and L_{A90} noise levels were measured during the 15-minute monitoring period.

Noise monitoring was also undertaken at the western boundary of the Australian BioResources site to quantify the existing L_{max} noise levels during the day, evening and night period. Third-octave band L_{Amax} noise levels were measured between the frequencies of 1 kHz and 20 kHz (frequencies mice are susceptible to hear and that have the potential to cause a disturbance). This data has been collected for reference only and has not been used to establish the criteria for the disturbance to mice.

The methodology for the noise monitoring program included the following:

- Noise monitoring was undertaken using three Svan 977 Type 1 environmental noise loggers. All noise loggers were programmed to accumulate L_{A90}, L_{A10} and L_{Aeq} noise descriptors continuously over the entire monitoring period. Details of the noise monitoring equipment are provided in Table 3.2, Table 3.3 and Table 3.4
- A calibration check was performed on the noise monitoring equipment using a sound level calibrator. At completion of the measurements, the meter's calibration was re-checked to ensure the sensitivity of the noise monitoring equipment had not varied. The noise loggers were found to be within the acceptable tolerance of ± 0.5 dBA
- All monitoring activities were undertaken with consideration of the specifications outlined in Australian Standard AS1055 (1997) *Description and Measurement of Environmental Noise*
- Noise monitoring was undertaken from Friday 5 March 2021 to Wednesday 17 March 2021, at the three residential locations near the the plastics recycling and reprocessing facility site to determine background noise levels to establish the construction noise criteria and also measure existing ambient noise levels for reference
    - For M1, noise monitoring was undertaken in an area representative of NCA1 and the nearest residential dwellings to the east of the the plastics recycling and reprocessing facility site.
    - For M2, noise monitoring was undertaken in an area representative of NCA2 and the nearest residential dwellings to the south of the the plastics recycling and reprocessing facility site.
    - For M3, noise monitoring was undertaken in an area representative of NCA3 and the nearest residential dwellings to the southwest of the the plastics recycling and reprocessing facility site.
    - All microphones were positioned at a height of 1.5 m above the ground
- A weather station was deployed at M2 to measure wind speed, wind direction and rainfall during the monitoring period. A Vaisala Weather Transmitter (WXT520 Serial no. M2520451) was used with a DataTaker DT82E Series 3 environmental data logger (Serial no. 107731) measuring in 15 minute intervals.
- The data collected by the noise loggers was downloaded and analysed to invalid data due to adverse weather conditions. Invalid data generally refers to periods of time where average wind speeds were greater than 5 m/s, or when rainfall occurred.
- Determination of the RBLs were undertaken in accordance with NPfI
- Supplementary meteorological data (temperature and humidity) was sourced from the Bureau of Meteorology's Moss Vale AWS (station number 068239).
- Attended noise measurements were undertaken using a Bruel & Kjaer 2250 Type 1 environmental sound level meter (SLM) (Serial no. 273849). Unattended noise monitoring at the BioResources site was undertaken using a RION NL-52 environmental noise logger. Details are presented in Table 3.5. Noise levels measured at this location have not been used to establish criteria for this assessment and are provided as a reference.

– Noise monitoring was conducted by the GHD staff member Rosy Browell, who:
  - is a member employee of GHD, a member firm of the Association of Australasian Acoustical Consultants (AAAC)
  - possesses the qualification Bachelor of Mechanical Engineering, attained at the University of New South Wales in 2020

Table 3.2 Logger 1 – 7-9 Lackey Road, Moss Vale – long-term noise monitoring results (background, ambient and road traffic)

Unattended noise monitoring results										
Date	ABL L_{90}, dBA			Ambient L_{Aeq} noise level, dBA			Road traffic noise levels, $L_{eq(1hour)}$		Equipment details	Equipment settings
	Day	**Eve**	**Night**	**Day**	**Eve**	**Night**	Day	Night		
Friday-5-Mar-21	42	39	32	46	42	39	47	41	Svan 977 Type 1 SN: 36872 1.5 m above ground level Free-field conditions IEC 61672-3:2013 Compliant Manufactured prior 2019	A-weighted Fast time response 15 minute intervals Pre and post calibration variation: -0.4 dBA Svantek SV30A Class 1 Sound level calibrator SN: 29030 AS 60942:2003 Compliant Manufactured prior 2017
Saturday-6-Mar-21	35	34	28	46	35	34	46	40		
Sunday-7-Mar-21	37	37	33	46	37	37	48	44		
Monday-8-Mar-21	40	40	34	47	40	40	48	47		
Tuesday-9-Mar-21	41	39	29	48	41	39	50	42		
Wednesday-10-Mar-21	39	43	36	47	39	43	49	46		
Thursday-11-Mar-21	42	43	35	49	42	43	50	46		
Friday-12-Mar-21	42	43	37	47	42	43	48	47	Equipment photo	Logger location
Saturday-13-Mar-21	38	39	32	46	38	39	47	46		
Sunday-14-Mar-21	36	33	38	51	36	33	54	44		
Monday-15-Mar-21	39	41	40	52	39	41	52	46		
Tuesday-16-Mar-21	37	36	32	43	37	36	45	43		
Wednesday-17-Mar-21	40			46	40		48	-		
RBL	**39**	**39**	**33**							
Overall Leq				**48**	**45**	**43**	**48**	**45**		

Attended noise monitoring results						
Date and time	**L_{max}**	**L_{A10}**	**L_{Aeq}**	**L_{90}**	**Equipment photo**	**Notes**
5 March 2021 **3:15 pm to 3:30 pm**	60	50	48	45		– Audible noise from nearby industry – Trucks on Lackey Road and Collins Road – Train noise – Crickets

Table 3.3 Logger 2 – 72 Beaconsfield Road, Moss Vale – long-term noise monitoring results (background, ambient and road traffic)

Unattended noise monitoring results										
Date	ABL L_{90}, dBA			Ambient L_{Aeq} noise level, dBA			Road traffic noise levels, $L_{eq(1hour)}$, dBA		Equipment details	Equipment settings
	Day	**Eve**	**Night**	**Day**	**Eve**	**Night**	Day	Night		
Friday-5-Mar-21	39	35	28	46	42	35	47	37	Svan 977 Type 1 SN: 36871 1.5 m above ground level Free-field conditions IEC 61672-3:2013 Compliant Manufactured prior 2019	A-weighted Fast time response 15 minute intervals Pre and post calibration variation: -0.1 dBA Svantek SV30A Class 1 Sound level calibrator SN: 29030 AS 60942:2003 Compliant Manufactured prior 2017
Saturday-6-Mar-21	34	35	30	50	51	43	55	37		
Sunday-7-Mar-21	36	40	36	49	49	42	51	44		
Monday-8-Mar-21	41	40	35	50	44	42	51	43		
Tuesday-9-Mar-21	39	40	30	48	50	44	52	48		
Wednesday-10-Mar-21	35	39	36	48	49	44	50	47		
Thursday-11-Mar-21	40	38	34	46	46	42	47	44		
Friday-12-Mar-21	39	41	37	47	46	42	48	44	Equipment photo	Logger location
Saturday-13-Mar-21	38	40	33	48	46	45	49	45		
Sunday-14-Mar-21	36	30	31	54	38	38	56	40		
Monday-15-Mar-21	35	37	35	45	41	41	46	41		
Tuesday-16-Mar-21	34	33	30	45	43	43	47	48		
Wednesday-17-Mar-21	36			45			46	-		
RBL	**36**	**39**	**33**	-	-	-				
Overall Leq	-	-	-	**49**	**47**	**42**	**49**	**44**		

Attended noise monitoring results						
Date and time	**L_{max}**	**L_{A10}**	**L_{Aeq}**	**L_{90}**	**Equipment photo**	**Notes**
5 March 2021 **1:15 pm to 1:30 pm**	56	44	43	40		– Dog barking – Train horn – Birds and crickets

Table 3.4 Logger 3 – 50 Bulwer Road, Moss Vale – long-term noise monitoring results (background and ambient)

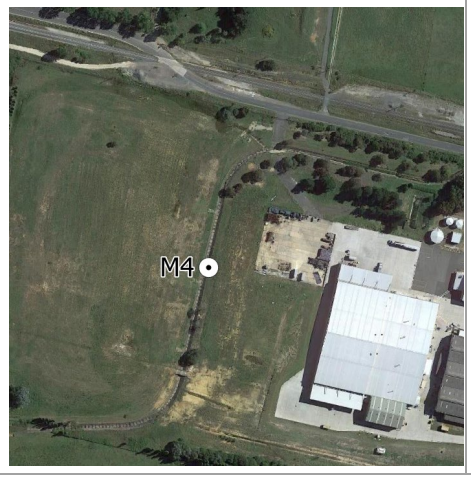
	ABL L_{90}, dBA			Ambient L_{Aeq} noise level, dBA			Equipment details	Equipment settings
Date	**Day**	**Eve**	**Night**	**Day**	**Eve**	**Night**		
Friday-5-Mar-21	32	33	25	45	41	34	Svan 977 Type 1 SN: 45743 1.5 m above ground level Free-field conditions IEC 61672-3:2013 Compliant Manufactured prior 2019	A-weighted Fast time response 15 minute intervals Pre and post calibration variation: +0.3 dBA Svantek SV30A Class 1 Sound level calibrator SN: 29030 AS 60942:2003 Compliant Manufactured prior 2017
Saturday-6-Mar-21	28	30	25	44	40	39		
Sunday-7-Mar-21	31	34	33	42	43	39		
Monday-8-Mar-21	33	32	29	43	41	37		
Tuesday-9-Mar-21	34	32	27	44	41	37		
Wednesday-10-Mar-21	31	35	31	41	43	40		
Thursday-11-Mar-21	35	34	27	44	46	40		
Friday-12-Mar-21	27	31	30	42	45	39	Equipment photo	Logger location
Saturday-13-Mar-21	32	32	31	42	44	47		
Sunday-14-Mar-21	38	30	29	55	38	38		
Monday-15-Mar-21	29	32	30	53	41	38		
Tuesday-16-Mar-21	35	31	25	56	41	37		
Wednesday-17-Mar-21	38			44				
RBL	**32**	**32**	**29**	-	-	-		
Overall Leq	-	-	-	**50**	**42**	**40**		

Attended noise monitoring results

Date and time	**L_{max}**	**L_{A10}**	**L_{Aeq}**	**L_{90}**	**Equipment photo**	**Notes**
5 March 2021 **12:15 pm to 12:30 pm**	62	41	39	34		– Industry noise just audible – Train and train horn – Birds and crickets – Light breeze

Table 3.5 Logger 4 – Australian BioResources site, Moss Vale – long-term noise monitoring results (background, ambient and road traffic)

Period	Third-octave band L_{max} noise level, 1 kHz to 20 kHz – Z-weighted														Overall (1-20 kHz)
	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10000	12500	16000	20000	
Day	54	52	48	45	47	51	47	45	40	40	39	44	56	58	**63**
Evening	56	55	59	54	56	54	51	55	53	51	53	52	65	72	**74**
Night	51	50	52	49	52	53	47	56	54	44	43	42	44	44	**62**

Logger photo	Logger location	Equipment details	Equipment settings
		RION NL-52 Type 1 SN: 00131632 1.5 m above ground level Free-field conditions IEC 61672-3:2013 Compliant Manufactured prior 2019	Z-weighted Fast time response 15 minute intervals Pre and post calibration variation: 0.0 dBA Svantek SV30A Class 1 Sound level calibrator SN: 29030 AS 60942:2003 Compliant Manufactured prior 2017

3.3 Local meteorology

Wind has the potential to increase noise levels at a receiver when it is light and stable and blows from the direction of the source of the noise. As the strength of the wind increases, the noise produced by the wind will mask noise from most industrial and transport sources.

Temperature inversions (i.e. where atmospheric temperature increases with altitude) typically occur during stable atmospheric conditions such as the night-time period in the winter months. Temperature inversion can also increase site noise levels at surrounding assessment locations.

Wind effects and temperature inversions need to be considered when predicting the long-term noise levels during the operation of the proposal.

3.3.1 Noise Policy for Industry requirements

The NPfI requires assessment of noise under standard and noise enhancing weather conditions. The NPfI defines these as follows:

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

The NPfI specifies the following two options to consider meteorological effects:

1. Adopt the noise-enhancing meteorological conditions for all assessment periods for noise impact assessment purposes without an assessment of how often these conditions occur – a conservative approach that considers source-to-receiver wind vectors for all receivers and F class temperature inversions with wind speeds up to 2 m/s at night; or
2. Determine the significance of noise-enhancing conditions. This involves assessing the significance of temperature inversions (F and G class stability categories) for the night-time period and the significance of light winds up to and including 3 m/s for all assessment periods during stability categories other than E, F or G. Significance is based on a threshold of occurrence of 30% determined in accordance with the provisions in this policy. Where noise-enhancing meteorological conditions occur for less than 30% of the time, standard meteorological conditions may be adopted for the assessment.

3.3.2 Wind effects

The NPfI recommends consideration of wind effects if they are “significant”. The NPfI defines “significant” as the presence of source-to-receiver wind speed (measured at 10 m above ground level) of 3 m/s or less, occurring for 30% of the time in any assessment period and season.

This is further clarified by defining source-to-receiver wind direction as being the directional component of wind. The NPfI states that where wind is identified to be a significant feature of the area then assessment of noise impacts should consider the highest wind speed below 3 m/s, which is considered to prevail for at least 30% of the time.

A thorough review of the vector components of hourly wind data from 2016 to 2020 was undertaken for data from the Bureau of Meteorology Moss Vale automatic weather station (AWS) (SN: 068239). The observations are approximately 5 km from the site and are considered representative for the site and surrounds. The analysis identified that wind directions were not found to be a feature of the area, as per the NPfI.

Figure 3.2 shows the wind roses (2016 to 2020) for wind speeds less than 3 m/s in each NPfI assessment period and for each season. Table 3.6 provides a summary of the prevailing wind conditions that are relevant to the assessment. The analysis indicates that noise-enhancing wind conditions are not identified to be a significant feature of the area during any season or period of the day, evening or night.

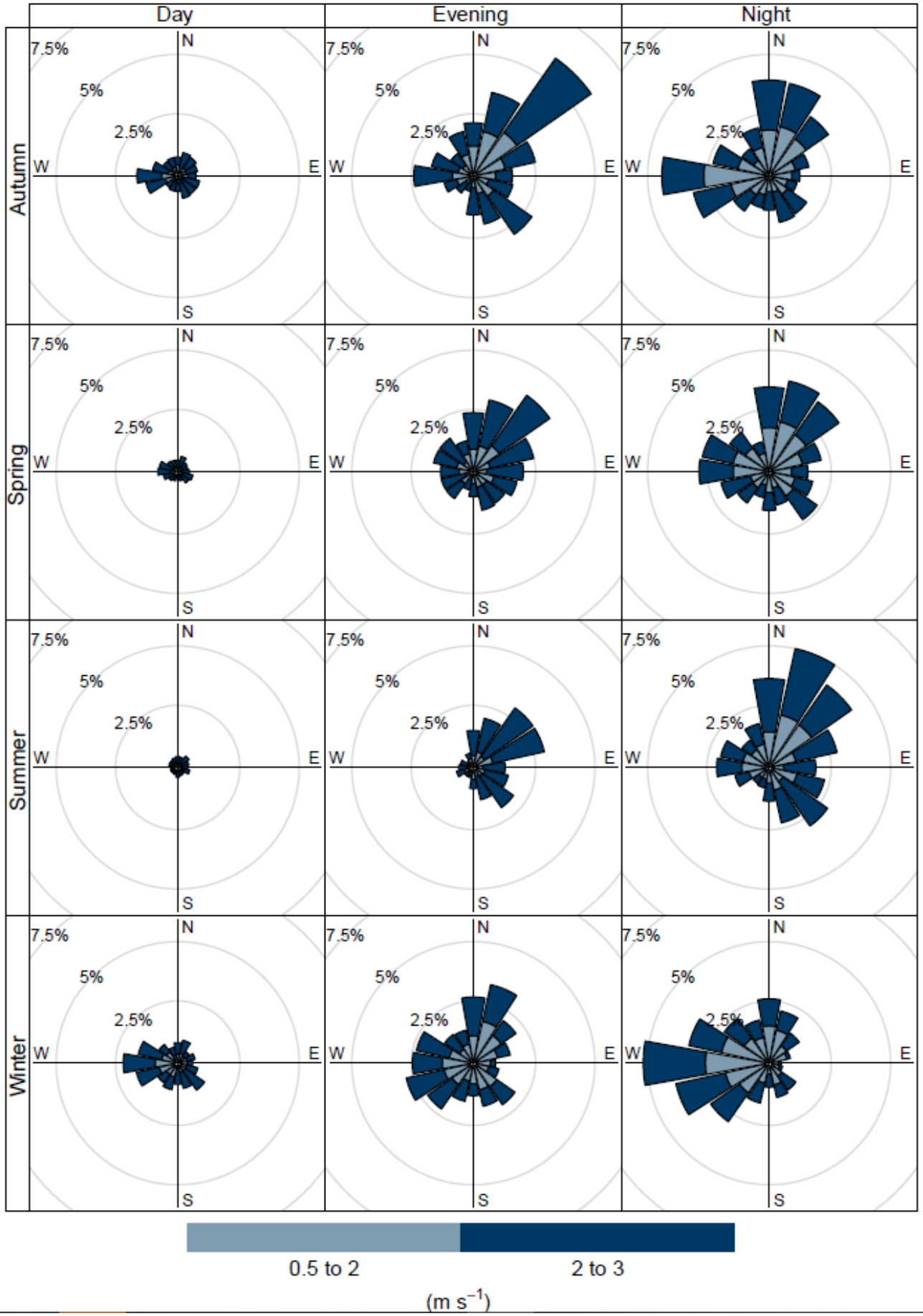


Figure 3.2 *5 year wind rose (seasonal and relevant assessment periods) – Moss Vale AWS*

Table 3.6 Significant wind effects analysis – Moss Vale BOM AWS

Wind direction[1]	Summer			Autumn			Winter			Spring		
	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
N	1.7%	7.1%	15.8%	3.7%	14.3%	13.9%	3.5%	10.7%	10.0%	2.1%	11.9%	13.8%
NNE	1.8%	9.8%	17.3%	3.8%	15.9%	14.3%	3.3%	10.8%	8.7%	2.0%	12.8%	14.0%
NE	1.8%	10.5%	17.4%	3.8%	15.6%	13.5%	3.2%	10.3%	7.3%	2.0%	13.6%	14.3%
ENE	1.9%	10.5%	16.0%	3.9%	15.1%	10.7%	3.2%	8.6%	5.2%	2.1%	13.0%	12.6%
E	1.7%	10.4%	13.9%	3.9%	14.5%	8.6%	3.6%	7.3%	4.3%	2.1%	11.5%	11.2%
ESE	1.5%	8.7%	12.0%	3.9%	10.5%	7.6%	4.1%	7.0%	4.3%	2.0%	9.2%	9.1%
SE	1.5%	6.6%	10.5%	3.7%	9.5%	7.3%	4.3%	6.8%	4.3%	1.8%	7.7%	8.4%
SSE	1.4%	5.7%	9.5%	3.6%	8.5%	7.4%	4.8%	7.5%	5.6%	1.7%	6.4%	7.9%
S	1.1%	4.6%	7.9%	3.2%	7.7%	8.0%	4.9%	8.8%	8.0%	1.5%	5.9%	7.7%
SSW	1.1%	3.3%	6.4%	3.6%	5.9%	9.3%	5.3%	9.5%	10.6%	1.6%	5.7%	7.3%
SW	1.0%	2.5%	6.2%	4.4%	6.4%	11.8%	6.5%	10.2%	14.4%	2.0%	5.4%	8.8%
WSW	1.0%	2.2%	6.9%	4.8%	6.5%	12.8%	7.3%	11.3%	16.9%	2.5%	6.0%	10.0%
W	1.1%	2.1%	7.4%	4.9%	7.0%	12.8%	7.2%	11.1%	17.4%	2.7%	7.0%	10.9%
WNW	1.2%	2.3%	8.5%	5.1%	8.0%	13.1%	6.8%	10.2%	16.3%	2.7%	6.9%	10.6%
NW	1.3%	3.1%	10.7%	4.5%	9.0%	13.8%	5.9%	10.1%	15.0%	2.6%	8.0%	12.1%
NNW	1.5%	4.6%	13.6%	3.8%	10.1%	13.3%	4.6%	10.9%	12.0%	2.4%	9.7%	13.1%

Notes:

1) The percentages shown are the frequency of counts by wind direction and include the arithmetic sum of the direction being reported and the four closest directions

3.3.3 Temperature inversions

Temperature inversions typically occur during the night-time period in the winter months and have the potential to also increase noise levels from the operations at the plastics recycling and reprocessing facility at the surrounding residents. As per the NPfI, temperature inversions are to be assessed when they are found to occur for 30% of the time (about two nights per week) or greater during the winter months. As the facility is proposed to operate 24 hours a day, the effect of temperature inversions on noise levels at night should be considered.

Noise enhancement due to temperature inversions occurs when the atmosphere is relatively stable which corresponds with atmospheric stability class category F and G. An analysis of the Goulburn Airport AWS meteorological data (three winter months from 2016 to 2020) has been undertaken using the Turner method and considers to the following observations parameters:

– hourly wind speed and direction at 10 m
– hourly cloud cover measurements
– hourly cloud ceiling-height measurements
– daily records of time of sunrise and sunset

The percentage occurrence of the Pasquill stability categories are presented in Table 3.7.

Table 3.7 Percentage occurrence of Pasquill stability categories

Pasquill–Gifford stability category	Percentage occurrence (winter night period)	F and G combined (night period) -Step 2	Are temperature inversions a feature of the area?
A	0%	36%	Yes
B	0%		
C	0%		
D	40%		
E	24%		
F	23%		
G	13%		

The results indicate that 'F' class temperature inversions are a feature of the area as they occur for more than 30% of the time during the winter and therefore are relevant to the assessment.

The NPfI states "*Where F class conditions are relevant for the assessment, any wind vectors that can occur up to 2 m/s wind speed at 10 metres above ground level (AGL) while F class conditions are maintained should be considered*". As such, analysis of the meteorological data indicates, wind speeds of up to 2 m/s can occur in any direction while F class conditions are maintained. As such, an F Class inversion with source to receiver winds of up to 2 m/s have been included in the model to represent 'adverse' meteorological conditions.

3.3.4 Atmospheric conditions

Temperature and humidity affects how sound is absorbed by the atmosphere. With a fixed temperature at 15ºC, a decrease in relative humidity from 80% to 20% can decrease the sound level at a listener standing 800 m from the noise source by 3 dB (at 1000 Hz). Fixing the relative humidity at 80%, an increase in temperature from 15 ºC to 30 ºC can decrease the sound level 800 m from the noise source by 3 dB (at 1000 Hz).

An average temperature of 10°C and average humidity of 80% has been adopted for the assessment and is representative of the climate conditions at the site.

4 Regulatory framework

4.1 Operational noise criteria

4.1.1 Noise Policy for Industry

The SEARs incorporate and consolidate the assessment requirements of the Department of Planning, Industry and Environment (DPIE) for Development Consent Applications and the Environment Protection Authority (EPA) for environment Protection License (EPL) applications for their consideration during the planning approval phase of the proposal. The Development Consent and/or EPL will generally contain conditions stipulating environmental noise limits for noise from the site.

These limits are normally derived from operational noise levels applied at assessment locations and are based on EPA guidelines (i.e. NPfI) or noise levels that can be achieved at a specific site following the application of all reasonable and feasible noise mitigation. The objectives of project noise trigger levels (PNTL) for industry are to protect the community from excessive intrusive noise and preserve amenity for specific land uses.

In circumstances where noise the PNTLs cannot be achieved, residual noise levels are used to assess noise impacts and manage noise from the site in negotiation between the regulatory authority and community. The regulatory authority then sets statutory compliance levels that reflect the achievable and agreed noise limits from the development.

It should be noted that the audibility of a noise source does not necessarily equate to disturbance at an assessment location. To ensure these objectives are met, the EPA provides two separate noise trigger levels: intrusiveness and amenity. The intrusiveness noise levels apply over 15 minutes in any period (day, evening or night) and aim to control the relative audibility of operational noise compared to the background level at residential receivers.

The amenity noise level limits the total level of extraneous noise for all receiver types and is assessed over the entire assessment period (day, evening or night). Both the intrusiveness and amenity noise levels are calculated and the lower of the two in each time period is set as the PNTL. For the purposes of assessment to standardise the approach the NPI recommends that the $L_{Aeq(15min)} = L_{Aeq(period)} + 3$ dBA unless an alternative approach can be justified.

4.1.2 Minimum assumed rating background levels

Where the measured RBLs are below the minimum assumed RBLs from the NPfI, the minimum assumed RBLs have been used to determine the intrusiveness noise criteria for the residential receivers in the study area. The minimum assumed RBLs are shown in Table 4.1.

Table 4.1 Minimum assumed rating background levels

Time of day	Minimum assumed rating background noise level (dBA)
Day	35
Evening	30
Night	30

Note should be made that the minimum RBLs have also been used to establish the construction noise management levels, where applicable. It should also be noted that the DCNG includes the adoption of the minimum RBLs as per the NPfI.

4.1.3 Intrusiveness noise level

The intrusiveness noise level is determined by a 5 dB addition to the RBL with a minimum intrusiveness noise level of 35 dBA for the evening and night period and 40 dBA for the day period. The NPfI recommends that the intrusiveness noise level for the evening and day period should not exceed the daytime period. The intrusiveness noise levels are only applicable to residential receivers.

4.1.4 Project amenity noise level

The recommended amenity noise level applies to all industrial noise in the area which when combined should remain below the recommended amenity noise level. The recommended amenity noise level represents the total industrial noise at a receiver location and a Project Amenity Noise Level is set at 5 dBA below the recommended amenity noise level.

Residential receiver areas are characterised into 'urban', 'suburban', 'rural' or other categories based on land uses and the existing level of noise from industry and road traffic. With consideration to the NPfI 'noise amenity area' classification, the residential receivers identified are classified as 'Rural Residential' as per the NPfI.

4.1.5 Summary of project noise trigger levels

Based on the NPfI, a summary of the project noise trigger levels (PNTLs) for residential land uses are presented in Table 4.2. All identified residential receivers have been classified as 'rural residential' to be conservative. Compliance with the residential PNTLs ensure compliance with the less-stringent non-residential PNTLs. The project noise trigger levels for non-residential receivers are presented in Table 4.3.

For a residence, the project noise trigger level and maximum noise levels are to be assessed at the reasonably most-affected point on or within the residential property boundary or, if that is more than 30 metres from the residence, at the reasonably most affected point within 30 m of the residence, but not closer than 3 m to a reflective surface and at a height of between 1.2–1.5 m above ground level.

In assessing amenity noise levels at commercial or industrial premises, the noise level is to be assessed at the reasonably most-affected point on or within the property boundary.

Table 4.2 Project noise trigger levels for residential receivers

NCA	Assessment period	Intrusive noise level, $L_{Aeq(15min)}$	Project amenity noise level, $L_{Aeq(15min)}$	Project noise trigger level, $L_{Aeq(15min)}$ dBA
NCA1 – rural residential receivers	Day	**44**	48	44
	Evening	44	**43**	43
	Night	**38**	**38**	38
NCA2 – rural residential receivers	Day	**41**	48	41
	Evening	**41**[1]	43	41
	Night	**38**	**38**	38
NCA3 – rural residential receivers	Day	**40**[2]	48	40
	Evening	**37**	43	37
	Night	**35**[2]	38	35

Notes:

1) As per the NPfI, the intrusiveness noise level for the evening should be set at a level no greater than the intrusiveness noise level for the day period

2) Minimum assumed RBLs have been used to establish the intrusiveness noise level

Table 4.3 Project noise trigger levels for non-residential receivers (external)

Type	Time of day	Project noise trigger level, $L_{Aeq(15min)}$ dBA
Commercial premises	When in use	63[1]
Industrial premises	When in use	68[1]

Notes:

1) A + 3 dB correction has been applied to convert $L_{Aeq(period)}$ to $L_{Aeq(15\ min)}$

4.1.6 Modifying factor corrections

The NPfI requires that corrections for annoying characteristics are applied if the noise sources contain tonal, intermittent or low frequency characteristics, which have the potential to increase annoyance. The modifying factor adjustments are detailed in Table 4.4.

Table 4.4 NPfI modifying factor corrections

Factor	Assessment/ measurement	When to apply	Correction[1,2]
Tonal noise	One-third octave or narrow band analysis	Level of one-third octave band exceeds the level of the adjacent bands on both sides by: 5 dB or more if the centre frequency of the band containing the tone is above 400 Hz 8 dB or more if the centre frequency of the band containing the tone is 160 to 400 Hz inclusive 15 dB or more if the centre frequency of the band containing the tone is below 160 Hz.	5 dBA[2]
Low frequency noise	Measurement of C-weighted and A-weighted level	Measure/assess C and A weighted $L_{eq,T}$ levels over same time period. Correction to be applied if the difference between the two levels is 15 dB or more and: Where any of the one-third octave noise levels in Table C2 are exceeded by up to and including 5 dB and cannot be mitigated, a 2 dBA positive adjustment to measured/predicted A-weighted levels for the evening/night period Where any of the one-third octave noise levels in Table C2 are exceeded by more than 5 dBA and cannot be mitigated, a 5 dBA positive adjustment to measured/predicted A-weighted noise levels applies for the evening/night period and a dBA positive adjustment for the daytime period.	5 dBA[2]
Intermittent noise	Subjectively assessed	When the night-time noise level drops to that of the background noise level with a noticeable change in noise level of at least 5 dBA.	5 dBA

Notes:

1) Where two or more modifying factors are present the maximum correction is limited to 10 dBA.

2) Where a source emits a tonal and low-frequency noise, only one 5 dB correction should be applied if the tone is in the low frequency range.

4.1.7 Cumulative noise impacts

Cumulative noise impacts affecting receivers from all industrial noise sources are assessed against the amenity criteria of the NPfI. The combined impact of all industrial noise sources at a receiver location should be considered, where industrial facilities are either operating or have been approved for development. The cumulative noise criteria that apply for the residential receivers within the study area are the recommended amenity noise levels for 'rural residential' receivers being:

– Day period – $L_{Aeq(period)}$ 50 dBA

– Evening period - $L_{Aeq(period)}$ 45 dBA
– Night period - $L_{Aeq(period)}$ 40 dBA

The objective of the NPfI amenity noise level is to limit continuing increases in noise levels from the application of the intrusiveness level so the total industrial noise level remains below the recommended amenity noise level for residential receivers. The NPfI provides a recommended amenity noise level to represent the objective for total industrial noise at a receiver location and a project amenity noise level for noise from a single industrial development at a receiver location.

To ensure that industrial noise levels (existing plus new) remain with the recommended amenity noise level for an area, the project amenity noise levels is set at the recommended amenity noise level minus 5 dBA.

The NPfI states that were the project amenity noise level can be met, no additional consideration of cumulative industrial noise is required.

4.1.8 Sleep disturbance impacts

To assess sleep disturbance the NPfI recommends the following screening criteria, assessed externally at the nearest residential location.

– $L_{Aeq(15min)}$ 40 dBA or the prevailing RBL + 5 dBA (whichever is greater); and/or
– L_{AFmax} 52 dBA or the prevailing RBL + 15 dBA (whichever is greater).

As the PNTLs for all NCAs during the night period are lower than the $L_{Aeq(15min)}$ 40 dBA sleep disturbance criteria, sleep disturbance has been assessed against the L_{AFmax} 52 dBA criteria.

Should maximum noise level events during operation exceed the screening criteria, a detailed maximum noise assessment should be undertaken.

The detailed assessment would cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period. Some guidance on possible impact is contained in the review of research results in the RNP.

4.2 Construction Noise

4.2.1 NSW Construction Noise Guidelines

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

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

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

The intent of the key changes in the DCNG have been considered in this assessment however construction noise associated with the project has been assessed against the requirements of the ICNG.

4.2.2 ICNG construction hours

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

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

Figure 4.1 shows the standard construction hours and the out-of-hours work periods for the day, evening and night.

Figure 4.1 Recommended standard and outside of recommended standard construction hours

Construction activities should aim to be undertaken during the recommended standard hours. However, the following activities have justification to be undertaken outside the recommended construction hours. This is assuming all reasonable and feasible mitigation measures are implemented to minimise the impacts to the surrounding community:

– the delivery of oversized plant or structure
– emergency work
– works for which it can be demonstrated that there is a need to operate outside the recommended standard hours
– works which maintain noise levels at receivers to below the noise affected construction noise management levels.
– after all reasonable and feasible mitigation has been implemented, and where agreement has been reached with the community (if the noise affected level would be exceeded by more than 5 dBA).

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

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

The management measures are aimed at reducing noise impacts at the residential receivers. However, it may not be reasonable and feasible to reduce noise levels to below the noise affected management level. The noise affected construction noise management levels are not intended as a noise limit but rather a level at which noise management is required and as such should not be considered as a noise limit in the environmental protection license or Consent Condition.

4.2.3 Noise management levels

Table 2 in the ICNG provides recommended noise management levels for residences, which are detailed in Table 4.5. Noise management levels are also provided in the ICNG for other sensitive land uses in Table 4.6.

Table 4.5 Residential construction noise management levels, dBA (ICNG, 2009)

Time of day	Noise management level, $L_{Aeq(15\ min)}$	Application notes
Recommended standard hours	Noise affected: RBL + 10 dBA	The noise affected level represents the point above which there may be some community reaction to noise. where the predicted or measured $L_{Aeq(15\ min)}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practices to meet the noise affected level the proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	Highly noise affected: 75 dBA	The highly noise affected level represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restricting the hours that the very noisy activities can occur, taking into account: times identified by the community when they are less sensitive to noise (such as before and after school, or mid-morning or mid-afternoon for works near residences) if the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended standard hours[1]	Noise affected: RBL + 5 dBA	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable measures have been applied and noise is more than 5 dBA above the noise affected level, the proponent should negotiate with the community.

Table 4.6 Noise at non-residential sensitive land uses, (ICNG, 2009)

Land use	Management level $L_{Aeq(15min)}$ (applies when properties are being used)
Industrial premises	External noise level 75 dBA
Commercial premises	External noise level 70 dBA

4.2.4 Project specific construction noise management levels

The noise management levels at sensitive receivers in the study area are summarised in Table 4.7 and have been based on Table 4.5 and Table 4.6. As the measured RBLs are lower than the minimum background levels specified in the NPfI, the minimum background noise levels have been used.

For the ancillary works outside the main construction area, minimum RBLs have been assumed to establish the relevant residential NMLs.

Table 4.7 Project specific construction noise management levels

Sensitive receiver type	Construction Noise Management Levels				
	Standard construction hours		Outside standard construction hours[1]		
	Noise affected	Highly noise affected	Day	Evening	Night
Residential – NCA1	49	75	44	44	38
Residential – NCA2	46	75	41	44	38
Residential – NCA3	45	75	40	37	35
Industrial premises	External noise level 75 dBA (when in use)				
Commercial premises	External noise level 70 dBA (when in use)				

Notes:

1) Noise management levels for outside of recommended standard construction hours are provided, however construction works are not proposed for non-standard hours

4.2.5 Sleep disturbance

No construction works are proposed outside standard construction hours. As such, no sleep disturbance impacts are anticipated during the construction phase of the proposal.

4.3 Construction vibration

4.3.1 Human comfort

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

Whilst the assessment of response to vibration in BS 6472-1:2008 is based on vibration dose value and weighted acceleration, for construction related vibration, it is considered more appropriate to provide guidance in terms of a peak particle velocity (PPV), since this parameter is likely to be more routinely measured based on the more usual concern over potential building damage. Table 4.9 provides guidance on the effect of vibration levels for human comfort in peak particle velocity as reference against the vibration guide values shown in Table 4.8.

Table 4.8 Acceptable PPV Values for Human Comfort (BS 6472-2008)

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

Notes:

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

Humans are capable of detecting vibration at levels which are well below those causing risk of damage to a building. The degrees of perception for humans are suggested by the vibration level categories given in *BS5228.2 – 2009, Code of Practice Part 2 Vibration for noise and vibration on construction and open sites – Part 2: Vibration* (British Standards, 2009), as shown below in Table 4.9.

Table 4.9 Guidance on effect of vibration levels for human comfort (BS 5228.2 – 2009)

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

4.3.2 Structural damage

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

The vibration levels in this standard are adopted as building damage criteria and are presented in Table 4.10.

Table 4.10 Transient vibration guide values - minimal risk of cosmetic damage

Type of building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse[1]	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures industrial and heavy commercial building	50 mm/s at 4 Hz and above	
Unreinforced or light framed structures residential or light commercial type buildings [2]	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Notes:

1) Values referred to are at the base of the building.

2) At frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) should not be exceeded.

4.4 Traffic noise (construction and operation)

The RNP provides traffic noise target levels for residential receivers in the vicinity of existing roads and are applied to road upgrades. For this assessment these levels are also applied to construction works to identify potential construction traffic impacts and the potential for reasonable and feasible mitigation measures. The RNP road types are based on the following functional roles.

Table 4.11 Road Categories from RNP

Road category	Functional role	Existing roads used by proposal	Planned new roads used by the proposal
Freeways or motorways/arterial roads	Support major regional and inter-regional traffic movement. Freeways and motorways usual feature strict access controls via grade separated interchanges.	Hume Hwy	N/A

Road category	Functional role	Existing roads used by proposal	Planned new roads used by the proposal
Sub-arterial roads	Provide connection between arterial roads and local roads. May support arterial roads during peak period. May have been designed as local streets but can serve major traffic generating developments or support non-local traffic.	Berrima Road	New access road (east/west Road off Lackey Road)
Local roads	Provide vehicular access to abutting property and surrounding streets. Provide a network of the movement of pedestrians and cyclists, and enable social interaction in a neighbourhood. Should connect ,where practicable, only to sub-arterial roads.	Lytton Road Beaconsfield Road	N/A

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

If the road traffic noise increase from the construction work is within 2 dBA of current levels then the objectives of the RNP are met and no specific mitigation measures are required. Mitigation should be applied when road traffic noise levels increase by 2 dB and the controlling noise criterion in Table 4.12 are exceeded when assessed at the nearest façade of the residential dwelling.

Table 4.12 Road traffic noise criteria, dBA

Development type	Day 7 am to 10 pm	Night 10 pm to 7 am
Existing residences affected by noise from **new** freeway/arterial/sub-arterial road corridors	55 Leq(15hr)	50 Leq(9hr)
Existing residence affected by **additional traffic** on arterial / sub-arterial / collector roads generated by land use developments	60 Leq(15hr)	55 Leq(9hr)
Existing residences affected by noise from **new** local road corridors	55 Leq(1hr)	50 Leq(1hr)
Existing residence affected by **additional traffic** on local roads generated by land use developments		

The new access road is a proposed collector road as part of the Wingecarribee Shire Council's MVEC development plan. However, until this road network and surrounding industrial complex is complete, Plasrefine Recycling will likely be the sole user of the new access road. Therefore, under this assumption, the more conservative peak 1 -hour criteria (for a new local road) has been assumed for the assessment of traffic noise along the new access road.

4.5 Hearing sensitivity for mice

It is understood that the Australian Bioresources facility (operated by the Garvan Institute of Medical Research) breed and conduct medical research on mice. A high-level assessment has been undertaken to assess any potential impact on the mice during both the construction and operation of the proposal.

Different species of fauna have different hearing sensitivities, depending on the evolutionary structure of the hearing organ. Generally, mice hearing range is in the ultrasound range (1-100 kHz) with the greatest sensitivity between 15 kHz and 20 kHz. Guidance from the Garvan Institute suggests a noise target for the assessment of L_{max} 60 dB as noise levels below this level are not anticipated to result in adverse impacts. The L_{max} noise descriptor has been used as '*sudden noises are more like to cause disturbance than constant background noise'* and the assessment considers the frequency bands between 1 kHz and 16 kHz to determine potential impacts. Construction equipment are not anticipated to produce significant noise above 16 kHz.

It should also be noted that mice are nocturnal and the worst impact would occur during daylight hours during the construction phase of the proposal (construction noise levels are anticipated to be significantly higher than noise levels during operation).

5 Noise and vibration impacts

5.1 Operational noise impacts

The design of the facility is still in an early stage of development and as such, noise modelling has been based on information provided thus far. As further detail is provided, the operational noise model should be updated to account for potential changes in the design or operating conditions to ensure compliance with the noise limits can be met at all sensitive receiver locations.

The following factors have been taken into account in the noise modelling methodology:

– Estimation of internal noise levels has been based on information from similar plastic recycling facilities and informed by the WHS noise exposure regulations
– The SWL of external noise sources either modelled as a point source or a line source. For line or area sources, the SWL can be represented either as a SWL (total area or line) or SWL" (per m^2) for an area of SWL" (per metre) for a line.

To predict the noise levels at sensitive receivers surrounding the site, the following factors have been taken in account in the environmental noise modelling methodology:

– The envelope of each building (3-dimensional) to predict noise levels from each building component including the noise reduction properties and surface area of each of the external building components
– External noise line sources (e.g. external truck movements, staff vehicles)
– External point sources (e.g ventilation fans)
– Terrain topography
– Absorption from the ground coverage
– Atmospheric absorption
– Relevant shielding objects (e.g. buildings / noise barriers)
– The operating times of the relevant noise sources and the frequency of vehicle movements
– Noise enhancing meteorological conditions

5.1.1 Internal noise modelling methodology

It has been assumed that the incident sound fields for the walls and the ceiling are a 'diffuse field' as the 'direct sound' levels from the internal noise sources on the walls and ceiling are expected to be lower than the spatially averaged diffuse levels. This 'diffusivity factor' on each external building component (walls, ceiling, door etc.) influences the portion of sound that will transmit out of the building structure.

'Diffusivity factor Cd' is defined in BS EN 12354-4: 2000 '*Building acoustics - Estimation of acoustic performance of buildings based on the performance of elements – Part 4: Transmission of indoor sound to the outside'* (British Standards, 2000) and states that Cd to be the difference between the sound pressure level at 1 to 2 m from the inside face of the relevant building element and the intensity level of the incident sound perpendicular to that element.

The standard notes that for a diffusive field and reflecting walls (as appropriate with this building), the diffusivity factor Cd is -6 dB and that for other situations it can have a value between 0 and – 6 dB depending on the proximity of noise sources to the relevant building elements. A diffusivity factor of -6 dB for roof elements and -5 dB for all other external building elements has been estimated in the environmental noise model.

5.1.2 Environmental noise modelling methodology

Acoustic modelling was undertaken using SoundPLAN 8.2 noise modelling software to predict indicative environmental noise levels at the sensitive receivers surrounding the the plastics recycling and reprocessing facility site during the operation of the facility. SoundPLAN is a computer program for the calculation,

assessment and prognosis of noise propagation. SoundPLAN calculates environmental noise propagation using industry standard models such as the ISO 9613-2 (ISO, 1996) or the CONCAWE (CONCAWE, 1981) prediction methods.

The CONCAWE calculation method has been selected as the preferred prediction algorithm due to the following reasons:

– CONCAWE takes into account the reduction of ground coverage attenuation as noise sources increase in height above the ground (ISO 9613-2 was not developed to account for noise sources at significant heights above the ground).
– CONCAWE implements the Pasquill stability categories in the algorithm as well as noise enhancing light winds up to 3 m/s (ISO 9613 assumes a moderate temperature inversion or a source to receiver wind as default)

General parameters used in the model are listed in Table 5.1.

Table 5.1 Noise modelling parameters

Variable	Parameter used
Calculation method	CONCAWE
Topography (existing)	Sourced from ELVIS GIS Australia - 5 m elevation intervals
Receiver heights	1.5 m above building ground level
Ground absorption	0.00 for all areas within the site 0.75 for all other areas (conservative) (0 is non-porous ground and 1 is porous ground such as that found in a rural setting comprising of mainly grass and vegetation)
Acoustic shielding from buildings	Extracted from Microsoft Building Footprints (Bing Maps). Building heights have been estimated based on a review of Google Maps.
Temperature	10°C
Humidity	80%
Number of reflections	A maximum number of 3 reflections from surrounding structures

The analysis in Section 3.3 indicates that standard meteorological conditions are appropriate to be used in the assessment during the day and evening periods. F-class conditions are considered a feature during the night period and have been included in the noise modelling with a source to receiver wind to represent worst-case conditions. No noise-enhancing wind effects have been included in the noise model during the day and evening period and they do not occur for more than 30% of the time (see Section 3.3.2).

