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Regional Renewable Organics Network

Noise Assessment

Barwon Water

14 August 2024

→ The Power of Commitment

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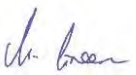
S4	0	S Ritchie V Lenchine	B Bloom		A Green		14/08/2024
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Glossary of terms

Term	Definition
Ambient Noise	The all-encompassing noise associated within a given environment. It is the composite of sounds from many sources, both near and far.
Background Noise Level	For a day, evening, or night period means the arithmetic average of the hourly L_{A90} levels that represents the background sounds in a noise sensitive area, in the absence of noise from any commercial, industrial or trade premises which appears to be intrusive at the point where the background level is measured.
dB	Unit of measurement for Sound Pressure Level known as a decibel
dB(A)	'A-weighted' decibel measurement, which represents the sound frequency response corresponding to the sensitivity of the human ear.
$L_{Aeq\ (Time)}$	Equivalent sound pressure level is the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring. This is considered to represent ambient noise.
$L_{A90\ (Time)}$	The A-weighted sound pressure level that is exceeded for 90 percent of the time over which a given sound is measured. This is considered to represent the background noise.
$L_{A10\ (Time)}$	The sound pressure level that is exceeded for 10 percent of the time specified.
Mitigation	Reduction in severity.
Sensitive receiver	A noise modelling term used to describe a map reference point where noise is predicted. A sensitive receiver would be a home, work place, church, school or other place where people spend time.
Sound Pressure Level (SPL)	The Sound Pressure Level is the change in air pressure above and below the average atmospheric pressure (amplitude) caused by a passing pressure wave. This is then converted to decibels and can be abbreviated as SPL or L_p.
Sound Power Level (PWL)	The Sound Power Level is defined as the average rate at which sound energy is radiated from a sound source. The Sound Power Level can be abbreviated as PWL or L_W.
Tonality	Noise with perceptible and definite pitch or tone.

1. Introduction

1.1 Background

Barwon Water (BW) has engaged GHD Pty Ltd to prepare a Development Licence Application (DLA) for its proposed Regional Renewable Organics Network (RRON). This operational noise assessment (ONA) has been prepared to support the DLA.

The RRON will be located at BW's Black Rock Water Reclamation Plant (WRP) located at 405 Blackrock Road, Connewarre, approximately 18 km south of Geelong. The Black Rock WRP is an established organic waste recycling facility that treats wastewater and produces Class A and Class C recycled water, as well as processing approximately 60,000 t/y of biosolids.

The RRON facility is proposed to process approximately 40,000 t/y of comingled food organics and garden organic (FOGO) waste predominately from local Municipalities. This FOGO stream will be pre-processed and separated to produce a food organics (FO) rich stream and a garden organics (GO) rich stream. The facility will also process other feedstocks including bulk green waste (~9,000 t/y), commercial and industrial (C&I) organic waste (~2,000 t/y), and biosolids (from BW's WRPs). The main processes proposed for the RRON include:

– Thermal processing via carbonisation of the GO-rich stream (separated from FOGO), bulk green waste and biosolids
– Plug flow anaerobic digestion (PFAD) of the FO-rich stream (separated from FOGO) and FO-rich C&I organic waste

The RRON will produce the following product streams:

– Biochar (from carbonisation), a high-value product for agriculture and production of advanced sustainable materials
– Syngas (from carbonisation), which will be used within the RRON facility to dry the carbonisation feedstocks down to a suitable moisture content for carbonisation
– Digestate (from the PFAD), a product containing high levels of nutrients, which is beneficial in agricultural applications
– Biogas (from the PFAD), which will be transferred to the neighbouring biosolids drying facility and converted into heat via a biogas boiler, reducing the demand for natural gas

Further information on the environmental setting of the RRON facility and a detailed process description are provided in the DLA report. This report should be read in conjunction with the DLA report.

1.2 Purpose of this report

The purpose of this report is to understand environmental noise risks from operation of the facility and to support the DLA submission for the proposed RRON through an operational noise assessment in accordance with the EPA Guideline 1826.4 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* (Noise Protocol).

1.3 Scope of works

The scope of work undertaken by GHD for this assessment is summarised below:

Baseline noise monitoring

– Initial desktop review to identify the study area for the assessment
– Desktop review of the surrounding environment from aerial imagery to identify potential existing noise sensitive receivers
– Review of information provided by Barwon Water detailing the proposed RRON facility, equipment, traffic generation and operational activities

– Site survey to confirm noise monitoring locations – unattended noise monitoring for a minimum period of one week at three (3) locations representative of the local environment (nearest residential dwellings) in order to determine local background and ambient noise levels at the nearest sensitive receivers
– Deployment of weather stations at representative sites adjacent to the noise monitoring equipment
– Assess and filter invalid noise data due to extraneous noise or adverse weather conditions
– Conducted operator attended noise observations during logger deployment at monitoring locations to assist in the identification and quantification of existing noise sources

Existing site noise survey

– Conducted site noise survey of key operational noise sources at the existing WRP and biosolids facilities.

Operational noise impact assessment

– Review design details, assumptions provided for noise generating equipment
– Determine the project noise criteria levels for the key sensitive receivers in the study based on the Noise Protocol
– A 3D noise model of identified noise sources associated with the project and existing site was developed (based on provided noise source data, assumptions, third-party information and drawings)
– Predict noise levels at the key sensitive receivers locations in the study area including cumulative impacts, at sensitive receivers
– Compare predicted operational noise levels with project noise criteria determined for sensitive receivers in the area and identify any exceedances
– Discuss noise management measures

1.4 Limitations

This report has been prepared by GHD for Barwon Water and may only be used and relied on by Barwon Water for the purpose agreed between GHD and Barwon Water as set out in section 1.1 of this report.

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

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

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

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section(s) 1.3 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

The opinions, conclusions and any recommendations in this report are based on information obtained from, and testing undertaken at or in connection with, specific sample points. Site conditions at other parts of the site may be different from the site conditions found at the specific sample points.

Investigations undertaken in respect of this report are constrained by the particular site conditions, such as the location of buildings, services and vegetation. As a result, not all relevant site features and conditions may have been identified in this report.

GHD has prepared this report on the basis of information provided by Barwon Water and others who provided information to GHD (including Government authorities)], which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

1.5 Assumptions

The assessment contained in this report is based on the following information and assumptions:

- Background noise measurement locations are representative of the existing background environment in the vicinity of noise sensitive receivers within the study area
- Attended noise measurements undertaken at existing WRP and biosolids drying facility sites were representative of typical operations of existing equipment and represent the key/relevant sources for environmental noise emission
- Noise modelling assumptions as per Section 5.1 and 5.2 of this report
- It is assumed that no noise character penalty is applicable to the site noise emissions

2. Project description

2.1 Location

The site is located at 405 Blackrock Road, Connewarre, approximately 18 km south of Geelong CBD. An aerial image showing the site location is presented in Figure 1. The proposed RRON will be sited within the boundary of the existing site.

The site is zoned as a mix of Public Use Zone – Service and Utility (PUZ1). The areas surrounding the Site ranges from farming land to public conservation areas within the Connewarre township. A summary of the surrounding areas and relevant zoning levels for identified activities are listed in Table 1 below.

Table 1 Zoning levels of surrounding areas

Direction	Activity	Zoning
North	Bicycle path then farming land	Farming Zone (FZ)
East	Thirteenth Beach	Public Conversation Resource Zone (PCRZ)
South	Zeally Bay and Breamlea Beach	PCRZ
West	Breamlea Flora and Fauna Reserve	PCRZ
	Farming land	FZ

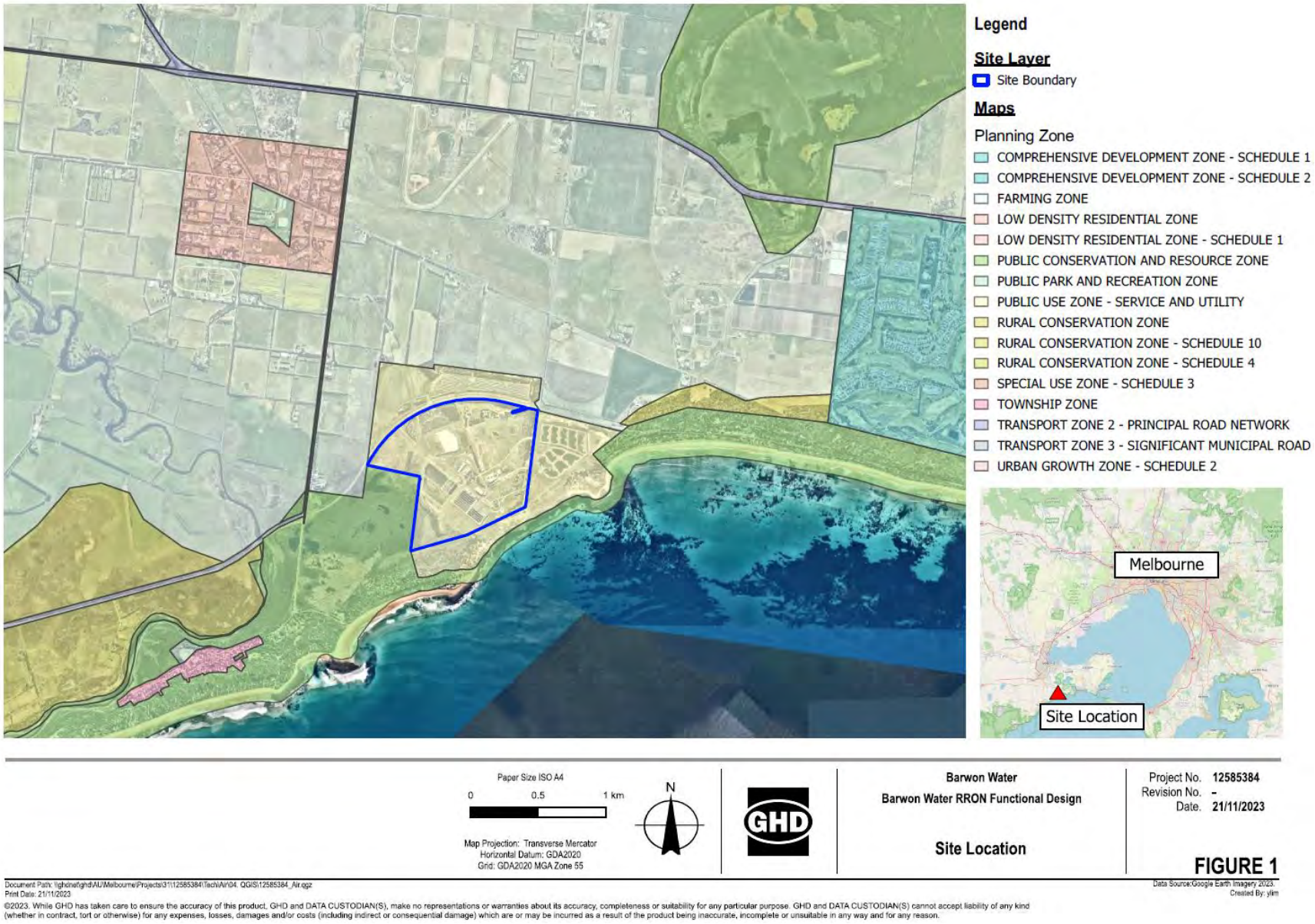

Figure 1 Location of Black Rock WRP site at 395-405 Blackrock Road, Connewarre

2.2 Existing operations

The Black Rock WRP treats sewage collected from the greater Geelong region and is currently holds an EPA Operating Licence (OL000071111) for sewage treatment (A03) issued on 2 December 2008. The Black Rock WRP includes:

– Recycled Water Plant
– Biosolid Drying Plant (operated by Trility Pty Ltd under EPA Operating Licence OL00007987 for reportable priority waste management (A01) and other waste treatment – incineration (A02a) issued on 6 September 2012)
– Hydro-slurry dewatering and storage area
– Various treatment plant buildings and structures including aeration tanks
– Class A and Class C water storage lagoons

The Black Rock WRP creates almost 140 tonnes of biosolids every day. The wet biosolids travel via a raised conveyor to an adjacent biosolids drying facility. BW's other WRPs produce biosolids in smaller quantities, which are periodically transported to the Black Rock biosolids drying facility. The biosolids drying process produces small biosolid pellets (known as bioprill), which are suitable for immediate use as fertiliser, and reduces the greenhouse gas emissions previously associated with the transport and storage of biosolids.

2.3 Process description

The proposed RRON facility will consist of the following primary process units located across the facility both externally and internally.

– Feedstock pre-processing
– Plug Flow Anaerobic Digester
– Biogas combustion equipment for heat recovery at the biosolids facility
– Biogas flaring & co-generation equipment
– Digestate dewatering and drying
– Carbonisation
– Syngas combustion and associated heat integration equipment
– Ancillary pumps, pipework, and conveyers

Process flow diagrams for the RRON facility are included in Appendix B of the DLA report. A brief summary of each main process unit is included below, and a more detailed process description is included in the DLA report.

2.3.1 Pre-processing

Organic feedstock will be delivered to the site into an unloading area within the main process building. From the feedstock storage area, feedstock will be loaded into the pre-processing equipment which will comprise of contaminant removal, size reduction equipment and separation including picking line/s, shredding, screening, magnetic separation, as well as associated transfer equipment (conveyers, pumps, pipes, etc) and interim storages. All of the pre-processing activities are undertaken indoors within the main process building (labelled as "proposed building one" on the site layout). Following pre-processing of the feedstock:

– The FO-rich stream (separated from FOGO) and FO-rich C&I organic waste will be fed to the PFAD train
– The GO-rich stream (separated from FOGO), the bulk green waste and the biosolids will be fed to the carbonisation train

2.3.2 Plug flow anaerobic digestion

The gas-tight horizontally mounted digester is heated and includes internal paddles mounted on a large shaft to facilitate the passing of the feedstock in a plug flow manner through the length of the digester. Organic feedstock is anaerobically digested producing biogas which is collected and extracted from the top of the digester. After a 14 to 21-day residence time, digestate will be discharged from the end of the digester.

2.3.3 Biogas utilisation

Collected biogas is transferred to a biogas storage vessel. From here, the biogas will be utilised by one of the following two approaches and any excess will be flared:

– Transferred to the neighbouring biosolids drying facility and used in a biogas burner for use in biosolids drying (Year 1 – 7). In this instance, a portion of the biogas will be utilised for heating the digester.
– Power generation via cogeneration process (Years 8 – 25). In this instance, the electricity output of cogeneration will be used at the neighbouring Black Rock WRP, and the heat output of cogeneration will be utilised for heating the digester.

2.3.4 Digestate dewatering

A screw press will separate digestate into liquid digestate and a dry fraction. Liquid digestate will be recycled as process water to the head of the PFAD process and any excess will be discharged as wastewater to the neighbouring wastewater treatment plant. Digestate dewatering takes place indoors within a compartment of the main processing building (labelled as “proposed building one” on the site layout).

Dewatered (solid) digestate will be loaded using front end loaders into a digestate drying process, which involves arranging the digestate into windrows on a perforated concrete slab and blowing air through the material to remove moisture. After a period of 1.5 to two weeks, the dried digestate will be around 49% moisture content and will be loaded onto trucks from an enclosed area for offsite reuse.

2.3.5 Carbonisation

The GO-rich stream (separated from FOGO), the bulk green waste and the biosolids will be fed into a multi pass rotary drum dryer’s inlet using a high-speed hot air stream. Hot gasses from the gasifier/oxidiser will directly dry the material as it is tumbled through the drum. A downstream cyclone will separate exiting dry material and moist air. The separated dry material will be transferred as the feed material to the gasifier and the moist air will continue through to the air treatment processes before being discharged.

The gasifier will carbonise the dried material in an oxygen-starved environment, producing a combustible syngas and biochar. The fixed bed gasifier will control inputs and outputs with variable frequency drives. Produced syngas exits towards the oxidiser, where air is introduced to create heat through combustion, from which the hot gases continue to the dryer. The solid products will be collected with a discharge conveyer and transferred to a mixing bin, where temperature and moisture can be adjusted using spray water for quenching. Finished biochar will be bagged at a semi-automatic bag rack. Drying and carbonisation occurs indoors within the carbonisation building (labelled as “proposed building two” on the site layout).

2.3.6 Air treatment

Moist air from the dryer will be transferred to the air pollution control system which includes wet scrubber and a 2-stage chemical scrubber system before being discharged to atmosphere via a biofilter and stack.

2.4 Noise sensitive receivers

In the context of the study area, a noise sensitive area is defined in the Environmental Protection Regulations 2021 as:

"(a) that part of the land within the boundary of a parcel of land that is –

(i) within 10 metres of the outside of the external walls of any of the following buildings—

(A) a dwelling (including a residential care facility but not including a caretaker's house);

(B) a residential building;

(C) a noise sensitive residential"

This report uses the terminology 'noise sensitive receiver' to refer to the assessment location for a specific noise sensitive area within the study area.

The closest noise sensitive receivers surrounding the site have been identified and summarised in Table 2. The closest sensitive receiver is located approximately 920 m to the north-northeast of the activity boundary (the area of the RRON facility operations). The closest identified sensitive receivers have been identified displayed in Figure 2.

Table 2 Closest noise sensitive receivers

Receiver ID	X (m) GDA2020 Z55	Y (m) GDA2020 Z55	Address	Distance to RRON facility	Direction from site
1	272625	5758539	1A Horwood Dr, Breamlea VIC 3227	1715 m	SW
2	272769	5759573	291 Breamlea Rd, Connewarre VIC 3227	1265 m	W
3	272832	5760162	211- 229 Breamlea Rd, Connewarre VIC 3227	1345 m	NW
4	273741	5761096	262- 290 Bluestone School Rd, Connewarre 3227	1510 m	N
5	274571	5760722	342 - 400 Bluestone School Rd, Connewarre 3227	1076 m	NNE
6	274995	5760630	550 Thirteenth Beach Rd, Connewarre 3227	922 m	NNE

Legend

Black Rock WRP site
Sensitive receptors
RRON site

Paper Size ISO A4

0 0.2 0.4 0.6 0.8 1 km

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

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RRON Noise Assessment

Noise sensitive receivers

Project No. **12585384**
Revision No. **B**
Date. **13/08/2024**

FIGURE 2

Print Date: 13/08/2024

Data Source: GHD, Geoscape | Imagery: Nearmap Aus Latest 2023-12-13 2024.
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3. Noise measurements

3.1 Unattended noise logging

Baseline noise monitoring was conducted at three sensitive receivers close to the site in accordance with AS 1055:2018 – *Acoustics – Description and measurement of environmental noise*. Locations were chosen based on the potential to represent the acoustic environment of other sensitive receivers in the area. The monitoring locations are presented in Figure 3 as monitoring location 1, 2 and 3 (M1, M2 and M3). Noise monitoring was conducted on two separate occasions between 27 April 2023 to 24 May 2023 and data was processed to report background values.

Background noise monitoring was measured continuously over each hour of the day, evening and night period (or other period as relevant) in 15 minute increments (integration period). Summary results are displayed in Table 5 and are representative of the overall background noise (LA90) and the ambient noise (LAeq) levels. No façade adjustment was applied to the monitoring data as the microphones were deployed in a free field location positioned away from building facades and other structures.

3.1.1 Instrumentation

Ambient noise levels were monitored using SVAN 977 (Class 1) environmental noise loggers. Details of the noise loggers used are displayed in Table 3. The Class 1 designation signifies the equipment meets certain tolerances for accuracy under IEC 61672 and IEC 61260.

All noise monitoring instrumentation was in current National Association of Testing Authorities (NATA) calibration at the time of use. All instruments were field-checked and calibrated both before and after noise measurements using a Brüel & Kjær Class 1 Acoustic Calibrator model 4231. Details of the loggers are summarised in Table 3

Table 3 Noise Monitoring Equipment

Site ID	M1 (R01)	M2 (R05)	M3 (R06)
Serial No.	36820	36821	97579
Type	Class 1	Class 1	Class 1
Start date (time)	27/04/2023 (12:00 pm)	27/04/2023 (1:00 pm)	11/05/2023 (12:00 pm)
End date (time)	07/05/2023 (7:00 pm)	11/05/2023 (9:00 am)	24/05/2023 (1:00 pm)
Photo			

3.1.2 Meteorological conditions

Adverse meteorological conditions such as high winds and rainfall can influence noise monitoring results. The following documents some provide guidance as follows:

– The Noise Protocol, which requires background noise measurements be carried out in dry conditions with light breeze to calm winds (Beaufort Scale 0, 1, 2, 3) (EPA Victoria, May 2021)
– Australian Standard AS 1055:2018: Acoustics – Description and Measurement of Environmental Noise which specifies that “Where the maximum wind speed exceeds 5 m/s at the measurement position and noise measurement are required caution should be applied and special windscreens should be utilised” (p. 13) (Standards Australia, 2018)

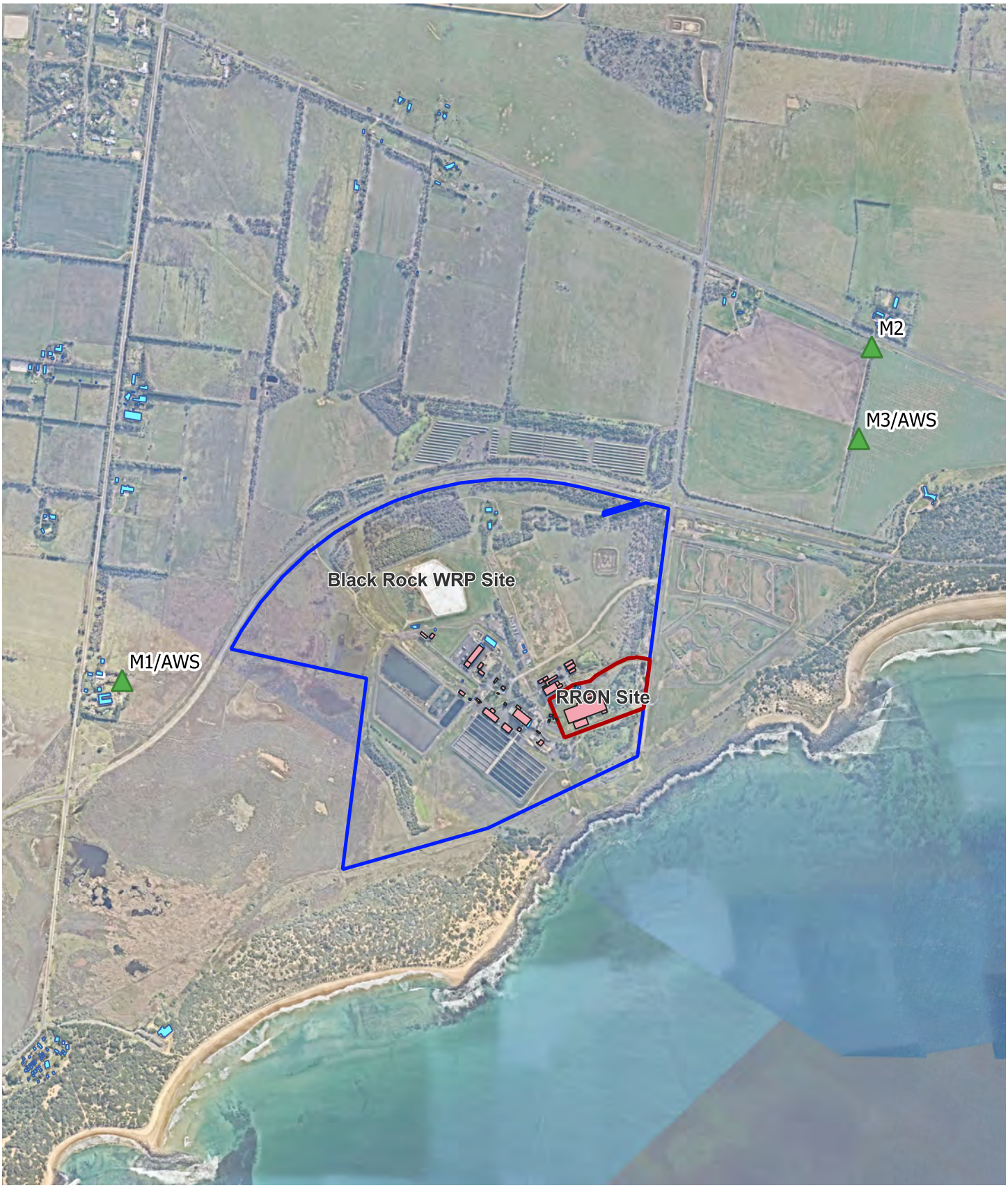
In order to obtain accurate site-specific meteorological data at the microphone level, GHD installed an ultrasonic automatic weather station (AWS) at the M1 and M3 monitoring locations to record wind direction and speeds. This information is included in the daily charts in Appendix A.

