PART C – CITY OF WANNEROO

1. Declarations of Due Consideration

2. Disclosure of Interests

3. Form 1 DAP Applications

3.1 Lot 100 (45) Trandos Road, Neerabup – Proposed Use Not Listed (Battery Energy Storage System) – DAP/25/02895

4. Form 2 DAP Applications

Nil.

5. Section 31 SAT Reconsiderations

Nil.

Part C – Item 3.1 – LOT 100 (45) TRANDOS ROAD, NEERABUP – PROPOSED USE NOT LISTED (BATTERY ENERGY STORAGE SYSTEM)

Form 1 – Responsible Authority Report
(Regulation 12)

DAP Name:	Metro Outer DAP
Local Government Area:	City of Wanneroo
Applicant:	GHD Pty Ltd
Owner:	NewGen Power Neerabup Pty Ltd
Value of Development:	$230 million
Responsible Authority:	City of Wanneroo
Authorising Officer:	Aaron Jones
LG Reference:	DA2025/476
DAP File No:	DAP/25/02895
Application Received Date:	25 March 2025
Report Due Date:	8 July 2025
Application Statutory Process Timeframe:	90 Days
Attachment(s):	1. Development Plans 2. Location Plan 3. Advertised properties map 4. Noise Impact Assessment 5. Bushfire Management Plan & Bushfire Risk Management Plan 6. DFES Referral Advice 7. Applicant response to DFES comments

Responsible Authority Recommendation

That the Metro Outer DAP resolves to:

1. **Accept** that the DAP Application reference DAP/25/02895 is appropriate for consideration as a "Use not Listed (Battery Energy Storage System)" land use and compatible with the objectives of the zoning table in accordance with Part 3 of the City of Wanneroo District Planning Scheme No. 2.

2. **Approve** DAP Application reference DAP/25/02895 and accompanying plans in accordance with Clause 68 of Schedule 2 (Deemed Provisions) of the *Planning and Development (Local Planning Schemes) Regulations 2015*, and the provisions of the City of Wanneroo District Planning Scheme No. 2, subject to the following conditions:

Conditions

1. This decision constitutes planning approval only and is valid for a period of 4 years from the date of approval. If the subject development is not substantially commenced within the specified period, the approval shall lapse and be of no further effect.

2. Parking areas, driveways and points of ingress and egress must be designed and constructed in accordance with the Australian Standard for Offstreet Carparking (AS 2890) and must be drained, sealed, marked and maintained to the satisfaction of the City prior to occupation of the development.

3. Wheel stops must be provided in accordance with AS 2890 where the parking bays abuts a concrete path.

4. The parking areas and associated access indicated on the approved plans must not be used for the purpose of storage or obstructed in any way at any time, without the prior approval of the City.

5. Stormwater and any other water run-off from buildings and/or paved areas must be collected and retained on site.

6. The development is to comply with the recommendations and assumptions of the **Noise Impact Assessment** (Project number 12649071) prepared by **GHD** dated **21 March 2025**. Recommended works must be completed prior to the commencement of the use.

7. All waste must be stored within the designated bin enclosure and collected from the site by a private contractor at the cost of the owner/occupier.

8. Any graffiti applied to the external surfaces of the building must be removed to the satisfaction of the City of Wanneroo.

9. Engineering drawings and specifications are to be submitted, approved, and works undertaken in accordance with the approved plans, engineering drawings and specifications, for the extension of Trandos Road to ensure that all proposed accessways are provided with frontage to a constructed road, and sufficient

turnaround area and are constructed and drained at the landowner/applicant's cost.

Drawings must be submitted and approved prior to the submission of a building permit.

10. Engineering drawings and specifications are to be submitted and approved, and works undertaken for construction of Trandos Road in accordance with the approved plan of subdivision, engineering drawings and specifications to ensure that:

    (a) street lighting in accordance with dark sky principles is installed on all new subdivisional roads to the standards of the relevant licensed service provider; and

    (b) roads that have been designed to connect with existing or proposed roads abutting the subject land are coordinated so the road reserve location and width connect seamlessly; and

    (c) temporary turning areas are provided to those roads that are subject to future extension.

    Drawings must be submitted and approved prior to the submission of a building permit.

11. The use shall be implemented in accordance with the measures outlined in the Bushfire Management Plan and Bushfire Risk Management Plan provided by **Covey** dated **14 March 2025** (attached), including, but not limited to the Asset Protection Zone (APZ).

12. Information is to be provided to demonstrate that the measures contained in Section 7; Table 6 of the bushfire management plan provided by **Covey** dated **14 March 2025** have been implemented. This information should include a completed 'Compliance Certificate' prepared by the bushfire planning practitioner.

13. A notification, pursuant to Section 70A of the *Transfer of Land Act 1893* is to be placed on the certificate of title of the lot. Notice of this notification is to be included on the diagram or plan of survey (deposited plan). The notification is to state as follows:

    "*The site is affected by the Pinjar Tip Site Leachate Plume".*

    The notification is to be lodged on the certificate of title prior to the commencement of the use.

14. A Construction Management Plan must be submitted for approval prior to an application being lodged for a building permit. This plan is to detail how construction will be managed to minimise disruption in the area and to adjoining landowners. The plan must address the following:

    a) The delivery of and delivery times for materials and equipment to the site;
    b) Storage of materials and the location and types of equipment on site;
    c) Parking arrangements for contractors and sub-contractors;

d) The impact on traffic movement;
e) Construction times;
f) The relocation of public footpaths;
g) Measures to minimise impacts of noise and sand drift and dust from the site;
h) Tree protection zones to be established for trees identified to be retained in the approved landscaping plan (including any verge trees) where applicable;
i) The relocation/disruption of any public transport infrastructure; and
j) Any other matter required by the City.

The construction management plan is to be submitted to and approved by the City prior to the commencement of any development. Construction is to be implemented in accordance with the approved construction management plan.

Advice Notes

1. The owner/applicant is to submit the "Certification of Compliance with Development Approval Conditions" form certifying that all of the conditions specified in the approval by the Council for the development of the land have been completed in accordance with the approved plans, and the certification is to be lodged with the Council within 14 days from the date of practical completion, and applies to all of the conditions, except for those conditions relating to on-going compliance.

2. In relation to Condition 9 and 10, the construction of Trandos Road is required to the extent that sufficient full movement access is provided to all crossovers and driveways of the proposed development. A sufficient turn-around area/temporary cul-de-sac is to be provided at the end of Trandos Road to enable the full movement of vehicles. As the road terminates at this point, the turn around area must facilitate a full turning movement without the need to enter into any private land.

3. It is recommended that the proponent engages with DFES on safety and emergency matters and implement an emergency plan to manage impacts of a smoke plume on the surrounding development. Further information surrounding the fire management of the site including justification on the water capacity on site should also be provided and discussed in further detail with DFES Metropolitan North Coastal Region Office, noting their role as the Hazard Management Authority for the area.

Details: outline of development application

Region Scheme	Metropolitan Region Scheme
Region Scheme - Zone	Industrial
Local Planning Scheme	District Planning Scheme No.2
Local Planning Scheme - Zone	General Industry
Structure Plan	Neerabup Industrial Area – ASP No. 17
Structure Plan - Land Use Designation	General Industrial
Use Class and permissibility:	Use Not Listed
Lot Size:	9.6567 hectares.
Existing Land Use:	Power Station
State Heritage Register	No

Local Heritage	☒ N/A ☐ Heritage List ☐ Heritage Area
Design Review	☒ N/A ☐ Local Design Review Panel ☐ State Design Review Panel ☐ Other
Bushfire Prone Area	Yes
Swan River Trust Area	No

Proposal:

The application proposes a Battery Energy Storage System (BESS) within the central portion of the lot. On the eastern portion of the lot is the Neerabup Power Station which will continue to operate and is not subject to this application.

The BESS is considered as a 'Use not Listed' under the City's District Planning Scheme No.2 (DPS 2) as the use is not incidental to the existing Power Station. The proposal incorporates the following aspects:

- 142-megawatt storage facility providing a four-hour supply capacity which is proposed to be connected to the South West Interconnected System via Western Power's Neerabup Terminal;
- 132 battery containers, 34 power conversion systems & 4 auxiliary skids;
- 330kV distribution transformer, control room, network service provided room and other associated infrastructure on site;
- 10 parking bays on site.

The development plans for consideration are included as **Attachment 1**.

Background:

The subject site is zoned 'General Industrial' under Agreed Structure Plan No.17 – Neerabup Industrial Area (ASP 17) and is located on the eastern side of the structure plan boundary.

A Location Plan is included as **Attachment 2**.

A portion of the site currently operates the Neerbaup Power Station, which was approved in 2008 and became operational in 2009. The Gas powered Station is capable of producing up to 330-megawatts of power and is a peak load station, meaning it is only in use when energy demand on the grid spikes. The BESS will not generally be powered by the Power Station, but from excess power received from the grid, usually through residential solar generation.

The subject site is adjacent to the City of Wanneroo's future Neerabup Resource Recovery Precinct, which is proposed to include a Waste to Energy Facility. ASP 17 identifies that Orchid Road, located on the western boundary of the site, will be required as the expansion of the Industrial estate continues and will connect with Trandos Road, which provides current access to the site. The intersection of Trandos Road and Old Yanchep Road to the east of the site is also scheduled to commence upgrades in late 2025.

Legislation and Policy:

Legislation

Metropolitan Region Scheme
District Planning Scheme No. 2

State Government Policies

State Planning Policy 3.7: Planning in Bushfire Prone Areas
WAPC Position Statement: Renewable Energy Facilities

Structure Plans

Neerabup Industrial Area – Agreed Structure Plan No. 17

Local Policies

N/A

Consultation:

Public Consultation

The proposed BESS does not align with any of the land uses outlined in Part 6 of DPS 2. As such the proposed development is considered to be a 'Use not Listed' which under Part 3 of DPS 2 can be considered subject to the following:

- Determine that the use is consistent with the objectives of a particular zone and is therefore a use that may be permitted in the zone subject to conditions imposed by the local government; or

- Determine that the use may be consistent with the objectives of a particular zone and advertise under clause 64 of the deemed provisions before considering an application for development approval for the use of the land.

As such, public consultation has been undertaken in accordance with clause 64 of the Deemed Provisions, contained within the *Planning and Development (Local Planning Schemes) Regulation 2015*. The application was advertised for a period of 28 days, commencing on 22 May 2025 and concluding on 19 June 2025. Advertising was undertaken by way of letter to surrounding landowners/occupiers within approximately 500-metres of the subject site, a sign being erected on site, a notice being placed in the local newspaper and all development plans and supporting documentation being made available on the City's website.

A map of the properties which were directly advertised to is included as **Attachment 3**.

Following the completion of the advertising period only one submissions was received, which objected to the proposal. The submitter raised concerns over the proximity of the proposal to residential land and the impact it would have on residents if it caught fire.

The site is zoned 'General Industry' and as such uses of this nature are expected to be accommodated. Furthermore, the site is located a minimum of 1.7km from the nearest existing or future residential development which is considered an appropriate buffer. The application has been supported by a Noise Impact Assessment (NIA) (**Attachment 4**) which concludes that the development will have no acoustic impacts on residents, and the Bushfire Management Plan and Bushfire Risk Management Plan (**Attachment 5**) provided outlines sufficient measures to address concerns surrounding bushfire.

Referrals/consultation with Government/Service Agencies

Part of the subject site, including the area where development is proposed is identified as Bushfire Prone. As such the application was referred to the Department of Fire and Emergency Services (DFES) given the use contains battery storage on-site which would be highly susceptible to fire. Section 9.4 of the SPP 3.7 Guidelines outlines that applications can be referred to DFES for technical advice, which is considered appropriate given the nature of the proposed use. Furthermore, section 9.4.2 of the Guidelines and section 7.1 (iv) of SPP 3.7 outlines that DFES's role as a Hazard Management Agency enables them to provide technical advice on emergency management.

DFES has provided comments on the proposal, which is included as **Attachment 6**.

The advice provided by the DFES is separated into two distinct categories. Firstly, DFES has provided comments that relate directly to the requirements outlined in SPP 3.7. These comments carry statutory weight, as SPP 3.7 is a state planning policy that must be complied with during the planning and development process, in accordance with Clause 67(2)(f) of the *Planning and Development (Local Planning Schemes) Regulations 2015*. In contrast, DFES has also provided comments based on the CFA Design Guidelines and Model Requirements – Renewable Energy Facilities v4 (REF Guidelines). These guidelines are considered best practice for the development of renewable energy facilities but do not form part of SPP 3.7 and therefore do not carry statutory authority. They are intended to support and enhance planning outcomes but are advisory in nature and not legally binding. As such, these comments have been acknowledged however are not enforceable through the development application.

DFES advice comments on the matters from SPP 3.7 and the REF Guidelines along with Administration's response to these are outlined below. The applicant has also provided a response to DFES comments, undertaken by Covey, which is included as **Attachment 7**.

DFES comments on SPP 3.7

DFES Referral Comment	Administration Comment
A2.1a – Siting and Design Evidence to support the exclusion of Plots 15 and 17 as managed to low threat in accordance with AS3959 is required. As these areas include the Trandos Road and Orchid Road reserves, confirmation from the responsible authority should be provided	The construction of Trandos Road is required as a condition of the development approval and as such, the area included within Plot 17 will become a bitumen road. This land will be managed by the City in accordance with the road and verge maintenance regime of the City, which is typically every 3 months. As such this land can be

that the reserve areas will be managed to low threat in perpetuity. If unsubstantiated, the vegetation should be classified as per AS3959, or the resultant BAL ratings may be inaccurate. The BAL ratings cannot be validated for the above reasons.	considered as excluded low threat vegetation. Plot 15 appears to be located entirely within the subject site, with the Orchid Road alignment being located to the west of the lot boundary. As such, it will be the responsibility of the proponent/landowner to maintain this land as low threat. Administration does not recommend any updates to the BMP and considers that the BMP adequately addresses these comments.
A3.1 – Vehicular Access – Private Driveways The proposed vehicular access to the development site is from the unconstructed portion of Trandos Road, it is unclear whether this complies with the weight capacity requirements of Appendix B.3, Table 10 of the Guidelines and whether any road upgrade is required to facilitate emergency services vehicles operation.	As detailed in Planning Assessment section below, Administration recommends conditions to be imposed surrounding the construction of Trandos Road to the extent required under the guidelines to access the site. As such, Administration does not recommend any updates to the BMP and considers that the BMP adequately addresses these comments, subject to the relevant conditions.
A4.1 – Water Supply The BMP proposes fire water tanks with a combined capacity of 30,000 litres for the proposed habitable buildings; however, the fire water location and capacity for the BESS facilities have not been specified, with 288,000 litres required in accordance with the REF Guidelines.	The proposal provides 30,000 litres of water in tanks based on the habitable buildings proposed on the site which may be inhabited as identified within Table 11 of SPP 3.7. Table 11 requires that for each habitable building, 10,000 litres of water per 1,500m^2 of floor space is provided, up to 50,000 litres. 30,000 litres accommodates the three habitable buildings (O&M building, switchroom/control room and NSP building) which has a combine floor space of approximately 300m^2.

DFES comments on REF Guidelines

DFES Referral Comment	Administration Comment
The submitted Bushfire Risk Management Plan (BRMP) has been provided based on the REF Guidelines but needs revisions to address the 'Water Supply' issue outlined above under A4.1.	As outlined in the above table, the water supply provided on site complies with the requirements of SPP 3.7. Notwithstanding this, the applicant has advised that prior to the site becoming operational, they will engage with DFES

If approved, the DFES District Officer should be consulted during the development, construction and leading up to the commission of the facility. It is considered critical for the local fire and emergency services to understand the hazards present in the facility and the measures required to ensure the safety of firefighting personnel when working in or around different parts of the facility.	once the final design elements have been determined and review water requirements. Section 7, Table 6 'Proponent (Renewable Energy Infrastructure) - prior to commissioning and facility occupation', point 9 details that ongoing reviews of the BRMP are required. This may include the review of firefighting matters including the volume of water provided on the site. The City recommends a condition is imposed requiring compliance with the BMP which includes the implementation and management table in section 7.
DFES' Metropolitan Operations has provided the following comments: • There is a lack of sufficient water to contain a fire and/or suppress smoke plumes (30,000 litres proposed as opposed to 288,000 litres required for BESS facilities in the REF Guidelines). • There appears to be a lack of spill containment that includes provision for management of fire water runoff. It is also unclear whether the proposed facility will have any negative impact on the groundwater aquifers. • The BMP does not provide a broader landscape map showing the potential impact on adjacent human activity areas such as the Wanneroo Raceway approximately 1.5 kilometres to the northwest, the Wesbeam factory directly adjacent to the site to the southwest, the Wanneroo Junior Motorcross Club less than 1 kilometre to the east and southeast, and the major residential development approximately 1.7 kilometres to the south. These locations could require evacuation in the event of smoke plume impact. The relevant emergency evacuation procedures should be discussed with DFES Metropolitan North Coastal Region Office.	<u>Water Supply</u> As noted above, the water provided on site complies with the SPP requirements, however the BMP implementation and management table requires ongoing review of this. <u>Spill containment</u> Whilst not a requirement of SPP 3.7, Section 7, Table 6 of the BMP requires review and updates of an emergency management plan which incorporates procedures for on site fire management. As such, management of spill containment can be address through the emergency management plan. Furthermore, the development plans do include underground firewater storage tanks which will contain used firewater. This is indicated by note 5 on the plans. <u>Broader Impacts</u> Section 5.8 of the BMP (derived from the BRMP) requires that an Emergency Management Plan is developed for the facility for various fire emergencies (including onsite fires and bushfires). This is required to be implemented in accordance with Section 7, Table 6 of the BMP and is considered appropriate to manage potential fire impacts, although it is noted that SPP 3.7 seeks to manage impacts of bushfire on the development itself and not potential impacts on surrounding land of the development.

	Notwithstanding this, an advice note is recommended to be imposed which recommends the proponent to engage with DFES on safety and emergency matters.
It is the responsibility of the proponent to ensure the proposal complies with relevant planning and building requirements. This advice does not exempt the applicant/proponent from obtaining approvals that apply to the proposal including planning, building, environmental health or any other approvals required by a relevant authority under written laws.	A condition is recommended to be imposed which requires the measures of the BMP including the implementation and management requirements of Section 7 to be undertaken and implemented at different stages of the development. As noted by DFES, it is the proponents responsibility to ensure any further approvals are obtained where relevant.

As outlined in the above tables, the City considers that the matters raised by DFES relating to SPP 3.7 have been suitability addressed and comply with the SPP requirements.

The comments surrounding the REF Guidelines do not hold any statutory weight as they are not a requirement of SPP 3.7. Notwithstanding this, through the requirement of an emergency management plan, as per Section 5.8 of the BMP, many of the points raised by DFES can be further discussed and addressed. As such, the City does not consider any modifications are necessary to the BMP or BRMP.

A condition is recommended to be imposed requiring development to be undertaken in accordance with the BMP and BRMP and for a certificate of bushfire compliance to be provided, by a suitability qualified consultant, outlining the relevant measures have been implemented. An advice note is also recommended to be imposed outlining DFES's recommendation to engage with the relevant officers to discuss future procedures and management of fire risk and for the preparation of an emergency management plan.

Design Review Panel Advice

Not applicable.

Planning Assessment:

An assessment of the proposal has been undertaken against the relevant provisions of the City's DPS 2, applicable State Planning Policies and ASP 17. The following matters have been identified as key considerations in the determination of the application:

- Consistency with Zone Objectives;
- ASP 17 Requirements;
- Landscaping; and
- Access, Parking and Road Construction;

Consistency with Zone Objectives

As outlined in the 'Proposal' section above, the proposed development is considered as a 'Use not Listed' and as such must be consistent with the objectives of the applicable zone under Part 3 of DPS 2. The objectives of the 'General Industry' are:

- To provide for a broad range of industrial, service and storage activities which, by the nature of their operations, should be isolated from residential and other sensitive land uses.
- To accommodate industry that would not otherwise comply with the performance standards of light industry.
- Seek to manage impacts such as noise, dust and odour within the zone.

The development proposes a large-scale battery storage facility which consists mostly of battery housing, which appear as large sea containers, as well as other incidental building and a large distribution transformer. The transformer and associated infrastructure will have a maximum height of 23-metres and as such should be isolated from residential and sensitive land uses.

Industry Light land uses typically contain service industries where customers are likely to visit the site for a service or retail type sale. Further, these uses should ensure they would not be detrimental to residential amenity. Given the scale and nature of the use and lack of landscaping, the proposed BESS would not be appropriate within the Industry Light zone.

The proposed use will not generate any dust or odour once it is operational. The application is supported by a NIA which concludes that noise levels measured at noise sensitive receptors during the baseline monitoring survey would be low and compliant with the relevant noise requirements contained within the *Environmental Noise (Protection) Regulations 1997*.

Therefore, the proposed 'Use not Listed' is considered as an appropriate use within the General Industry zone as it manages impacts generated by noise, dust and odour and meets the objectives of the zone.

ASP 17 Requirements

The site is located within ASP 17 which contains provisions surrounding development and subdivision within the locality. The proposed development complies with all requirements of the ASP, however is identified as being located within the Pinjar Tip leachate plume. Given there is already existing development on the site, the requirement of a notification on the title, identifying the leachate plume is not necessary.

Landscaping

Schedule 6 of DPS 2 prescribes that non-residential development is required to provide a minimum of 8% of the site area with landscaping. The development does not propose any landscaping on the site, which is consistent with the existing Power Station operation.

Given the nature of the use, which is predominantly battery storage an the sites classification as being bushfire prone, the omittance of landscaping on the site is

considered appropriate. Any landscaping on the site could increase the threat of fire which would be catastrophic given the sensitive nature of the use. Furthermore, the site is zoned 'General Industrial' and is intended to accommodate uses which would not otherwise comply with the performance standards of light Industry. Therefore, the uses accommodated within the zone are not intended to provide high levels of amenity where landscaping would be expected. The location of the site does not abut any sensitive land uses, where vegetation would be required to improve the amenity of the development and drainage sumps are provided on site to ensure sufficient stormwater management.

As such, the lack of vegetation of site is supported and is not considered to impact the amenity of the development in this circumstance.

Access, Parking and Road Construction

The site is accessed via Trandos Road, located on the northern side of the site. The development plans indicate three access ways to the site via Trandos Road, however all three access points are located beyond the existing bitumen road and as such the necessary road connection is not provided. The applicant has indicated that access to the site in the interim would be via the existing access way to the site, which currently provides access to the Power Station. Whilst this is appropriate for construction, the proposed access ways must be connected to a sealed road prior to the site being operational to ensure sufficient connection and movements on site. As such, the City recommends that conditions are imposed for the construction of Trandos Road to the extent required for access to all three crossover and driveways.

Schedule 11 of DPS 2 prescribes parking standards for uses listed within the scheme. As the development proposed is a 'Use not Listed' there are no set parking requirements. Once operational the site will only have four full time staff members and ten parking bays are proposed on site. As such, this is an appropriate amount of parking, given the use will not attract visitors or customers to the site.

Conclusion:

The development application for a Use not Listed (Battery Energy Storage System) is compliant with the relevant legislation and planning requirements of DPS 2, ASP 17 and State Planning Policies.