Table 5.2 NPfI meteorological conditions modelled

Assessment period	Standard or noise-enhancing conditions	Pasquill stability category	Winds
Day	Standard / Neutral	D	None
Evening	Standard / Neutral	D	None
Night	Standard / Neutral	D	None
	Noise-enhancing / Adverse	F	2 m/s

5.1.3 Source noise levels

A conservative approach has been taken to estimate the internal noise levels of both Building 1 and Building 2. A spatially averaged internal noise level of 85 dBA has been used for Building 1 as equipment noise levels are required to be reduced at the source to comply with the Work Healthy and Safety (WHS) Regulation noise exposure requirement of 85 dBA for operators working within the buildings. Similarly, a spatially averaged internal noise level of 80 dBA has been assumed for Building 2 and 85 dBA for the WWTP.

The source noise levels used in the noise model are presented in Table 5.3 below and are indicative only. Third octave data for ventilation fans and air emission system fans has not been provided and indicative sound power levels have been modelled at centre frequency of 500 Hz. The source noise levels will require further refinement during the design phase once vendor technical data sheets for the selected equipment have been made available, especially in the case of the stack as they have the potential to result in low-frequency noise at the nearest sensitive receivers.

Detailed assumptions for each noise source are presented in Appendix F.

Table 5.3 Source noise levels used in the noise model, dBA

Source group	Noise Source	Overall, dBA	Input Type
Internal noise levels	Building 1 – main processing building	85	SPLi
	Building 2 – deep processing building	80	SPLi
	Waste water treatment plant	80	SPLi
2 Dimensional and point noise sources	Building 1 roof fans – x 6 (indicative)	80 (each)	SWL (point)
	Building 1 stacks – x 2	85 (each)	SWL (point)
	Building 2 roof fans – x 6 (indicative)	75 (each)	SWL (point)
	Building 2 stacks – x 2	85 (each)	SWL (point)
	WWTP roof fans – x 3 (indicative)	85 (each)	SWL (point)
	Delivery truck – 5 per hour (day period)	107	SWL (moving point)
	Staff vehicles – 60 per hour	85	SWL (moving point)

5.1.4 Predicted noise levels

The predicted $L_{Aeq(15min)}$ noise levels at the most-affected sensitive receivers within each of the NCAs are presented in Table 5.4, with detailed results for all receivers are presented in Appendix G. The noise modelling indicates compliance is predicted at all sensitive receiver locations. L_{Aeq} noise contours at 1.5 m

above ground are presented in Figure 5.4.and Figure 5.5 for the day (neutral conditions) and night period (adverse conditions), respectively.

The dominant noise sources from the site include the delivery truck during the day period and the emission of noise from Building 1 through the walls and roller doors and from the stacks of both buildings during all periods. Figure 5.1, Figure 5.2 and Figure 5.3 show the contribution of the modelled noise sources at R010, R019 and R160 respectively for neutral conditions during the day and evening and adverse conditions at night.

As there is the potential for the stack outlets to result in low-frequency noise at receivers (defined as annoying noise in Fact Sheet C of the NPfI), the stacks should be designed to achieve a stack exit sound power of L_{Aeq} 80 dBA or less (5 dB below the modelled level) to account for this..

Table 5.4 Predicted $L_{Aeq(15min)}$ noise levels at sensitive receivers, dBA

RID	Receiver Type	NCA	NPfI Project noise trigger level, $L_{Aeq(15min)}$ dBA			Predicted $L_{Aeq(15min)}$ noise level, dBA				Complies?
			Day	Evening	Night	Day Neutral	Evening Neutral	Night Neutral	Night Adverse	
R010	Residential	NCA1	44	43	38	33	32	32	34	Yes
R019	Residential	NCA2	41	41	38	39	37	37	38	Yes
R160	Residential	NCA3	40	37	35	34	33	33	35	Yes

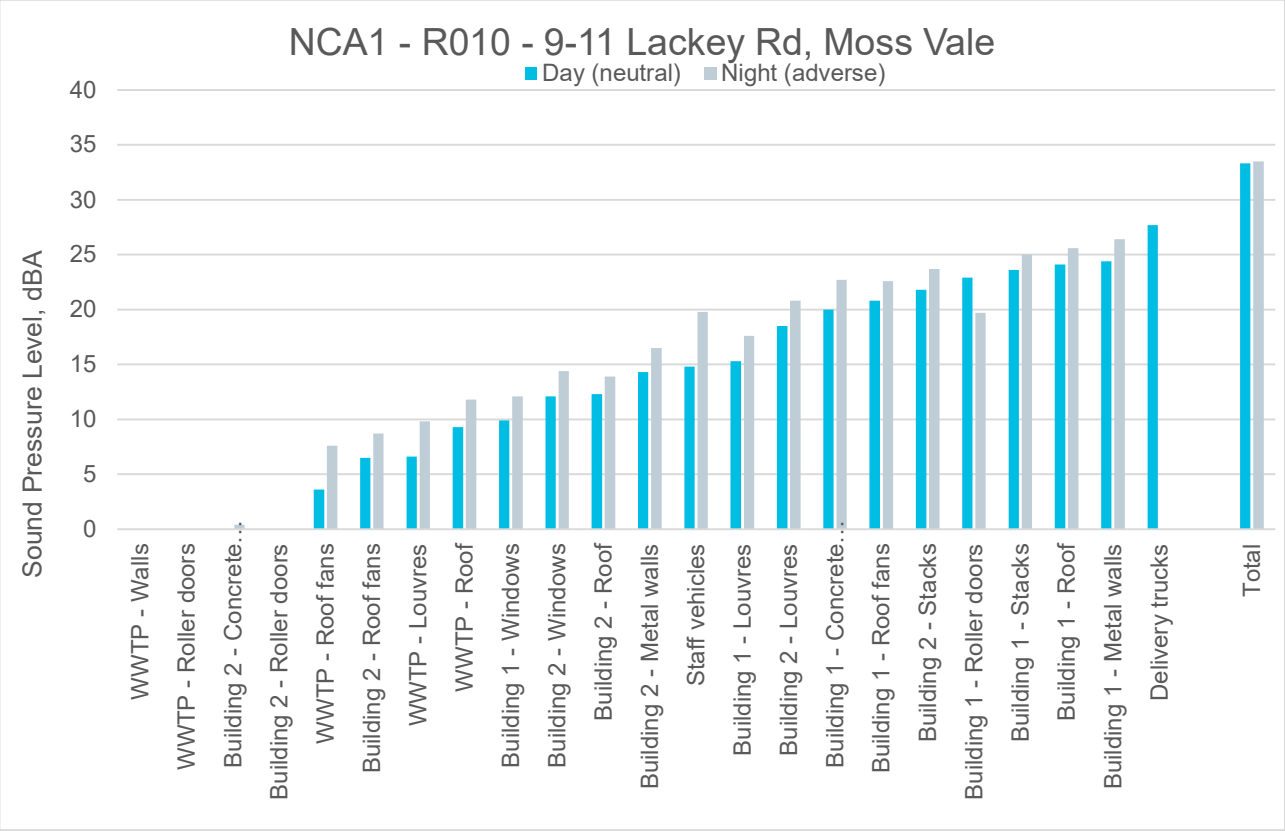


Figure 5.1 Contribution of the modelled noise sources at R010 – 9-11 Lackey Rd, Moss Vale

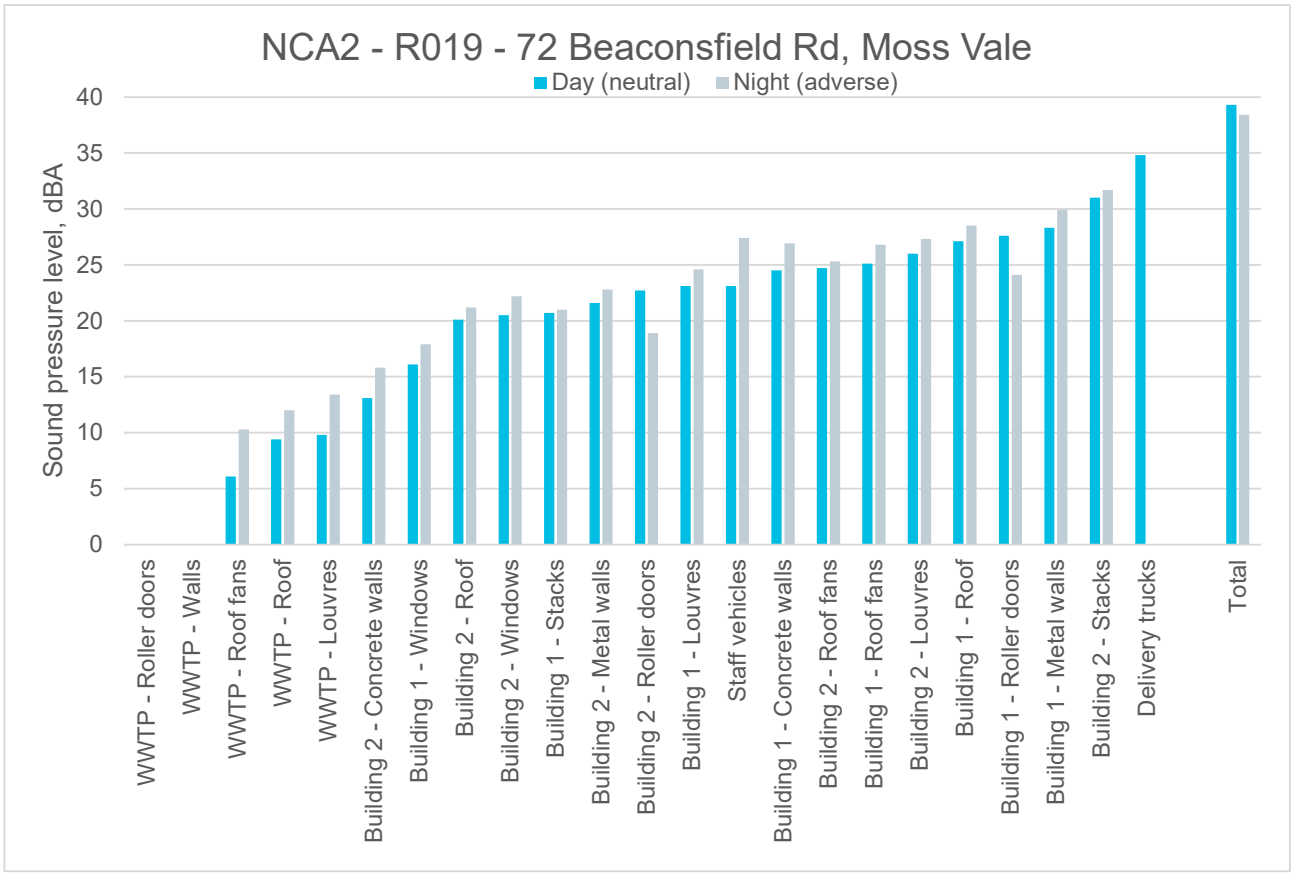


Figure 5.2 *Contribution of the modelled noise sources at R019 - 72 Beaconsfield Rd, Moss Vale*

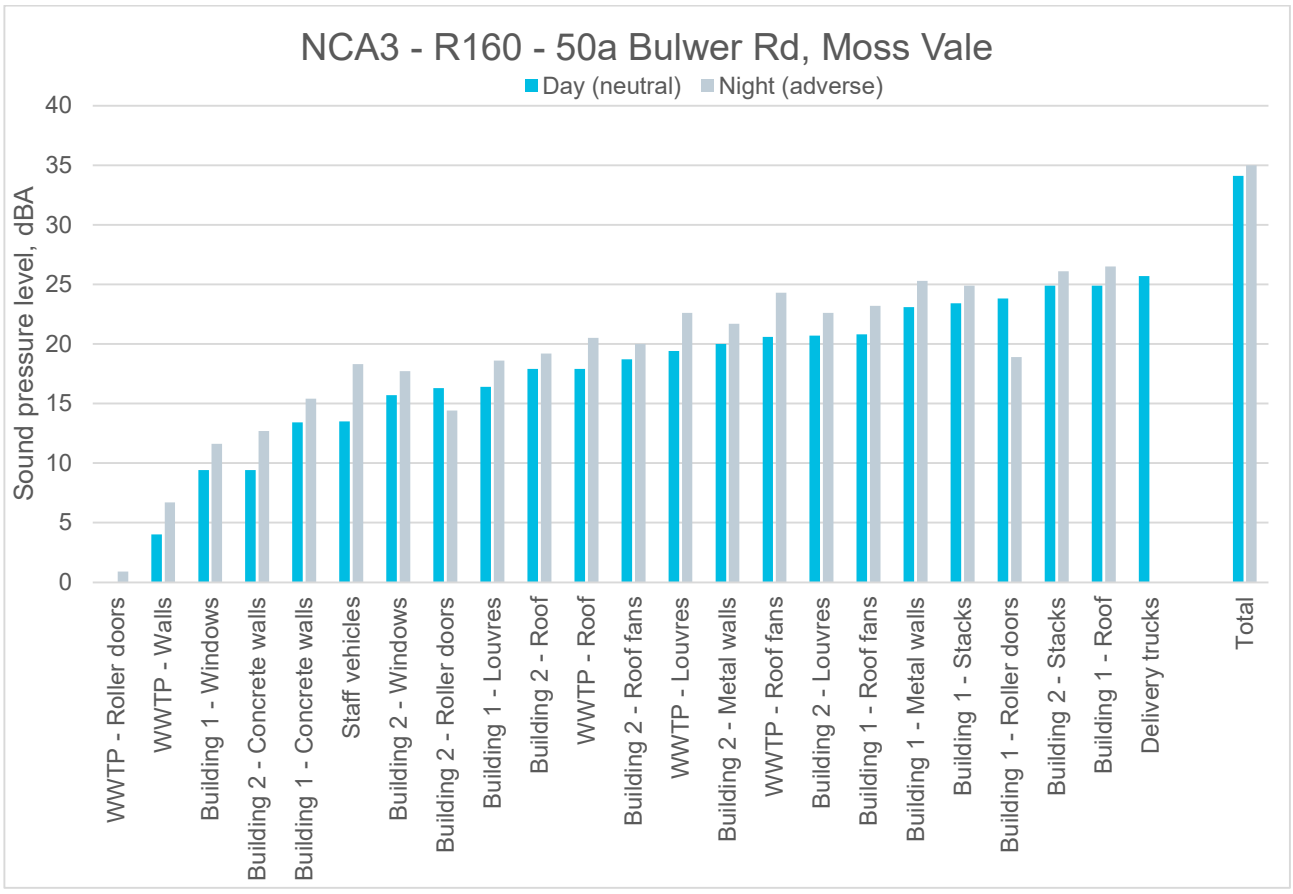
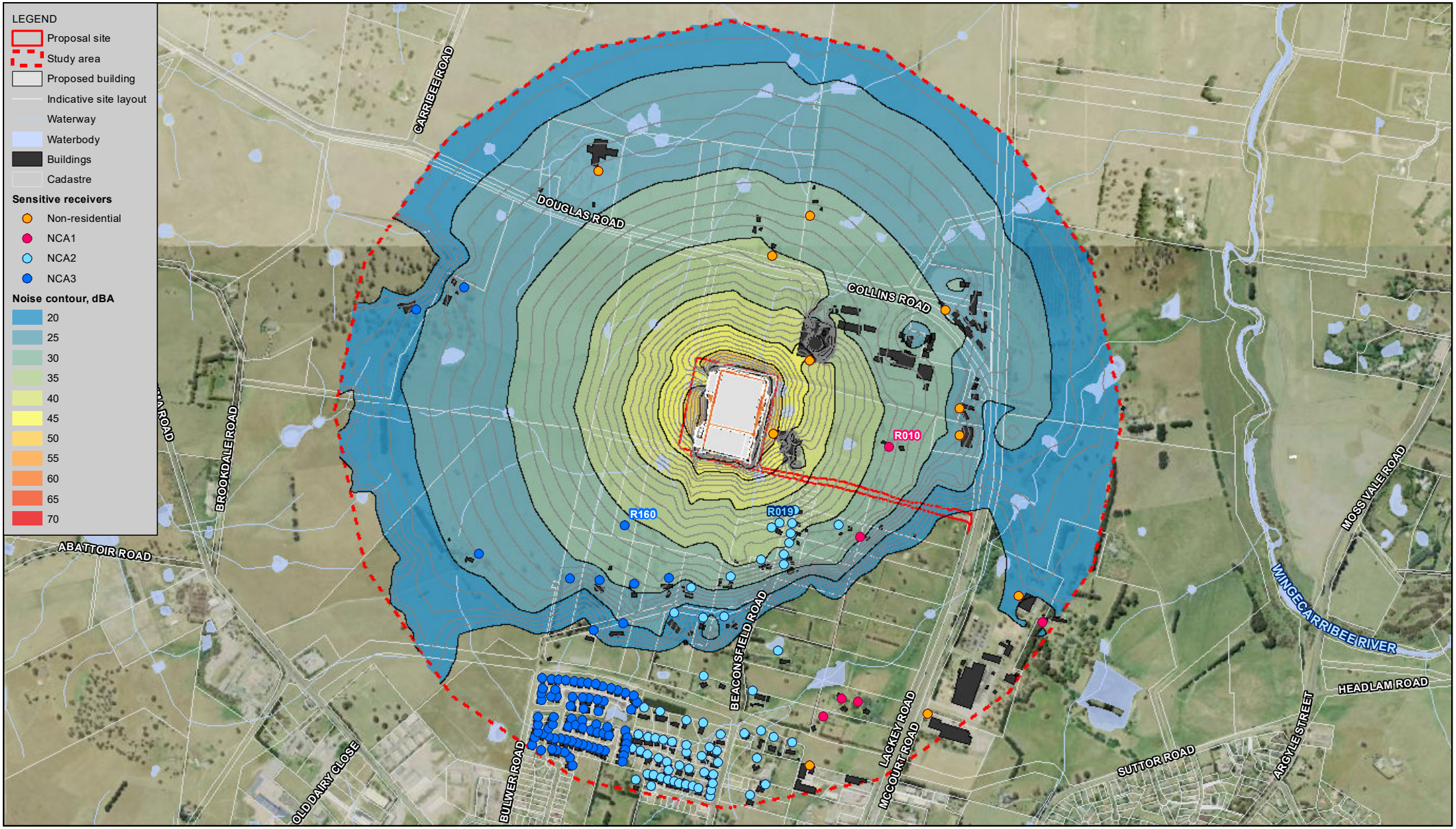


Figure 5.3 *Contribution of the modelled noise sources at R160 - 50a Bulwer Rd, Moss Vale*



Paper Size ISO A4

0 200 400

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

Plasrefine Pty Ltd
Moss Vale Plastics Recycling Facility
Noise Assessment

LAeq noise contour - day period (neutral conditions)

Project No. **12524108**
Revision No. **B**
Date **25 Jan 2022**

FIGURE 5-4

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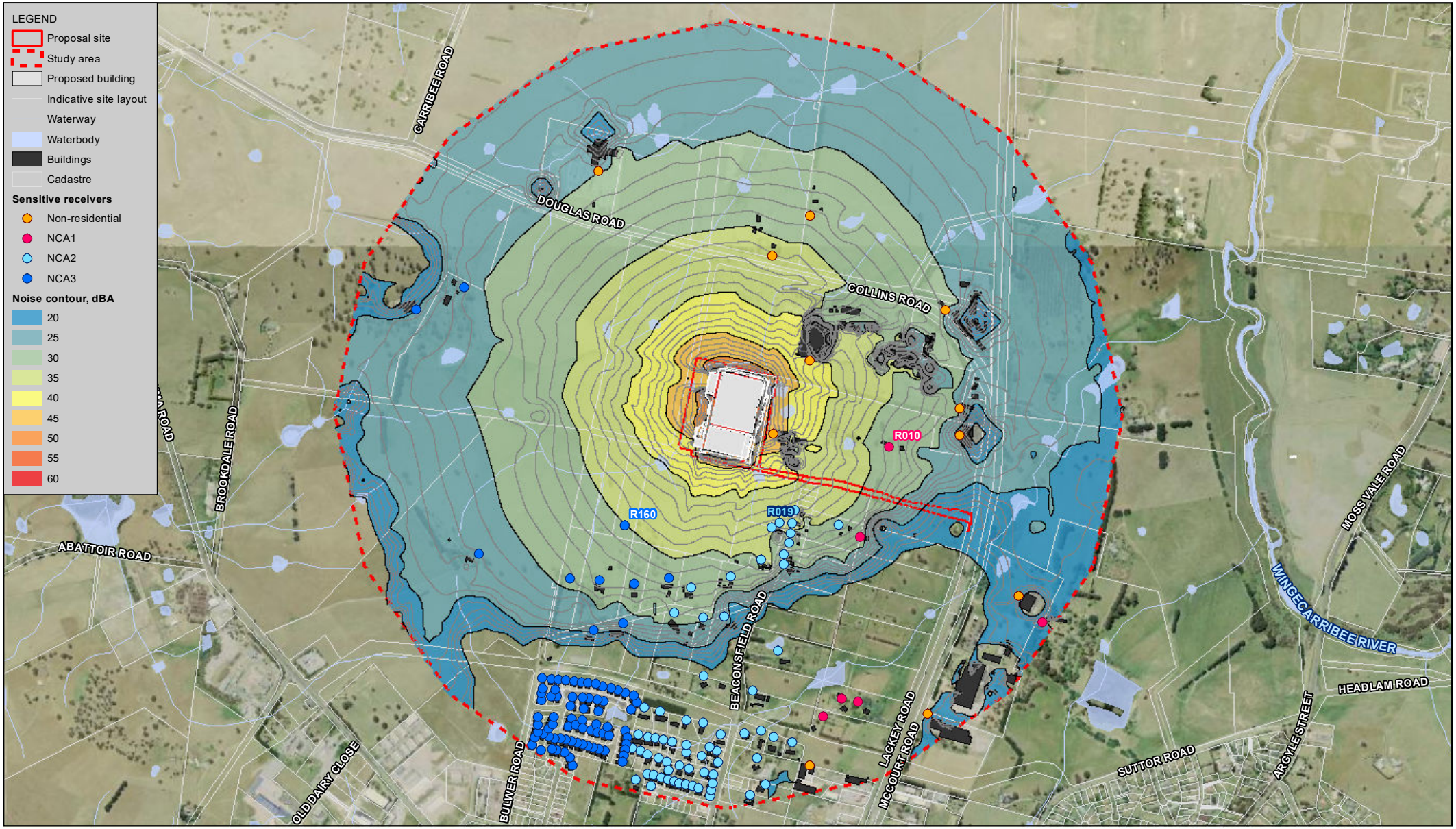
Data source: Aerial imagery - sixmaps 2022; General topo - NSW LPI DTDB 2020, 2015. Created by: eibbertson



Paper Size ISO A4

0 200 400

Metres

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

Plasrefine Pty Ltd
Moss Vale Plastics Recycling Facility
Noise Assessment

LAeq noise contour - night period (adverse conditions)

Project No. **12524108**
Revision No. **B**
Date **25 Jan 2022**

FIGURE 5-5

\\ghdnet\ghd\AU\Sydney\Projects\21\12524108\GIS\Maps\Deliverables\Noise\12524108_NOISE005_LAeqNoiseContour_NightPeriod_Adverse.mxd

Data source: Aerial imagery - sixmaps 2022; General topo - NSW LPI DTDB 2020, 2015. Created by: eibbertson

5.1.5 Sleep disturbance impacts

There is the potential for sleep disturbance only if there are short-duration, high noise level noise events. While the proposal will be operation during the night period, the noise generating activities will all occur within the enclosed buildings and are expected to be in practice, continuous in nature. Furthermore, no deliveries are proposed during the night period and as such all roller doors would remain closed for the entire evening and night periods. As such no maximum noise events are predicted from the internal operations during the night period.

However, significant maximum noise level events could occur from staff members slamming car doors on arrival to or departure from the site. The maximum sound power levels for the car door slammed was modelled at 95 dBA. No residential receivers are predicted to receive L_{Amax} noise levels over 52 dBA, with a highest predicted noise level of 43 dBA at R019, and therefore no sleep disturbance impacts are predicted. The predicted L_{AFmax} noise levels for all sensitive receivers are presented in Appendix G.

5.2 Construction noise impacts

Information was provided by Plasrefine Recycling regarding the proposed equipment for construction activity associated with the proposal. The most significant impacts are expected to occur during bulk earthworks across the site. It has been assumed that all construction activity associated with the proposal would be conducted during the recommended standard construction hours.

5.2.1 Construction equipment

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

– Australian Standard 2436 – Guide to Noise Control on Construction, Maintenance and Demolition Site (2010)
– NSW Roads and Maritimes Services – Construction Noise and Vibration Guideline (2016)

The construction of the proposal would follow the methodology outlined in Table 2.2 as provided by Plasrefine Recycling. The anticipated plant and equipment to be used for each construction scenario is shown in Table 5.5 with the corresponding sound power levels and source of the noise level as well as activity sound power levels used in the noise model.

Table 5.5 Construction equipment sound power levels

Equipment	SWL, dBA	Source	CS1	CS2	CS3	CS4 a	CS4 b	CS5
Activity SWL, dBA			**108**	**115**	**116**	**112**	**112**	**109**
Bobcat	106	AS2436				✓		
Boom lift	105	AS2436				✓		
Bulldozer	108	AS2436		✓	✓			
Compactor	113	AS2436		✓	✓			
Concrete truck	113	AS2436			✓			
Excavator	107	AS2436		✓	✓	✓		
Forklift	106	AS2436				✓	✓	
Grader	110	AS2436			✓			
Hand tools	102	AS2436	✓					✓
Mini-loader	110	AS2436					✓	
Mobile crane	104	AS2436				✓		
Scissor lift	105	AS2436					✓	

Equipment	SWL, dBA	Source	CS1	CS2	CS3	CS4 a	CS4 b	CS5
Smooth drum roller	107	CNVG			✓			
Tipper truck	110	CNVG		✓	✓	✓		
Trucks	107	AS2436	✓	✓	✓	✓	✓	✓
Welders	105	AS2436						✓

5.2.2 Noise modelling assumptions and parameters

Acoustic modelling was undertaken using SoundPLAN 8.2 noise modelling software to predict the effects of construction noise generated by the proposed works. General parameters used in the model are listed in Table 5.6.

Table 5.6 Noise modelling parameters

Variable	Parameter used
Calculation method	ISO 9613- 2:1996
Meteorology	Well-developed moderate ground based temperature inversion, such as commonly occurs on clear, calm nights or 'downwind' conditions which are favourable to sound propagation.
Topography	Sourced from ELVIS GIS Australia - 5 m elevation intervals
Receiver heights	1.5 m above building ground level
Ground absorption	0.50 for all areas (0 is non-porous ground and 1 is porous ground such as that found in a rural setting comprising of mainly grass and vegetation)

5.2.3 Predicted noise levels

Construction noise levels have been predicted at the sensitive receivers within the study area with consideration to the acoustic requirements of the ICNG. The predicted L_{Aeq} noise level along with the noise management levels (NML) for each receiver are presented in Appendix H. The noise modelling assumes that the two loudest items of equipment in the scenario are operating at maximum capacity simultaneously at the closest distance between the construction works and the receiver. As such, the predicted noise levels are often highly conservative and actual noise levels are likely to be lower than those the levels presented below for the majority of the time.

Reasonable and feasible mitigation measures are recommended in Table 6.1 to reduce any potential noise impacts at sensitive receivers with consideration to the following (discussed further in Section 5.2.5).

– the effectiveness of the mitigation measures
– whether the measures are considered reasonable and feasible

Construction noise contours for each scenario are shown in Appendix I.

Table 5.7 Summary of construction noise levels – Standard construction hours (day)

		CS1	CS2	CS3	CS4a	CS4b	CS5
NCA1	No. of exceedances	2	1	3	0	0	0
	Max. level	54	50	62	46	46	46
	Max. exceedance	5	1	13	-	-	-
	Most affected receiver	R016	R010	R016	R010	R010	R010
NCA2	No. of exceedances	10	12	13	10	10	10
	Max. level	57	60	65	56	56	56
	Max exceedance	11	14	19	10	10	10

		CS1	CS2	CS3	CS4a	CS4b	CS5
	Most affected receiver	R018	R019	R018	R019	R019	R019
NCA3	No. of exceedances	1	5	5	2	2	2
	Max. level	46	51	54	48	48	48
	Max. exceedance	1	6	9	3	3	3
	Most affected receiver	R160	R160	R160	R160	R160	R160

5.2.4 Construction works during standard hours

At the majority of the receivers in the study area, construction noise levels are predicted to be below noise management level (NML). During worst-case construction conditions (when construction works are at the closest distance between the source and receiver), there are predicted to be exceedances of the NML at the closest receivers to the construction footprint. The application of reasonable and feasible mitigation measures at the source (see distance, screening, enclosures and silencers/mufflers in Table 5.8) are anticipated to reduce the predicted noise levels by approximately 5 to 10 dB.

The following sub-sections summarise the predicted exceedances of the NML.

Site establishment and enabling works

Up to 13 residential receivers are predicted to experience noise levels above the NML, including two in NCA1, one in NCA3 and 10 in NCA2. The maximum exceedance is predicted to be 11 dBA at R018. The loudest equipment in this scenario are anticipated to be hand tools and use of trucks.

Ground works and excavation

Up to 19 residential receivers are predicted to experience noise levels above the NML during ground works and excavation. NCA2 has the highest number of exceedances with R019 anticipated to receive the highest exceedance of 14 dBA. The loudest equipment in this scenario are anticipated to be dozers, compactors and use of trucks.

The commercial premises, Australian BioResources (R001), is predicted to receive noise levels above 70 dBA during the excavation and ground works when works are located at the nearest location. An assessment for the impact from construction works on the mice is provided in Section 4.5.

Road access construction

Works associated with the construction of the new access road are predicted to lead to up to 22 residential receivers experiencing noise levels above their respective NML with 14 of these within NCA2. The residence at R018 is anticipated to experience the highest noise levels, with an exceedance of 19 dBA above the NML. The loudest equipment in this scenario are anticipated to be compactors, graders and use of concrete trucks.

Construction of the main structures

Up to 15 residential receivers are predicted to experience noise levels above their NML during the construction of the proposal buildings and installation of processing equipment, with R019 anticipated to receive the highest noise levels. The loudest equipment used in this scenario is anticipated to be use of mini-loaders, tipper trucks and other trucks.

Testing and commissioning

Up to 15 residential receivers are predicted to experience noise levels above the NML for testing and commissioning works. R018 is anticipated to receive the highest noise levels. The loudest equipment in this scenario is anticipated to be use of a welder. The predicted noise levels assume there is no acoustic shielding provided by the buildings and as such are highly conservative. Noise levels are anticipated to be below the NML at all receivers for the majority of the construction works.

5.2.5 Effectiveness of mitigation measures

Measures for reducing noise impacts from construction activities follow three main control strategies:

– First preference and most desirable - Reducing the noise at the source

– Second preference – Reducing the noise in transmission (between source and receiver)

– Third preference and least desirable – Reducing the noise at the receiver

The following sections present the justification for the mitigation measures recommended in Section 6 along with a discussion of the reasonableness or feasibility of the noise control type.

Mitigation at the source is deemed the most reasonable and feasible mitigation strategy, due to the large construction area this strategy will benefit the greatest number of receivers when compared with other methods. A majority of the plant required for construction is mobile and as such silencers or mufflers should be considered to reduce noise levels at the source. This would provide a reduction at the source, and subsequently at the receiver, of 5-10 dB.

Mitigation at the source

The relative effectiveness of various forms of noise control at the source are presented in Table 5.8.

Table 5.8 Effectiveness of various forms of noise control at the source

Control by	Nominal noise reduction, dBA	Mobile plant[1]		Stationary plant[2]	
		Discussion of effectiveness	Reasonable or feasible test	Discussion of effectiveness	Reasonable or feasible test
Distance (first preference)	Approximately 6 for each doubling of distance	Very effective when implemented.	Considered reasonable and feasible.	Very effective when implemented.	Considered reasonable and feasible.
Silencing / mufflers (second preference)	Normally 5 to 10 (maximum 20)	Very effective when implemented – expected reduction of up to 10 dB for mobile plant and trucks. Silenced jackhammers can reduce noise levels by up to 10 dB.	Considered reasonable and feasible, where possible.	Compressors, pumps and generators can be selected include silencers, if appropriate.	Considered reasonable and feasible, where possible.
Screening (third preference, if required)	Normally 5 to 10 (maximum of 15)	Not generally possible and not effective for mobile plant within large construction areas during early construction works. Screening can be utilised once buildings have been erected.	Not considered feasible for mobile plant until buildings have been erected.	If screening is possible for stationary plant, screening can be very effective.	Considered reasonable if distance alone cannot provide sufficient attenuation.
Enclosure (fourth preference, if required)	Normally 15 to 25 (maximum 50)	Not generally possible and not effective for mobile plant.	Not considered feasible for mobile plant.	If possible and appropriate, enclosing stationary plant such as generators, pumps, compressors, transformers etc. can be very effective. Effectiveness of the enclosure will depend on the material and design of the enclosure.	Considered reasonable if distance alone cannot provide sufficient attenuation.

Notes: 1. Mobile plant refers to equipment such as excavators, dump trucks, bulldozers, loaders, water carts etc.
2. Stationary plant equipment such as refers to generators, compressors, pumps, A/C units etc.

Controls in transmission

The relative effectiveness of various forms of noise control in transmission are presented in Table 5.9.

Table 5.9 Effectiveness of various forms of noise control at transmission

Control by	Nominal noise reduction, dBA	Mobile plant		Stationary plant	
		Discussion of effectiveness	Reasonable or feasible test	Discussion of effectiveness	Reasonable or feasible test
Shield stationary noise sources such as pumps, compressors, fans etc.	Depends on the location of source and the receiver (normally 5 to 15)	Not applicable	Not applicable	Effective when it breaks the line of sight between the source and receiver. Not effective if it doesn't.	Considered reasonable and feasible, where possible.
Temporary noise barriers	Depends on the location of source and the receiver (normally 5 to 15)	Not generally possible and not effective for mobile plant within large construction areas.	Not feasible	Effective when it breaks the line of sight between the source and receiver. Not effective if it doesn't. Using distance, screening, enclosures, silencers are probably more appropriate and effective mitigation measures.	Feasible but not reasonable as other mitigation measures are more appropriate for main site works. Temporary noise barriers can be used if generators or transformers are required at the temporary workers accommodation facility.

Controls at the receiver

The relative effectiveness of various forms of noise control in transmission are presented in Table 5.10.

Table 5.10 Effectiveness of various forms of noise control at the receiver

Control by	Nominal noise reduction, dBA	All construction equipment	
		Discussion of effectiveness	Reasonable or feasible test
Temporary accommodation	Generally eliminates the noise impacts	Where all reasonable and feasible mitigation measures have been applied and there are significant residual impacts at residential receivers, temporary accommodation can be offered to affected residences.	Based on the low-impact residual noise levels at sensitive receivers (subsequent to the incorporation of controls at the source and in transmission), temporary accommodation is not considered reasonable.
Architectural treatment to a sensitive receiver	Depends on the type of treatment (normally 10 to 20)	Where all reasonable and feasible mitigation measures at source and transmission have been applied, and temporary accommodation has been offered and there are significant residual impacts at residential receivers, architectural treatments at the affected residences can be considered.	Based on the low-impact residual noise levels at sensitive receivers (subsequent to the incorporation of controls at the source and in transmission), architectural treatment at the receiver is not considered reasonable.

5.3 Construction vibration impacts

5.3.1 Vibration modelling methodology

The method for the construction vibration assessment included:

- Identifying safe working distances to comply with the human comfort and the cosmetic damage criteria. These buffer distances have been adopted from *Construction Noise and Vibration Strategy* (CNVS) (TfNSW 2019).
- Safe working distances for vibration intensive equipment are shown in Table 5.11. The vibratory equipment associated with the project include vibratory rollers, rock breakers and jackhammers.
- Buildings within the safe working distances have been identified for consideration of management measures.

5.3.2 Vibration safe working distances

Safe working distances for vibratory intensive equipment has been sourced from the TfNSW CNVS and are shown in Table 5.11.

Table 5.11 Vibration safe working distances

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

5.3.3 Human comfort

The most vibration intensive activities associated with the construction works are anticipated to be excavation works with a 26 tonne excavator and vibratory rolling during construction of the road.

Excavation activities have the potential to exceed the human comfort vibration criteria should these works occur within 73 m of residences, while rolling works have the potential to exceed human comfort levels within 100 m. No residences have been identified within 100 m of these vibration intensive works and as such, no adverse vibration impacts are anticipated as a result of the project.

5.3.4 Structural damage

Excavation works have the potential to exceed the cosmetic damage criteria should these works occur within 22 m of a sensitive receiver building. No buildings have been identified within 22 m of excavation works and as such, no adverse cosmetic damage vibration impacts are anticipated as a result of the project.

5.4 Traffic noise impacts along public roads

5.4.1 Existing traffic conditions

Traffic counts were undertaken in from Thursday 3 December to Wednesday 9 December 2020 by Matrix along Beaconsfield Road (between Roche and Stables) and Lytton Road (west of Beaconsfield) to quantify the existing (pre-construction and pre-operation) traffic volumes. As hourly traffic data for Lackey Road is not available, peak and minimum hour traffic volumes have been estimated based on the ratio of peak/minimum hour traffic to AADT traffic volumes for Beaconsfield Road and Lytton Road from the Matrix traffic counts. AADT traffic volumes for Lackey Road have been sourced from a 2017 council survey. The existing traffic volumes along Beaconsfield Road, Lytton Road and Lackey Road are shown in Table 5.12 for a 24-hour period and for the peak and quietest hours and include light vehicle (LV) and heavy vehicle (HV) composition.

Table 5.12 Existing traffic volumes along haulage routes

Road	Period	Vehicles	%HV	LV	HV	Source
Lytton Road	AADT	883	10%	791	92	Matrix 2020
	Peak hour between 7 am and 6 pm (8 am – 9 am)	85	11%	76	9	
	Min hour between 7 am and 6 pm (12 pm – 1 pm)	55	14%	48	8	
Beaconsfield Road	AADT	699	11%	621	78	Matrix 2020
	Peak hour between 7 am and 6 pm (8 am – 9 am)	90	8%	83	7	
	Min hour between 7 am and 6 pm (12 pm – 1 pm)	32	13%	28	4	
Lackey Road	AADT	1651	4%	1585	66	Council 2017
	Peak hour between 7 am and 6 pm (9 am – 10 am)	165	4%	158	7	based on 10% of AADT for peak hour and consistent HV %
	Min. hour between 7 am and 6 pm (5 pm – 6 pm)	83	4%	79	3	based on 5% of AADT for min hour and consistent HV %

5.4.2 Operational traffic

5.4.2.1 Operational traffic generation

Traffic generated by the proposal during its operation would be associated with transport of waste to the facility, transport of product from the facility and staff travelling to and from the site.

Haulage route for trucks would be along Berrima Road to Douglas Road, along Collins Road and Lackey Road and onto the newly constructed access road (part of the MVEC).

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

– Up to 100 truck movements between 7 am and 6 pm, with a maximum of 5 trucks in a peak hour period
– Staff 140 full time equivalents with up to 60 staff arriving and leaving at a change-over period.

5.4.2.2 Operational traffic modelling methodology

Noise modelling was undertaken using SoundPLAN 8.2 utilising the CoRTN method to assess the noise level from the operational traffic generation. The parameters used in this noise model are presented in Table 5.13.

Table 5.13 Noise modelling parameters – operational road traffic noise model

Variable	Parameter used
Calculation method	CoRTN
Topography	Sourced from ELVIS GIS Australia - 5 m elevation intervals
Pavement surface	Dense Graded Asphalt (DGA) +0.0 dBA correction
Receiver height	1.5 m above building ground level
Traffic speeds	25 km/hr (conservative)
Ground absorption	0.5 for all areas (0 is non-porous ground and 1 is porous ground such as that found in a rural setting comprising of mainly grass and vegetation)
Source heights	0.5 for cars 1.5 for truck engines (-0.8 dB correction) 3.6 for truck exhausts (-8.0 dB correction)
Temperature	10°C
Humidity	80%

5.4.2.3 Operational traffic noise impacts

The nearest residences located along Douglas Road, Collins Road and Lackey Road are set back over 130 m from the road and as such the controlling criterion is not anticipated to be exceeded from the traffic generated by the operation of the proposal.

SoundPlan 8.2 was utilised to predict noise levels at the nearest sensitive receivers for traffic noise generated from the operation of the proposal along the new access road. This road is a planned new collector road as part of the MVEC. As Plasrefine Recycling are likely to be the sole users of the new access road while the MVEC is being completed, the more conservative 1-hour criteria for new local roads has been adopted for the assessment.

Table 5.14 presents the predicted noise levels from the operational traffic generation at the nearest sensitive receivers to the new access road. Compliance at these receivers indicates compliance at receivers further away from the road. The results indicate that the highest predicted noise levels, at R018 and R016, are 48 dBA during the day period and 46 dBA during the night period which is 5 dB below the noise criteria.

Table 5.14 Modelled results for traffic generation on the new access road

Name	Address	Criteria, $L_{Aeq\ (1\ hour)}$ dBA		Level, $L_{Aeq\ (1\ hour)}$ dBA	
		Day	Night	Day	Night
R010	9-11 Lackey Rd, Moss Vale	55	50	46	43
R014	16 McCourt Rd, Moss Vale			39	36
R016	77 Beaconsfield Rd, Moss Vale			48	45
R017	77 Beaconsfield Rd, Moss Vale			46	43
R018	79 Beaconsfield Rd, Moss Vale			48	45
R019	72 Beaconsfield Rd, Moss Vale			47	44
R020	72 Beaconsfield Rd, Moss Vale			46	43
R021	66 Beaconsfield Rd, Moss Vale			41	38
R022	69 Beaconsfield Rd, Moss Vale			40	37
R023	69 Beaconsfield Rd, Moss Vale			41	38
R149	64 Beaconsfield Rd, Moss Vale			39	36
R150	58 Bulwer Rd, Moss Vale			38	35
R151	54-56 Bulwer Rd, Moss Vale			38	35
R152	52 Bulwer Rd, Moss Vale			37	34
R153	48-50 Bulwer Rd, Moss Vale			36	33
R162	75 Beaconsfield Rd, Moss Vale			46	43
R163	73 Beaconsfield Rd, Moss Vale			44	42
R164	71 Beaconsfield Rd, Moss Vale			41	39

5.4.3 Construction traffic

5.4.3.1 Construction traffic modelling methodology

Noise modelling was undertaken using the RMS construction noise estimator utilising the CoRTN method to assess the noise level from the construction traffic generation. The parameters used in this noise model are presented in Table 5.15.

Table 5.15 Noise modelling parameters – RMS construction noise estimator model

Variable	Parameter used
Calculation method	CoRTN
Pavement surface	Dense Graded Asphalt (DGA)
Road type	Local road
Traffic speeds	50 km/hr
Ground type	Undeveloped green fields (rural areas with isolated dwellings)

5.4.3.2 Construction traffic generation

Construction traffic will access the site via Berrima Road, Lytton Road and Beaconsfield Road while the access along the new access road is under construction. While the total construction period is estimated to be 16.5 months, it is assumed that construction traffic will utilise the new access road once constructed. Construction vehicles would then access the site using the same haulage route proposed for operational access, along Berrima Road, Douglas Road and then Collins Road and Lackey Road before turning into the new access road.

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

– Up to 40 truck movements per day during construction hours – averaged to 4 truck movements per hour
– 30 construction workers – all entering or leaving the site in within one hour

5.4.3.3 Construction traffic noise impacts

Beaconsfield Road and Lytton Road

The *RMS construction noise estimator* has been utilised to predict noise impacts from traffic generated along Beaconsfield Road and Lytton Road during construction of the proposal.