Noise measurements where the wind speed was greater than 5 m/s, or whenever rainfall occurred were both defined as ‘adverse weather’ conditions. Noise data collected during hours with adverse weather were excluded from the background noise assessment.

3.1.3 Measurement locations

To assess the environmental noise impact from the site at the nearest receiver, the ambient noise level must be considered. Long term noise monitoring was performed at three locations around the project site as shown in Figure 3. Loggers at monitoring locations M1 and M3 were collocated with automatic weather stations (AWS).

Monitoring location M1 (R01) is located to the west of the site. Two other loggers M2 (R05) and M3 (R07) were deployed to characterise background at north and north-eastern receivers.



Legend

Black Rock WRP site
RRON site
Monitoring Locations

Paper Size ISO A4

0 0.1 0.2 0.3 0.4 0.5 km

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

N

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RRON Noise Assessment

Noise monitoring locations

Project No. **12585384**
Revision No. **B**
Date. **13/08/2024**

FIGURE 3

Print Date: 13/08/2024

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3.1.4 Noise monitoring results

Noise levels at each unattended monitoring location have been analysed for all day, evening and night time periods as defined in the Environment Protection Regulations 2021 (EP Regulations) and the Noise Protocol. These assessment periods are outlined in Table 4.

Table 4 Noise protocol time periods

Time period	Time
Day	Monday to Saturday (except public holidays) from 7 am to 6 pm
Evening	Monday to Saturday, from 6 pm to 10 pm; and Sunday and public holidays, from 7 am to 10 pm
Night	Any day of the week, 10 pm to 7 am the following day

A summary of the daily noise monitoring results for all monitoring locations are provided with noise logging charts in Appendix A.

Table 5 provides the measured L_{A90} and L_{Aeq} noise metrics for each relevant time period and monitoring location, analysed in accordance with the procedures outlined in Section 4 of EPA Victoria Publication 1826.4 Noise Protocol. These values represent the existing background and ambient noise environment and are used to derive the project's noise criteria for both operation as described in section 4.5.

The L_{A90} is the measured noise level that was exceeded for 90% of the measurement period and is used to determine the background noise levels. The L_{Aeq} is the measured noise level which is equivalent to the general ambient noise in the area and includes the noise energy from the background noise as well as all other noise sources in the area.

Table 5 Noise Monitoring Results

Monitoring location	L_{A90} dBA noise levels			L_{Aeq} dBA noise levels		
	Day	Evening	Night	Day	Evening	Night
M1	40	34	35	48	43	43
M2	43	39	39	55	48	48
M3	42	40	40	50	48	47

Background and ambient noise level descriptors at the monitoring locations was mainly controlled by wind moving through local vegetation/foliage, local traffic, aircraft, and local wildlife noise including birds. It is noted that noise from the existing site was not observed as audible at the noise logging locations during deployment and retrieval of the noise loggers.

3.2 Existing site noise source measurement survey

Attended sound pressure level measurements of noise emissions from the current operations at the existing Black Rock WRP and the biosolids drying facility were undertaken to identify noise characteristics and sound power levels of dominant noise sources. Black Rock WRP and Biosolids facility are located to the west and north of the future RRON facility.

The measurements were used to establish the existing noise emissions from the site and to allow for a comparison of the measured site emissions with model predictions. Emissions from the existing sources are also taken into account in predictions of cumulative noise impact from WRP, Biosolids facility and RRON facility facilities at sensitive receivers.

The attended noise measurements were undertaken on 11 May 2023 with the Black Rock WRP and the biosolids drying facility operating at typical conditions. Measurements were taken using Type 1 Brüel & Kjær 2270 sound level meters (Serial Number: 3009634 and 3030784) using a combination of sound pressure and sound intensity methods. All equipment was in NATA calibration. Unit 3009634 was field calibrated using a Type 1 Brüel & Kjær 4231 acoustic calibrator (Serial Number: 3025447) while Unit 3030784 was field calibrated using a Brüel & Kjær 4297 intensity probe calibrator (Serial Number: 3342036) before and after measurements and found within the ±0.5 dB(A) requirement for Class 1 instruments. No known changes have occurred at the site impacting noise since these noise measurements were taken.

Measurements were conducted using a simplified field survey methodology consisting of:

– Sound pressure level measurements at distance to sources able to be approximated as point sources
– Sound intensity measurements using scanning method across external building elements such as walls, doors and openings
– Sound intensity measurements of individual noise sources using virtual bounding-box surface

Noise source levels resulting from the measurements are presented in Section 5.2, Table 9.

4. Noise criteria

4.1 Noise Protocol

Noise emissions from commercial, industrial and trade premises should meet the relevant Victorian environmental legislation in relation to noise. The applicable environmental noise legislation in Victoria is EPA Publication 1826.4 *Noise limit and assessment protocol for the control of noise from commercial, industrial and trade premises and entertainment venues* (Noise Protocol).

The Noise Protocol provisions have been incorporated into the Environment Protection Regulations 2021 (EP Regulations), which came into effect with the commencement of the amended Environment Protection Act 2017 on 1 July 2021. EPA Publication 1826.4 provides a protocol for the purpose of determining noise limits for new and existing commercial, industrial and trade premises and entertainment venues as defined by the EP Regulations. It sets the methodology for assessing the effective noise level to determine unreasonable noise under the EP Regulations.

The Noise Protocol prescribes the methodology to determine the maximum effective noise level allowed in a noise sensitive area from any commercial/industrial premises depending on the time period (day, evening, night), land use zoning and existing background noise levels.

There are two main methodologies to determine appropriate environmental noise criteria, which are dependent on the location of the noise sensitive receiver that is being assessed:

– Part I A.1 Noise limits - urban area method, or
– Part I A.2 Noise limits - rural area method

The urban area method must be utilised when the noise sensitive receiver is located within a major urban area and the rural area method is utilised when the noise sensitive receiver is located outside of a major urban area. The major urban area boundary is defined by the Victorian Government[1].

The identified noise sensitive receivers shown in Figure 2 are located outside of a major urban area boundary. As such, the environmental noise criteria should be determined in accordance with the rural area methodology.

4.2 General environmental duty

General Environmental Duty (GED) is prescribed under the Environment Protection Act 2017 and requires that individuals and businesses engaging in activities that could pose risks to human health or the environment from pollution or waste, such as noise, must minimise those risks so far as reasonably practicable such that noise emissions from site activities will not adversely impact the surrounding ambient environment. The assessment of whether noise is unreasonable is a core aspect of the GED. Consideration is given to level, intensity, duration, character, and the time and place of its occurrence.

4.3 EPA Publication 1856 - Reasonably Practicable

EPA Publication 1856 is a guidance document from the Environment Protection Authority Victoria, detailing what constitutes 'reasonably practicable' measures to minimise or respond to risks in compliance with the Environment Protection Act 2017 and GED requirements. It outlines the duties required under the act to minimise the risk of harm to human health and the environment from pollution and waste by using controls that are proportionate to the level of risk, emphasizing the importance of proactive measures over reactive ones.

[1] https://discover.data.vic.gov.au/dataset/major-urban-area-location-polygons-and-table

4.4 EPA Publication 1996 - Noise Guidelines: Assessing low frequency noise.

EPA Publication 1996 is a guideline document for assessing low frequency noise, specifically noise with significant acoustic energy within the range of 10 to 160 Hertz. It provides a framework for understanding and managing low frequency noise emissions from commercial, industrial, and trade premises. The guideline states that is not applicable to music noise from entertainment venues, noise from residential premises or noise from wind turbines.

Assessment using Publication 1996 is separate to assessment for compliance to regulatory limits, which is undertaken as set out in the Environmental Protection Regulations 2021 and the Noise Protocol (Publication 1826.4).

4.5 Environmental noise limits

All identified noise sensitive receivers and the future facility site fall outside of a Major Urban Area and, therefore, the applicable Noise Protocol noise limits should be established in accordance with Part I Section A-2 of the Noise Protocol.

The following steps are followed to determine the applicable noise limits for the site:

- **STEP 1: Determination of the Zone Level** from Table B.1 of the Noise Protocol (EPA Victoria Guideline 1826.4), with PUZ1 *Generation zone* and FZ *Receiving zone.*
- **STEP 2: Distance adjustment levels.** The Noise Protocol stipulates that "*if the noise generator and receiver are not located in land use zones with the same zone code subtract 1 dB for every 100 metres of receiver distance*". 'Receiver distance' is the shortest distance from the receiver to the boundary of the zone in which the noise emitter is located.

  If a distance adjustment is required, the maximum subtraction is 9 dB.
- **STEP 3: Base noise level check**. Check the distance adjusted levels against the Noise Protocol/EP Regulations baseline noise levels for each period during the day and adopt the greater of the two.
- **STEP 4: Background level check and adjustment**. A background level assessment is required where the location of the noise sensitive receivers is considered to be situated within a 'background-relevant area'. 'Background-relevant area' means a noise sensitive area where background levels may be higher than usual for a rural area.

Where a background level assessment is conducted:

- For the day period, adopt the greater of:
  - The distance-adjusted level or base noise level; or
  - The day background level plus 8 dB
- For the evening period, adopt the greater of:
  - The distance-adjusted level or base noise level; or
  - The evening background level plus 5 dB
- For the night period, adopt the greater of:
  - The distance-adjusted level or base noise level; or
  - The night background level plus 5 dB
  - However, must not be greater than 55 dB(A)

Background noise monitoring was conducted for the nearest noise sensitive receivers as described in section 3.1. Also derived noise criteria cannot be less as minimum baseline criteria in accordance with Environment Protection Regulations 2021: Day: 45 dB(A), Evening: 37 dB(A), Night: 32 dB(A).

The applicable zone levels, distance-adjusted levels, and adjustment, and derived noise limits applicable to the site for all identified nearest noise sensitive receivers have been established and are presented in Table 6.

Table 6 Derived noise limits – rural area method

Receiver ID	Zoning levels			Distance adjusted levels			Background noise levels			Derived Noise Limit, L_{Aeq} dB(A)		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
R01, R02, R03	48	43	38	45	40	35	40	34	35	**48**	**40**	**40**
R04	48	43	38	45	40	35	43	39	39	**51**	**44**	**44**
R05	48	43	38	42	37	32	43	39	39	**51**	**44**	**44**
R06	48	43	38	46	41	36	42	40	40	**50**	**45**	**45**

5. Noise impact assessment

5.1 Noise modelling methodology

A computational noise model of the site was developed using Computer Aided Noise Abatement (CadnaA) version 2024 software. The noise model takes into account the existing equipment at the Black Rock WRP and biosolids drying facility sites and the proposed RRON facility. A noise survey was conducted to identify key noise emissions from existing equipment as described in section 3.2.

Noise modelling was undertaken using the ISO 9613-2 (1996) *Acoustics – Attenuation of sound during propagation outdoors* noise prediction algorithm. The ISO 9613-2 (1996) algorithm takes into account sound intensity losses due to distance attenuation, atmospheric absorption and ground absorption. It also takes into account the presence of a well-developed moderate ground based temperature inversion, such as those that commonly occur on clear, calm nights or downwind conditions, which are favourable to sound propagation.

The general noise model parameters used within CadnaA is presented in Table 7.

Table 7 Noise model parameters

Variable	Parameter used
Calculation method	ISO 9613-2 (1996) prediction algorithm
Meteorology	Average temperature of 10˚C Average humidity of 70%
Ground absorption coefficient	0 for hard ground and water bodies within the WRP site, biosolids facility, for the RRON building pad and immediate surrounds. 0.75 for a mix of hard and soft ground elsewhere (0 represents hard ground and 1 represents soft ground)
Reflections	2nd order of maximum reflections
Ground topography	0.5 metre elevation contours for the site and surrounds. Source: 2020-21 Golden plains LiDAR, DELWP. © Commonwealth of Australia (Geoscience Australia). Accessed 2023-09-16 from https://elevation.fsdf.org.au/
Receiver heights	1.5 m above ground level
RRON buildings	Site layout provided by Barwon Water: *Ground plan BN01, prepared by NALG, dated 24-10-2023*
WRP buildings	Footprints from Drawing REF#12446 provided by Barwon Water Heights extracted from Nearmap (December 2023)
Biosolids drying facility buildings	Footprints from Drawing REF#12446 provided by Barwon Water Heights extracted from Nearmap (December 2023)

5.2 Operational noise sources

Noise source sound power levels for a majority of the RRON proposed equipment are not currently available, however, HZI and NALG (the ECI contractors) provided GHD with a combination of indicative equipment details and noise levels in the vicinity of equipment operating at similar facilities. A number of assumptions have been made to convert this information into source inputs for the noise model.

As such, the noise model has been based on the following:

- Updated *Floor Plan BN01* by NALG, *received 23-07-2024*
- Existing equipment noise emissions as described in section 3.2 and presented in Table 9 based on site measurements. This measured equipment is assumed to be the dominant and relevant noise generating equipment for the WRP and Biosolids facility for the purposes of environmental noise assessment to surrounding noise sensitive receivers.
- Assumed equipment and noise levels as part of the upgrade as outlined in Table 8.
- Assumed key noise sources and noise levels for the WRP and Biosolids facility outlined in Table 9 based on measurement and assumptions.
- Sound power levels and spectrums for select equipment as part of the upgrade estimated utilising CadnaA Set-S module and/or methodologies published in *Engineering Noise Control 4th Edition* by David A. Bies and Colin H. Hansen as presented in Table 8.
    - It is noted that these methodologies have been established in the 1980s and were based on equipment available at the time. It is expected that equipment will have been engineered to operate more efficiently and quieter since these methodologies have been established. As such, these estimations are considered conservative.
- Similar equipment with available noise source levels.
- GHD's internal noise source database.
- All plant and equipment operating on a continuous basis.
- Internal noise levels at each façade within RRON building predicted using CadnaR noise software. External radiated noise levels from the RRON building predicted using area sources and material transmission loss.
    - RRON buildings constructed from:
        - Walls (R_W 24) consisting of Kingspan KS1000 or equivalent.
        - Roof (R_W 21) consisting of 0.3 mm polycarbonate (Lexan) or equivalent.
        - RRON automatic roller doors on south and east facing walls assumed to be in open position to provide worst-case assessment.
- External RRON fixed plant (i.e. not located within a building) modelled as point sources.
- Biofilter and Digestate Dryer blower fans are assumed to be enclosed within a steel shed structure (Plant Room, assumed height 4.5 m) with southern roller door in closed position.
    - Interior acoustic energy emitted from Digestate Dryer fans has been evenly split between the Plant Room and Digestate building before propagated to the environment from building exterior walls and roof.
    - Both structures are assumed to be constructed of Colorbond steel or equivalent (Rw20).
- Vehicles modelled as line sources (moving point sources) considering assumed worst-case hourly volumes and a site speed limit of 20 km/h.

The sound power levels and heights for the major noise sources associated with the RRON and utilised within the noise model are presented in Table 8 along with their assumed parameters required to estimate the sound power levels.

Results of the modelling present cumulative noise impact from existing noise sources on the WRP and the Biosolids facility and future onsite noise sources at the RRON facility.

Table 8 RRON modelled operational noise sources

Plant area	Equipment desc.	No.	Sound power level in dB for Octave Band Centre Frequency (Hz)									dB(A)	Comment
			31.5	63	125	250	500	1000	2000	4000	8000		
RRON Building	Gasifier	1	-	-	-	-	89	-	-	-	-	86	Provided by Barwon Water (RFI55). Assumed as 1-metre SPL dB(lin) (500Hz)
RRON Building	Dryer	1	-	-	-	-	101	-	-	-	-	98	Provided by Barwon Water (RFI55). Assumed as 1-metre SPL dB(lin) (500Hz)
RRON Building	Shredder	1	-	-	125	118	117	113	110	107	-	119	Overall SWL dB(A) Provided by Barwon Water (RFI56). Model TDS V20. Spectrum adopted from GHD database, landfill shredder.
RRON Building	Double shaft shredder	1	-	-	118	110	110	106	103	100	-	112	Overall SWL dB(A) Provided by Barwon Water (RFI56). Model TDS 820. Spectrum adopted from GHD database, 'landfill shredder'.
RRON Building	Front end loader	1	-	-	110	101	102	99	93	88	-	104	CAT 938G-IT38H from GHD database, assumed equivalent to CAT950 proposed by Barwon Water.
RRON Building	Screen	1	-	-	101	98	97	97	95	90	-	101	Overall level from MWA Environmental report dated 16 June 2023, provided by Barwon Water. Spectrum adopted from GHD database 'vibrating screen'.
RRON Building	Fan motor	1	-	102	104	104	106	97	94	92	88	105	Provided by Barwon Water (RFI55). Assumed as 1-metre SPL dB(lin) (500Hz)
RRON Digester	Drive motor	1	79	78	84	87	86	85	83	78	74	90	360 kW rating calculated from 7-day PFAD power consumption of 60256 kWh. SWL estimated using CadnaA Set-S: Standard electric motor 50Hz/<1000RPM.
RRON Plant Room	Biofilter and digestate drying fans	6	-	102	104	104	106	97	94	92	88	105	Overall level from MWA Environmental report dated 16 June 2023, provided by Barwon Water. Spectrum adopted from Fantech centrifugal fan type *Blue Rhino SWSI – BRH23-585LS-48* based on operational specifications provided by Barwon Water.
RRON Digestate Building	Front end loader	1	-	-	110	101	102	99	93	88	-	104	CAT 938G-IT38H from GHD database, assumed equivalent to CAT950 proposed by Barwon Water.
RRON carpark	Car door slam	8/		82	84	87	87	87	85	82	78	92	Adopted level from SoundPLAN noise database. Modelled as 8x 1-s duration events during each period (day, evening, night)

Plant area	Equipment desc.	No.	Sound power level in dB for Octave Band Centre Frequency (Hz)									dB(A)	Comment
			31.5	63	125	250	500	1000	2000	4000	8000		
RRON Carpark	Staff carpark	1	-	-	-	-	-	-	-	-	-	83	Modelled using RLS90 method. 8 spaces, 1 event per space/hour.
RRON Carpark	Staff vehicles	4/hr	49	63	69	73	79	81	77	72	64	84	Modelled using moving point source, 4 veh/hr. GHD database ‘car passby 20 km/h’.
RRON FOGO	Truck delivery	5/hr 2/hr	107	107	107	107	104	101	101	93	85	107	Assumed 5/hr (day) and 2/hr (evening) as worst case. Source level “Road Truck” from GHD database. Site speed 20km/h
RRON Carbonisation	Truck export	1/hr	107	107	107	107	104	101	101	93	85	107	Assumed 1/hr (day, evening) as worst case. Source level “Road Truck” from GHD database. Site speed 20km/h