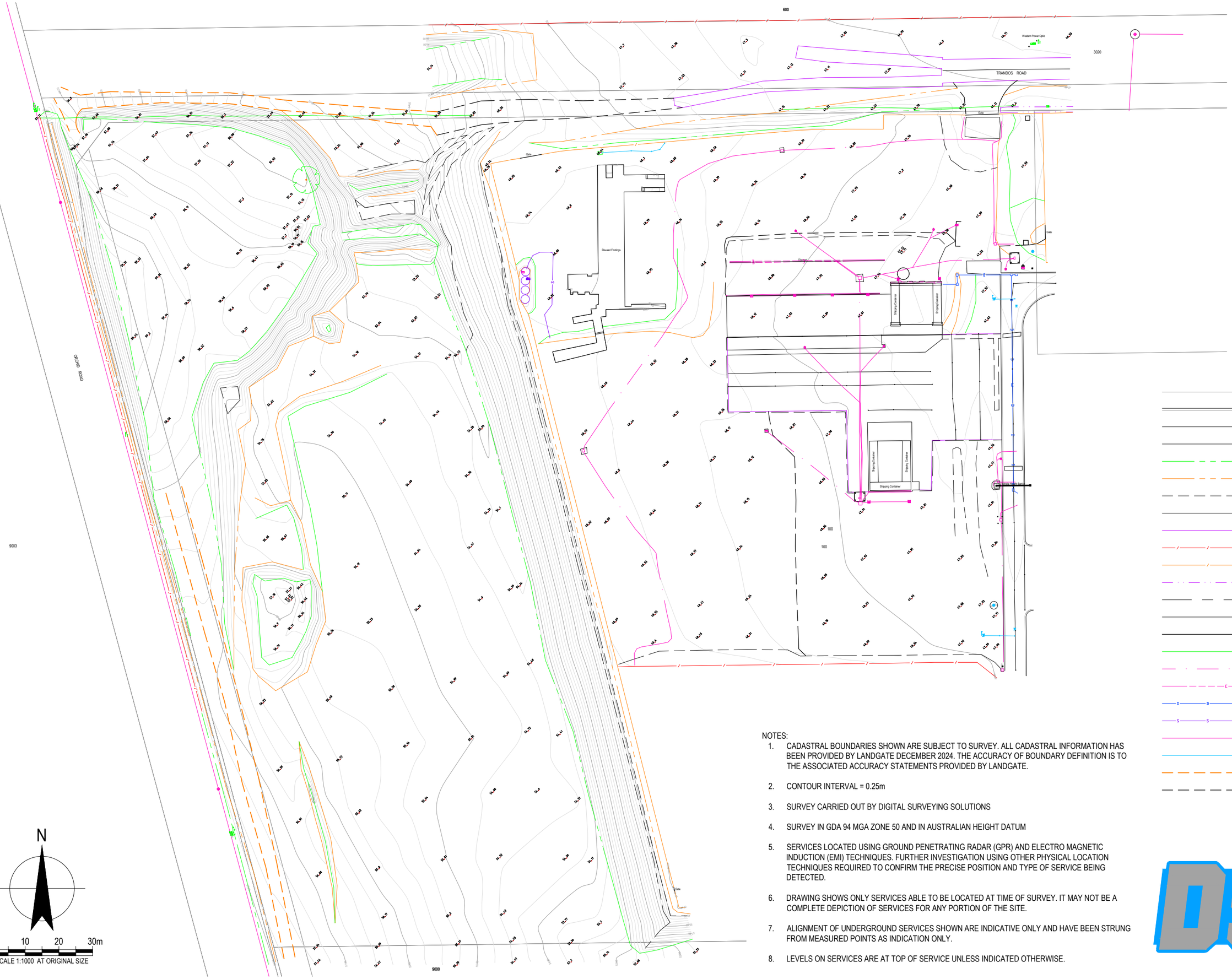
The site is identified as bushfire prone and the application is supported by a Bushfire Management Plan and Bushfire Risk Management Plan. The Noise Impact Assessment provided in support of the application outlines that the development will comply, at all times, with the Environmental Protection (Noise) Regulations 1997.

The site is accessed via Trandos Road, to the north of the site, which currently does not extend to the proposed accessways for the development. As such, the extension of Trandos Road will be required to be undertaken with engineering drawings being provided and works undertaken at the cost of the proponent to ensure sufficient access, as indicated on the proposed plans.

The development is considered to adequately address the matters outlined in SPP 3.7. DFES advice provides comments based on the REF Guidelines which are used for best practice but do not form part of the SPP and as such there is no planning requirement to adhere to these recommendations. Notwithstanding this, an advice

note is recommended to be imposed for the applicant to further engage with DFES on these matters.

Therefore, it is recommended that the application be approved, subject to conditions.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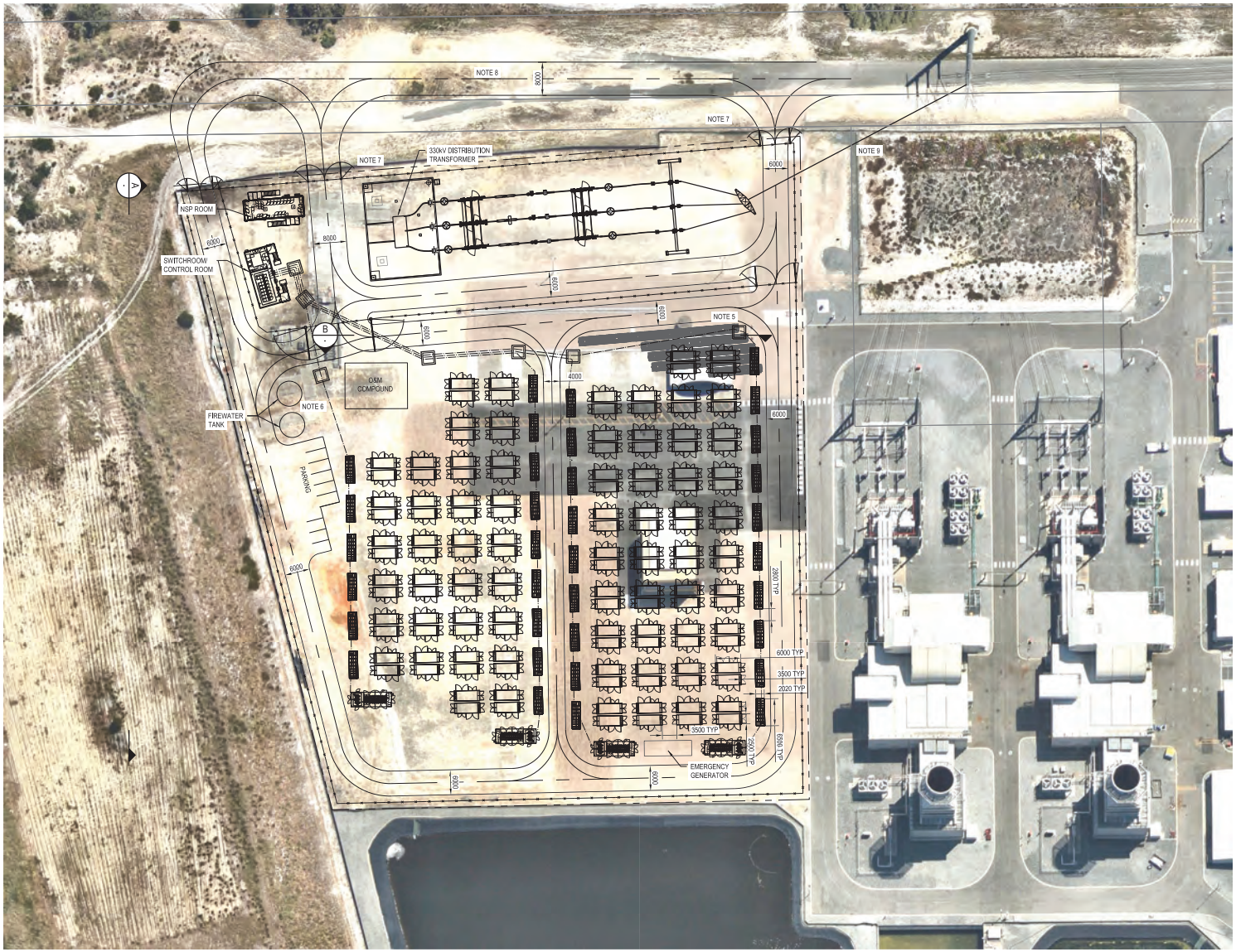

GENERAL ARRANGEMENT

SCALE 1:500

NOTES:

1. PRELIMINARY DESIGN.
2. THE BESS CONSISTS OF 34 POWER CONVERSION SYSTEMS, 132 BATTERY CONTAINERS, AND 4 AUXILIARY SKIDS.
3. UNDERGROUND FIREWATER STORAGE LOCATIONS TO BE DECIDED DURING DETAILED DESIGN.
4. VEHICLE TURNING CIRCLES TO BE DESIGNED AS PER AUSTROADS GUIDANCE FOR A B-DOUBLE (26m), AT 5 TO 15km/h.
5. FIREWATER STORAGE TANKS TO BE INSTALLED UNDERGROUND. DESIGN TO BE CONFIRMED DURING DETAILED DESIGN.
6. FIREWATER TANKS TO HAVE A COMBINED VOLUME OF 452kL IN LINE WITH CFA GUIDELINES. DESIGN TO BE CONFIRMED DURING DETAILED DESIGN.
7. THE EASTERN AND CENTRAL EXITS ARE TO REMAIN CLOSED DURING NORMAL OPERATION AND ARE RESERVED FOR LARGE EQUIPMENT DELIVERY AND EMERGENCY ACCESS.
8. ROAD UPGRADE DESIGN TO BE CONFIRMED DURING DETAILED DESIGN AND IS FOR INDICATIVE PURPOSES ONLY.
9. NETWORK CONNECTION IS INDICATIVE ONLY FOR DEVELOPMENT APPLICATION PURPOSES. NETWORK CONNECTION DETAILS TO BE CONFIRMED DURING DETAILED DESIGN.

LEGEND:

- FENCE LINE
- DEVELOPMENT AREA
- INDICATIVE MV CABLE ROUTE
- CADASTRE BOUNDARY
- CABLE PIT
- POWER CONVERSION SYSTEM
- BESS CONTAINER
- AUXILIARY SKID
- UNDERGROUND CONTAMINATED FIREWATER STORAGE

PRELIMINARY
NOT FOR CONSTRUCTION

Rev	Description	Author	Checked	Approved	Date
B	ISSUED FOR INFORMATION	DH	MO		24.03.25
A	ISSUED FOR INFORMATION	DH	MO		20.01.25

Author O. ARCAY | Drafting Check S. ALANO
Designer Z. VAKIL | Design Check D. HOY

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SCALE 1:500 AT ORIGINAL SIZE

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Project No. 12649071

Client: SHELL ENERGY POWER DEVELOPMENTS PTY LTD
Project: NEERABUP BESS
Status: ISSUED FOR INFORMATION

Drawing Title: SHELL ENERGY BESS GENERAL ARRANGEMENT
Drawing No.: 12649071-00000-EL-SKT-001
Size: A1
Rev: B

Plot Date: 12 May 2020 - 10:48 AM Plotted by: Tim Stavrinou
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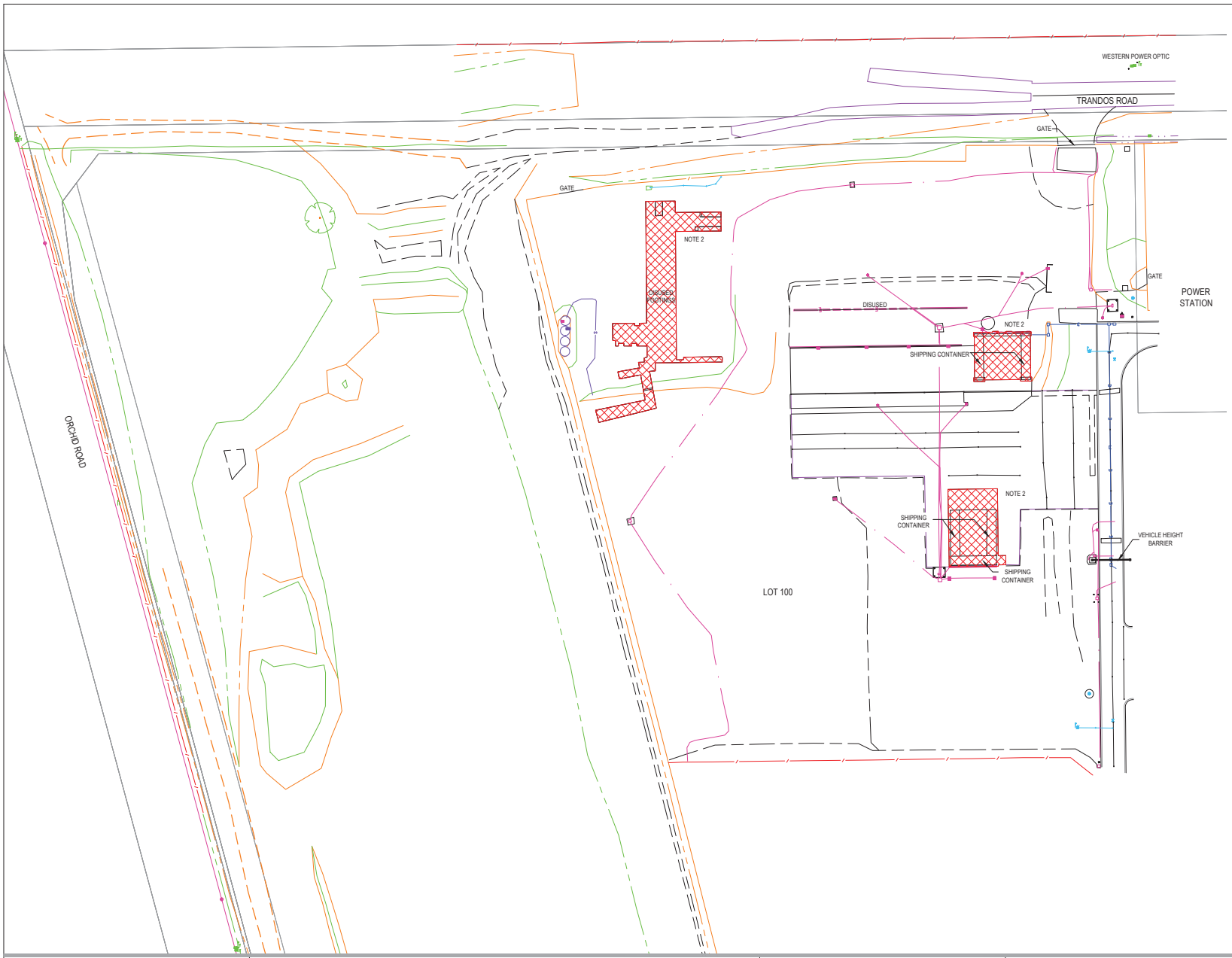

NOTES:

1. FENCING , CABLES, SUBTERRANEAN INFRASTRUCTURE, ETC. TO BE REMOVED AS NECESSARY.
2. RED HATCHED AREAS DENOTE STRUCTURES TO BE REMOVED AS PART OF THE WORKS.

LEGEND:

- SSM OR TRIG STATION
- DEPTH OF PIPE
- STOP VALVE
- WATER MAIN MARKER POST
- BORE MONITOR
- SEWER OVERFLOW PUMP
- ON ROAD
- CAMERA
- GROUND FLOOD LIGHT
- EARTH PIT
- DISTRIBUTION BOARD
- MEDIUM TREE
- COMM PIT
- COMM CABLE MARKER
- BOLLARD
- HIGH TENSION POWER POLE
- DRAINAGE GULLY/SEP/MH
- SEWER TANK
- ELECTRICAL MH
- UNKNOWN MH
- CADASTRAL BOUNDARY
- KERB
- TOP OF WALL
- SHED / STORAGE CONTAINER
- TOP OF BANK
- BOTTOM OF BANK
- CHANGE OF GRADE
- EDGE OF CONCRETE
- EDGE OF BITUMEN
- FENCE LOW
- FENCE HIGH
- BITUMEN FOOTPATH
- ROAD - CENTRE LINE
- ROAD - SOLID LINE
- TANK SURROUND
- COMMS CABLE
- ELECTRICAL CABLE
- ELECTRICAL CONDUIT
- DRAIN PIPE
- SEWER LINE
- OVERHEAD POWER
- WATER PIPE
- EDGE OF TRACK
- EDGE OF GRAVEL

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Project No. 12649071

Client SHELL ENERGY POWER DEVELOPMENTS PTY LTD

Project NEERABUP BESS

Status ISSUED FOR INFORMATION

Drawing Title SHELL ENERGY NEERABUP BESS DEMOLITION PLAN

Drawing No. 61-12649071-00000-EL-SKT-003

Size A1

Rev A

Plot Date: 26 February 2025 - 4:07 PM Plotted by: Omar Arcay

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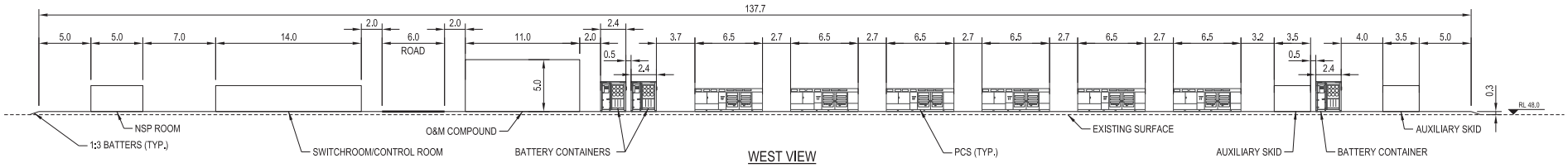

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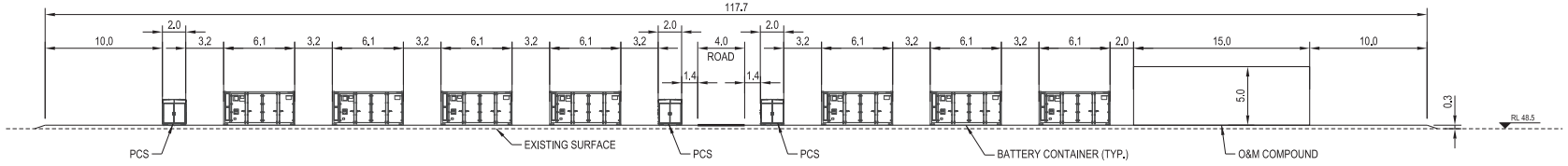

NORTH VIEW

Rev	Description	Checked	Approved	Date
A	ISSUED FOR INFORMATION	DH	MD	20.03.25

Author D. STEWART Drafting Check M. LE ROUX
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0 2 4 6 8 10m
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Project NEERABUP BESS
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Rev A

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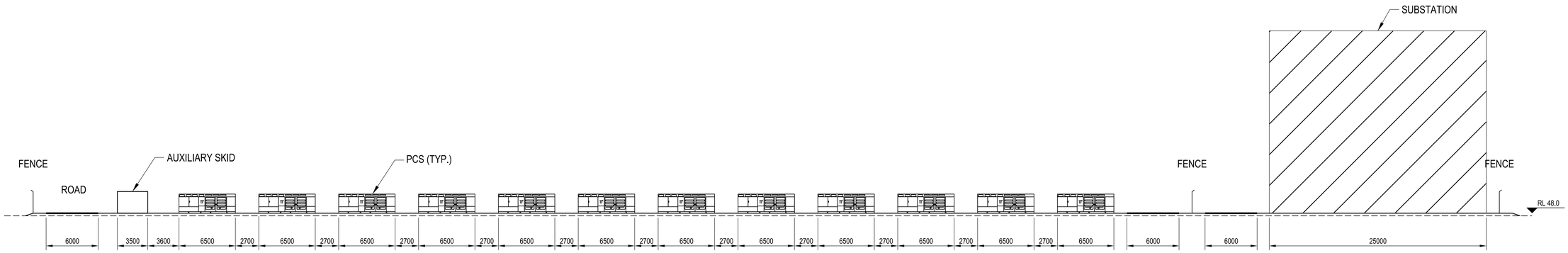
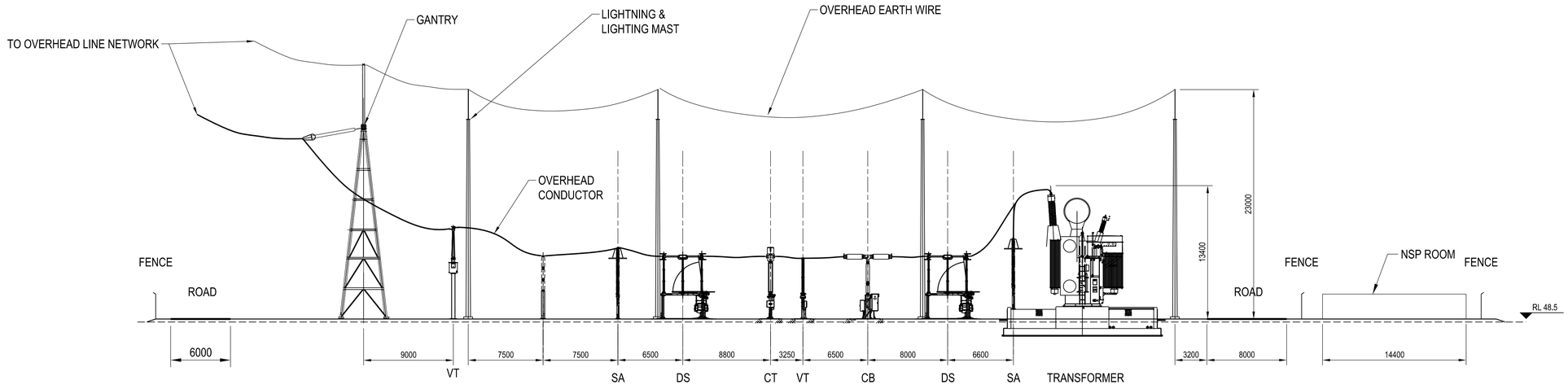


EAST VIEW



NORTH SECTION (SUBSTATION)

Rev	Description	Checked	Approved	Date
A	ISSUED FOR INFORMATION	CZ	MO	11.04.25

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Project: NEERABUP BESS
Status: PRELIMINARY

Drawing Title: NEERABUP BESS ELEVATIONS DRAWING EAST AND SUBSTATIONS ELEVATIONS

Size: A1
Rev: A

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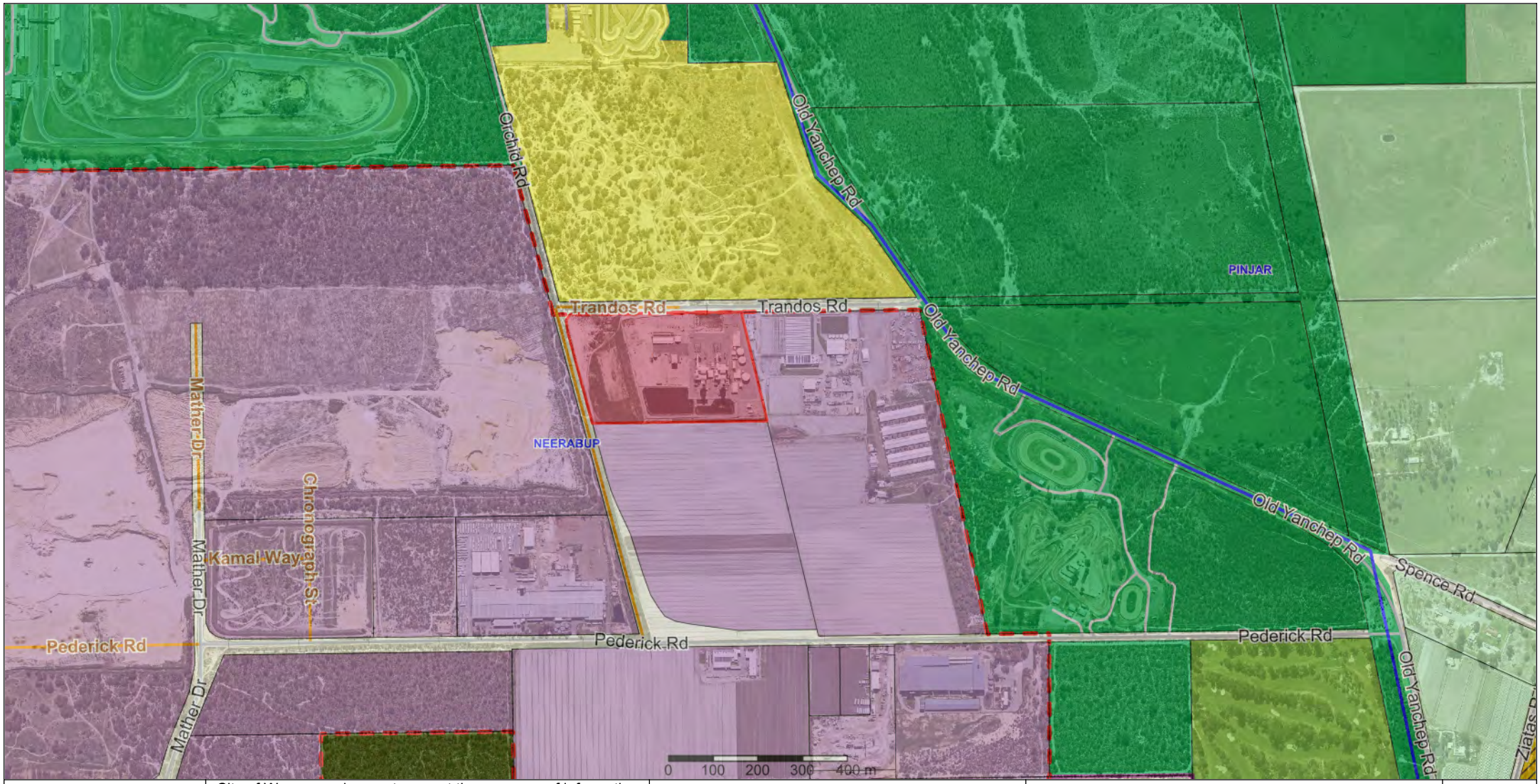