It is predicted that noise levels at residence along Beaconsfield Road will increase by more than 2 dB during the hour from 12 pm to 1 pm (hour of least amount of traffic between 7 am and 6 pm) and as such, the target noise levels provided in Table 4.12 have been used to predict the distance from the road where the controlling noise criterion of 55 dBA would be exceeded (where mitigation should be considered).

Results of the noise modelling are presented in Table 5.16 below and show the predicted received noise level at the worst affected residence on Beaconsfield Road is 58 dBA. Residences within 19 m of Beaconsfield Road are likely to be impacted by construction traffic noise, these residences are shown on Figure 5.6.

Mitigation measures recommended in Section 6.1 should be implemented to ensure noise disturbances along these routes are minimised during the construction period. As the predicted noise levels are less than 5 dBA above the controlling criteria impacts can be managed using reasonable and feasible measures provided.

New access road

Lytton Road and Beaconsfield Road would only be utilised for construction access until the construction of the new access road is complete which is anticipated to result in about one to two month of impact.

Once the new access road has been constructed, it will be used as site access for construction traffic. As construction traffic generation is less than operational traffic it is anticipated that noise levels will be below those presented in Section 5.4.2 and no impacts are predicted from the use of this route. Priority should be made to

constructing the new access road to reduce impacts to residential receivers along Lytton Road and Beaconsfield Road.

Other Roads

The separation distance to residential receivers along Douglas Road, Collins Road and Lackey Road is over 130 m, and as such the noise criteria is not anticipated to be exceeded from the traffic generated by the construction of the proposal.

Table 5.16 Construction traffic results, $L_{Aeq(1hour)}$ dBA

Road	Road type	Distance of nearest receiver, m	Controlling criteria, dBA	Period	Predicted noise level, dBA	Noise level increase, dB	Mitigation distance, m	Consideration for mitigation
Lytton Road	Local road	12	55	Peak hour (8 am – 9 am)	60	1.5	27	No
				Min hour (12 pm – 1 pm)	60	1.9	24	No
Beaconsfield Road	Local road	12	55	Peak hour (8 am – 9 am)	60	1.7	26	No
				Min hour (12 pm – 1 pm)	58	3.1	19	Yes

Paper Size ISO A4

0 100 200

Metres

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

Plasrefine Pty Ltd
Moss Vale Plastics Recycling Facility
Noise Assessment

Project No. **12524108**
Revision No. **A**
Date **25 Jan 2022**

Construction traffic mitigation buffer

FIGURE 5-7

\\ghdnet\ghd\AU\Sydney\Projects\21\12524108\GIS\Maps\Deliverables\Noise\12524108_NOISE006_ConstructionTrafficMitigation.mxd

Data source: Aerial imagery - sixmaps 2022© Department of Customer Service 2020; General topo - NSW LPI DTDB 2020, 2015. Created by: eibbertson

5.5 Potential noise impacts to mice

A high-level noise assessment has been undertaken for transient construction activities that may cause adverse responses for the mice housed at the Australian Bioresources facility (R001). Noise levels have been assessed against the levels outlined in Section 4.5.

As a worst-case, a dump truck (dumping load) has been modelled with a noise level of L_{max} 118 dBA at the closest distance between the construction area and the Australian Bioresources building. To predict the internal noise level, the façade of the building has been assumed to provide a sound transmission loss performance of Rw 38 and is considered conservative.

Table 5.17 Predicted L_{max} octave band noise levels, dBZ

Location	Third-octave band L_{max} noise level, 1 kHz to 20 kHz – Z-weighted					Overall (1 kHz-16 kHz)
	1000	2000	4000	8000	16000	
Dump truck noise level at Façade of Australian Bioresources	68	66	60	50	47	71
Internal noise level of dump truck	22	15	16	6	3	24

The Z-weighted octave band results indicate:

– The external noise level at the façade is predicted to be 71 dBZ (1 kHz to 16 kHz)

– The internal noise level is predicted to be 24 dBZ (1 kHz to 16 kHz)

In view of the above, the worst-case noise levels associated with the proposal are not anticipated to result in noise levels above 60 dB when assessed at the internal areas of the Australian Bioresources facility. As such, no adverse noise impacts to the mice are anticipated as a result of the proposal.

6 Mitigation measures

6.1 Construction mitigation measures

It is predicted that construction activities would exceed the construction noise management levels for the project. The measures provided below would be implemented to minimise potential construction noise and vibration impacts.

Table 6.1 Mitigation measures during the construction phase

Control type	Environmental Safeguard	Responsibility	Timing
Community consultation			
Notification of works	Notification should be a minimum of 7 calendar days prior to the start works and should include information such as total building time, what works are expected to be noisy, their duration, what is being done to minimise noise and when respite periods will occur. If there are works outside standard hours, inform affected residents and other sensitive land use occupants within 14 days of commencement. Provide information to neighbours before and during construction through media such as letterbox drops, meetings or individual contact. In some areas, the proponent will need to provide notification in languages other than English. A website will also be established for the project to provide information. All potentially affected receivers to be notified for each of the relevant construction scenarios are shown in Appendix H.	Contractor	Pre-construction
Community relations	Ensure site managers periodically check the site and nearby residences and other sensitive land uses for noise problems so that solutions can be quickly applied. Maintain good communication between the community and project staff. Consider a regular newsletter with site news, significant project events and timing of different activities. Facilitate contact with people to ensure that everyone can see that the site manager understands potential issues, that a planned approach is in place and that there is an ongoing commitment to minimise noise.	Contractor	Pre-construction/ Construction
Community liaison officer	Appoint a community liaison officer available to the affected community to: provide a designated point of contact attend local group or forum meetings manage and implement any community consultation obligations resolve complaints (to the greatest extent practicable)	Contractor	Construction
Complaints handling.	Provide a readily accessible contact point, e.g. through a 24 hour toll-free information and complaints line. Document and maintain a complaints register detailing the following: date and time complainants details person receiving complaint and person referred to description of complaint. Provide quick response to complaints, with complaint handling staff having both a good knowledge of the works and ready to access information.	Contractor	Pre-construction/ Construction
Management measures			
Implementation of any project	Implementation of any project specific mitigation measures required.	Contractor	Pre-construction/ Construction

Control type	Environmental Safeguard	Responsibility	Timing
specific mitigation measures required			
Site inductions	All employees, contractors and subcontractors are to receive an environmental induction. The induction must at least include: all project specific and relevant standard noise and vibration mitigation measures relevant licence and approval conditions permissible hours of work any limitations on high noise generating activities location of nearest sensitive receivers construction employee parking areas designated loading/unloading areas and procedures site opening/closing times (including deliveries) environmental incident procedures	Contractor	Construction
Schedule activities to minimise noise impacts	All activities on site should be confined between the hours: daytime hours of 7:00 am to 6:00 pm from Monday to Friday and 8:00 am to 1:00 pm on Saturday, with the exception of the following activities: the delivery of oversized plant of structures emergency work to avoid the loss of life or damage to property, or to prevent environmental harm.	Contractor	Pre-construction/ Construction
Behavioural practices	Avoid the use of radios or stereos outdoors where neighbours can be affected. Avoid the overuse of public address systems (including in the temporary workers accommodation facility). Avoid shouting and minimise talking loudly and slamming vehicle doors. Reduce throttle setting and turn off equipment when not being used. Avoid use of reversing alarms by designing site layout to avoid reversing, such as by including drive- through for parking and deliveries. • Install where feasible and reasonable less annoying alternatives to the typical 'beeper' alarms taking into account the requirements of the Occupational Health and Safety legislation; examples are smart alarms that adjust their volume depending on the ambient level of noise and multifrequency alarms that emit noise over a wide range of frequencies.	Contractor	Construction
Update Construction Environmental Management Plans	The Construction Environmental Management Plan CEMP must be regularly updated to account for changes in noise and vibration management issues and strategies.	Contractor	Pre-construction Construction
Construction Noise and Vibration Management Plan	A CNVMP should be prepared post approval, after the alliance partner has been engaged and prepared its construction methodology. The CNVMP would include a review of the construction noise predictions during the environmental impact assessment phase based on the construction contractor's methodology, and revise it accordingly to include a detailed examination of feasible and reasonable work practices and noise mitigation measures to manage sensitive receivers that are predicted to be 'noise affected'. CNVMP should also include details of the construction methodology feasible and reasonable mitigation measures to be implemented updated noise predictions at sensitive receivers a noise monitoring procedure for the duration of works	Contractor	Post approval

Control type	Environmental Safeguard	Responsibility	Timing
	a community consultation plan to liaise with the noise affected receivers		
Out of hours works	An out of hours works procedure should be developed as part of the CEMP for the project, if these works are required. This should include a detailed construction noise and vibration assessment for the potential construction activities proposed to occur out of hours. An out of hours works application form for any works outside of the approved working hours for the project will be re required. A description of the works, justification and management measures would also be included as part of the application. It is expected that strong justification and negotiation with the community would be required if these works are to be undertaken during any out of hours periods.	Contractor	Pre-construction Construction
Source mitigation measures			
Construction hours and scheduling.	Where feasible and reasonable, construction should be carried out during the standard daytime working hours. Work generating high noise and/or vibration levels should be scheduled during less sensitive time periods.	Contractor	Construction
Non-tonal and ambient sensitive reversing alarms	Non-tonal reversing beepers (or an equivalent mechanism) must be fitted and used on all construction vehicles and mobile plant regularly used on site and for any out of hours work. Consider the use of ambient sensitive alarms that adjust output relative to the ambient noise level.	Contractor	Construction
Equipment selection	Use quieter and less vibration emitting construction methods where feasible and reasonable.	Contractor	Pre-construction Construction
Plant noise levels.	The noise levels of plant and equipment should have an operating Sound Power lower or similar to the levels presented in Table 5.5. Implement a noise monitoring audit program to ensure equipment remains within the more stringent of the manufacturers specifications or Table 5.5.	Contractor	Pre-construction Construction
Silencers on mobile plant	When purchasing, select, where feasible and reasonable, the most effective mufflers Always seek the manufacturer's advice before making modifications to plant to reduce noise. Silencers/mufflers are required on the following mobile plant: – dozers – graders – backhoe – loaders – concrete trucks – rollers – asphalt pavers – excavators – trucks – water carts – bobcats – scrapers	Contractor	Construction
Selection of low-noise attachments	Select the most effective enclosures and low-noise tool bits and blades. Seek the manufacturer's advice before modifying to reduce noise.	Contractor	Pre-construction Construction
Location of plant	Place as much distance as possible between the plant or equipment and residences and other sensitive land uses.	Contractor	Construction
Direction of equipment	Orient equipment with directional noise characteristics away from noise sensitive receivers.	Contractor	Construction

Control type	Environmental Safeguard	Responsibility	Timing
Plan worksites and activities to minimise noise and vibration.	Where additional activities or plant may only result in a marginal noise increase and speed up works, consider limiting duration of impact by concentrating noisy activities at one location and move to another as quickly as possible.	Contractor	Construction
Reduced equipment power	Use only the necessary size and power	Contractor	Construction
Minimise disturbance arising from delivery of goods to construction sites.	Loading and unloading of materials/deliveries is to occur as far as possible from sensitive receivers. Select site access points and roads as far as possible away from sensitive receivers. Dedicated loading/unloading areas to be shielded if close to sensitive receivers. Delivery vehicles to be fitted with straps rather than chains for unloading, wherever possible. Avoid or minimise these out of hours movements where possible.	Contractor	Construction
Engine compression brakes	Limit the use of engine compression brakes in proximity to residences. Ensure vehicles are fitted with a maintained Original Equipment Manufacturer exhaust silencer or a silencer that complies with the National Transport Commission's 'In-service test procedure' and standard.	Contractor	Construction
Maintain equipment	Regularly inspect and maintain equipment to ensure it is in good working order. Also check the condition of mufflers. Equipment must not be operated until it is maintained or repaired, where maintenance or repair would address the annoying character of noise identified.	Contractor	Construction
Transmission path mitigation measures			
Maximise shielding	Use temporary site buildings and materials stockpiles as noise barriers. Use natural landform as noise barrier – place fixed equipment in cuttings, or behind earth berms.	Contractor	Construction
Compliance monitoring			
Compliance noise and vibration monitoring	A noise monitoring procedure and program should be carried out for the duration of works in accordance with the Construction Noise and Vibration Management Plan and any approval or licence conditions. Monitoring reports should be prepared in accordance with the requirements of the noise monitoring procedures. This should include a long-term noise monitoring plan at key sensitive receiver locations throughout the project area.	Contractor	Construction
Complaints	Compliance monitoring should be undertaken to investigate complaints.	Contractor	Construction
Routine monitoring	Regular routine monitoring should be undertaken for high risk activities, including activities undertaken outside recommended standard hours, to quantify noise, vibration or blasting emissions.	Contractor	Construction
Construction vibration			
Reduce size of vibratory roller or compactor	Limit the size of the vibratory compactor to 18 tonnes to maintain the safe work buffer distances.	Contractor	Construction
Construction traffic			

Control type	Environmental Safeguard	Responsibility	Timing
Organise deliveries and access	– Optimise the number of vehicle trips to and from site – movements can be organised to amalgamate loads rather than using a number of vehicles with smaller loads. – Limit access routes to the site to the designated routes outlined in the CEMP and make drivers aware of nominated vehicle routes. – Provide on-site parking for staff and on-site truck waiting areas away from residences and other sensitive land uses. Truck waiting areas may require bunding or walls to minimise noise. – With the exception of delivery of oversized plant or structures, schedule deliveries to nominated hours only – Encourage staff ride-sharing to minimise traffic and, where possible, provide parking and on-site truck waiting areas away from noise sensitive receivers.	Contractor	Pre-construction/ Construction
Manage vehicle speeds	– Reduce delivery truck vehicle speeds where road noise criteria may be exceeded along Lytton Road and Beaconsfield Road. – Manage driver behaviour and avoidance of the use of engine compression brakes.	Contractor	Construction
Vehicle entrances	Locate site vehicle entrances away from residences and other sensitive land uses. Ensure that vehicles are not queuing near residential receivers before and after work shifts.	Contractor	Construction
At-receiver noise mitigation treatments	Prior to construction works, notification to residences along both Lytton Road and Beaconsfield Road routes should be made, focusing on construction traffic.	Contractor	Construction

6.2 Mitigation measures for design (operation)

To ensure compliance with the requirements of the NPfI can be maintained throughout the design process of the plastics recycling and reprocessing facility, mitigation measures have been recommended for the significant noise generating components of the facility.

Note should be made that the design of the facility is subject to change however, noise modelling is recommended to be undertaken during detailed design to ensure the final design complies with the relevant environmental license conditions and the requirements of the NPfI.

Table 6.2 Recommended mitigation measures to be considered during detailed design

Control type	Mitigation measure	Responsibility	Timing
Building 1			
Façade construction	Building envelope (walls and roof) should be constructed of materials with a minimum sound transmission reduction as presented in Appendix F	Design team / Contractor	Detailed design / Pre-construction
Air intake louvres	Louvres will likely require acoustic louvres (100 – 300 mm thick dependent on detailed design noise modelling)	Design team / Contractor	Detailed design / Pre-construction
Rooftop mechanical ventilation fans	Ensure the discharge mechanical ventilation system for each building has a max total sound power level of 88 dBA (equal to 6 fans of 80 dBA each)	Design team / Contractor	Detailed design / Pre-construction
Air emissions stack fan	Design the air emissions system fans and associated stack to result in a maximum stack exit sound power level of 80 dBA (each stack) – a 5 dB reduction from the modelled noise level to account for the potential for low frequency noise characteristics.	Design team / Contractor	Detailed design / Pre-construction
Internal noise levels	Ensure the $L_{Aeq(15min)}$ average internal noise levels will not exceed 85 dBA during operation: Once exact equipment has been selected during detailed design, noise modelling should be undertaken to ensure	Design team / Contractor	Detailed design / Pre-construction

Control type	Mitigation measure	Responsibility	Timing
	noisy plant within these areas are adequately attenuated as not to exceed these noise levels.		
Roller doors	– All roller doors should be constructed with an acoustic roller door system that can achieve R_w 21. – The roller doors for Building 1 are to be an automatic fast action system to limit the time the roller doors are open.	Design team / Contractor	Detailed design / Pre-construction
Building 2			
Façade construction	Building envelope (walls and roof) should be constructed of materials with a minimum sound transmission reduction as presented in Appendix F	Design team / Contractor	Detailed design / Pre-construction
Air intake louvres	Louvres will likely require acoustic louvres (100 – 300 mm thick dependent on detailed design noise modelling)	Design team / Contractor	Detailed design / Pre-construction
Rooftop mechanical ventilation fans	Ensure the discharge mechanical ventilation system for each building has a max total sound power level of 83 dBA (equal to 6 fans of 75 dBA each)	Design team / Contractor	Detailed design / Pre-construction
Air emissions stack fan	Design the air emissions system fans and associated stack to result in a maximum stack exit sound power level of 80 dBA (each stack) – a 5 dB reduction from the modelled noise level to account for the potential for low frequency noise characteristics.	Design team / Contractor	Detailed design / Pre-construction
Internal noise levels	Ensure the $L_{Aeq(15min)}$ average internal noise levels will not exceed 80 dBA during operation: Once exact equipment has been selected during detailed design, noise modelling should be undertaken to ensure noisy plant within these areas are adequately attenuated as not to exceed these noise levels.	Design team / Contractor	Detailed design / Pre-construction
Roller doors	– All roller doors should be constructed with an acoustic roller door system that can achieve R_w 21. – The roller doors for Building 1 are to be an automatic fast action system to limit the time the roller doors are open.	Design team / Contractor	Detailed design / Pre-construction
WWTP			
Façade construction	Building envelope (walls and roof) should be constructed of materials with a minimum sound transmission reduction as presented in Appendix F	Design team / Contractor	Detailed design / Pre-construction
Air intake louvres	Louvres will likely require acoustic louvres (100 – 300 mm thick dependent on detailed design noise modelling)	Design team / Contractor	Detailed design / Pre-construction
Rooftop mechanical ventilation fans	Ensure the discharge mechanical ventilation system for each building has a max total sound power level of 85 dBA (equal to 3 fans of 90 dBA each)	Design team / Contractor	Detailed design / Pre-construction
Internal noise levels	Ensure the $L_{Aeq(15min)}$ average internal noise levels will not exceed 85 dBA during operation: Once exact equipment has been selected during detailed design, noise modelling should be undertaken to ensure noisy plant within these areas are adequately attenuated as not to exceed these noise levels.	Design team / Contractor	Detailed design / Pre-construction
Roller doors	– All roller doors should be constructed with an acoustic roller door system that can achieve R_w 21. – The roller doors for Building 1 are to be an automatic fast action system to limit the time the roller doors are open.	Design team / Contractor	Detailed design / Pre-construction
Ancillary equipment			

Control type	Mitigation measure	Responsibility	Timing
Ancillary plant and equipment	Noise generating plant and equipment that have not been included in the noise model should be included in the detailed design noise model and designed to comply with the relevant license noise conditions / NPfI requirements.	Design team / Contractor	Detailed design / Pre-construction

6.3 Operational Noise Management Plan (NMP)

An operational NMP should be developed to minimise the risk of adverse noise impacts during the operation of the facility. The operational NMP should have consideration to:

– The relevant license conditions (to be confirmed)
– Conditions of approval (to be confirmed)
– The Noise Policy for Industry (EPA, 2017)
– Australian Standards 1055 Acoustics – Description and measurement of environmental noise
– Approved methods for the measurement and analysis of environmental noise in NSW (EPA, 2021) - currently in draft form

The NMP is to be refined throughout the design process. Table 6.3 provides recommendations for inclusions in the operational NMP to minimise the risk of adverse noise impacts at sensitive receivers during the operation of the proposal.

Table 6.3 Draft Operational Noise Management Plan (NMP)

Control type	Measure	Responsibility	Timing
Delivery trucks			
Maximum truck movements	During operation, delivery truck movements should not exceed the following hourly volumes: – Day period 7* am to 6 pm – 10 in and 10 out *8 am on Sundays and public holidays No truck deliveries should occur between 6 pm and 7 am	Operators / Staff	During operation
Delivery truck operations	Ensure all trucks are in good working order and comply with the relevant noise emissions standards by checks and regular inspection. – Operations should be designed to minimise reversing on site. – Keep to speed limits on public roads and onsite. – Where possible, driving of trucks should minimise: • Heavy acceleration and braking. • Engine/compression braking (especially during the evening and night). • Reversing using tonal alarms, where feasible	Operators / Staff	During operation
Significant items of noisy plant			
Significant noise sources	Staff are to be aware of the significant noise sources that have the potential to cause noise disturbances at sensitive receivers, including (but not limited to): – Heavy vehicles and mobile plant including: • Waste and fuel delivery trucks • Trucks dumping material • Loading of ash residues • Handling of materials (dropping and dragging) • Reversing alarms – Noise breaking out from buildings. Roller doors should remain closed except for the ingress or egress of vehicles.	Operators / Staff	During operation

Control type	Measure	Responsibility	Timing
	– Noise emission from fixed plant		
General mitigation measures			
Mitigation measures	– All equipment should be properly maintained in accordance with the manufacturer's specifications. – All equipment should be operated in the appropriate manner. – Maintaining site roads in good order to minimise the risk of rattling and other attributes associated with heavy vehicles on uneven roads. – All on site mobile plant and trucks should be fitted with broadband or smart reversing alarms, where practical. – Minimise the use of engine/compression brakes on site. – Carry out materials handling and processing within buildings where possible. – Minimise dropping and scraping of materials on the ground. – Buildings openings such as doors or shutters should remain closed when not in use. – All buildings and enclosures are to be maintained to preserve their acoustic performance. – All equipment should be designed and tested to meet the required internal or external noise levels to satisfy environmental noise goals. – Carrying out maintenance work on noisy plant with the potential to generate noise impacts to be carried out away from sensitive receivers or to use buildings to shield noise. – Where noisy maintenance is required, it should be scheduled to occur during periods when receivers are less sensitive, such as during the daytime.	Operators / Staff	During operation
Complaints handling protocol			
Complaints handling	In situations where noise emission levels are perceived by residents to be a problem, the following procedure should be undertaken when receiving, handling, responding to and reporting community complaints: – A site manager should investigate to determine the possible source of the noise. – Should a problem noise source be identified, the method of operation is to be altered or controlled – If required, noise monitoring at the complainant's property should be undertaken if a noise source if the complainant is not satisfied with the corrective action. – Any corrective action is to be recorded and reported to the site manager, who is to keep a record of all significant actions. – The site manager should be informed of any complaint and details must be recorded in a complaints register. – The site manager should notify potentially affected receivers if observations indicate that the noise criteria is being exceeded due to the activities carried out on site. The affected receiver should be notified of exceedances and the source of the impact in writing within 48 hours of detection and verification.	Operators / Staff	During operation
Noise monitoring program			

Control type	Measure	Responsibility	Timing
Noise complaint records	In the event of a noise complaint received from the community and during the initial stage of the development's operation, compliance noise monitoring is to be conducted. Noise will be monitored at the most critical time of day near the complainant and near the identified source of the impact	Operators / Staff	During operation
Noise monitoring qualifications	All attended noise monitoring is to be carried out by a suitably qualified noise specialist. Records of routine equipment calibration and testing are to be maintained by the qualified noise specialist undertaking the monitoring	Operators / Staff	During operation
Frequency of noise monitoring	It is recommended that noise monitoring is carried out every quarter during the facility's first year of operation, to confirm compliance and verify noise emissions. On completion of this year, the frequency of noise monitoring should be reviewed.	Operators / Staff	During operation
Identification of potential noise issues and control measures	Where a non-compliance is measured and recorded by the monitoring, an investigation should be launched to identify the causes and control measures required. A non-compliance should be reported to site management as soon as possible after verification. The investigation should occur as soon as practically possible after a non-compliance is measured. A noise specialist may be engaged to carry out the investigation. The investigation as a minimum should detail the following: – Date and time of exceedance. – The location where the exceedance was identified. – The meteorological conditions during the identification of the exceedance. – The identified cause of the exceedance from the project. – Identification of other non-project related noise sources. – Recommendations for corrective action.	Operators / Staff	During operation

7 Evaluation and conclusion

The noise and vibration impact assessment has established the existing ambient and background noise and vibration and assessed the potential noise impacts associated with the construction and operational phases of the proposal and the increases in noise along the local transport network (during construction and operation) with respect to the following guidelines:

– Operational phase - Noise Policy for Industry (NPfI)
– Construction phase - Interim Construction Noise Guideline (ICNG) and the Draft Construction Noise Guideline (DCNG)
– Road transport network - Road Noise Policy (RNP)

An assessment of potential noise impacts during the construction phase has been undertaken against the ICNG during standards hours. Construction noise levels during all stages of construction are predicted to result in noise levels above the NML at receivers in each of the NCAs.

No sensitive receivers have been identified within the safe working distances for vibratory intensive work. As such, no adverse (structural damage or human comfort) vibration impacts are anticipated during construction.

Mitigation measures to reduce noise levels and the risk of the noise impacts during construction have been recommended in Section 6.1 and should be incorporated into the Contractor's CEMP.

3D noise modelling was undertaken using SoundPLAN 8.2 to predict operational noise levels at sensitive receivers and assessed against the NPfI project noise trigger levels during the day, evening and night periods based on worst-case operating conditions. No receivers are predicted to receive noise levels above the project noise trigger levels established for the three NCAs.

Mitigation measures to reduce operational noise levels at the source and in transmission are recommended in Section 6.2 to be considered during detailed design and a draft operational Noise Management Plan (NMP) has been provided in Section 6.3 to be refined in the later stages of the proposal. Subsequent to the incorporation of the mitigation measures, the proposal is anticipated to comply with the requirements of the Noise Policy for Industry (EPA 2017).

A high-level assessment has been undertaken to assess any potential impact on mice, housed at the Australian Bioresources facility, during both the construction and operation of the proposal. No adverse impacts are anticipated to the mice as predicted internal noise levels are below the hearing sensitivity for mice.

Noise modelling using the CoRTN method was undertaken to predict traffic noise levels at the most-affected residential receivers along haulage routes during both the operational and construction phases of the proposal. The results indicate the noise levels from traffic generated during construction are predicted to increase at residential receivers along Beaconsfield Road by more than 2 dBA during the hour with minimum existing traffic and are likely to exceed the controlling criteria during the peak hour.

Temporary mitigation measures should be considered for the period in which these roads are used to access the proposal site. Operational traffic is proposed to access the site via the new access road (Braddon Road and Braddon Road east extension), traffic generation along this route has been modelled using SoundPlan8.2 and no receivers are predicted to exceed the worst-case 1-hour criteria.

8 References

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Appendices

Appendix A

Acoustic concepts and terminology

Acoustic concepts and terminology

Definition of ‘noise’

Sound may be defined as any pressure variation that the human ear can detect. The terms “sound” and “noise” are more or less interchangeable however, “noise” is generally often referred to as unwanted sound.

Factors that contribute the environmental noise

Noise from an activity such as construction noise or noise during the operation of a facility at a given receiver location can be affected by a number of different factors, including:

– How loud the source activity is and the type of source:
  - Point (for e.g. a pump or motor)
  - Line (for e.g. a road or railway line)
  - Area (for e.g. the external façades of an industrial building)
– The distance from the source to receiver
– The type of ground between the sound and receiver locations (e.g. hard surfaces or porous ground)
– The ground topography between the source and the receiver. For e.g. is it flat or hilly? Blocking the line of sight will generally reduce the noise level for the receiver
– Obstacles that may block the line of sight between the source and the receiver. For e.g. buildings or noise walls
– Atmospheric absorption (dependent on humidity and temperature)
– Meteorological conditions that may increase or reduce environmental sound propagation (for e.g. wind direction or temperature inversions)

Noise measurements

Noise is generally measured using a specially designed ‘sound level meter’ (SLM) and must meet internationally recognized performance standards. To avoid expressing sound or noise in terms of Pa, which could involve some unmanageable numbers, the logarithmic decibel or dB scale is used. The scale uses the hearing threshold of 20 µPa or 20 x 10^{-6} Pa as the reference level and is defined as 0 dB.

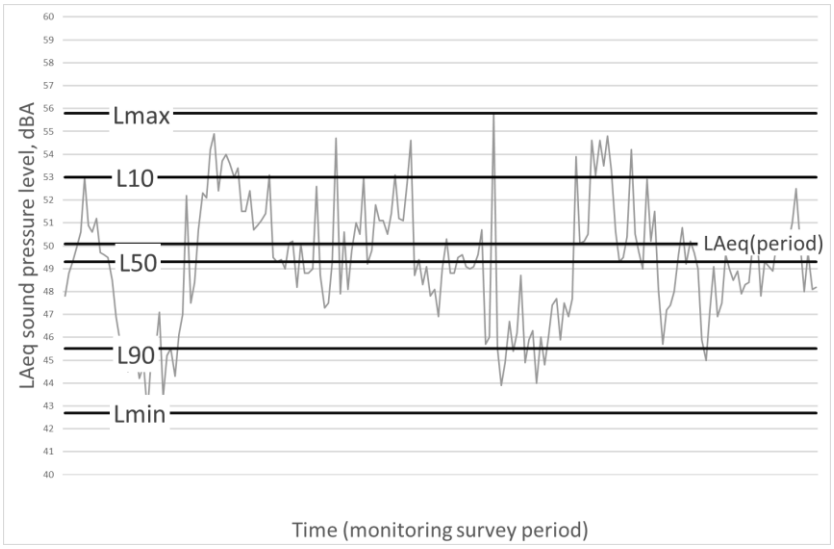
Typical noise levels

The table below presents typical noise sources for each various sound pressure levels and a corresponding subjective noise level description.

Subjective level	Sound pressure level (dBA)	Typical sources
Silent	0	Threshold of hearing
Almost silent	20	Recording studio
Quiet	30	Bedroom
	40	Private office
Moderate	50	General office
	60	Department store
Loud	70	Loud television
	80	Kerb side of busy street
Very loud	90	Construction site
	100	Loud car horn (3 m away)
Extremely loud	110	Grinding on steel
	120	Heavy rock concert
Intolerable	130	Threshold for pain

Typical noise descriptors

Noise is represented by the descriptor L_{AN}, representing a statistical sound measurement recorded on the 'A' weighted scale. A typical noise monitoring chart is shown in the graph below along with the noise descriptors.



Where:

- L_{Amax}: The maximum sound level recorded during the measurement period.
- L_{Amin}: The minimum sound level recorded during the measurement period.
- $L_{A10(period)}$: The A-weighted sound pressure level that is exceeded for 10% of the measurement period.
- $L_{Aeq(period)}$: Equivalent sound pressure leve, the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
- $L_{A90(period)}$: The A-weighted sound pressure level that is exceeded for 90% of the time over which a given sound is measured. This is considered to represent the background noise e.g. $L_{A90(15min)}$.

Changes in noise levels

The table below presents a qualitative description of average human responses to changes in noise levels.

Difference	Human response
Difference of 2 dBA	Generally imperceptible by the human ear
Difference of 5 dBA	Considered significant
Difference of 10 dBA	Perceived as a doubling (or halving) of the noise source
Addition of two identical noise levels	Increase levels by 3 dBA
Addition of second noise level of similar character	If the secondary noise level is a minimum 8 dBA below the primary noise level, the noise level will not significantly increase
Doubling of distance between source and receiver	Results in a 3 dBA decrease for a line source and 6 dBA for a point source
A doubling of traffic volume	Results in a 3 dBA increase in noise

Audibility of noise

The table below presents quantitative guidance and qualitative descriptions regarding the audibility of noise.

Audibility	Description
Inaudible	Noise source cannot be heard. The noise level is generally less than the background noise level, potentially by more than 10 dBA or greater
Barely audible	Characteristics of the noise is difficult to define or masked by extraneous noise. The noise level is generally 5-7 dBA below the background noise or ambient noise level, depending on the nature of the noise e.g. constant or intermittent
Just audible	Characteristics of the noise can be defined but extraneous noise sources are also contributing to the received noise. The noise level is typically below the background and ambient noise level.
Audible	Characteristics of the noise can be easily defined. The noise level may be at the level of the background noise and above.
Dominant	The noise source is significantly ‘louder’ than all other noise sources. The noise level will likely be significantly greater than the background noise level.

Types of noise sources

The table below offers a qualitative description of various noise types and provides the noise descriptor that is typically used to measure the type of noise.

Duration of the noise	Description
Continuous noise	Continuous noise is produced by equipment or activities that operates without interruption in the same mode, for e.g. blowers, pumps and processing equipment. Measuring for just a few minutes with hand-held equipment is sufficient to determine the noise level. If tones or low frequencies are heard, the frequency spectrum can be measured for documentation and further analysis. Continuous noise sources are generally captured by the L_{90} noise descriptor.
Intermittent noise	Intermittent noise is a noise level that increases and decreases rapidly. This might be caused by a train passing by, factory equipment that operates in cycles, or aircraft flying above. Intermittent noise is measured in a similar way to continuous noise, with a sound level meter. The duration of each occurrence and the time between each event is important to note. To gain a more reliable estimate of the noise level, multiple occurrences of the noise source is measured to gain a reliable estimate. Intermittent noise sources are generally captured by the L_{eq} noise descriptor.
Impulsive noise	The noise from impacts or explosions, for e.g. from a pile driver, punch press or gunshot, is called impulsive noise. It is brief and abrupt, and its startling effect causes greater annoyance than would be expected from a simple measurement of sound pressure level. To quantify the impulsiveness of noise, the difference between a quickly responding and a slowly responding parameter can be used. Impulsive noise sources are generally captured by the L_{max} or L_{peak} noise descriptor.
Frequency content	Description
Low frequency	Noise containing major components in the low-frequency range (10 hertz [Hz] to 160 Hz) of the frequency spectrum
Tonal noise	Tonal noise contains one or more prominent tones (i.e. distinct frequency components), and is normally regarded as more offensive than ‘broad band’ noise
Defining characteristic	Description
Extraneous noise	Noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
Subject noise	The noise in question removed from any extraneous noise in the area
Offensive noise	The definition of offensive noise in the POEO Act is noise: (a) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances: (i) is harmful to (or is likely to be harmful to) a person who is outside the premises from which it is emitted, or (ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or (b) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances, prescribed by the regulations.

Frequency analysis

Frequency analysis is the process used to examine the tones (or frequency components) which make up the overall noise or vibration signal. This analysis was traditionally carried out using analogue electronic filters, but is now normally carried out using Fast Fourier Transform (FFT) analysers. The units for frequency are Hertz (Hz), which represent the number of cycles per second. Frequency analysis can be in:

– Octave bands (where the centre frequency and width of each band is double the previous band)
– 1/3 octave bands (3 bands in each octave band)
– Narrow band (where the spectrum is divided into 400 or more bands of equal width)

Vibration

Definition of ‘vibration’

Vibration may be defined as cyclic or transient motion. This motion can be measured in terms of its displacement, velocity or acceleration. Most assessments of human response to vibration or the risk of damage to buildings use measurements of vibration velocity.

Vibration descriptors

These may be expressed in terms of ‘peak’ velocity or ‘rms’ velocity. The former is the maximum instantaneous velocity, without any averaging, and is sometimes referred to as ‘peak particle velocity’, or PPV. The latter incorporates ‘root mean squared’ averaging over some defined time period. Vibration measurements may be carried out in a single axis or alternatively as triaxial measurements. Where triaxial measurements are used, the axes are commonly designated vertical, longitudinal (aligned toward the source) and transverse. The common units for velocity are millimetres per second (mm/s). As with noise, decibel units can also be used, in which case the reference level should always be stated. A vibration level V, expressed in mm/s can be converted to decibels by the formula 20 log (V/Vo), where Vo is the reference level (10^{-9} m/s). Care is required in this regard, as other reference levels may be used by some organisations.

Types of vibration

Vibration in buildings can be caused by many different external sources, including industrial, construction and transportation activities. The vibration may be continuous (with magnitudes varying or remaining constant with time), impulsive (such as in shocks) or intermittent (with the magnitude of each event being either constant or varying with time). A description of each vibration type including examples are presented in the table below.

Vibration type	Description	Examples
Continuous vibration	Vibration continues uninterrupted for a defined period (usually throughout daytime and/or night-time). This type of vibration is assessed on the basis of weighted rms acceleration values	Machinery, steady road traffic, continuous construction activity (such as tunnel boring machinery)
Impulsive vibration	A vibration source (continuous or intermittent) which has 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). This type of vibration is assessed on the basis of weighted rms acceleration values	Infrequent: Activities that create up to 3 distinct vibration events in an assessment period, e.g. occasional dropping of heavy equipment, occasional loading and unloading.
Intermittent vibration	Interrupted periods of continuous (for e.g. a drill) or repeated periods of impulsive vibration (for e.g. a pile driver), or continuous vibration that varies significantly in magnitude. This type of vibration is assessed on the basis of vibration dose values	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

How humans perceive vibration

People are able to ‘feel’ vibration at levels lower than those required to cause even superficial damage to the most susceptible classes of building (even though they may not be disturbed by the motion). An individual's perception of motion or response to vibration depends very strongly on previous experience and expectations, and on other connotations associated with the perceived source of the vibration. For example, the vibration that a person responds to as ‘normal’ in a car, bus or train is considerably higher than what is perceived as ‘normal’ in a shop, office or dwelling.

Typical vibration levels

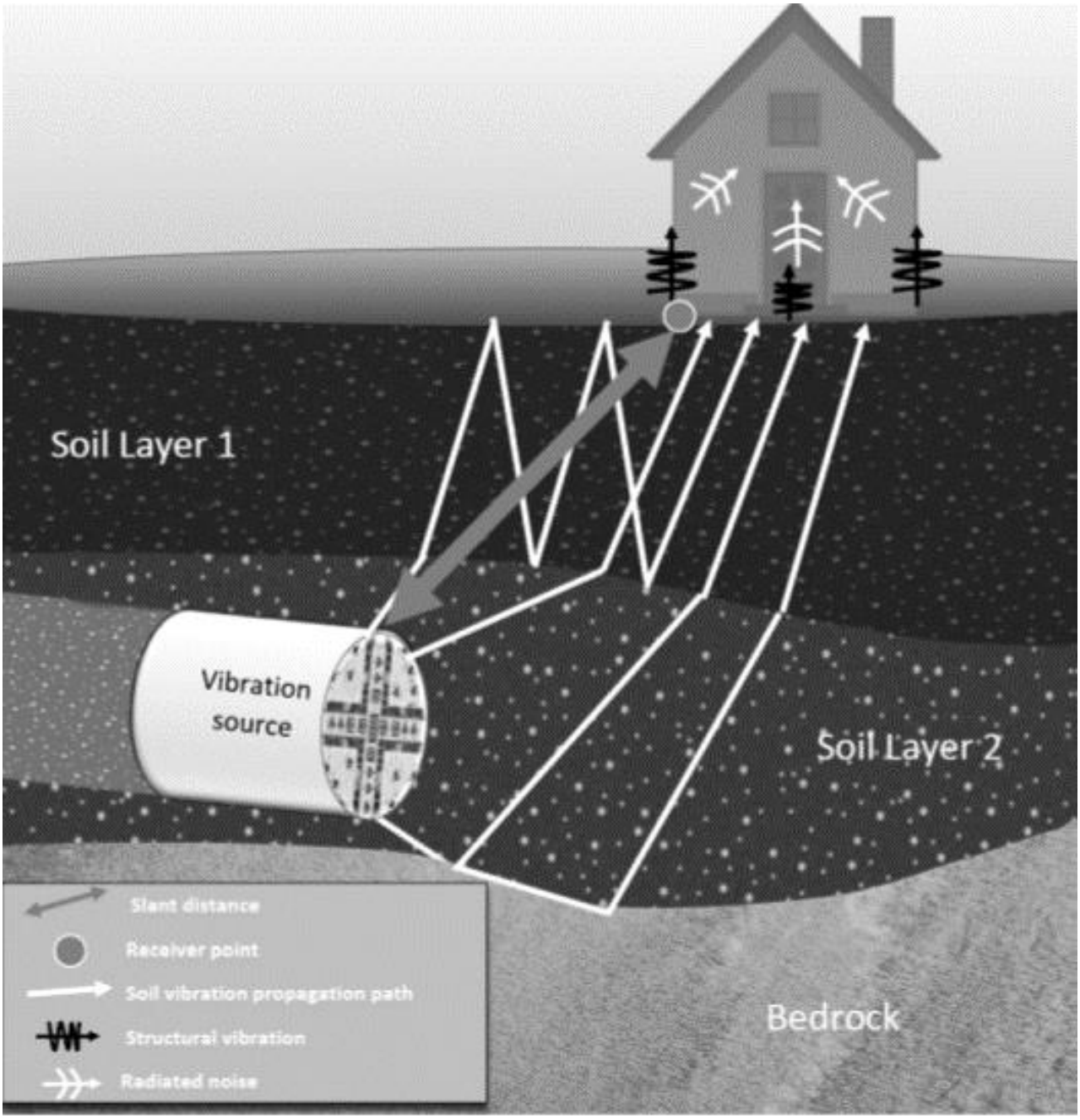
Typical ground vibration from civil construction activities occurs in the frequency range of approximately 8 Hz to 100 Hz. Within this frequency range, building contents such as blinds and pictures would commence visible movement at 0.5 mm/s. At vibration levels higher than 0.9 mm/s, rattling of windows, crockery or loose objects would be audible and annoying.

Velocity level (mm/s)	Typical source	Response
0.01	Typical background vibration level	Scanning electron microscopes to 50000 x amplification
0.03		500x amplification bench microscopes
0.1	Average passenger train vibration	Approximate threshold for human perception of vibration
0.3	Average freight train vibration Max passenger train vibration	Approx. residential annoyance for train passbys
1	Large rock breaker	Vibration level that will generally result in complaints
3	Blasting/ Impact pile driving	Threshold for minor cosmetic damage

Ground-borne noise and vibration

Noise that propagates through a structure as vibration and is radiated by vibrating wall, ceiling and floor surfaces is termed “ground-borne noise”, “regenerated noise”, or sometimes “structure borne noise”. Ground-borne noise originates as vibration and propagates between the source and receiver through the ground and/or building structural elements, rather than through the air. Typical sources of ground-borne noise include tunnelling construction works or underground railway operations.

The figure below presents the various paths by which vibration and ground-borne noise may be transmitted between a source and receiver for construction activities that occur below the ground level (for e.g. a tunnel boring machine).