Table 9 WRP and biosolids drying facility modelled operational noise sources

Plant area	Equipment desc.	No.	Sound power level in dB for Octave Band Centre Frequency (Hz)									dB(A)	Comment
			31.5	63	125	250	500	1000	2000	4000	8000		
Biosolids	PelletDrop	1	-	-	-	-	-	-	-	-	-	78	measured 2023-05-11, B&K2270 (3009634)
Biosolids	Biofilter	1	-	-	-	-	-	-	-	-	-	96	measured 2023-05-11, B&K2270 (3009634)
Biosolids	Extract Fan export	1	-	-	-	-	-	-	-	-	-	107	measured 2023-05-11, B&K2270 (3009634)
Biosolids	Extract fan Import	1	-	-	-	-	-	-	-	-	-	106	measured 2023-05-11, B&K2270 (3009634)
Biosolids	CTpump	1	-	-	-	-	-	-	-	-	-	83	measured 2023-05-11, B&K2270 (3009634)
Biosolids	Thermal oil room 2	/sqm	38	48	56	76	71	75	76	72	67	82	measured 2023-05-11, B&K2270 (3030784)
Biosolids	b/w TOR1&2	/sqm	31	34	39	57	55	60	60	55	52	65	measured 2023-05-11, B&K2270 (3030784)
Biosolids	Dryer roller door	/sqm	26	42	46	44	44	49	48	42	31	54	measured 2023-05-11, B&K2270 (3030784)
Biosolids	Dryer wall (whole building)	/sqm	25	41	46	41	45	44	44	37	24	52	measured 2023-05-11, B&K2270 (3030784)
Biosolids	Bio solid storage	/sqm	23	45	48	43	42	44	42	36	25	52	measured 2023-05-11, B&K2270 (3030784)
Biosolids	Cooling tower (one side of 1 tower)	/sqm	29	31	41	54	58	68	65	61	57	71	measured 2023-05-11, B&K2270 (3030784)
Biosolids	Compressor	/sqm	35	45	49	59	65	57	61	61	58	69	measured 2023-05-11, B&K2270 (3030784)
Biosolids	Truck delivery Truck export	2/hr 2/hr	107	107	107	107	104	101	101	93	85	107	Assumed 2/hr as worst case for both import and export. Source level “Road Truck” from GHD database. Site speed 20km/h
WRP	Class A mixing pump	1	60	65	57	56	67	70	69	57	52	74.1	measured 2023-05-11, B&K2270 (3030784)
WRP	Class A blend pump 1	2	66	71	64	63	70	70	66	81	68	83	measured 2023-05-11, B&K2270 (3030784)
WRP	RO permeate pump 1&2	2	63	64	64	70	75	75	72	67	71	80	measured 2023-05-11, B&K2270 (3030784)
WRP	Ancillary DS walls	/sqm	28	37	47	54	57	60	62	54	35	66	measured 2023-05-11, B&K2270 (3030784)

Plant area	Equipment desc.	No.	Sound power level in dB for Octave Band Centre Frequency (Hz)									dB(A)	Comment
			31.5	63	125	250	500	1000	2000	4000	8000		
WRP	Louvre	/sqm	34	40	56	68	78	84	83	68	56	87	measured 2023-05-11, B&K2270 (3030784)
WRP	Blowers	/sqm	36	50	65	77	81	82	80	71	63	87	measured 2023-05-11, B&K2270 (3030784)
WRP	Roller door on west	/sqm	27	40	51	45	50	52	48	40	29	57	measured 2023-05-11, B&K2270 (3030784)
WRP	Class A RO Train	/sqm	19	25	29	41	56	62	66	67	61	71	measured 2023-05-11, B&K2270 (3030784)
WRP	High pressure pump	/sqm	38	36	57	66	73	71	72	80	78	83	measured 2023-05-11, B&K2270 (3030784)
WRP	Class A roller door	/sqm	18	25	34	36	41	49	50	46	37	54	measured 2023-05-11, B&K2270 (3030784)
WRP	Class A outside wall	/sqm	30	37	39	38	39	46	47	41	34	51	measured 2023-05-11, B&K2270 (3030784)
WRP	Class A louvres (front)	/sqm	27	35	44	55	55	51	41	41	33	59	measured 2023-05-11, B&K2270 (3030784)
WRP	Class A roller door	/sqm	20	29	41	48	50	51	45	46	42	56	measured 2023-05-11, B&K2270 (3030784)
WRP	Class A louvres (back)	/sqm	24	35	46	55	56	55	45	42	35	61	measured 2023-05-11, B&K2270 (3030784)
WRP	Class A concrete wall	/sqm	21	19	36	47	46	43	37	36	29	51	measured 2023-05-11, B&K2270 (3030784)
WRP	Class A door (back)	/sqm	20	19	33	40	40	41	35	40	33	47	measured 2023-05-11, B&K2270 (3030784)
WRP	Class A mixing pump	/sqm	21	39	41	47	64	70	71	58	51	74	measured 2023-05-11, B&K2270 (3030784)
WRP	Class A blend pump 1	/sqm	27	45	48	54	67	70	68	82	67	83	measured 2023-05-11, B&K2270 (3030784)
WRP	RO permeate pump 1&2	/sqm	23	38	48	61	72	75	73	68	70	80	measured 2023-05-11, B&K2270 (3030784)
WRP	Building louvre	/sqm	17	36	47	54	50	47	53	57	41	60	measured 2023-05-11, B&K2270 (3030784)
WRP	Building wall	/sqm	19	29	34	48	38	35	32	35	33	49	measured 2023-05-11, B&K2270 (3030784)

Plant area	Equipment desc.	No.	Sound power level in dB for Octave Band Centre Frequency (Hz)									dB(A)	Comment
			31.5	63	125	250	500	1000	2000	4000	8000		
WRP	Building roller door	/sqm	20	30	38	47	53	52	54	55	46	60	measured 2023-05-11, B&K2270 (3030784)
WRP	Septic wall	/sqm	22	30	35	46	46	50	47	34	14	54	measured 2023-05-11, B&K2270 (3030784)
WRP	Septic roller door	/sqm	23	33	45	53	57	60	56	42	30	64	measured 2023-05-11, B&K2270 (3030784)
WRP	Septic window	/sqm	20	33	47	62	65	66	62	52	42	70	measured 2023-05-11, B&K2270 (3030784)
WRP	Septic pipe	/sqm	24	37	47	60	68	72	61	50	45	74	measured 2023-05-11, B&K2270 (3030784)
WRP	Microbiological	/sqm	23	40	52	53	59	65	55	52	44	67	measured 2023-05-11, B&K2270 (3030784)
WRP	Biosolid dewatering roller	/sqm	19	29	41	41	45	50	46	43	31	54	measured 2023-05-11, B&K2270 (3030784)
WRP	Biosolid dewatering wall	/sqm	23	33	35	37	41	43	42	37	30	48	measured 2023-05-11, B&K2270 (3030784)
WRP	Sludge pump large door	/sqm	22	30	37	51	54	51	51	46	38	59	measured 2023-05-11, B&K2270 (3030784)
WRP	Sludge pump louvre	/sqm	23	40	54	58	61	63	61	60	51	68	measured 2023-05-11, B&K2270 (3030784)
WRP	Staff vehicles	15/hr	49	63	69	73	79	81	77	72	64	84	Modelled using moving point source, 4 veh/hr. GHD database ‘car passby 20km/h’.

5.3 Predicted noise levels

Predictions have been made for likely worst-case noise emissions with all identified fixed noise sources operating simultaneously over a 30-minute period. Transitory and moving noise sources, such as site vehicles and trucks, were modelled as moving point sources that consider the anticipated number of movements and site speeds.

The predicted noise contours for the cumulative operation of the WRP, biosolids facility and RRON are presented in Figure 4. Table 10 shows that the RRON and cumulative noise impact scenarios are predicted to comply with the strictest night-time criteria without additional noise mitigation measures.

Table 10 Predicted operational noise levels at WRP and RRON

Receiver	RRON Only	WRP, Biosolids and RRON (Cumulative)	Noise Protocol noise limit, L_{eq} dB(A)			Compliance
	L_{eq} dB(A)	L_{eq} dB(A)	Day	Evening	Night	
R01	28	29	**48**	**40**	**40**	✓
R02	29	35	**48**	**40**	**40**	✓
R03	27	34	**48**	**40**	**40**	✓
R04	24	32	**51**	**44**	**44**	✓
R05	26	33	**51**	**44**	**44**	✓
R06	29	34	**50**	**45**	**45**	✓

It is to be noted that noise levels presented in Table 10 for day, evening and night period are based on a single conservative operating scenario and it is likely that night time levels in particular will be significantly lower than those presented. This is due to the primary contributing site noise source at receivers to the north being the Import and Export extraction fans from the Biosolids facility, which only operate as-needed for generally short durations during vehicle loading and unloading activities. Furthermore, deliveries and other truck movements are expected to generally occur during the daytime period.

Based on the outcome of noise modelling and with consideration to the assumptions stated in this assessment, cumulative noise emissions from the proposed RRON and existing adjacent WRP and Biosolid facility are predicted to meet noise limits at all affected receivers during the day, evening and night periods.

5.3.1 Characteristic noise penalties

Penalties may be applied to noise from an industrial source which contains annoying characteristics in accordance with the procedures of Section 3.4 of the Noise Protocol.

Tonality: A 2 dB(A) penalty would apply when the tonal character of the noise is just detectable, and a 5 dB(A) penalty would apply when the tonal character of the noise is prominent.

As this assessment has been based on a number of assumptions, further information on selected equipment would be required to conduct an in-depth analysis for any tonality penalty.

It is noted that the existing operations is not audible at the nearest noise sensitive receivers (during monitoring). However, there is a risk that the actual selected equipment for the upgrade may exhibit tonal or other characteristics that may evoke adjustment under the Noise Protocol.

Should a 2 dB(A) or 5 dB(A) characteristic noise penalty apply to RRON noise sources, predicted operational noise levels are not anticipated to exceed the relevant limits due to the low relative noise contribution at sensitive receivers from the proposed RRON site.

5.3.2 Low frequency noise

Prediction of low frequency noise (LFN) is discussed in EPA Publication 1996 (Noise Guidelines: Assessing low frequency noise), which acknowledges that calculation can be problematic and of limited accuracy. The following Table 11 presents key issues in LFN assessment and how this assessment has addressed them.

Table 11 Predicting low frequency noise

Issue	How this has been addressed
Manufacturer, supplier or client noise data does not typically extend to the full low-frequency range (to 10Hz)	Where specifications do not include lower frequencies, these have been extrapolated to 25Hz 1/3-Octave band using the conservative approach presented in Publication 1996 - *"use a flat value when the frequency spectrum trend shows a reduction in noise as frequency decreases"*
Manufacturer, supplier or client noise data may be 1/1-Octave instead of 1/3-Octave band as required in the LFN assessment.	1/1 Octave band source data was extrapolated to 1/3 octave spectra using equal energy spread across each of the three bands. Where lower range was missing, extrapolation was conducted as per the item above.
Manufacturer, supplier or client noise data may be broadband.	Noise spectra for these noise sources was either obtained from similar equipment or calculated from engineering formula and then normalised to the overall supplied broadband level.
Propagation calculation and prediction limitations	Indoor noise levels were evaluated in 1/1 Octave bands for dominant sources. Re-radiated noise levels were handled in CadnaA as 1/3 Octave bands as per the above interpolation/extrapolation methods. Environmental propagation was undertaken for 1/3octave bands down to 25Hz. This is deemed appropriate based on the guidance in Publication 1996 which suggests that frequencies 25Hz and below can be discarded where overall C-weighted noise level is less than or equal to 54 dB(C). (see Table 12 below)

Evaluation guides whether 1/3 Octave bands are able to be excluded from the assessment and the number of bands discarded.

Table 12 Publication 1996 – Overall 'C' weighted levels below which the given 1/3 octave band can be discarded

Overall C weighted levels below which the given 1/3 octave bands can be discarded						
Overall C-frequency weighted level L_C	> 76 dB(C)	≤ 76 dB(C)	≤ 71 dB(C)	≤ 66 dB(C)	≤ 60 dB(C)	≤ 54 dB(C)
One-third octave band that can be discarded	None	10 Hz	10 Hz and 12.5 Hz	10 Hz to 16 Hz	10 Hz to 20 Hz	10 Hz to 25 Hz

Overall C-weighted noise levels from the site as predicted at nearby noise sensitive receivers are presented below. Extrapolation of low-frequency spectral content was undertaken as outlined in Table 11. As indicated, C weighted noise levels are predicted to be less than 54dB(C) at nearby noise sensitive receivers, therefore 1/3 octave band frequencies 25Hz and below can be discarded in the LFN assessment.

Table 13 Overall predicted C-weighted noise levels

Receiver:	R1	R2	R3	R4	R5	R6
Overall C-frequency weighted level L_C	42	44.2	44.9	41.8	42.8	44.9

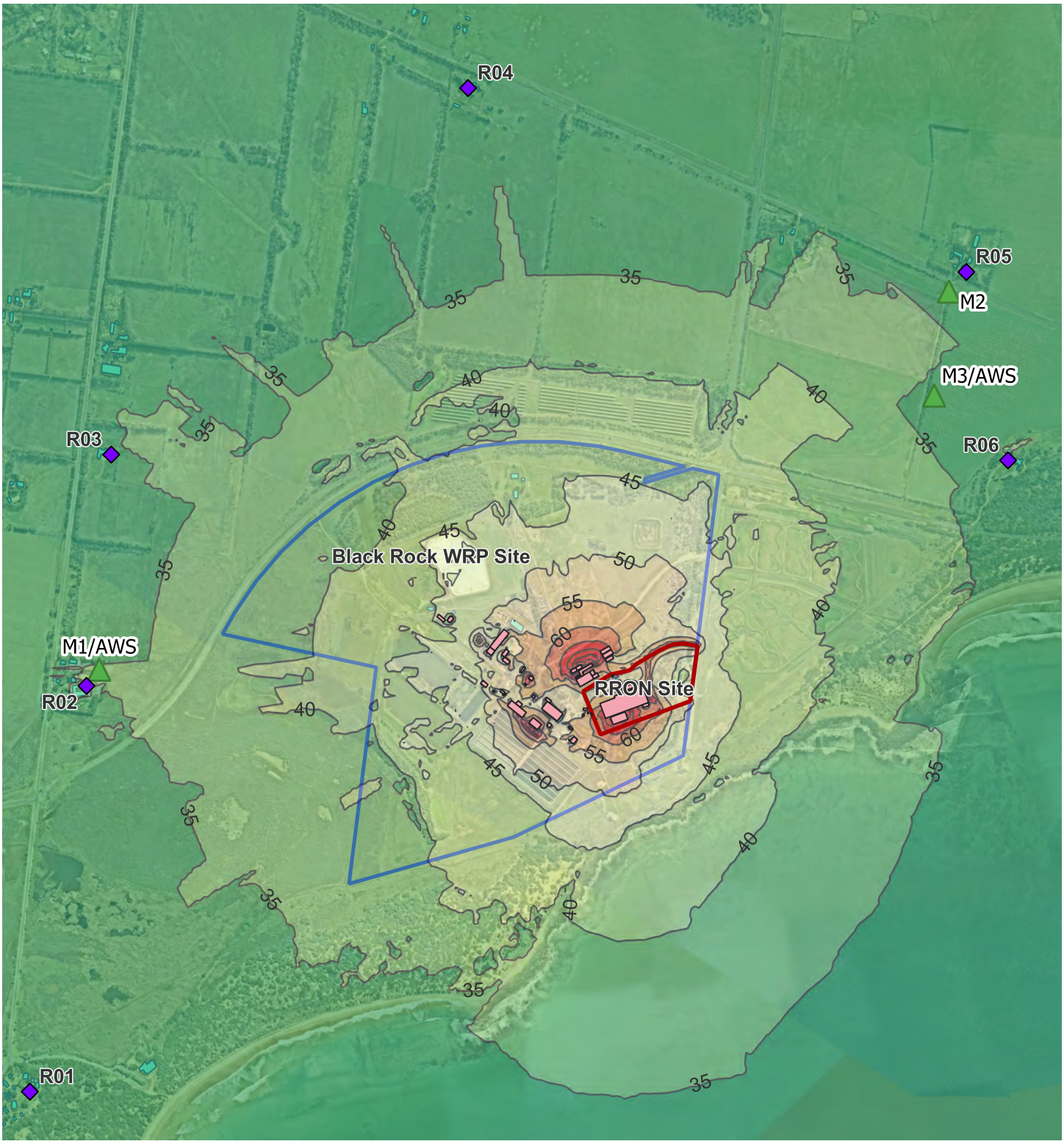
To assess low frequency noise, predicted noise levels from the site are compared against the outdoor thresholds from Publication 1996. These thresholds are compared against predicted 1/3-Octave band spectra for the cumulative site consisting of the existing and proposed operations.

Table 14 Publication 1996: Outdoor one-third octave low frequency noise threshold levels from 10 Hz to 160 Hz

1/3 Octave band (Hz)	10	12.5	16	20	25	31.5	40	50	63	80	100	125	160
L_{eq} (dB)	92	89	86	77	69	61	54	50	50	48	48	46	44
Receiver	Predicted noise level 1/3-Octave band, L_{eq} (dB)												
R01	Excluded by C-weighting assessment					33	33	32	32	32	34	34	32
R02						34	34	33	33	33	36	35	34
R03						37	37	36	36	36	35	34	33
R04						33	33	31	31	31	33	33	31
R05						33	33	32	32	32	34	34	33
R06						36	36	35	35	35	36	36	35

Modelling results presented in Table 14 indicate that low frequency noise is expected to be below the Publication 1996 thresholds. While compliance is expected, this relies on a number of assumptions regarding the operational noise sources as discussed in this report.

Therefore, additional review is recommended to be conducted during detailed design and procurement stages where source noise specifications are checked against the assumptions stated in this report. If found to be higher in source level or found to contain low frequency, tonality or other undesirable noise characteristics, then an updated assessment of impacts is recommended. This is recommended to be included as a requirement for the Contractor procuring the equipment to confirm.



Legend

- Black Rock WRP site
- RRON site
- Sensitive receptors

Predicted operational noise levels, dB(A) LAeq, 1.5mAGL

- 35.000
- 40.000
- 45.000
- 50.000
- 55.000
- 60.000
- 65.000

Paper Size ISO A4

0 0.1 0.2 0.3 0.4 0.5 km

Map Projection: Transverse Mercator
Horizontal Datum: GDA2020
Grid: GDA2020 MGA Zone 55

N

Barwon Water

RRON Noise Assessment

Operational noise contours WRP, Biosolids, RRON (cumulative scenario)

Project No. **12585384**
Revision No. **C**
Date. **13/08/2024**

FIGURE 4

Print Date: 13/08/2024

Data Source: GHD, Geoscape | Imagery: Nearmap Aus Latest 2023-12-13 2024.
Created By: SR

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6. Mitigation measures

Based on the results of the noise impact assessment, cumulative operational noise is expected to comply with the relevant Noise Protocol noise limits at all noise sensitive receivers during the day, evening and night periods.

As the assessment has been based on a number of assumptions, further information on selected equipment would be required to conduct an in-depth analysis for any characteristic noise penalties or excess low frequency noise at the nearest noise sensitive receivers.

Therefore, at subsequent design and procurement stages for the RRON facility, the following design aspects should have careful consideration during the selection of plant and equipment:

– Minimising the generation of sound energy
– Minimising the objectionable characteristics of the sound through selection or design equipment to minimise any tonal or other noise characteristics that may evoke penalty in accordance with the Noise Protocol and/or with consideration to low frequency noise thresholds outlined in Publication 1996
– Sound power for final choice of equipment should not exceed the assumed sound power levels summarised in Table 8
– If noise generating equipment is proposed that is not listed in Table 8, an updated assessment is recommended
– Reducing sound energy using noise mitigation such as sound absorption, acoustic enclosures, local noise barriers and the like
– Increasing the acoustic performance of building/enclosure facades
– Appropriate location of any louvres for building/enclosures

It is noted that as the design progresses and further information on selected equipment becomes available, any specific operational noise mitigation measures required for the site can be specified. It is therefore recommended that a review of site noise emissions be undertaken during subsequent design and procurement stage to enable appropriate noise mitigation measures to be considered in the design where relevant.

6.1 Operational management measures

As part of the operation of the RRON facility the following mitigation measures will be adopted to minimise noise levels as far as practical:

– Pre-treatment building roller doors are automatic and operate on sensors
– Ensure mobile plant used is fitted with silencers
– Ensure all machinery, plant and equipment is maintained in proper working order in accordance with the manufacturer’s requirements
– Maintain the effectiveness of any noise suppression equipment on plant at all times and ensure defective plant is not used operationally until fully repaired
– Avoidance of noisy activities at night, if possible
– Enforcing speed limits for trucks entering and exiting the facility
– Assess noise emissions and implement actions to ensure compliance with the relevant conditions of the Development Licence

The above measures are captured in the Environmental Management Plan framework (refer Appendix G of the main application).

7. Conclusion

A noise impact assessment has been undertaken by GHD for the proposed RRON located at Blackrock Road, Connewarre. The existing WRP and biosolids drying facility also contribute to noise impact in the area. Therefore, cumulative noise impact was assessed for the most conservative operational scenario assuming simultaneous operation of key site noise sources.

Unattended noise measurements were undertaken to quantify the existing ambient noise environment at noise sensitive receivers in the vicinity of the WRP and Biosolids facility.

Operational noise limits have been established in accordance with the provisions of the EPA Publication 1826.4 – Noise Protocol (EPA Victoria, 2021), with the most stringent night-time noise limits ranging 37 – 42 dB(A) at the nearest identified noise sensitive receivers.

Due to the limited available information on equipment for the proposed RRON facility, a number of assumptions and sound power level estimations have been utilised to provide a conservative operational noise assessment.

The operational noise levels from the proposed RRON facility were predicted to comply with the established relevant Noise Protocol noise limits at each identified noise sensitive receivers without additional noise mitigation measures. The noise model assumed that all identified major noise sources operate simultaneously in conjunction with the existing WRP and biosolids facilities.

No characteristic noise penalties were considered in the predicted noise levels. It is noted that the existing operations were not audible during noise logger deployment or retrieval at the noise monitoring locations.

As the assessment has been based on a number of assumptions, further information on selected equipment would be required to conduct an in-depth analysis for any noise character penalty. Therefore, additional review is recommended to be conducted during detailed design and procurement stages where source noise specifications are checked against the assumptions stated in this report. If found to be higher in source level or found to contain low frequency, tonality or other undesirable noise characteristics, then an updated assessment of impacts is recommended. This is recommended to be included as a requirement for the contractor procuring the equipment to confirm.

In-principle noise management measures have been provided to assist to minimise noise from the operation of the site with the proposed upgrade to satisfy the general environmental duty.

It is also recommended that noise measurements should be taken from equipment operating under typical conditions during the RRON facility commissioning in order to evaluate compliance with the site specific noise criteria established in this report.