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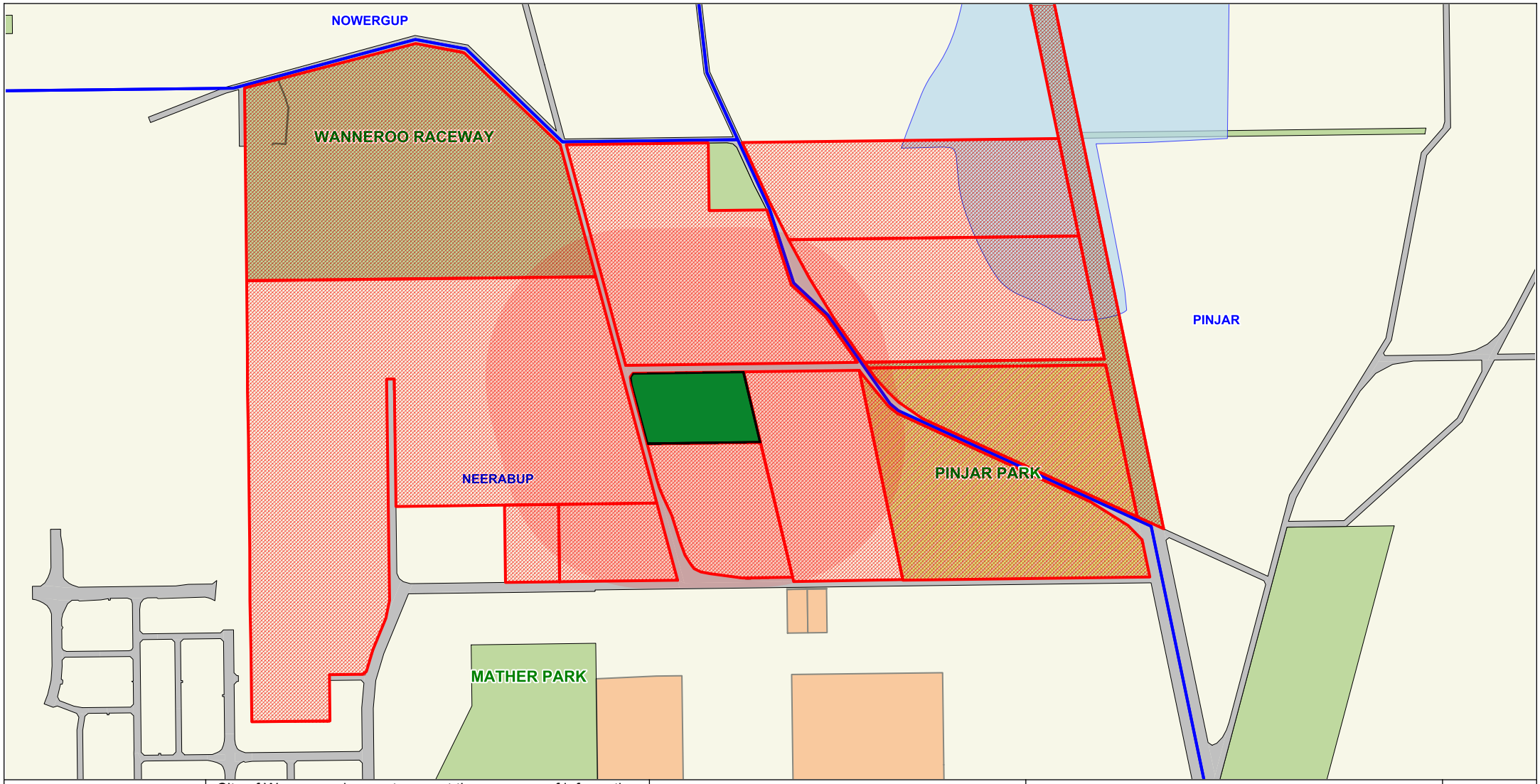

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Neerabup Battery Energy Storage System

Noise Impact Assessment

Shell Power Developments Pty Ltd

21 March 2025

→ The Power of Commitment

Project name		Shell WA BESS Tech Studies for DA					
Document title		Neerabup Battery Energy Storage System | Noise Impact Assessment					
Project number		12649071					
File name		12649071-REP-1_Shell WA BESS Acoustic Assessment.docx					
Status Code	Revision	Author	Reviewer		Approved for issue		
			Name	Signature	Name	Signature	Date
S3	A	A Farhath	B Hillion		M Oosthuizen	M Oosthuizen	06/03/25
S4	A	A Farhath	B Hillion		M Oosthuizen	M Oosthuizen	21/03/25

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GHD acknowledges Aboriginal and Torres Strait Islander peoples as the Traditional Custodians of the land, water and sky throughout Australia on which we do business. We recognise their strength, diversity, resilience and deep connections to Country. We pay our respects to Elders of the past, present and future, as they hold the memories, knowledges and spirit of Australia. GHD is committed to learning from Aboriginal and Torres Strait Islander peoples in the work we do.

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Appendix B	Unattended noise measurement graphs
Appendix C	Noise monitoring result tables
Appendix D	Noise contours
Appendix E	Historical temperature graphs

Glossary and abbreviated terms

Term	Description
AS	Australian Standard
Ambient noise level	The ambient noise level at a particular location is the overall environmental noise level caused by all noise sources in the area, both near and far, including all forms of traffic, industry, lawnmowers, wind in foliage, insects, animals, etc. Usually assessed as an energy average over a set time period 'T' ($L_{Aeq, T}$).
Background noise level	The background noise level is the minimum repeatable level of noise measured in the absence of the noise under investigation and any other short-term noises such as those caused by all forms of traffic, industry, lawnmowers, wind in foliage, insects, animals, etc.. It is quantified by the noise level that is exceeded for 90 percent of the measurement period 'T' ($L_{A90,T}$). Background noise levels are often determined for the day, evening, and nighttime periods where relevant. This is done by statistically analysing the range of time period (typically 15 minute) measurements over multiple days (often seven days).
BESS	Battery Energy Storage System
CONCAWE	CONservation of Clean Air and Water in Europe
dB	Decibel, which is 10 times the logarithm (base 10) of the ratio of a given sound pressure to a reference pressure; used as a unit of sound.
dB(A)	Unit used to measure 'A-weighted' sound pressure levels.
DWER	Department of Water and Environmental Regulation
GHD	GHD Pty Ltd
L_{A1}	A-weighted noise levels that should not be exceeded for more than one percent of the time.
L_{A10}	A-weighted noise levels that should not be exceeded for more than 10 percent of the time.
L_{A90}	A-weighted noise levels that should not be exceeded for more than 90 percent of the time.
$L_{Aeq(time)}$	Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
L_{Amax}	A-weighted noise levels that should not be exceeded any time
Mitigation	Reduction in severity.
MW	Megawatts
MVA	Megavolt-amperes
NIA	Noise Impact Assessment
Representative Assessment Period	Regulation 8 requires the assessment period to be between 15 minutes and four hours for the purpose of assessing noise emissions from a source.
RFI	Request for Information
Sensitive receptor	A noise modelling term used to describe a map reference point where noise is predicted. A sensitive receptor would be a home, workplace, church, school, or other place where people spend time.
Sound pressure level (SPL or Lp)	The level of sound measured on a sound level meter and expressed in decibels (dB). Where L_p = 10 $\log_{10}$ (P_a/P_o)2 dB (or 20 log10 (P_a/ P_o) dB) where Pa is the rms sound pressure in Pascal and Po is a reference sound pressure conventionally chosen is 20 µPa (20 x 10-6 Pa) for airborne sound. SPL varies with distance from a noise source.
Sound power level (SWL or L_W)	The sound power level of a noise source is the inherent noise of the device. Therefore, sound power level does not vary with distance from the noise source or with a different acoustic environment.
WA	Western Australia

1. Introduction

GHD Pty Ltd (GHD) acts on behalf of Shell Power Developments Pty Ltd (Shell), the proponent of the Neerabup Battery Energy Storage System (BESS), in preparing this Noise Impact Assessment (NIA). The NIA has been prepared to support an application for development approval (DA) for the Neerabup BESS, proposed to be located at Lot 100 (No. 45) Trandos Road, Neerabup in Western Australia (the project).

The project comprises a 142-megawatt (MW) BESS facility. This system will have a four-hour supply capacity and will be used in the wholesale electricity market for buying and selling electricity. It will also provide essential system services and participate in non-co-optimised essential system services (NCESSs).

1.1 Purpose of this report

This Noise Impact Assessment (NIA) has been prepared to assess environmental noise levels associated with the project resulting from battery storage packs, inverters, and ancillary infrastructure. Both operational and construction noise impacts are assessed.

1.2 Scope of works

The scope of works to undertake the NIA is as follows:

- Identify nearest noise-sensitive receptors and determine noise criteria.
- Collect baseline noise data using four type 1 noise loggers for four weeks at suitable locations arranged by Shell
- Develop operational noise model to predict operational noise levels from battery storage packs, step-up transformers, and main transformers.
- Assess compliance with *Environmental Protection (Noise) Regulations 1997* (the Regulations) and *Draft Guideline: Assessment of environmental noise emissions (June 2021).*
- Provide mitigation measures if noise levels exceed criteria.
- Conduct construction noise and vibration desktop assessment.
- Prepare acoustic assessment report with methodologies, results, and potential mitigation measures (this report).

1.3 Limitations

This report has been prepared by GHD for Shell Power Developments Pty Ltd and may only be used and relied on by Shell Power Developments Pty Ltd for the purpose agreed between GHD and Shell Power Developments Pty Ltd as set out in Section 1.1 of this report.

GHD otherwise disclaims responsibility to any person other than Shell Power Developments Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

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

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

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer Section(s) 1.4 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

1.4 Assumptions

The following assumptions were made during the preparation of this report:

- All information provided by Shell Power Developments Pty Ltd and its affiliated companies, including relevant site location and receptor information, operational parameters for relevant BESS systems and noise modelling study reports undertaken previously, are correct.
- All parameters and other relevant data used in the modelling and assessment are based on best estimates using the information provided by Shell Power Developments Pty Ltd and its affiliated companies and other relevant sources.
- The assessment radius for this acoustic assessment is to relevant noise sensitive receptors and based on the specific site layout and noise data for the proposed BESS and ancillary equipment.

2. Noise criteria

2.1 Regulations and guidelines

Noise emissions from the project are regulated by the assigned noise levels set out in the Regulations.

Regulation 8 sets out the maximum allowable noise levels ('assigned noise levels') based on different times of day and the land use applicable at the premises receiving the noise (i.e., noise sensitive premises, commercial- and industrial-type premises).

The assigned noise levels of various parameters (L_{A10}, L_{A1} and L_{Amax}) are also dependent on 'influencing factors' (IF), which are calculated in accordance with Schedule 3 of the Regulations. The assigned levels consider the quantity of industrial and commercial land and the presence of major roads adjacent to the noise receptor.

A summary of the assigned noise levels from Regulation 8 is presented in Table 2.1.

Table 2.1 Assigned noise levels from the Regulations

Type of premises receiving noise	Time of day	Assigned noise level dB(A)		
		L_{A10}	L_{A1}	L_{Amax}
Noise sensitive premises: highly sensitive area (i.e., noise sensitive premises at locations within 15 m of a building directly associated with a noise sensitive use)	7:00 am to 7:00 pm Monday to Saturday ('Day')	45 + IF	55 + IF	65 + IF
	9:00 am to 7:00 pm Sunday and public holidays (Sunday 'Day' and Public Holiday 'Day')	40 + IF	50 + IF	65 + IF
	7:00 pm to 10:00 pm all days ('Evening)	40 + IF	50 + IF	55 + IF
	10:00 pm on any day to 7:00 am Monday to Saturday and 9:00 am Sunday and public holidays ('Night')	35 + IF	45 + IF	55 + IF
Noise sensitive premises: any area other than highly sensitive area (i.e., noise sensitive premises at locations further than 15 m from a building directly associated with a noise sensitive use)	All hours	60	75	80
Commercial premises	All hours	60	75	80
Industrial and utility premises	All hours	65	80	90

2.1.1 Influencing factor

In this report, IFs have been calculated and used to determine the assigned noise level criteria shown in Table 2.4 for nearest sensitive receptors.

Schedule 3 of the Regulations details the process how to determine the IF on noise sensitive premises, which can be summarised as the following steps:

1. Obtain a council zoning map covering an area up to 500 m from the receiving location.

2. Draw two circles around the receiving point, of 100 m radius and a 450 m radius.
3. Determine the percentage of each circle that is taken up with industrial and commercial zonings. Note that the industrial and commercial areas in the inner circle are also counted in the outer circle.
4. Add up the percentages as follows:
    a. (Percent industrial in small circle + percent industrial in a large circle) x 1/10 = I
    b. (Percent commercial in small circle + percent commercial in large circle) x 1/20 = C
5. Determine the transport factor (TF) as follows (Note – TF cannot be more than 6):
    a. Major road (more than 15,000 vehicles/day) in small circle, TF = 6
    b. A major road in a large circle, TF = 2
    c. For each secondary road (6,000 - 15,000 vehicles/day) in small circle, TF = 2
6. Add I, C and TF from steps 4 and 5 above to obtain the IF (i.e., IF = I + C + TF), and
7. Fill in the table of assigned levels by adding in the IF to obtain the L_{A10}, L_{A1} and L_{Amax} assigned levels.

2.1.2 Annoying noise characteristics

Regulation 7 also requires that the noise character received at sensitive receptors must be 'free' of annoying characteristics of tonality, modulation and impulsiveness. If these characteristics cannot be reasonably and practicably removed, then a series of adjustments to the measured or calculated received levels are set out, and the adjusted level must comply with the assigned level. The adjustments are set out in Table 2.2 and are further defined in Regulation 9(1).

Table 2.2 Table of adjustments

Adjustment where noise emission is not music (adjustments are cumulative to a maximum of 15 dB)			**Adjustment where noise emission is music**	
Where tonality is present	Where modulation is present	Where impulsiveness is present	Where impulsiveness is not present	Where impulsiveness is present
+5 dB	+5 dB	+10 dB	+10 dB	+15 dB

Tonality is defined in Regulation 9(1) as being present where the difference between the A-weighted sound pressure level in any one third octave band and the arithmetic average of the A-weighted sound pressure levels in the two adjacent one-third octave bands is greater than 3 dB in terms of $L_{Aeq, T}$ where the period T is greater than 10 percent of the representative assessment period, or greater than 8 dB at any time when the sound pressure levels are determined as $L_{A, Slow}$ levels.

Modulation is defined as a variation in the emission of noise that:

- Is more than 3 dB $L_{A, Fast}$ or is more than 3 dB $L_{A, Fast}$ in any one third octave band; and
- Is present for at least 10 percent of the representative assessment period; and
- Is regular, cyclic and audible

Impulsiveness is defined as present where the difference between L_{Apeak} and $L_{Amax,S}$ is more than 15 dB when determined for a single representative event. Assigned noise levels for noise sensitive premises adjacent to the project site.

2.1.3 Noise sensitive receptors

The IFs were calculated for four nearest noise sensitive receptors, as presented in Table 2.3 and shown Figure 3.1.

The 100 m and 450 m circles used for the calculation are presented in Appendix A.

Table 2.3 IF calculation for noise sensitive receptors

Receptor	Address	Lot	Zoning	IF (dB)
R1	35 Pollen Turn, Banksia Grove WA	629	Residential	0
R2	1521 Old Yanchep Road, Pinjar WA	2679	Rural	0
R3	1 Spence Street, Pinjar WA	2	Rural	0
R4	50 Tropicbird Dr, Banksia Grove WA	2154	Residential	2

Plan WA, an online public mapping tool, was accessed on 28 January 2025, and the local planning schemes show the surrounding land is predominantly zoned ‘rural’ and ‘industrial’.

There are no industrial premises within 450 m of receptors R2 and R3, resulting in an IF of 0 for these receptors. There were also no major or secondary roads within the vicinity of any of these zones for each receptor. Receptor R1 and R4 were in the vicinity of industrial zoned land. The area of this land is small enough to not significantly contribute to the IF calculation for receptor R1 (IF of 0). However, the area was large enough to calculate an IF of 2 for receptor R4.

It should also be noted that the project is located on land zoned industrial, as shown in Appendix A.

The assigned noise levels for the noise sensitive receptors are presented in Table 2.4.

Table 2.4 Assigned noise levels at project noise sensitive receptors

Type of premises receiving noise	Time of the day	Assigned noise level (dB)		
		L_{A10}	L_{A1}	L_{Amax}
Receptors R1 to R3 Noise sensitive premises at locations within 15 m of a building directly associated with a noise sensitive use	07.00 to 19.00 hrs Monday to Saturday	45	55	65
	09.00 to 19.00 hrs Sunday and Public holidays	40	50	65
	19.00 to 22.00 hrs All days	40	50	55
	22.00 to 07.00 hours Monday to Saturday and; 22.00 to 09.00 hours on Sundays and Public Holidays	35	45	55
Receptor R4 Noise sensitive premises at locations further than 15 m from a building directly associated with a noise sensitive use	07.00 to 19.00 hrs Monday to Saturday	47	57	67
	09.00 to 19.00 hrs Sunday and Public holidays	42	52	67
	19.00 to 22.00 hrs All days	42	52	57
	22.00 to 07.00 hours Monday to Saturday and; 22.00 to 09.00 hours on Sundays and Public Holidays	37	47	57

2.1.4 Construction noise

Noise emitted during construction work is governed by the Regulations. Construction work is covered under Regulation 13 and states the following for construction work done outside of normal hours (7.00 am to 7.00 pm Monday to Saturday):

- Construction work must be carried out in accordance with environmental noise practices set out in Section 4 of *AS 2436-2010 Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites*;
- The equipment used for construction must be the quietest reasonably available;
- The Contractor must advise all nearby sensitive receptors likely to receive noise levels which fail to comply with the assigned levels under Regulation 8 of the work to be done at least 24 hours before it commences;
- The Contractor must show that it is reasonably necessary for the work to be done out of hours;
- The Contractor must submit to the relevant Chief Executive Officer (CEO) a noise management plan at least seven days prior to the commencement of work and the plan must be approved by the CEO. The plan must include details of:
  - Reasons for the construction work needing to be completed out of hours;
  - Details of activities which are likely to result in high noise emissions;
  - Predictions of the noise emissions from the site;
  - Details of measures to be used to control noise (including vibration) emissions;
  - Procedures to be adopted for monitoring noise (including vibration) emissions;
  - Complaint response procedures to be adopted.

2.1.5 Construction vibration

For blasting vibration, the following limits minimise risk to any premises nearby.

Table 2.5 Blasting vibration guide values

Time period	Time	Blasting requirements
Day time	7:00 am to 6:00 pm on any day which is not a Sunday or a public holiday	– No vibration level resulting from blasting on any premises or public place, when received at any other premises, may exceed a peak particle velocity of 10 mm/s. – The vibration levels for 9 in any 10 consecutive blasts (regardless of the interval between blasts) on any premises or public place, when received at any other premises, must not exceed 5.0 mm/s.
Out of hours	6:00 pm and 7:00 am on any day which is not a Sunday or a public holiday	– No vibration level resulting from blasting on any premises or public place, when received at any other premises, may exceed a peak particle velocity of 1.0 mm/s. – The vibration levels for 9 in any 10 consecutive blasts (regardless of the interval between blasts) on any premises or public place, when received at any other premises, must not exceed 0.5 mm/s.

3. Baseline noise monitoring

As part of this assessment, unattended baseline ambient noise monitoring was conducted. The purpose of the baseline ambient noise monitoring is to capture samples of the existing noise climate in the direct vicinity of the noise sensitive receptors prior to operation off the BESS.

The baseline noise dataset will enable the following assessments to be undertaken in the future:

– Understand the impacts of any potential noise level increases associated with operational noise from within the project, with respect to the existing ambient noise.
– Identify the likelihood of noise exceedances resulting from the combination of the existing ambient noise (from the Neerabup Power Station) with that of the project.
– To enable assessment of the likely audibility of noise at the noise sensitive receptors (NSR) from the project including any tonal, modulation or impulsive components.

3.1 Noise monitoring for compliance assessment

3.1.1 Monitoring instrumentation

Svantek SVAN 977 noise loggers were deployed at three locations in direct vicinity of selected noise sensitive residential land where ambient noise levels are expected to be typical of the surrounding setting. One additional 977 logger was deployed in the vicinity of the proposed site to measure near-field noise from the Neerabup power station. Continuous noise monitoring was performed at each location and deployment was from 13th January to 12th February 2025.

All noise monitoring instruments were in current National Association of Testing Authorities (NATA) calibration at the time of use. All instruments were field checked and calibrated before and after noise measurements using a Svantek SV-36 calibrator. No discrepancies equal to or greater than 1 dB were noted throughout the measurement duration as is required under Section 5.6 of *Australian Standard AS 1055:2018 Acoustics – Description and Measurement of Environmental Noise* (Standards Australia, 2018).

Table 3.1 shows the noise monitoring locations, along with a picture of the noise logger at each site.

