

Monday, 21 November 2022

Project number: S210693  
Reference: S210693LT2

Attn: Sue Atwell  
Lendlease Pty Ltd

Dear Sue,

**Glenaeon Retirement Village  
Acoustic Design Compliance Certificate**

Resonate Consultants has undertaken the design and documentation in relation to the acoustic assessment for Glenaeon Retirement Village Stage 1 - Sewer Pumpstation Upgrade Works.

I hereby certify that the above acoustic assessment has been conducted in accordance with normal engineering practice and meets the requirements of the NSW Environment Protection Authority's *Noise Policy for Industry*.

I, Raymond Sim of Resonate Consultants Pty Ltd at Suite 4.01, Level 4, 275 Pacific Highway, Crows Nest NSW 2065, am an appropriately qualified and competent person in this area being listed as a Member of the Australian Acoustical Society and a Member of Engineers Australia, and as such can certify that the acoustic design and performance of the design systems comply with the above.

This certificate does not relieve any other party of its responsibilities, liabilities or contractual obligations.

I possess Indemnity Insurance to the satisfaction of the building owner.

Yours sincerely,



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## **Glenaeon Retirement Village Pumping Station**

### **Environmental Noise Assessment**

S210693RP1 Revision B

Wednesday, 16 November 2022



#### Document Information

<b>Project</b>	Glenaeon Retirement Village Pumping Station
<b>Client</b>	SCP Consulting Pty Ltd
<b>Report title</b>	Environmental Noise Assessment
<b>Project Number</b>	S210693

#### Revision Table

<b>Report revision</b>	<b>Date</b>	<b>Description</b>	<b>Author</b>	<b>Reviewer</b>
0	1 March 2022	Draft – first issue	Alex Salazar	Raymond Sim
A	17 March 2022	Final – first issue	Alex Salazar	Raymond Sim
B	16 November 2022	Re-assessed new layout	Alex Salazar	Raymond Sim

## Glossary

'A' Weighted	A spectrum adaption that is applied to measured noise levels to approximate human hearing. A-weighted levels are used as human hearing does not respond equally at all frequencies.
dB	Decibel—a unit of measurement used to express sound level. It is based on a logarithmic scale which means a sound that is 3 dB higher has twice as much energy. We typically perceive a 10 dB increase in sound as a doubling of that sound level.
dB(A)	'A' Weighted sound level in dB.
Daytime	As defined in the <i>Noise Policy for Industry</i> between the hours of 7:00 am to 6:00 pm
Evening	As defined in the <i>Noise Policy for Industry</i> between the hours of 6:00 pm to 10:00 pm
Night-time	As defined in the <i>Noise Policy for Industry</i> between the hours of 10:00 pm to 7:00 am
L <sub>A10</sub>	A-weighted energy noise level present for 10% of the 15-minute interval. Commonly referred to the average maximum noise level.
L <sub>A90</sub>	A-weighted energy noise level exceeded for 90% of time (background level). The average minimum background sound level (in the absence of the source under consideration)
L <sub>Aeq</sub>	Equivalent Noise Level— A-weighted energy averaged noise level over the measurement time.
L <sub>Aeq</sub> , (15 min)	A-weighted energy averaged noise level over a 15-minute period. Used in the EPA's <i>Noise Policy for Industry</i> .
L <sub>Amax</sub>	Maximum recorded noise level.
Rating Background Level (RBL)	The Rating Background Level for each period is the median value of the average background values for the period over all of the days measured. There is an RBL value for each period (day, evening and night).



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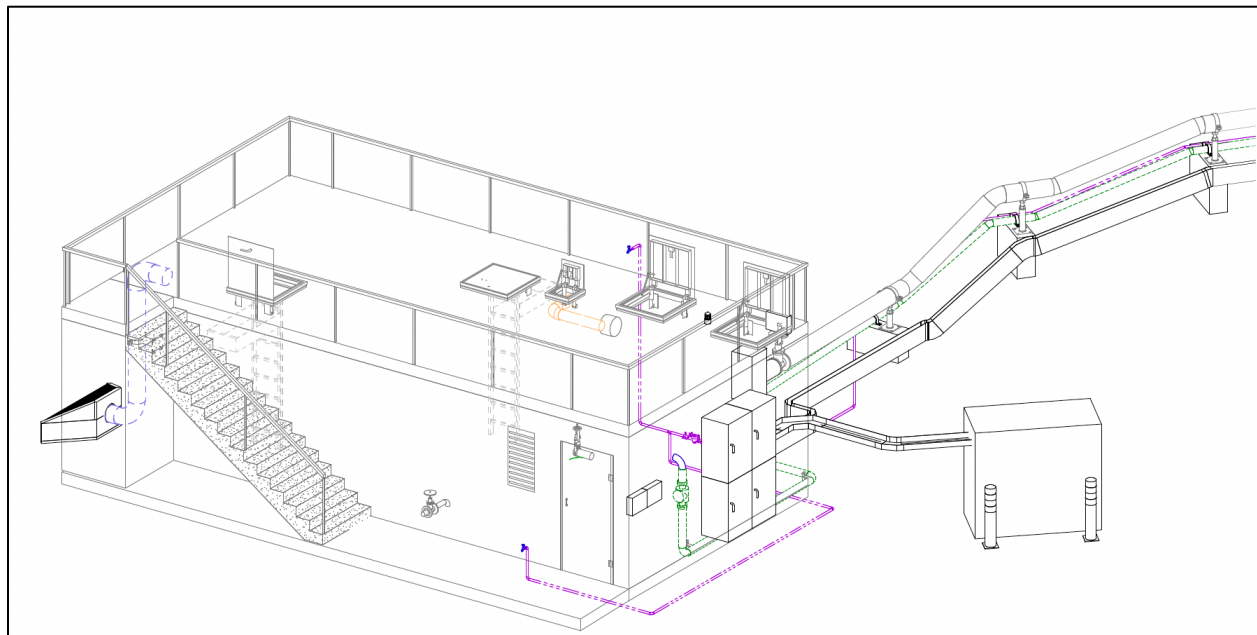
## 1 Introduction

Resonate Consultants (Resonate) has been engaged to provide a noise impact assessment for the installation of a new above ground sewer pumpstation at the Glenaeon Retirement Village. This new pump station is to replace the existing pumping station that will be decommissioned. The pump station will be servicing the approximate 300 units in the Glenaeon Retirement Village which is operated by Lend Lease.

The pump station location and layout can be seen in Figure 1 and Figure 2 below, respectively. The pump station is to be installed at ground level and will operate during the day, evening and night periods as defined in the NSW EPA *Noise Policy for Industry (NPI)*.



Figure 1 - Site map and approximate pump station location



**Figure 2 - Pump station layout**

image extracted from SCP drawings (Project: S210157, Revision: E, dated 08/11/2022)

## 2 Existing Acoustic Environment

### 2.1 Unattended noise monitoring

Unattended noise monitoring was undertaken between the dates of 18 January 2022 and 31 January 2022 at the Glenaeon Retirement Village on North Avenue (at the location denoted in Figure 3 below) to characterise the background noise level at the surrounding residential receiver locations from the proposed pump station.

Noise monitoring could not be conducted closer to the proposed location of the pump station due to the noise from the existing pump station still in operation and nearby active construction works happening within the Glenaeon Retirement Village along South Avenue.

### 2.2 Instrumentation

The instrumentation of the unattended noise monitoring comprised of one Rion NL-21 environmental noise logger (serial number: 00709535) fitted with a wind shield. Calibration of the logger and sound level meter was checked prior to and following measurements using a Casella CEL-120 (serial number: 254977). Field calibration was conducted at the commencement of the conclusion of the logging period and no significant calibration drift was observed (drift in calibration did not exceed  $\pm 0.5$  dB(A)). All instrumentation carried appropriate and current NATA (or manufacturer) calibration certificates.

### 2.3 Weather conditions

It is a requirement that noise data is captured during periods of favourable weather conditions avoiding adverse impacts of wind and rain on background noise levels. To assess weather conditions for the measurement period, half-hourly weather data was obtained from the Bureau of Meteorology (BOM) weather observation station ID 066059 at Terrey Hills NSW.

Noise data has been excluded from the processed results if:

- Rain was observed during a measurement period, and/or
- Wind speed exceeded 5 m/s (18 km/h) at the measurement height of 1.5 m above ground. Wind data obtained from the BOM is presented as the value at 10 m above ground.

The BOM wind speed data obtained for this report was measured at a height of 10 m above ground level. It is therefore necessary to apply a correction factor in order to estimate the wind speed at the height of the logger (1.5 m).