Acronyms and abbreviations

Term	Definition
AWS	Automatic Weather Station
BOM	Bureau of Meteorology
dB	Decibel is the unit used for expressing the sound pressure level (SPL) or power level (SWL) in acoustics.
dBA	Decibel expressed with the frequency weighting filter used to measure 'A-weighted' sound pressure levels, which conforms approximately to the human ear response, as our hearing is less sensitive at low and high frequencies.
dBZ or dBL	The unit used to measure 'Z-weighted' sound pressure levels with no weighting applied, linear.
CEMP	Construction Environmental Management Plan
DECC	Department of Environment and Climate Change
DECCW	Department of Environment, Climate Change and Water
EPA	Environmental Protection Authority
ICNG	*Interim Construction Noise Guideline* (DECC, 2009).
NPfI	*Noise Policy for Industry* (EPA, 2017).
$L_{Aeq(period)}$	Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
$L_{A10(period)}$	The noise level exceeded for 10 per cent of the time and is approximately the average of the maximum noise levels.
$L_{A90(period)}$	The sound pressure level that is exceeded for 90% of the measurement period.
L_{Amax}	The absolute maximum noise level in a noise sample
NSW	New South Wales
OOHW	Out-of-hours Works
PPV	Peak particle velocity is the maximum vector sum of three orthogonal time-synchronized velocity components regardless of whether these component maxima occurred simultaneously.
RBL	Rating Background Level . The overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period.
rms	Root Mean Square Amplitude (rms) is the square root of the average of the squared values of the waveform. In the case of the sine wave, the RMS value is 0.707 times the peak value, but this is only true in the case of the sine wave.
RNP	*Road Noise Policy* (DECCW, 2011).
SEARs	Secretary's Environmental Assessment Requirements
SPL	Sound Pressure Level
SWL	Sound Power Level
SWRO	Seawater Reverse Osmosis
Rw	Weighted Sound Reduction Index which provides a single-number quantity which characterises the airborne sound insulation of a material or building element over a range of frequencies
TBM	Tunnel Boring Machine
VDV	Vibration dose value - As defined in BS6472 – 2008, VDV is given by the fourth root of the integral of the fourth power of the frequency weighted acceleration.
WFP	Water Filtration Plant

Common Terms

Term	Definition
A weighting	The human ear responds more to frequencies between 500 Hz and 8 kHz and is less sensitive to very low-pitch or high-pitch noises. The frequency weightings used in sound level measurements are often related to the response of the human ear to ensure that the meter better responds to what you actually hear
Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).
Ambient noise	The all-encompassing noise associated within a given environment. It is the composite of sounds from many sources, both near and far. This is described using the Leq descriptor
Background noise	The underlying level of noise present in the ambient noise, excluding the noise source under investigation, when extraneous noise is removed. This is described using the L90 descriptor
Compliance	The process of checking that source noise levels meet with the noise limits in a statutory context.
Determining authority	Defined by Section 110 of the *Environmental Planning and Assessment Act 1979* as 'a Minister or public authority and, in relation to any activity, means the Minister or public authority by or on whose behalf the activity is or is to be carried out or any Minister or public authority whose approval is required in order to enable the activity to be carried out.'
Extraneous noise	Noise resulting from activities that are not typical of the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous
EIS	Environmental Impact Assessment
Feasible and reasonable measures	Feasibility relates to engineering considerations and what is practical to build. reasonableness relates to the application of judgement in arriving at a decision, taking into account the following factors: - Noise mitigation benefits (amount of noise reduction provided, number of people protected); Cost of mitigation (cost of mitigation versus benefit provided); Community views (aesthetic impacts and community wishes); Noise levels for affected land uses (existing and future levels, and changes in noise levels)
Ground-borne noise	Noise heard within a building that is generated by vibration transmitted through the ground into the structure from construction works, sometimes referred to as 'regenerated noise' or 'structure-borne noise'. Ground-borne noise can be more noticeable than airborne noise for underground works such as tunnelling. The ground-borne noise levels are only applicable when ground-borne noise levels are higher than airborne noise levels.
Ground-borne vibration	Vibration transmitted from a source to a receptor via the ground
Hertz	The measure of frequency of sound wave oscillations per second. 1 oscillation per second equals 1 hertz.
Masking	The phenomenon of one sound interfering with the perception of another sound. For example, the interference of traffic noise with use of a public telephone on a busy street.
Maximum noise event	The loudest event or events within a given period of time. This is generally described using the L_{max} descriptor
Meteorological conditions	Wind and temperature inversion conditions
Most-affected location	Location(s) that experience (or will likely experience) the greatest noise impact from the construction works under consideration. In determining these locations, existing background noise levels, noise source location(s), distance and any shielding between the construction works (or proposed works) and the residences and other sensitive land uses need to be considered.

Term	Definition
Noise management level	The Noise Management Level (NML) as defined as the EPA's ICNG. To be measured and assessed at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the residential property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most affected point within 30 m of the residence.
Noise sensitive receiver	An area or place potentially affected by noise which includes: a residential dwelling an educational institution, library, childcare centre or kindergarten a hospital, surgery or other medical institution an active (e.g. sports field, golf course) or passive (e.g. national park) recreational area commercial or industrial premises a place of worship.
Non-compliance	Development is deemed to be in non-compliance with its noise consent/ licence conditions if the monitored noise levels exceed its statutory noise limit (exceptions may be given if the noise level exceeds by less than 2 dB)
Octave	A division of the frequency range into bands, the upper frequency limit
Project noise trigger level	Target noise levels for a particular noise generating facility. They are based on the most stringent of the intrusive criteria or amenity criteria. Which of the two criteria is the most stringent is determined by measuring the level and nature of existing noise in the area surrounding the actual or propose noise generating facility.
Proposal	The construction and operation of the SWRO site, the modifications to the Illawarra WFP site and associated infrastructure including the power route, the delivery pipeline, the se and the intake and outlet tunnels.
proposal site	The immediate location of the proposal, which is the area that has the potential to be directly disturbed by construction and operation.
Resonance	Resonance describes the phenomenon of increased amplitude that occurs when the frequency of a periodically applied force is equal or close to a natural frequency of the system on which it acts.
Study area	Land in the vicinity of, and including, the proposal site. The 'study area' is the wider area surrounding the proposal site.
Temperature inversion	An atmospheric condition in which temperature increases with height above the ground.
Third-octave	Single octave bands divided into three parts.

Appendix B

Sensitive receivers and land uses

Name	Receiver Type	NCA	Address	Land use c	Direction	Approx. distance to the plastics recycling and reprocessing facility site, m
R001	Commercial	-	79 Beaconsfield Rd, Moss Vale	IN1 - General Industrial	East	25
R002	Industrial	-	9-11 Lackey Rd, Moss Vale	IN1 - General Industrial	Northeast	115
R003	Industrial	-	2 Lackey Rd, Moss Vale	IN3 - Heavy Industrial	East	575
R004	Industrial	-	2 Lackey Rd, Moss Vale	IN1 - General Industrial	North	520
R005	Industrial	-	9-11 Lackey Rd, Moss Vale	IN1 - General Industrial	North	370
R006	Industrial	-	50 Carribee Rd, Moss Vale	IN1 - General Industrial	Northwest	670
R007	Residential	NCA3	64 Brookdale Rd, Moss Vale	IN1 - General Industrial	West	770
R008	Residential	NCA3	64 Brookdale Rd, Moss Vale	IN1 - General Industrial	West	905
R009	Residential	NCA3	194 Berrima Rd, Moss Vale	IN1 - General Industrial	Southwest	725
R010	Residential	NCA1	9-11 Lackey Rd, Moss Vale	IN1 - General Industrial	East	395
R011	Industrial	-	7 Lackey Rd, Moss Vale	IN1 - General Industrial	East	610
R012	Industrial	-	3 Lackey Rd, Moss Vale	IN1 - General Industrial	East	590
R013	Industrial	-	16 McCourt Rd, Moss Vale	IN3 - Heavy Industrial	Southeast	925
R014	Residential	NCA1	16 McCourt Rd, Moss Vale	E3 - Environmental Management	Southeast	1030
R015	Industrial	-	13-14 McCourt Rd, Moss Vale	IN3 - Heavy Industrial	Southeast	955
R016	Residential	NCA1	77 Beaconsfield Rd, Moss Vale	RU2 - Rural Landscape	Southeast	395
R017	Residential	NCA2	77 Beaconsfield Rd, Moss Vale	RU2 - Rural Landscape	Southeast	315
R018	Residential	NCA2	79 Beaconsfield Rd, Moss Vale	RU2 - Rural Landscape	Southeast	185
R019	Residential	NCA2	72 Beaconsfield Rd, Moss Vale	RU2 - Rural Landscape	South	195
R020	Residential	NCA2	72 Beaconsfield Rd, Moss Vale	RU2 - Rural Landscape	South	200
R021	Residential	NCA2	66 Beaconsfield Rd, Moss Vale	RU2 - Rural Landscape	South	300
R022	Residential	NCA2	69 Beaconsfield Rd, Moss Vale	RU4 - Primary Production Small Lots	South	325
R023	Residential	NCA2	69 Beaconsfield Rd, Moss Vale	RU4 - Primary Production Small Lots	South	295
R024	Residential	NCA2	63 Beaconsfield Rd, Moss Vale	RU4 - Primary Production Small Lots	South	590
R025	Residential	NCA1	77 Lackey Rd, Moss Vale	RU4 - Primary Production Small Lots	South	785
R026	Residential	NCA1	77 Lackey Rd, Moss Vale	RU4 - Primary Production Small Lots	Southeast	815
R027	Residential	NCA1	57 Beaconsfield Rd, Moss Vale	RU4 - Primary Production Small Lots	South	825
R028	Residential	NCA2	59 Beaconsfield Rd, Moss Vale	RU4 - Primary Production Small Lots	South	715
R029	Industrial	-	5 Lackey Rd, Moss Vale	IN1 - General Industrial	South	965
R030	Residential	NCA2	57 Beaconsfield Rd, Moss Vale	R2 - Low Density Residential	South	885
R031	Residential	NCA2	53 Beaconsfield Rd, Moss Vale	R2 - Low Density Residential	South	865
R032	Residential	NCA2	51 Beaconsfield Rd, Moss Vale	R2 - Low Density Residential	South	845
R033	Residential	NCA2	49 Beaconsfield Rd, Moss Vale	R2 - Low Density Residential	South	855
R034	Residential	NCA2	39-41 Beaconsfield Rd, Moss Vale	R2 - Low Density Residential	South	930
R035	Residential	NCA2	35 Beaconsfield Rd, Moss Vale	R2 - Low Density Residential	South	1015
R036	Residential	NCA2	31-33 Beaconsfield Rd, Moss Vale	R2 - Low Density Residential	South	1050
R037	Residential	NCA2	40 Beaconsfield Rd, Moss Vale	R2 - Low Density Residential	South	1065
R038	Residential	NCA2	42 Beaconsfield Rd, Moss Vale	R2 - Low Density Residential	South	1045
R039	Residential	NCA2	46 Beaconsfield Rd, Moss Vale	R2 - Low Density Residential	South	1020

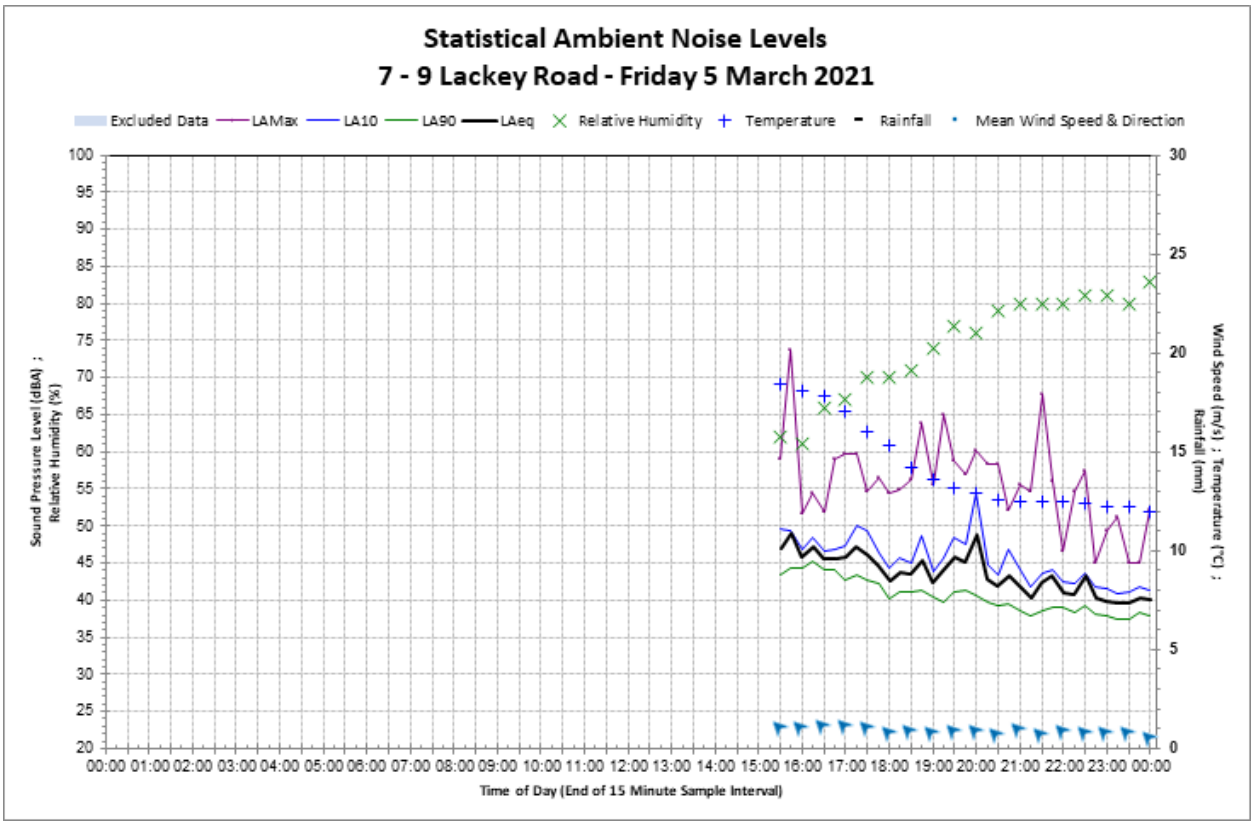
Name	Receiver Type	NCA	Address	Land use c	Direction	Approx. distance to the plastics recycling and reprocessing facility site, m
R040	Residential	NCA2	46 Beaconsfield Rd, Moss Vale	R2 - Low Density Residential	South	995
R041	Residential	NCA2	48 Beaconsfield Rd, Moss Vale	R2 - Low Density Residential	South	955
R042	Residential	NCA2	50 Beaconsfield Rd, Moss Vale	R2 - Low Density Residential	South	915
R043	Residential	NCA2	56a Beaconsfield Rd, Moss Vale	R2 - Low Density Residential	South	865
R044	Residential	NCA2	52 Beaconsfield Rd, Moss Vale	R2 - Low Density Residential	South	910
R045	Residential	NCA2	56b Beaconsfield Rd, Moss Vale	R2 - Low Density Residential	South	835
R046	Residential	NCA2	54b Beaconsfield Rd, Moss Vale	R2 - Low Density Residential	South	830
R047	Residential	NCA2	54c Beaconsfield Rd, Moss Vale	R2 - Low Density Residential	South	830
R048	Residential	NCA2	13-15 Stables Pl, Moss Vale	R2 - Low Density Residential	South	920
R049	Residential	NCA2	11 Stables Pl, Moss Vale	R2 - Low Density Residential	South	920
R050	Residential	NCA2	9 Stables Pl, Moss Vale	R2 - Low Density Residential	South	920
R051	Residential	NCA2	7 Stables Pl, Moss Vale	R2 - Low Density Residential	South	915
R052	Residential	NCA2	5 Stables Pl, Moss Vale	R2 - Low Density Residential	South	920
R053	Residential	NCA2	3 Stables Pl, Moss Vale	R2 - Low Density Residential	South	940
R054	Residential	NCA2	56c Beaconsfield Rd, Moss Vale	R2 - Low Density Residential	South	840
R055	Residential	NCA2	3a Stables Pl, Moss Vale	R2 - Low Density Residential	South	915
R056	Residential	NCA2	18 Stables Pl, Moss Vale	R2 - Low Density Residential	South	965
R057	Residential	NCA2	18 Stables Pl, Moss Vale	R2 - Low Density Residential	South	970
R058	Residential	NCA2	14 Stables Pl, Moss Vale	R2 - Low Density Residential	South	975
R059	Residential	NCA2	12 Stables Pl, Moss Vale	R2 - Low Density Residential	South	975
R060	Residential	NCA2	10a Stables Pl, Moss Vale	R2 - Low Density Residential	South	985
R061	Residential	NCA2	8 Stables Pl, Moss Vale	R2 - Low Density Residential	South	1010
R062	Residential	NCA2	6 Stables Pl, Moss Vale	R2 - Low Density Residential	South	985
R063	Residential	NCA2	4 Stables Pl, Moss Vale	R2 - Low Density Residential	South	990
R064	Residential	NCA2	1 Stables Pl, Moss Vale	R2 - Low Density Residential	South	940
R065	Residential	NCA2	2 Stables Pl, Moss Vale	R2 - Low Density Residential	South	990
R066	Residential	NCA2	18 Roche Cl, Moss Vale	R2 - Low Density Residential	South	1035
R067	Residential	NCA2	18 Roche Cl, Moss Vale	R2 - Low Density Residential	South	1035
R068	Residential	NCA2	20 Roche Cl, Moss Vale	R2 - Low Density Residential	South	1070
R069	Residential	NCA2	16 Roche Cl, Moss Vale	R2 - Low Density Residential	South	1035
R070	Residential	NCA2	14 Roche Cl, Moss Vale	R2 - Low Density Residential	South	1035
R071	Residential	NCA2	12 Roche Cl, Moss Vale	R2 - Low Density Residential	South	1040
R072	Residential	NCA2	10 Roche Cl, Moss Vale	R2 - Low Density Residential	South	1040
R073	Residential	NCA2	8 Roche Cl, Moss Vale	R2 - Low Density Residential	South	1040
R074	Residential	NCA2	36-42 Roche Cl, Moss Vale	R2 - Low Density Residential	South	1040
R075	Residential	NCA2	4 Roche Cl, Moss Vale	R2 - Low Density Residential	South	1045
R076	Residential	NCA3	24 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	915
R077	Residential	NCA3	26 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	935
R078	Residential	NCA3	28 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	955
R079	Residential	NCA3	30 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	975
R080	Residential	NCA3	32 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	995
R081	Residential	NCA3	34 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	1015
R082	Residential	NCA2	22 Roche Cl, Moss Vale	R2 - Low Density Residential	South	1060
R083	Residential	NCA3	29 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	995

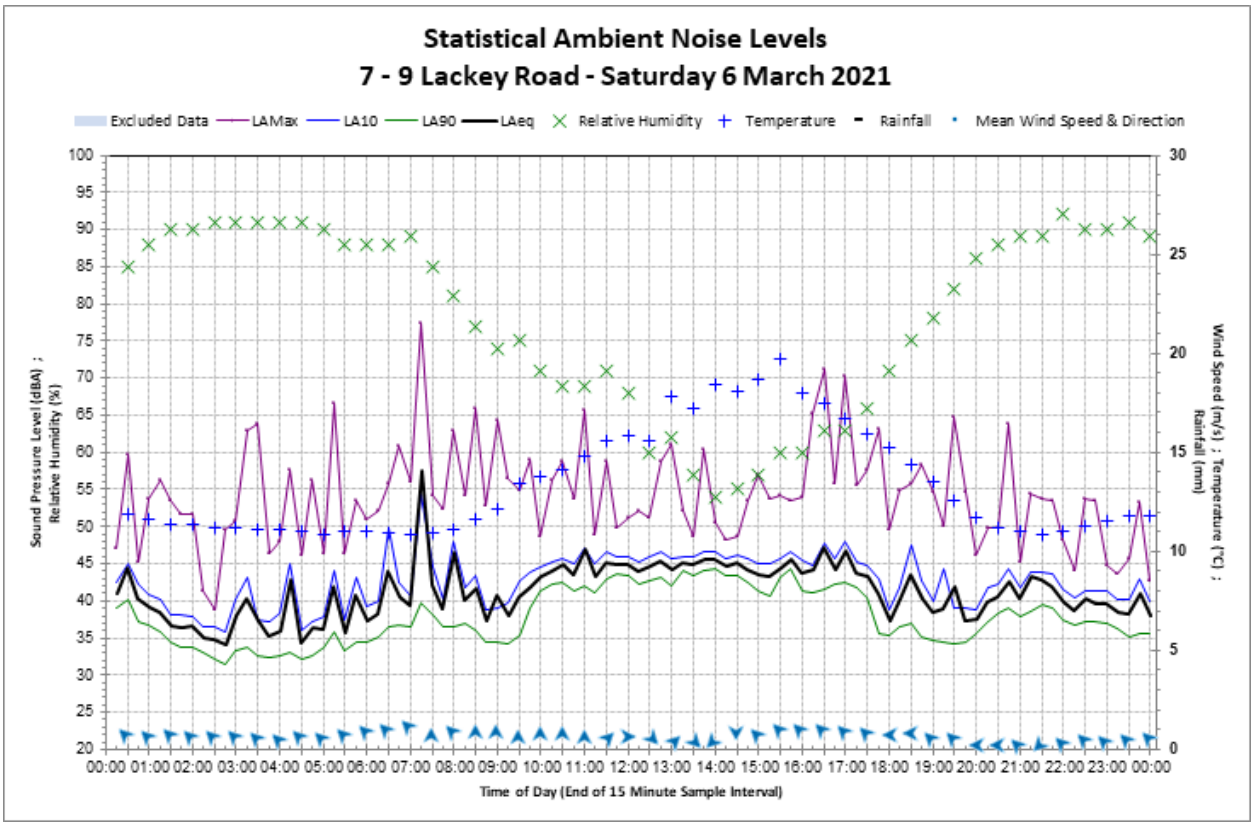
Name	Receiver Type	NCA	Address	Land use c	Direction	Approx. distance to the plastics recycling and reprocessing facility site, m
R084	Residential	NCA3	27 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	995
R085	Residential	NCA3	25 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	995
R086	Residential	NCA3	23 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	995
R087	Residential	NCA3	21 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	995
R088	Residential	NCA3	19 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	995
R089	Residential	NCA3	17 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	995
R090	Residential	NCA3	15 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	1000
R091	Residential	NCA3	13 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	1000
R092	Residential	NCA3	11 Eloura Lane, Moss Vale	R2 - Low Density Residential	Southwest	1010
R093	Residential	NCA3	9 Eloura Lane, Moss Vale	R2 - Low Density Residential	Southwest	1010
R094	Residential	NCA3	21 Reeyana Pl, Moss Vale	R2 - Low Density Residential	South	1065
R095	Residential	NCA3	23 Reeyana Pl, Moss Vale	R2 - Low Density Residential	South	1045
R096	Residential	NCA3	25 Reeyana Pl, Moss Vale	R2 - Low Density Residential	South	1035
R097	Residential	NCA3	27 Reeyana Pl, Moss Vale	R2 - Low Density Residential	South	1040
R098	Residential	NCA3	26 Reeyana Pl, Moss Vale	R2 - Low Density Residential	Southwest	1040
R099	Residential	NCA3	24 Reeyana Pl, Moss Vale	R2 - Low Density Residential	Southwest	1060
R100	Residential	NCA3	25 Bulwer Rd, Moss Vale	R2 - Low Density Residential	Southwest	1055
R101	Residential	NCA3	27 Bulwer Rd, Moss Vale	R2 - Low Density Residential	Southwest	1030
R102	Residential	NCA3	7 Eloura Lane, Moss Vale	R2 - Low Density Residential	Southwest	1010
R103	Residential	NCA3	29 Bulwer Rd, Moss Vale	R2 - Low Density Residential	Southwest	1010
R104	Residential	NCA3	31 Bulwer Rd, Moss Vale	R2 - Low Density Residential	Southwest	990
R105	Residential	NCA3	5 Eloura Lane, Moss Vale	R2 - Low Density Residential	Southwest	985
R106	Residential	NCA3	3 Eloura Lane, Moss Vale	R2 - Low Density Residential	Southwest	970
R107	Residential	NCA3	1 Eloura Lane, Moss Vale	R2 - Low Density Residential	Southwest	945
R108	Residential	NCA3	33 Bulwer Rd, Moss Vale	R2 - Low Density Residential	Southwest	970
R109	Residential	NCA3	2 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	930
R110	Residential	NCA3	4 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	955
R111	Residential	NCA3	6 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	940
R112	Residential	NCA3	10 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	920
R113	Residential	NCA3	8 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	945
R114	Residential	NCA3	14 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	940
R115	Residential	NCA3	12 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	920
R116	Residential	NCA3	16 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	945
R117	Residential	NCA3	18 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	940
R118	Residential	NCA3	20 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	945
R119	Residential	NCA3	22 Eloura Lane, Moss Vale	R2 - Low Density Residential	South	920
R120	Residential	NCA3	34 Napper Cl, Moss Vale	R2 - Low Density Residential	South	845
R121	Residential	NCA3	32 Napper Cl, Moss Vale	R2 - Low Density Residential	South	820
R122	Residential	NCA3	30 Napper Cl, Moss Vale	R2 - Low Density Residential	South	800
R123	Residential	NCA3	28 Napper Cl, Moss Vale	R2 - Low Density Residential	South	800
R124	Residential	NCA3	26 Napper Cl, Moss Vale	R2 - Low Density Residential	South	795
R125	Residential	NCA3	24 Napper Cl, Moss Vale	R2 - Low Density Residential	South	795
R126	Residential	NCA3	22 Napper Cl, Moss Vale	R2 - Low Density Residential	South	800
R127	Residential	NCA3	15 Napper Cl, Moss Vale	R2 - Low Density Residential	South	845

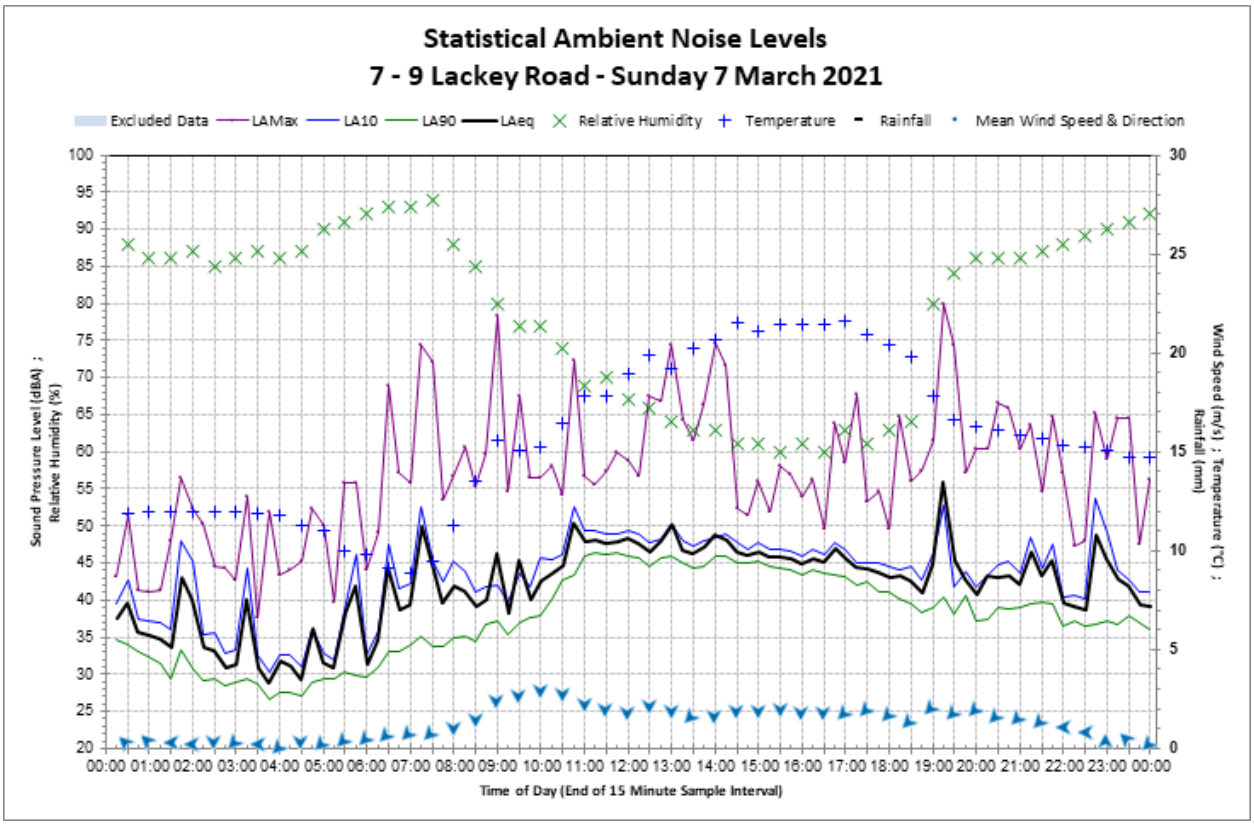
Name	Receiver Type	NCA	Address	Land use c	Direction	Approx. distance to the plastics recycling and reprocessing facility site, m
R128	Residential	NCA3	13 Napper Cl, Moss Vale	R2 - Low Density Residential	South	845
R129	Residential	NCA3	11 Napper Cl, Moss Vale	R2 - Low Density Residential	South	875
R130	Residential	NCA3	9 Napper Cl, Moss Vale	R2 - Low Density Residential	South	885
R131	Residential	NCA3	7 Napper Cl, Moss Vale	R2 - Low Density Residential	South	845
R132	Residential	NCA3	5 Napper Cl, Moss Vale	R2 - Low Density Residential	South	855
R133	Residential	NCA3	1 Napper Cl, Moss Vale	R2 - Low Density Residential	Southwest	890
R134	Residential	NCA3	3 Napper Cl, Moss Vale	R2 - Low Density Residential	Southwest	865
R135	Residential	NCA3	3 Jopling Way, Moss Vale	R2 - Low Density Residential	Southwest	885
R136	Residential	NCA3	1 Jopling Way, Moss Vale	R2 - Low Density Residential	Southwest	890
R137	Residential	NCA3	4 Napper Cl, Moss Vale	R2 - Low Density Residential	Southwest	865
R138	Residential	NCA3	35 Bulwer Rd, Moss Vale	R2 - Low Density Residential	Southwest	915
R139	Residential	NCA3	37 Bulwer Rd, Moss Vale	R2 - Low Density Residential	Southwest	900
R140	Residential	NCA3	39 Bulwer Rd, Moss Vale	R2 - Low Density Residential	Southwest	880
R141	Residential	NCA3	6 Napper Cl, Moss Vale	R2 - Low Density Residential	Southwest	840
R142	Residential	NCA3	8 Napper Cl, Moss Vale	R2 - Low Density Residential	Southwest	835
R143	Residential	NCA3	10 Napper Cl, Moss Vale	R2 - Low Density Residential	Southwest	825
R144	Residential	NCA3	12 Napper Cl, Moss Vale	R2 - Low Density Residential	Southwest	815
R145	Residential	NCA3	14 Napper Cl, Moss Vale	R2 - Low Density Residential	Southwest	810
R146	Residential	NCA3	16 Napper Cl, Moss Vale	R2 - Low Density Residential	South	805
R147	Residential	NCA3	22 Napper Cl, Moss Vale	R2 - Low Density Residential	South	800
R148	Residential	NCA3	6 Napper Cl, Moss Vale	R2 - Low Density Residential	Southwest	855
R149	Residential	NCA2	64 Beaconsfield Rd, Moss Vale	RU4 - Primary Production Small Lots	South	360
R150	Residential	NCA2	58 Bulwer Rd, Moss Vale	RU4 - Primary Production Small Lots	South	425
R151	Residential	NCA3	54-56 Bulwer Rd, Moss Vale	RU4 - Primary Production Small Lots	South	410
R152	Residential	NCA3	52 Bulwer Rd, Moss Vale	RU4 - Primary Production Small Lots	South	455
R153	Residential	NCA3	48-50 Bulwer Rd, Moss Vale	RU4 - Primary Production Small Lots	Southwest	495
R154	Residential	NCA3	49-53 Bulwer Rd, Moss Vale	RU4 - Primary Production Small Lots	Southwest	640
R155	Residential	NCA3	Bulwer Rd, Moss Vale	RU4 - Primary Production Small Lots	South	585
R156	Residential	NCA2	61-65 Bulwer Rd, Moss Vale	RU4 - Primary Production Small Lots	South	515
R157	Residential	NCA2	67 Bulwer Rd, Moss Vale	RU4 - Primary Production Small Lots	South	510
R158	Residential	NCA2	67 Bulwer Rd, Moss Vale	RU4 - Primary Production Small Lots	South	490
R159	Residential	NCA2	60 Beaconsfield Rd, Moss Vale	RU4 - Primary Production Small Lots	South	690
R160	Residential	NCA3	50a Bulwer Rd, Moss Vale	RU2 - Rural Landscape	Southwest	305
R161	Residential	NCA3	46 Bulwer Rd, Moss Vale	RU4 - Primary Production Small Lots	Southwest	545
R162	Residential	NCA2	75 Beaconsfield Rd, Moss Vale	RU2 - Rural Landscape	Southwest	215
R163	Residential	NCA2	73 Beaconsfield Rd, Moss Vale	RU2 - Rural Landscape	Southwest	230
R164	Residential	NCA2	71 Beaconsfield Rd, Moss Vale	RU2 - Rural Landscape	Southwest	250

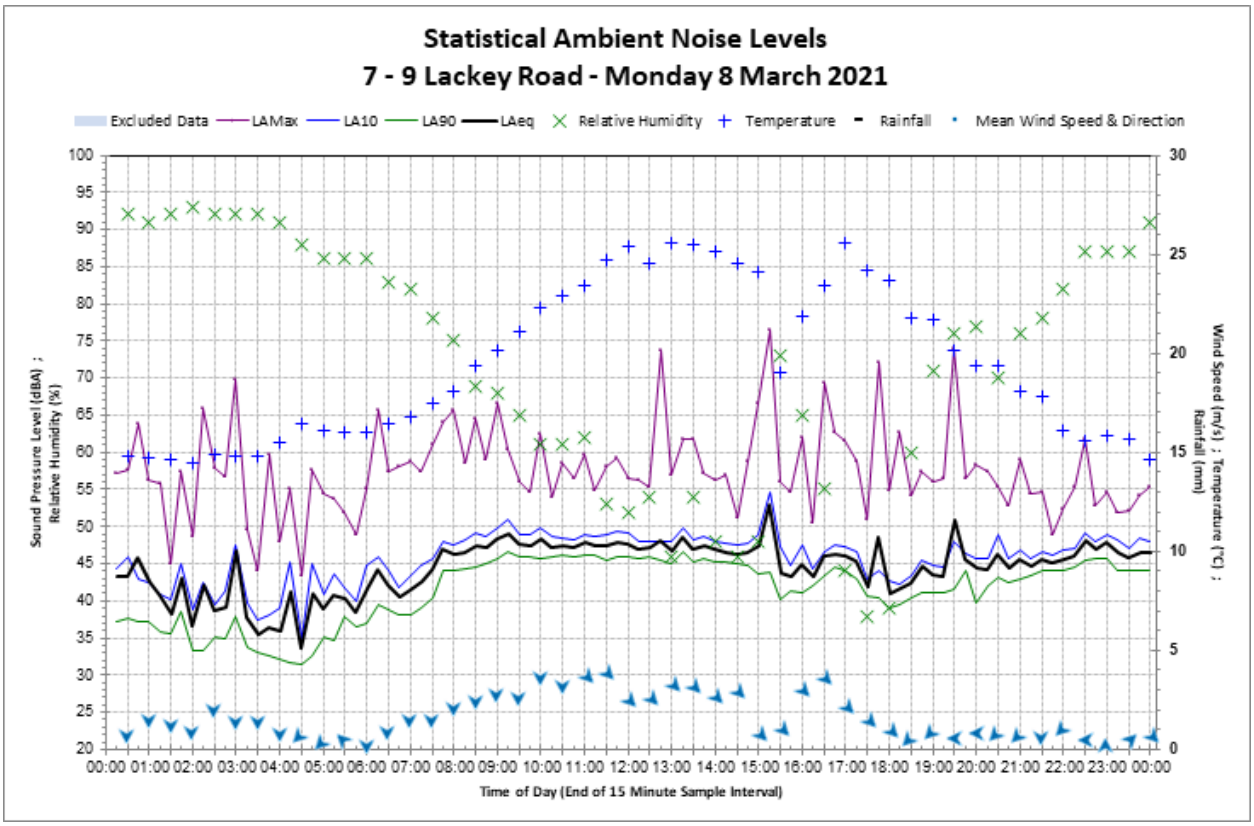
Appendix C

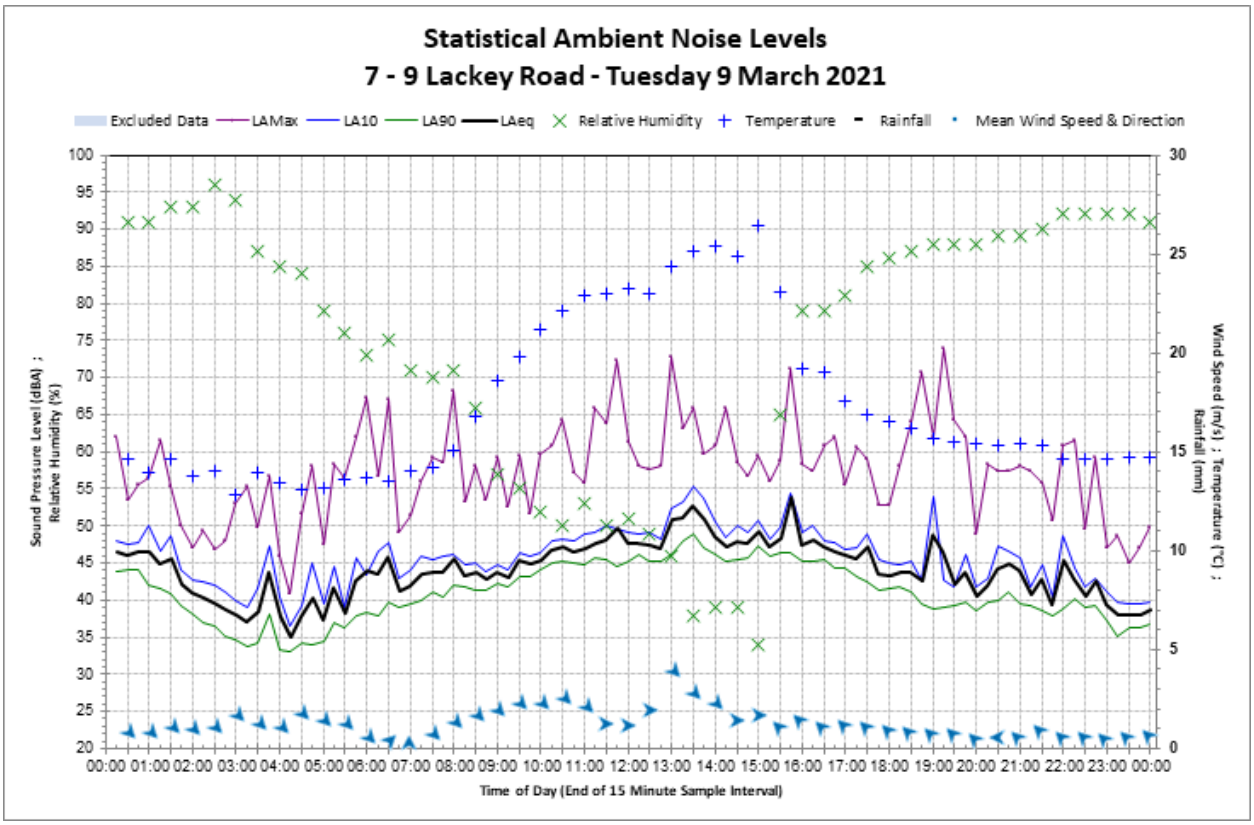
M1 - Noise monitoring charts

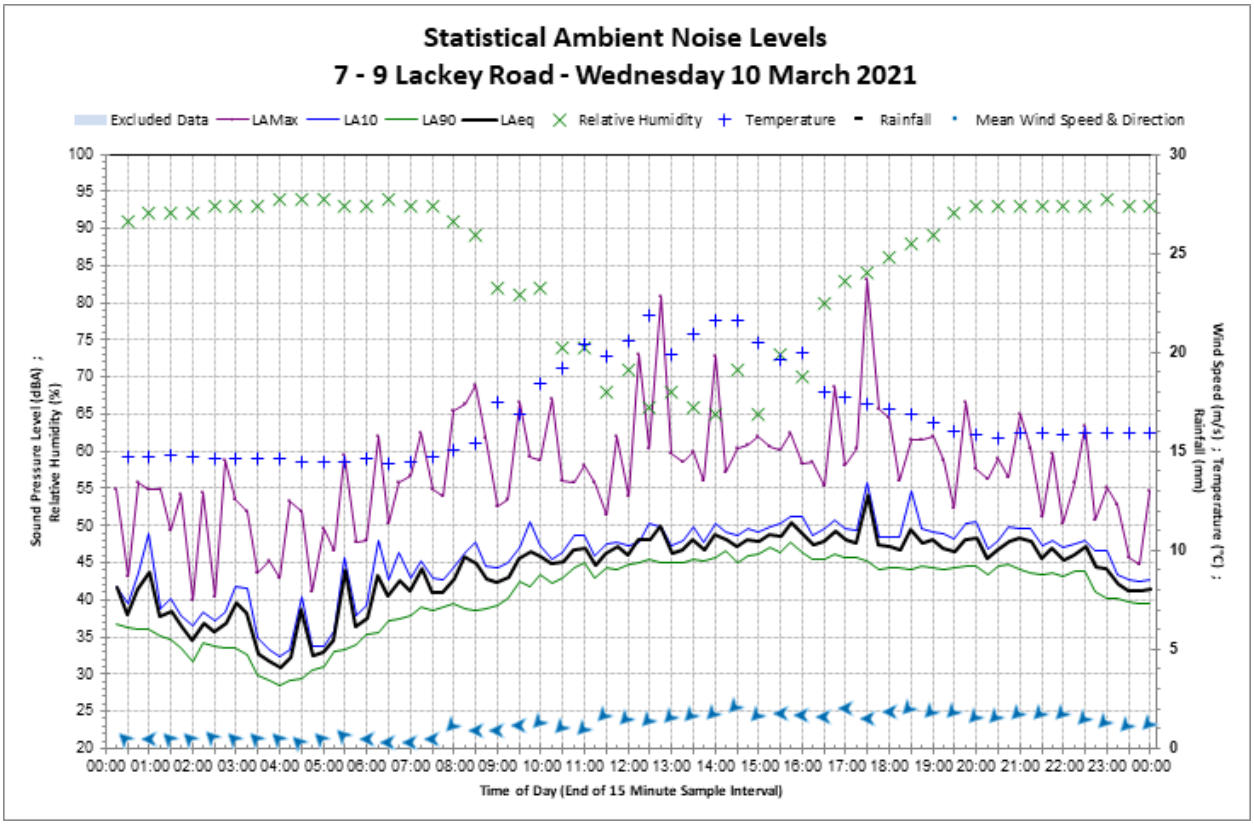

Statistical Ambient Noise Levels
7 - 9 Lackey Road - Friday 5 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

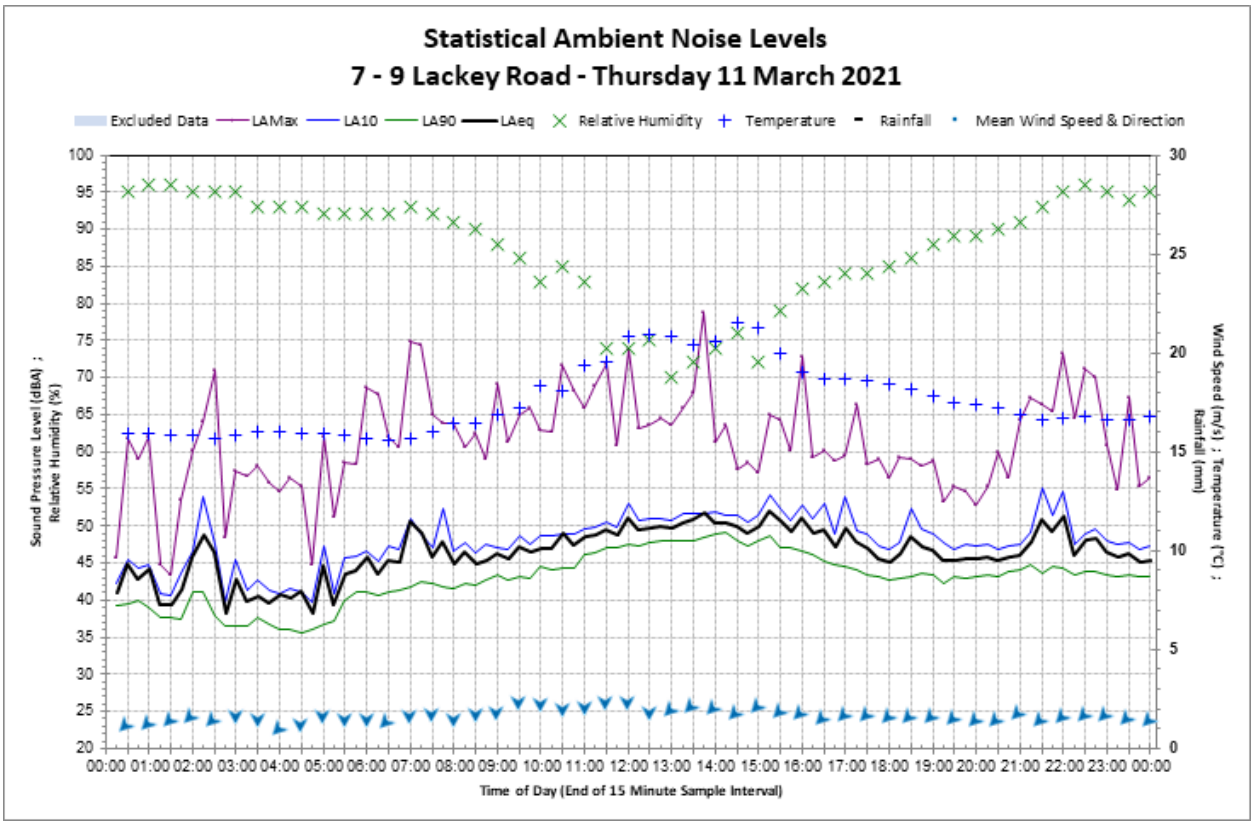

Statistical Ambient Noise Levels
7 - 9 Lackey Road - Saturday 6 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