Table 3.1 Noise monitoring equipment details

Logger No.	Serial No.	Location	Site photo	Type
L1	98026	35 Pollen Turn, Banksia Grove WA		Far-field

Logger No.	Serial No.	Location	Site photo	Type
L2	99261	1521 Old Yanchep Road, Pinjar WA		Far-field
L3	99736	1 Spence Street, Pinjar WA		Far-field
L4	99073	45 Trandos Rd, Neerabup WA		Near field

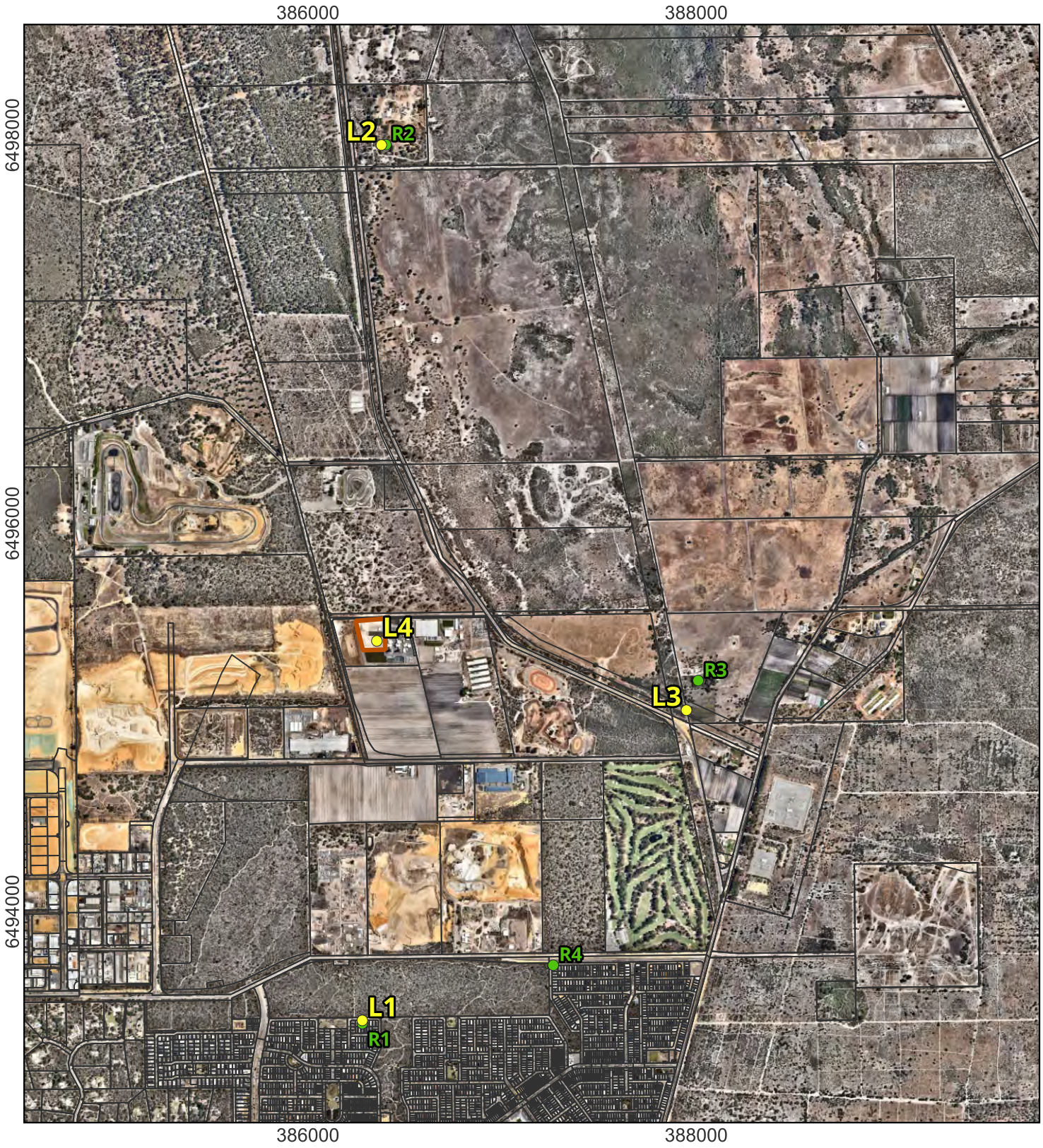
3.1.2 Monitoring locations

Noise loggers were deployed at each of the three noise sensitive receptors R1, R2 and R3. Noise receptor R4 was included in the noise assessment after the noise monitoring period was conducted to allow for more receptors to be assessed within a 2 km radius from the Project site.

Table 3.2 Noise sensitive receptor locations and monitoring status

Noise sensitive receptor	Distance to site	Direction from site	Noise monitoring conducted?
R1	1. 9 km	South	Yes
R2	2.4 km	North	Yes
R3	1.6 km	East	Yes
R4	1.8 km	Southeast	No

The fourth noise logger was deployed at site, intending to capture temporal trends of noise from the gas turbine exhausts at the Neerabup Power Station. Figure 3.1 shows both noise logger and noise sensitive receptor locations.



Legend

- Noise sensitive receptors
- Noise monitoring locations
- Development envelope
- Cadastre

Paper Size ISO A4

0 0.25 0.5 0.75 1 km

Map Projection: Transverse Mercator
Horizontal Datum: GDA94
Grid: GDA94 / MGA zone 50

N

Shell Energy
BESS Noise Impact Assessment

Noise sensitive receptors and logger locations

Project No. **12649071**
Revision No. **1**
Date. **21/03/2025**

FIGURE 3.1

Document Path: \\ghdnet\ghd\AU\Perth\Projects\61\12649071\Tech\Noise\12649071_working.qgz
Print Date: 21/03/2025

Data Source:Google Earth Imagery 2025

Created By: afarhath

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3.2 Meteorological conditions

Adverse meteorological conditions such as high winds and rainfall can contaminate noise monitoring results. Where the wind speed at the microphone height was determined to be greater than 5 m/s, or whenever rainfall occurred, the noise data was excluded from further analysis.

Rainfall and wind speeds during the period of noise measurements were checked based on the Bureau of Meteorology (BoM) automatic weather station (AWS) Millendon (Station ID: 9281) which is located within 20 km from site and considered representative of site conditions.

3.3 Noise monitoring methodology

The noise loggers were set to log overall A-weighted and third-octave band noise levels using the slow time response of the logger. The logger recorded L_{A90}, L_{A10}, L_{A1} and L_{Aeq} noise levels at 15-minute intervals.

– L_{Aeq} is the equivalent continuous sound level over the measurement period.
– L_{A90} is representative of ambient noise as it describes the noise level exceeded for 90 percent of the measurement period.
– L_{A10} is the noise level exceeded for 10 percent of the measurement period and is used to understand received noise level at noise sensitive receptors.
– L_{A1} is the noise level exceeded for one percent of the measurement period.

The noise loggers were calibrated before and after logging with allowable calibration drift as per Schedule 4 of the *Environmental Protection (Noise) Regulations 1997*.

3.4 Noise monitoring results

Graphs presenting daily noise levels for the entire monitoring period are presented for each location in Appendix B. The charts show:

– Noise levels for the L_{A90}, L_{A10}, L_{Amax} and L_{Aeq} noise descriptors in 15-minute intervals
– Wind speed and direction
– times of adverse weather conditions

A tabulated summary of the L_{A90} is presented in Appendix C.

Logger L4 was deployed to capture noise emissions resulting from the operation of the existing power station/turbines. The intention for this logger was to interrogate whether a correlation could be established between noise generated at the existing power station facility and the ambient noise captured at the other receptors. As expected, L4 was influenced heavily by noise likely dominated by gas turbine exhausts located at the Neerabup Power Station. The nighttime values were between 47 and 55 dB L_{A90} and daytime values were typically 46 to 55dB L_{A90}, indicating that there is little to no difference in ambient noise within the project site during day vs nighttime.

For loggers L2 and L3, the nighttime values were typically between 22 and 32 dB L_{A90} whilst daytime values were typically from 34 to 44 dB L_{A90}. Both markers are typical of the soundscape in a rural area.

L1, which is a residential zoned location, had overall higher nighttime and daytime values at 22 to 40 dB L_{A90} and 25 to 48 dB $L_{A90,}$ respectively. This is consistent and typical of soundscape in a residential, suburban area likely attributed to more human activity due to the overall population density as well as higher traffic counts through peak morning and evening traffic as indicated by the daily noise level charts.

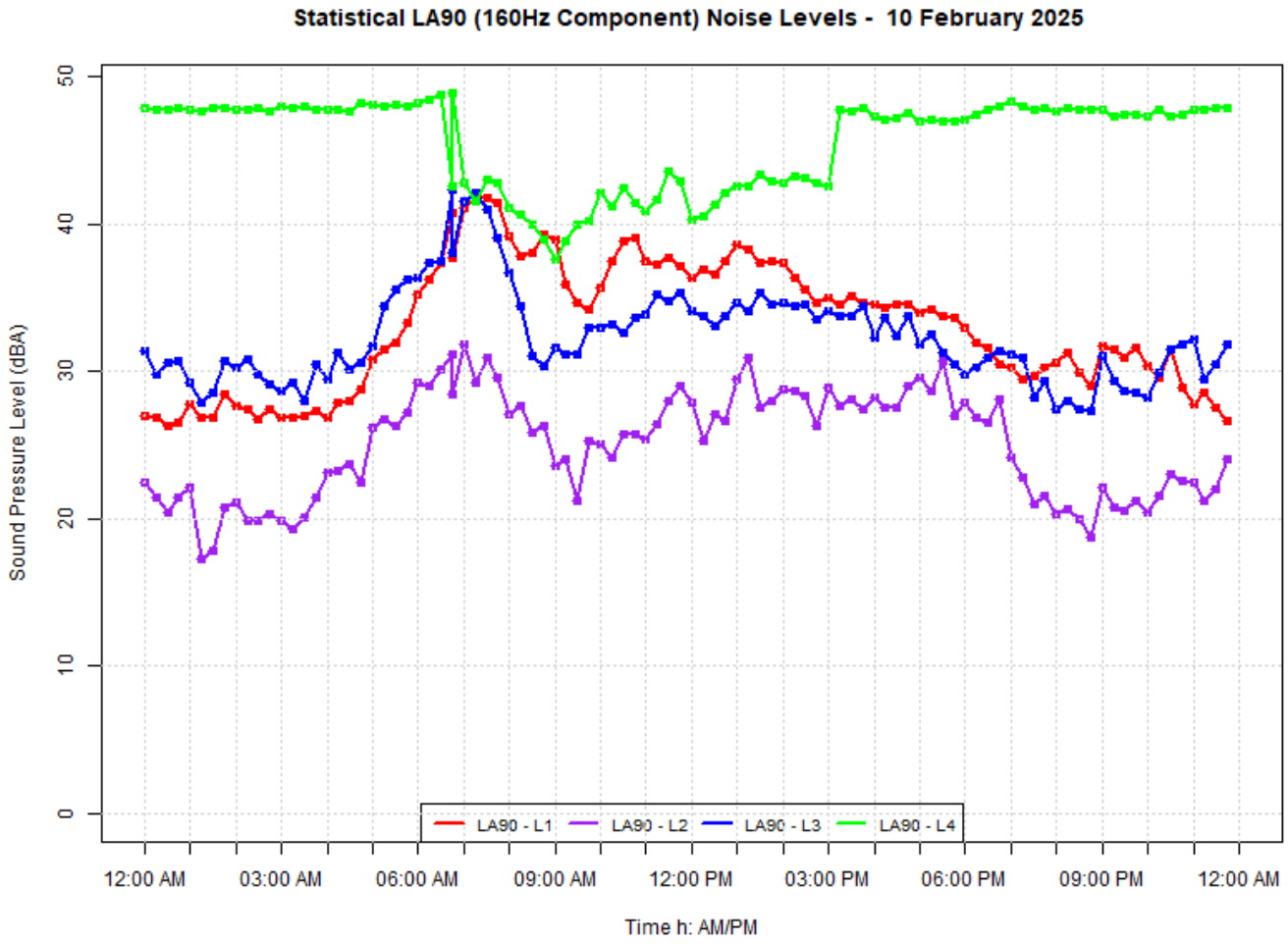

Figure 3.2 L_{A90} *(160Hz component) comparison between site deployment logger (L4) and sensitive receptor noise loggers (L1-L3) for 10th February*

In order to identify any correlation between noise emitted by the power station and noise at the sensitive receptor locations, the low frequency component of the background noise (160 Hz) has been plotted for each of the days (Appendix B).

During days of high activity at site (e.g. 10th February 2025 shown in Figure 3.2), the low frequency component, which travels larger distances, have no clear correlation with the received noise at the receptors. This means that there is no clear indication of industrial noise from the existing Neerabup Power Station influencing the received noise at monitored noise sensitive locations.

Hence, there is no requirement for noise criteria to be set at 5 dB below the assigned noise levels provided in Table 2.4, the noise criteria are therefore set at the assigned levels.

4. Operational noise assessment

Operational noise modelling was undertaken to investigate the noise from the proposed BESS on nearby sensitive receptor locations. The following sections provide a summary of this noise assessment.

4.1 Modelling algorithm

Noise modelling was undertaken using SoundPLAN Version 9.1 software to predict the effects of operational related noise from the Project site.

SoundPLAN is a computer program for the calculation, assessment, and prognosis of noise propagation. SoundPLAN calculates environmental noise propagation according to CONCAWE and other algorithms. Propagation calculations take into account sound intensity losses due to geometrical spreading, terrain effects, atmospheric absorption and ground absorption.

The CONCAWE algorithm also takes into account the presence of wind conditions, such as 'downwind' conditions, which are favourable to sound propagation. As a result, predicted received noise levels are expected to represent a worst-case scenario, due to the distances involved between source and receptors, enhancement of noise due to weather is expected to have an effect on the closest sensitive receptor locations.

4.2 Modelling scenarios

4.2.1 Equipment modelled

The following number of equipment items associated with the BESS were modelled:

– 136 battery packs,
– 34 inverters,
– 1x 250 MVA power transformer,
– 4x 2.5 MVA auxiliary skids (transformers), and
– 3x HVAC condenser units for the Switchroom

4.2.2 Ambient temperature considerations

Publicly available weather data suggests that temperatures above 25˚C for both evening and nighttime occurs quite frequently (See Appendix E).

The below table summarises the key temperature conditions expected at the BESS site during typical summer months.

Table 4.1 Typical temperature at Project site in summer months based on years 2023-2025

Time period	Temperature condition	Expected % of days above temperature condition	Expected % of days below temperature condition
Day (7am-7pm)	40˚C	5%	95%
	25˚C	100%	0%
Evening (7pm-10pm)	40˚C	0%	100%
	25˚C	35%	65%
Night (10pm-7am)	40˚C	0%	100%
	25˚C	30%	70%

Due to these ambient temperature considerations at the project site, daily operation of the BESS as confirmed in correspondence with Shell (dated 26th February 2025) have been presented below:

Table 4.2 Suggested operational matrix

Time period	Hours	Suggested operation
Day	7am-7pm	- Inverters at 80% fan speed at 88 dB L_{wA} if <40˚C (otherwise 100% fan speed at 90 dB $L_{wA)}$ - Battery at 100% fan/chiller speed at 82 dB $L_{wA)}$ - Power Transformers at 99 dB L_{wA} - Auxiliary transformers at 72 dB L_{wA} - Switchroom HVAC at 72 dB L_{wA}
Evening	7pm-10pm	- Inverters at 80% fan speed at 88 dB L_{wA} - Battery at 100% fan/chiller speed at 82 dB $L_{wA)}$ - Power Transformers at 99 dB L_{wA} - Auxiliary transformers at 72 dB L_{wA} - Switchroom HVAC at 72 dB L_{wA}
Night	10pm-7am	- Inverters at 80% fan speed at 88 dB L_{wA} - Battery at 100% fan/chiller speed at 82 dB $L_{wA)}$ - Power Transformers at 99 dB L_{wA} - Auxiliary transformers at 72 dB L_{wA} - Switchroom HVAC at 72 dB L_{wA}

Battery fan/chiller speeds are modelled at 100% for all potential scenarios, due to a lack of data available on how ambient temperature impacts fan/chiller speed operation. This makes the assessment conservative from a noise emissions perspective.

4.2.3 Scenario selection

Scenario 1

During the evening period, based on Table 4.1, ambient temperatures typically never reach 40 degrees. Inverter fans are therefore expected to operate at 80% (same as operation during the day). Due to this and the fact that Sunday Day/ Public Holiday Day has the same L_{A10} assigned noise level, a scenario considering Sunday daytime and evening time operation was modelled as one scenario (Scenario 1).

Scenario 2

Based on Table 4.1, ambient temperatures typically remain below 25˚C at nighttime but have significant number of nights above 25˚C. To remain conservative, inverter fan/chillers were modelled to operate at 80% speed

Scenario 3

Even though the inverters/batteries are not expected to run with fans at 100% a third scenario has been considered for completeness with 100% fan/chiller operation of the inverter without any attenuation kit.

Table 4.3 details the various modelling parameters for each scenario.

Each scenario has been assessed against the L_{A10} noise metric as fan/chiller noise is expected to be fairly continuous in nature (i.e. typically lasting more than 24 minutes over a typical 4-hour representative assessment period).

Table 4.3 Scenarios operational parameters

Scenario No.	Plant item	Fan/ Chiller speed	Modelled Height, m	SWL, dB(A)
1 - Inverter Without Kit at 80% fan speed Sunday Day / Public Holiday Day - outside ambient temperature <40˚C *OR* Evening - outside ambient temperature <40˚C	34x Inverter PCSM Gen3	80%	2.3	88
	136x Battery SolBank3.0	100%	2.9	82
	Power Transformer (1x 250 MVA)	-	6 (typical)	99
	Auxiliary Transformer (4x 2.5 MVA)	-	2.5 (typical)	72
	Switchroom HVAC (3x condenser units)	100%	3 (typical)	72
2 - Inverter Without Kit at 80% fan speed Night - outside ambient temperature >25˚C	34x Inverter PCSM Gen3	80%	2.3	88
	136x Battery SolBank3.0	100%	2.9	82
	Power Transformer (1x 250 MVA)	-	6 (typical)	99
	Auxiliary Transformer (4x 2.5 MVA)	-	2.5 (typical)	72
	Switchroom HVAC (3x condenser units)	100%	3 (typical)	72
3 - Inverter Without Kit at 100% fan speed Absolute worst case (Day) - outside ambient temperature >40˚C	34x Inverter PCSM Gen3	100%	2.3	91
	136x Battery SolBank3.0	100%	2.9	82
	Power Transformer (1x 250 MVA)	-	6 (typical)	99
	Auxiliary Transformer (4x 2.5 MVA)	-	2.5 (typical)	72
	Switchroom HVAC (3x condenser units)	100%	3 (typical)	72

4.3 Modelling assumptions

The following assumptions and parameters were adopted for this noise impact assessment. Facility noise was modelled to be operating continuously throughout the day, evening, and nighttime period.

Table 4.4 Noise modelling parameters

Variable	Parameter used
Prediction algorithm	CONCAWE prediction algorithm
Ground absorption coefficient G = 0 is for hard, reflective ground G = 1 is for soft, porous ground	G = 0.6 (based on sparsely vegetated land) G = 0 (at the Project site hardstands)
Receptor heights	1.5 m above ground.
Terrain	Three-dimensional terrain has been used in the model. 5m elevation contours DEM obtained from Elvis (accessed February 2025)
Shielding	Shielding from buildings Building data obtained from the WA Landgate Large scale Topo Building (accessed February 2025)
Order of reflection	3
Proposed layout	GHD site layout (as of February 11th, 2025) “61-12649071-00000-EL-SKT-001.dwg”

Noise propagation was modelled using CONCAWE prediction algorithm considering larger distances between the noise sources and the receptors (minimum of 1.6 km), with default worst case meteorological conditions based on DWER guidelines on noise emissions - listed in Table 4.5.

Table 4.5 Meteorological conditions for noise modelling

Parameter	Day (7:00 am-7:00 pm)	Night (7:00 pm – 7:00 am)
Temperature	20°C	15°C
Relative Humidity	50%	50%
Wind Speed [1]	4 m/s	3 m/s
Pasquill Stability	E	F

Notes:

1. The wind direction considered in the noise model is from source to receptor as this constitutes worst case form a noise emissions perspective.

The equipment outlined in Table 4.6, Table 4.7 and Table 4.8 was modelled for this assessment. The quantity of each item of equipment and their location within the Project site are described in Section 4.2 and shown in Figure 4.1, respectively. The location for the noise sources was referenced from the proposed layout indicated in Table 4.4.

Noise level data for the inverters have been derived from recent field measurements undertaken whilst noise level data for the batteries were derived from manufacture noise reports provided by the Client and its subcontractors. The sound power level of the 250 MVA substation transformer was estimated based on *AS/NZ standard IEC 60076.10-2009, part 10: Determination of sound levels*.

Table 4.6 Battery pack sound power level data, dB(A)

Fan/Chiller speed	Third octave centre frequency band, dB(A) Hz																							Overall dB(A)
	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz	
100%[1]	37	43	45	51	55	71	62	62	70	68	70	71	70	72	70	71	71	70	69	67	65	62	59	53	82

Note 1: Sound power level noise data was derived from manufacturer site measurements

Table 4.7 Inverter sound power level data, dB(A)

Fan/chiller speed	Side of unit considered	Third octave centre frequency band, dB(A) Hz																							Overall dB(A)
		50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz	
80%[1]	Top	66	66	64	65	67	67	68	72	65	61	63	60	60	60	60	57	55	55	55	52	50	48	46	45	78
	Rear	70	74	71	71	73	73	73	77	71	68	70	68	67	68	69	68	65	64	62	59	58	56	53	51	84
	Right	67	64	68	67	65	66	70	71	63	60	63	59	59	61	61	59	57	56	56	56	56	55	55	54	78
	Front	73	73	70	71	70	71	75	79	72	68	72	69	68	70	70	68	65	64	63	61	59	58	56	54	85
	Left	60	63	64	65	63	66	65	64	60	58	61	60	65	61	64	58	57	57	54	51	50	48	46	42	75
	Total	**76**	**77**	**75**	**76**	**76**	**77**	**79**	**82**	**75**	**72**	**75**	**72**	**72**	**73**	**74**	**72**	**69**	**68**	**67**	**64**	**63**	**62**	**60**	**58**	**88**
100%[1]	Top	68	68	66	67	69	69	70	74	67	63	65	62	62	62	62	59	57	57	57	54	52	50	48	47	80
	Rear	72	76	73	73	75	75	75	79	73	70	72	70	69	70	71	70	67	66	64	61	60	58	55	53	86
	Right	69	66	70	69	67	68	72	73	65	62	65	61	61	63	63	61	59	58	58	58	58	57	57	56	80
	Front	75	75	72	73	72	73	77	81	74	70	74	71	70	72	72	70	67	66	65	63	61	60	58	56	87
	Left	62	65	66	67	65	68	67	66	62	60	63	62	67	63	66	60	59	59	56	53	52	50	48	44	77
	Total	**78**	**79**	**77**	**78**	**78**	**79**	**81**	**84**	**77**	**74**	**77**	**74**	**74**	**75**	**76**	**74**	**71**	**70**	**69**	**66**	**65**	**64**	**62**	**60**	**90**

Note 1: Sound power level noise data was derived from site measurements provided by the Client and its subcontractors

Table 4.8 Ancillary equipment sound power levels, dB(A)

Equipment	Octave centre frequency band, dB(A) Hz								Overall dB(A)
	63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	
Substation transformer (250 MVA)[1]	65	86	94	94	92	89	81	69	99
Switchroom HVAC condenser[2]	54	64	62	66	66	66	59	54	72
Aux skid transformer (2.5 MVA)[3]	38	59	67	67	65	62	54	42	72

Note 1: Sound power level noise data for transformers is derived from AS/NZ standard IEC 60076.10-2009, part 10: Determination of sound levels

Note 2: Sound power level noise for Switchroom HVAC condenser units is derived from typical AC outdoor condenser units

Note 3: Overall sound power level noise for aux skids is derived from typical MV transformers

Legend

- Development envelope
- Battery sources
- Inverter sources
- Ancillary sources (Transformers)
- Buildings
- Switchroom (HVAC source)

Paper Size ISO A4

0 15 30 45 60 m

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA94
Grid: GDA94 / MGA zone 50

GHD

Shell Energy
BESS Noise Impact Assessment

Site layout and noise sources

Project No. **12649071**
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Date. **21/03/2025**

FIGURE 4.1

Document Path: \\ghdnet\ghd\AU\Perth\Projects\61\12649071\Tech\Noise\12649071_working.qgz
Print Date: 21/03/2025

Data Source:Google Earth Imagery 2025

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4.4 Tonality

The distance between the BESS noise sources and the closest noise-sensitive receptor is 1.6 km. At this distance, based on previous experience with BESS projects and the definition of tonality in the Regulations, it is difficult to assess if tonality would be present without conducting any measurements in situ. For conservatism tonality has been accounted for with a +5 dB adjustment applied to the predicted noise levels (Section 4.5). GHD recommends for a tonality assessment to be conducted via noise monitoring during the commissioning phase of the project.

4.5 Predicted noise levels

Predicted noise levels from the project are provided in Table 4.9 and noise contours are presented in Appendix D. As outlined above, a +5 dB adjustment due to tonality has been applied to the predicted noise.

Table 4.9 Predicted sound pressure levels at modelled receptors

Scenario (Time of day)	Scenario 1 (Day)					Scenario 2 (Night)					Scenario 3 (Day)				
Receptor (distance to site)	Predicted L_{A10}, dB	Tonality adj.	Assessable Noise level	Criteria (Sunday	Complies? (Y/N)	Predicted L_{A10}, dB	Tonality	Assessable Noise level	Criteria (Night)	Complies? (Y/N)	Predicted L_{A10}, dB	Tonality adj.	Assessable Noise level	Criteria (Sunday	Complies? (Y/N)
R1 (1.9 km)	26	+5	31	**40**	Y	26	+5	31	**35**	Y	27	+5	32	**40**	Y
R2 (2.4 km)	21	+5	26	**40**	Y	21	+5	26	**35**	Y	22	+5	27	**40**	Y
R3 (1.6 km)	26	+5	31	**40**	Y	26	+5	31	**35**	Y	26	+5	31	**40**	Y
R4 (1.8 km)	22	+5	27	**42**	Y	23	+5	28	**37**	Y	23	+5	28	**42**	Y

4.6 Discussion

4.6.1 Audibility

Receptors have predicted noise levels at nighttime between 26 – 31 dB. Typical nighttime background noise levels tend to be higher than the predicted noise at these locations (See Appendix C for Loggers L1, L2 and L3 L_{A90} corresponding to R1, R2 and R3).