Appendices

Appendix A

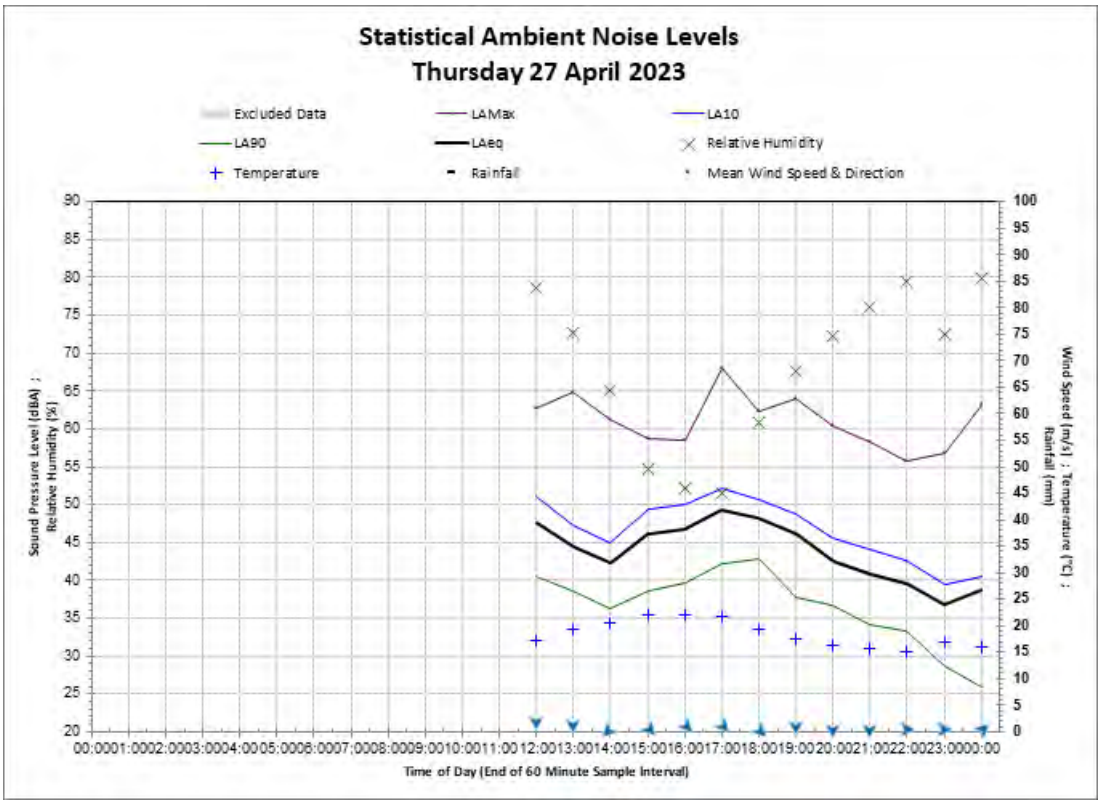
Noise monitoring results

Logger location M1

Table A1 Logger location M1 daily noise levels

Date	ABL Day L90	ABL Evening L90	ABL Night L90	Leq Day	Leq Evening	Leq Night
Thursday-27-Apr-23	39.9	35.4	28.9	46.9	43.0	38.2
Friday-28-Apr-23	39.8	34.0	35.1	47.4	42.1	42.4
Saturday-29-Apr-23	39.3	33.9	41.9	47.6	41.6	46.2
Sunday-30-Apr-23	37.6	35.9	42.4	47.7	43.2	45.6
Monday-1-May-23	38.7	33.9	31.2	48.0	40.6	38.7
Tuesday-2-May-23	42.1	31.0	30.8	48.1	41.2	42.9
Wednesday-3-May-23	43.6	35.6	37.3	50.0	42.3	42.6
Thursday-4-May-23	37.4	27.9	23.5	46.2	41.3	38.5
Friday-5-May-23	40.7	33.1	36.9	49.4	42.5	43.1
Saturday-6-May-23	41.2	38.7	41.1	48.1	44.5	45.6
Sunday-7-May-23	41.5	39.8		49.4	44.9	
Leq Overall				48.2	42.7	43.2
RBL Weekday	**40.3**	**33.0**	**32.0**			
RBL Weekday + Saturday	**40.3**	**33.7**	**34.1**			
RBL Sunday only	**39.6**		**42.4**			

M1 Charts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Temperature
Rainfall
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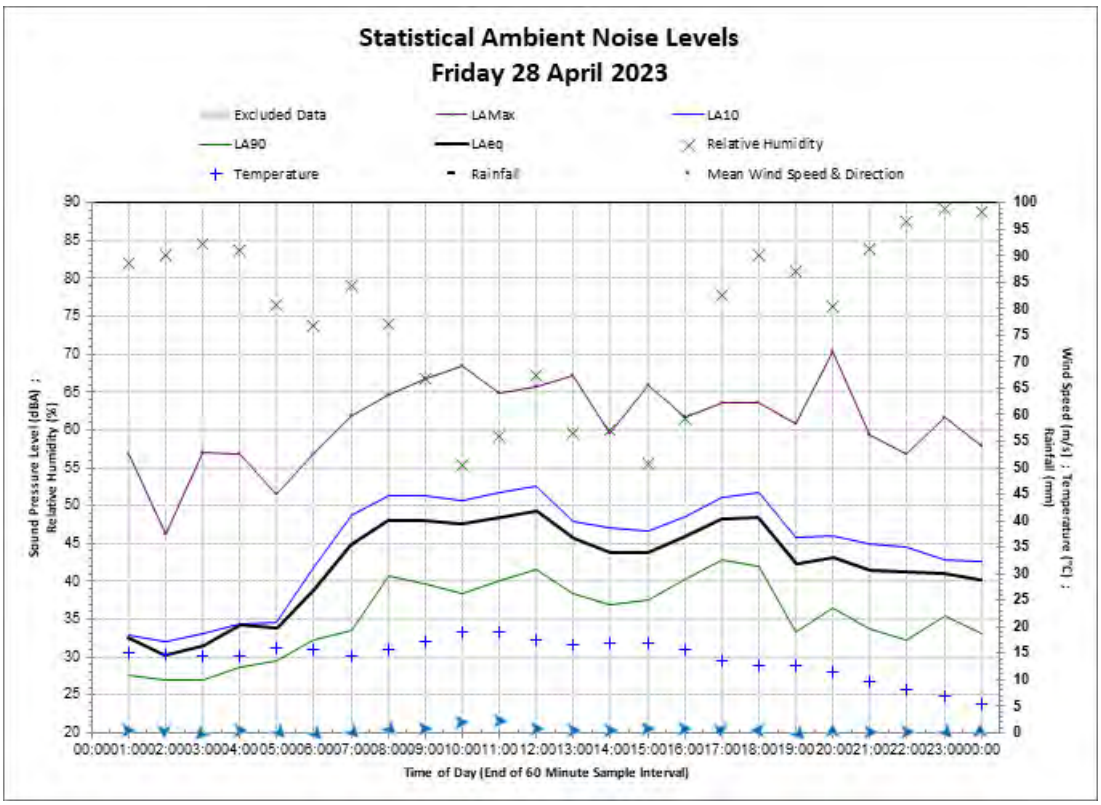
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 60 Minute Sample Interval)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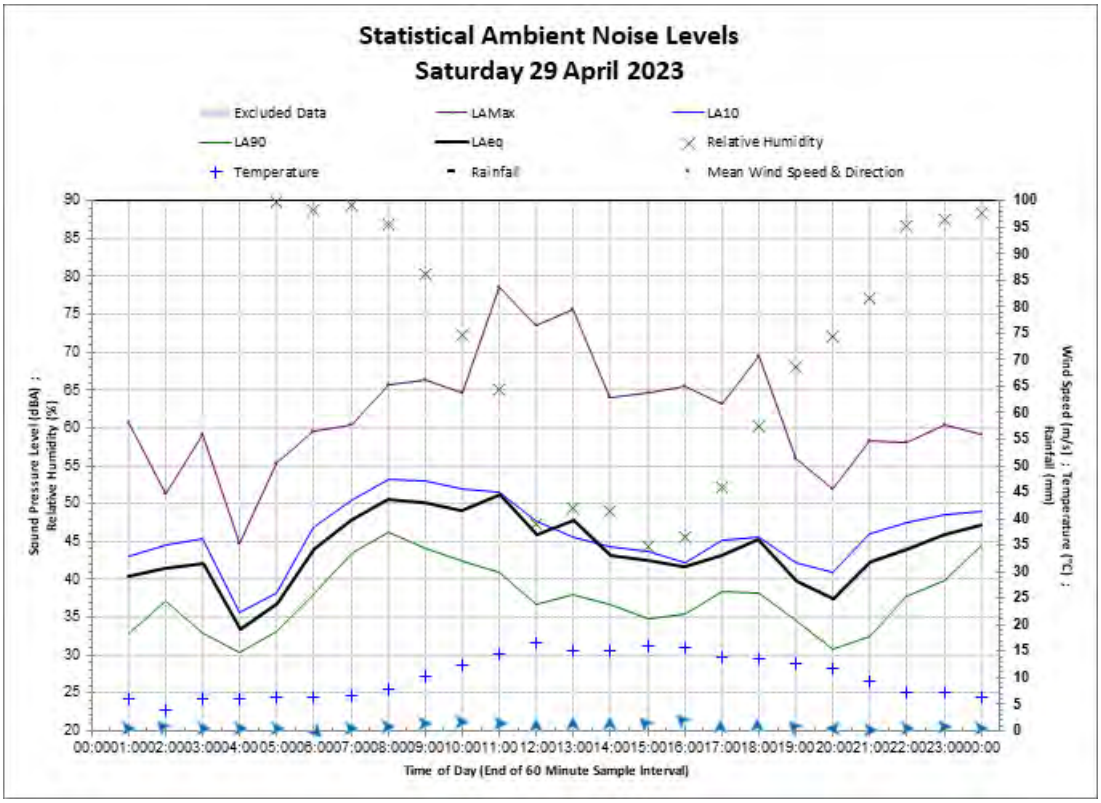
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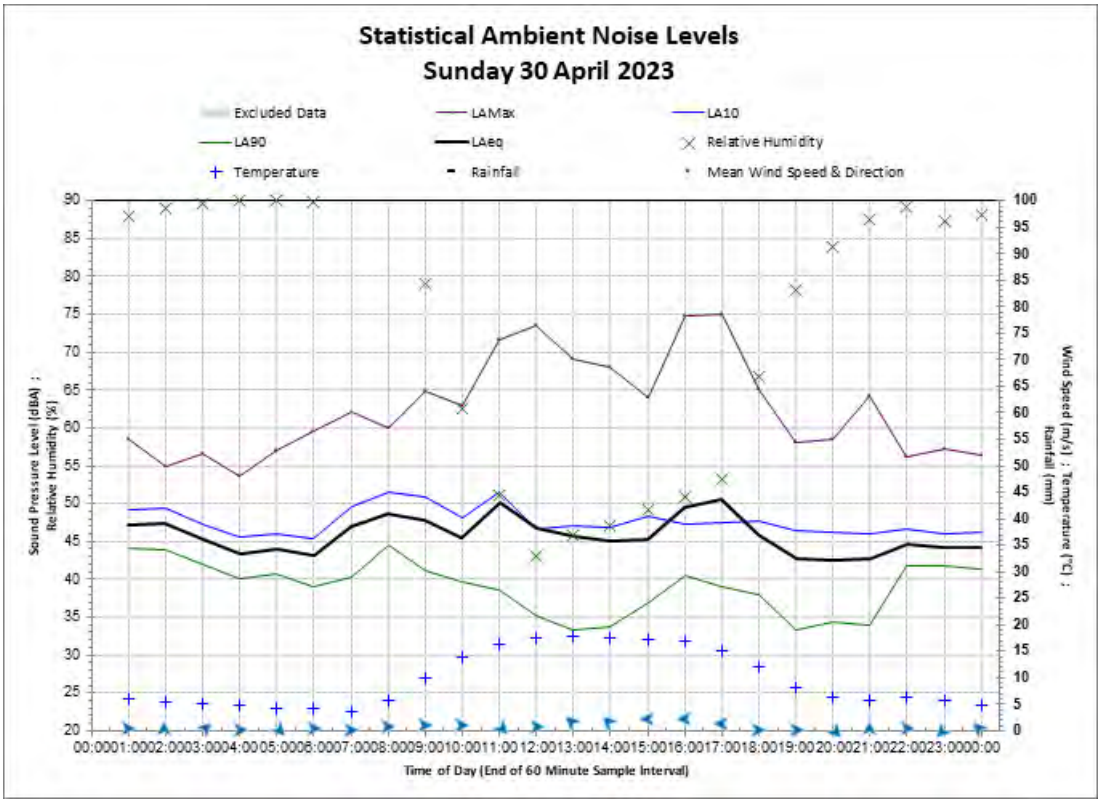
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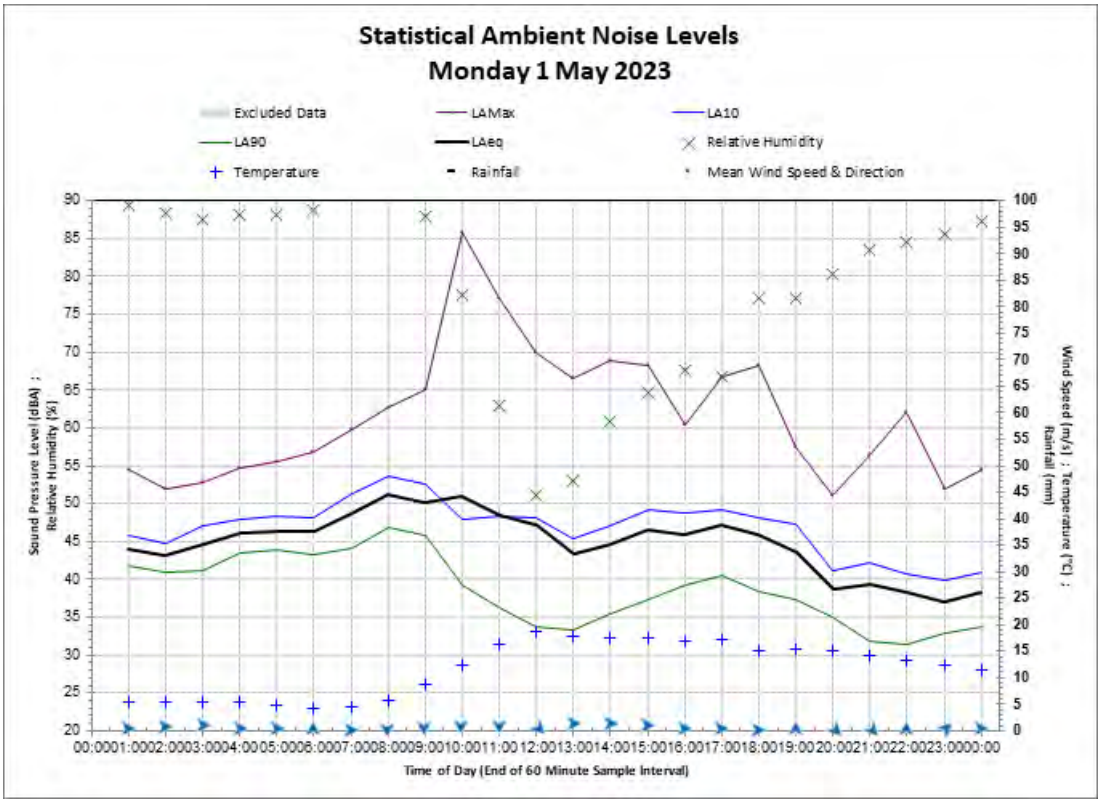
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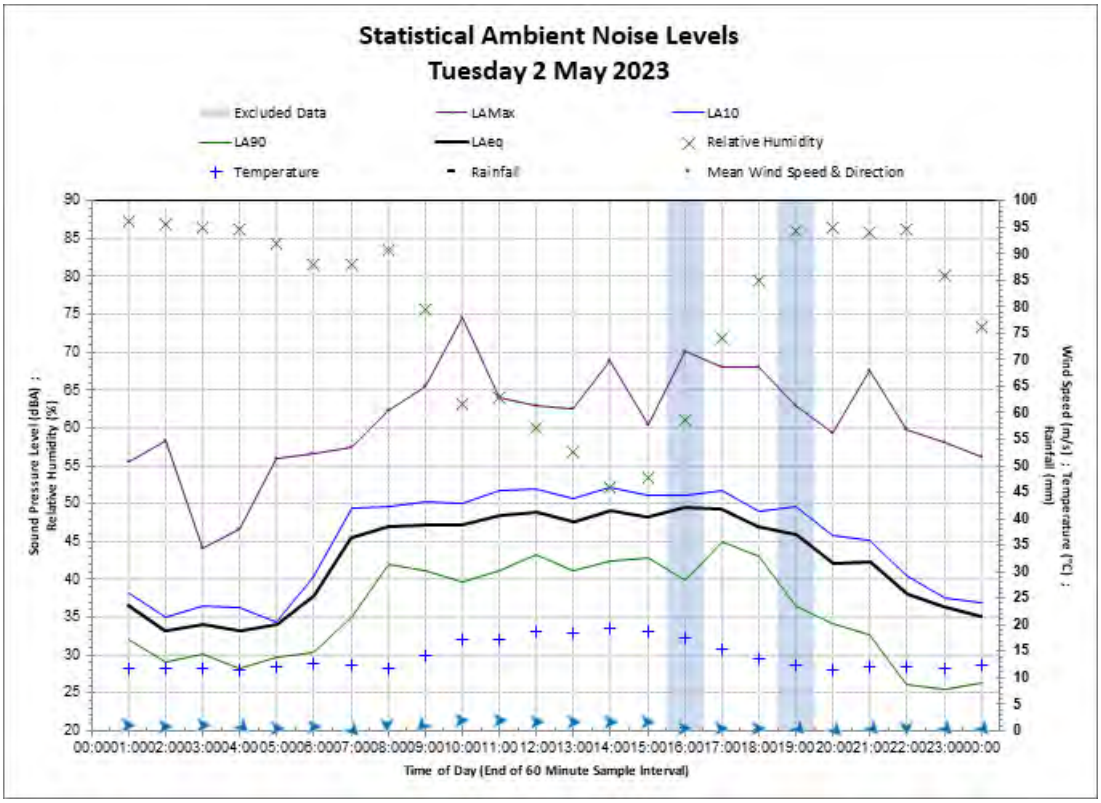
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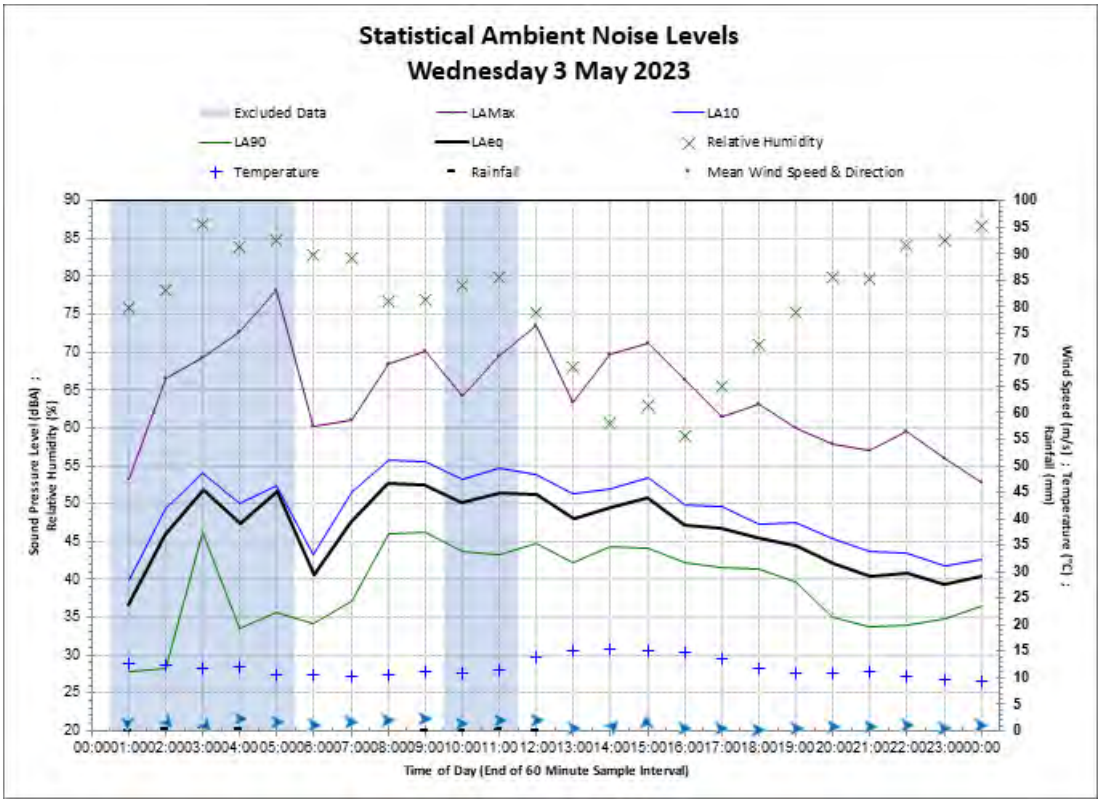
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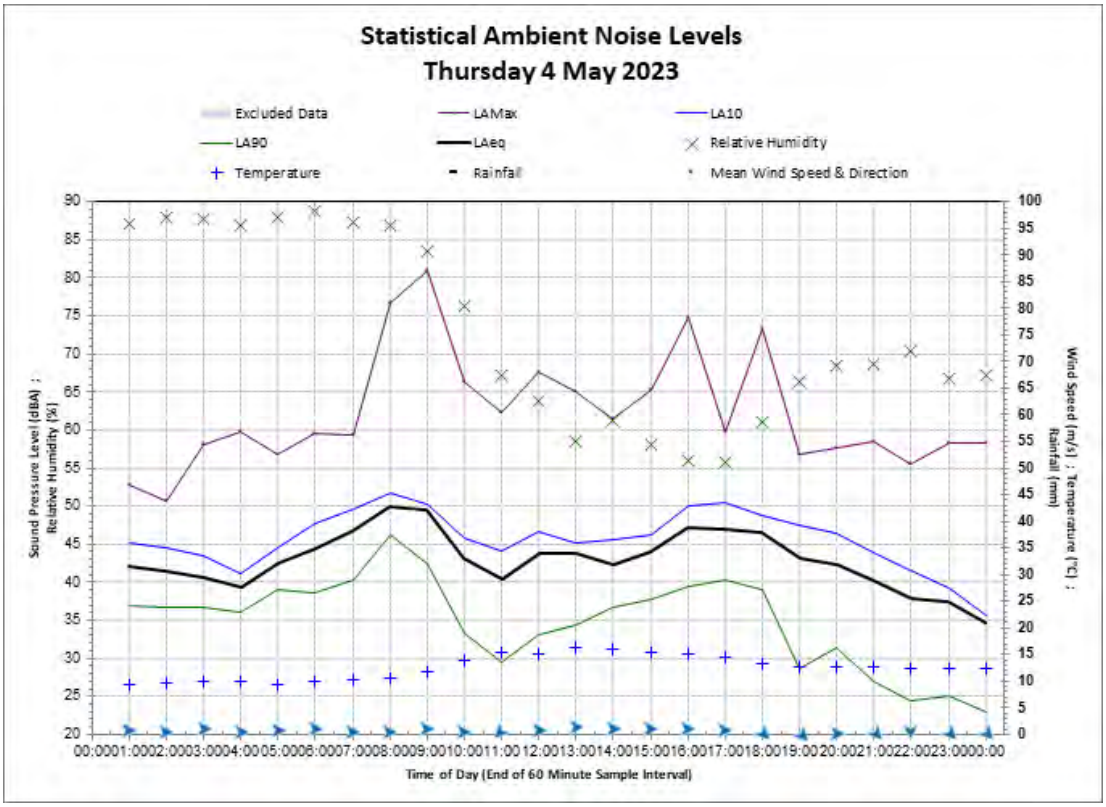
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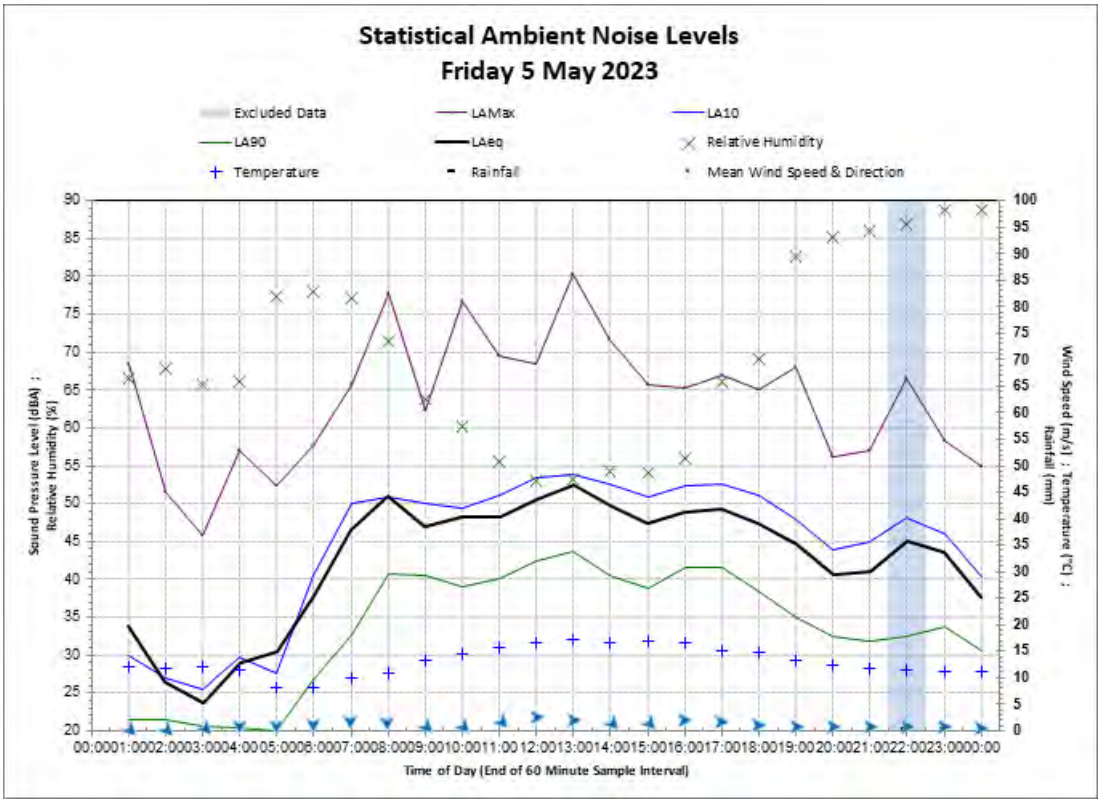
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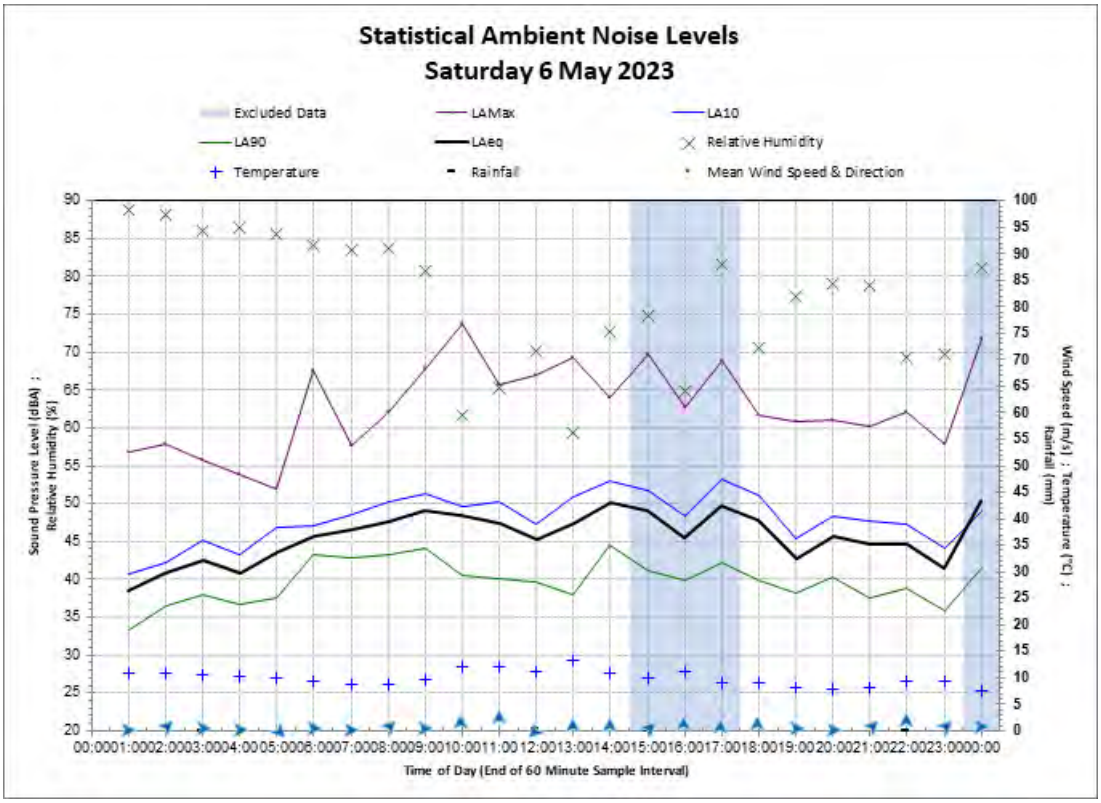
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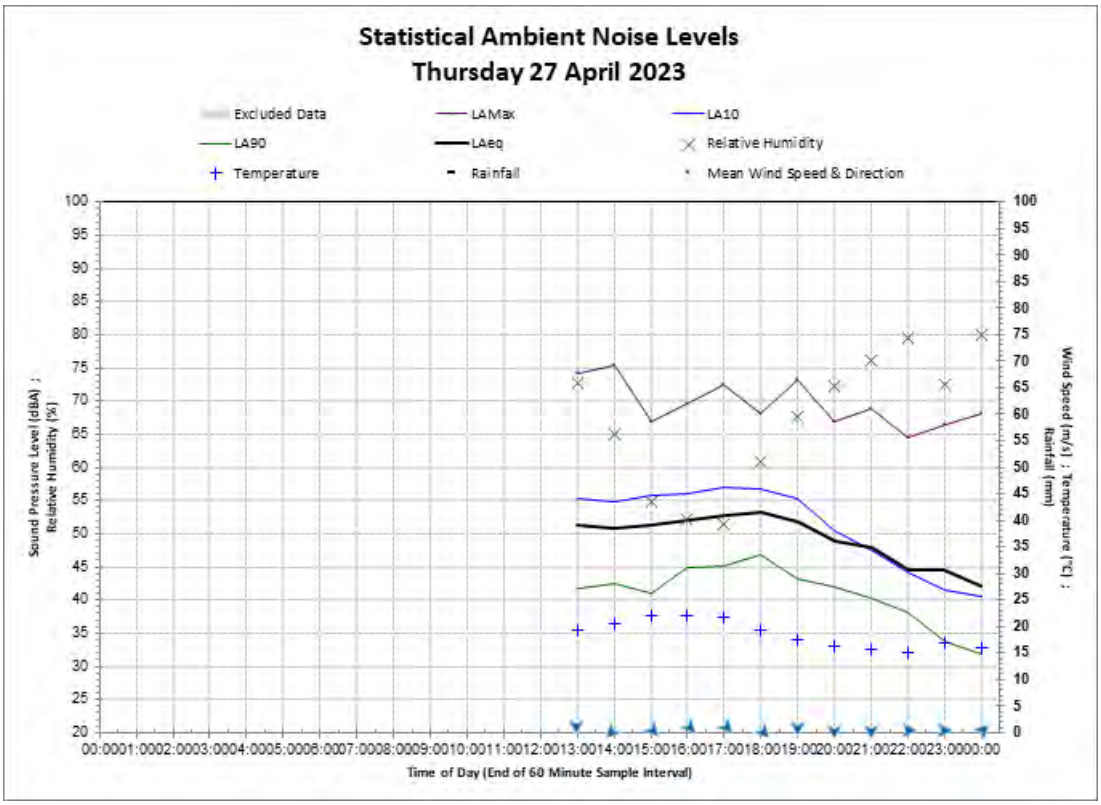
Logger location M2