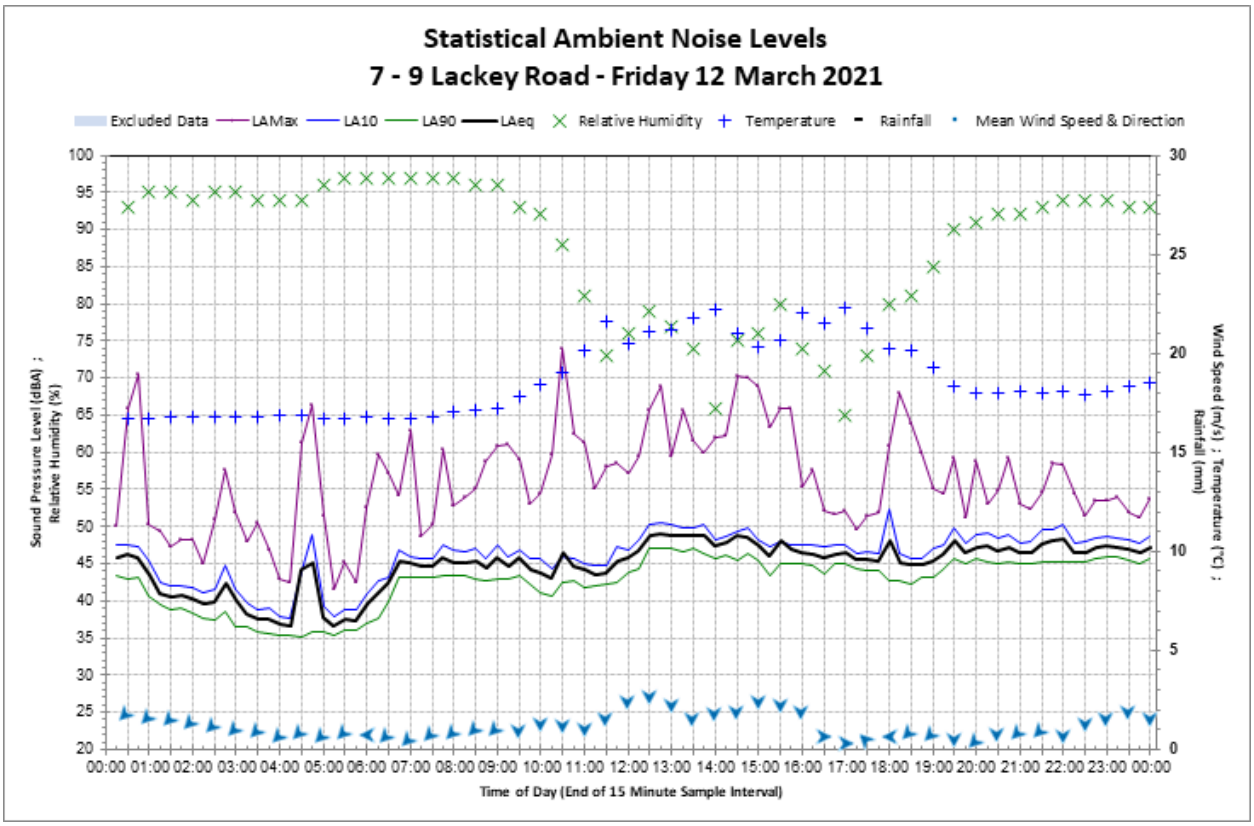

Statistical Ambient Noise Levels
7 - 9 Lackey Road - Sunday 7 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
7 - 9 Lackey Road - Monday 8 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

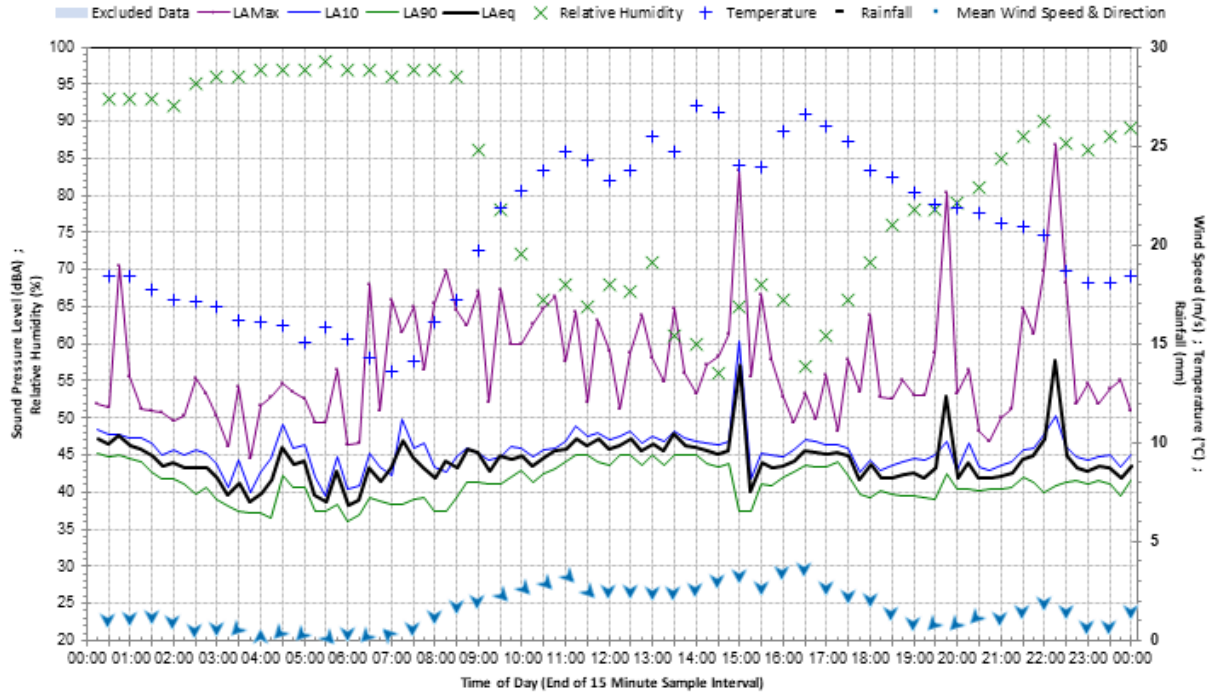

Statistical Ambient Noise Levels
7 - 9 Lackey Road - Tuesday 9 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
7 - 9 Lackey Road - Wednesday 10 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

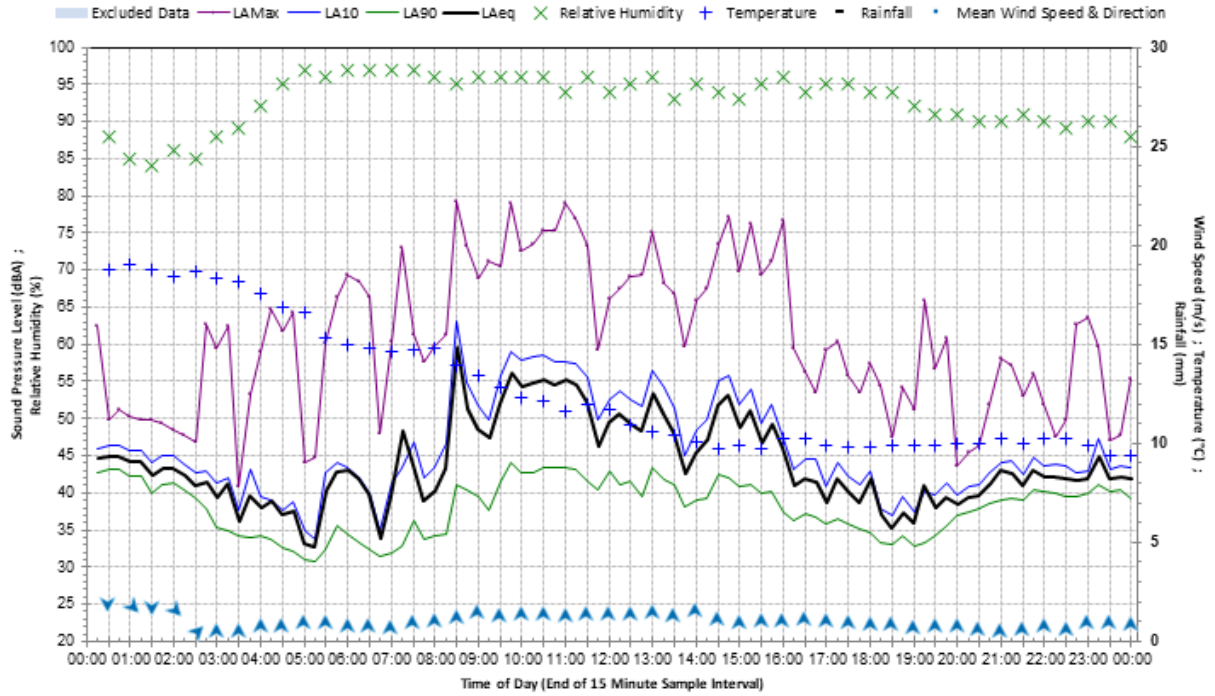

Statistical Ambient Noise Levels
7 - 9 Lackey Road - Thursday 11 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

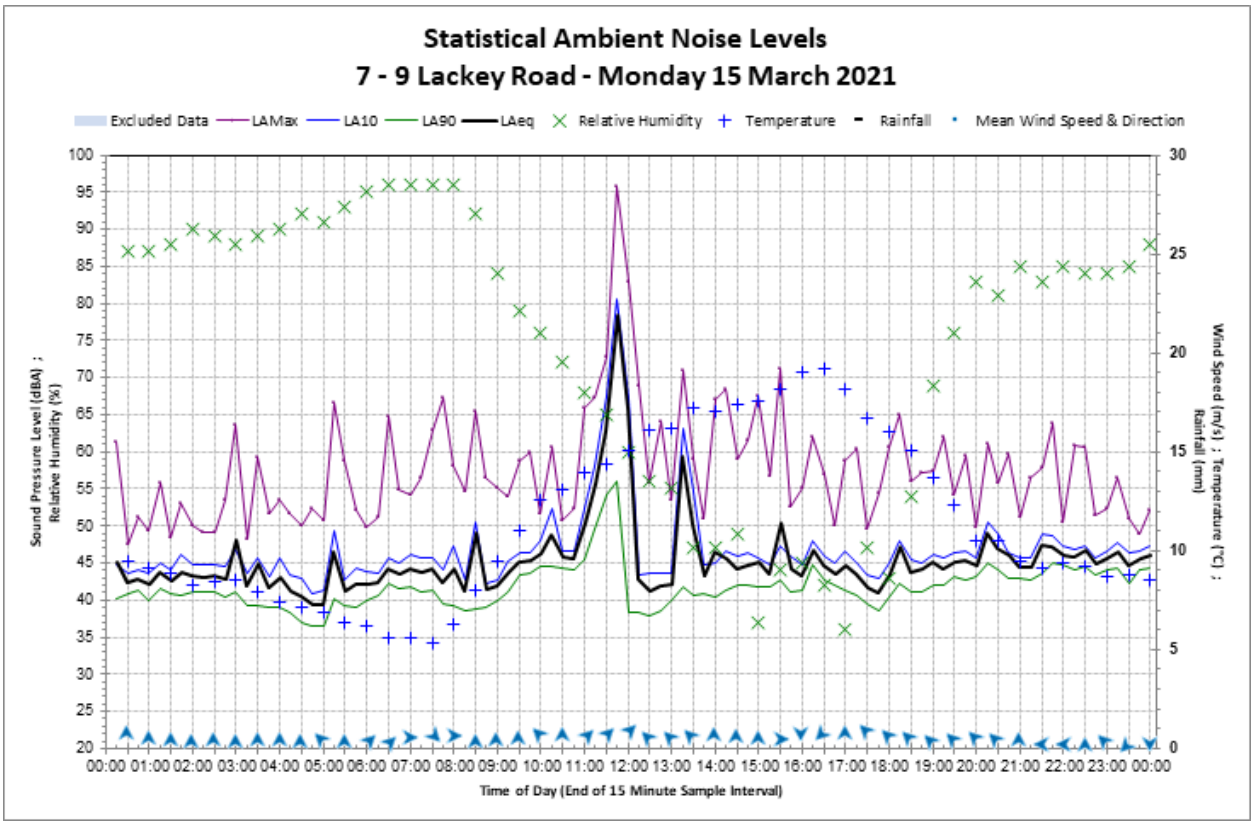

Statistical Ambient Noise Levels
7 - 9 Lackey Road - Friday 12 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

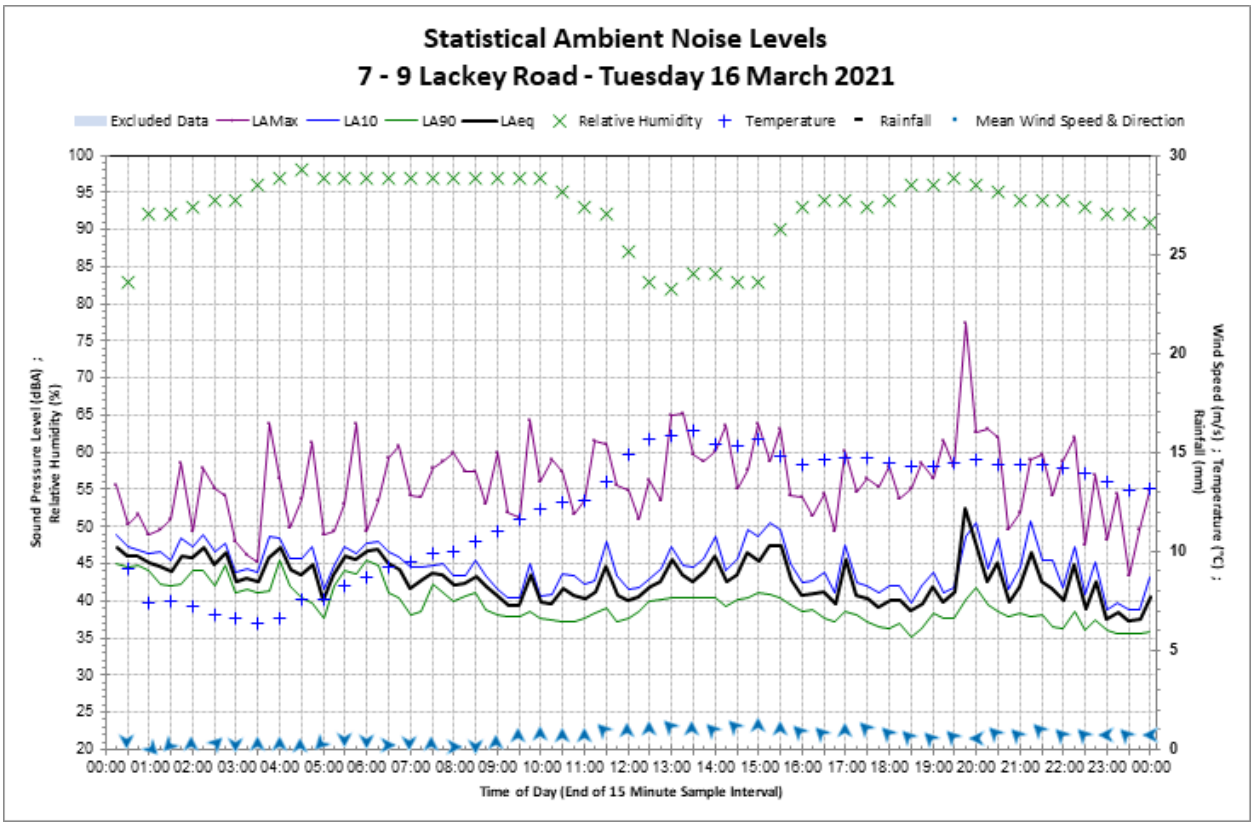
Statistical Ambient Noise Levels
7 - 9 Lackey Road - Saturday 13 March 2021

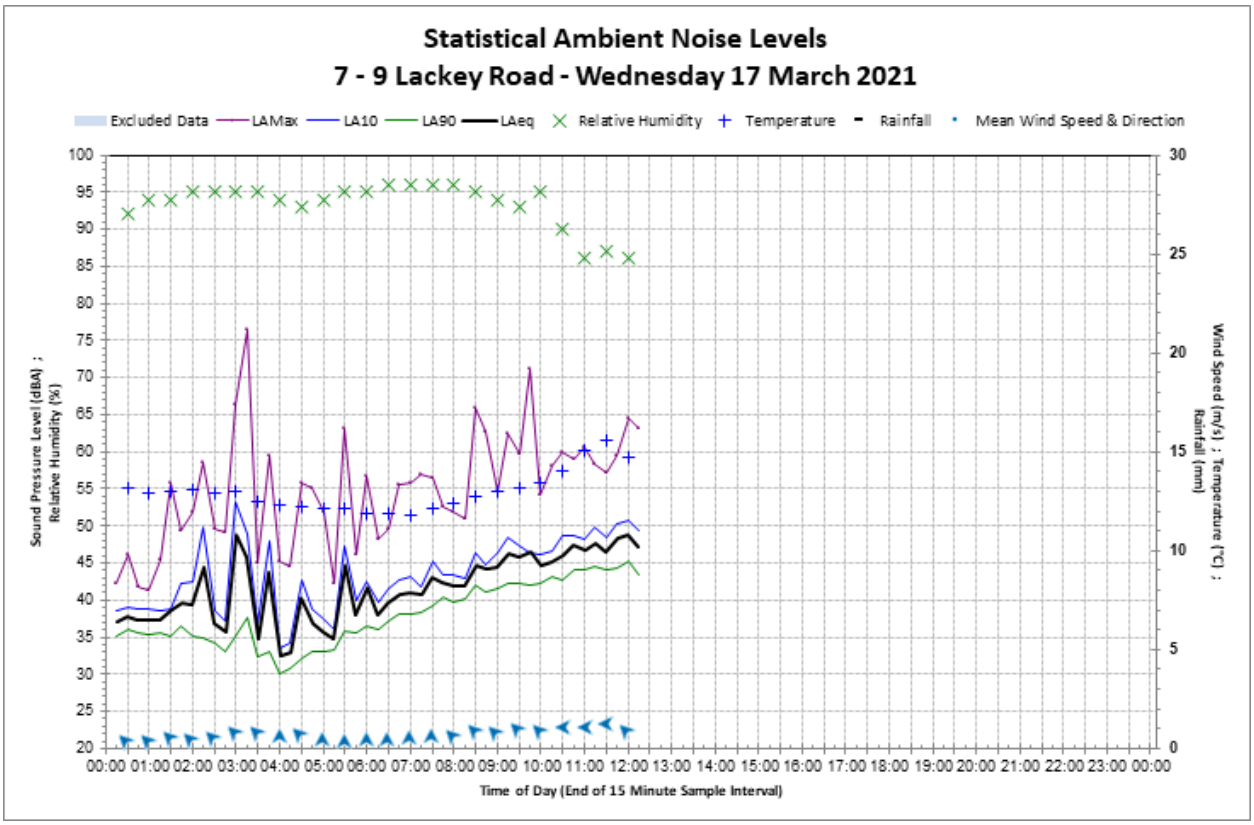


Statistical Ambient Noise Levels
7 - 9 Lackey Road - Sunday 14 March 2021



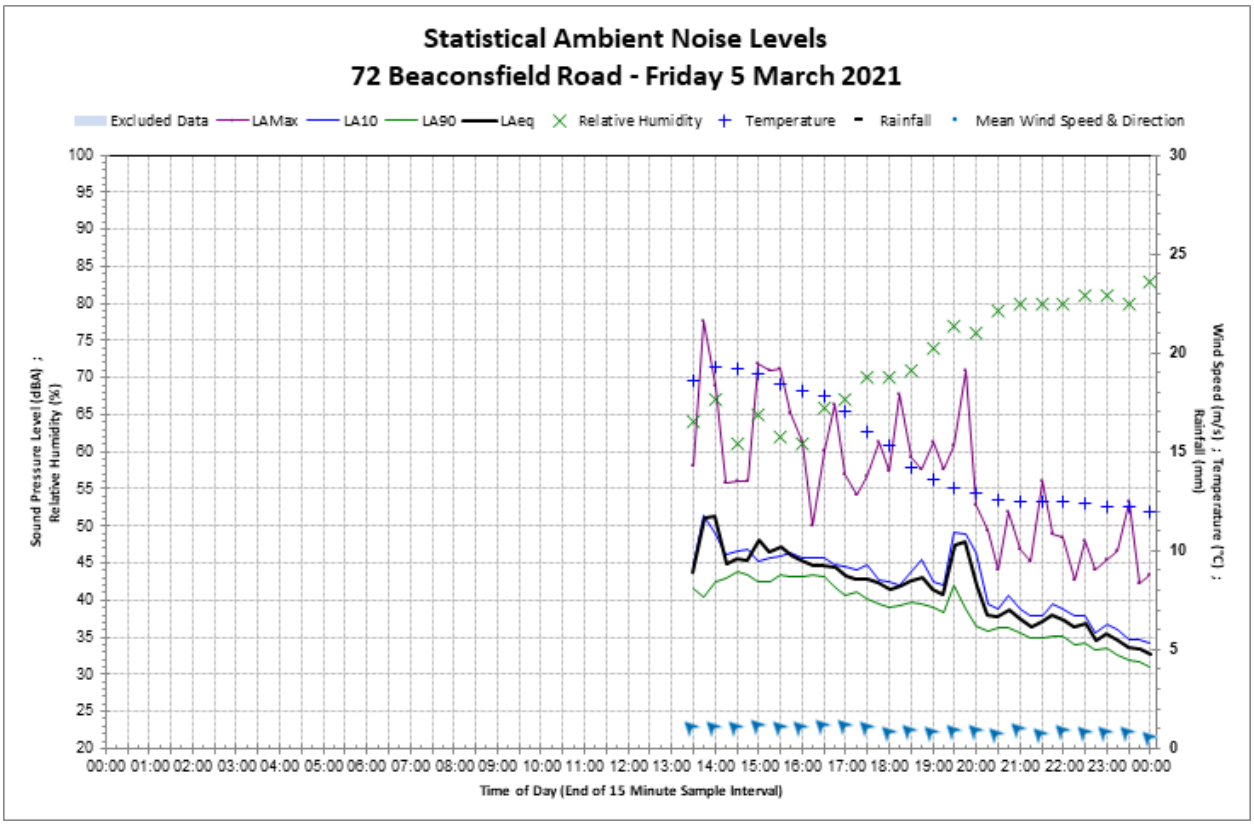

Statistical Ambient Noise Levels
7 - 9 Lackey Road - Monday 15 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

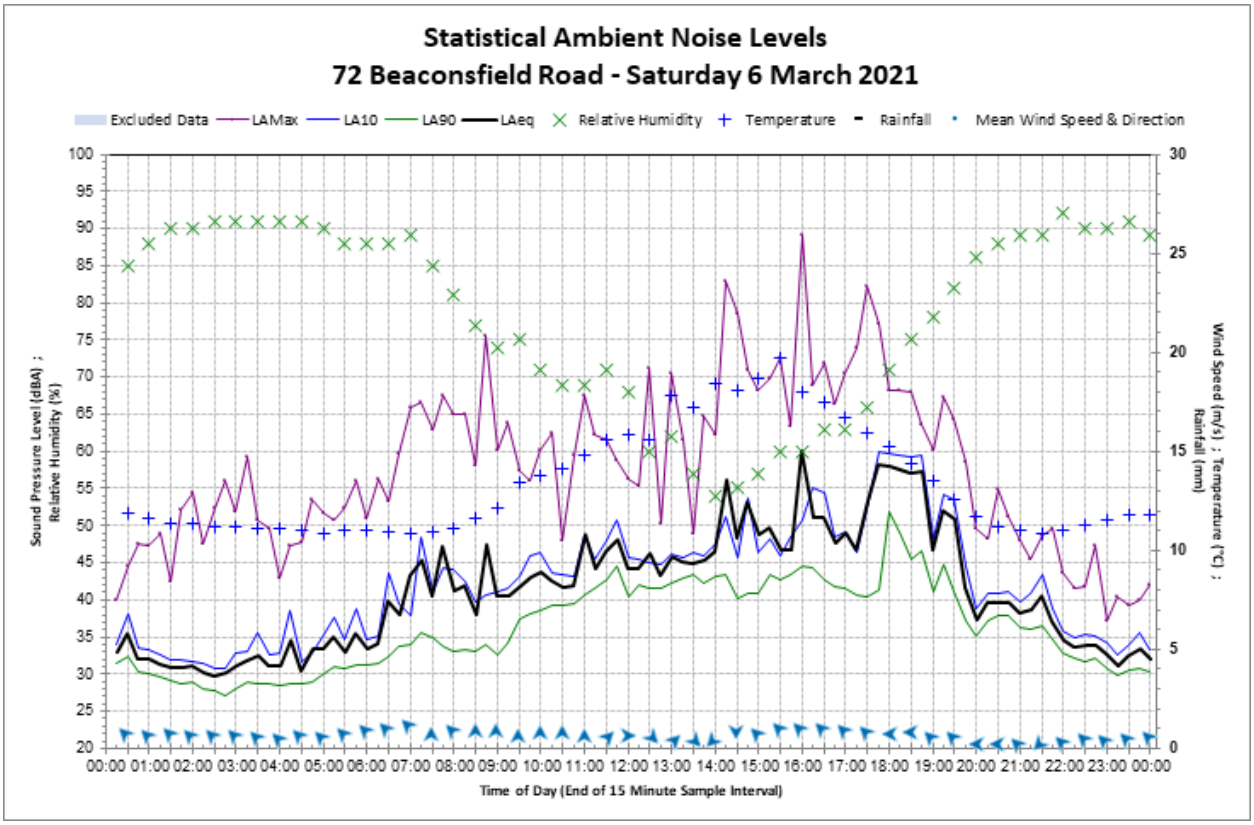

Statistical Ambient Noise Levels
7 - 9 Lackey Road - Tuesday 16 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

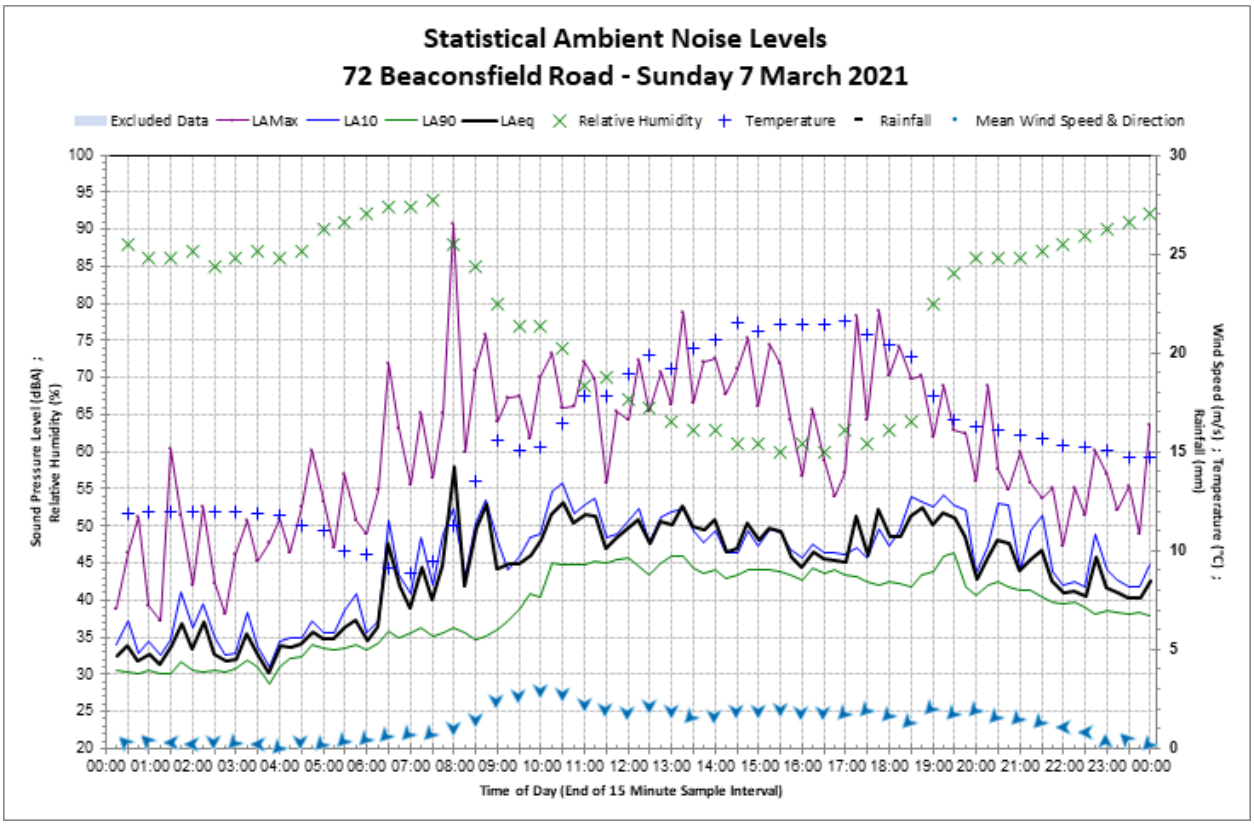

Statistical Ambient Noise Levels
7 - 9 Lackey Road - Wednesday 17 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

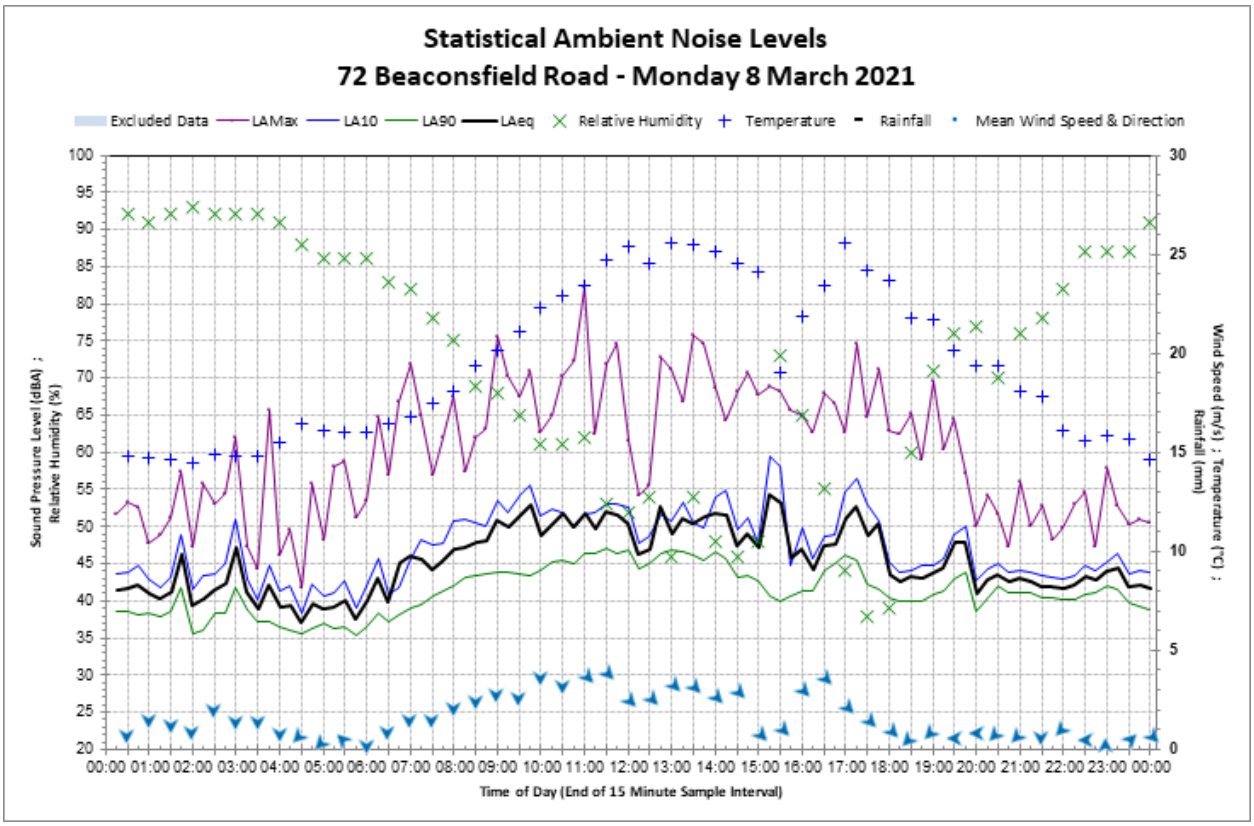
Appendix D

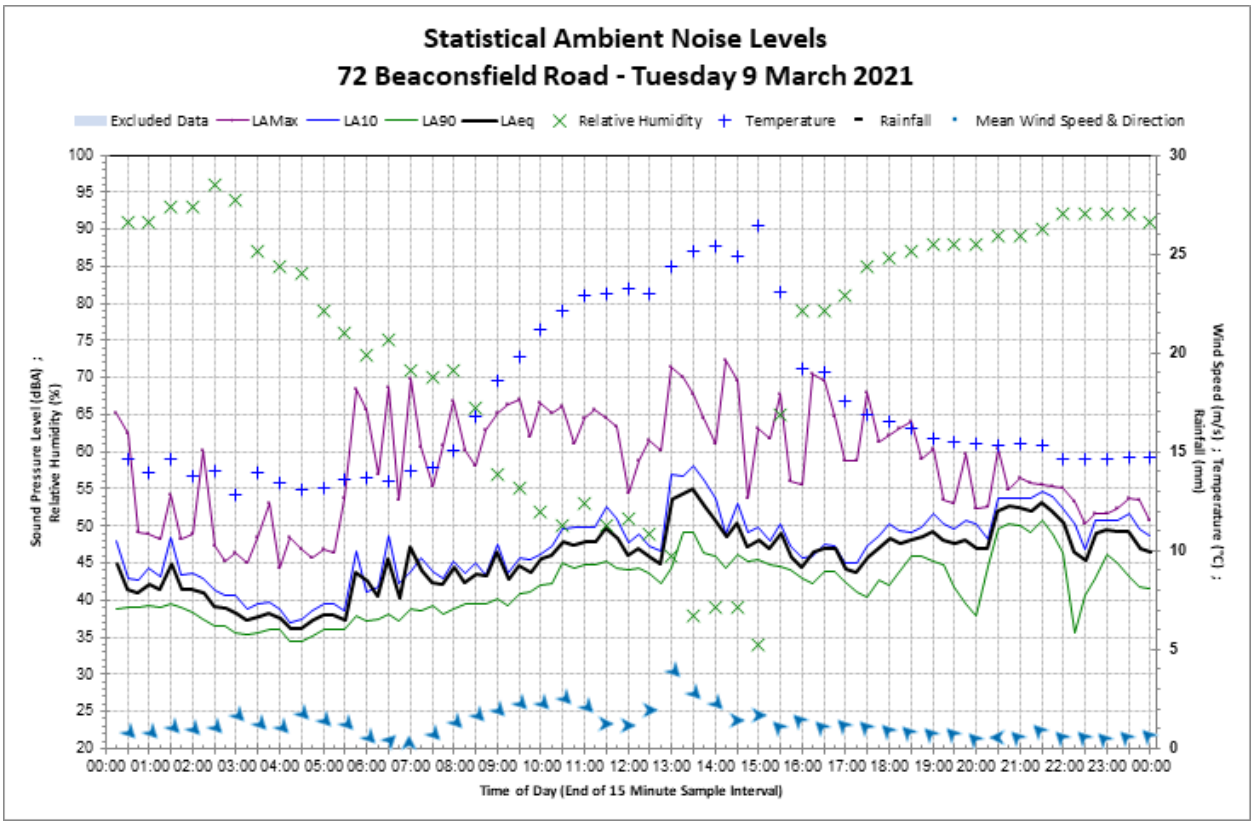
M2 - Noise monitoring charts

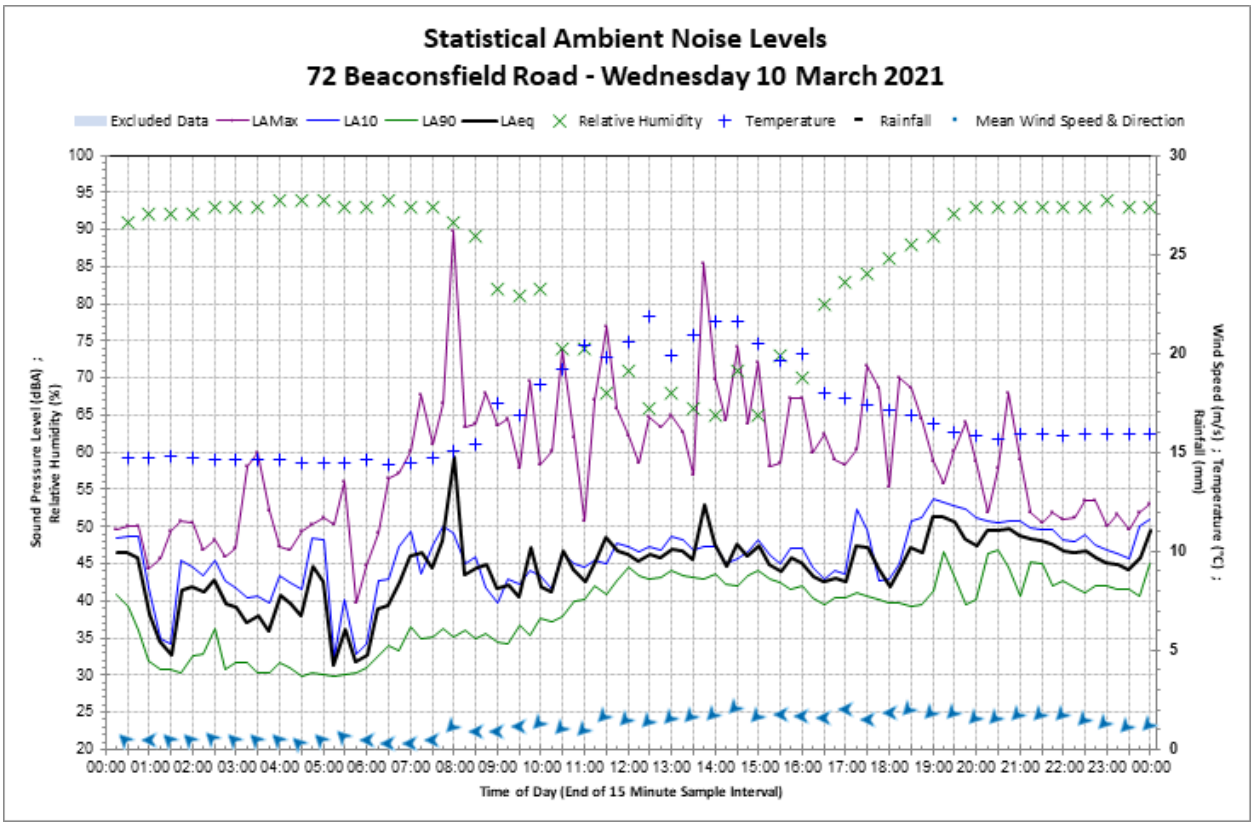

Statistical Ambient Noise Levels
72 Beaconsfield Road - Friday 5 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

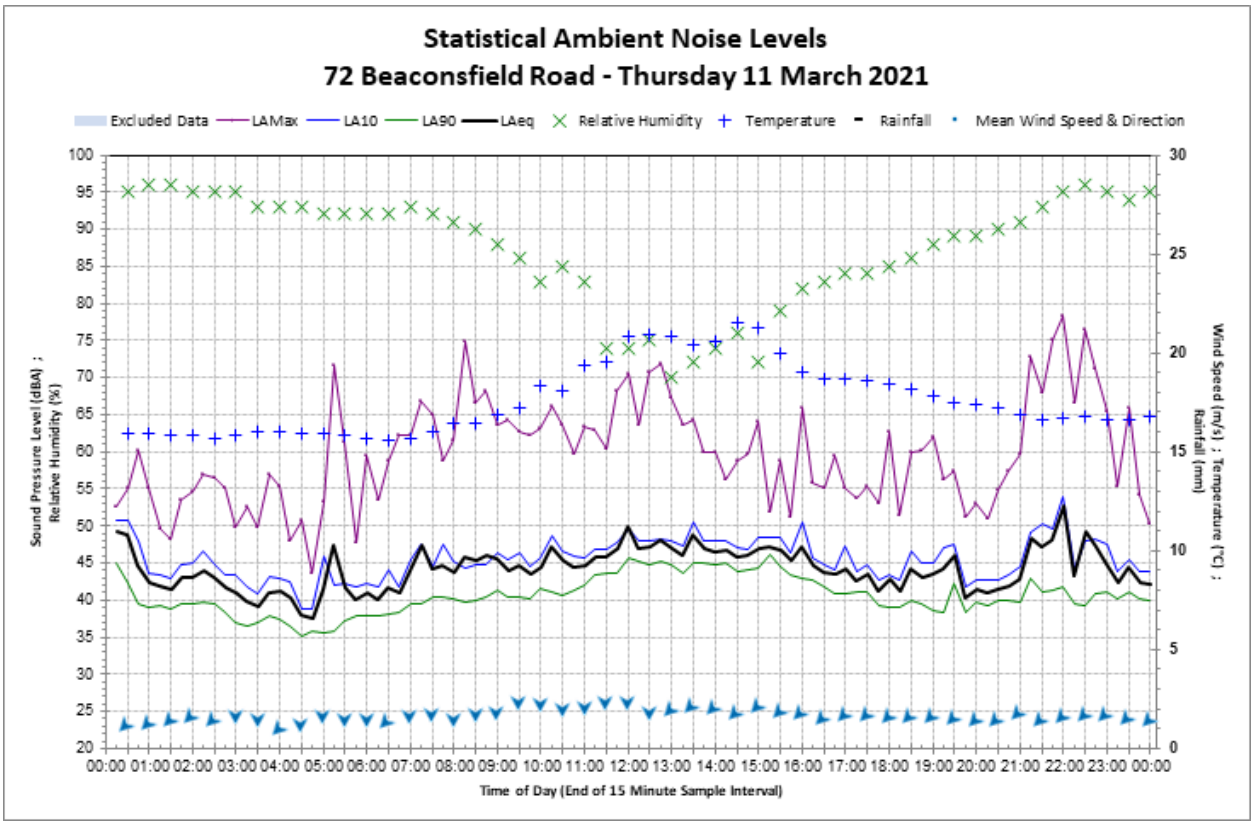

Statistical Ambient Noise Levels
72 Beaconsfield Road - Saturday 6 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