Table 4.10 Assessable noise level at night (Scenario 2) compared to measured existing background noise

Noise sensitive receptor	Assessable noise level at Night, dB L_{A10}	Typical background noise level at Night, dB L_{A90}
R1	26	33
R2	21	25
R3	26	28
R4	23	Not measured at this location

Hence, receptor locations are deemed unlikely to have audibility of the proposed BESS. Noise is assessed as audible if the predicted noise level values protrude above the ambient monitoring data by more than 3 dB as a person typically does not detect a change in noise levels below 2 to 3 dB (David Bies, 2018).

4.6.2 Compliance

Predicted noise levels provided in Table 4.9 show that all noise sensitive receptors are expected to comply from the noise predicted at the project site. This is the case even with tonality considered – although it is possible that it is proven to be absent in the future (i.e. this would typically be conformed at noise commissioning phase once the facility is up and running). Noise compliance is expected to be achieved at all noise sensitive receptors during all time periods.

It should be noted that worst-case assumptions have been made for this NIA with the inclusion of Scenario 3, assessing noise levels from the Inverters and Batteries running at 100% fan/chiller speeds (i.e. a highly unlikely scenario in practice).

5. Construction noise assessment

5.1 Construction noise

The following relationship between distance and attenuation were considered as the basis for the construction noise assessment:

$$SPL = SWL - 20\log(d) + 10\log(Q) - 11$$

where: d = Distance between the source and receptor (m)

Q = Directivity index (2 for a flat surface)

SPL = Sound pressure level at the distance from the source, dB(A)

SWL = Sound power level of the source, dB(A)

Typical noise levels produced were referenced from typical construction equipment used at BESS sites.

Propagation calculations only take into account losses due to spherical spreading, with additional minor losses such as atmospheric absorption, directivity and ground absorption ignored. As a result, predicted received noise levels are conservative.

Noise produced at distances relevant to the Project by anticipated activities during the construction are shown in Table 5.1, with no noise barriers or acoustic shielding in place and with each item assumed to be operating at full power.

The magnitude of noise impact associated with construction will be dependent upon a number of factors:

– The intensity and location of construction activities.

– The type of equipment used.

– Existing local noise sources.

– Intervening terrain.

– The prevailing weather conditions.

Construction machinery will move about the Project site area, altering the directivity of the noise source with respect to individual receptors. During any given period of time, the machinery items to be used in the area will operate at maximum sound power levels for only brief stages. At other times, the machinery may produce lower sound levels while carrying out activities not requiring full power. It is unlikely that all construction equipment would be operating at their maximum sound power levels at any one time.

Table 5.1 Construction noise equipment noise attenuation as a result of spherical spreading

Equipment	SWL, dB(A)	Sound pressure level SPL, dB(A) at distance						
		10 m	100 m	1000 m	2000 m	3000 m	4000 m	5000 m
Excavator	107	79	59	39	33	29	27	25
Bulldozer	108	80	60	40	34	30	28	26
Tracked loader	108	80	60	40	34	30	28	26
Roller	110	82	62	42	36	32	30	28
Concrete pump	108	80	60	40	34	30	28	26
Concrete truck	108	80	60	40	34	30	28	26
Compactor (15 t)	113	85	65	45	39	35	33	31
Delivery trucks	107	79	59	39	33	29	27	25
Crane (500 t)	110	82	62	42	36	32	30	28
Extendable trailer truck	107	79	59	39	33	29	27	25
Grinder	115	87	67	47	41	37	35	33
Bobcat	108	80	60	40	34	30	28	26

The closest sensitive receptor to any potential noise source during construction of the Project, is located approximately 1.6 km from the development envelope (R3 with an IF of 0). From Table 5.1, compliance with the daytime assigned level of 55 dB L_{A1} is expected at such distances (See Table 2.4 for assigned noise levels for sensitive receptors at all times of the day).

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5.2 Construction vibration

Vibration impacts discussed in this section essentially focus on potential structural damage to properties in close proximity to the Project site area. It is possible that construction vibration will be perceived at times by local sensitive receptors. However, the level of annoyance will depend on individuals.

There is a large separation distance of 1.6 km between the closest impacted receptor and site construction activities.

The nature and levels of vibration emitted by the Project site will vary with the activities being carried out on site. Table 5.2 outlines typical vibration levels for different activities that may be generated on site, sourced from the NSW Roads and Traffic Authority (RTA) *Environmental Noise Management Manual* (RTA, 2001).

Table 5.2 Typical vibration levels for expected high-vibration construction equipment

Plant item	Peak particle velocity at 10 metres (mm/s)
Compactor (15 t)	7.0 - 8.0
Roller	7.0 - 8.0

Construction activity may result in varying degrees of ground vibration depending on the equipment used and methods employed. Operation of construction equipment causes ground vibration which spread through the ground and diminish in strength with distance. Buildings founded on the soil in the vicinity of the construction site respond to these vibrations with varying results, ranging from no perceptible effects at the lowest levels, low rumbling and perceptible vibrations at moderate levels and slight building damage at the highest levels.

From Table 5.2, equipment proposed for site preparation and construction of the Project site will generate low levels of vibration which are unlikely to result in any vibration risks to structures as existing buildings are over 1 km from the project site. The lower limit for vibrations resulting in building damage of 5 mm/s is normally not exceeded by general construction activities at distances greater than 20 metres from the nearest sensitive receptor.

Given the distances involved between site works and the nearest existing receptors, vibrations affecting human comfort and building integrity are not expected to be an issue.

5.3 Management measures

As there are no predicted exceedances to construction noise during hours (7.00 am to 7.00 pm Monday to Saturday), there is no requirement under the construction noise criteria (Section 2.1.4) to undertake mitigation measures. This is provided reasonable care is taken to select quietest reasonably available equipment and the construction work is carried out in accordance with environmental noise practices set out in Section 4 of *AS 2436-2010 Guide to Noise and Vibration Control on Construction, Demolition and Maintenance Sites*.

Should there be work required out of hours, the following management controls are to be implemented:

– The Contractor must advise all nearby sensitive receptor likely to receive noise levels which fail to comply with the assigned levels under Regulation 8 of the work to be done at least 24 hours before it commences;
– The Contractor must show that it is reasonably necessary for the work to be done out of hours;
– The Contractor must submit to the relevant Chief Executive Officer (CEO) a noise management plan at least seven days prior to the commencement of work and the plan must be approved by the CEO. The plan must include details of:
    - Reasons for the construction work needing to be completed out of hours;
    - Details of activities which are likely to result in high noise emissions;
    - Predictions of the noise emissions from the site;
    - Details of measures to be used to control noise (including vibration) emissions;
    - Procedures to be adopted for monitoring noise (including vibration) emissions;
    - Complaint response procedures to be adopted.

6. Conclusions

GHD has been commissioned by Shell to undertake a NIA study for the proposed BESS facility adjacent to the Neerabup Power Station. This assessment aims to assess operational noise levels associated with the project resulting from battery storage packs, inverters, and ancillary infrastructure at the proposed BESS near Neerabup Power Station.

A baseline environmental noise survey has been conducted using noise loggers deployed at noise sensitive receptor locations nearest to site as well as within the near field of the existing gas turbines on site.

1. Results of long-term unattended baseline noise monitoring showed industry is not currently audible at any of the receptors. Furthermore, no clear correlation exists between noise at Neerabup Power Station and ambient noise at sensitive receptors.
2. The outcome of the operational noise modelling study indicates that:
    a. Three scenarios were modelled by considering various fan speeds for the proposed equipment inverters during day and night, based on typical summer outdoor temperature in Neerabup.
    b. Battery fan/chiller speeds were conservatively assumed to be 100% for all periods of the day and inverter fan speeds were only considered 100% when ambient temperatures considered above 40˚C.
    c. Inverters have been modelled without attenuation kits (conservative) due to relatively large distance to closest sensitive receptor at 1.6 km.
    d. A +5 dB adjustment was conservatively applied to the predicted noise levels to account for possible tonality at receptors. The tonality assumption may be disproved by the results of noise commissioning tests in future.
    e. Based on typical background noise levels measured at noise sensitive receptors during the baseline monitoring survey the likelihood of the BESS being audible at these locations is deemed low.
    f. The predicted noise levels all scenarios showed no noise exceedance of the applicable noise criteria at each of the noise sensitive receptors. Therefore, noise compliance is expected to be achieved at all noise sensitive receptors during all time periods.
3. The outcome of the construction noise assessment indicates that:
    a. Construction equipment operating during daytime are predicted to generate noise that comply with the daytime assigned noise levels at all sensitive receptors.
    b. Given the distances involved between site works and nearest sensitive receptors, construction vibration affecting human comfort and building integrity are not expected to be an issue.
    c. If construction is to take place outside of normal hours (7:00 am to 7:00 pm Monday to Saturday), management measures must be undertaken as per Regulation 13 of the *Environmental Protection (Noise) Regulations 1997*.

7. References

David Bies, C. H. (2018). *Engineering Noise Control.* CRC Press.

EPA. (1997). *Environmental Protection (Noise) Regulation.*

Hanson, B. (2009). *Engineering Noise Control.*

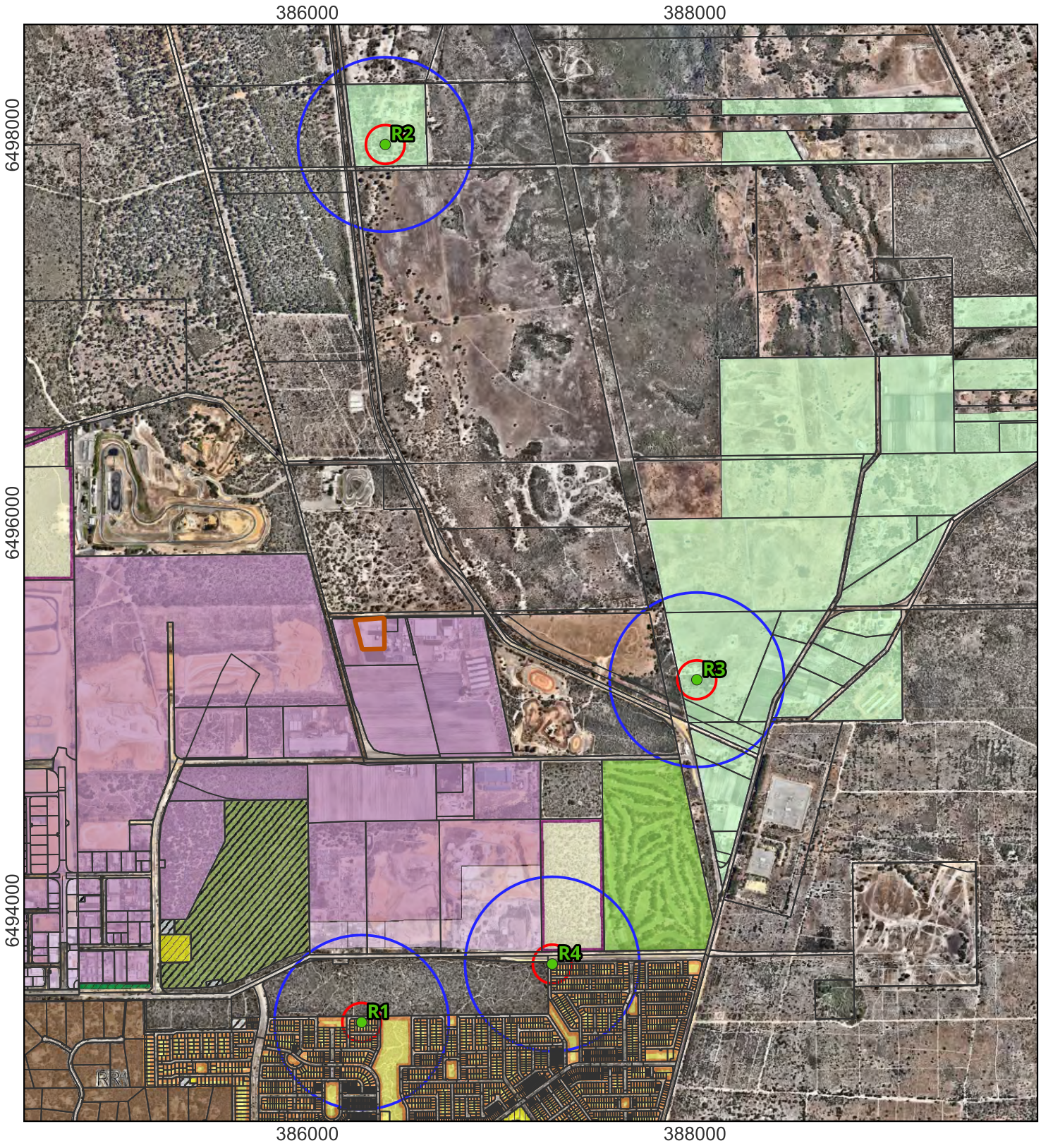
RTA. (2001). *NSW Roads and Traffic Authority (RTA) Environmental Noise Management Manual.*

Standards Australia. (2001). *60076 Part 10: 2009 Power Transformers – Determination of Sound Levels (IEC 60076-10, Ed.1 (2001) MOD).*

Standards Australia. (2018). *AS 1055:2018 : Acoustics - Description and measurement of environmental noise.* Standards Australia.

Appendix A

IF calculation at noise sensitive receptors



Legend

- 450m radius circle (IF calculation)
- 100m radius circle (IF calculation)
- Noise sensitive receptors
- Roads
- Industrial
- Light industrial
- Rural
- Private community
- Urban development
- Rural residential
- Industrial development
- Park and reserves
- Public purposes
- Drainage
- Cadastre
- Development envelope

Paper Size ISO A4

0 0.25 0.5 0.75 1 km

Map Projection: Transverse Mercator
Horizontal Datum: GDA94
Grid: GDA94 / MGA zone 50

N

GHD

Shell Energy
BESS Noise Impact Assessment

Noise receiver locations Local Planning: 100m and 450m radius circles for IF calculation

Project No. **12649071**
Revision No. **1**
Date. **21/03/2025**

FIGURE A.1

Document Path: \\ghdnet\ghd\AU\Perth\Projects\61\12649071\Tech\Noise\12649071_working.qgz
Print Date: 21/03/2025

Data Source:Google Earth Imagery 2025

Created By: afarhath

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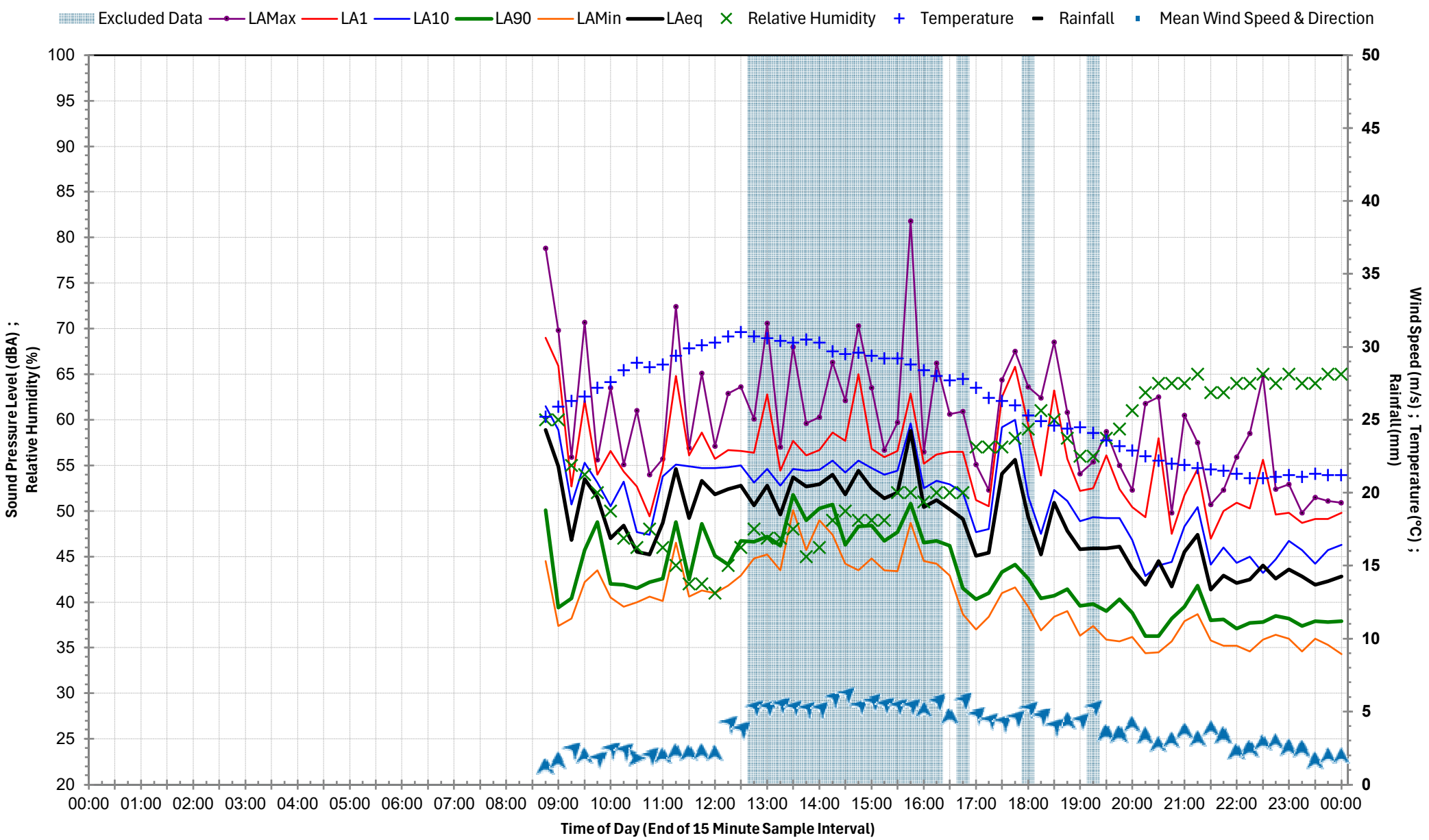
Appendix B