The methodology to formulate a correction factor has been derived<sup>1</sup>. The correction multiplier for the measured wind speed at 10 m is derived by the following formula:

$$W_{1.5} = W_{10} \times \left( \frac{M_{1.5,cat}}{M_{10,cat}} \right)$$

where:

- $W_{1.5}$  = Wind speed at height of 1.5 m
- $W_{10}$  = Wind speed at height of 10 m
- $M_{1.5,cat}$  = AS 1170 multiplier for receiver height of 1.5 m and terrain category
- $W_{10,cat}$  = AS 1170 multiplier for receiver height of 10 m and terrain category

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<sup>1</sup> Gowen, T., Karantonis, P. & Rofail, T. (2004), *Converting Bureau of Meteorology wind speed data to local wind speeds at 1.5m above ground level*, Proceedings of ACOUSTICS 2004



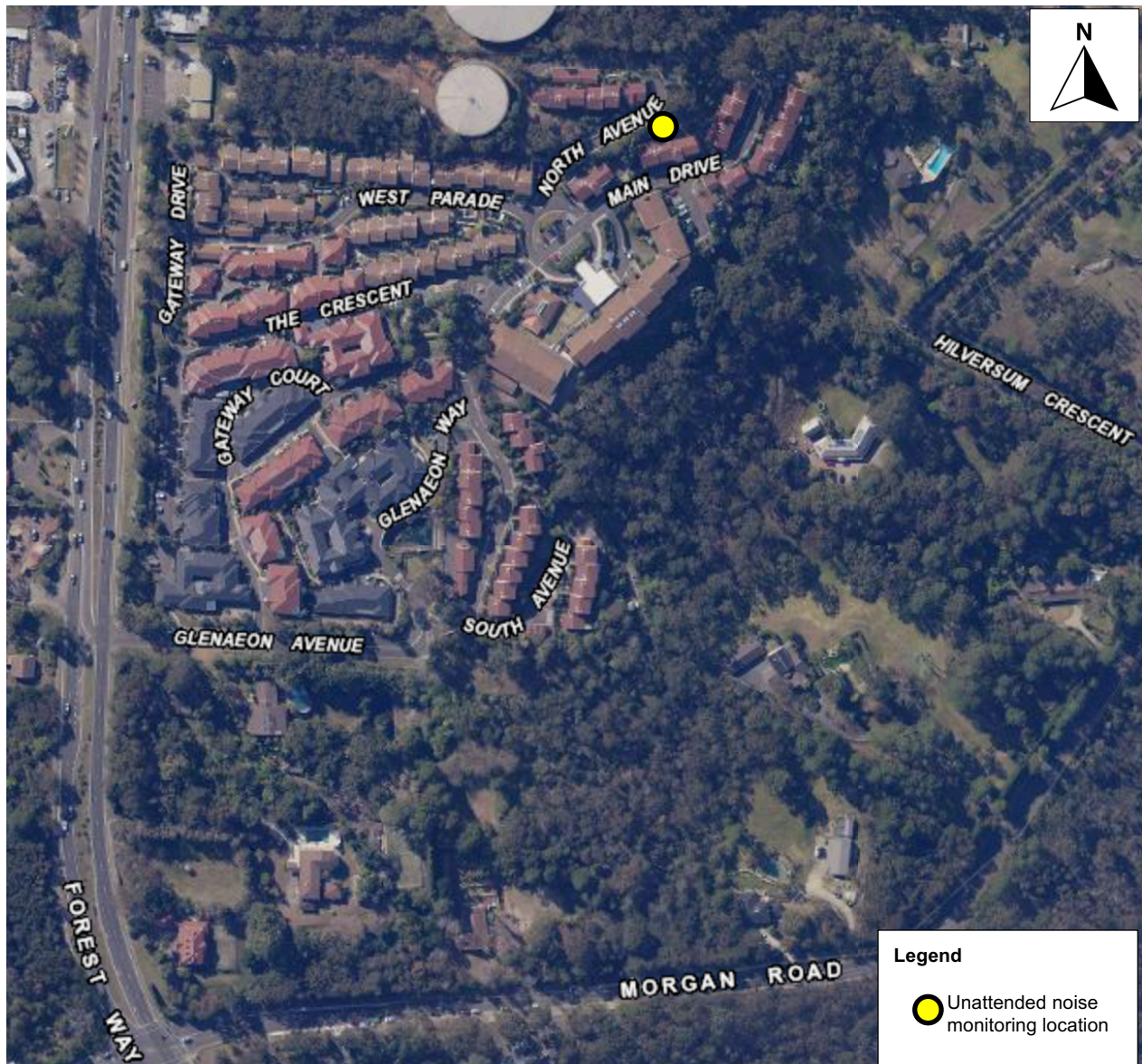


Figure 3 – Site map with measurement location

## 2.4 Unattended noise monitoring results

The noise data obtained from the noise logger has been processed in accordance with the procedures contained in the NPI to establish representative noise levels at the monitoring location.

The background noise levels were determined by taking the arithmetic mean noise level that was exceeded for 90% of the time during the relevant assessment periods for each day, and then taking the median of all the days where monitoring took place for each assessment period as identified in the NPI. This process provides a single figure rating background noise level (RBL) for the day, evening and night periods. These RBLs were used to establish the relevant noise criteria in accordance with the NPI for each assessment period.

A summary of the RBL results from the unattended noise survey during proposed operational hours of the playground is presented in Table 1.

**Table 1 Unattended noise monitoring results summary**

Location	RBL (dB L <sub>A90,15 min</sub> ) during Period		
	Daytime 7:00 am – 6:00 pm	Evening 6:00 pm – 10:00 pm	Night 10:00 pm – 7:00 am
Glenaeon Retirement Village – North Avenue (See Figure 3)	40	36	30

## 3 Noise Criteria

### 3.1 External mechanical services

Mechanical services noise impacts associated with proposed new pump station at the Glenaeon Retirement Village will be assessed against the NPI. The NPI was released in 2017 and supersedes the EPA NSW Industrial Noise Policy (INP) and sets out the EPA's requirements for the assessment and management of noise from industry in NSW.

The NPI is designed for large and complex industrial noise sources and outlines processes designed to strike a feasible and reasonable balance between the operations of industrial activities and the protection of the community from noise levels that may be intrusive or unpleasant.

The NPI measurement and evaluation methodology to quantify existing ambient and background noise levels has been adopted for this assessment.

#### 3.1.1 Trigger levels

The NPI describes 'trigger levels' which indicate the noise level at which feasible and reasonable noise management measures should be considered. Two forms of noise criteria are provided – one to account for 'intrusive' noise impacts and one to protect the 'amenity' of particular land uses.

- The intrusiveness of an industrial noise source is generally considered acceptable if the  $L_{Aeq}$  noise level of the source, measured over a period of 15 minutes, does not exceed the background noise level by more than 5 dB. Intrusive noise levels are only applied to residential receivers. For other receiver types, only the amenity levels apply.
- To limit continual increases in noise levels from the use of the intrusiveness level alone, the ambient noise level within an area from all industrial sources should remain below the recommended amenity levels specified in the NPI for that particular land use.

For this assessment, the area surrounding the proposal is considered to be 'suburban'.

#### 3.1.2 Project specific noise criteria

The project specific noise criteria for industrial noise generated by the new pump station in accordance with the NPI are determined by the Project Noise Trigger Levels (PNTL). The PNTL is the lowest value of the intrusiveness or project amenity noise level for each period and are presented below in Table 2.

**Table 2 NPI noise criteria (suburban amenity area)**

Receiver Type	Period <sup>(4)</sup>	Noise level – dB(A)			
		Recommended amenity noise level $L_{eq}$	Measured RBL	Project noise trigger level <sup>(5)</sup> $L_{eq}(15\text{minute})$	
			RBL <sup>(1)</sup>	Intrusiveness Noise Level	Project Amenity Noise Level <sup>(2),(3)</sup>
Residential Receivers	Day	55	40	<b>45</b>	53
	Evening	45	36	<b>41</b>	43
	Night	40	30	<b>35</b>	38
Commercial	When in use	65	-	-	<b>63</b>

(1) RBL = Rating Background Level.

(2) The recommended amenity noise level has been used to determine the project amenity noise level as there are no other industries present or likely to be introduced.

(3) The project amenity noise level is the suburban amenity noise level minus 5 dB(A) to account for existing industrial sources and plus 3 dB(A) to convert from a period to a 15-minute level.

(4) Periods of the day in accordance with the NPI

(5) The Project Noise Trigger Levels (PNTL) to be adopted are marked in bold.

### 3.1.3 Sleep disturbance noise criteria

The NPI also recommends criteria for the assessment of potential sleep disturbance, for the period between 10 pm and 7 am. The term “sleep disturbance” is considered to be both awakenings and disturbance to sleep stages.

To evaluate potential sleep disturbance or awakening issues associated with the operation of the new pump station the NPI screening method has been adapted as follows.

There is limited potential for sleep disturbance or awakening issues to occur, where:

- The predicted project night-time noise level ( $L_{eq, 15 \text{ min}}$  in dB(A)) at any residential receptor remains below 40 dB(A) (or the prevailing night-time background noise level plus 5 dB(A)), whichever is the greater.
- The predicted project night-time noise level ( $L_{max}$  in dB(A)) at any residential receptor remains below 52 dB(A) (or the prevailing night-time background noise level plus 15 dB(A)), whichever is the greater.

In accordance with the NPI, the sleep disturbance noise criteria for assessing the operations of the Project are presented in Table 3 below.

**Table 3 Sleep disturbance noise criteria**

Receiver Type	NPI Sleep disturbance trigger levels	
	$L_{eq, 15 \text{ min}}$ in dB(A)	$L_{max}$ dB(A)
Residential receivers	40	52



## 4 Noise Impact Assessment

Operation of the proposed new pump station may generate adverse noise impacts at nearby sensitive receivers. This section details the assessment of the potential for noise impacts from the proposed pump station. Noise impacts predicted at nearest residential receivers have been assessed against the adopted NPI noise criteria.

### 4.1 Noise assessment methodology

Potential operational noise impacts from the pump station at surrounding receptors have been modelled using the CONCAWE algorithm within SoundPLAN v8.2. This method is commonly used and accepted by regulatory agencies in NSW.

Terrain has been based on 1 metre LIDAR scans of the area sourced from NSW Spatial Services. Noise sources and receivers have been based on aerial imagery sourced from Nearmap. Building footprints and heights have been based on a combination of aerial imagery, street level photography and site inspections.

The parameters adopted in the noise modelling are presented in Table 4 below.