Table A2 Logger location M3 daily noise levels

Date	ABL Day L90	ABL Evening L90	ABL Night L90	Leq Day	Leq Evening	Leq Night
Thursday-27-Apr-23	43.7	40.9	32.5	52.0	49.0	44.8
Friday-28-Apr-23	44.4	39.6	39.8	53.6	48.9	46.5
Saturday-29-Apr-23	42.5	39.9	46.8	56.2	51.6	52.5
Sunday-30-Apr-23	40.5	40.4	47.8	56.5	49.0	52.0
Monday-1-May-23	41.6	38.4	37.1	54.4	46.9	45.3
Tuesday-2-May-23	45.6	36.3	35.6	54.5	47.1	47.4
Wednesday-3-May-23	48.2	40.0	40.4	56.8	48.2	45.0
Thursday-4-May-23	40.3	32.6	26.7	54.3	46.0	42.7
Friday-5-May-23	43.5	37.7	39.6	55.4	47.5	46.2
Saturday-6-May-23	43.9	41.0	43.5	54.5	48.3	49.2
Sunday-7-May-23	43.9	43.6	43.0	52.7	50.5	48.1
Monday-8-May-23	43.9	40.1	42.6	55.3	47.3	49.9
Tuesday-9-May-23	47.6	43.0	40.8	55.3	48.2	45.9
Wednesday-10-May-23	42.1	38.7	36.3	51.1	45.1	44.7
Thursday-11-May-23	40.8			54.1		
Leq Overall				**54.7**	**48.4**	**48.1**
RBL Weekday	**43.8**	**38.7**	**37.1**			
RBL Weekday + Saturday	**43.7**	**39.0**	**38.5**			
RBL Sunday only	**42.2**		**45.4**			