Unattended noise measurement graphs

Logger 1

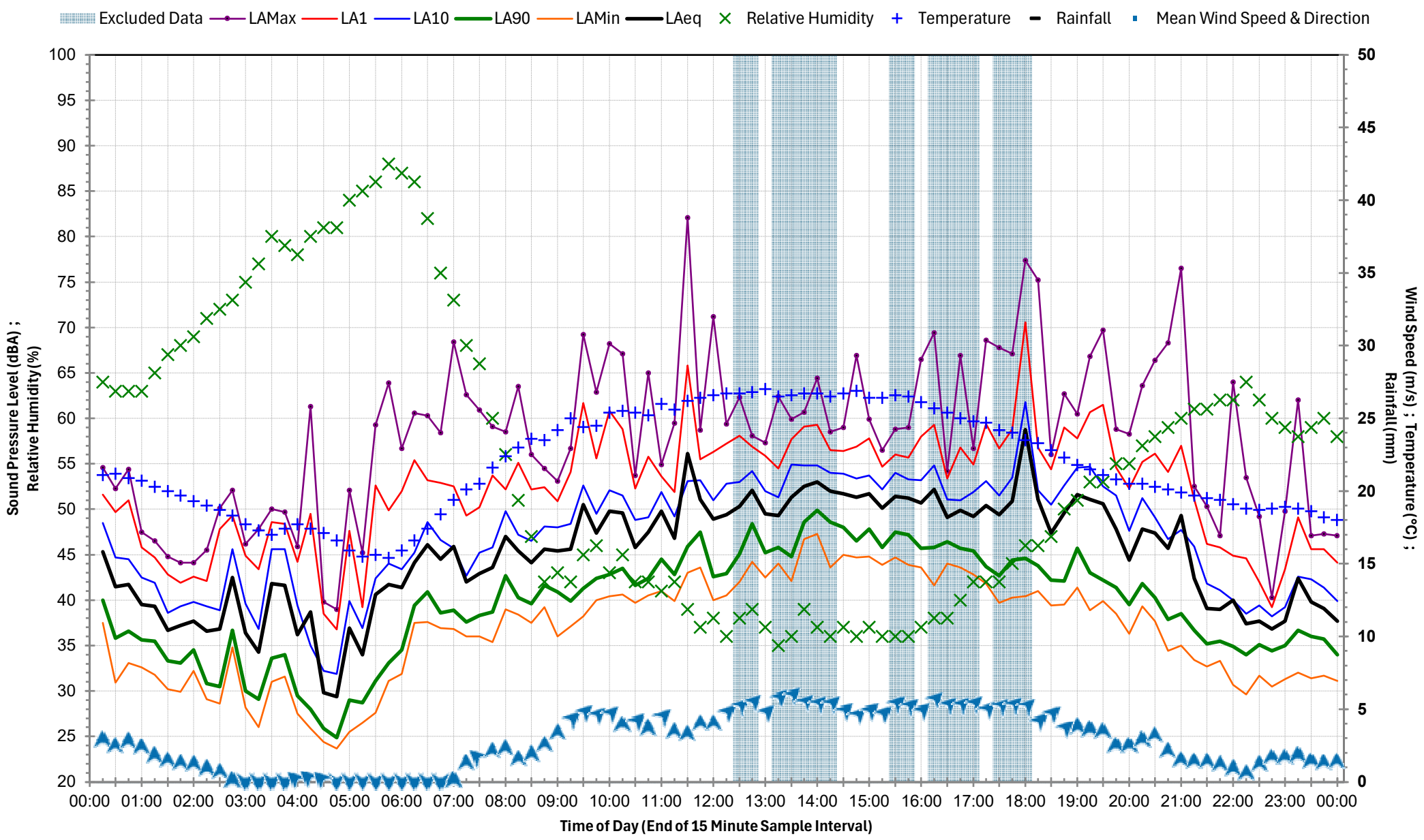
Statistical Ambient Noise Levels

Shell BESS - L1 - 35 Pollen Turn, Banksia Grove 6031 - Monday 13 January 2025



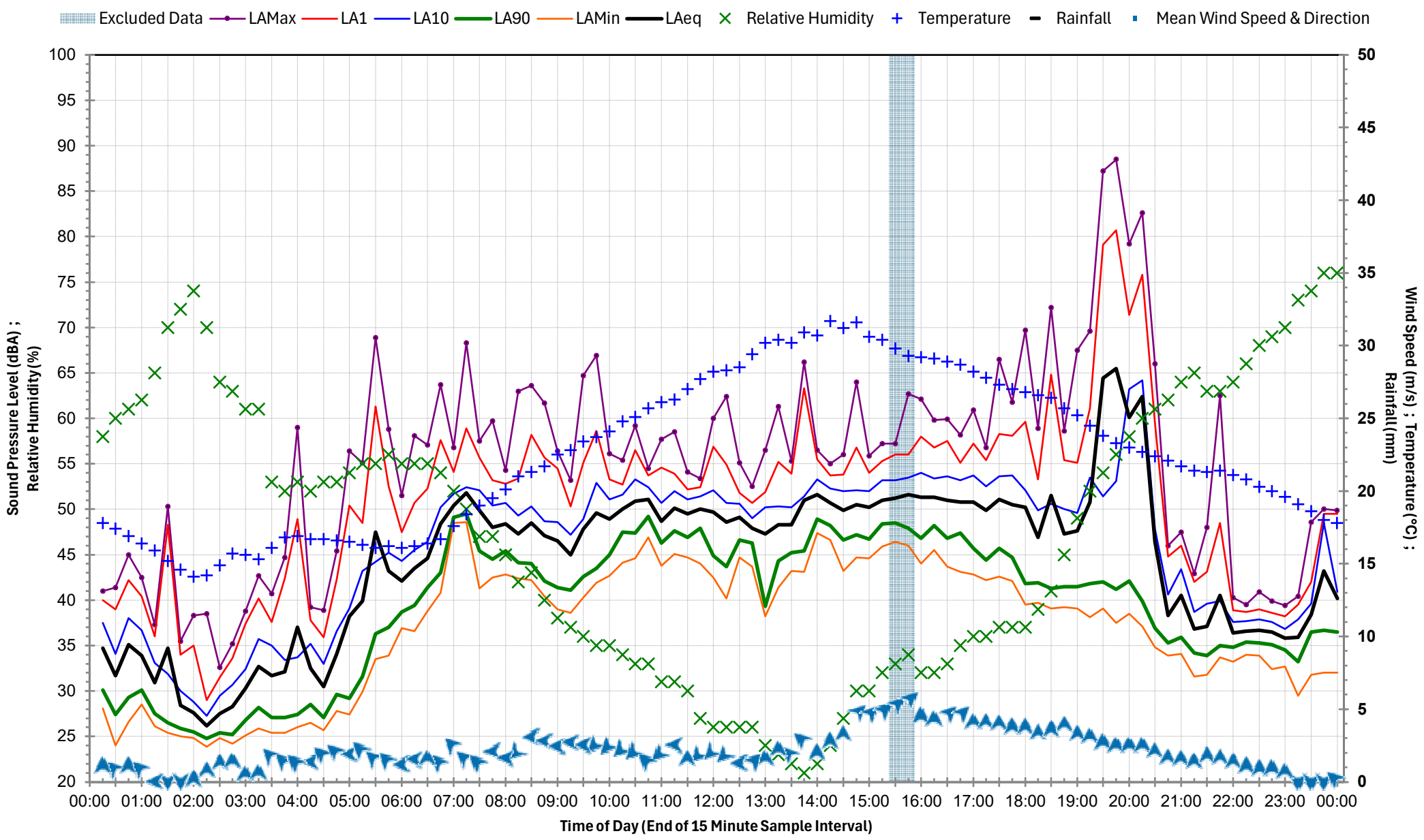
Statistical Ambient Noise Levels

Shell BESS - L1 - 35 Pollen Turn, Banksia Grove 6031 - Tuesday 14 January 2025



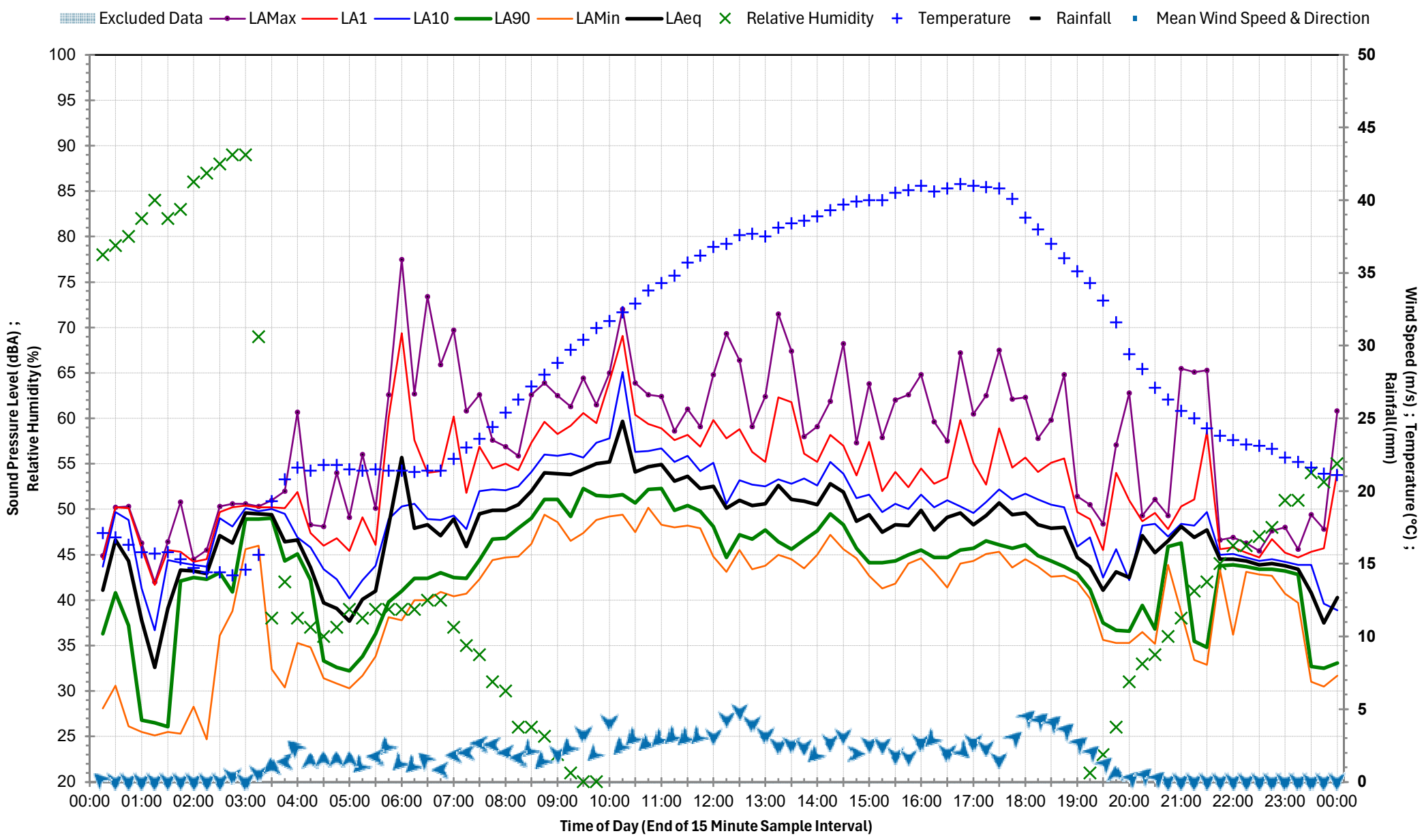
Statistical Ambient Noise Levels

Shell BESS - L1 - 35 Pollen Turn, Banksia Grove 6031 - Wednesday 15 January 2025



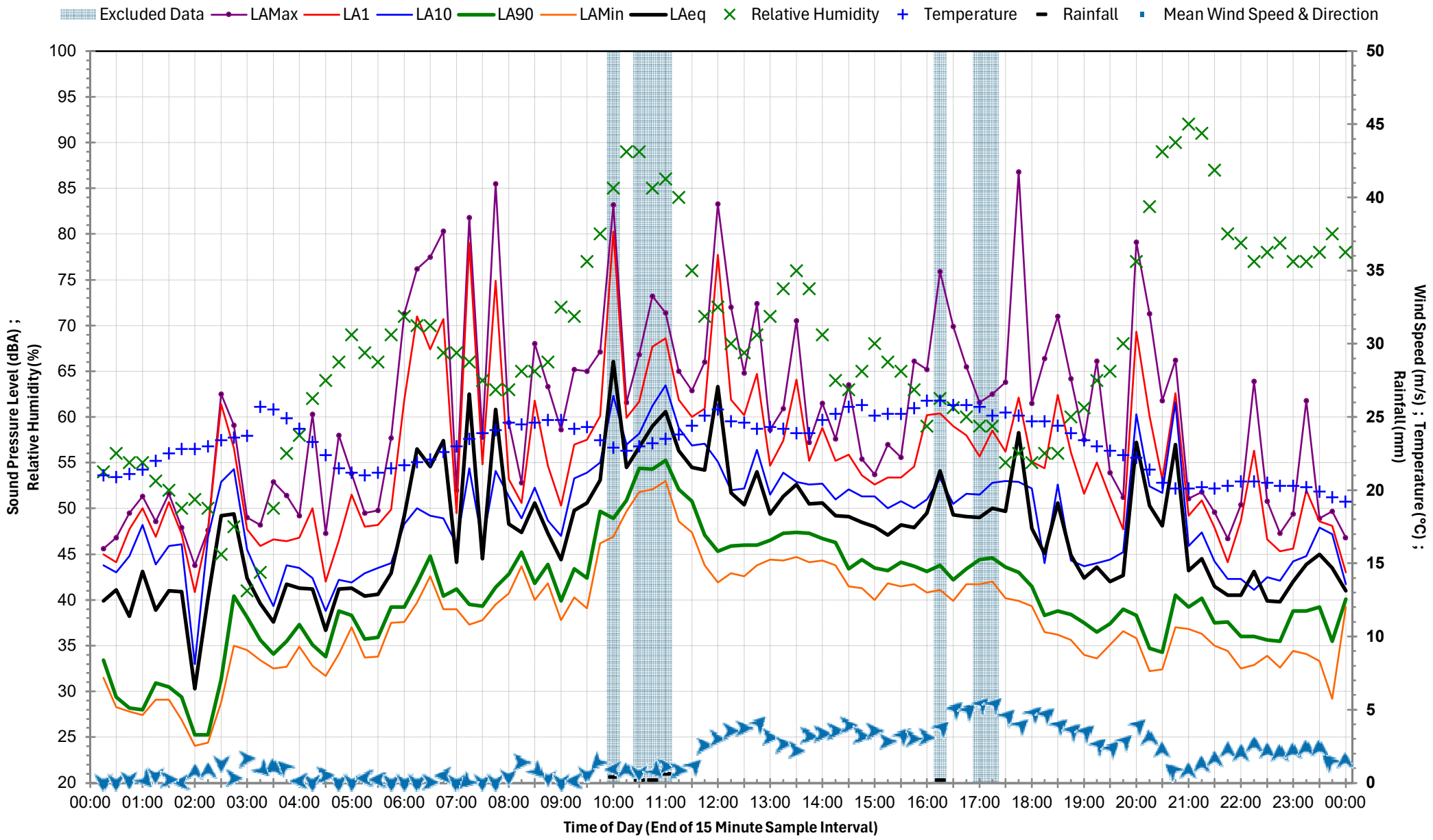
Statistical Ambient Noise Levels

Shell BESS - L1 - 35 Pollen Turn, Banksia Grove 6031 - Thursday 16 January 2025



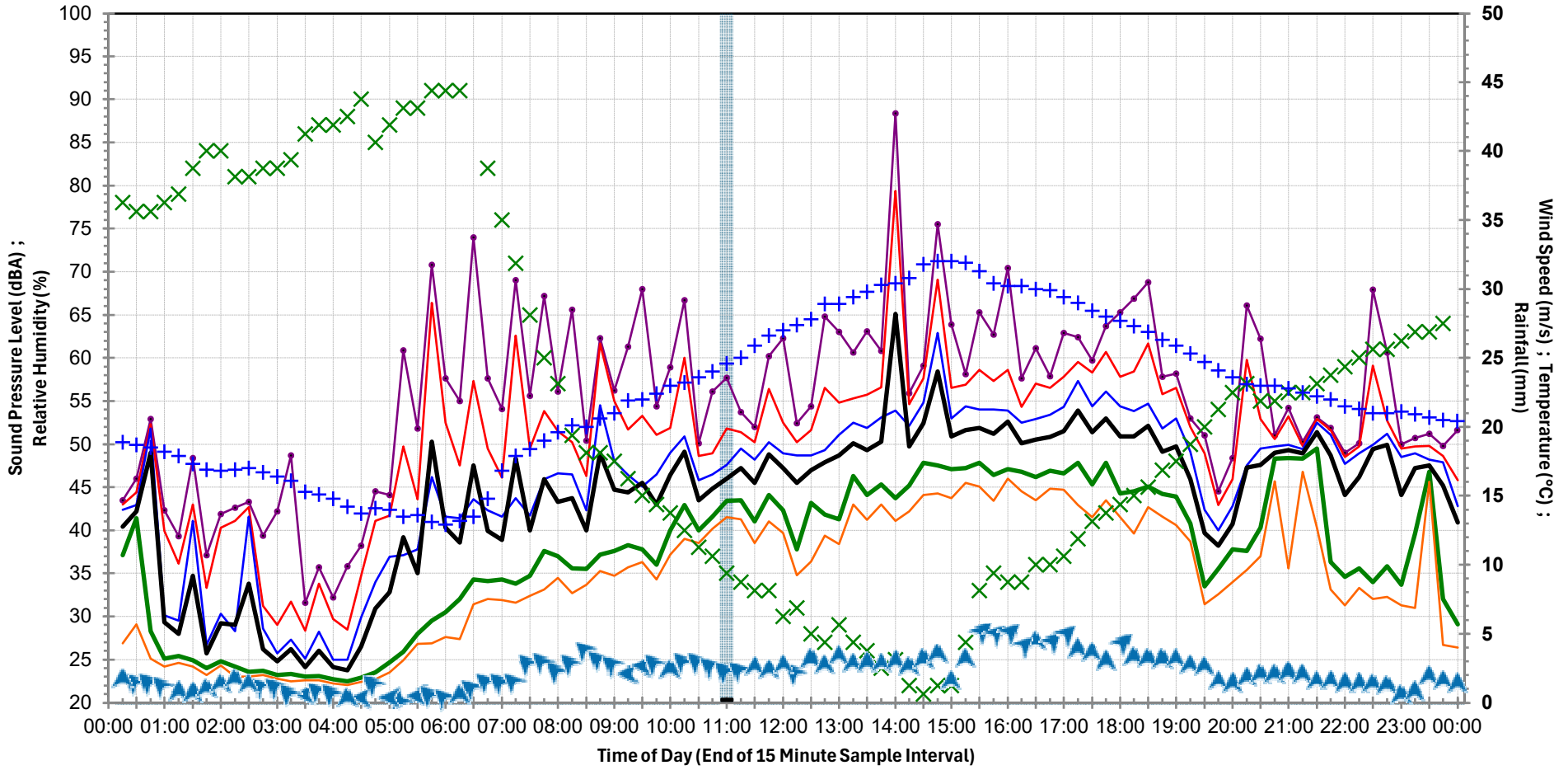
Statistical Ambient Noise Levels

Shell BESS - L1 - 35 Pollen Turn, Banksia Grove 6031 - Friday 17 January 2025



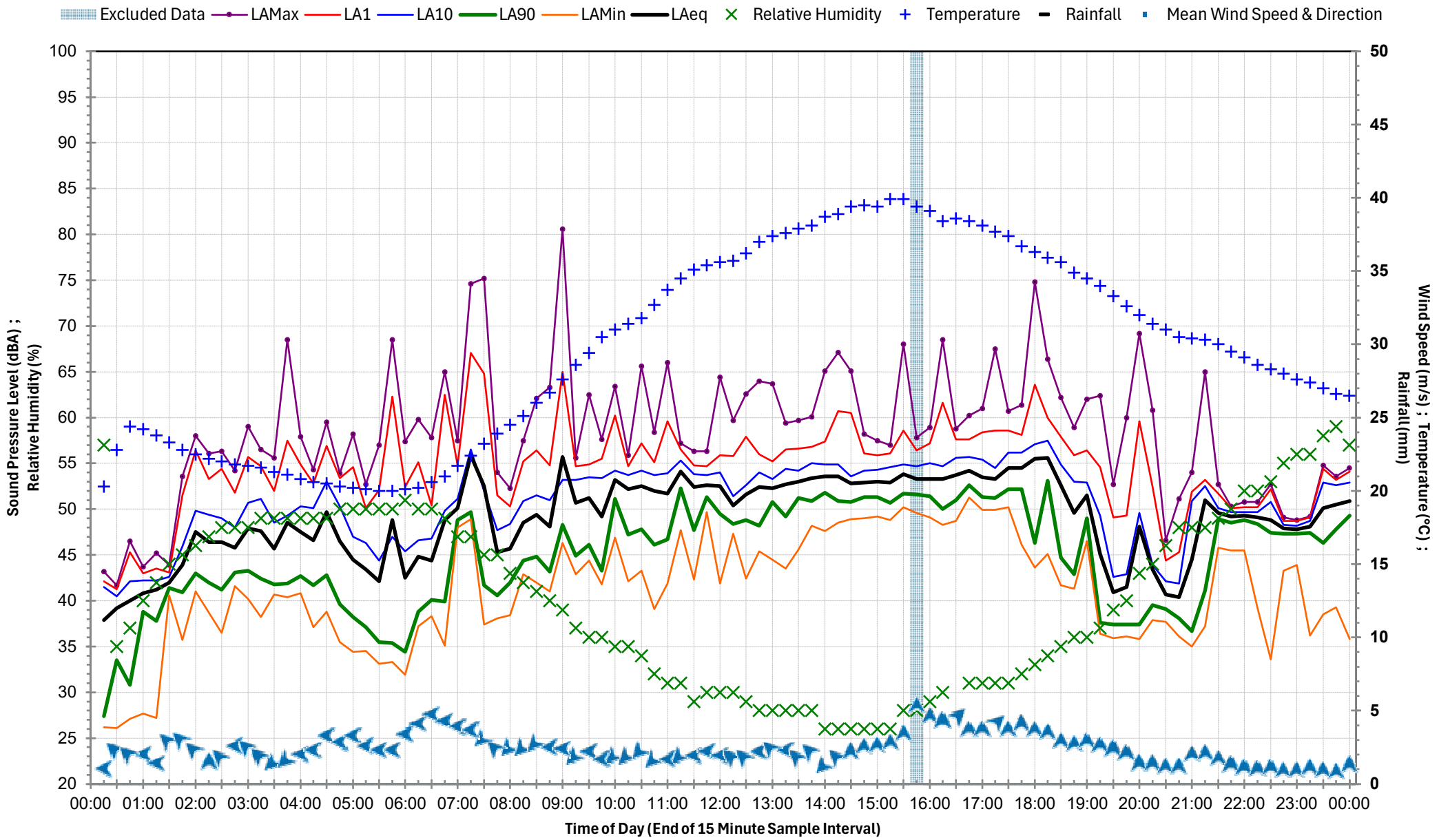
Statistical Ambient Noise Levels

Shell BESS - L1 - 35 Pollen Turn, Banksia Grove 6031 - Saturday 18 January 2025



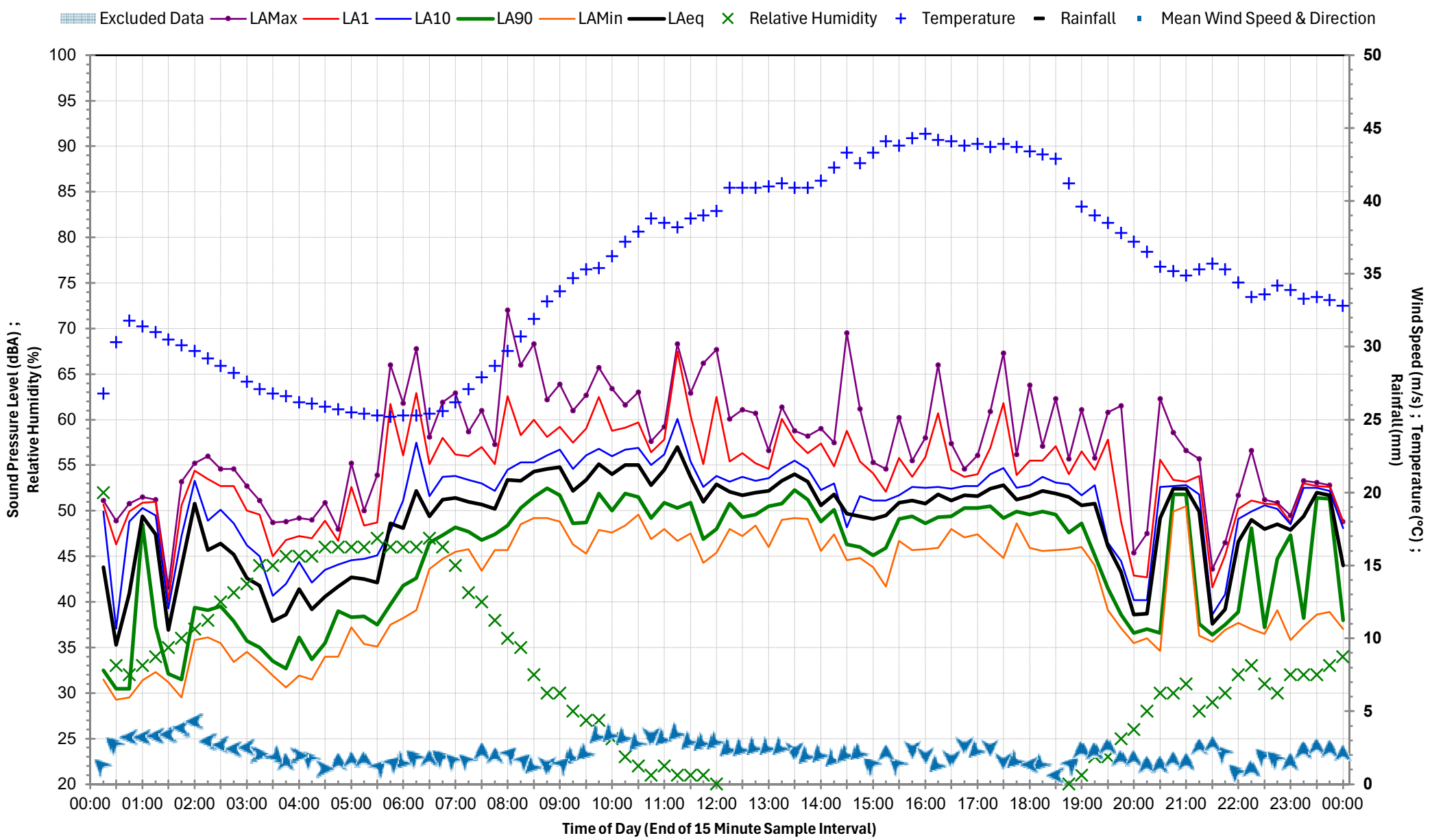
Statistical Ambient Noise Levels

Shell BESS - L1 - 35 Pollen Turn, Banksia Grove 6031 - Sunday 19 January 2025



Statistical Ambient Noise Levels

Shell BESS - L1 - 35 Pollen Turn, Banksia Grove 6031 - Monday 20 January 2025



Statistical Ambient Noise Levels

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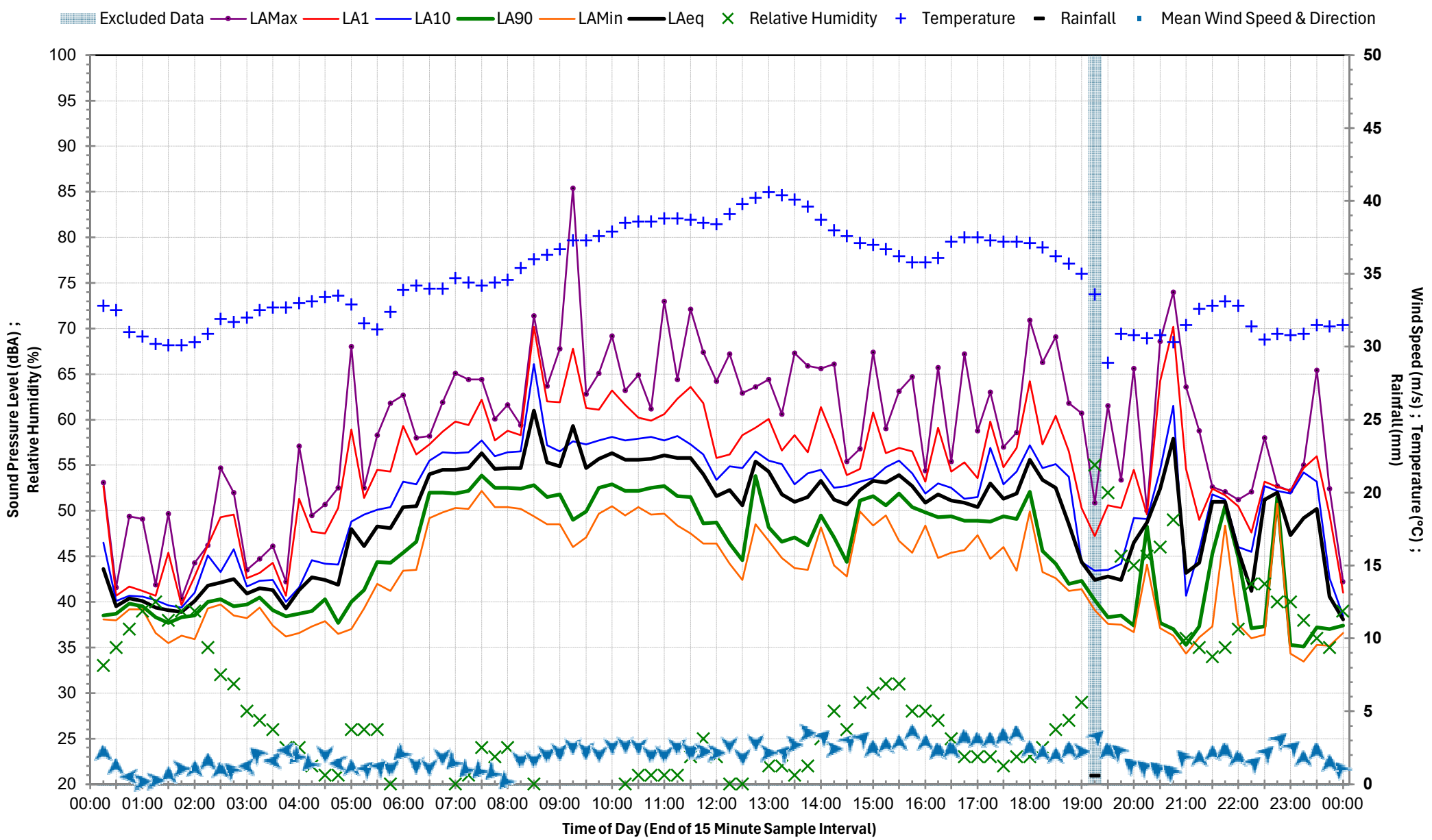