**Table 4 Operational noise modelling parameters**

Parameter	Input data
Buildings	<ul style="list-style-type: none"> <li>Footprints taken from aerial photography</li> <li>Typical building heights have been estimated from Google Street-view and site inspections as follows: per floor 3 m.</li> <li>Number of floors observed from site inspections and desktop survey.</li> <li>The buildings within the project site and the building services plant have been digitised into the model.</li> </ul>
Terrain	1 metre ground contours from NSW Spatial Services.
Ground surface / absorption	0.6
Receivers	Surrounding buildings have been digitised into the model. Ground floor receivers have been placed at 1.5 m above ground floor and first floor receivers at 4.5 m above ground.
Sources	<ul style="list-style-type: none"> <li>Noise emission scenarios and sources associated with the facility as detailed in Section 4.3</li> </ul>
SoundPLAN module	CONCAWE industrial module
Noise contours	The noise contours height has been set at 1.5 metres.
Meteorological condition	<p>Noise-enhancing meteorological conditions in accordance with the NPI:</p> <ul style="list-style-type: none"> <li>Day/evening: stability category D with wind speeds of 0.5 m/s and 3 m/s.</li> <li>Night: stability category D with wind speeds of 0.5 m/s (neutral) and stability category F with wind speed of 2 m/s (adverse).</li> <li>Windspeed (worst-case source to receiver direction).</li> <li>70% relative humidity.</li> <li>10°C temperature.</li> <li>1013.3 mbar air pressure.</li> </ul>

## 4.2 Operational noise sources

The primary noise sources for the operational of the new pump station are the two new Xylem Flygt 3171 pump sets and associated macerator motors that will all be housed within a concrete room with an entry opening only to the east (as presented in Figure 2. We note that the pump sets are arranged so that only one pump will operate at any one time. Resonate has been advised that the macerator motor is not noise intensive and will not adversely impact on surrounding receivers.

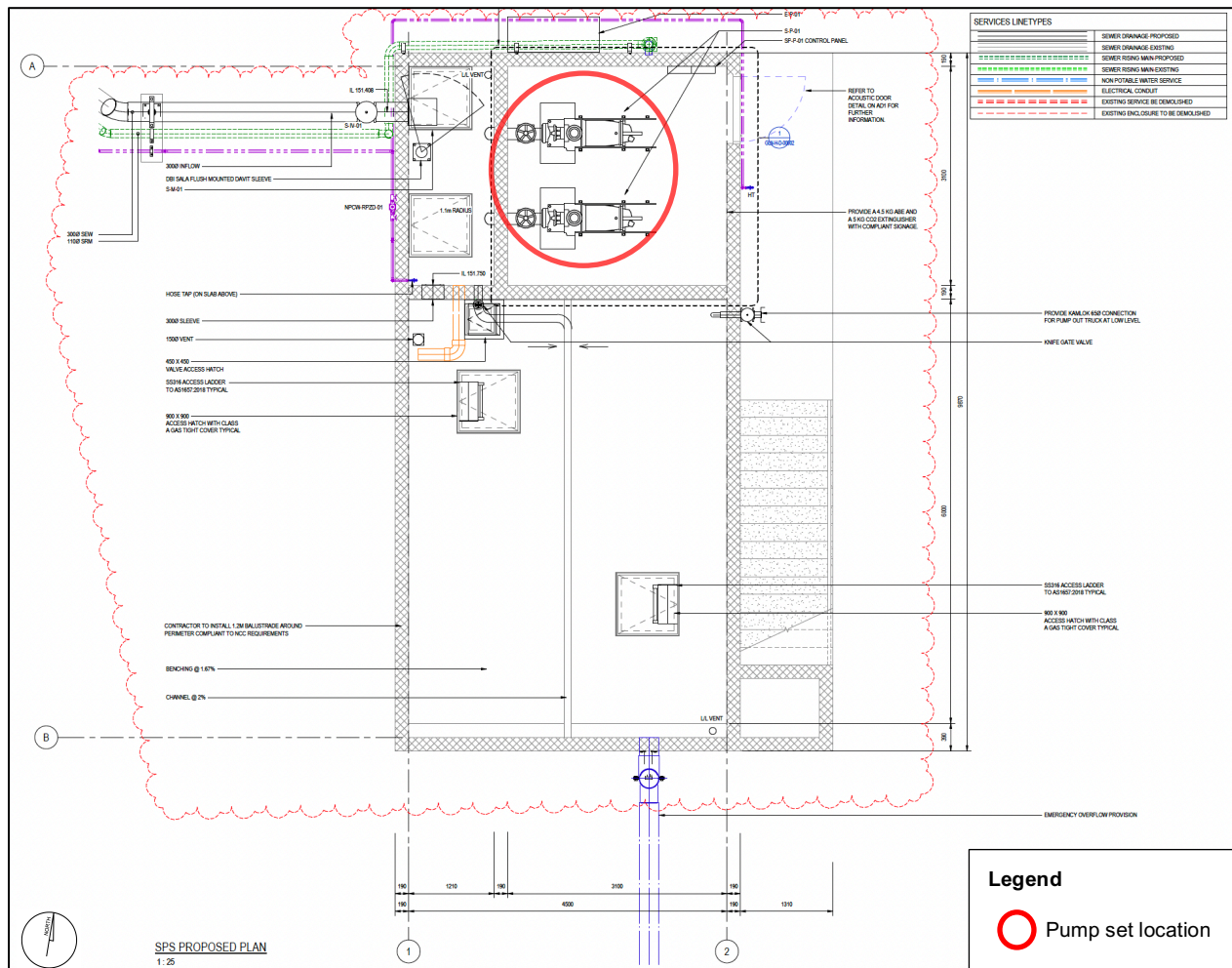


Figure 4 - Aerial plan view of pump station and pump set location

image extracted from SCP drawings (Project: S210157, Revision: E, dated 08/11/2022)

Noise levels have been calculated based on assumed combined SWL dB(A) determined by the information provided by SCP Consulting from Xylem and past noise assessments of similar equipment by this office. The assumed combined sound power levels (SWL) of the pump sets and associated motors are presented in Table 5 below.

**Table 5 Operational noise sources from pump station**

Operational Source	Source type	Number of units	Combined SWL dB(A)
Xylem Flygt 3171 (including associated macerator motor)	Area Source	1 <sup>(2)</sup>	70

- (1) A +5 dB penalty has been added to the predicted noise levels to account for potential tonality of the electrical equipment. This should be reassessed at the detailed design phase when equipment selection has been finalised.
- (2) Pump sets are arranged so that only one pump set will operate at any one time. The Macerator is not noise intensive and will not adversely impact on surrounding receivers.

## 4.3 Operational noise assessment scenarios

The following operational scenario is considered to be the most realistic worst-case and have been investigated as part of the assessment:

- New pump station with singular pump set in operation (Combined SWL in Table 5 used) with a solid core single hinged door. All the door openings are proposed to have acoustic louvres (Acran Acraflow Series 100 or similar) with minimum insertion losses presented in Table 6.

**Table 6 Acoustic louvre insertion loss**

Model	Octave Band Centre Frequencies (Hz)					
	125	250	500	1000	2000	4000
Acran Airflow Series 100 Acoustic Louvre	8	8	10	15	21	21

## 4.4 Predicted operational noise levels

This section presents an overview of predicted operational noise levels during temperature inversion conditions. The operational noise contours during temperature inversion conditions are presented in **Error! Reference source not found**. Figure 5, with detailed noise results presented in **Error! Reference source not found**. Table 7 for the modelled scenario.

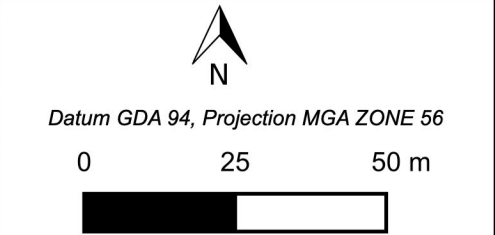




**Glenaeon Retirement Village  
New Pumping Station with  
Acoustic Louvred Doors**

**FIGURE 5  
Predicted Operational Noise  
Contours during Temperature  
Inversion Condition**

Date: November 2022  
Client: SCP Consultants  
Prepared by: RS



- Legend**
- Predicted Operational Noise Contours
- 25 dB(A)
  - 30 dB(A)
  - 35 dB(A)
  - 40 dB(A)
  - 45 dB(A)
  - 50 dB(A)
  - 55 dB(A)
  - 60 dB(A)



**Table 7 Single point receiver noise levels from pump station noise sources**

Name	Floor	Receiver Type	Direction	Neutral Weather	Adverse Weather	Complies with Project Criteria
1 Morgan Rd, Belrose NSW 2085	GF	Residential	N	0	1	✓
2 Hilversum Cres, Belrose NSW 2085	GF	Residential	SW	15	16	✓
7 Morgan Rd, Belrose NSW 2085	GF	Residential	N	3	4	✓
9 Morgan Rd, Belrose NSW 2085	GF	Residential	NW	21	21	✓
11 Morgan Rd, Belrose NSW 2085	GF	Residential	W	9	11	✓
31 Glenaeon Ave, Belrose NSW 2085	GF	Residential	S	14	14	✓
31 Glenaeon Ave, Belrose NSW 2085	F 1	Residential	S	14	15	✓
197 Forest Way, Belrose NSW 2085	GF	Residential	E	0	0	✓
Glenaeon Ave, Belrose NSW 2085	GF	Residential	SE	13	14	✓
Glenaeon Ave, Belrose NSW 2085	F 1	Residential	SE	13	14	✓
Glenaeon Ave, Belrose NSW 2085	GF	Residential	SE	11	12	✓
Glenaeon Ave, Belrose NSW 2085	F 1	Residential	SE	14	15	✓
Glenaeon Ave, Belrose NSW 2085	GF	Residential	SE	12	14	✓
Glenaeon Ave, Belrose NSW 2085	F 1	Residential	SE	12	14	✓
Glenaeon Ave, Belrose NSW 2085	GF	Residential	SE	15	16	✓
Glenaeon Ave, Belrose NSW 2085	GF	Residential	SE	14	15	✓
Glenaeon Ave, Belrose NSW 2085	F 1	Residential	SE	14	15	✓
Glenaeon Ave, Belrose NSW 2085	GF	Residential	SE	11	13	✓
Glenaeon Ave, Belrose NSW 2085	F 1	Residential	SE	11	13	✓
Units 1 Glenaeon Ave	GF	Residential	E	20	20	✓
Units 2 & 3 Glenaeon Ave	GF	Residential	E	24	24	✓
Units 2 & 3 Glenaeon Ave	F 1	Residential	E	23	23	✓
Units 4 & 5 Glenaeon Ave	GF	Residential	E	26	26	✓
Units 4 & 5 Glenaeon Ave	F 1	Residential	E	26	26	✓

Name	Floor	Receiver Type	Direction	Neutral Weather	Adverse Weather	Complies with Project Criteria
Units 6 & 7 Glenaeon Ave	GF	Residential	E	28	28	✓
Units 6 & 7 Glenaeon Ave	F 1	Residential	E	28	28	✓
Units 8 & 9 Glenaeon Ave	GF	Residential	E	29	29	✓
Units 8 & 9 Glenaeon Ave	F 1	Residential	E	28	28	✓

## 4.5 Discussion

As presented in Section 4.4 above the operational noise of the new mechanical plant for the proposed pump station is expected to comply with the most stringent night-time project criteria of 35 dB(A) for residential receivers. Therefore, the proposed pump station is also expected to be compliant with the NPI the day and evening noise criteria at surrounding sensitive receivers.