M2 Charts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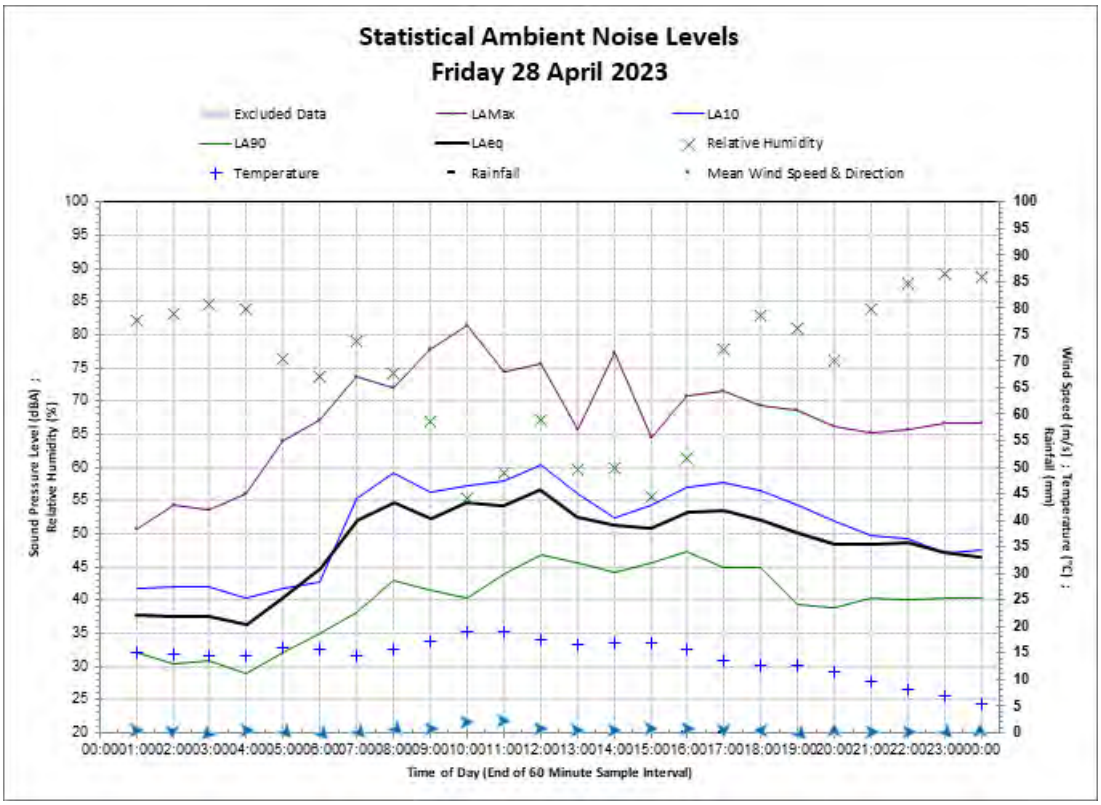
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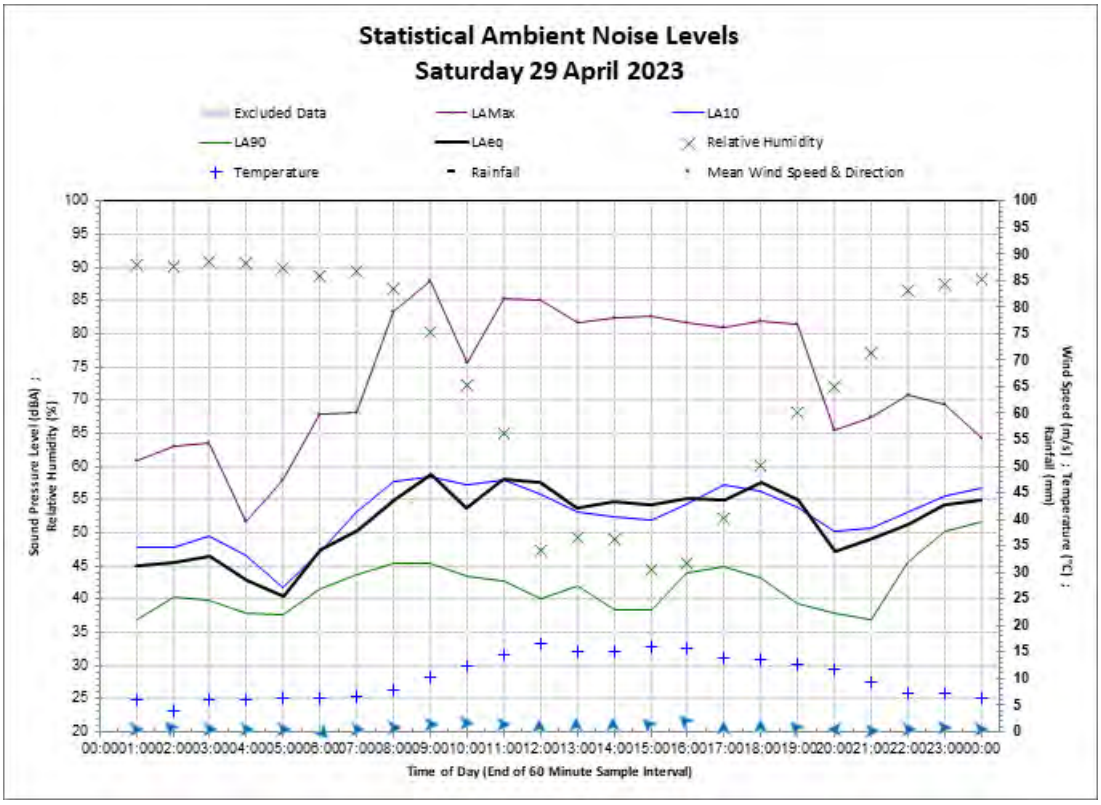
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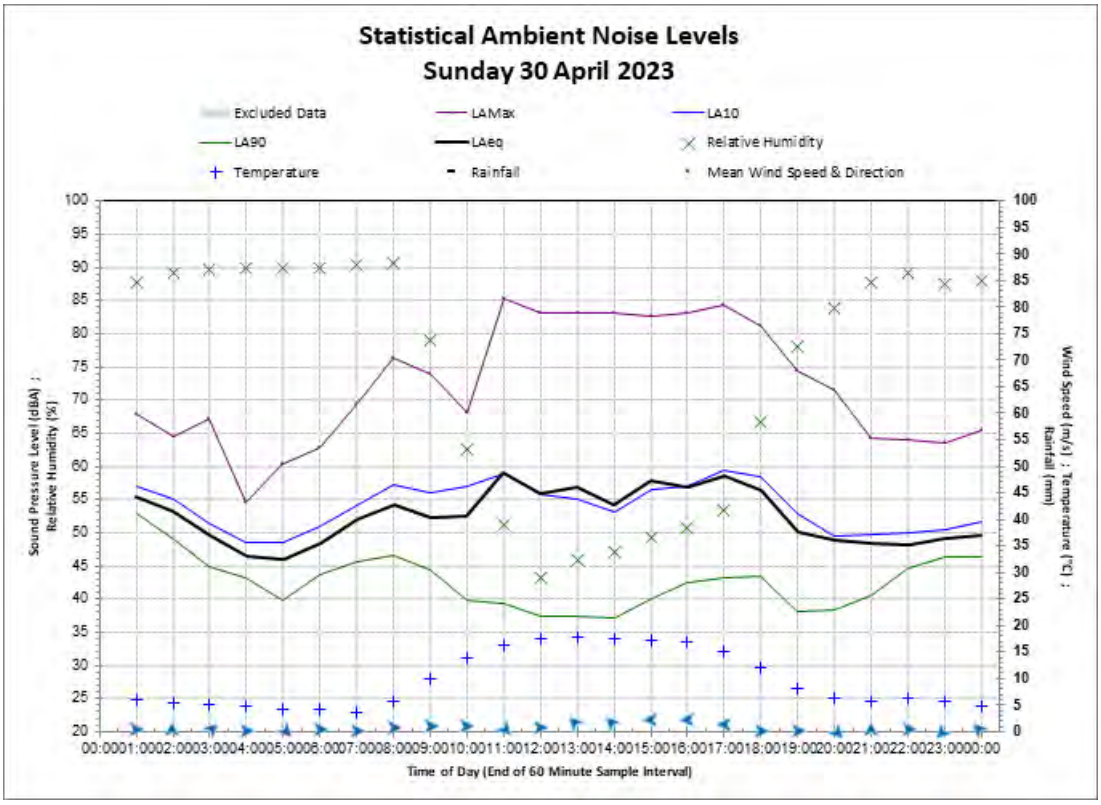
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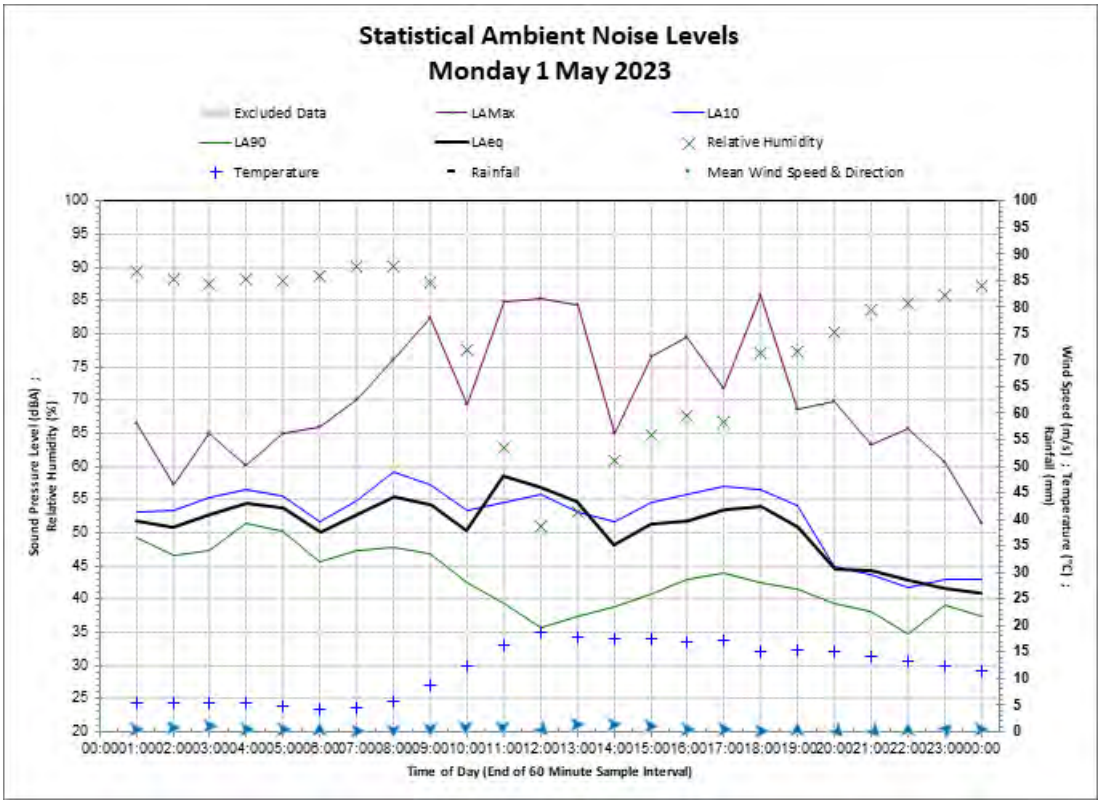
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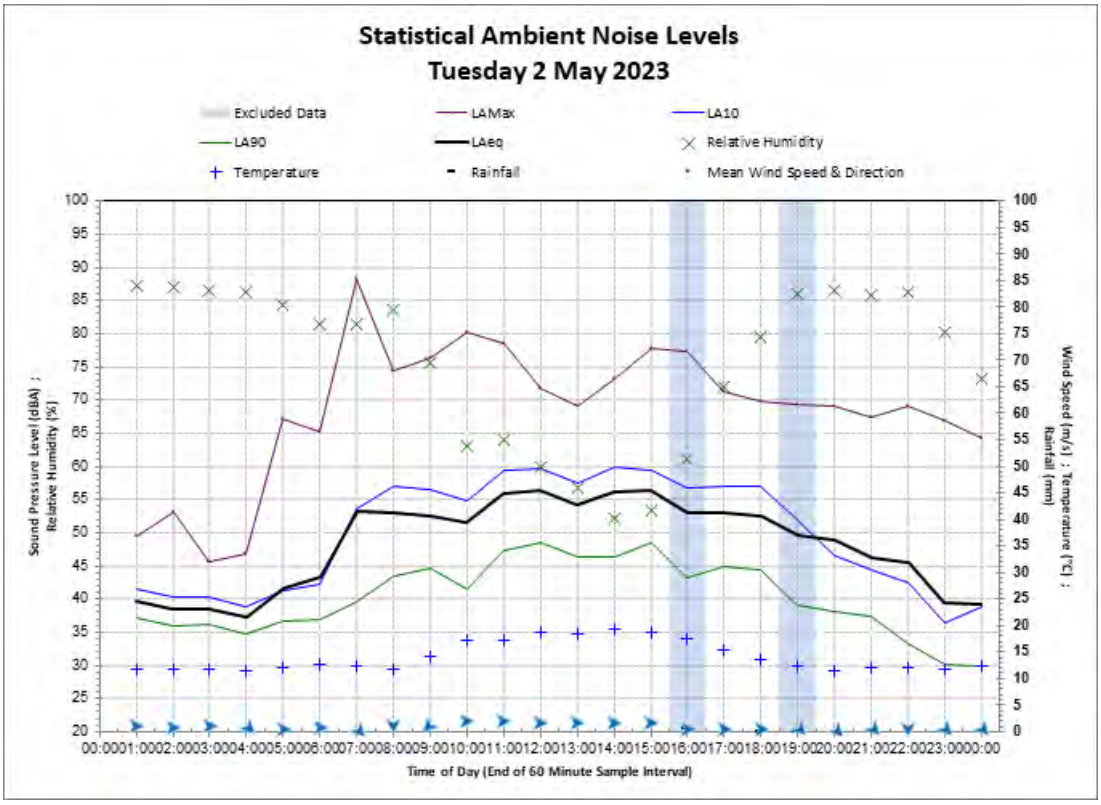
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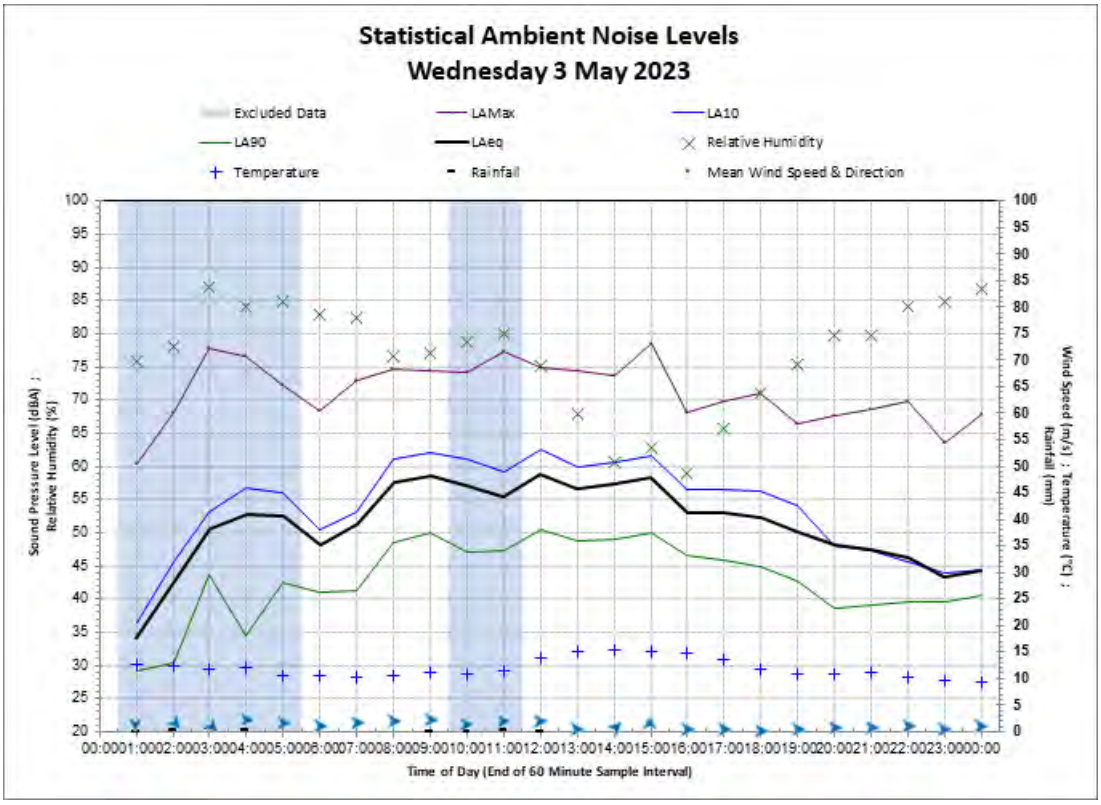
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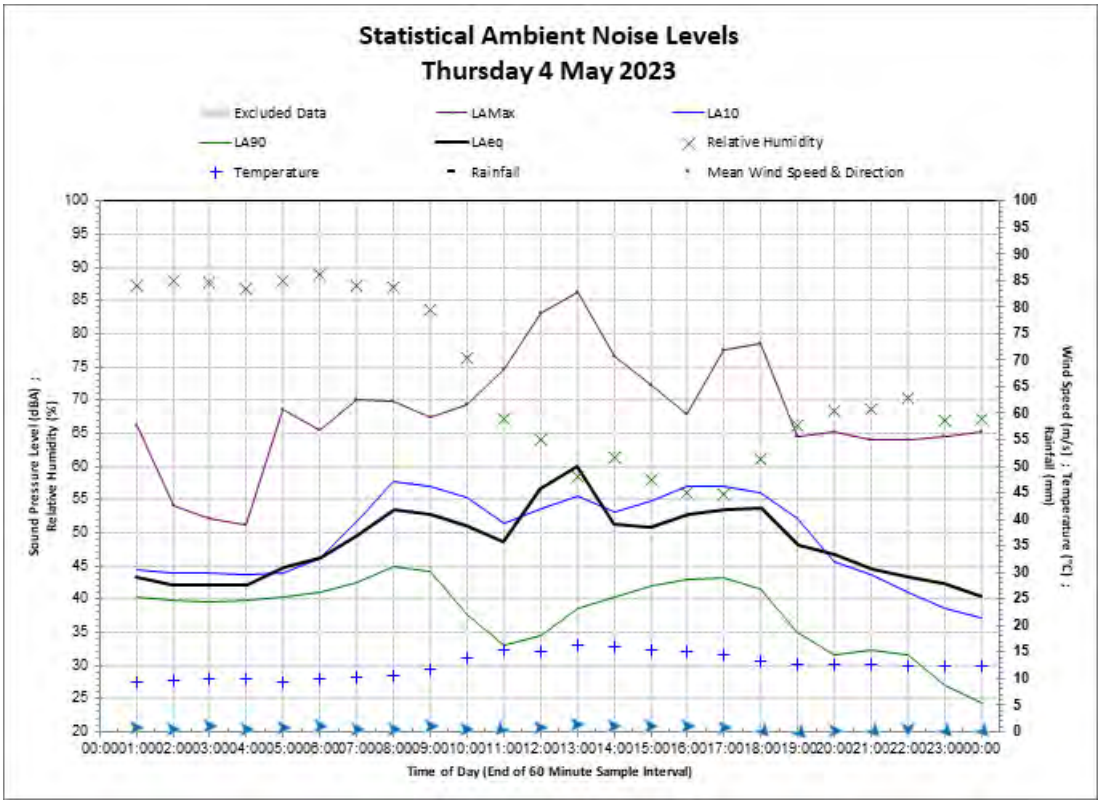
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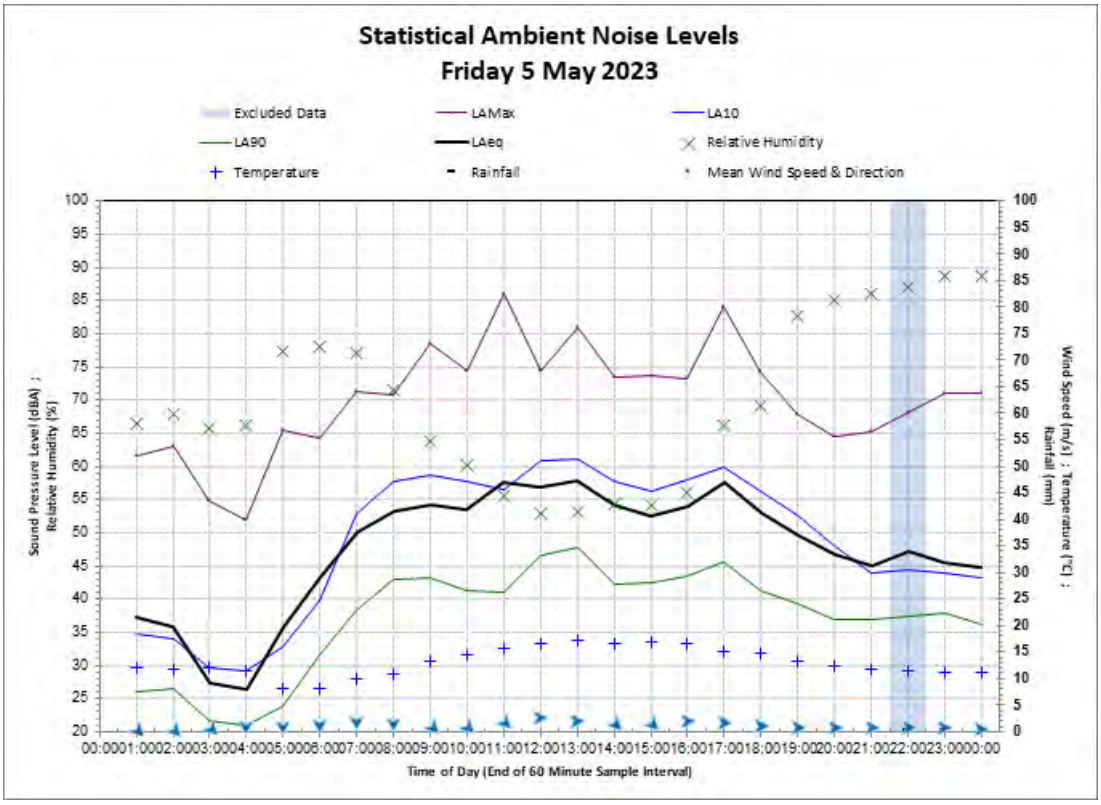
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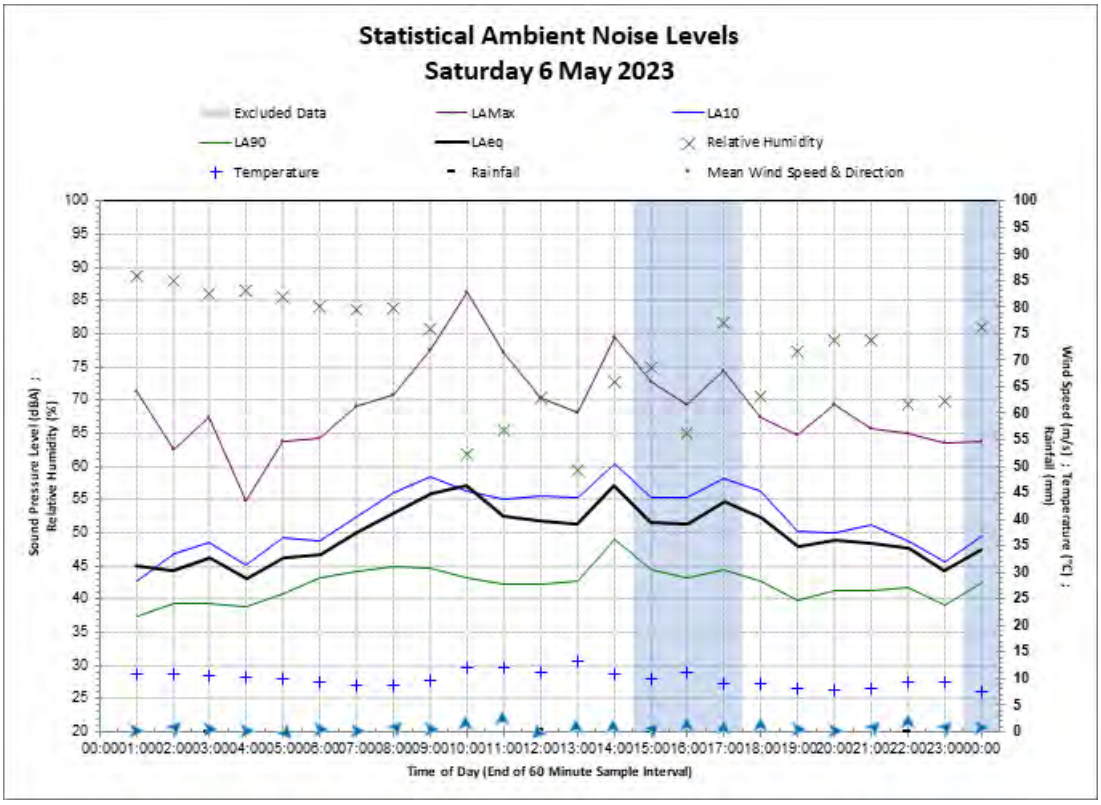
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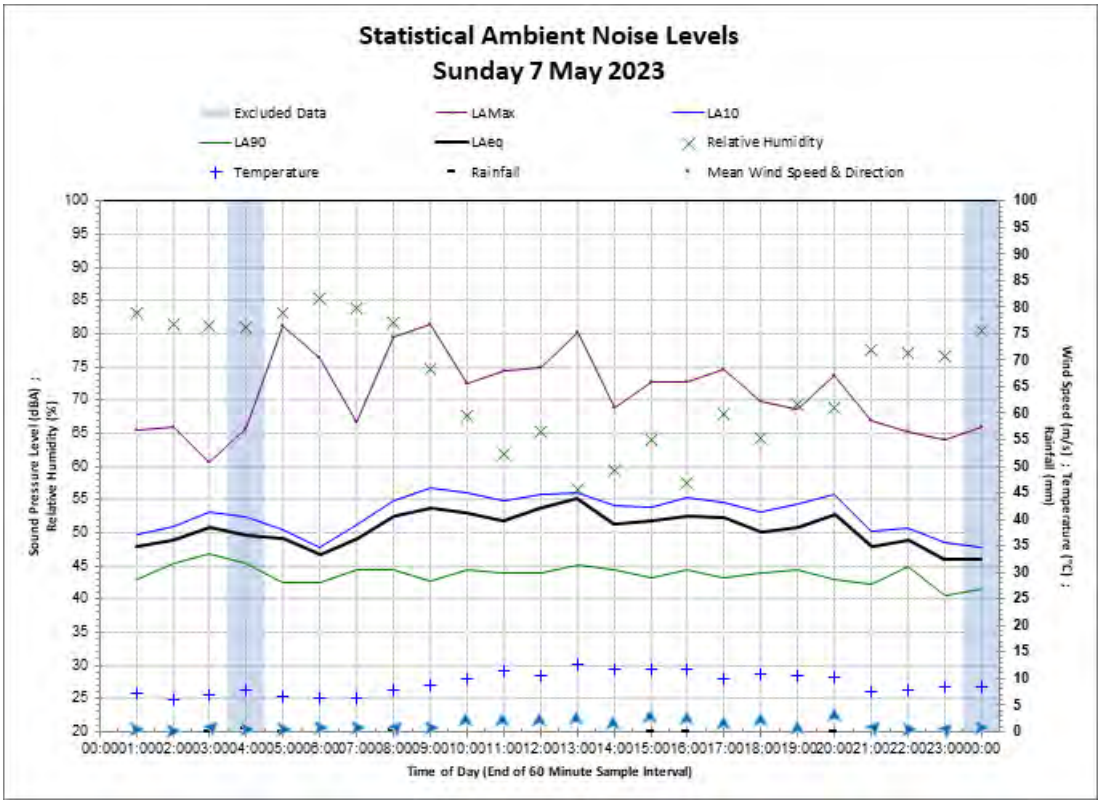
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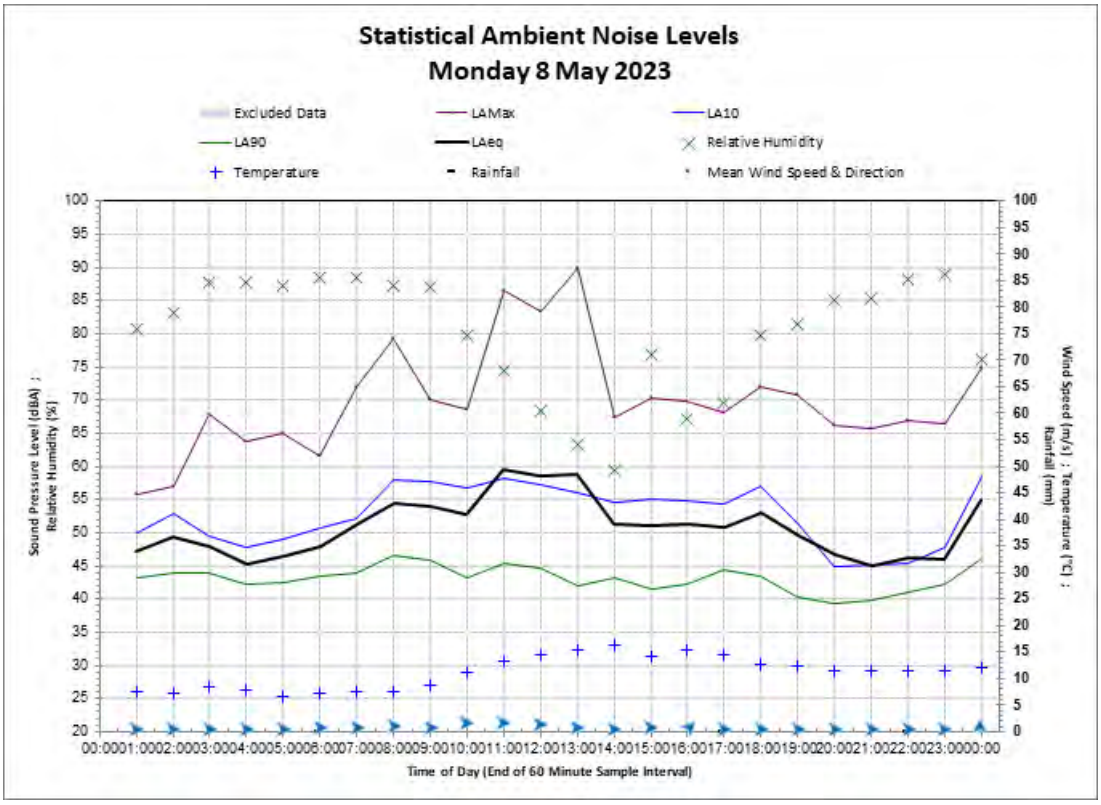
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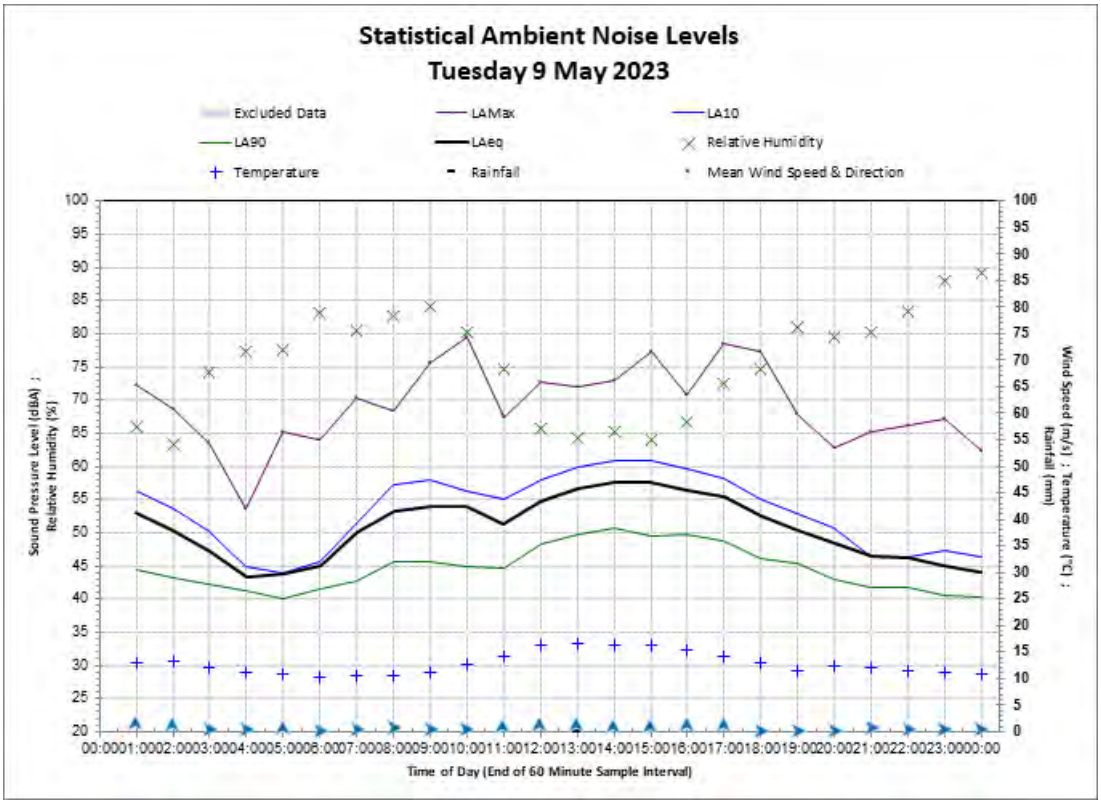
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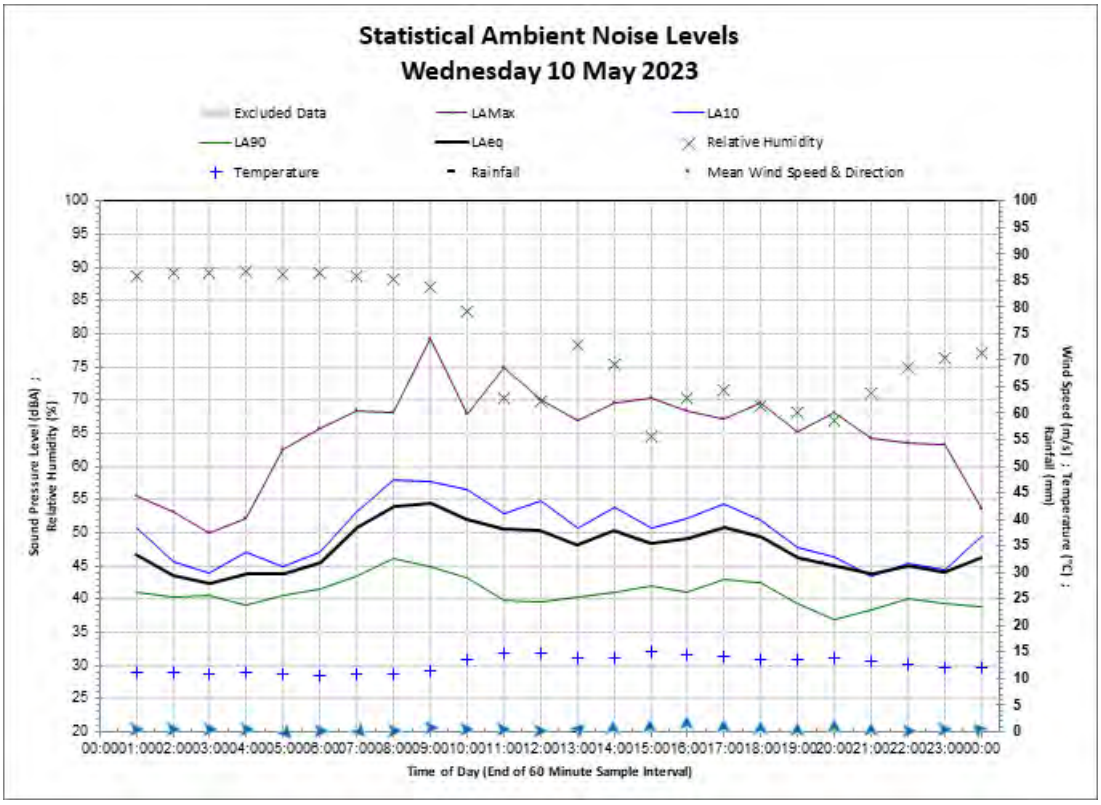
Time of Day (End of 60 Minute Sample Interval)