Statistical Ambient Noise Levels

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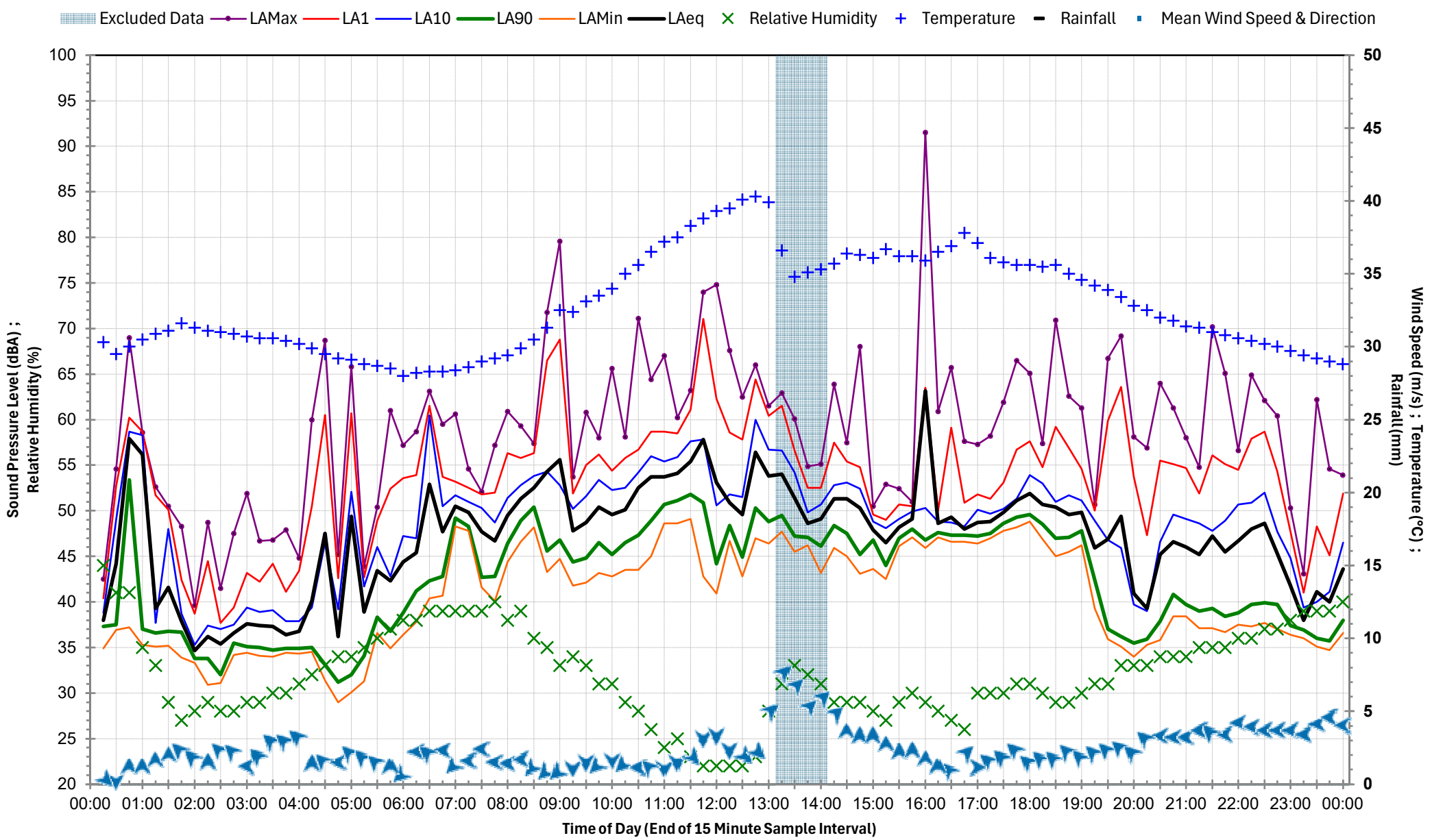
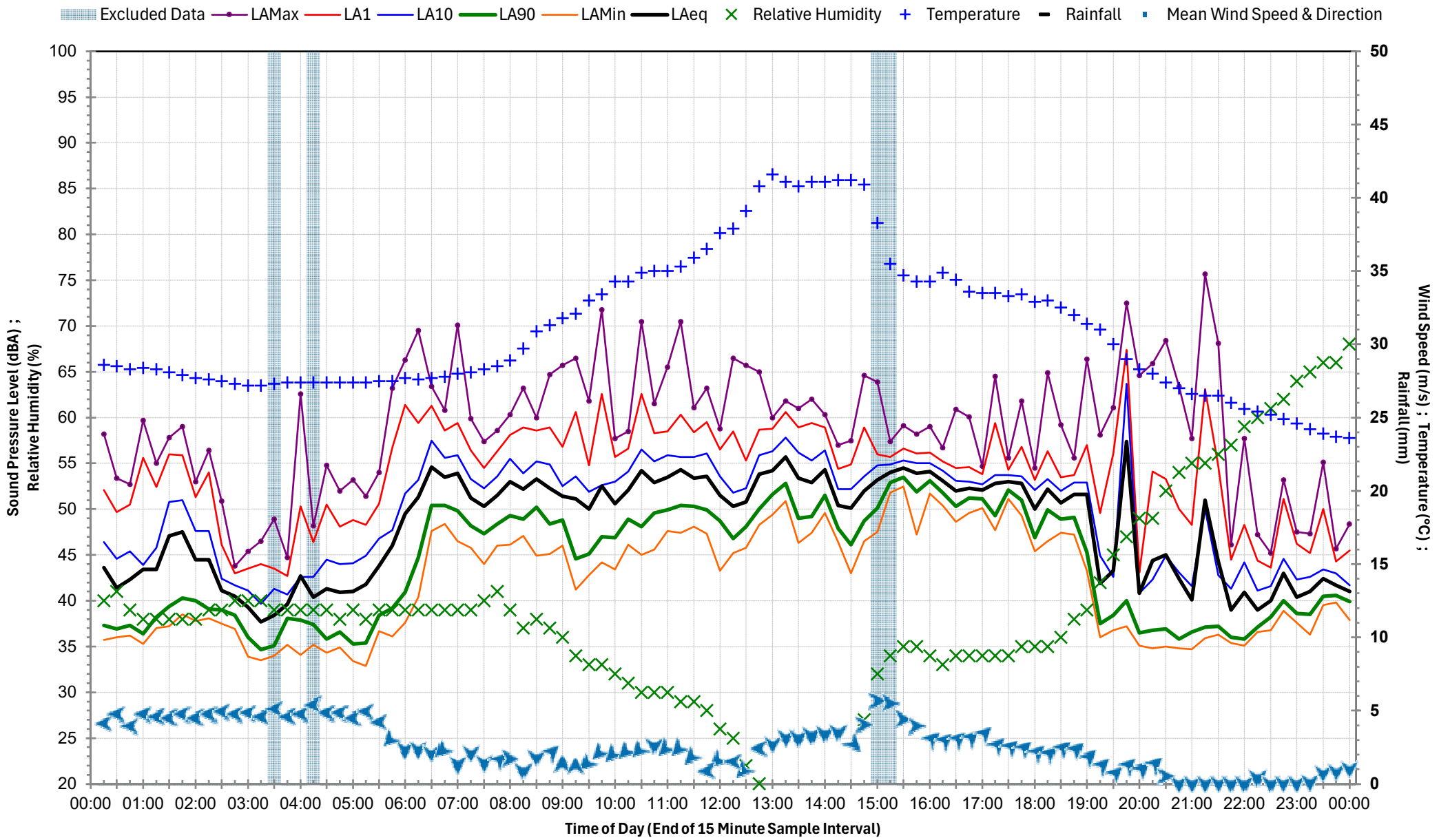


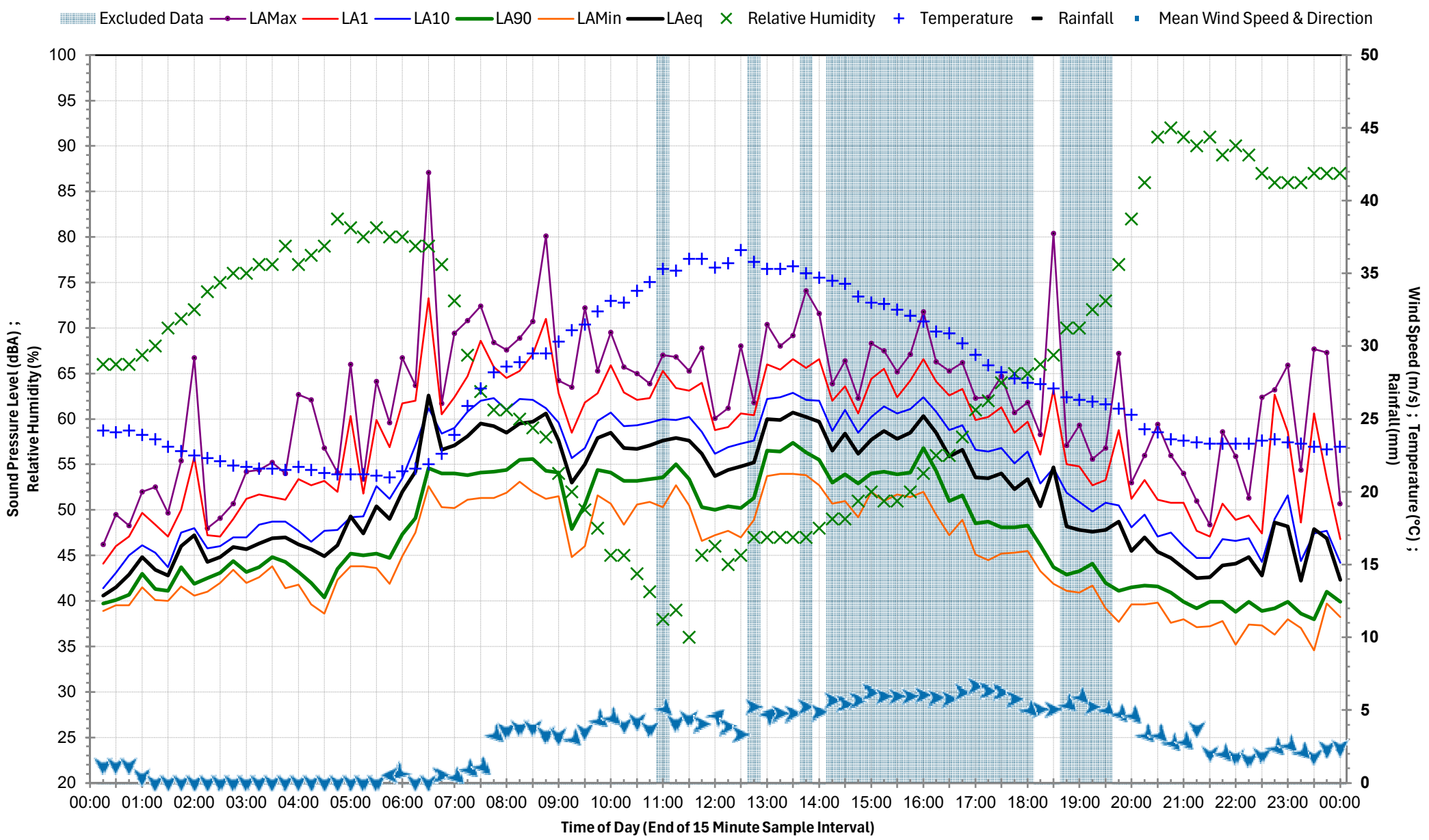
Statistical Ambient Noise Levels

Shell BESS - L1 - 35 Pollen Turn, Banksia Grove 6031 - Thursday 23 January 2025



Statistical Ambient Noise Levels

Shell BESS - L1 - 35 Pollen Turn, Banksia Grove 6031 - Friday 24 January 2025



Statistical Ambient Noise Levels

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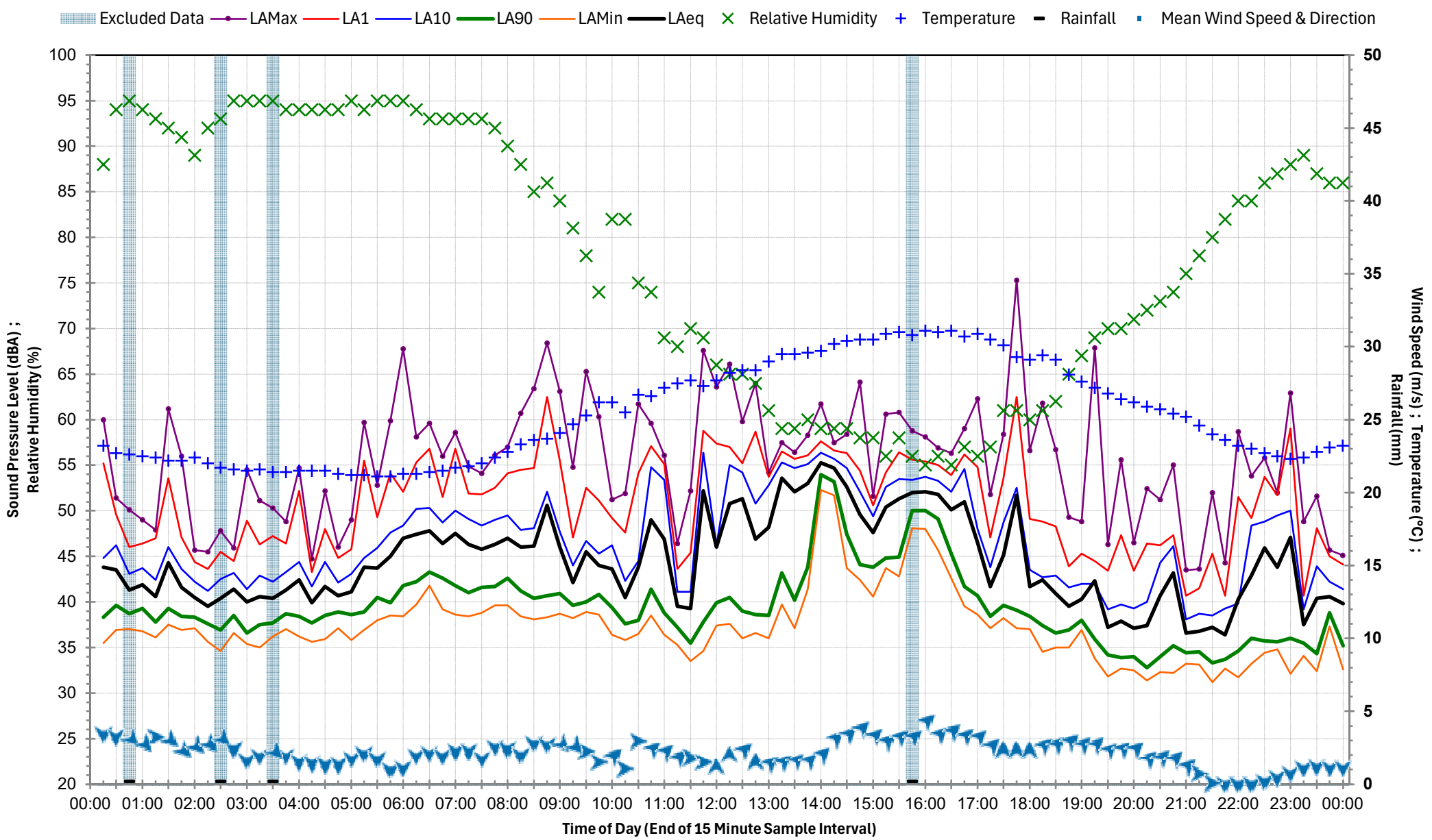
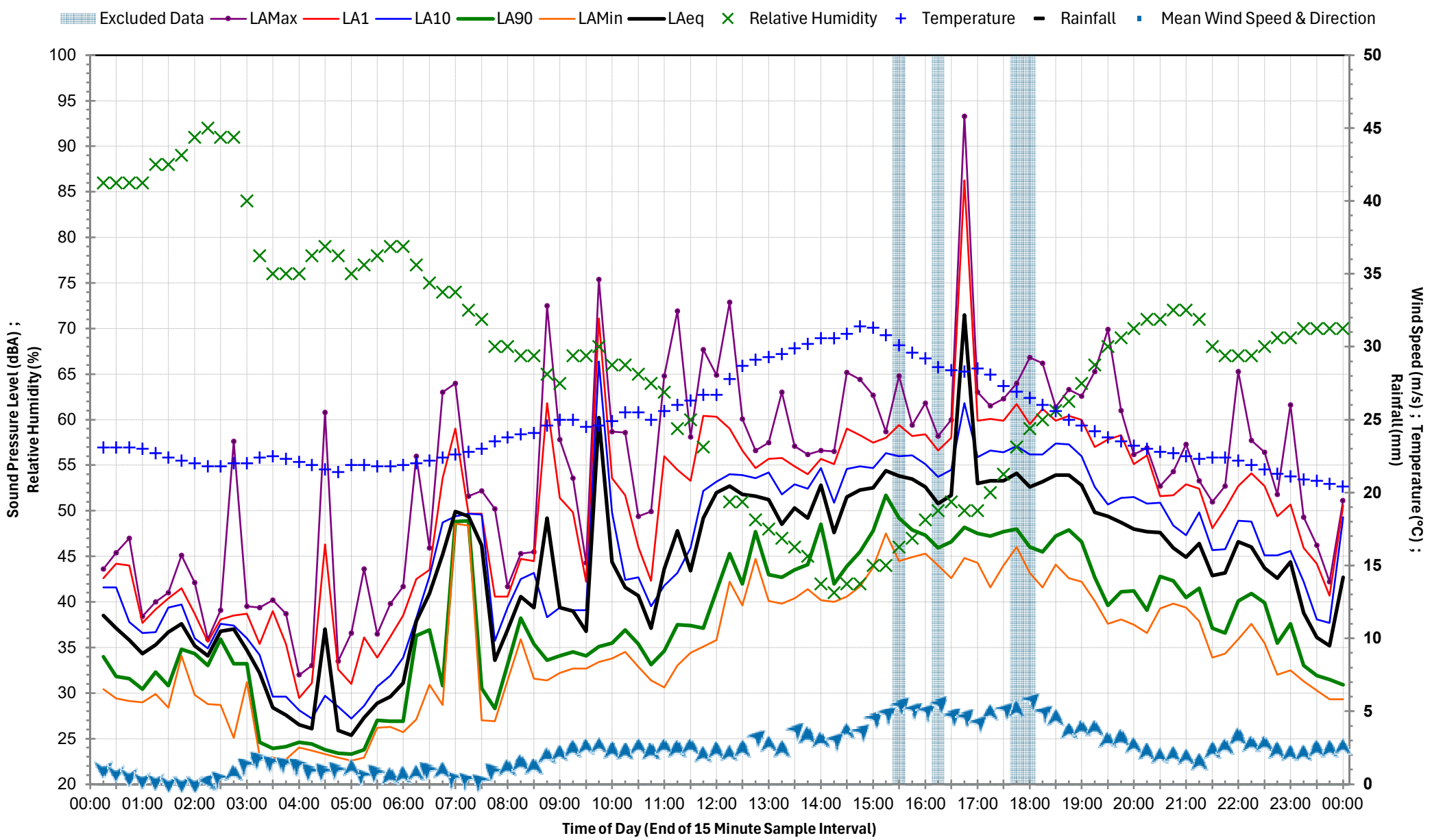