In the event the current design of the pump station is to be altered, then a review of the pump station noise impact should be undertaken to ensure compliance with the project specific noise criteria. This may include adjustments to the choice of equipment and/or refinements to the facility layout.

## 5 Conclusion

Resonate has conducted a noise impact assessment for the proposed new at ground pump station installation that will contain two new pump sets to service the Glenaeon Retirement Village located at 207 Forest Way, Belrose NSW 2085.

SoundPLAN noise modelling assessment has been undertaken for the operational noise from the proposed pump station to the surrounding sensitive receivers. The results of this assessment are presented in Section 4.4 of this report.

Our assessment shows that based on the proposed operational noise sources (as shown in Section 4.2) the operation of the new pump station is expected to comply with the NPI project noise criteria presented in Section 3 of this report.

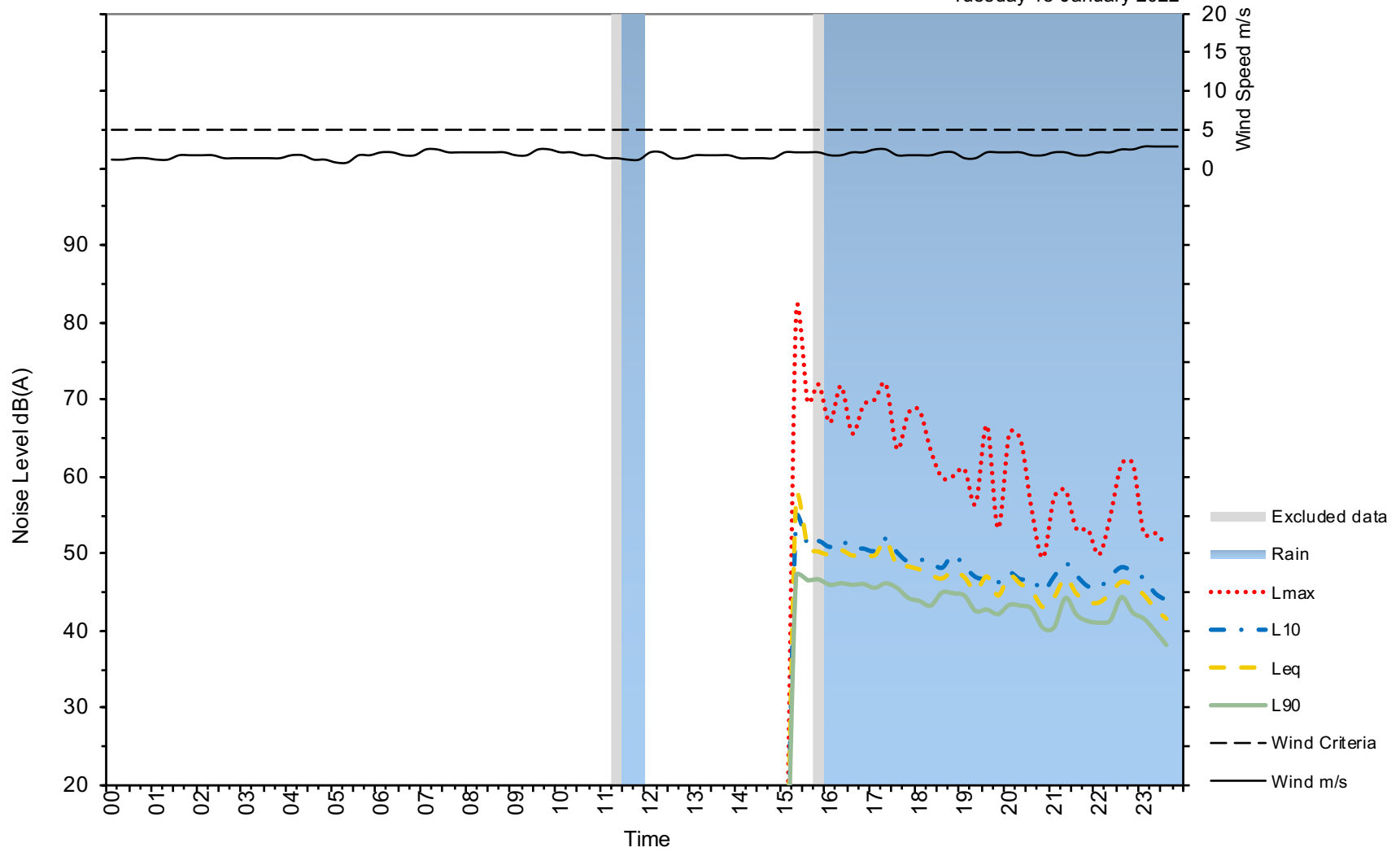


## Appendix A - Unattended Noise Monitoring Data



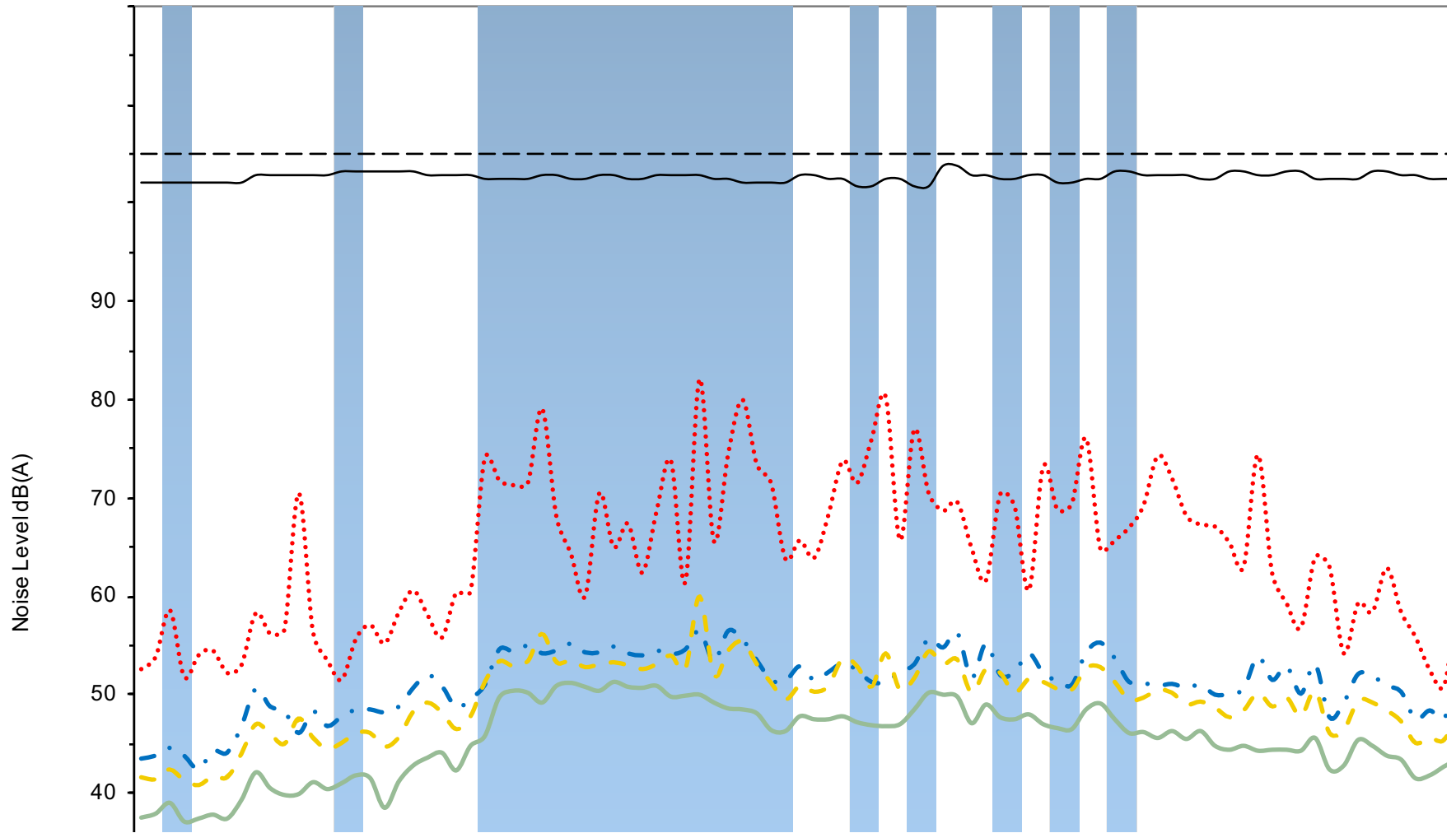
Glenaeon Retirement Village Pumping Station