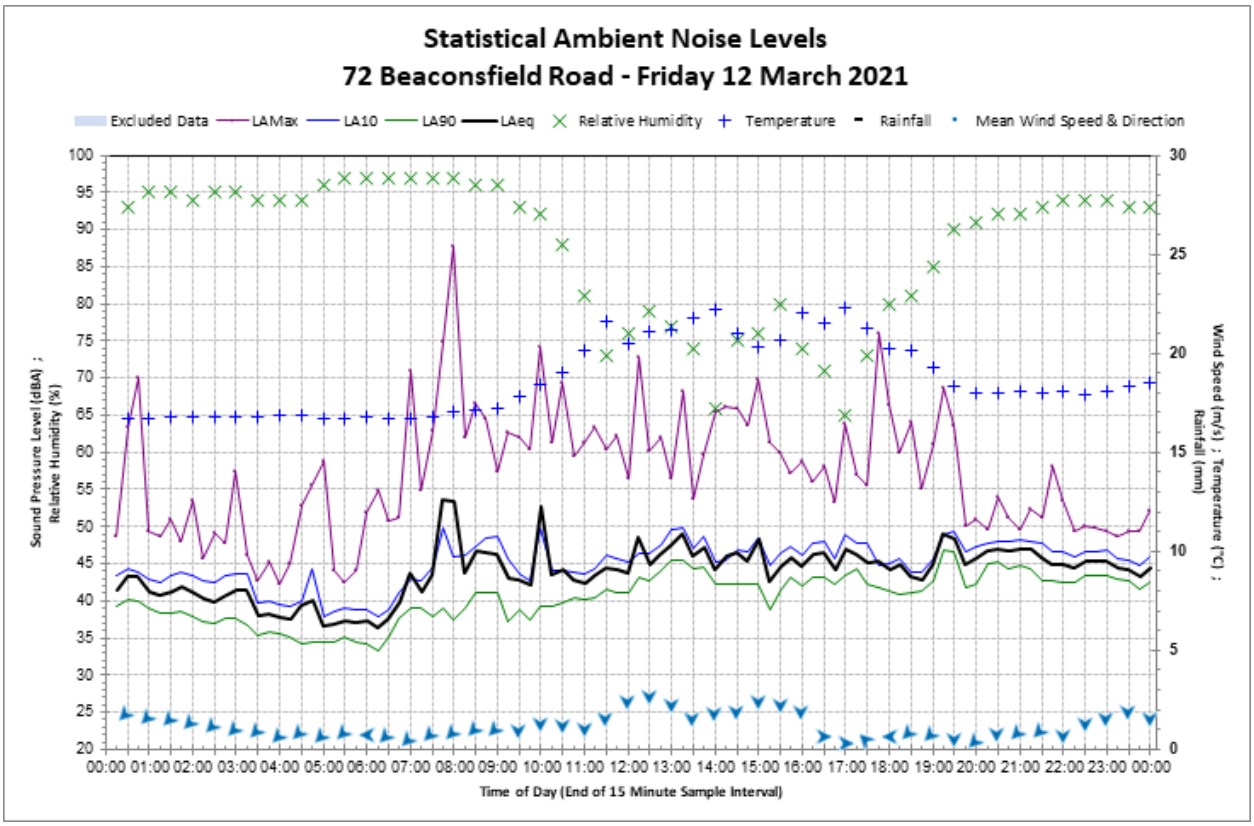

Statistical Ambient Noise Levels
72 Beaconsfield Road - Sunday 7 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

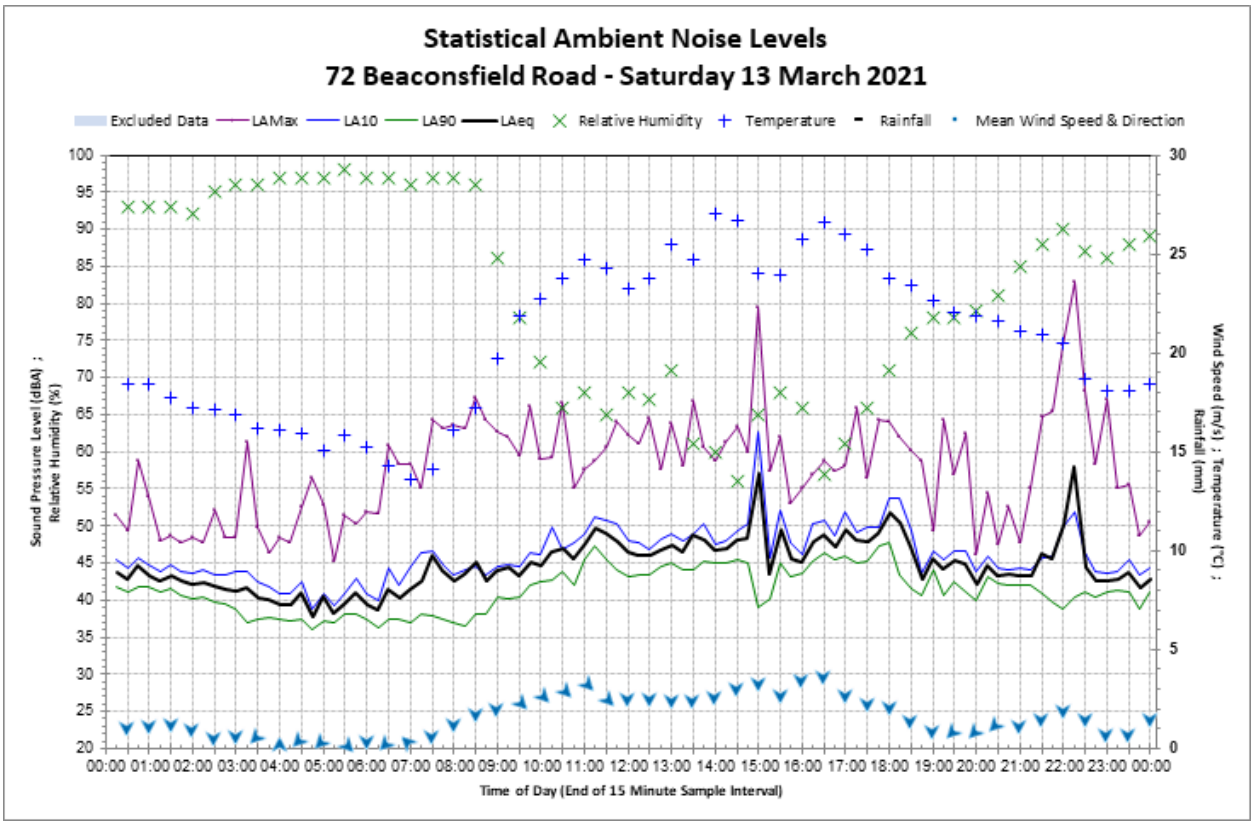

Statistical Ambient Noise Levels
72 Beaconsfield Road - Monday 8 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

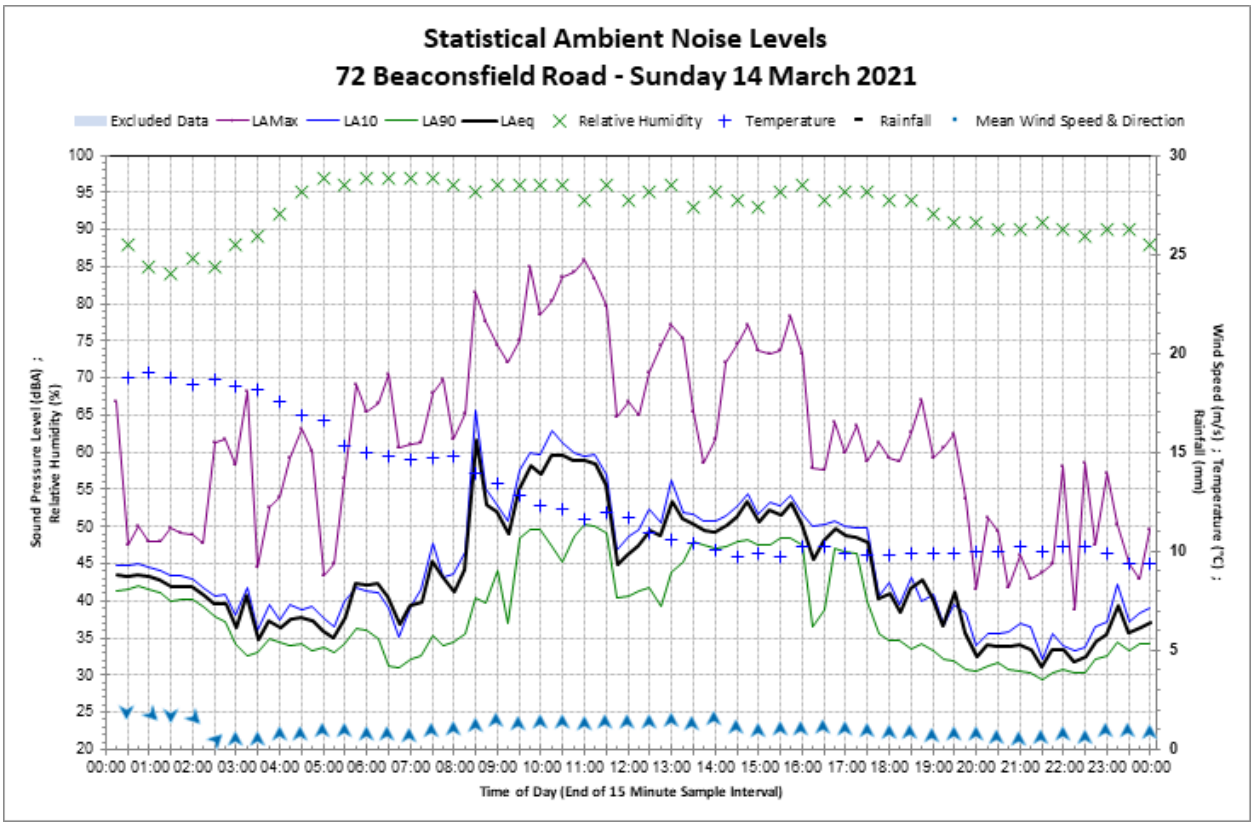

Statistical Ambient Noise Levels
72 Beaconsfield Road - Tuesday 9 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

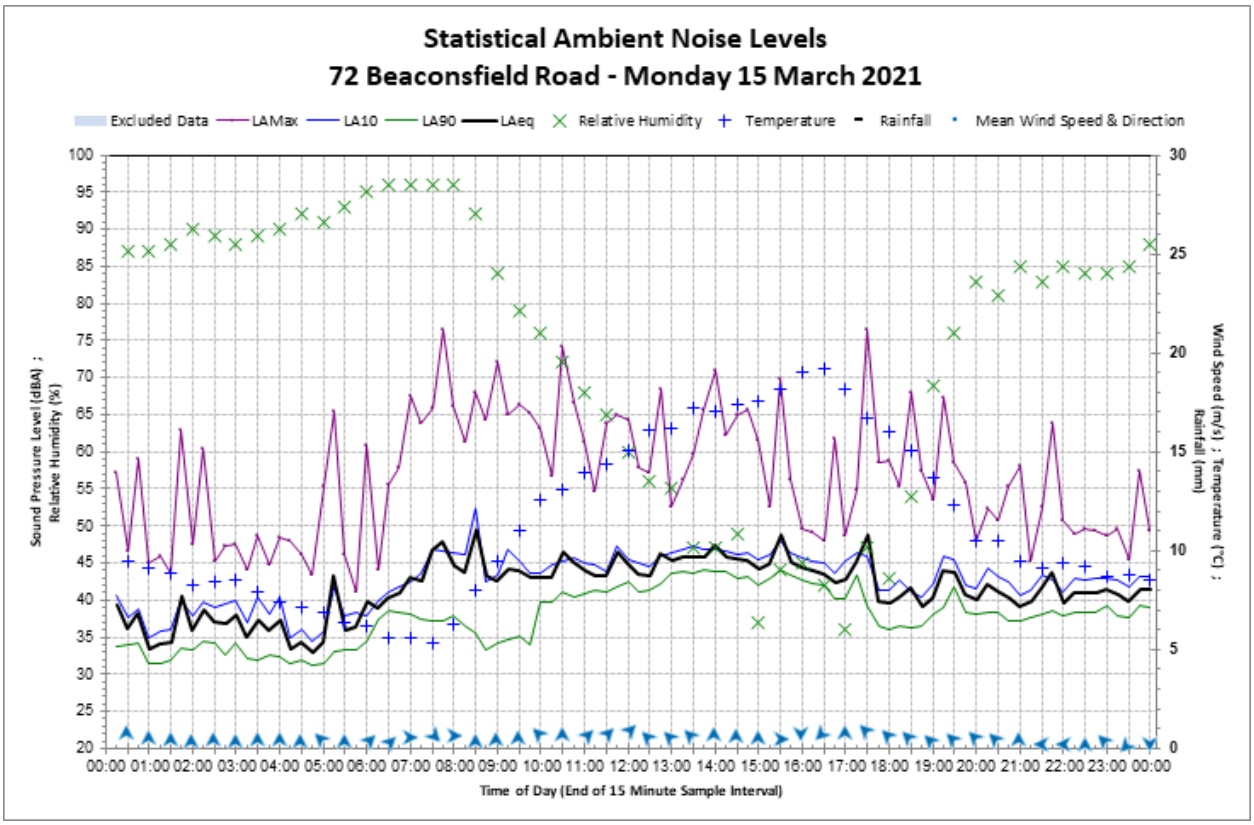

Statistical Ambient Noise Levels
72 Beaconsfield Road - Wednesday 10 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

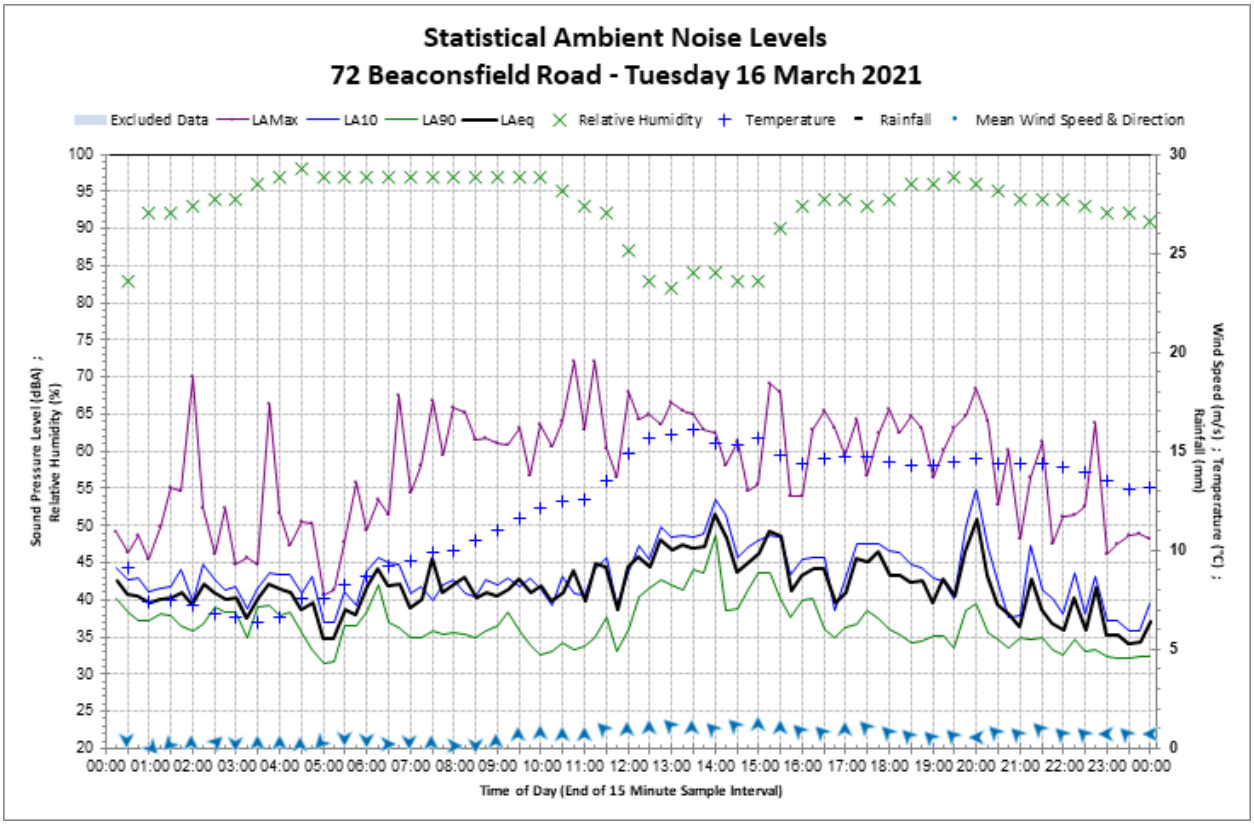

Statistical Ambient Noise Levels
72 Beaconsfield Road - Thursday 11 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

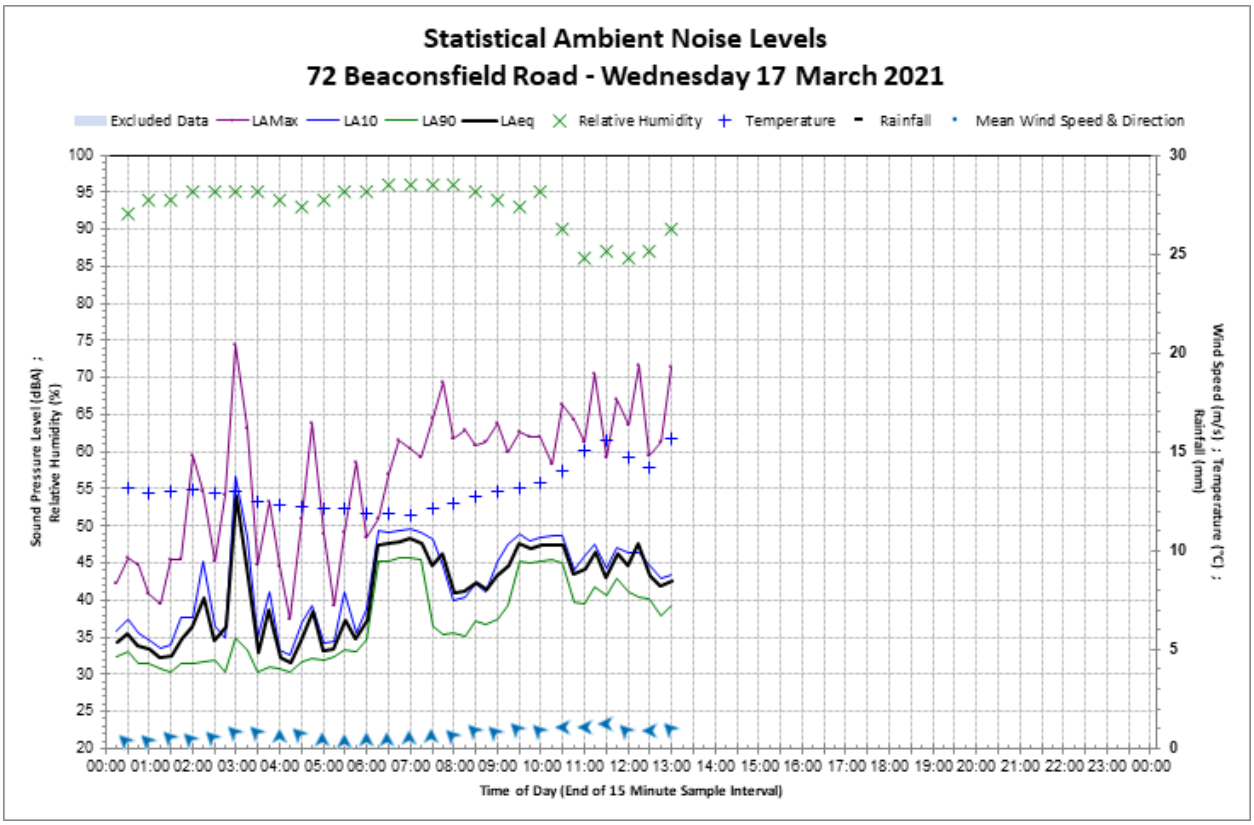

Statistical Ambient Noise Levels
72 Beaconsfield Road - Friday 12 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
72 Beaconsfield Road - Saturday 13 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
72 Beaconsfield Road - Sunday 14 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

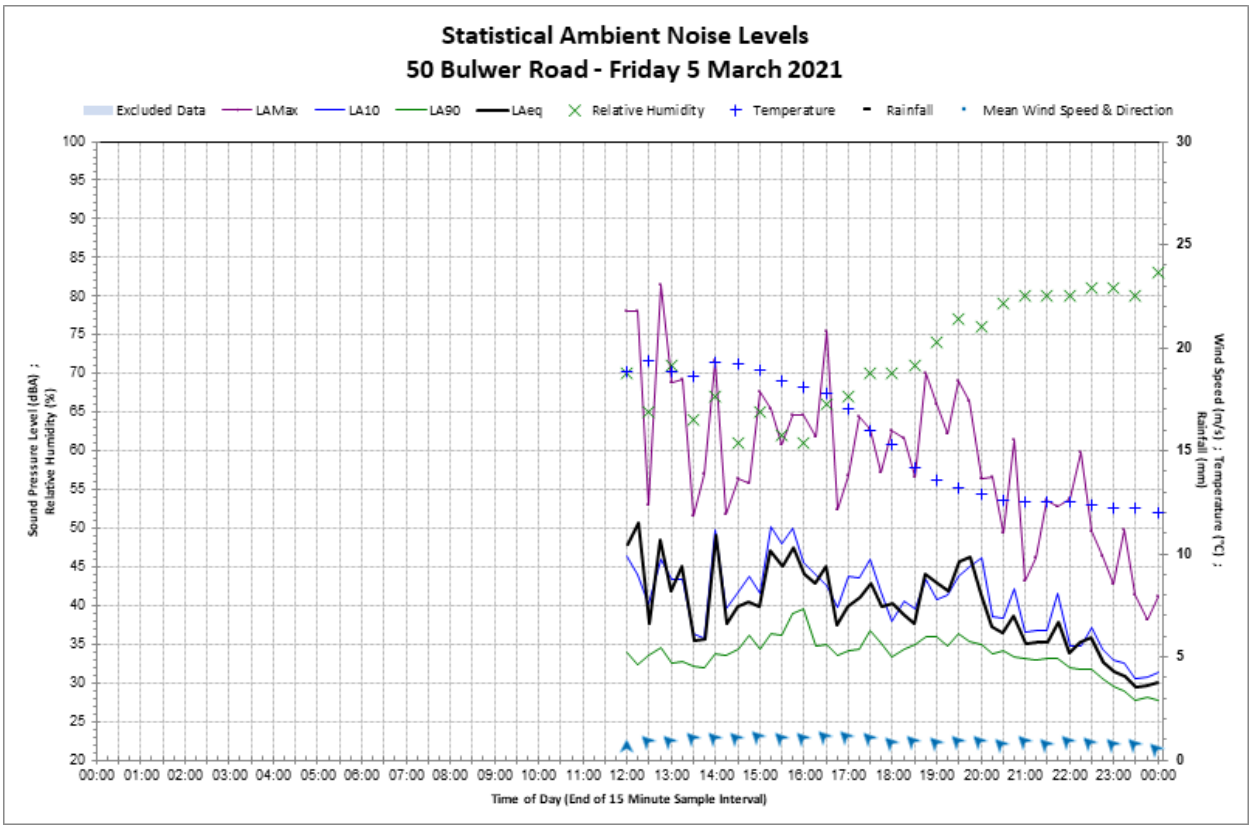

Statistical Ambient Noise Levels
72 Beaconsfield Road - Monday 15 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

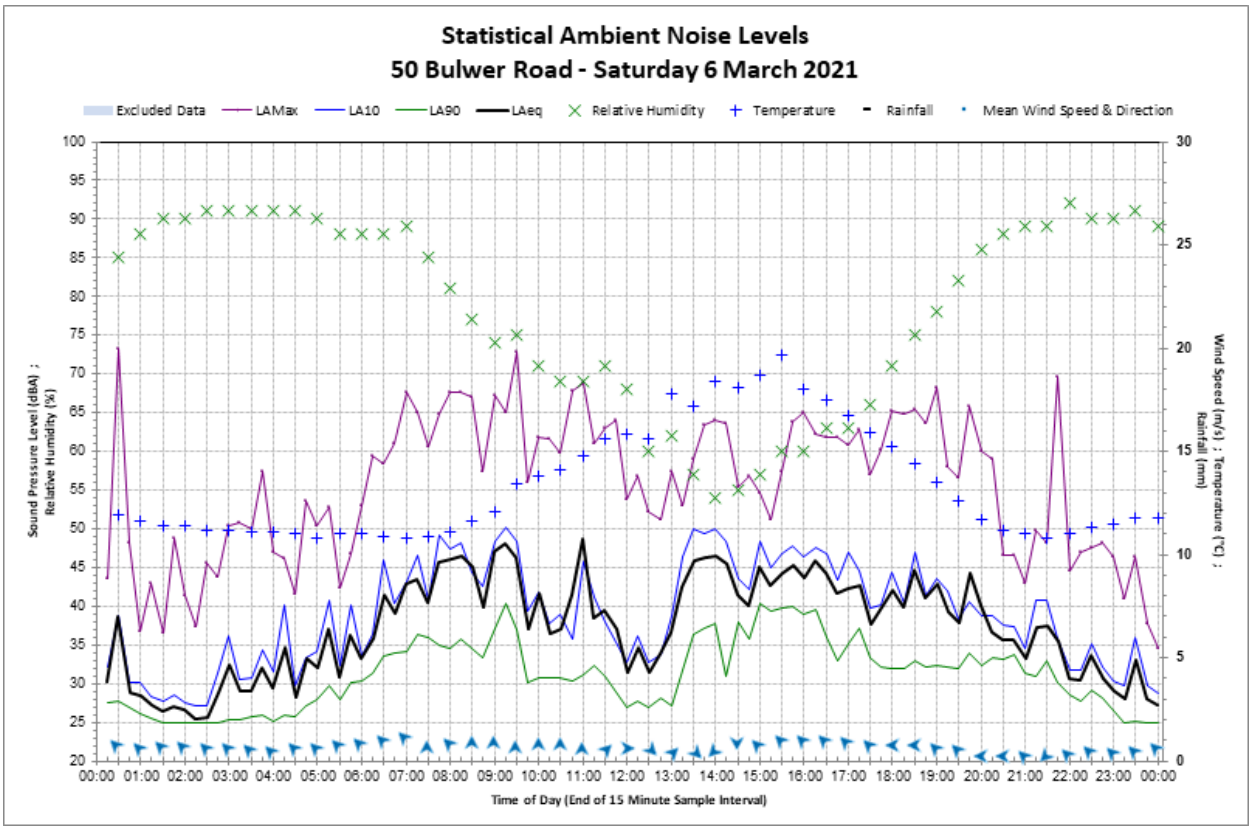

Statistical Ambient Noise Levels
72 Beaconsfield Road - Tuesday 16 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

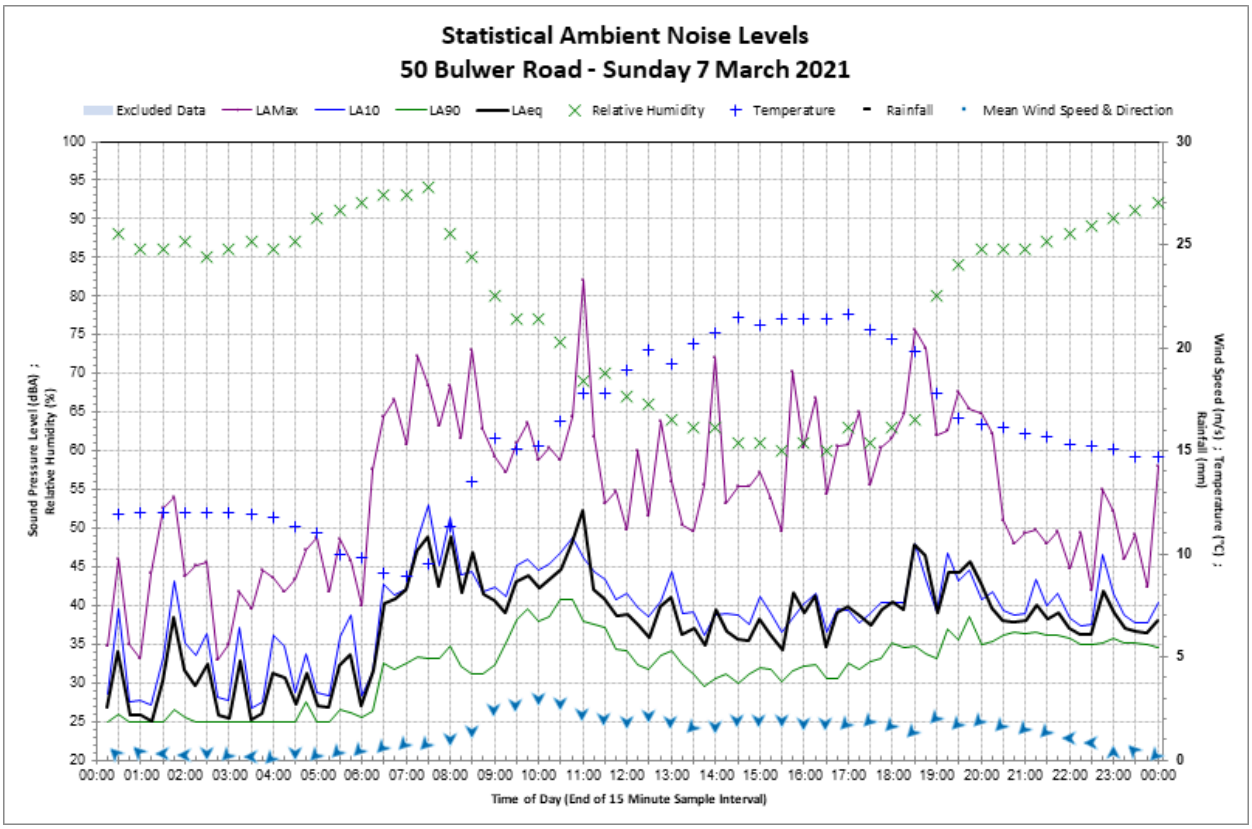

Statistical Ambient Noise Levels
72 Beaconsfield Road - Wednesday 17 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

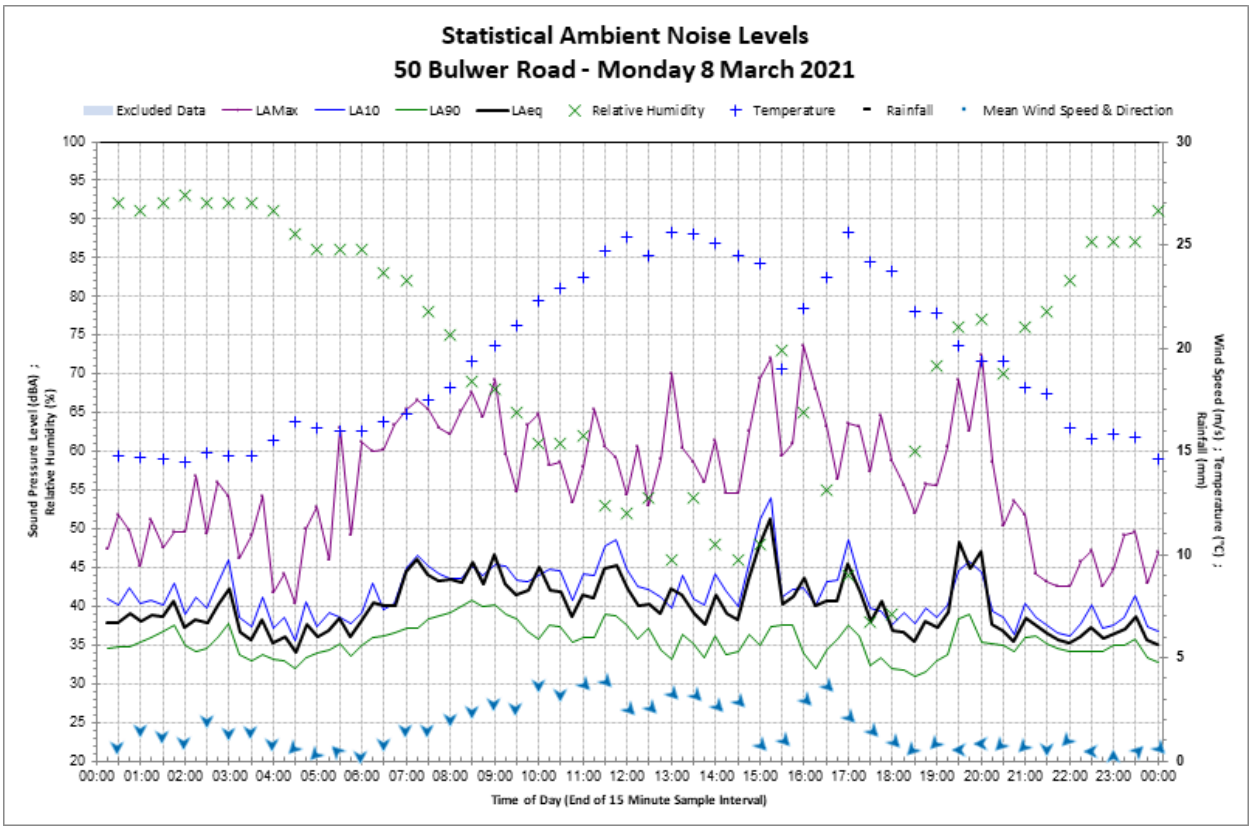
Appendix E

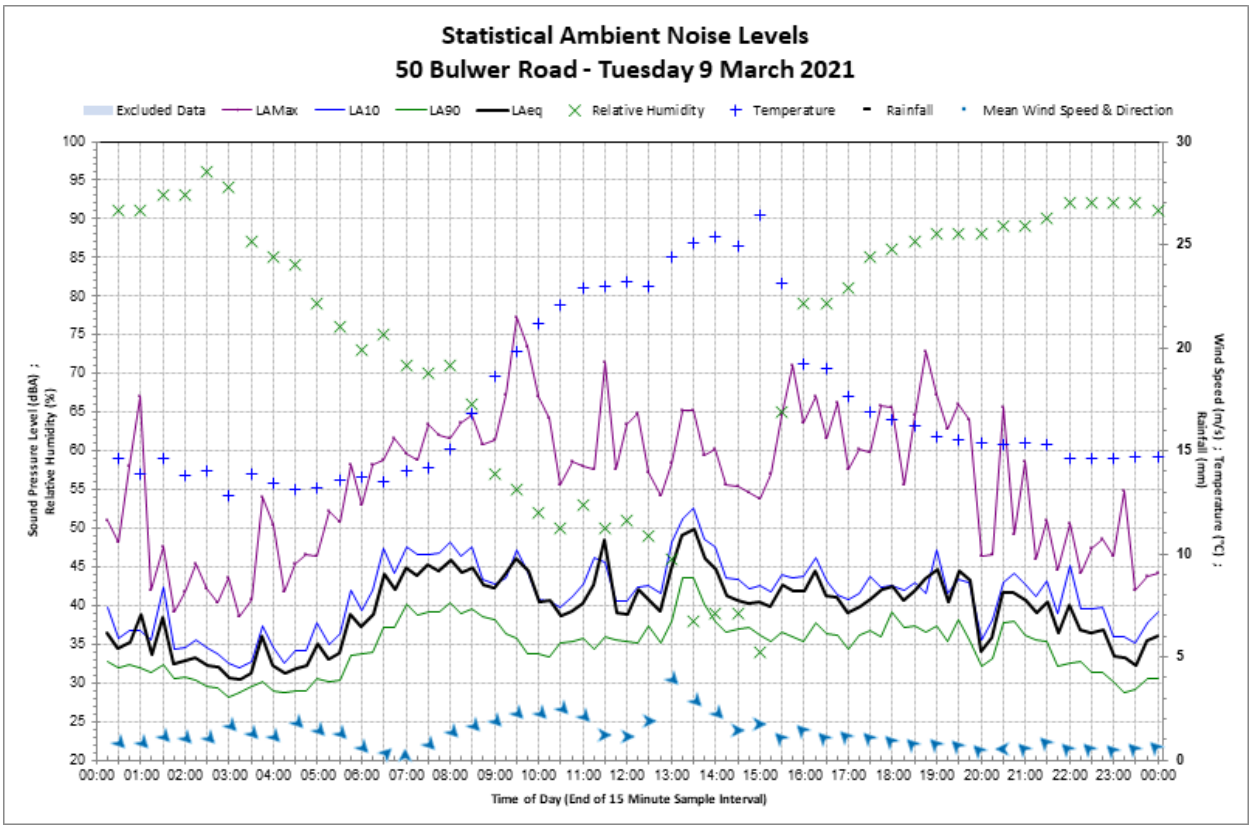
M3 - Noise monitoring charts

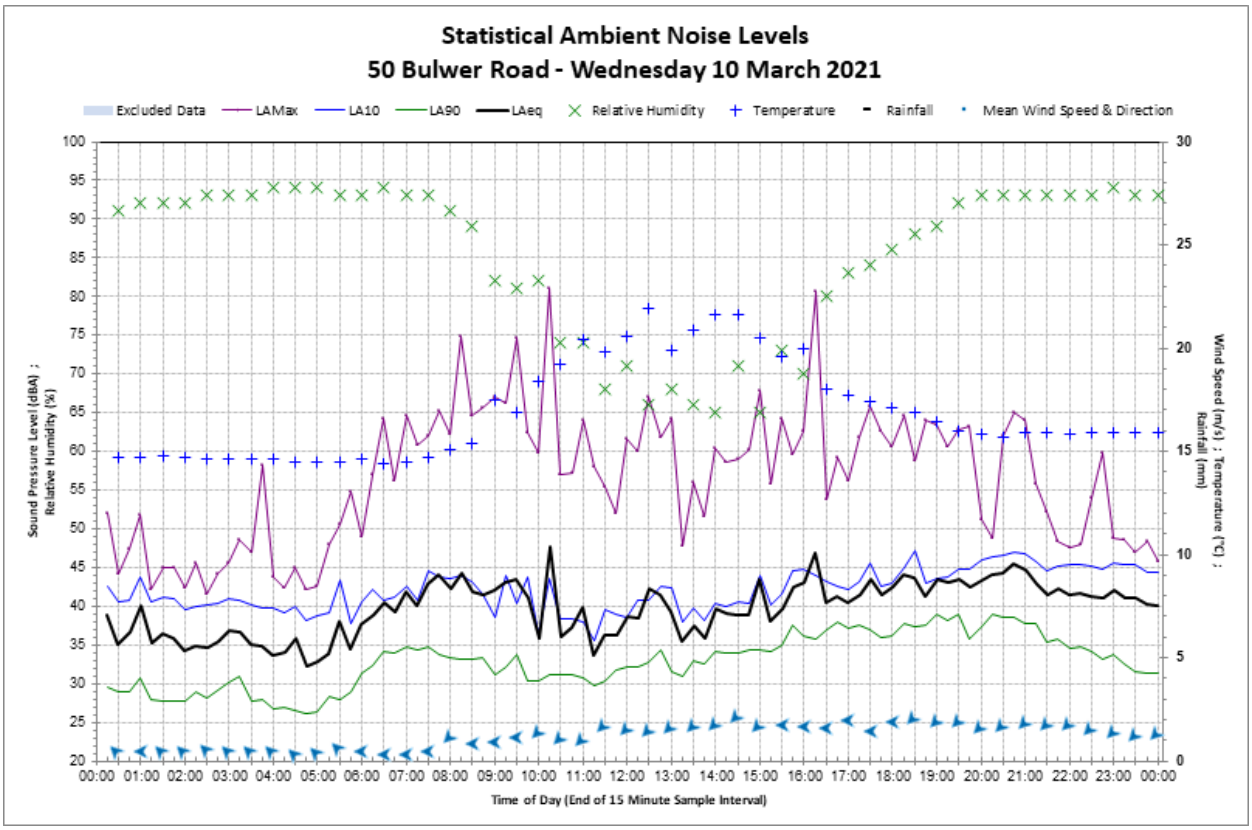

Statistical Ambient Noise Levels
50 Bulwer Road - Friday 5 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

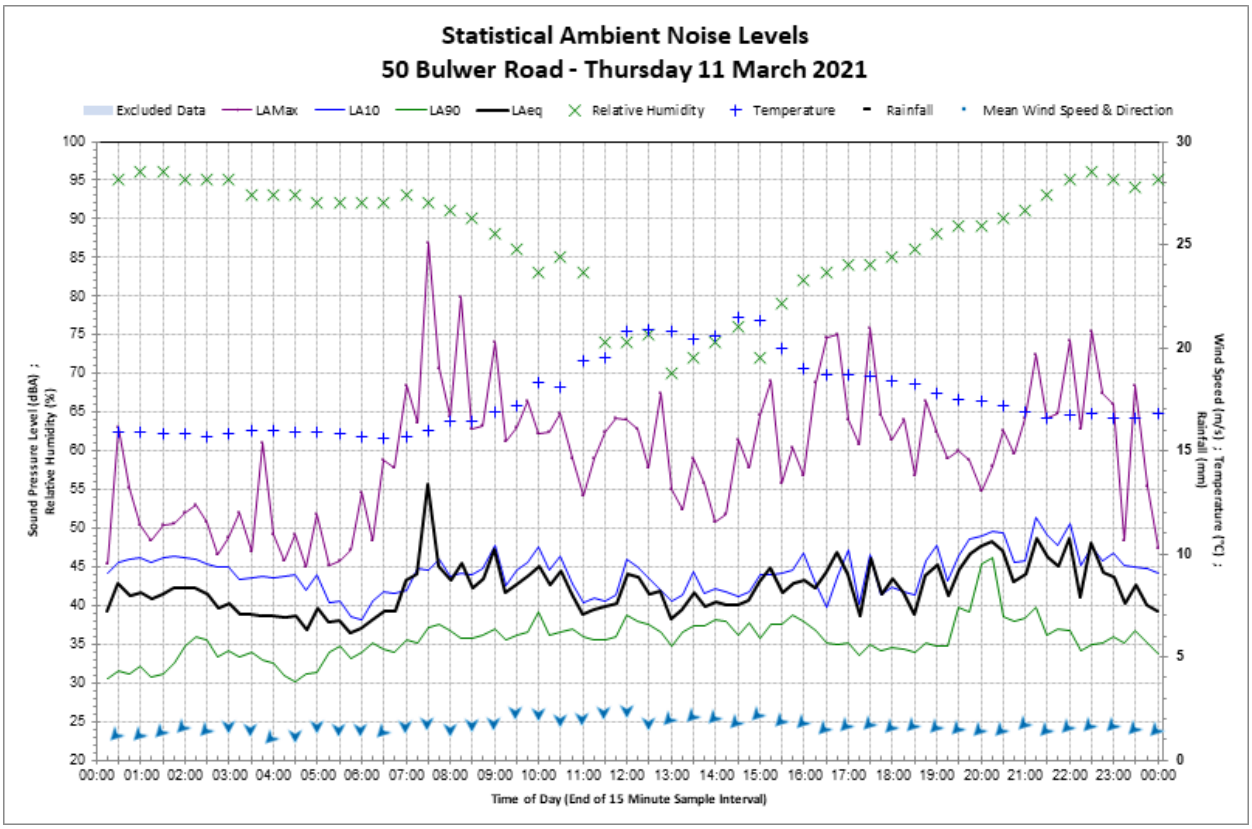

Statistical Ambient Noise Levels
50 Bulwer Road - Saturday 6 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