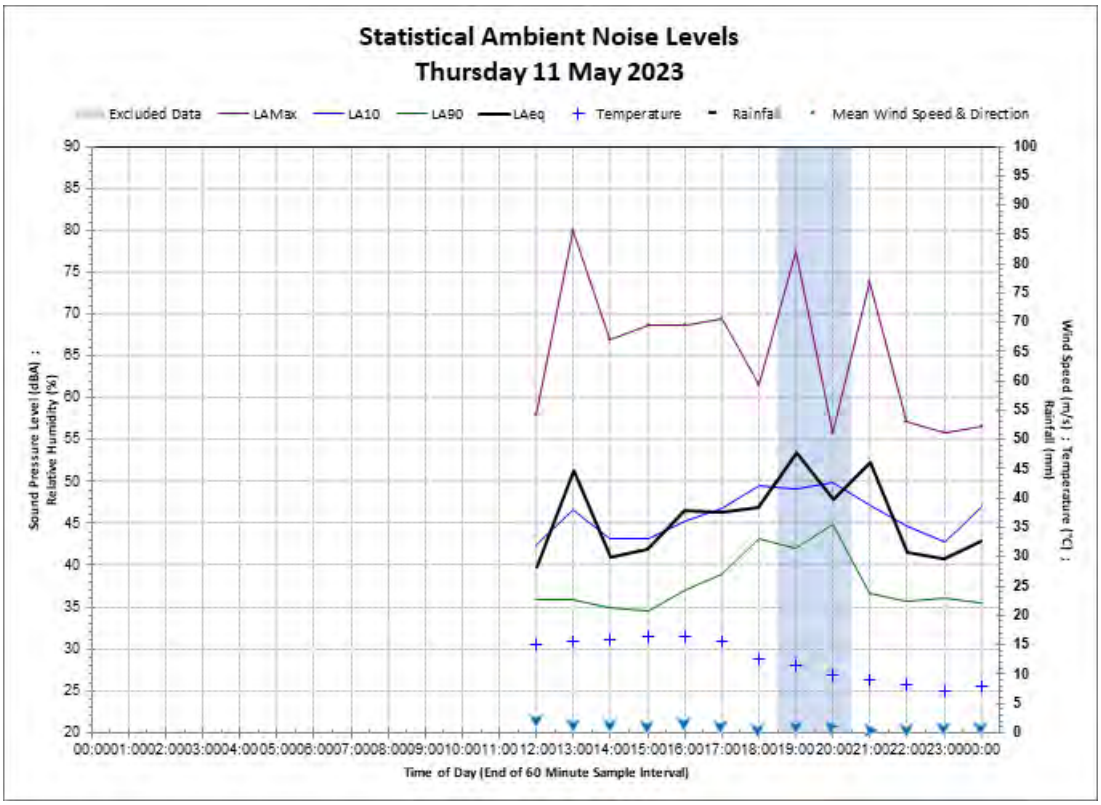

Statistical Ambient Noise Levels
Wednesday 10 May 2023
Excluded Data
LAMax
LA10
LA90
LAeq
Relative Humidity
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
00:0001:0002:0003:0004:0005:0006:0007:0008:0009:0010:0011:0012:0013:0014:0015:0016:0017:0018:0019:0020:0021:0022:0023:0000:00
Time of Day (End of 60 Minute Sample Interval)

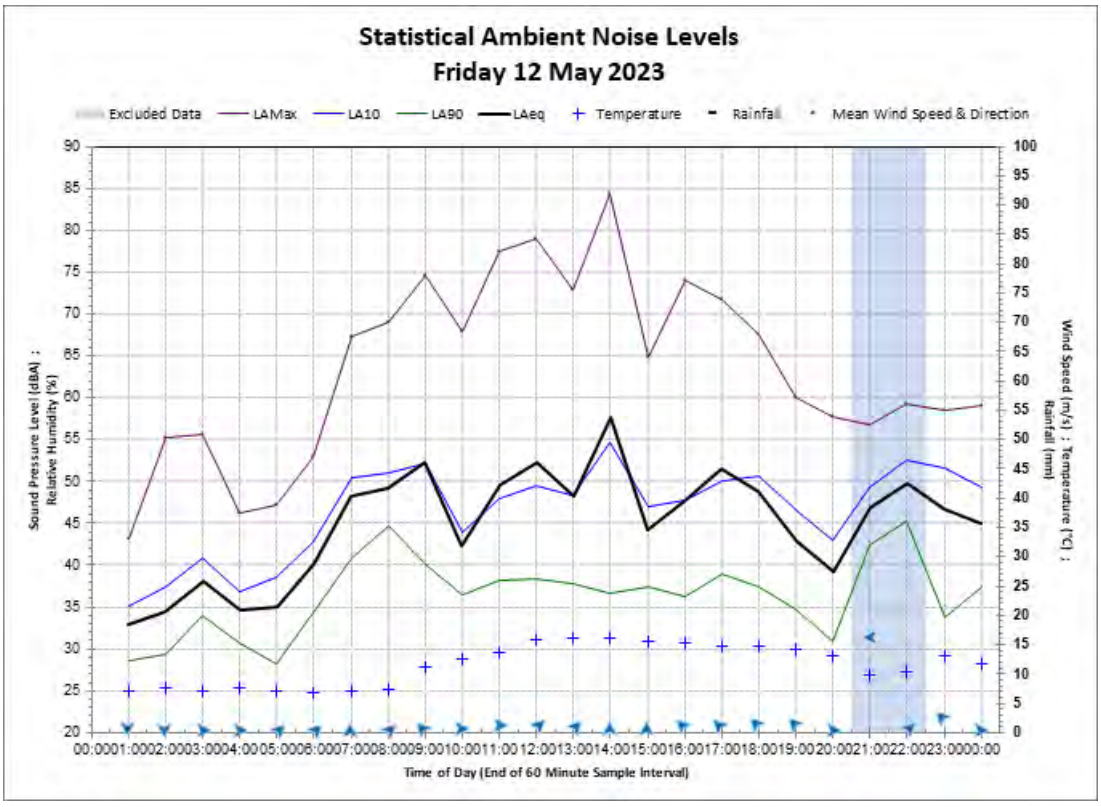
Logger location M3

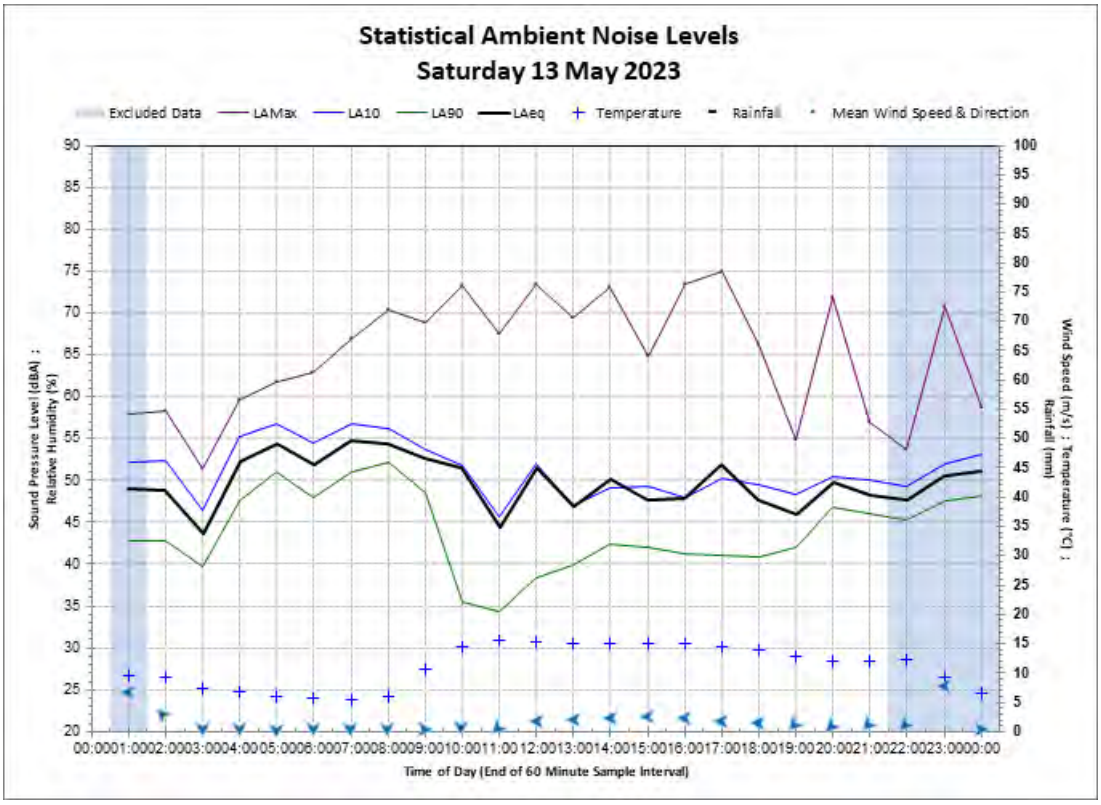
Table A3 Logger location M3 daily noise levels

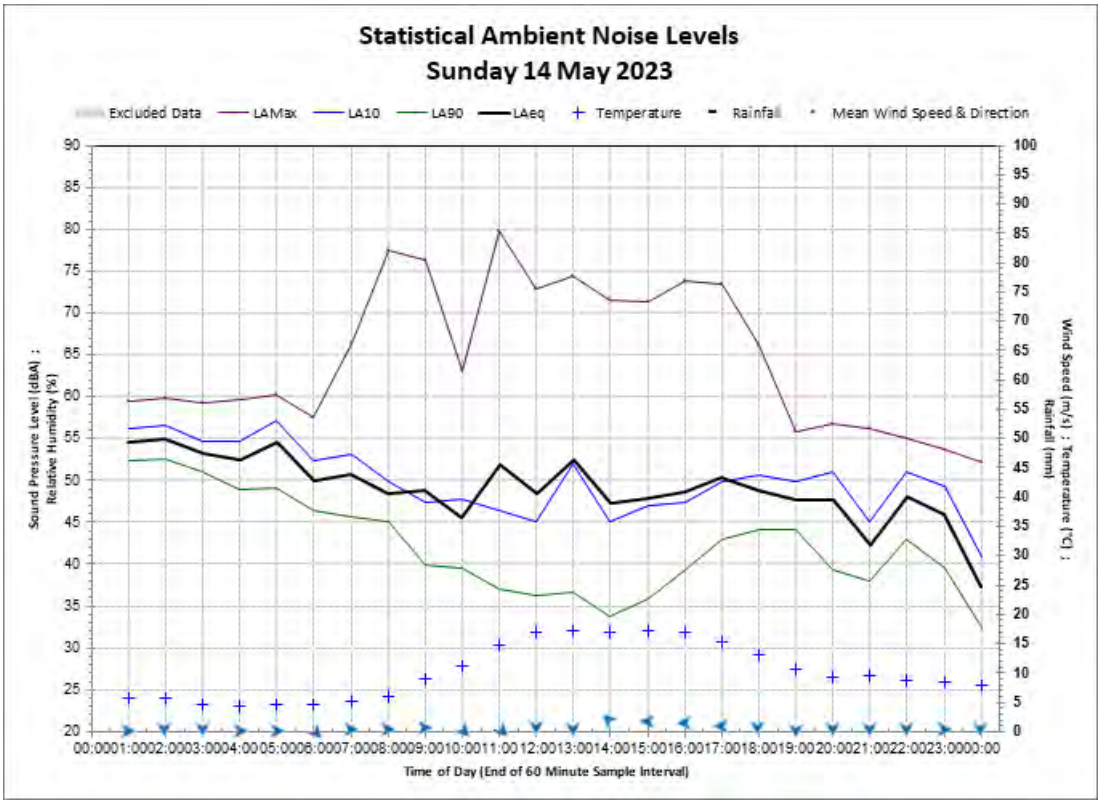
Date	ABL Day L90	ABL Evening L90	ABL Night L90	Leq Day	Leq Evening	Leq Night
Thursday-11-May-23	37.2	36.2	33.1	46.5	49.6	41.5
Friday-12-May-23	38.3	32.8	44.0	51.3	41.4	51.3
Saturday-13-May-23	41.5	44.9	48.9	50.6	48.2	52.9
Sunday-14-May-23	38.5	41.1	35.2	49.5	46.9	41.8
Monday-15-May-23	42.5	40.4	39.9	49.6	55.4	50.8
Tuesday-16-May-23	47.4	44.9	43.3	53.8	49.5	46.9
Wednesday-17-May-23	43.2	41.6	41.3	48.2	45.4	46.9
Thursday-18-May-23	39.6	39.8	37.5	47.6	43.7	40.5
Friday-19-May-23	40.2	38.3	38.1	47.3	41.9	41.4
Saturday-20-May-23	41.0	40.7	43.2	48.5	47.1	47.5
Sunday-21-May-23	48.2	43.2	42.3	53.0	47.4	46.1
Monday-22-May-23	42.2	38.7	38.5	48.8	42.8	41.3
Tuesday-23-May-23	41.5	34.9	33.9	48.8	40.4	38.7
Wednesday-24-May-23	41.3			51.8		
Leq Overall				**50.2**	**48.2**	**47.4**
RBL Weekday	**41.4**	**38.6**	**38.8**			
RBL Weekday + Saturday	**41.3**	**39.4**	**40.1**			
RBL Sunday only	**43.3**		**38.8**			

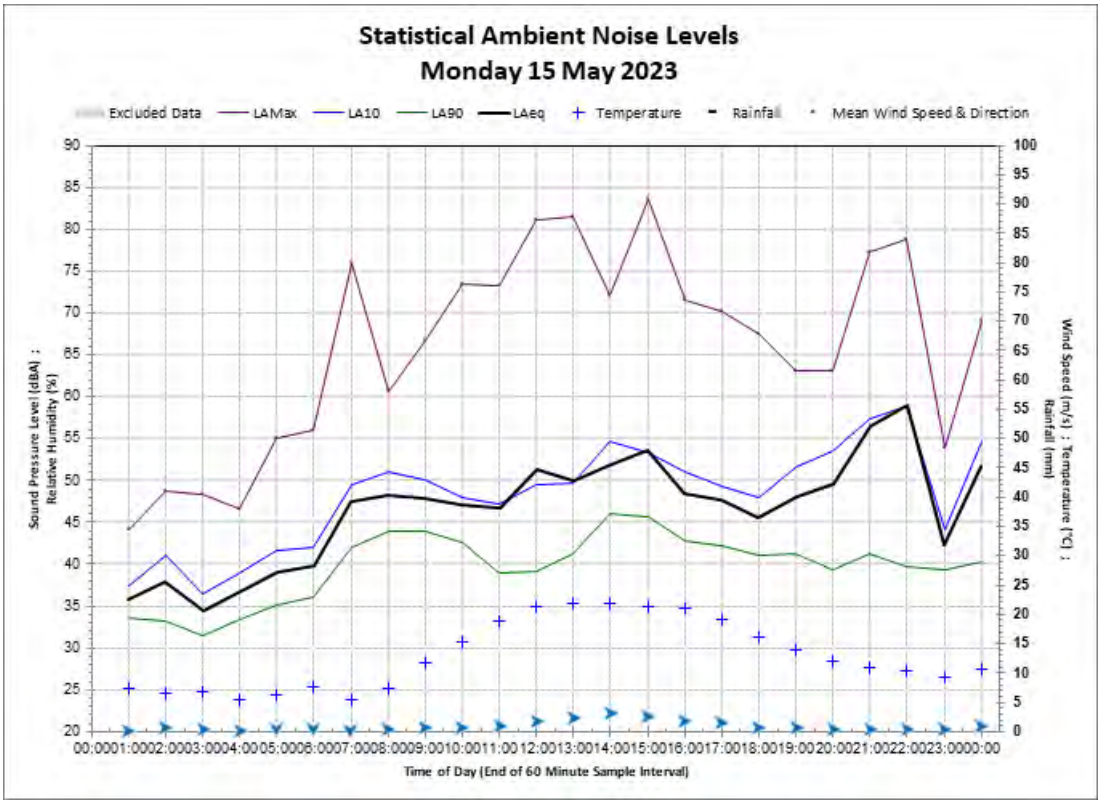
M3 Charts

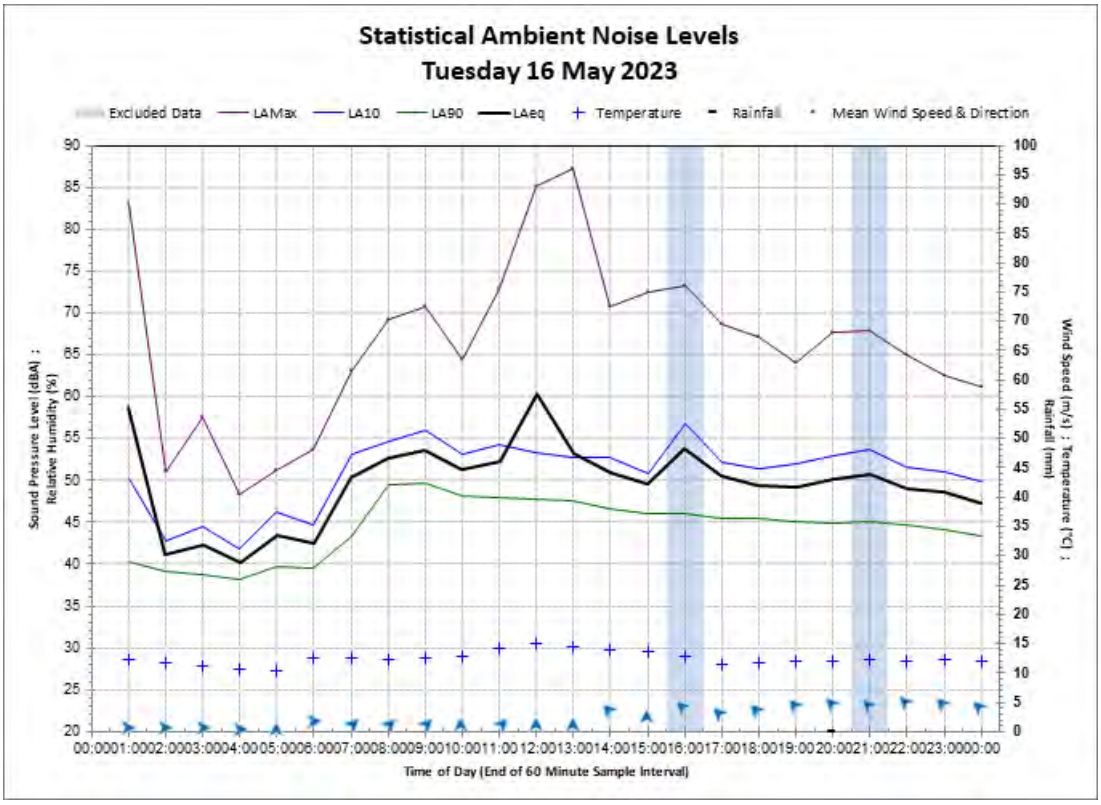

Statistical Ambient Noise Levels
Thursday 11 May 2023
Excluded Data
LAMax
LA10
LA90
LAeq
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 60 Minute Sample Interval)