Tuesday 18 January 2022



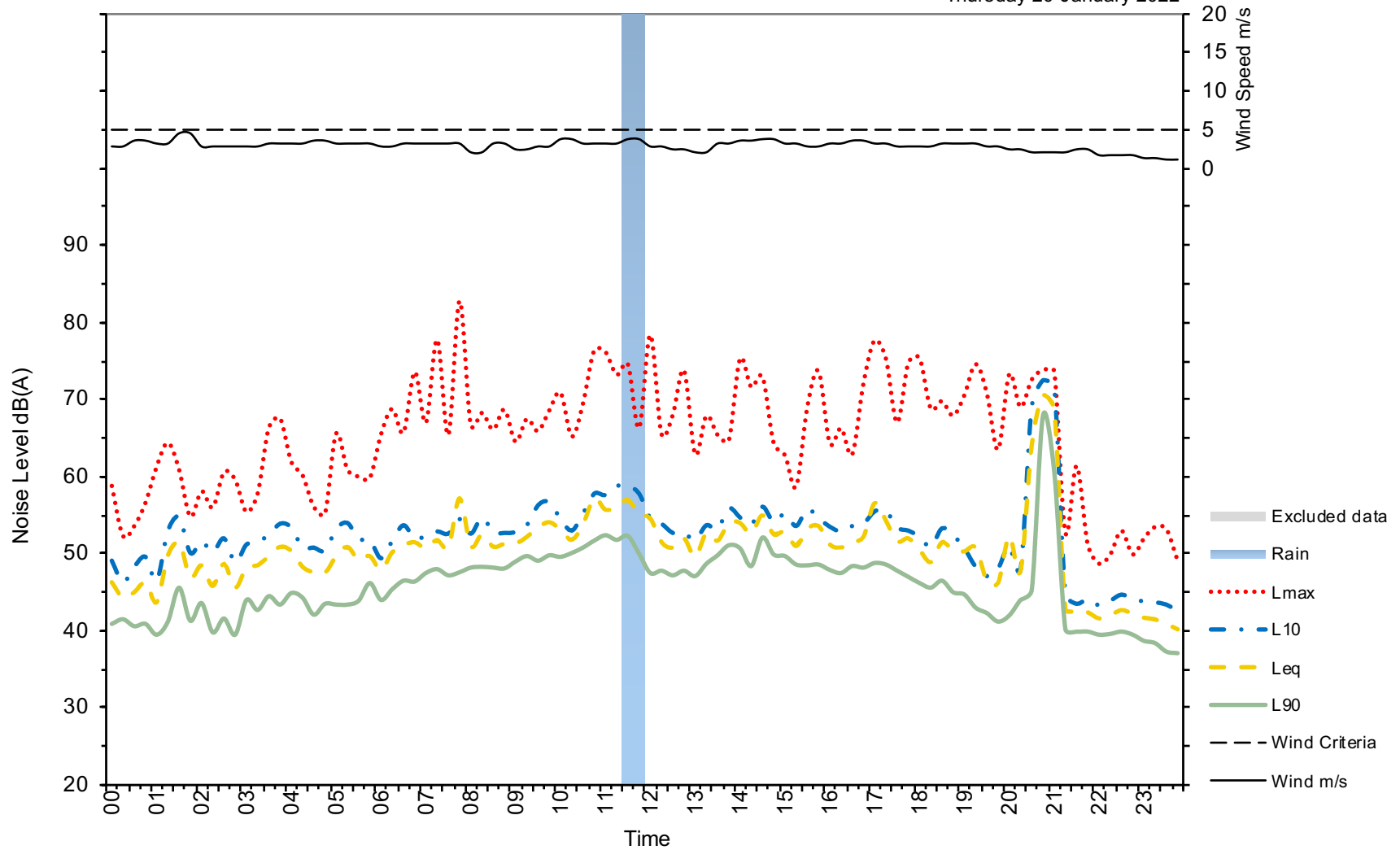
Glenaeon Retirement Village Pumping Station

Wednesday 19 Januar



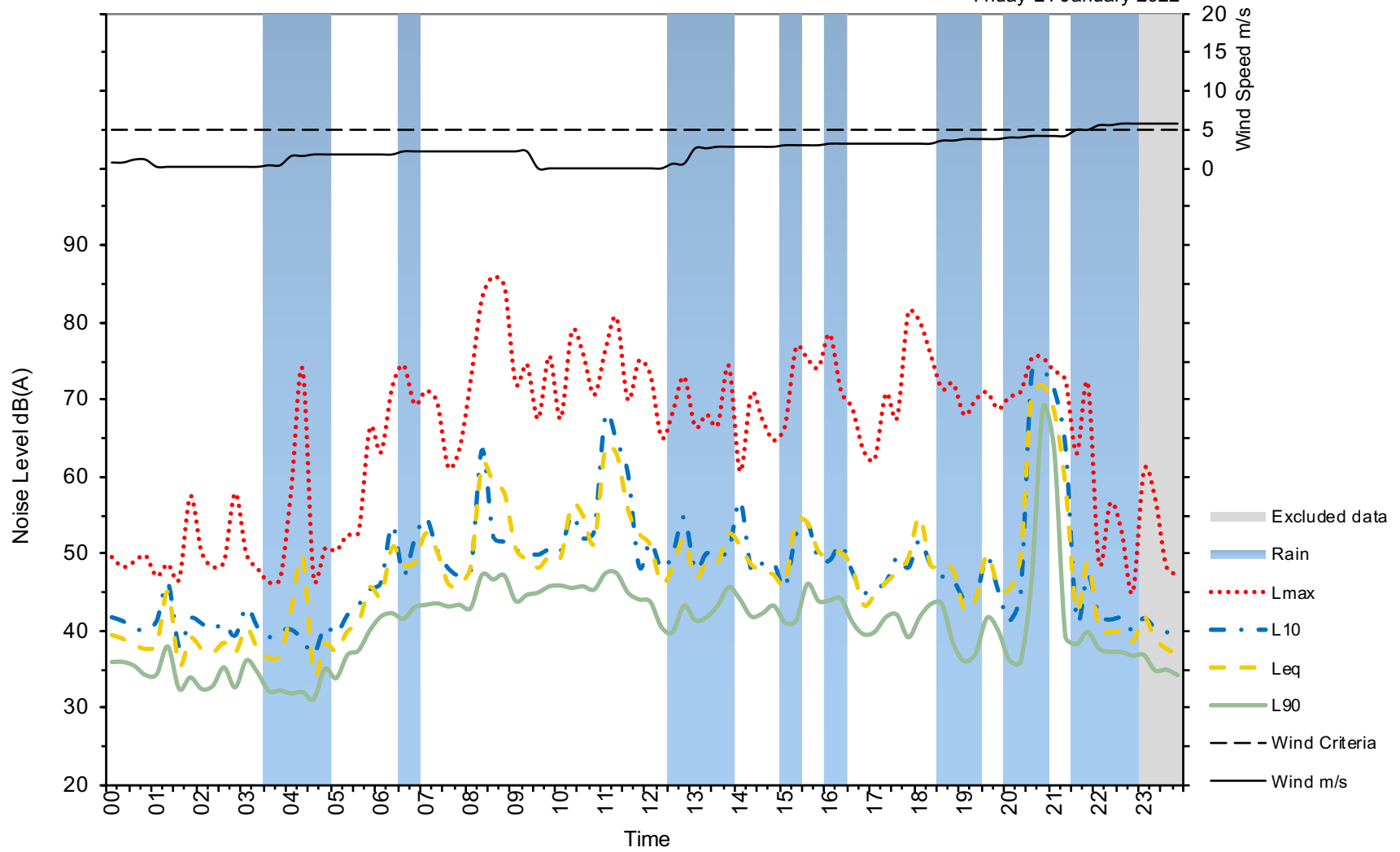
Glenaeon Retirement Village Pumping Station