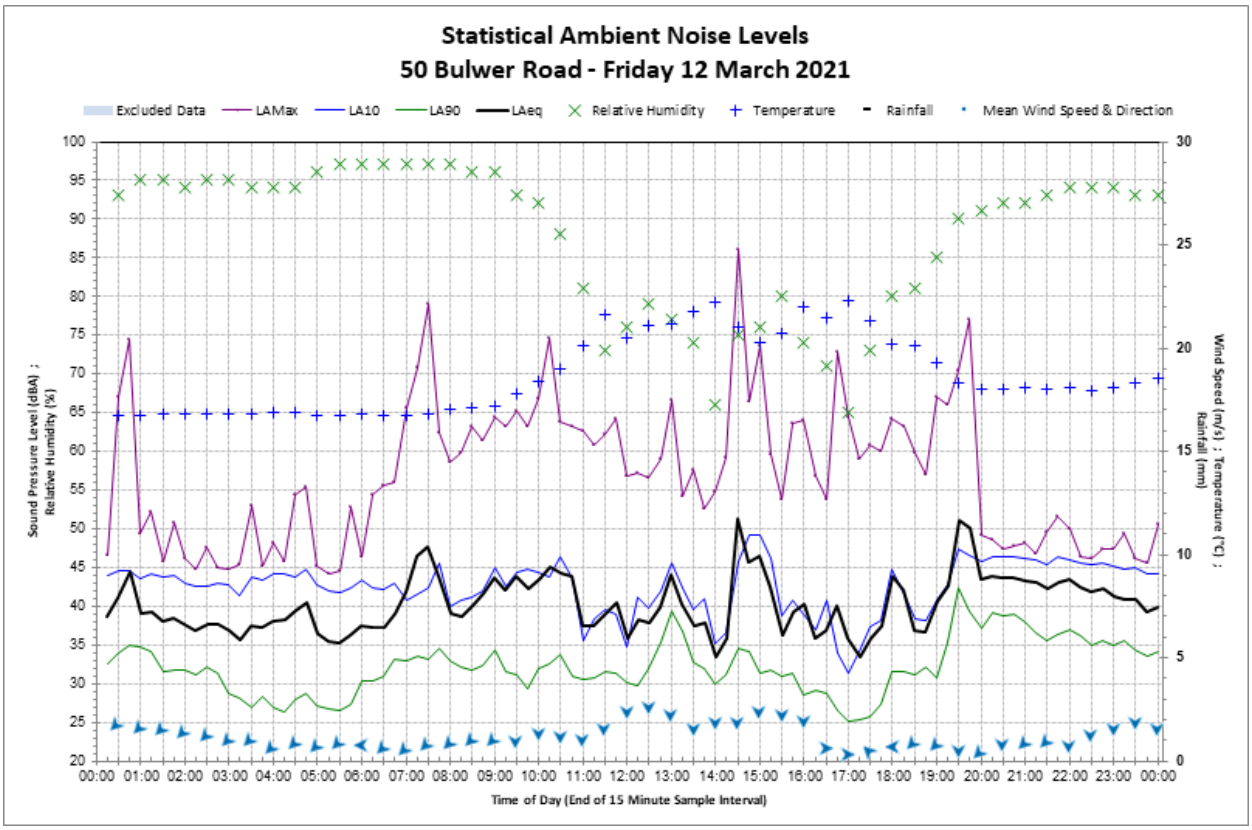

Statistical Ambient Noise Levels
50 Bulwer Road - Sunday 7 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

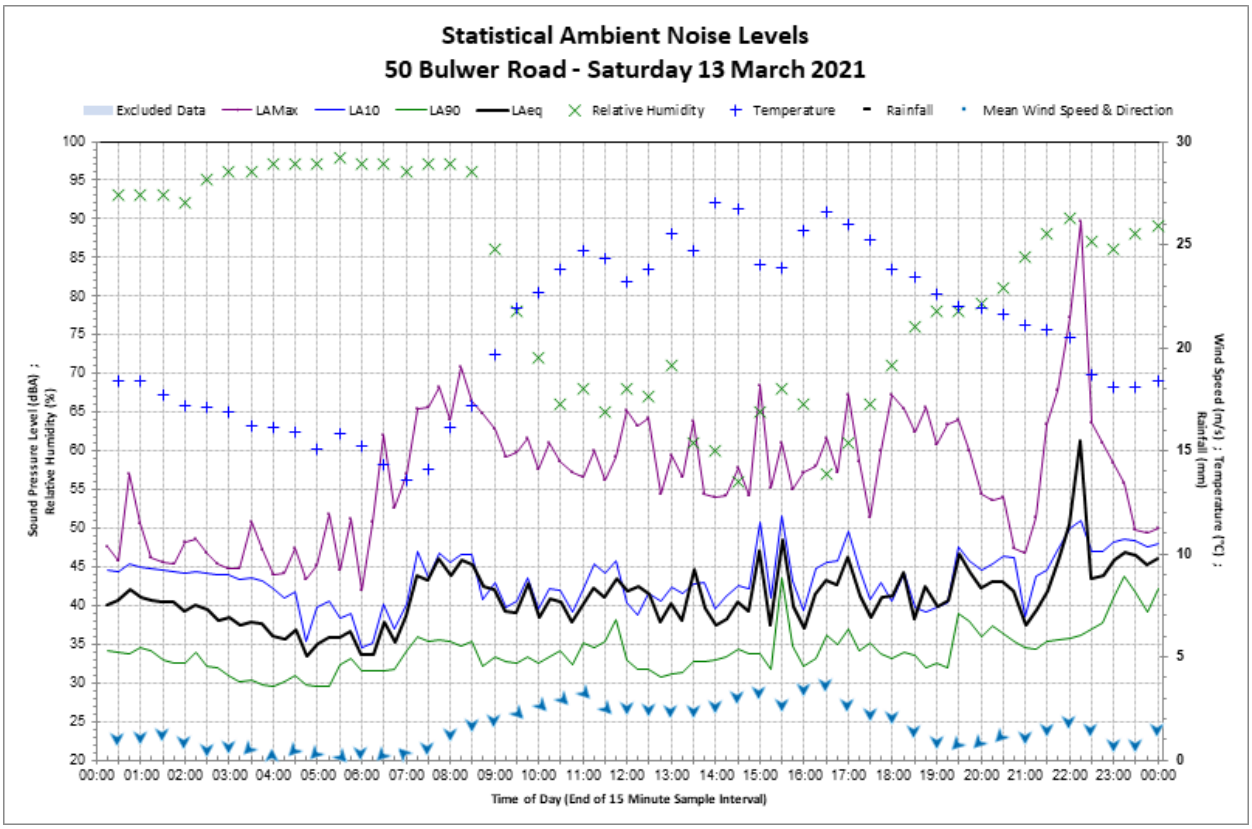

Statistical Ambient Noise Levels
50 Bulwer Road - Monday 8 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

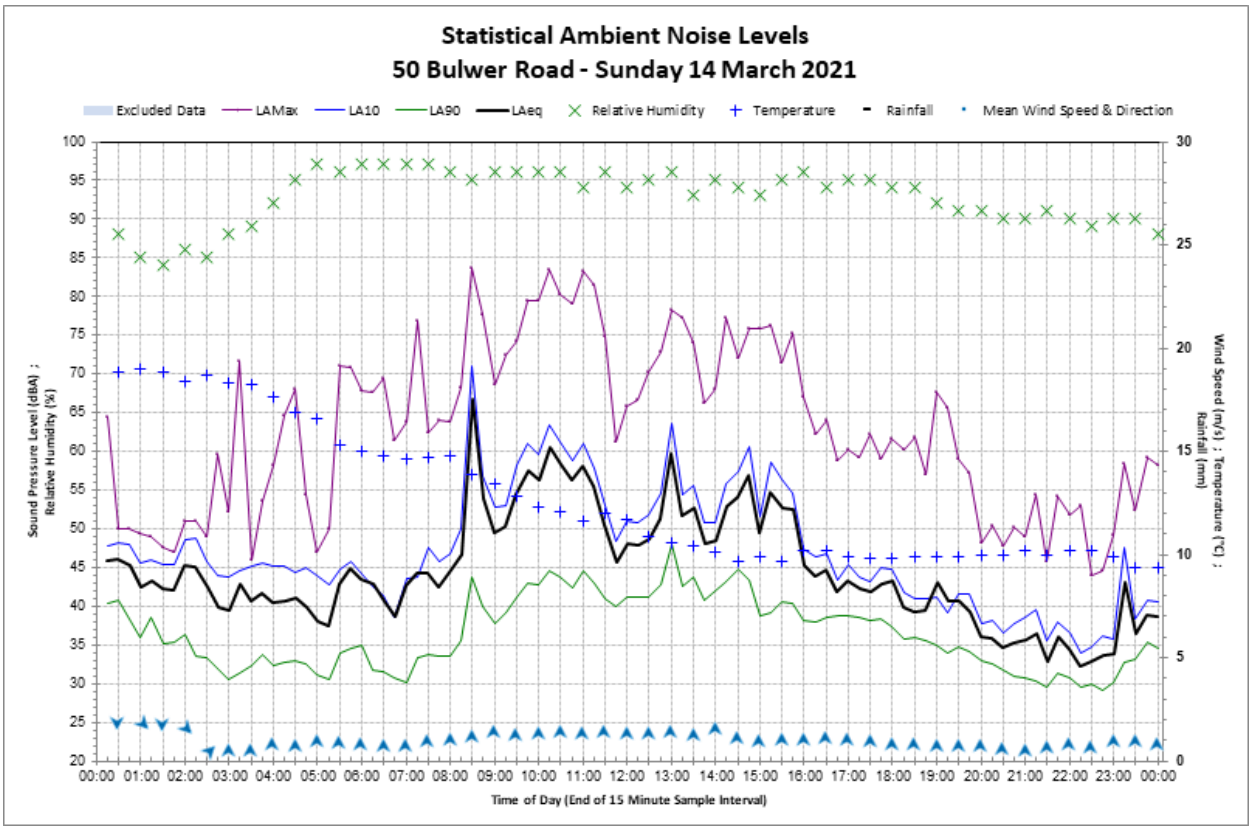

Statistical Ambient Noise Levels
50 Bulwer Road - Tuesday 9 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

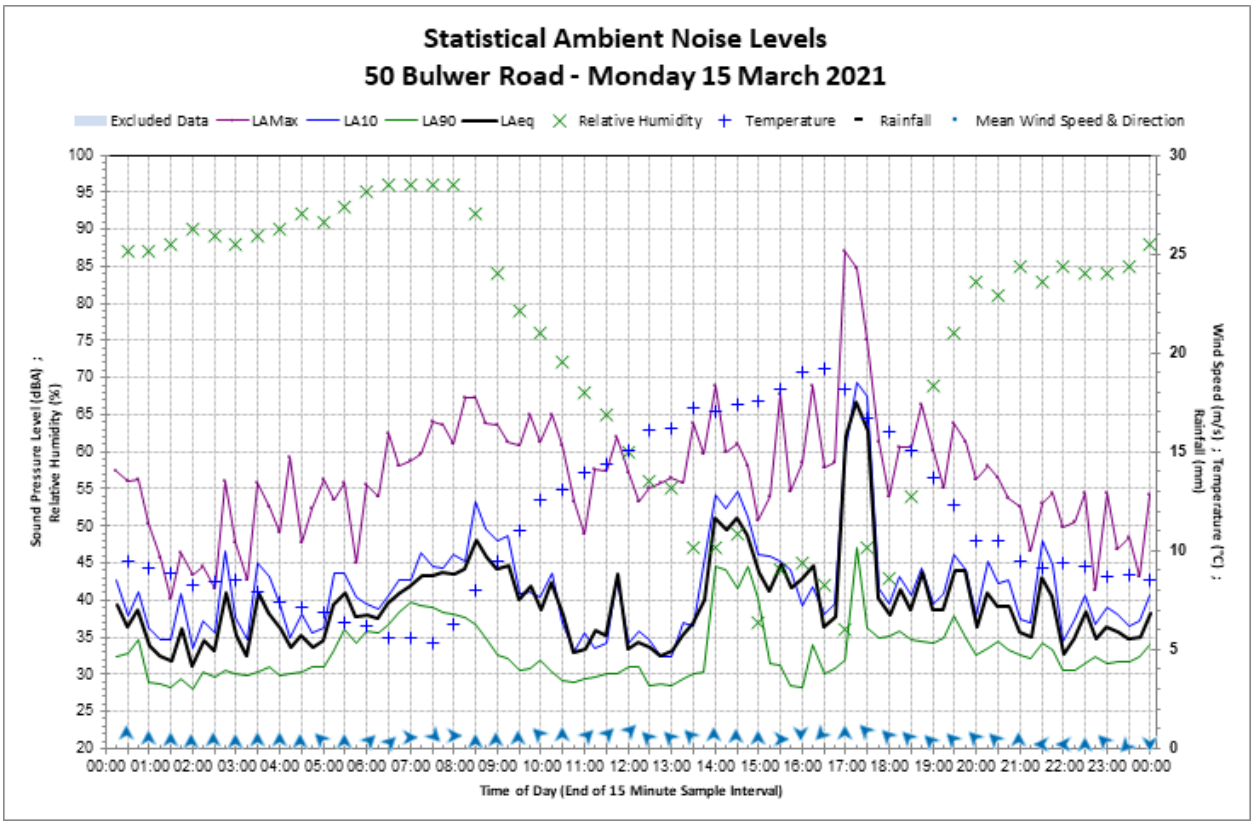

Statistical Ambient Noise Levels
50 Bulwer Road - Wednesday 10 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

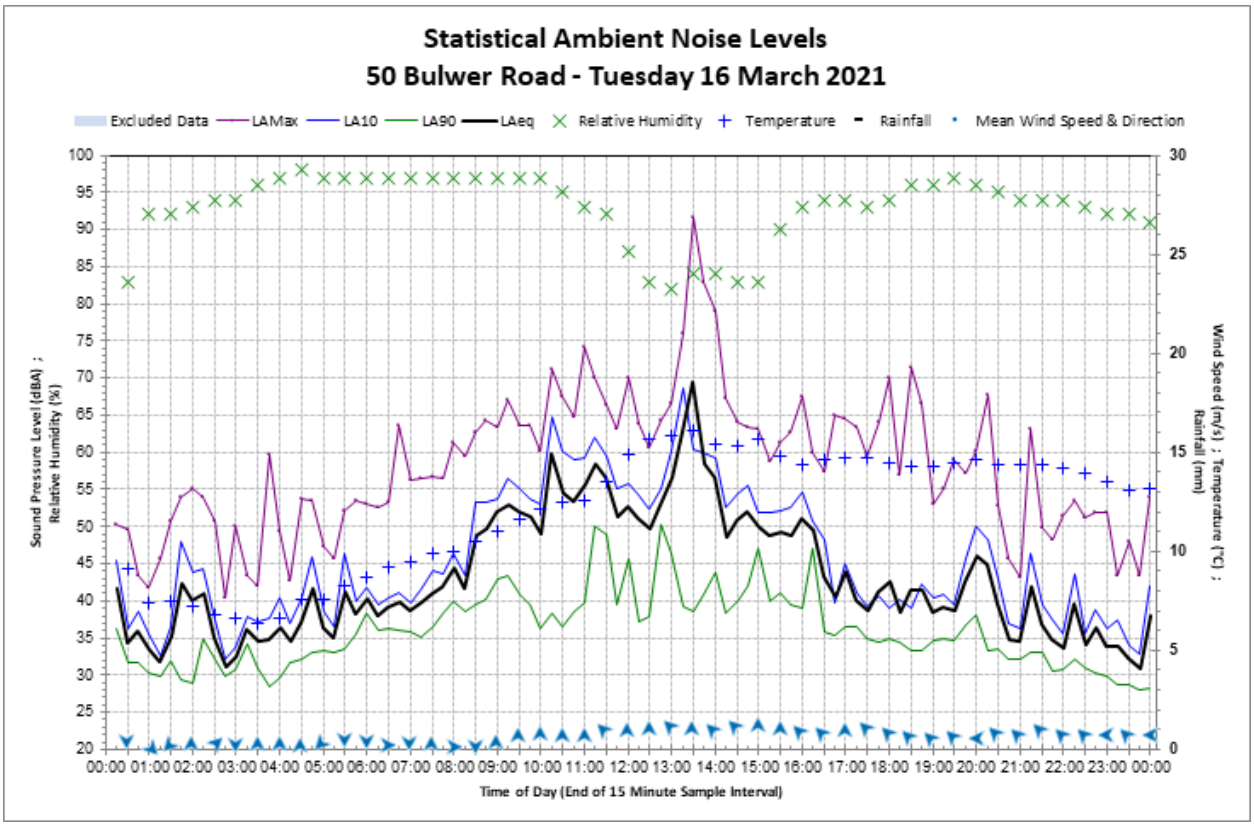

Statistical Ambient Noise Levels
50 Bulwer Road - Thursday 11 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

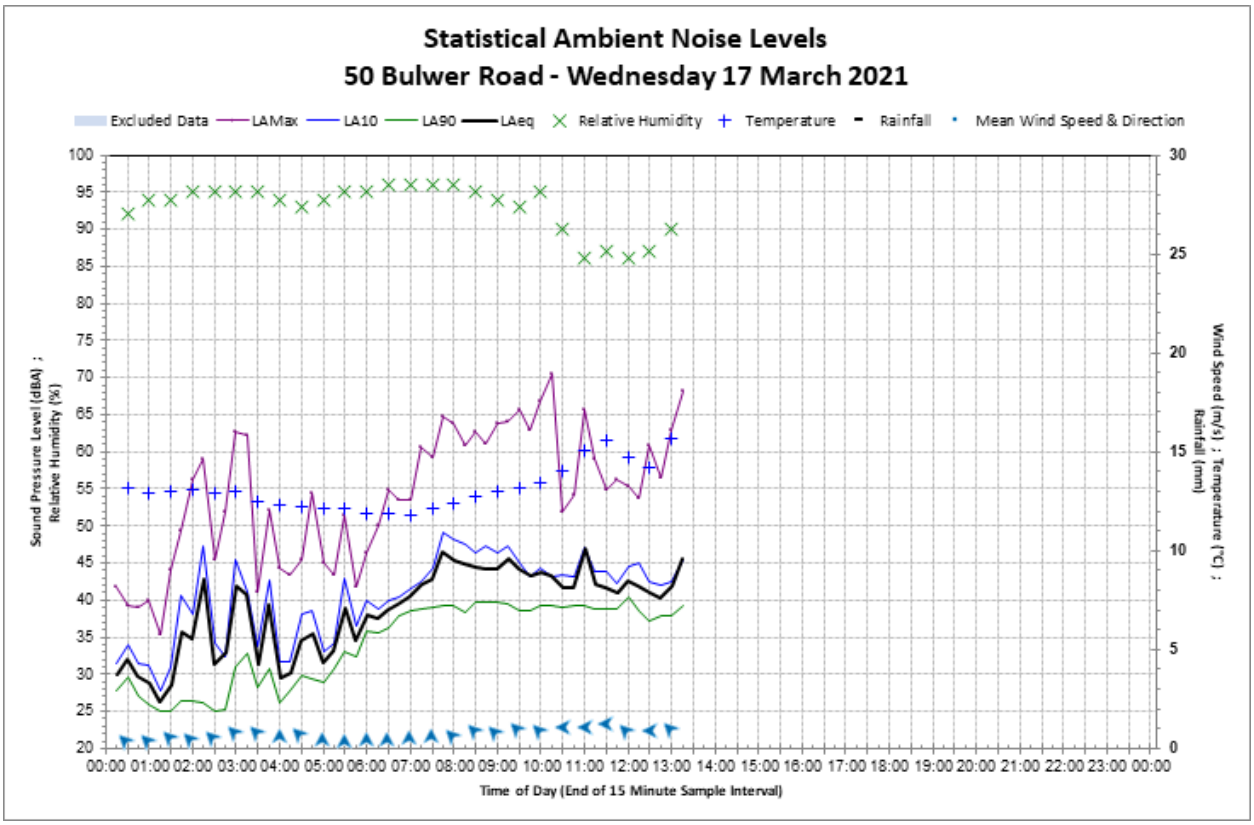

Statistical Ambient Noise Levels
50 Bulwer Road - Friday 12 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
50 Bulwer Road - Saturday 13 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
50 Bulwer Road - Sunday 14 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
50 Bulwer Road - Monday 15 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
50 Bulwer Road - Tuesday 16 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)


Statistical Ambient Noise Levels
50 Bulwer Road - Wednesday 17 March 2021
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 15 Minute Sample Interval)

Appendix F

Noise source levels and modelling assumptions

Source noise levels

Table 8.1 $L_{Aeq(15min)}$ Internal noise levels, dBA

Noise Source	Octave-band noise level, dBA[1]									OA, dBA	Input Type
	31.5	63	125	250	500	1000	2000	4000	8000		
Building 1 – main processing building	44	57	69	76	76	79	79	75	69	85	SPLi
Building 2 – deep processing building	39	52	64	71	71	74	74	70	64	80	SPLi
Waste water treatment plant	56	64	75	76	79	80	78	75	71	85	SPLi

Notes:

1) Based on reference spectra for similar noise sources

Table 8.2 2-Dimensional and point noise sources, $L_{Aeq(15min)}$ dBA

Noise Source	Octave-band noise level, dBA									OA, dBA	Input Type[1]
	31.5	63	125	250	500	1000	2000	4000	8000		
Building 1 roof fans – x 6 (indicative)	-	-	-	-	80	-	-	-	-	80	SWL (point)
Building 1 stack – x2 (indicative)	-	-	-	-	85	-	-	-	-	85	SWL (point)
Building 2 roof fans – x 6 (indicative)	-	-	-	-	75	-	-	-	-	75	SWL (point)
Building 2 stack – x2 (indicative)	-	-	-	-	85	-	-	-	-	85	SWL (point)
WWTP roof fans – x 3 (indicative)	-	-	-	-	85	-	-	-	-	85	SWL (point)
Delivery truck – 10 per hour (day period)	85	89	93	97	100	103	101	96	91	107	SWL (moving point)
Staff vehicles – 50 per hour	63	67	71	75	78	81	79	74	69	85	SWL (moving point)
Car door slam	-	-	-	-	95	-	-	-	-	80	SWL (point)

Notes:

1) SWL refers to total sound power level.

Building break out noise

Building break-out noise was calculated using internal noise levels presented in Table 8.2. The architectural details of the proposal have not yet been finalised and as such, the building façade compositions have been assumed based on discussions with Plasrefine Recycling.

Transmission loss data for façade materials have been estimated using INSUL 9.0 (sound transmission loss estimation program) and manufacturer data sheets for acoustic louvres. Walls of the processing buildings, Building 1 and Building 2, are to be constructed of precast concrete to 3 m and metal cladding above. Walls of the WWTP are to be constructed entirely of precast concrete. The roof of all buildings has been assumed as a metal profile with internal plasterboard ceiling (Rw 42).

The ventilation system of the proposal is yet to be designed. The following assumptions have been made regarding the sizing and location of louvres for each of the buildings enclosing noisy equipment:

– 135 m^2 of 200 mm thick acoustic louvres on both the southern and northern façade of Building 1 (high-level)
– 95 m^2 of 200 mm thick acoustic louvres on the southern façade of Building 2 (high-level)
– 118 m^2 of 200 mm thick acoustic louvres on the southern façade of Building 2 (high-level)
– 50 m^2 of 200 mm thick acoustic louvres on the southern and northern façade of WWTP (high-level)

The following assumptions were made for the roller doors:

– 3x 36 m^2 roller shutter doors (fast-action) on eastern façade of Building 1. (2 assumed closed, 1 assumed open 10% during waste receival hours)
– 1x 36 m^2 roller shutter doors on the western façade of Building 1 (assumed closed)
– 2x 60 m^2 roller shutter doors on the western façade of Building 1 (1 assumed closed, 1 assumed open 10% during waste receival hours)
– 3x 25 m^2 roller shutter doors on the southern façade of Building 2 (2 assumed closed, 1 assumed open 10% during waste receival hours)
– 2x 60 m^2 roller shutter doors on the western façade of Building 2 (1 assumed closed, 1 assumed open 10% during waste receival hours)
– 1 x 25 m^2 roller shutter door on the eastern façade of the WWTP building (assumed closed)

The following assumptions were made for the windows:

– 300 m^2 of standard glazed windows on both the southern and northern façades of Building 1 (high-level)
– 295 m^2 of standard glazed windows on both the southern and northern façades of Building 2 (high-level)
– The WWTP is assumed to have no windows

Alternate construction materials may be used for the final architectural design given they achieve the sound transmission reduction performances (Rw) presented in Table 8.3 or better.

Table 8.3 Sound transmission performance of building components, Rw

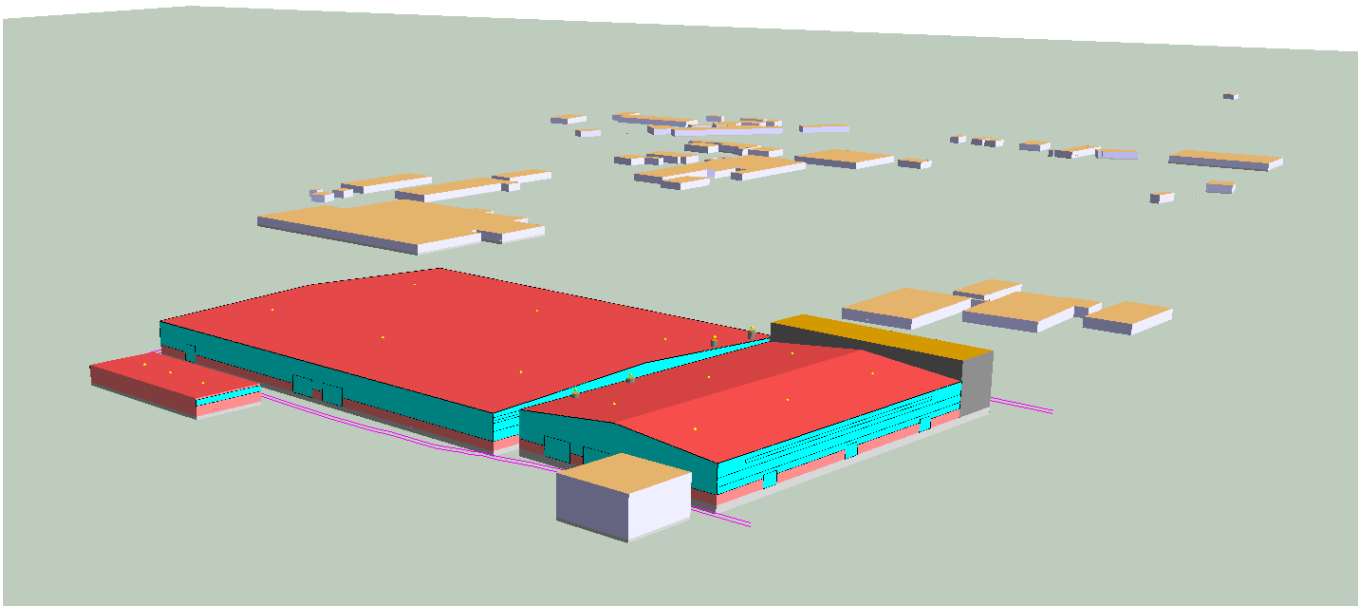
Area	Component	Type	Sound reduction performance, octave-band (Hz)									Rw
			31.5	63	125	250	500	1k	2k	4k	8k	
Building 1	Walls	Concrete panel	10	22	36	36	41	51	59	65	65	47
		Metal panel	5	10	15	19	34	46	46	47	46	33
	Roof	Metal profile with ceiling	5	9	18	33	43	51	53	47	45	42
	Windows	Single glazed	11	17	11	24	28	32	27	35	39	29
	Roller door	0.6 mm steel	6	8	11	15	19	23	20	21	21	21
	Louvres	Acran 200	8	8	8	7	11	21	24	16	8	17
Building 2	Walls	Concrete panel	10	22	36	36	41	51	59	65	65	47
		Metal panel	5	10	15	19	34	46	46	47	46	33
	Roof	Metal profile with ceiling	5	9	18	33	43	51	53	47	45	42
	Windows	Single glazed	11	17	11	24	28	32	27	35	39	29
	Roller door	0.6 mm steel	6	8	11	15	19	23	20	21	21	21
	Louvres	Acran 200	8	8	8	7	11	21	24	16	8	17
WWTP	Walls	Concrete panel	10	22	36	36	41	51	59	65	65	47

Area	Component	Type	Sound reduction performance, octave-band (Hz)									Rw
			31.5	63	125	250	500	1k	2k	4k	8k	
	Roof	Metal profile with ceiling	5	9	18	33	43	51	53	47	45	43
	Roller door	0.6 mm steel	6	8	11	15	19	23	20	21	21	21
	Louvres	Acran 200	8	8	8	7	11	21	24	16	8	17

Screenshots of SoundPLAN 8.2 noise model

Plan view

View from southwest



Appendix G

Predicted operational noise levels at sensitive receivers, dBA

RID	Receiver Type	NCA	Address	Criteria, $L_{Aeq(15min)}$ dBA			$L_{Aeq(15min)}$ noise level, dBA			L_{Amax} noise level, dBA	Complies?
				Day	Evening	Night	Day Neutral	Evening/Night Neutral	Night Adverse	Sleep diturbance	
R001	Commercial	-	9-11 LACKEY RD, MOSS VALE	65	65	65	53	47	48	-	Yes
R002	Residential	-	9-11 LACKEY RD, MOSS VALE	70	70	70	45	41	42	-	Yes
R003	Residential	-	2 LACKEY RD, MOSS VALE	70	70	70	30	27	30	-	Yes
R004	Industrial	-	2 LACKEY RD, MOSS VALE	70	70	70	33	30	33	-	Yes
R005	Industrial	-	9-11 LACKEY RD, MOSS VALE	70	70	70	36	34	36	-	Yes
R006	Industrial	-	50 CARRIBEE RD, MOSS VALE	70	70	70	29	26	29	-	Yes
R007	Residential	NCA3	64 BROOKDALE RD, MOSS VALE	40	37	35	28	25	29	27	Yes
R008	Residential	NCA3	64 BROOKDALE RD, MOSS VALE	40	37	35	25	22	25	26	Yes
R009	Residential	NCA3	194 BERRIMA RD, MOSS VALE	40	37	35	26	24	27	27	Yes
R010	Residential	NCA1	9-11 LACKEY RD, MOSS VALE	44	43	38	34	30	32	33	Yes
R011	Residential	-	7 LACKEY RD, MOSS VALE	70	70	70	29	24	27	-	Yes
R012	Residential	-	3 LACKEY RD, MOSS VALE	70	70	70	30	26	29	-	Yes
R013	Industrial	-	16 MCCOURT RD, MOSS VALE	70	70	70	21	19	23	-	Yes
R014	Residential	NCA1	16 MCCOURT RD, MOSS VALE	44	43	38	20	18	22	22	Yes
R015	Industrial	-	13-14 MCCOURT RD, MOSS VALE	70	70	70	16	15	18	-	Yes
R016	Residential	NCA1	77 BEACONSFIELD RD, MOSS VALE	44	43	38	29	26	29	28	Yes
R017	Residential	NCA2	77 BEACONSFIELD RD, MOSS VALE	41	41	38	35	31	34	35	Yes
R018	Residential	NCA2	79 BEACONSFIELD RD, MOSS VALE	41	41	38	39	35	36	38	Yes
R019	Residential	NCA2	72 BEACONSFIELD RD, MOSS VALE	41	41	38	40	35	37	41	Yes
R020	Residential	NCA2	72 BEACONSFIELD RD, MOSS VALE	41	41	38	38	34	36	37	Yes
R021	Residential	NCA2	66 BEACONSFIELD RD, MOSS VALE	41	41	38	35	31	34	35	Yes
R022	Residential	NCA2	69 BEACONSFIELD RD, MOSS VALE	41	41	38	34	31	33	33	Yes
R023	Residential	NCA2	69 BEACONSFIELD RD, MOSS VALE	41	41	38	33	31	33	32	Yes
R024	Residential	NCA2	63 BEACONSFIELD RD, MOSS VALE	41	41	38	15	14	16	10	Yes
R025	Residential	NCA1	77 LACKEY RD, MOSS VALE	44	43	38	13	12	15	7	Yes
R026	Residential	NCA1	77 LACKEY RD, MOSS VALE	44	43	38	14	13	15	10	Yes
R027	Residential	NCA1	57 BEACONSFIELD RD, MOSS VALE	44	43	38	15	15	17	12	Yes
R028	Residential	NCA2	59 BEACONSFIELD RD, MOSS VALE	41	41	38	14	14	16	11	Yes
R029	Industrial	-	5 LACKEY RD, MOSS VALE	70	70	70	15	14	17	-	Yes
R030	Residential	NCA2	57 BEACONSFIELD RD, MOSS VALE	41	41	38	16	16	19	10	Yes
R031	Residential	NCA2	53 BEACONSFIELD RD, MOSS VALE	41	41	38	15	14	17	10	Yes
R032	Residential	NCA2	51 BEACONSFIELD RD, MOSS VALE	41	41	38	14	13	16	11	Yes
R033	Residential	NCA2	49 BEACONSFIELD RD, MOSS VALE	41	41	38	16	15	18	11	Yes
R034	Residential	NCA2	39-41 BEACONSFIELD RD, MOSS VALE	41	41	38	16	16	19	11	Yes
R035	Residential	NCA2	35 BEACONSFIELD RD, MOSS VALE	41	41	38	16	16	19	11	Yes
R036	Residential	NCA2	31-33 BEACONSFIELD RD, MOSS VALE	41	41	38	16	15	19	9	Yes
R037	Residential	NCA2	40 BEACONSFIELD RD, MOSS VALE	41	41	38	11	11	14	9	Yes
R038	Residential	NCA2	42 BEACONSFIELD RD, MOSS VALE	41	41	38	9	8	11	3	Yes
R039	Residential	NCA2	46 BEACONSFIELD RD, MOSS VALE	41	41	38	10	9	12	2	Yes
R040	Residential	NCA2	46 BEACONSFIELD RD, MOSS VALE	41	41	38	14	13	17	11	Yes
R041	Residential	NCA2	48 BEACONSFIELD RD, MOSS VALE	41	41	38	13	12	15	11	Yes
R042	Residential	NCA2	50 BEACONSFIELD RD, MOSS VALE	41	41	38	13	12	15	10	Yes
R043	Residential	NCA2	56A BEACONSFIELD RD, MOSS VALE	41	41	38	13	12	15	8	Yes
R044	Residential	NCA2	52 BEACONSFIELD RD, MOSS VALE	41	41	38	13	12	15	9	Yes
R045	Residential	NCA2	56B BEACONSFIELD RD, MOSS VALE	41	41	38	14	13	15	9	Yes
R046	Residential	NCA2	54B BEACONSFIELD RD, MOSS VALE	41	41	38	12	11	13	6	Yes
R047	Residential	NCA2	54C BEACONSFIELD RD, MOSS VALE	41	41	38	12	11	14	5	Yes
R048	Residential	NCA2	13-15 STABLES PL, MOSS VALE	41	41	38	12	11	14	8	Yes
R049	Residential	NCA2	11 STABLES PL, MOSS VALE	41	41	38	12	10	13	9	Yes
R050	Residential	NCA2	9 STABLES PL, MOSS VALE	41	41	38	14	13	16	8	Yes
R051	Residential	NCA2	7 STABLES PL, MOSS VALE	41	41	38	12	11	14	10	Yes
R052	Residential	NCA2	5 STABLES PL, MOSS VALE	41	41	38	12	11	14	9	Yes
R053	Residential	NCA2	3 STABLES PL, MOSS VALE	41	41	38	13	12	15	10	Yes
R054	Residential	NCA2	56C BEACONSFIELD RD, MOSS VALE	41	41	38	13	12	15	9	Yes
R055	Residential	NCA2	3A STABLES PL, MOSS VALE	41	41	38	13	12	14	8	Yes
R056	Residential	NCA2	18 STABLES PL, MOSS VALE	41	41	38	13	12	15	8	Yes
R057	Residential	NCA2	18 STABLES PL, MOSS VALE	41	41	38	13	12	15	10	Yes
R058	Residential	NCA2	14 STABLES PL, MOSS VALE	41	41	38	12	11	14	9	Yes
R059	Residential	NCA2	12 STABLES PL, MOSS VALE	41	41	38	12	11	14	10	Yes
R060	Residential	NCA2	10A STABLES PL, MOSS VALE	41	41	38	13	12	15	9	Yes
R061	Residential	NCA2	8 STABLES PL, MOSS VALE	41	41	38	7	7	9	0	Yes
R062	Residential	NCA2	6 STABLES PL, MOSS VALE	41	41	38	13	12	15	9	Yes
R063	Residential	NCA2	4 STABLES PL, MOSS VALE	41	41	38	13	13	16	9	Yes
R064	Residential	NCA2	1 STABLES PL, MOSS VALE	41	41	38	13	12	15	6	Yes
R065	Residential	NCA2	2 STABLES PL, MOSS VALE	41	41	38	15	14	17	9	Yes
R066	Residential	NCA2	18 ROCHE CL, MOSS VALE	41	41	38	16	15	18	11	Yes
R067	Residential	NCA2	18 ROCHE CL, MOSS VALE	41	41	38	15	15	17	11	Yes
R068	Residential	NCA2	20 ROCHE CL, MOSS VALE	41	41	38	13	13	16	5	Yes
R069	Residential	NCA2	16 ROCHE CL, MOSS VALE	41	41	38	15	14	17	12	Yes
R070	Residential	NCA2	14 ROCHE CL, MOSS VALE	41	41	38	16	15	18	12	Yes
R071	Residential	NCA2	12 ROCHE CL, MOSS VALE	41	41	38	11	10	13	9	Yes
R072	Residential	NCA2	10 ROCHE CL, MOSS VALE	41	41	38	14	14	17	11	Yes
R073	Residential	NCA2	8 ROCHE CL, MOSS VALE	41	41	38	14	13	17	9	Yes
R074	Residential	NCA2	36-42 ROCHE CL, MOSS VALE	41	41	38	14	13	16	6	Yes
R075	Residential	NCA2	4 ROCHE CL, MOSS VALE	41	41	38	15	14	18	8	Yes
R076	Residential	NCA3	24 ELOURA LANE, MOSS VALE	40	37	35	15	14	17	8	Yes
R077	Residential	NCA3	26 ELOURA LANE, MOSS VALE	40	37	35	12	11	14	5	Yes
R078	Residential	NCA3	28 ELOURA LANE, MOSS VALE	40	37	35	12	12	14	5	Yes
R079	Residential	NCA3	30 ELOURA LANE, MOSS VALE	40	37	35	13	12	15	6	Yes
R080	Residential	NCA3	32 ELOURA LANE, MOSS VALE	40	37	35	12	11	14	6	Yes
R081	Residential	NCA3	34 ELOURA LANE, MOSS VALE	40	37	35	13	13	16	6	Yes
R082	Residential	NCA2	22 ROCHE CL, MOSS VALE	41	41	38	13	13	15	9	Yes
R083	Residential	NCA3	29 ELOURA LANE, MOSS VALE	40	37	35	15	14	17	9	Yes
R084	Residential	NCA3	27 ELOURA LANE, MOSS VALE	40	37	35	14	14	17	6	Yes
R085	Residential	NCA3	25 ELOURA LANE, MOSS VALE	40	37	35	15	15	18	11	Yes
R086	Residential	NCA3	23 ELOURA LANE, MOSS VALE	40	37	35	15	15	18	11	Yes
R087	Residential	NCA3	21 ELOURA LANE, MOSS VALE	40	37	35	15	15	17	9	Yes
R088	Residential	NCA3	19 ELOURA LANE, MOSS VALE	40	37	35	14	13	16	9	Yes
R089	Residential	NCA3	17 ELOURA LANE, MOSS VALE	40	37	35	13	13	16	9	Yes
R090	Residential	NCA3	15 ELOURA LANE, MOSS VALE	40	37	35	14	13	16	9	Yes
R091	Residential	NCA3	13 ELOURA LANE, MOSS VALE	40	37	35	14	13	16	10	Yes
R092	Residential	NCA3	11 ELOURA LANE, MOSS VALE	40	37	35	13	12	15	10	Yes
R093	Residential	NCA3	9 ELOURA LANE, MOSS VALE	40	37	35	14	13	16	10	Yes
R094	Residential	NCA3	21 REEYANA PL, MOSS VALE	40	37	35	14	13	17	9	Yes
R095	Residential	NCA3	23 REEYANA PL, MOSS VALE	40	37	35	12	12	15	6	Yes
R096	Residential	NCA3	25 REEYANA PL, MOSS VALE	40	37	35	12	12	15	9	Yes
R097	Residential	NCA3	27 REEYANA PL, MOSS VALE	40	37	35	12	11	15	10	Yes