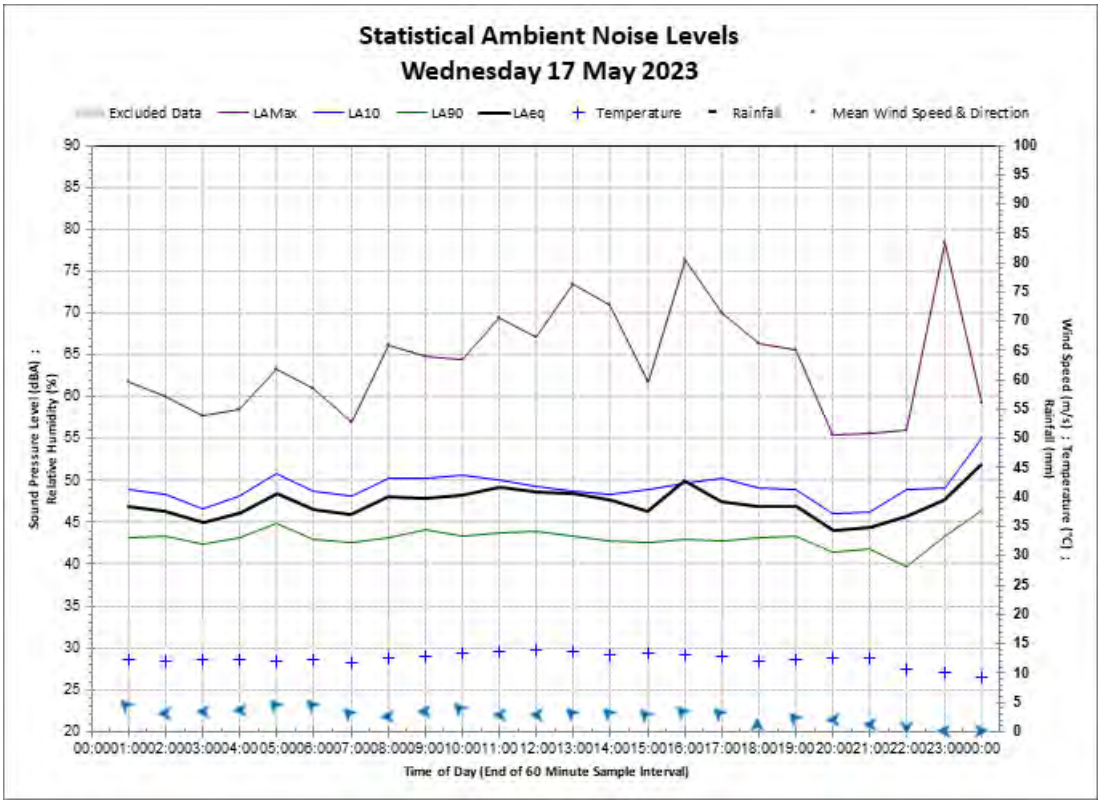

Statistical Ambient Noise Levels
Friday 12 May 2023
Excluded Data
LAMax
LA10
LA90
LAeq
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 60 Minute Sample Interval)

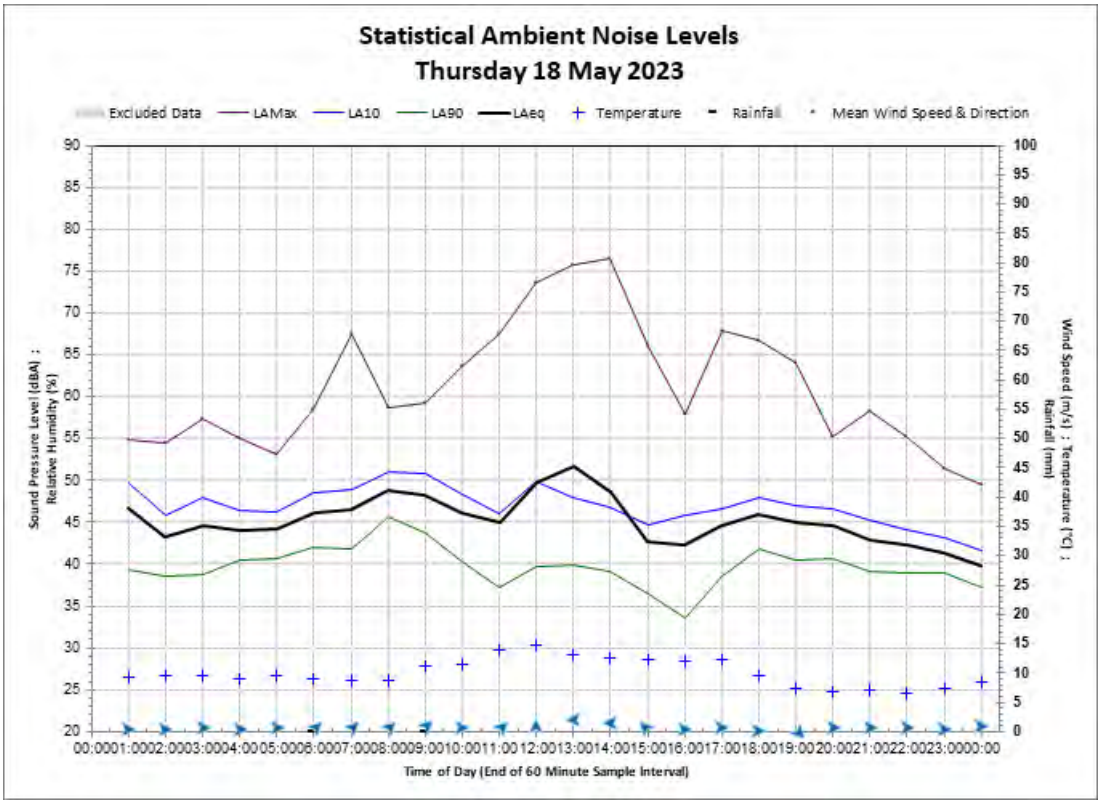

Statistical Ambient Noise Levels
Saturday 13 May 2023
Excluded Data
LAMax
LA10
LA90
LAeq
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 60 Minute Sample Interval)

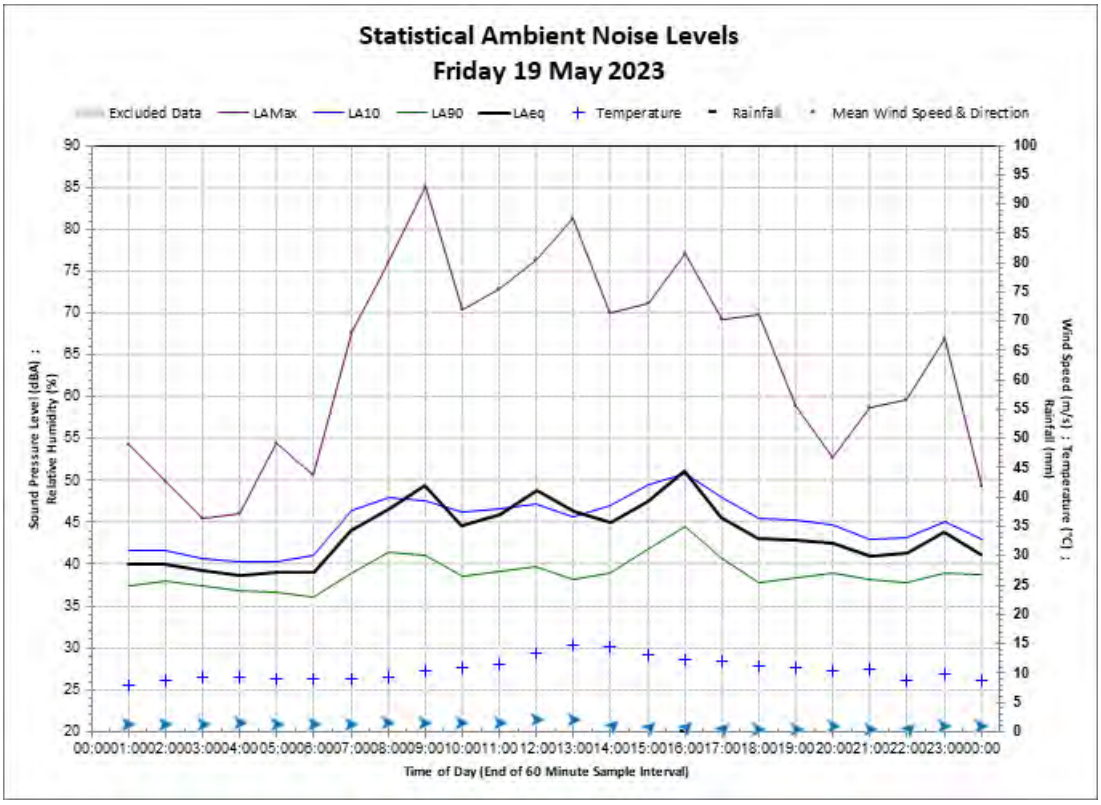

Statistical Ambient Noise Levels
Sunday 14 May 2023
Excluded Data
LAMax
LA10
LA90
LAeq
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 60 Minute Sample Interval)

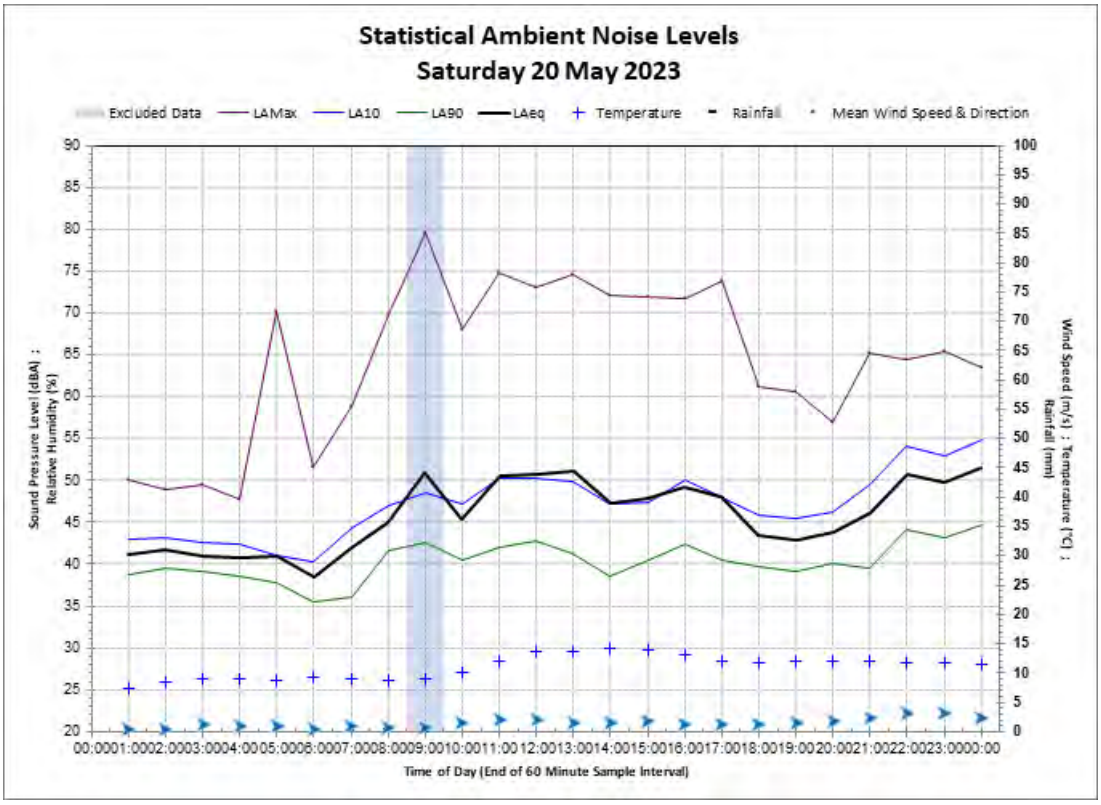

Statistical Ambient Noise Levels
Monday 15 May 2023
Excluded Data
LAMax
LA10
LA90
LAeq
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 60 Minute Sample Interval)

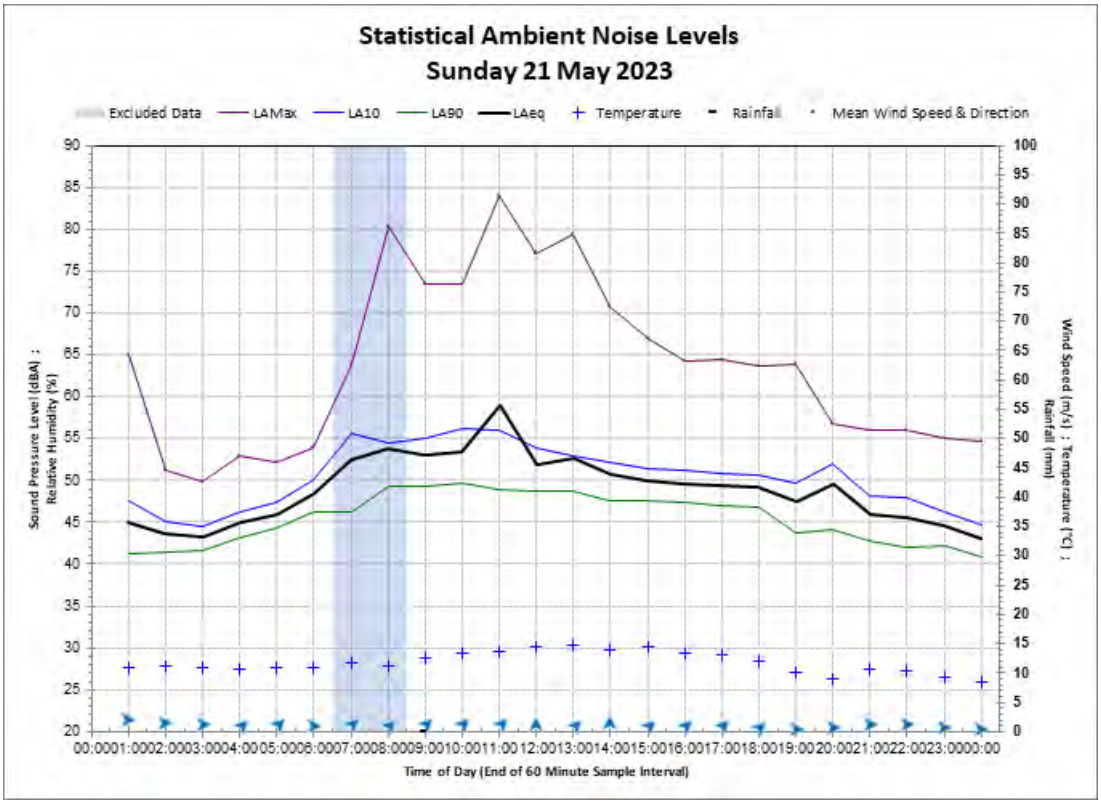

Statistical Ambient Noise Levels
Tuesday 16 May 2023
Excluded Data
LAMax
LA10
LA90
LAeq
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 60 Minute Sample Interval)

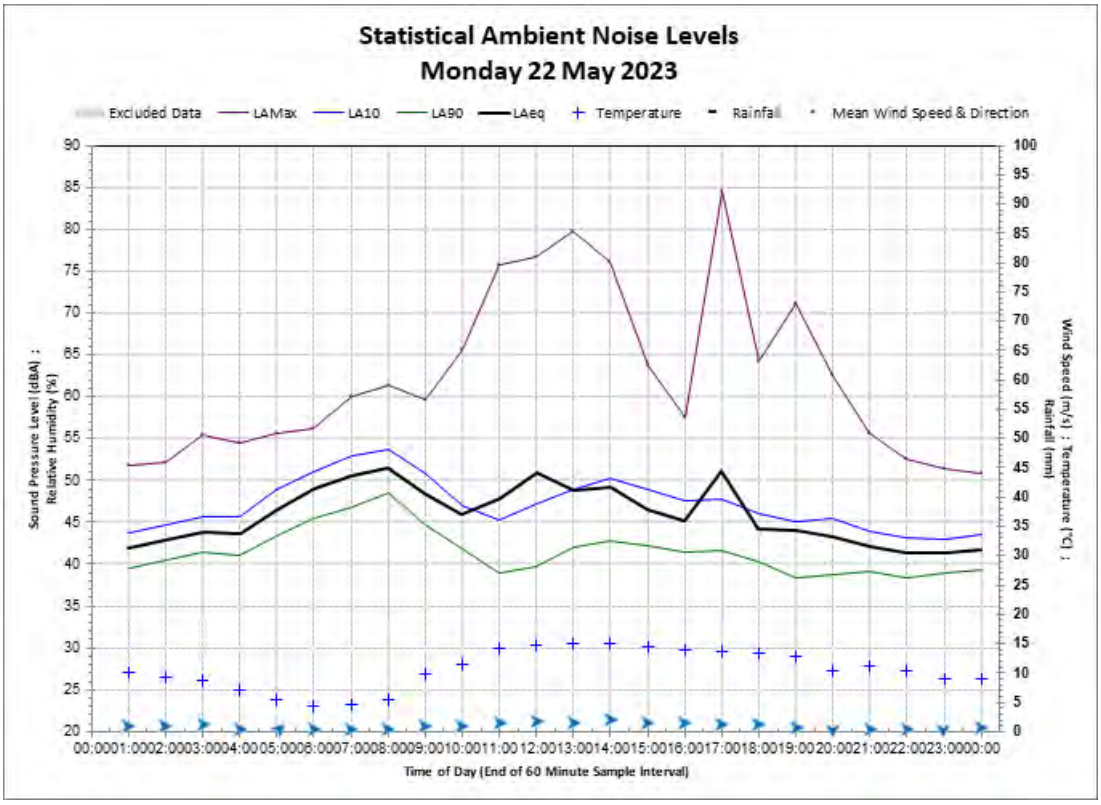

Statistical Ambient Noise Levels
Wednesday 17 May 2023
Excluded Data
LAMax
LA10
LA90
LAeq
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 60 Minute Sample Interval)

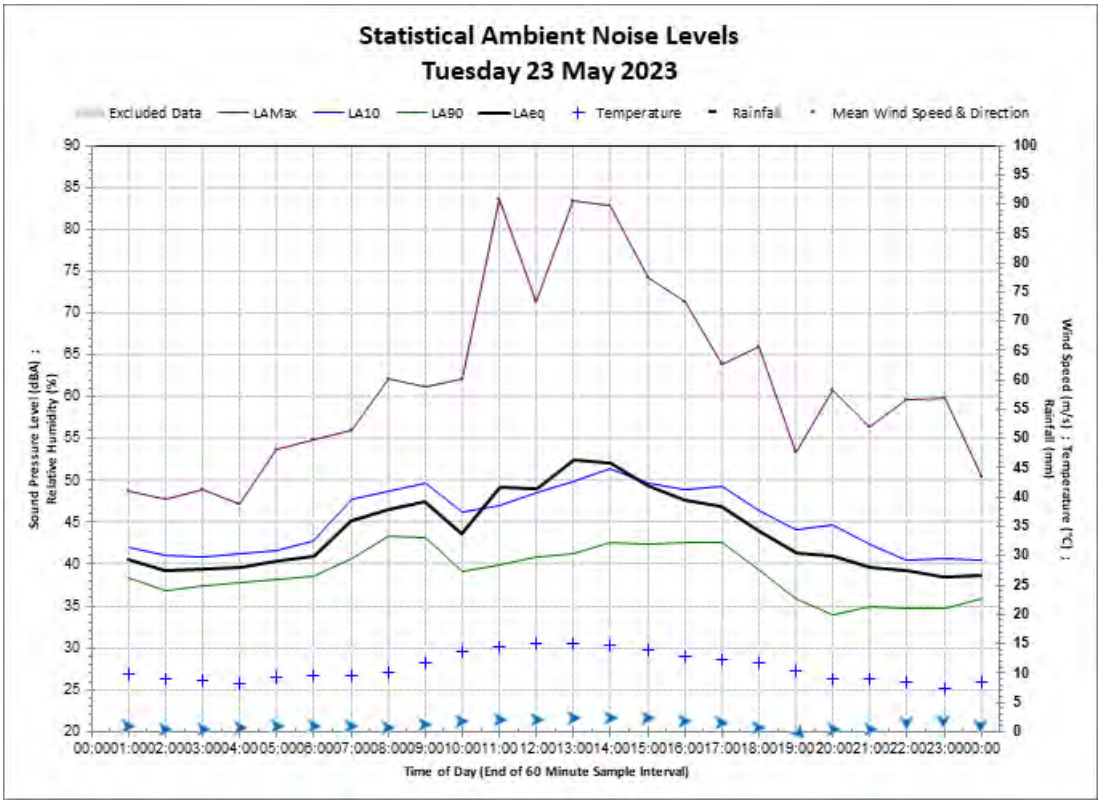

Statistical Ambient Noise Levels
Thursday 18 May 2023
Excluded Data
LAMax
LA10
LA90
LAeq
Temperature
Rainfall
Mean Wind Speed & Direction
Sound Pressure Level (dBA) ; Relative Humidity (%)
Wind Speed (m/s) ; Temperature (°C) ; Rainfall (mm)
Time of Day (End of 60 Minute Sample Interval)


Statistical Ambient Noise Levels
Friday 19 May 2023
Excluded Data
LAMax
LA10
LA90
LAeq
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 60 Minute Sample Interval)


Statistical Ambient Noise Levels
Saturday 20 May 2023
Excluded Data
LAMax
LA10
LA90
LAeq
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 60 Minute Sample Interval)


Statistical Ambient Noise Levels
Sunday 21 May 2023
Excluded Data
LAMax
LA10
LA90
LAeq
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 60 Minute Sample Interval)


Statistical Ambient Noise Levels
Monday 22 May 2023
Excluded Data
LAMax
LA10
LA90
LAeq
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 60 Minute Sample Interval)


Statistical Ambient Noise Levels
Tuesday 23 May 2023
Excluded Data
LAMax
LA10
LA90
LAeq
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 60 Minute Sample Interval)

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