Thursday 20 January 2022



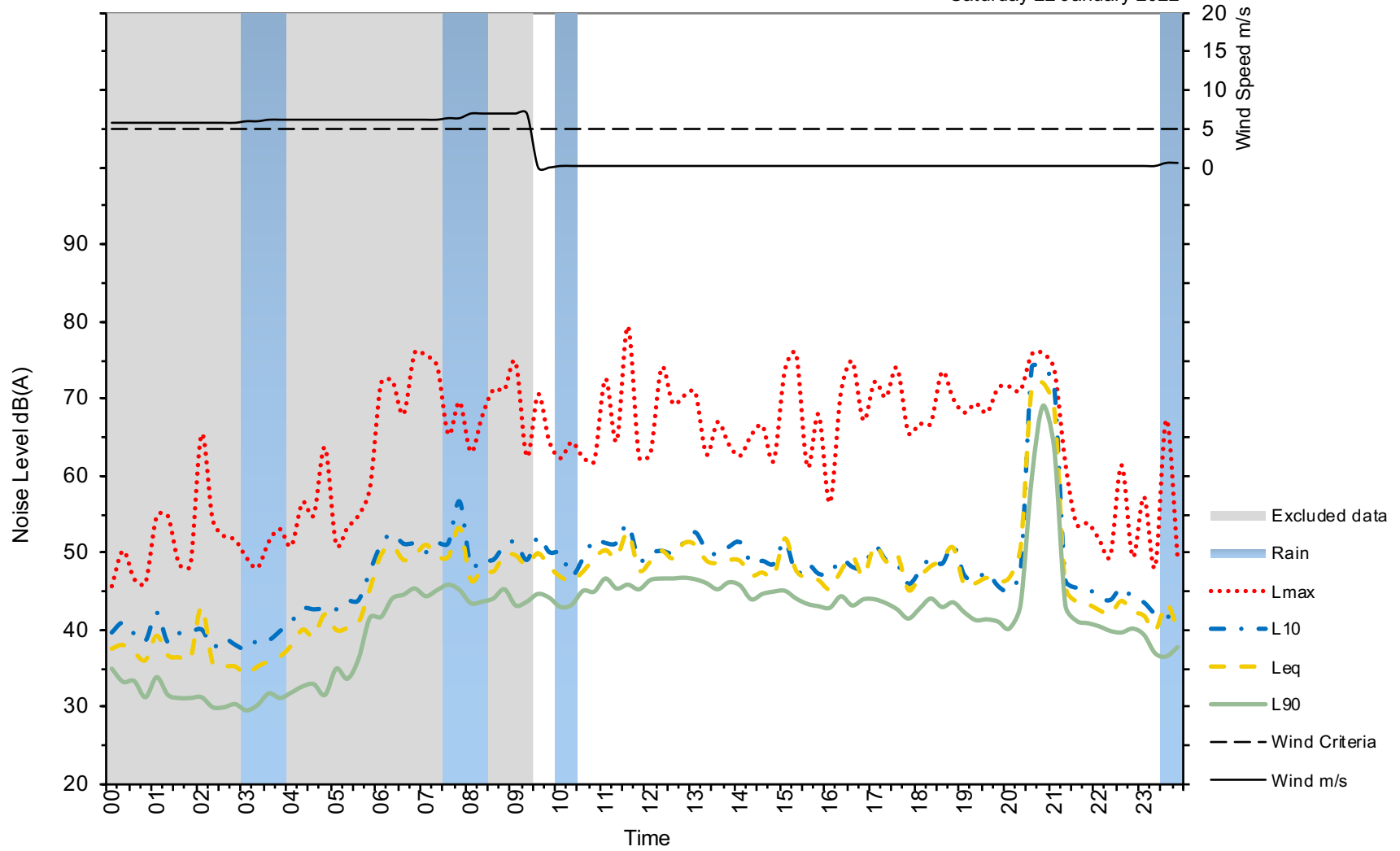
Glenaeon Retirement Village Pumping Station