RID	Receiver Type	NCA	Address	Criteria, $L_{Aeq(15min)}$ dBA			$L_{Aeq(15min)}$ noise level, dBA			L_{Amax} noise level, dBA	Complies?
				Day	Evening	Night	Day Neutral	Evening/Night Neutral	Night Adverse	Sleep diturbance	
R098	Residential	NCA3	26 REEYANA PL, MOSS VALE	40	37	35	10	9	13	2	Yes
R099	Residential	NCA3	24 REEYANA PL, MOSS VALE	40	37	35	12	11	14	7	Yes
R100	Residential	NCA3	25 BULWER RD, MOSS VALE	40	37	35	10	9	12	1	Yes
R101	Residential	NCA3	27 BULWER RD, MOSS VALE	40	37	35	11	10	13	1	Yes
R102	Residential	NCA3	7 ELOURA LANE, MOSS VALE	40	37	35	9	8	11	1	Yes
R103	Residential	NCA3	29 BULWER RD, MOSS VALE	40	37	35	11	11	14	7	Yes
R104	Residential	NCA3	31 BULWER RD, MOSS VALE	40	37	35	11	10	13	7	Yes
R105	Residential	NCA3	5 ELOURA LANE, MOSS VALE	40	37	35	8	7	10	0	Yes
R106	Residential	NCA3	3 ELOURA LANE, MOSS VALE	40	37	35	11	11	14	6	Yes
R107	Residential	NCA3	1 ELOURA LANE, MOSS VALE	40	37	35	12	11	14	9	Yes
R108	Residential	NCA3	33 BULWER RD, MOSS VALE	40	37	35	14	13	16	10	Yes
R109	Residential	NCA3	2 ELOURA LANE, MOSS VALE	40	37	35	12	12	15	10	Yes
R110	Residential	NCA3	4 ELOURA LANE, MOSS VALE	40	37	35	6	5	8	1	Yes
R111	Residential	NCA3	6 ELOURA LANE, MOSS VALE	40	37	35	14	13	16	8	Yes
R112	Residential	NCA3	10 ELOURA LANE, MOSS VALE	40	37	35	14	13	16	8	Yes
R113	Residential	NCA3	8 ELOURA LANE, MOSS VALE	40	37	35	10	9	12	8	Yes
R114	Residential	NCA3	14 ELOURA LANE, MOSS VALE	40	37	35	9	7	10	7	Yes
R115	Residential	NCA3	12 ELOURA LANE, MOSS VALE	40	37	35	15	14	17	10	Yes
R116	Residential	NCA3	16 ELOURA LANE, MOSS VALE	40	37	35	15	14	17	10	Yes
R117	Residential	NCA3	18 ELOURA LANE, MOSS VALE	40	37	35	10	10	12	6	Yes
R118	Residential	NCA3	20 ELOURA LANE, MOSS VALE	40	37	35	10	9	12	4	Yes
R119	Residential	NCA3	22 ELOURA LANE, MOSS VALE	40	37	35	15	14	17	3	Yes
R120	Residential	NCA3	34 NAPPER CL, MOSS VALE	40	37	35	12	11	14	4	Yes
R121	Residential	NCA3	32 NAPPER CL, MOSS VALE	40	37	35	13	12	14	5	Yes
R122	Residential	NCA3	30 NAPPER CL, MOSS VALE	40	37	35	13	12	15	7	Yes
R123	Residential	NCA3	28 NAPPER CL, MOSS VALE	40	37	35	15	14	17	4	Yes
R124	Residential	NCA3	26 NAPPER CL, MOSS VALE	40	37	35	13	13	15	4	Yes
R125	Residential	NCA3	24 NAPPER CL, MOSS VALE	40	37	35	15	14	17	10	Yes
R126	Residential	NCA3	22 NAPPER CL, MOSS VALE	40	37	35	13	12	15	6	Yes
R127	Residential	NCA3	15 NAPPER CL, MOSS VALE	40	37	35	13	13	15	3	Yes
R128	Residential	NCA3	13 NAPPER CL, MOSS VALE	40	37	35	14	14	16	8	Yes
R129	Residential	NCA3	11 NAPPER CL, MOSS VALE	40	37	35	7	6	9	1	Yes
R130	Residential	NCA3	9 NAPPER CL, MOSS VALE	40	37	35	12	11	14	8	Yes
R131	Residential	NCA3	7 NAPPER CL, MOSS VALE	40	37	35	13	12	15	8	Yes
R132	Residential	NCA3	5 NAPPER CL, MOSS VALE	40	37	35	13	12	15	8	Yes
R133	Residential	NCA3	1 NAPPER CL, MOSS VALE	40	37	35	13	12	15	9	Yes
R134	Residential	NCA3	3 NAPPER CL, MOSS VALE	40	37	35	13	12	15	9	Yes
R135	Residential	NCA3	3 JOPLING WAY, MOSS VALE	40	37	35	13	12	15	8	Yes
R136	Residential	NCA3	1 JOPLING WAY, MOSS VALE	40	37	35	11	10	13	0	Yes
R137	Residential	NCA3	4 NAPPER CL, MOSS VALE	40	37	35	13	13	15	3	Yes
R138	Residential	NCA3	35 BULWER RD, MOSS VALE	40	37	35	13	12	15	9	Yes
R139	Residential	NCA3	37 BULWER RD, MOSS VALE	40	37	35	9	9	11	0	Yes
R140	Residential	NCA3	39 BULWER RD, MOSS VALE	40	37	35	11	10	13	1	Yes
R141	Residential	NCA3	6 NAPPER CL, MOSS VALE	40	37	35	12	12	14	7	Yes
R142	Residential	NCA3	8 NAPPER CL, MOSS VALE	40	37	35	14	14	16	10	Yes
R143	Residential	NCA3	10 NAPPER CL, MOSS VALE	40	37	35	12	11	14	8	Yes
R144	Residential	NCA3	12 NAPPER CL, MOSS VALE	40	37	35	13	12	15	10	Yes
R145	Residential	NCA3	14 NAPPER CL, MOSS VALE	40	37	35	12	11	14	7	Yes
R146	Residential	NCA3	16 NAPPER CL, MOSS VALE	40	37	35	12	11	14	8	Yes
R147	Residential	NCA3	22 NAPPER CL, MOSS VALE	40	37	35	12	12	14	8	Yes
R148	Residential	NCA3	6 NAPPER CL, MOSS VALE	40	37	35	15	14	17	9	Yes
R149	Residential	NCA2	64 BEACONSFIELD RD, MOSS VALE	41	41	38	34	31	33	32	Yes
R150	Residential	NCA2	58 BULWER RD, MOSS VALE	41	41	38	31	29	32	30	Yes
R151	Residential	NCA3	54-56 BULWER RD, MOSS VALE	40	37	35	34	31	33	24	Yes
R152	Residential	NCA3	52 BULWER RD, MOSS VALE	40	37	35	31	29	32	30	Yes
R153	Residential	NCA3	48-50 BULWER RD, MOSS VALE	40	37	35	29	27	30	29	Yes
R154	Residential	NCA3	49-53 BULWER RD, MOSS VALE	40	37	35	25	24	27	24	Yes
R155	Residential	NCA3	BULWER RD, MOSS VALE	40	37	35	24	24	26	17	Yes
R156	Residential	NCA2	61-65 BULWER RD, MOSS VALE	41	41	38	29	26	29	29	Yes
R157	Residential	NCA2	67 BULWER RD, MOSS VALE	41	41	38	30	26	29	29	Yes
R158	Residential	NCA2	67 BULWER RD, MOSS VALE	41	41	38	22	21	24	16	Yes
R159	Residential	NCA2	60 BEACONSFIELD RD, MOSS VALE	41	41	38	17	16	19	12	Yes
R160	Residential	NCA3	50A BULWER RD, MOSS VALE	40	37	35	34	32	34	32	Yes
R161	Residential	NCA3	46 BULWER RD, MOSS VALE	40	37	35	29	27	30	28	Yes
R162	Residential	NCA2	75 BEACONSFIELD RD, MOSS VALE	41	41	38	38	34	35	37	Yes
R163	Residential	NCA2	73 BEACONSFIELD RD, MOSS VALE	41	41	38	37	33	35	36	Yes
R164	Residential	NCA2	71 BEACONSFIELD RD, MOSS VALE	41	41	38	35	32	34	34	Yes

Appendix H

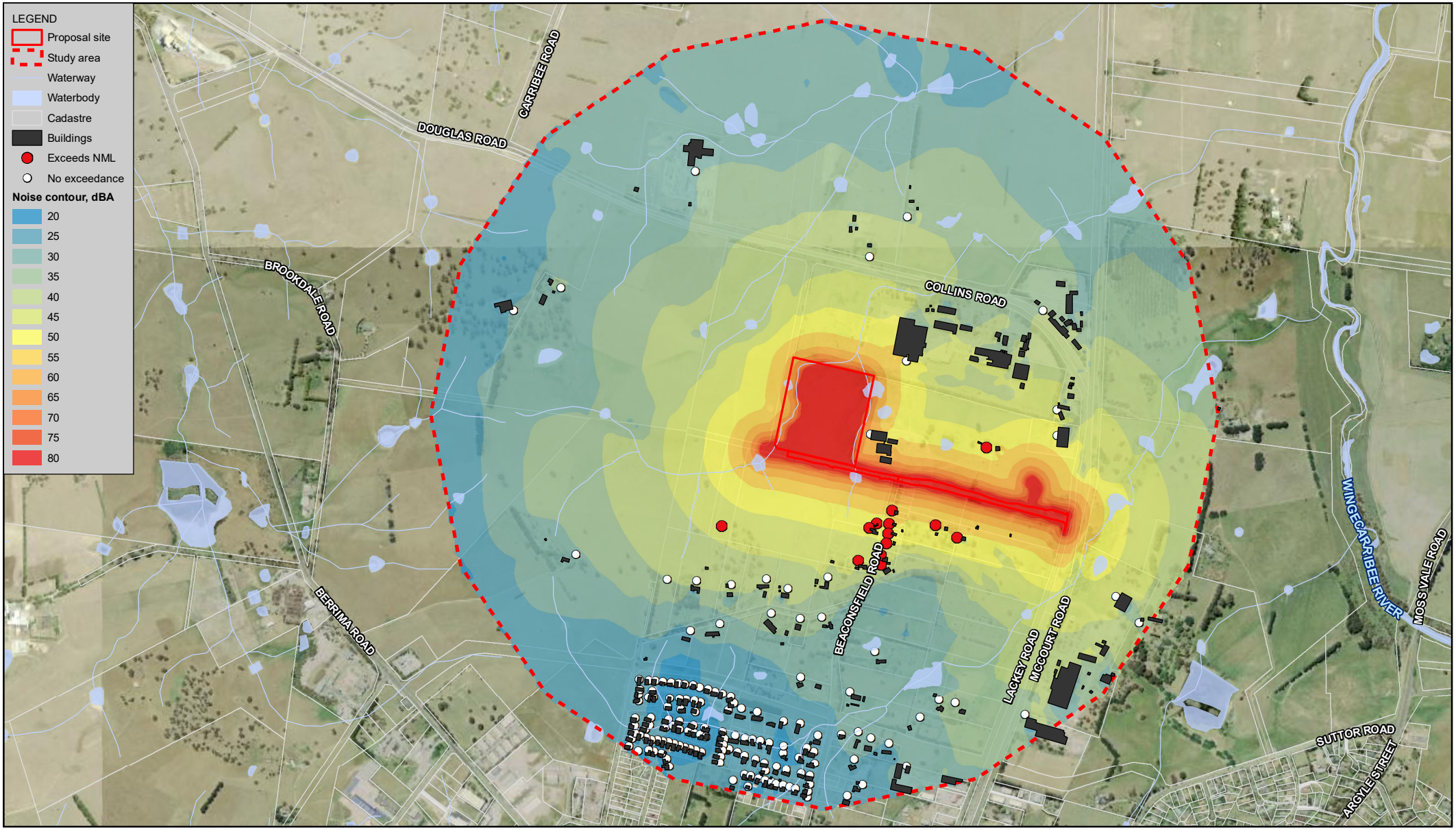
Predicted construction noise levels at sensitive receivers, dBA

RID	Receiver Type	NCA	Address	Noise management level, dBA	$L_{Aeq(15min)}$ noise level, dBA					
					CS1	CS2	CS3	CS4a	CS4b	CS5
R001	Commercial	-	9-11 LACKEY RD, MOSS VALE	**70**	65	72	67	66	66	66
R002	Residential	-	9-11 LACKEY RD, MOSS VALE	**75**	56	63	53	59	59	59
R003	Residential	-	2 LACKEY RD, MOSS VALE	**75**	39	45	48	41	41	41
R004	Industrial	-	2 LACKEY RD, MOSS VALE	**75**	40	47	43	43	43	43
R005	Industrial	-	9-11 LACKEY RD, MOSS VALE	**75**	45	52	47	48	48	48
R006	Industrial	-	50 CARRIBEE RD, MOSS VALE	**75**	35	42	41	38	38	38
R007	Residential	NCA3	64 BROOKDALE RD, MOSS VALE	**45**	35	42	42	39	39	39
R008	Residential	NCA3	64 BROOKDALE RD, MOSS VALE	**45**	30	36	38	33	33	33
R009	Residential	NCA3	194 BERRIMA RD, MOSS VALE	**45**	33	39	42	36	36	36
R010	Residential	NCA1	9-11 LACKEY RD, MOSS VALE	**49**	52	50	61	46	46	46
R011	Residential	-	7 LACKEY RD, MOSS VALE	**75**	54	42	62	38	38	38
R012	Residential	-	3 LACKEY RD, MOSS VALE	**75**	48	41	56	38	38	38
R013	Industrial	-	16 MCCOURT RD, MOSS VALE	**75**	49	38	57	34	34	34
R014	Residential	NCA1	16 MCCOURT RD, MOSS VALE	**49**	42	35	50	31	31	31
R015	Industrial	-	13-14 MCCOURT RD, MOSS VALE	**75**	38	35	46	31	31	31
R016	Residential	NCA1	77 BEACONSFIELD RD, MOSS VALE	**49**	54	44	62	40	40	40
R017	Residential	NCA2	77 BEACONSFIELD RD, MOSS VALE	**46**	55	51	63	47	47	47
R018	Residential	NCA2	79 BEACONSFIELD RD, MOSS VALE	**46**	57	56	65	52	52	52
R019	Residential	NCA2	72 BEACONSFIELD RD, MOSS VALE	**46**	55	60	63	56	56	56
R020	Residential	NCA2	72 BEACONSFIELD RD, MOSS VALE	**46**	52	56	60	52	52	52
R021	Residential	NCA2	66 BEACONSFIELD RD, MOSS VALE	**46**	47	52	55	49	49	49
R022	Residential	NCA2	69 BEACONSFIELD RD, MOSS VALE	**46**	46	53	54	49	49	49
R023	Residential	NCA2	69 BEACONSFIELD RD, MOSS VALE	**46**	48	52	56	46	46	46
R024	Residential	NCA2	63 BEACONSFIELD RD, MOSS VALE	**46**	31	34	39	30	30	30
R025	Residential	NCA1	77 LACKEY RD, MOSS VALE	**49**	34	33	42	30	30	30
R026	Residential	NCA1	77 LACKEY RD, MOSS VALE	**49**	34	35	42	31	31	31
R027	Residential	NCA1	57 BEACONSFIELD RD, MOSS VALE	**49**	33	36	41	33	33	33
R028	Residential	NCA2	59 BEACONSFIELD RD, MOSS VALE	**46**	31	34	39	31	31	31
R029	Industrial	-	5 LACKEY RD, MOSS VALE	**75**	30	35	38	32	32	32
R030	Residential	NCA2	57 BEACONSFIELD RD, MOSS VALE	**46**	32	37	40	33	33	33
R031	Residential	NCA2	53 BEACONSFIELD RD, MOSS VALE	**46**	31	37	39	34	34	34
R032	Residential	NCA2	51 BEACONSFIELD RD, MOSS VALE	**46**	32	35	40	32	32	32
R033	Residential	NCA2	49 BEACONSFIELD RD, MOSS VALE	**46**	32	37	40	34	34	34
R034	Residential	NCA2	39-41 BEACONSFIELD RD, MOSS VALE	**46**	30	36	38	32	32	32
R035	Residential	NCA2	35 BEACONSFIELD RD, MOSS VALE	**46**	30	35	38	32	32	32
R036	Residential	NCA2	31-33 BEACONSFIELD RD, MOSS VALE	**46**	30	36	38	33	33	33
R037	Residential	NCA2	40 BEACONSFIELD RD, MOSS VALE	**46**	31	26	39	22	22	22
R038	Residential	NCA2	42 BEACONSFIELD RD, MOSS VALE	**46**	30	27	38	23	23	23
R039	Residential	NCA2	46 BEACONSFIELD RD, MOSS VALE	**46**	29	27	37	22	22	22
R040	Residential	NCA2	46 BEACONSFIELD RD, MOSS VALE	**46**	31	30	39	27	27	27
R041	Residential	NCA2	48 BEACONSFIELD RD, MOSS VALE	**46**	31	35	39	32	32	32
R042	Residential	NCA2	50 BEACONSFIELD RD, MOSS VALE	**46**	30	31	38	28	28	28
R043	Residential	NCA2	56A BEACONSFIELD RD, MOSS VALE	**46**	31	34	39	31	31	31
R044	Residential	NCA2	52 BEACONSFIELD RD, MOSS VALE	**46**	31	36	39	33	33	33
R045	Residential	NCA2	56B BEACONSFIELD RD, MOSS VALE	**46**	32	33	40	30	30	30
R046	Residential	NCA2	54B BEACONSFIELD RD, MOSS VALE	**46**	27	31	35	26	26	26
R047	Residential	NCA2	54C BEACONSFIELD RD, MOSS VALE	**46**	26	30	34	27	27	27
R048	Residential	NCA2	13-15 STABLES PL, MOSS VALE	**46**	29	33	37	29	29	29
R049	Residential	NCA2	11 STABLES PL, MOSS VALE	**46**	29	33	37	29	29	29
R050	Residential	NCA2	9 STABLES PL, MOSS VALE	**46**	30	35	38	30	30	30
R051	Residential	NCA2	7 STABLES PL, MOSS VALE	**46**	30	34	38	30	30	30
R052	Residential	NCA2	5 STABLES PL, MOSS VALE	**46**	30	34	38	30	30	30
R053	Residential	NCA2	3 STABLES PL, MOSS VALE	**46**	31	34	39	31	31	31
R054	Residential	NCA2	56C BEACONSFIELD RD, MOSS VALE	**46**	30	33	38	29	29	29
R055	Residential	NCA2	3A STABLES PL, MOSS VALE	**46**	29	32	37	29	29	29
R056	Residential	NCA2	18 STABLES PL, MOSS VALE	**46**	30	35	38	31	31	31
R057	Residential	NCA2	18 STABLES PL, MOSS VALE	**46**	30	35	38	31	31	31
R058	Residential	NCA2	14 STABLES PL, MOSS VALE	**46**	30	36	38	30	30	30
R059	Residential	NCA2	12 STABLES PL, MOSS VALE	**46**	30	36	38	31	31	31
R060	Residential	NCA2	10A STABLES PL, MOSS VALE	**46**	30	35	38	31	31	31
R061	Residential	NCA2	8 STABLES PL, MOSS VALE	**46**	28	24	36	20	20	20
R062	Residential	NCA2	6 STABLES PL, MOSS VALE	**46**	31	35	39	32	32	32
R063	Residential	NCA2	4 STABLES PL, MOSS VALE	**46**	31	36	39	30	30	30
R064	Residential	NCA2	1 STABLES PL, MOSS VALE	**46**	29	34	37	31	31	31
R065	Residential	NCA2	2 STABLES PL, MOSS VALE	**46**	31	33	39	30	30	30
R066	Residential	NCA2	18 ROCHE CL, MOSS VALE	**46**	31	37	39	32	32	32
R067	Residential	NCA2	18 ROCHE CL, MOSS VALE	**46**	30	37	38	32	32	32
R068	Residential	NCA2	20 ROCHE CL, MOSS VALE	**46**	27	30	35	24	24	24
R069	Residential	NCA2	16 ROCHE CL, MOSS VALE	**46**	30	36	38	33	33	33
R070	Residential	NCA2	14 ROCHE CL, MOSS VALE	**46**	31	37	39	33	33	33
R071	Residential	NCA2	12 ROCHE CL, MOSS VALE	**46**	28	29	36	25	25	25
R072	Residential	NCA2	10 ROCHE CL, MOSS VALE	**46**	30	36	38	32	32	32
R073	Residential	NCA2	8 ROCHE CL, MOSS VALE	**46**	29	31	37	26	26	26
R074	Residential	NCA2	36-42 ROCHE CL, MOSS VALE	**46**	28	34	36	31	31	31
R075	Residential	NCA2	4 ROCHE CL, MOSS VALE	**46**	30	37	38	33	33	33
R076	Residential	NCA3	24 ELOURA LANE, MOSS VALE	**45**	29	34	37	31	31	31
R077	Residential	NCA3	26 ELOURA LANE, MOSS VALE	**45**	27	32	35	29	29	29
R078	Residential	NCA3	28 ELOURA LANE, MOSS VALE	**45**	31	33	39	29	29	29
R079	Residential	NCA3	30 ELOURA LANE, MOSS VALE	**45**	29	33	37	29	29	29
R080	Residential	NCA3	32 ELOURA LANE, MOSS VALE	**45**	28	33	36	29	29	29
R081	Residential	NCA3	34 ELOURA LANE, MOSS VALE	**45**	30	34	38	30	30	30
R082	Residential	NCA2	22 ROCHE CL, MOSS VALE	**46**	29	36	37	32	32	32
R083	Residential	NCA3	29 ELOURA LANE, MOSS VALE	**45**	30	36	38	32	32	32

RID	Receiver Type	NCA	Address	Noise management level, dBA	$L_{Aeq(15min)}$ noise level, dBA					
					CS1	CS2	CS3	CS4a	CS4b	CS5
R084	Residential	NCA3	27 ELOURA LANE, MOSS VALE	**45**	30	36	38	32	32	32
R085	Residential	NCA3	25 ELOURA LANE, MOSS VALE	**45**	30	36	38	33	33	33
R086	Residential	NCA3	23 ELOURA LANE, MOSS VALE	**45**	30	36	38	33	33	33
R087	Residential	NCA3	21 ELOURA LANE, MOSS VALE	**45**	30	36	38	32	32	32
R088	Residential	NCA3	19 ELOURA LANE, MOSS VALE	**45**	30	36	38	32	32	32
R089	Residential	NCA3	17 ELOURA LANE, MOSS VALE	**45**	30	36	38	31	31	31
R090	Residential	NCA3	15 ELOURA LANE, MOSS VALE	**45**	30	36	38	31	31	31
R091	Residential	NCA3	13 ELOURA LANE, MOSS VALE	**45**	28	35	36	31	31	31
R092	Residential	NCA3	11 ELOURA LANE, MOSS VALE	**45**	29	35	37	31	31	31
R093	Residential	NCA3	9 ELOURA LANE, MOSS VALE	**45**	29	35	37	32	32	32
R094	Residential	NCA3	21 REEYANA PL, MOSS VALE	**45**	29	36	37	32	32	32
R095	Residential	NCA3	23 REEYANA PL, MOSS VALE	**45**	27	34	35	31	31	31
R096	Residential	NCA3	25 REEYANA PL, MOSS VALE	**45**	28	35	36	31	31	31
R097	Residential	NCA3	27 REEYANA PL, MOSS VALE	**45**	28	32	36	28	28	28
R098	Residential	NCA3	26 REEYANA PL, MOSS VALE	**45**	26	28	35	23	23	23
R099	Residential	NCA3	24 REEYANA PL, MOSS VALE	**45**	26	33	34	30	30	30
R100	Residential	NCA3	25 BULWER RD, MOSS VALE	**45**	29	26	37	23	23	23
R101	Residential	NCA3	27 BULWER RD, MOSS VALE	**45**	30	37	38	32	32	32
R102	Residential	NCA3	7 ELOURA LANE, MOSS VALE	**45**	24	31	32	27	27	27
R103	Residential	NCA3	29 BULWER RD, MOSS VALE	**45**	27	34	35	30	30	30
R104	Residential	NCA3	31 BULWER RD, MOSS VALE	**45**	27	34	35	31	31	31
R105	Residential	NCA3	5 ELOURA LANE, MOSS VALE	**45**	29	32	37	28	28	28
R106	Residential	NCA3	3 ELOURA LANE, MOSS VALE	**45**	30	32	38	29	29	29
R107	Residential	NCA3	1 ELOURA LANE, MOSS VALE	**45**	29	34	37	30	30	30
R108	Residential	NCA3	33 BULWER RD, MOSS VALE	**45**	29	35	37	31	31	31
R109	Residential	NCA3	2 ELOURA LANE, MOSS VALE	**45**	30	34	38	30	30	30
R110	Residential	NCA3	4 ELOURA LANE, MOSS VALE	**45**	29	30	37	25	25	25
R111	Residential	NCA3	6 ELOURA LANE, MOSS VALE	**45**	28	35	36	30	30	30
R112	Residential	NCA3	10 ELOURA LANE, MOSS VALE	**45**	30	31	38	27	27	27
R113	Residential	NCA3	8 ELOURA LANE, MOSS VALE	**45**	29	28	37	25	25	25
R114	Residential	NCA3	14 ELOURA LANE, MOSS VALE	**45**	26	31	34	28	28	28
R115	Residential	NCA3	12 ELOURA LANE, MOSS VALE	**45**	30	34	38	31	31	31
R116	Residential	NCA3	16 ELOURA LANE, MOSS VALE	**45**	32	35	40	32	32	32
R117	Residential	NCA3	18 ELOURA LANE, MOSS VALE	**45**	26	33	34	30	30	30
R118	Residential	NCA3	20 ELOURA LANE, MOSS VALE	**45**	27	27	35	23	23	23
R119	Residential	NCA3	22 ELOURA LANE, MOSS VALE	**45**	29	34	37	31	31	31
R120	Residential	NCA3	34 NAPPER CL, MOSS VALE	**45**	22	25	30	21	21	21
R121	Residential	NCA3	32 NAPPER CL, MOSS VALE	**45**	27	30	35	27	27	27
R122	Residential	NCA3	30 NAPPER CL, MOSS VALE	**45**	25	29	33	25	25	25
R123	Residential	NCA3	28 NAPPER CL, MOSS VALE	**45**	29	32	37	28	28	28
R124	Residential	NCA3	26 NAPPER CL, MOSS VALE	**45**	27	31	35	27	27	27
R125	Residential	NCA3	24 NAPPER CL, MOSS VALE	**45**	28	31	36	28	28	28
R126	Residential	NCA3	22 NAPPER CL, MOSS VALE	**45**	27	29	35	26	26	26
R127	Residential	NCA3	15 NAPPER CL, MOSS VALE	**45**	28	31	36	27	27	27
R128	Residential	NCA3	13 NAPPER CL, MOSS VALE	**45**	27	32	35	29	29	29
R129	Residential	NCA3	11 NAPPER CL, MOSS VALE	**45**	28	25	36	21	21	21
R130	Residential	NCA3	9 NAPPER CL, MOSS VALE	**45**	23	29	31	25	25	25
R131	Residential	NCA3	7 NAPPER CL, MOSS VALE	**45**	28	30	36	27	27	27
R132	Residential	NCA3	5 NAPPER CL, MOSS VALE	**45**	26	30	34	25	25	25
R133	Residential	NCA3	1 NAPPER CL, MOSS VALE	**45**	29	28	37	25	25	25
R134	Residential	NCA3	3 NAPPER CL, MOSS VALE	**45**	28	27	36	24	24	24
R135	Residential	NCA3	3 JOPLING WAY, MOSS VALE	**45**	29	34	37	29	29	29
R136	Residential	NCA3	1 JOPLING WAY, MOSS VALE	**45**	25	23	33	19	19	19
R137	Residential	NCA3	4 NAPPER CL, MOSS VALE	**45**	28	33	36	26	26	26
R138	Residential	NCA3	35 BULWER RD, MOSS VALE	**45**	29	34	37	31	31	31
R139	Residential	NCA3	37 BULWER RD, MOSS VALE	**45**	24	28	32	25	25	25
R140	Residential	NCA3	39 BULWER RD, MOSS VALE	**45**	26	29	34	25	25	25
R141	Residential	NCA3	6 NAPPER CL, MOSS VALE	**45**	26	31	34	27	27	27
R142	Residential	NCA3	8 NAPPER CL, MOSS VALE	**45**	28	32	36	29	29	29
R143	Residential	NCA3	10 NAPPER CL, MOSS VALE	**45**	28	32	36	27	27	27
R144	Residential	NCA3	12 NAPPER CL, MOSS VALE	**45**	27	31	35	28	28	28
R145	Residential	NCA3	14 NAPPER CL, MOSS VALE	**45**	27	29	35	26	26	26
R146	Residential	NCA3	16 NAPPER CL, MOSS VALE	**45**	28	30	36	27	27	27
R147	Residential	NCA3	22 NAPPER CL, MOSS VALE	**45**	27	31	35	28	28	28
R148	Residential	NCA3	6 NAPPER CL, MOSS VALE	**45**	28	34	36	30	30	30
R149	Residential	NCA2	64 BEACONSFIELD RD, MOSS VALE	**46**	46	51	54	48	48	48
R150	Residential	NCA2	58 BULWER RD, MOSS VALE	**46**	43	50	51	43	43	43
R151	Residential	NCA3	54-56 BULWER RD, MOSS VALE	**45**	44	50	51	47	47	47
R152	Residential	NCA3	52 BULWER RD, MOSS VALE	**45**	42	48	50	45	45	45
R153	Residential	NCA3	48-50 BULWER RD, MOSS VALE	**45**	42	47	50	44	44	44
R154	Residential	NCA3	49-53 BULWER RD, MOSS VALE	**45**	33	40	41	37	37	37
R155	Residential	NCA3	BULWER RD, MOSS VALE	**45**	34	41	42	37	37	37
R156	Residential	NCA2	61-65 BULWER RD, MOSS VALE	**46**	36	43	44	40	40	40
R157	Residential	NCA2	67 BULWER RD, MOSS VALE	**46**	38	45	46	41	41	41
R158	Residential	NCA2	67 BULWER RD, MOSS VALE	**46**	37	41	45	37	37	37
R159	Residential	NCA2	60 BEACONSFIELD RD, MOSS VALE	**46**	32	32	40	28	28	28
R160	Residential	NCA3	50A BULWER RD, MOSS VALE	**45**	46	51	54	48	48	48
R161	Residential	NCA3	46 BULWER RD, MOSS VALE	**45**	40	46	48	43	43	43
R162	Residential	NCA2	75 BEACONSFIELD RD, MOSS VALE	**46**	54	56	62	51	51	51
R163	Residential	NCA2	73 BEACONSFIELD RD, MOSS VALE	**46**	51	56	59	53	53	53
R164	Residential	NCA2	71 BEACONSFIELD RD, MOSS VALE	**46**	50	52	58	49	49	49

Appendix I

Construction noise contours, $L_{Aeq(15\ min)}$ dBA



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Metres

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

GHD

Plasrefine Pty Ltd
Moss Vale Plastics Recycling Facility
Noise Assessment

Construction noise contours, LAeq(15 min) dBA - CS01

Project No. **12524108.0**
Revision No. **A**
Date **25 Jan 2022**

APPENDIX I

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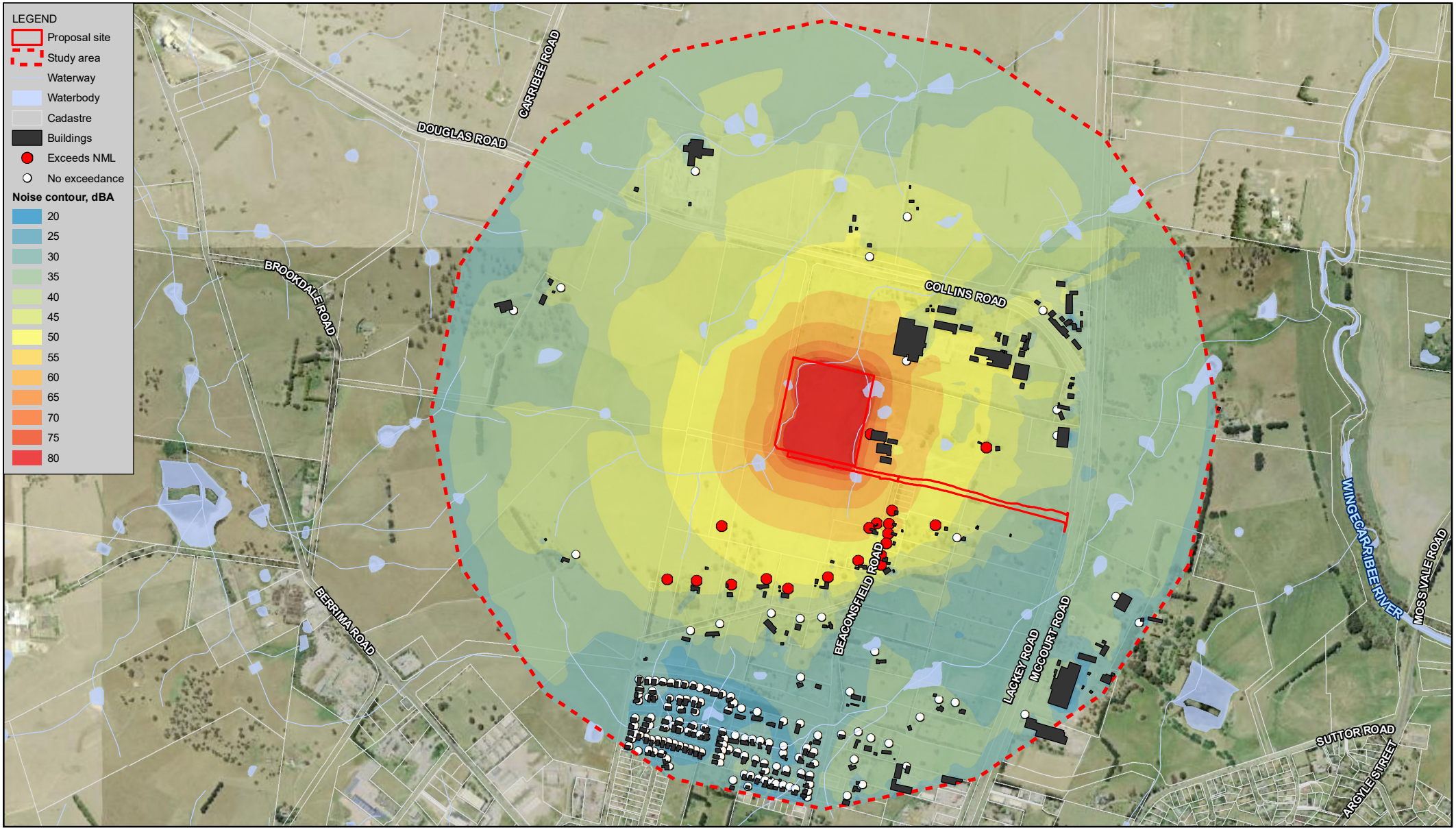
Data source: Aerial imagery - sixmaps 2022© Department of Customer Service 2020; General topo - NSW LPI DTDB 2020, 2015. Created by: eibbertson



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Map Projection: Transverse Mercator
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Plasrefine Pty Ltd
Moss Vale Plastics Recycling Facility
Noise Assessment

Construction noise contours, LAeq(15 min) dBA - CS02

Project No. **12524108.0**
Revision No. **A**
Date **25 Jan 2022**

APPENDIX I

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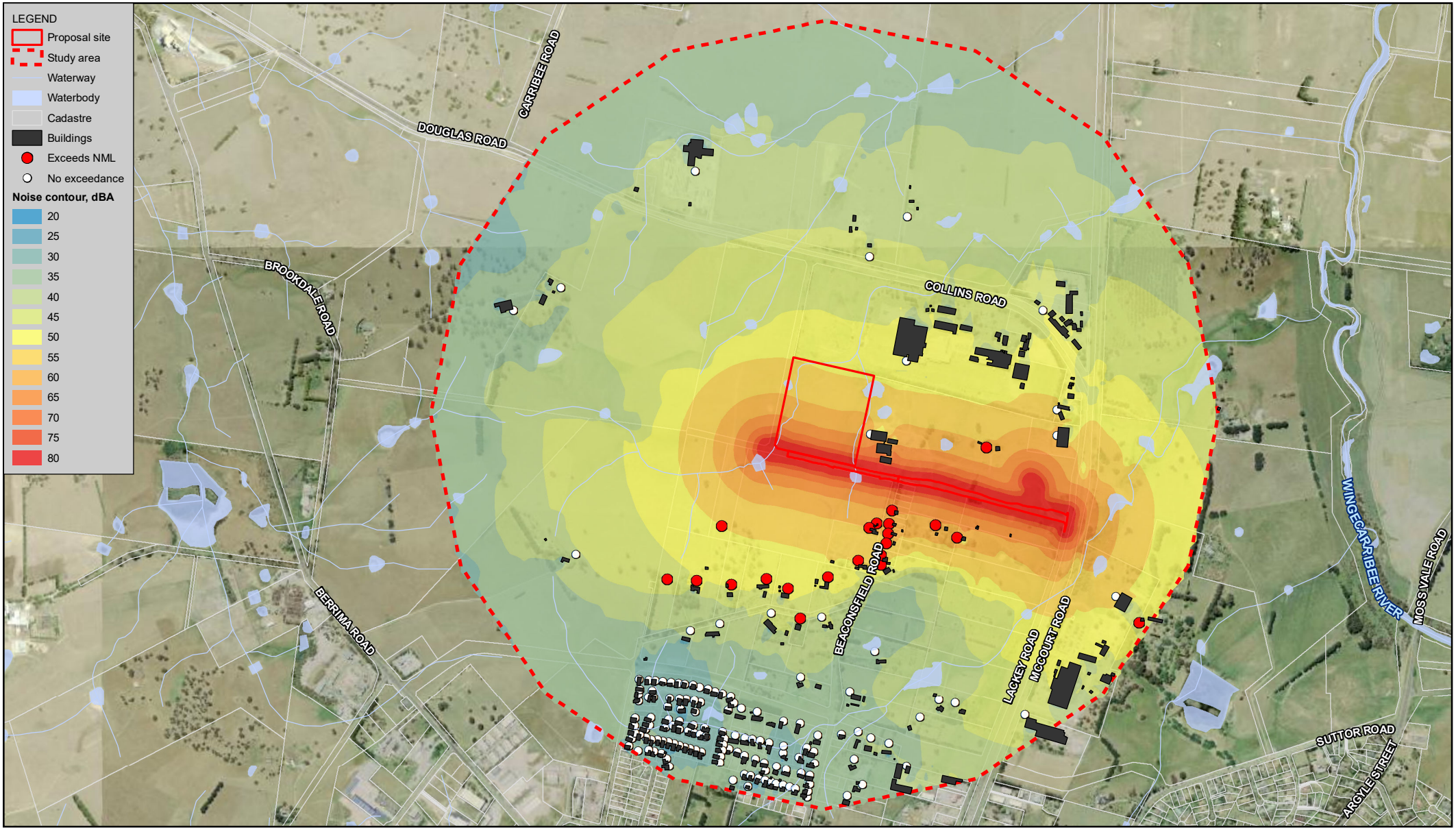
Data source: Aerial imagery - sixmaps 2022© Department of Customer Service 2020; General topo - NSW LPI DTDB 2020, 2015. Created by: eibbertson



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Grid: GDA 1994 MGA Zone 56

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GHD

Plasrefine Pty Ltd
Moss Vale Plastics Recycling Facility
Noise Assessment

Construction noise contours, LAeq(15 min) dBA - CS03

Project No. **12524108.0**
Revision No. **A**
Date **25 Jan 2022**

APPENDIX I

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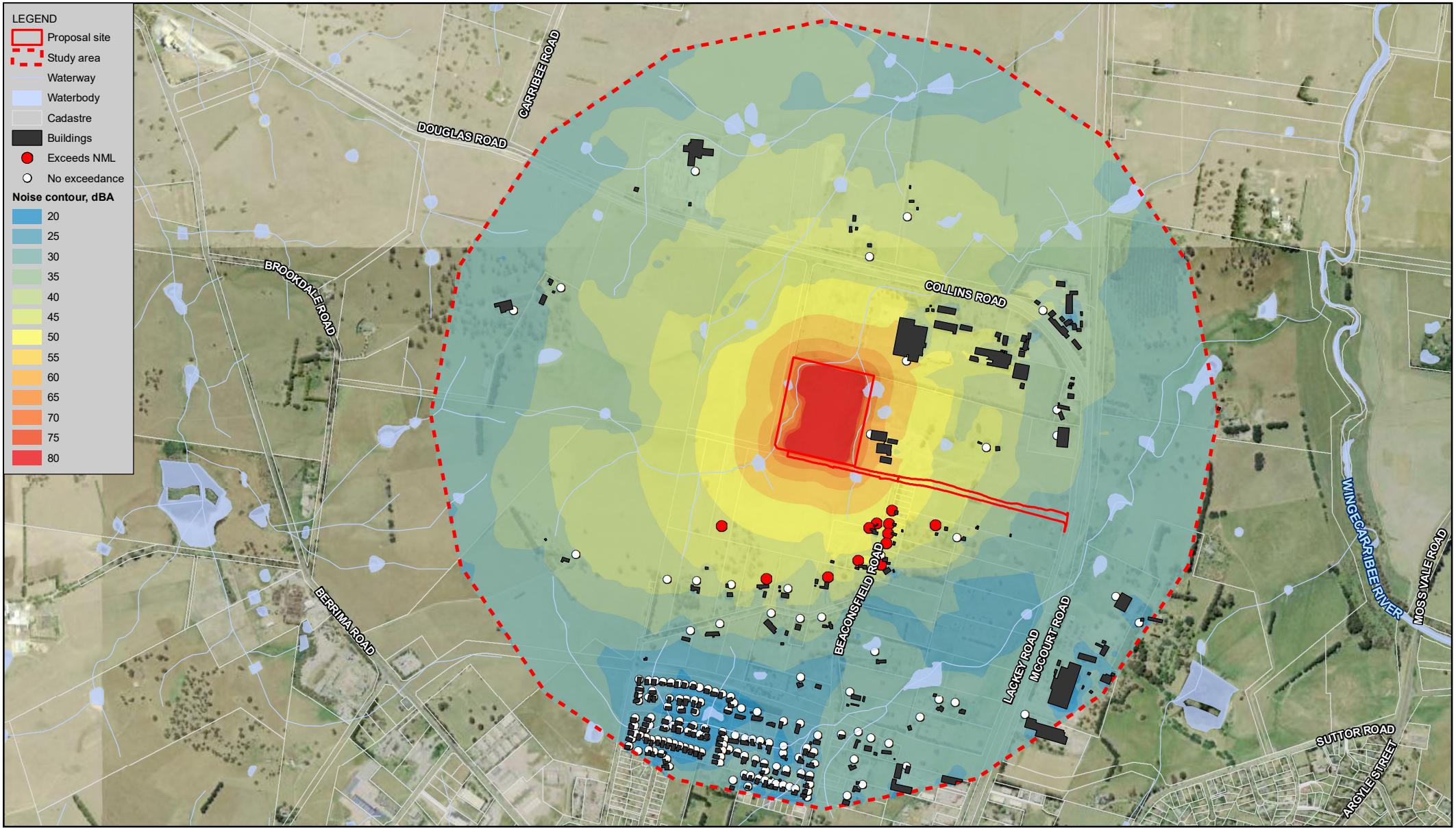
Data source: Aerial imagery - sixmaps 2022© Department of Customer Service 2020; General topo - NSW LPI DTDB 2020, 2015. Created by: eibbertson



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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

GHD

Plasrefine Pty Ltd
Moss Vale Plastics Recycling Facility
Noise Assessment

Construction noise contours, LAeq(15 min) dBA - CS04

Project No. **12524108.0**
Revision No. **A**
Date **25 Jan 2022**

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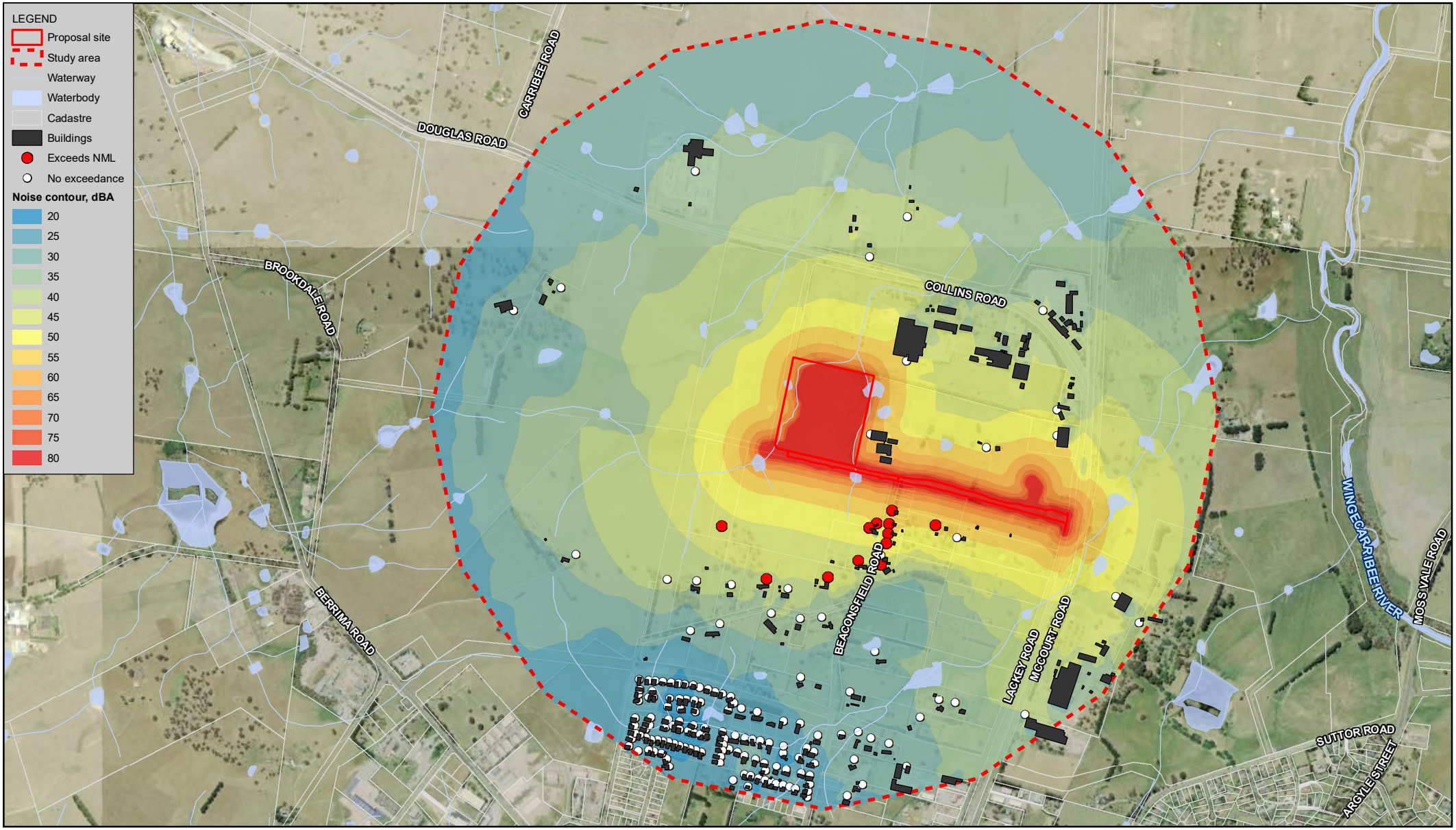

Paper Size ISO A4

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Metres

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Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

GHD

Plasrefine Pty Ltd
Moss Vale Plastics Recycling Facility
Noise Assessment

Construction noise contours, LAeq(15 min) dBA - CS05

Project No. **12524108.0**
Revision No. **A**
Date **25 Jan 2022**

APPENDIX I

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