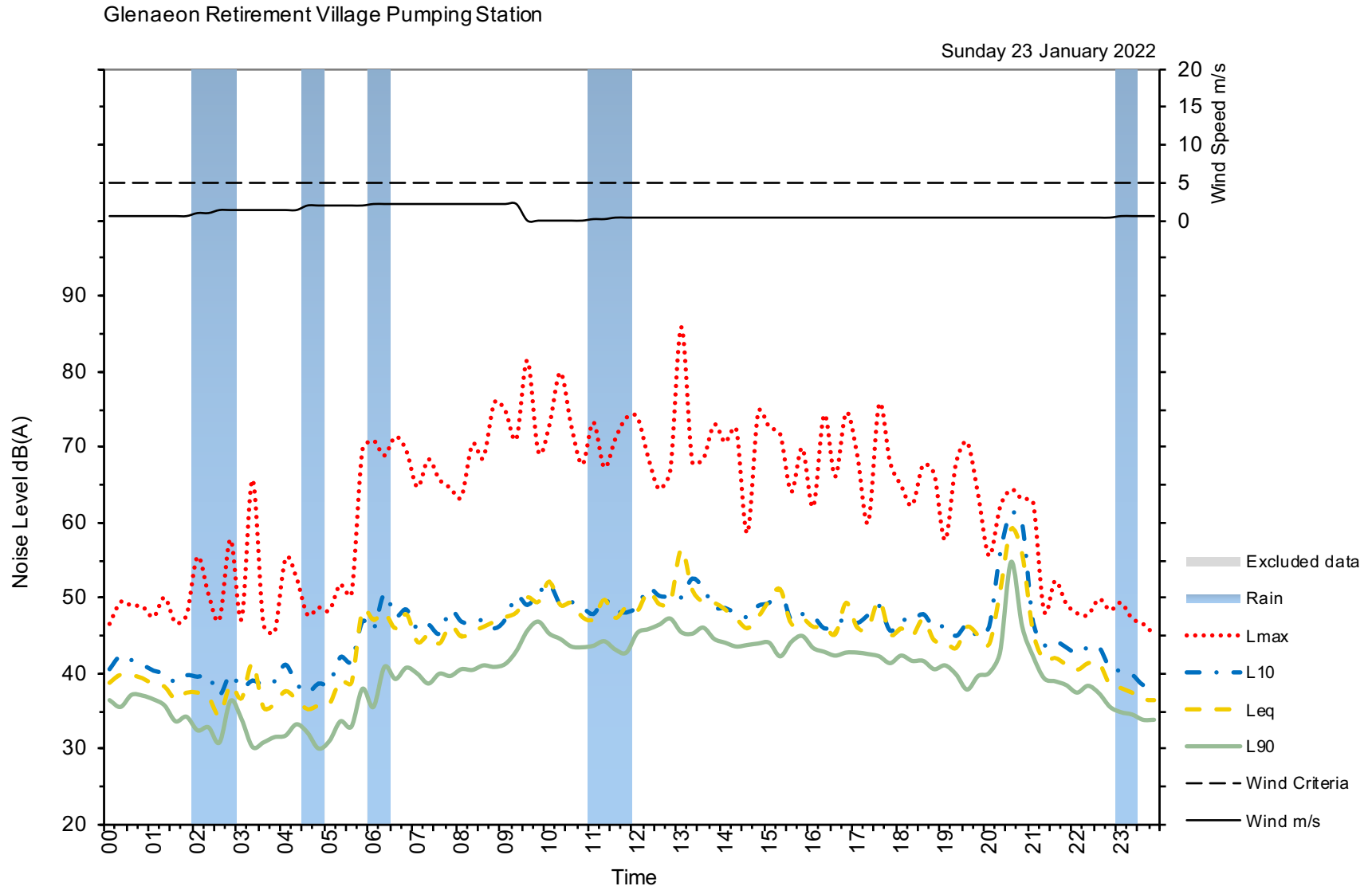
Friday 21 January 2022



Glenaeon Retirement Village Pumping Station

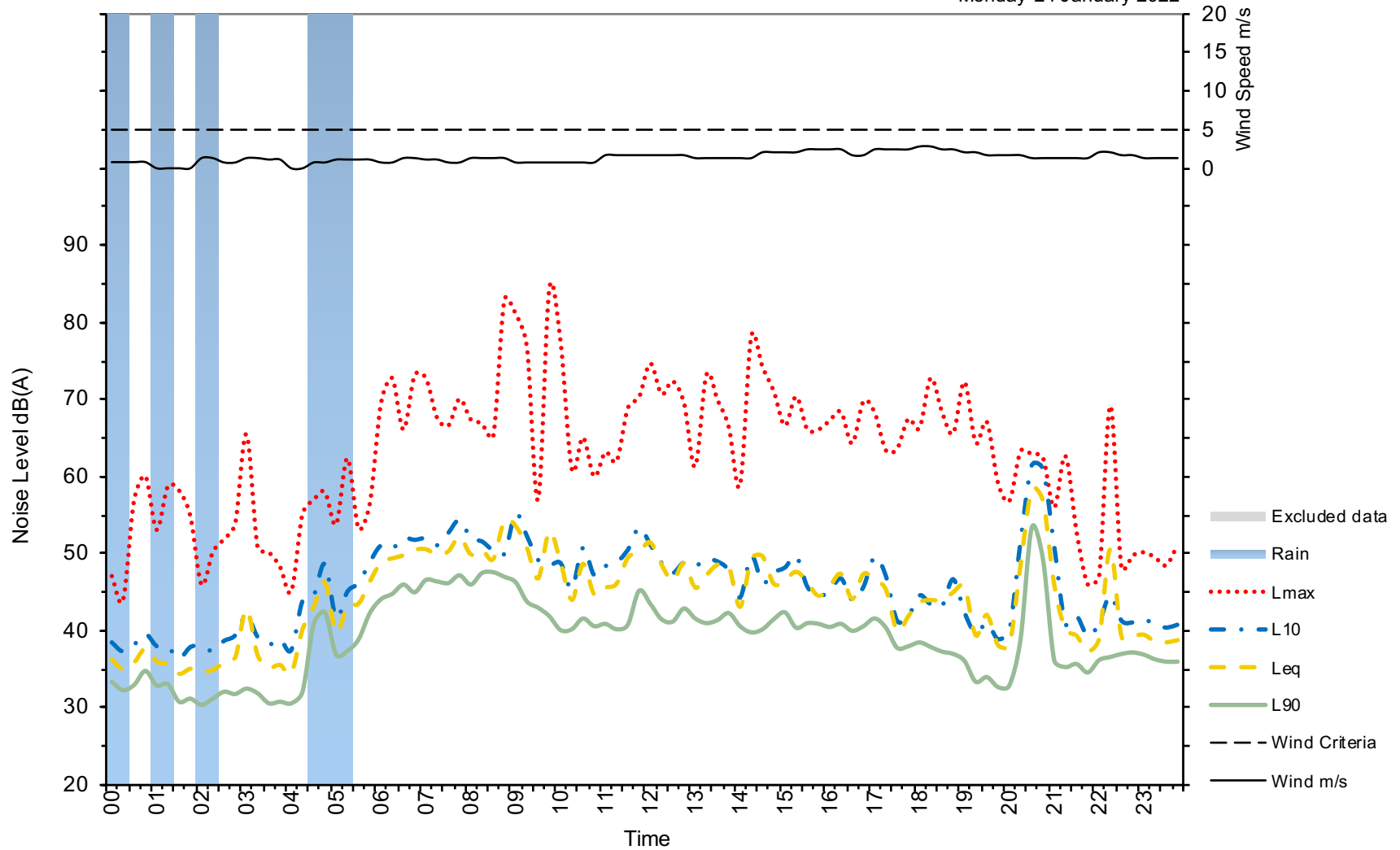
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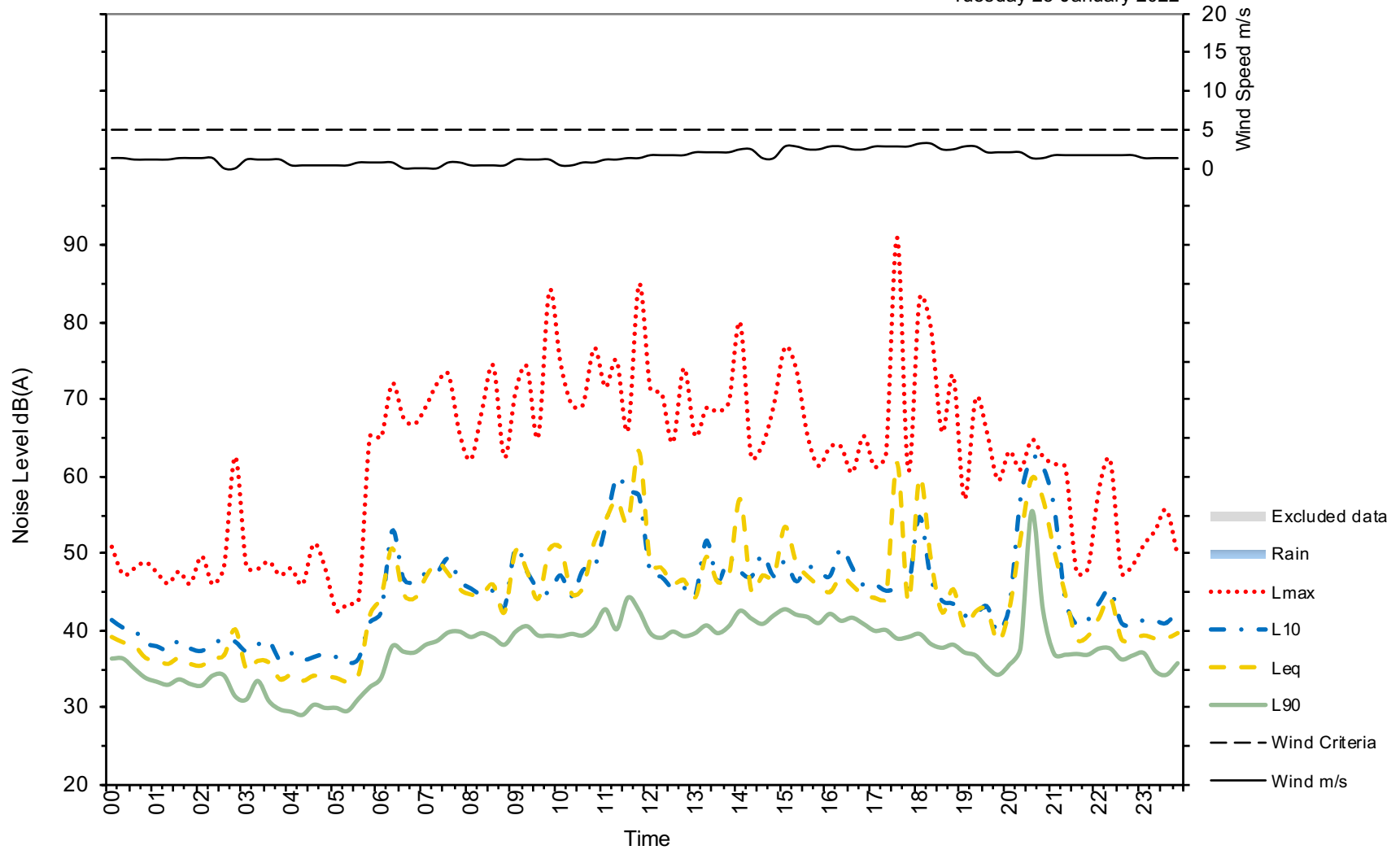
Glenaeon Retirement Village Pumping Station

Monday 24 January 2022



Glenaeon Retirement Village Pumping Station

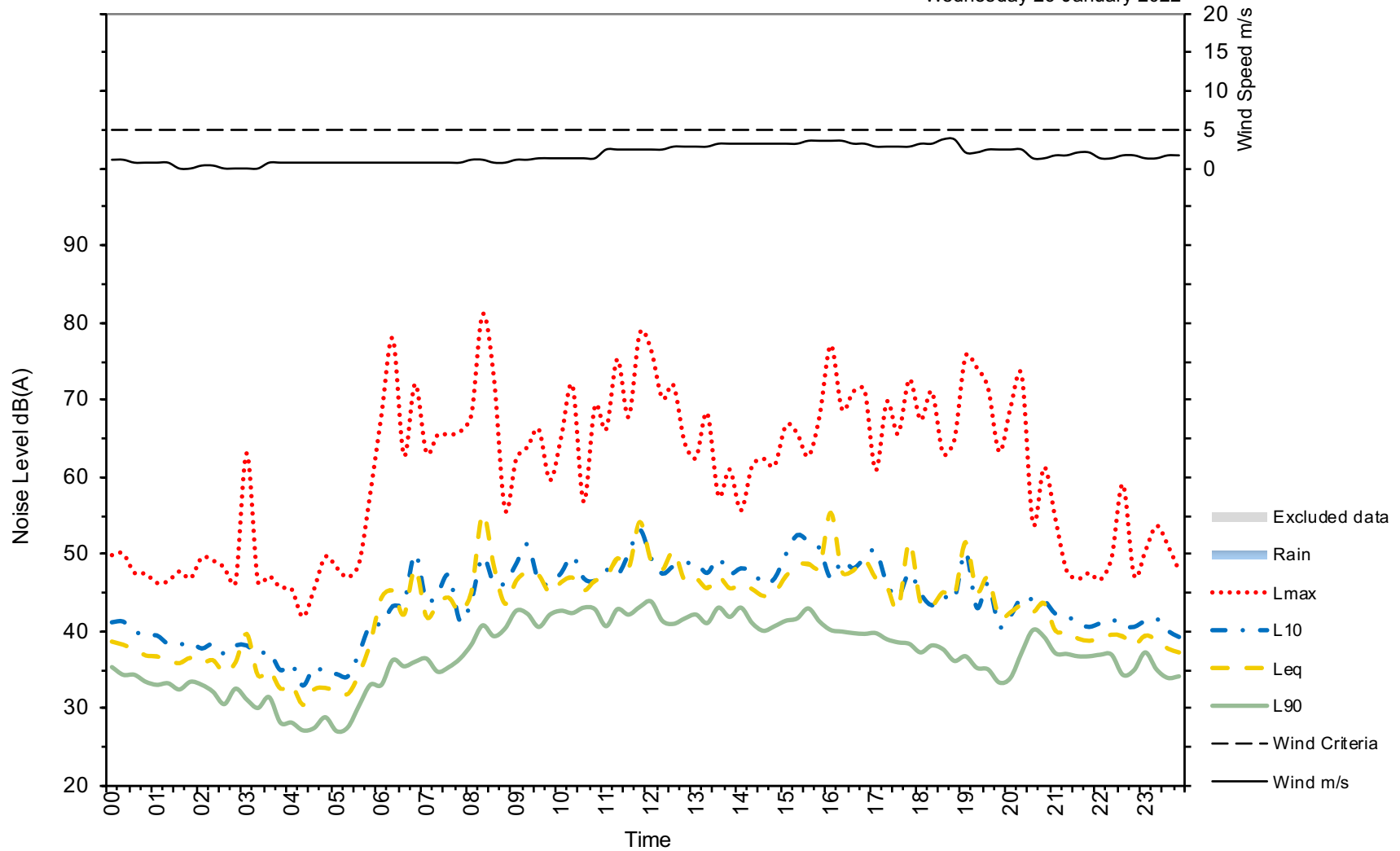
Tuesday 25 January 2022





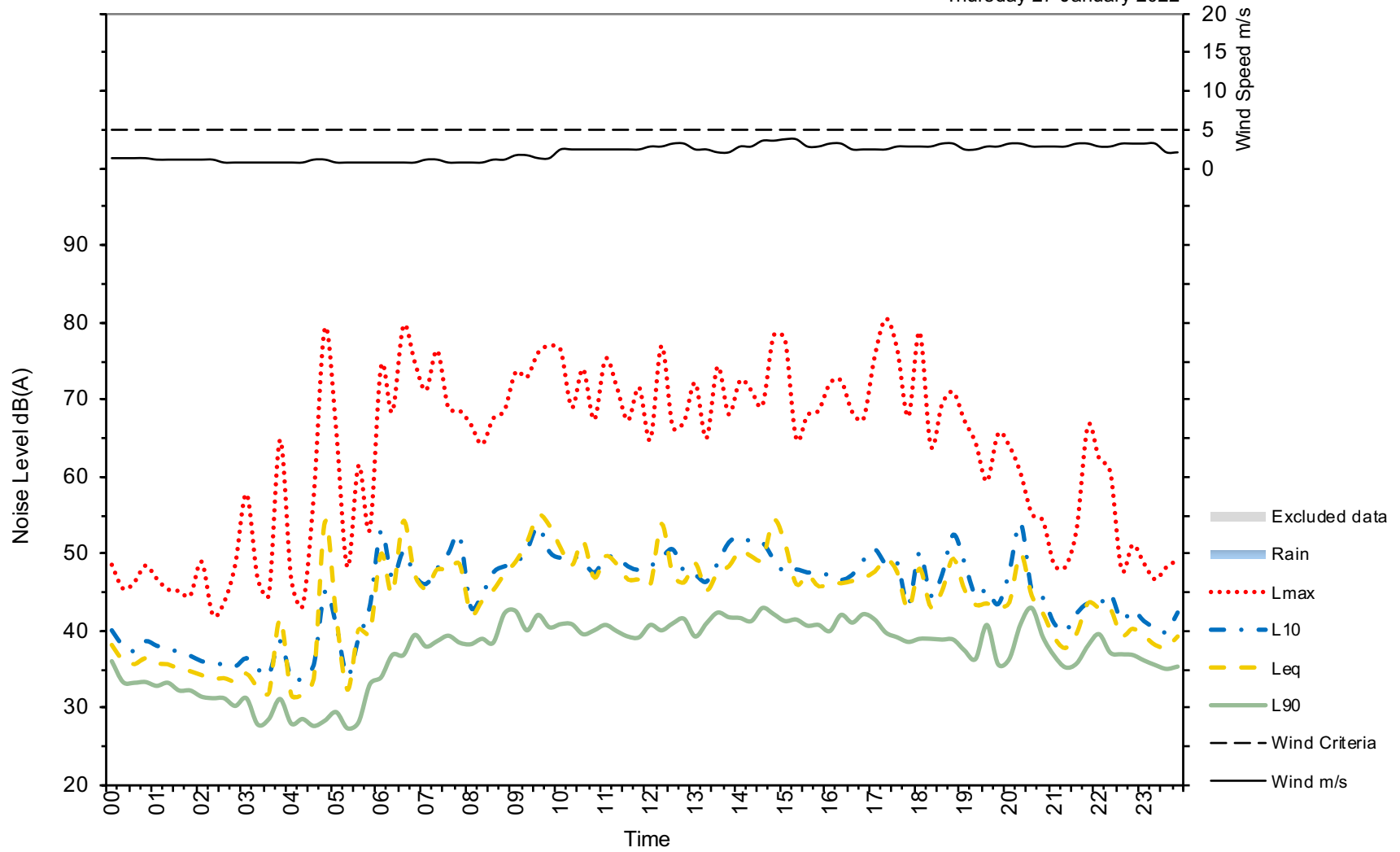
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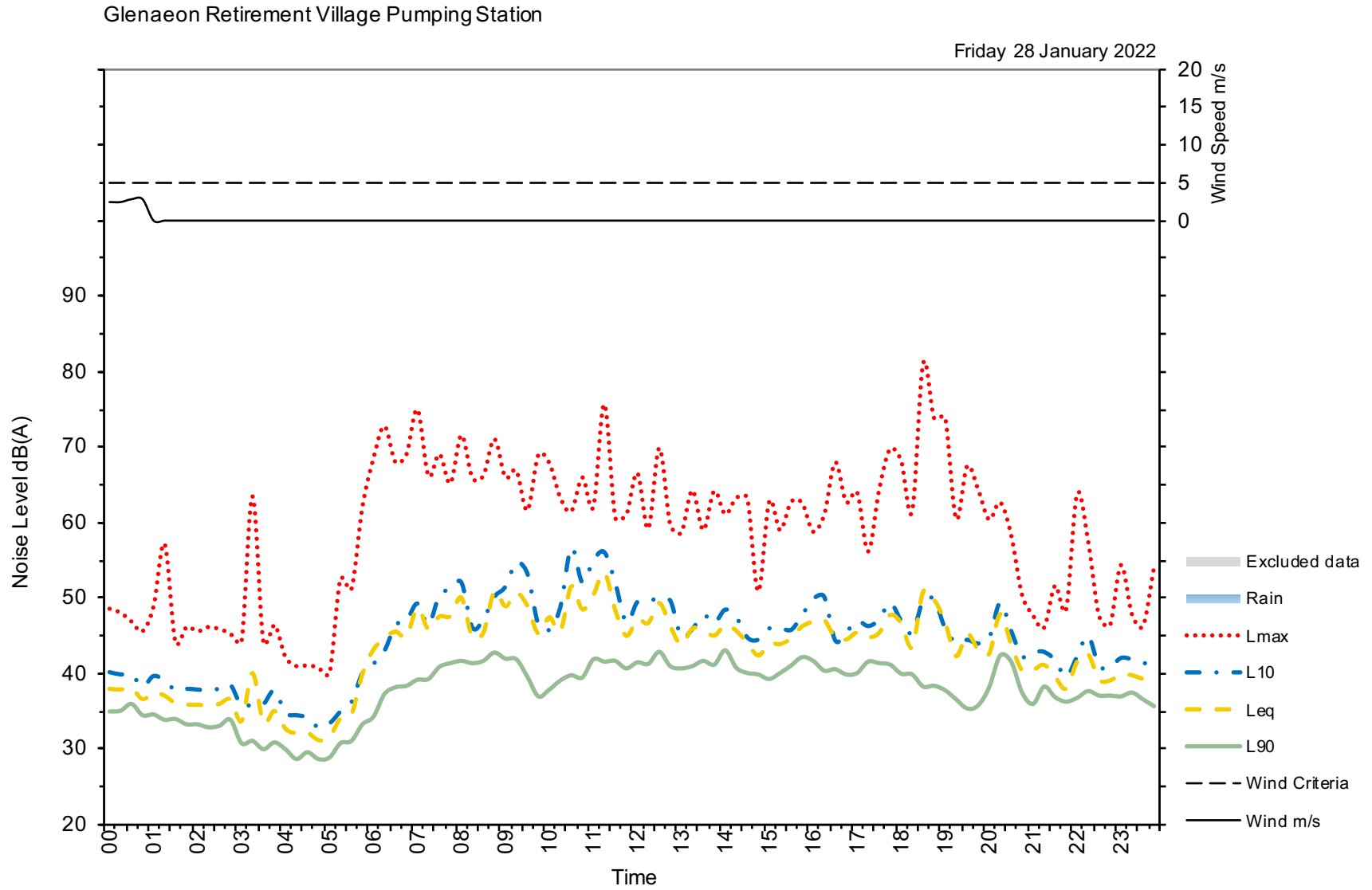
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Glenaeon Retirement Village Pumping Station

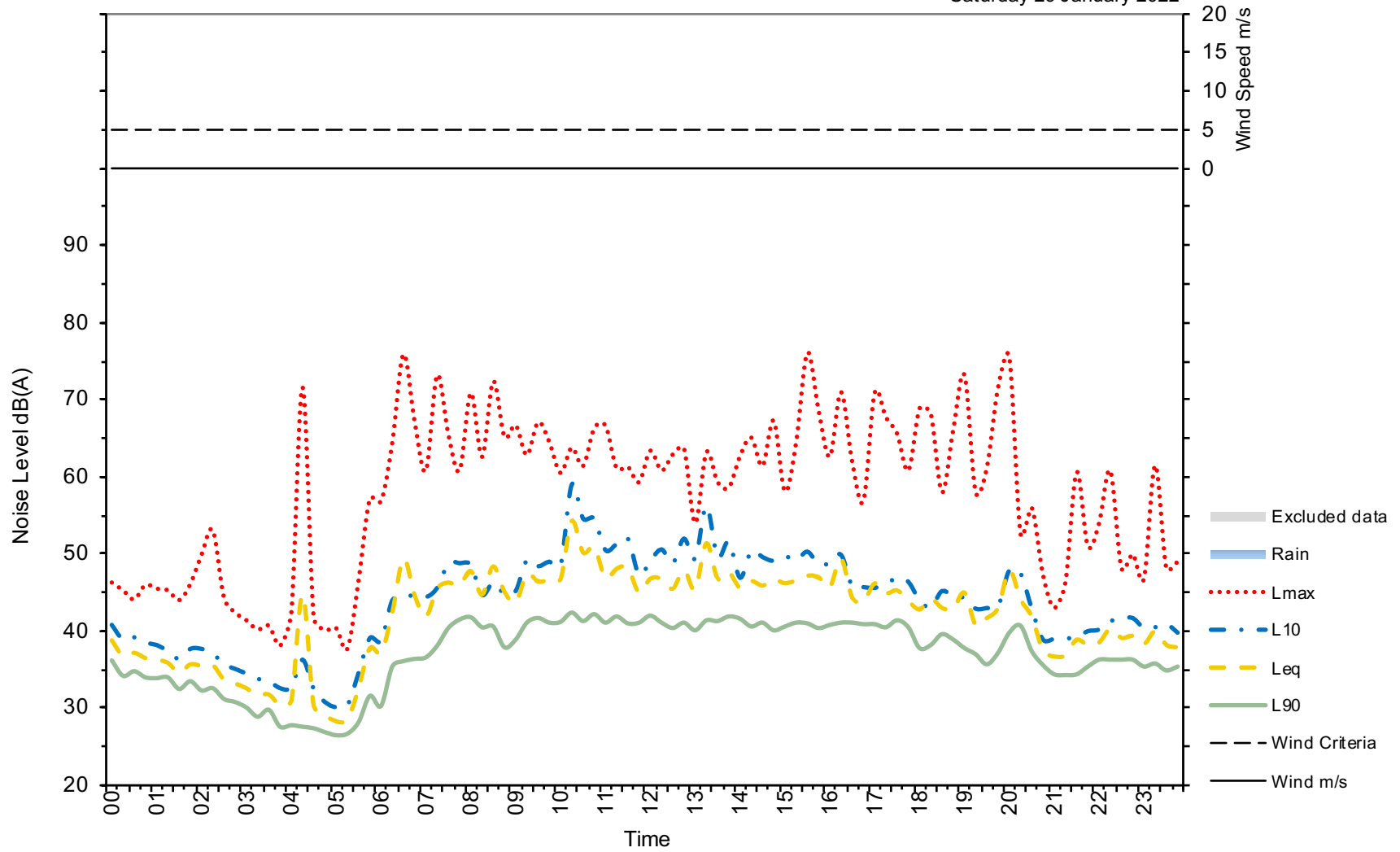
Thursday 27 January 2022





Glenaeon Retirement Village Pumping Station

Saturday 29 January 2022



Glenaeon Retirement Village Pumping Station

Sunday 30 January 2022