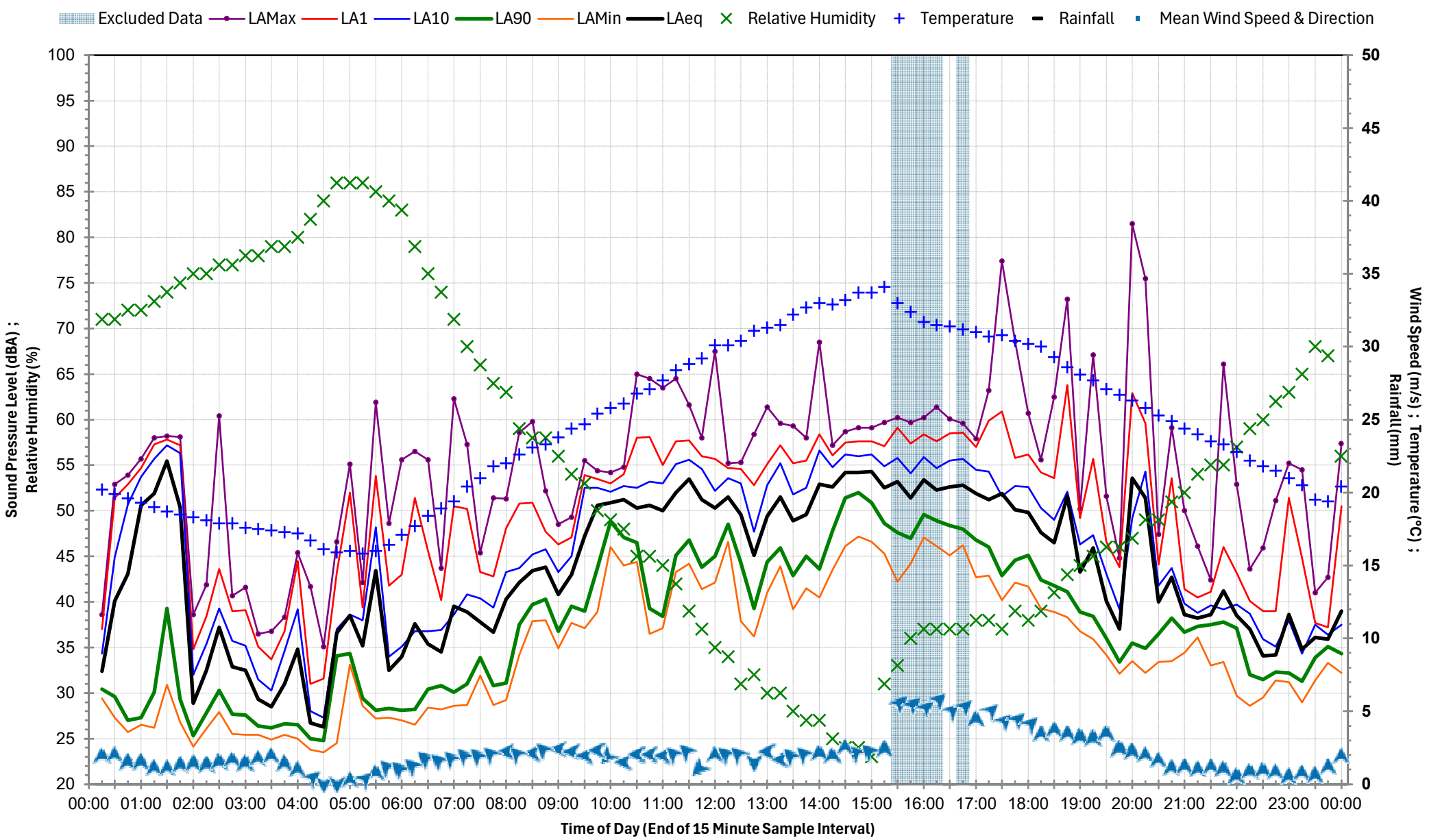
Statistical Ambient Noise Levels

Shell BESS - L1 - 35 Pollen Turn, Banksia Grove 6031 - Sunday 26 January 2025



Statistical Ambient Noise Levels

Shell BESS - L1 - 35 Pollen Turn, Banksia Grove 6031 - Monday 27 January 2025



Statistical Ambient Noise Levels

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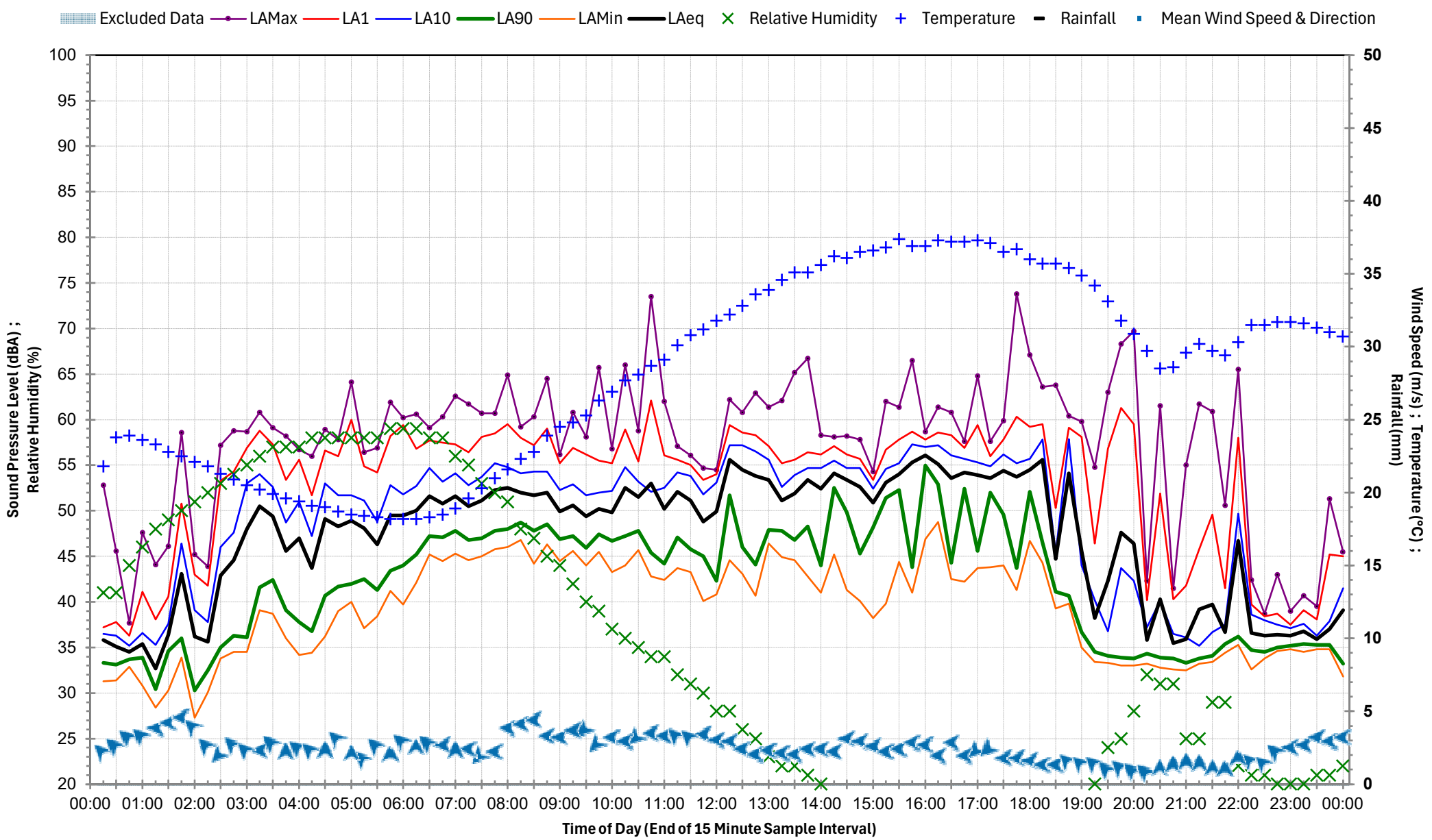
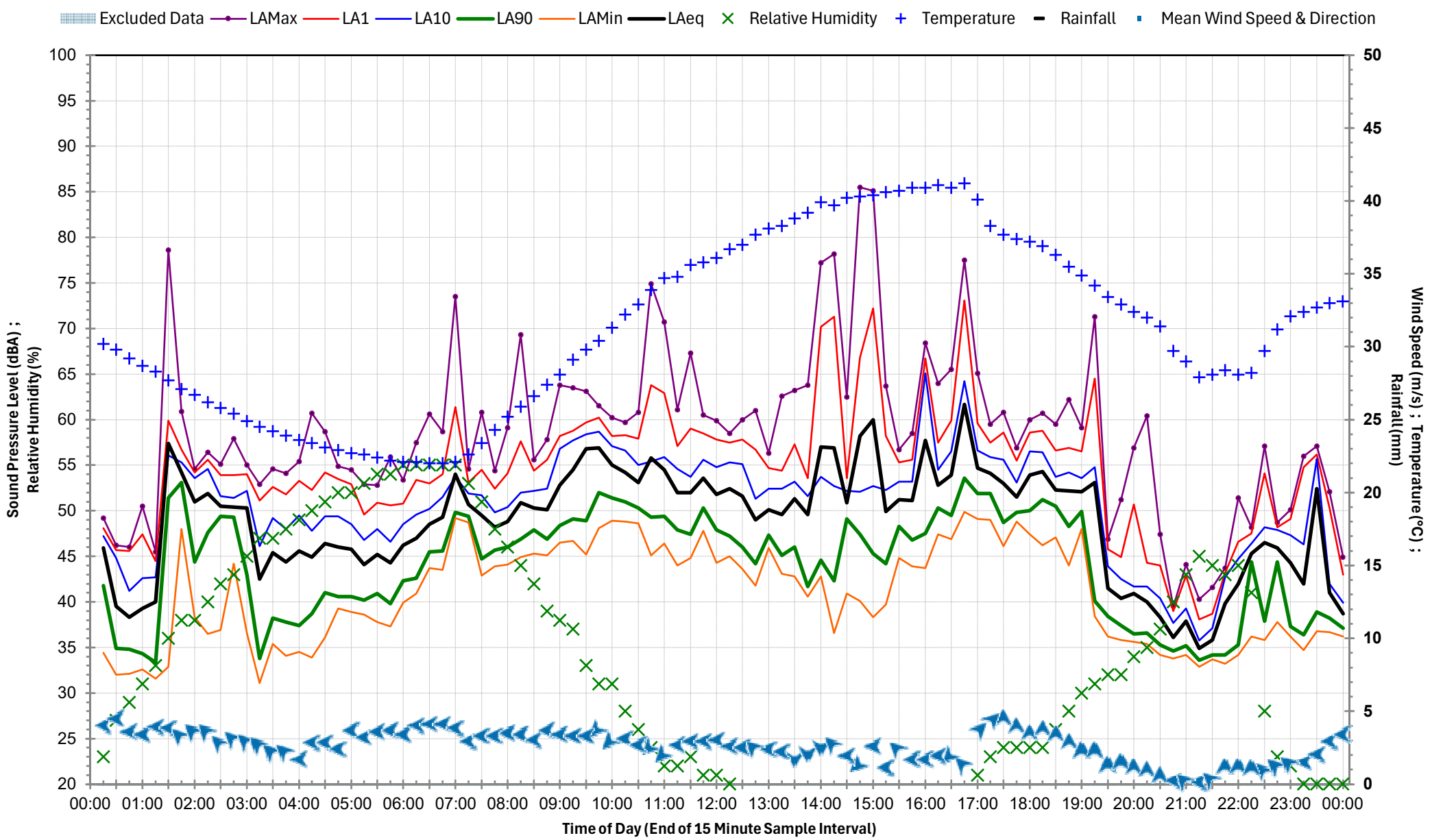


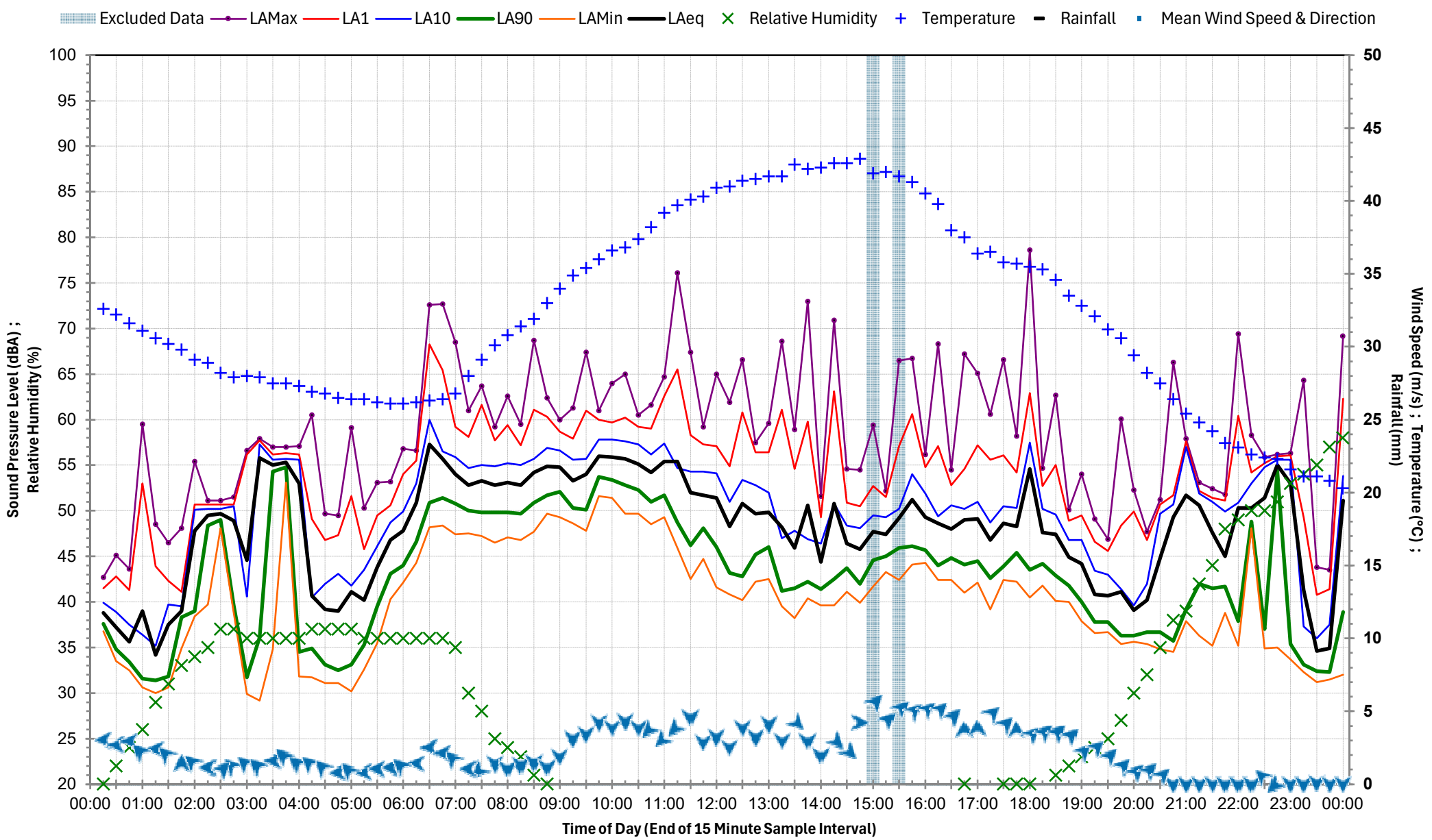
Statistical Ambient Noise Levels

Shell BESS - L1 - 35 Pollen Turn, Banksia Grove 6031 - Wednesday 29 January 2025



Statistical Ambient Noise Levels

Shell BESS - L1 - 35 Pollen Turn, Banksia Grove 6031 - Thursday 30 January 2025



Statistical Ambient Noise Levels

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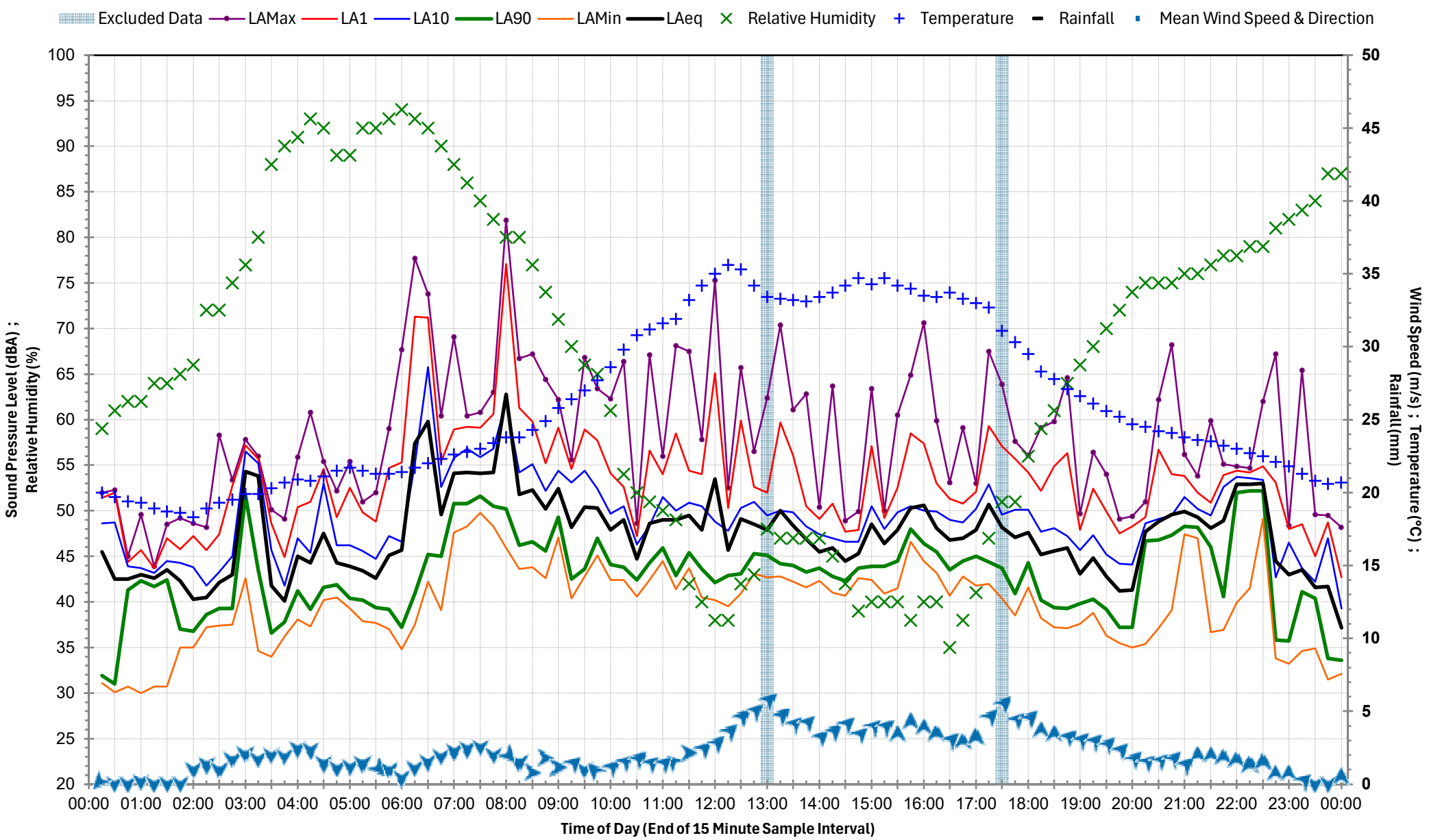
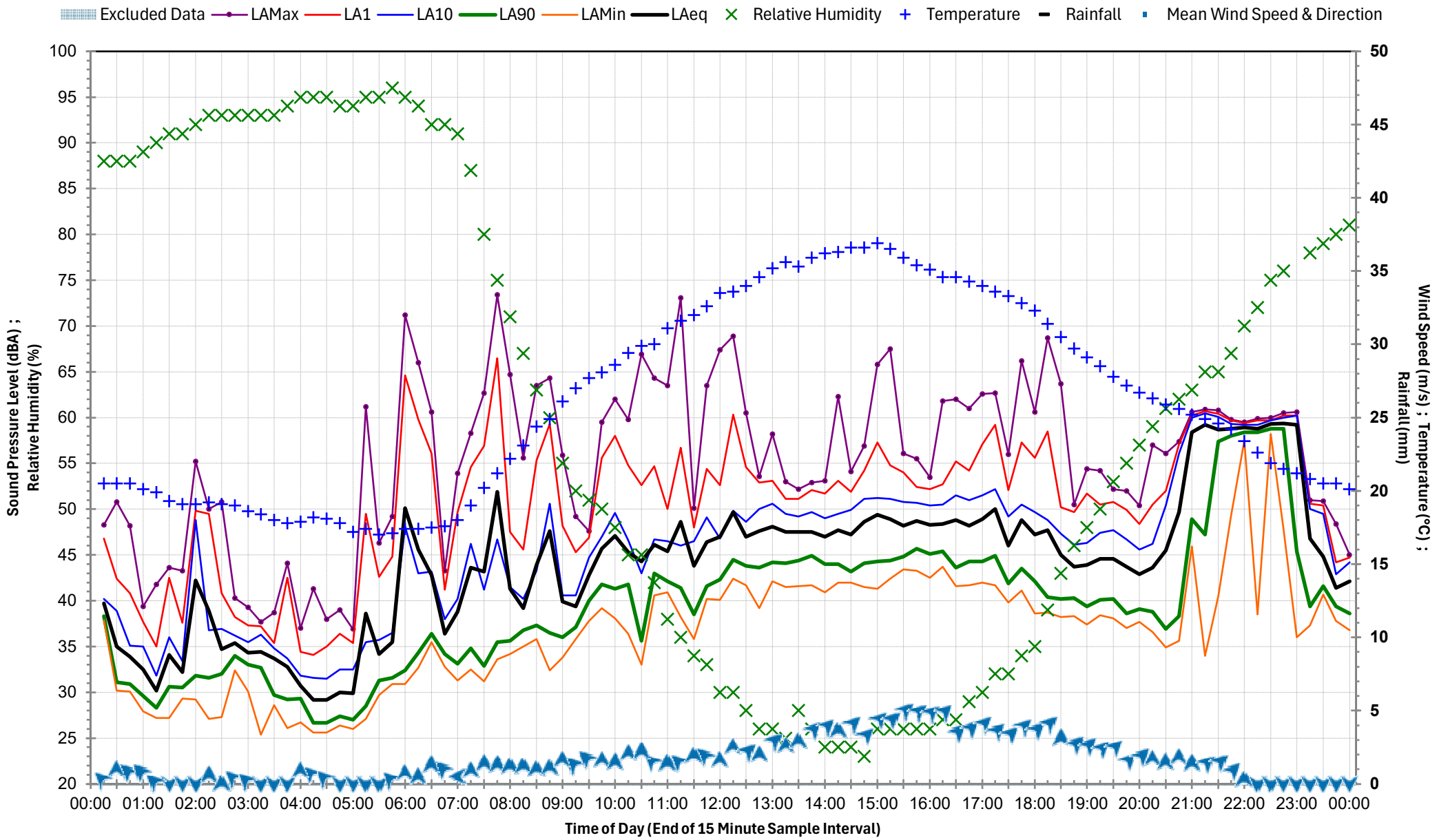


Statistical Ambient Noise Levels

Shell BESS - L1 - 35 Pollen Turn, Banksia Grove 6031 - Saturday 1 February 2025



Statistical Ambient Noise Levels
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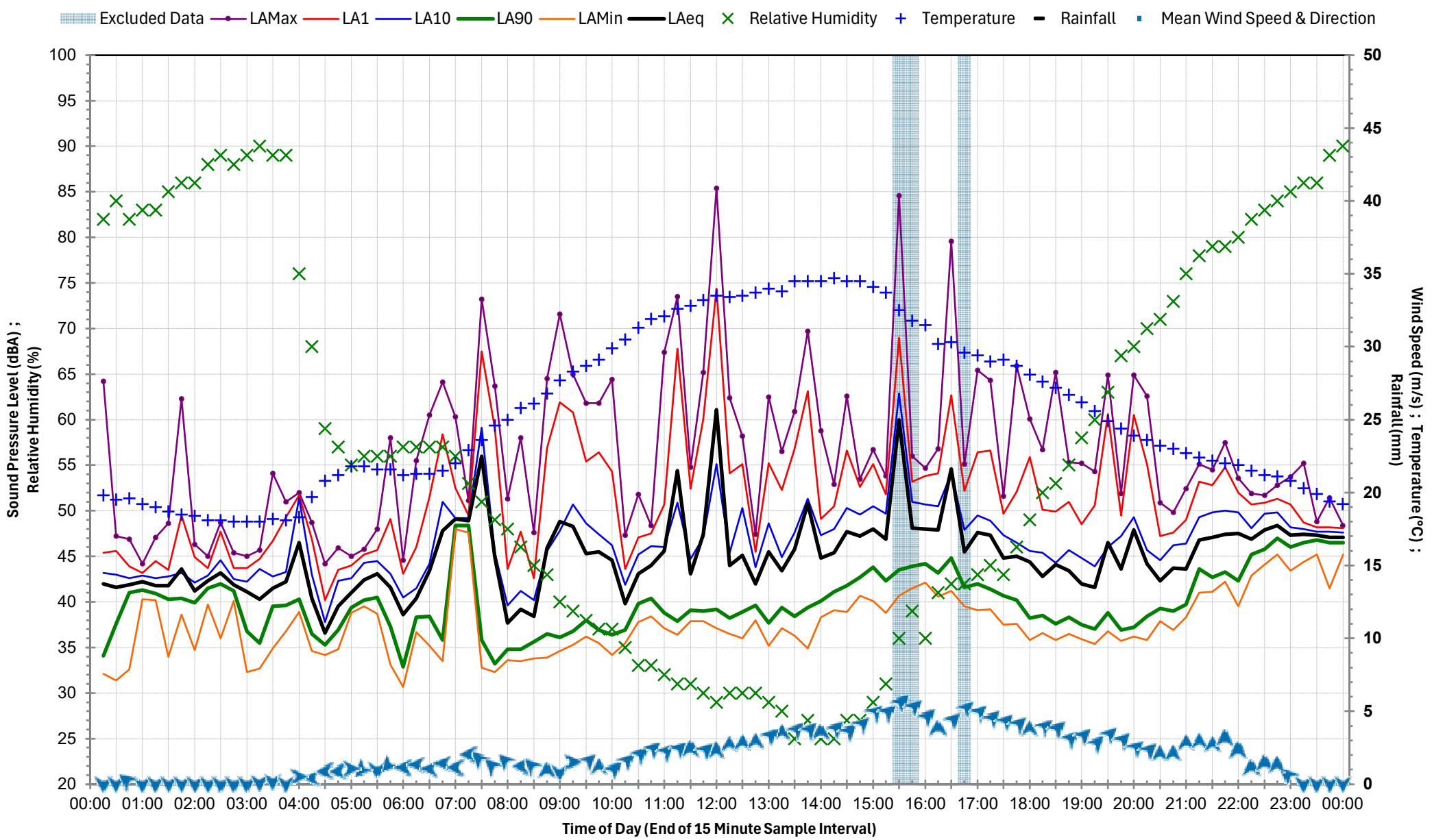
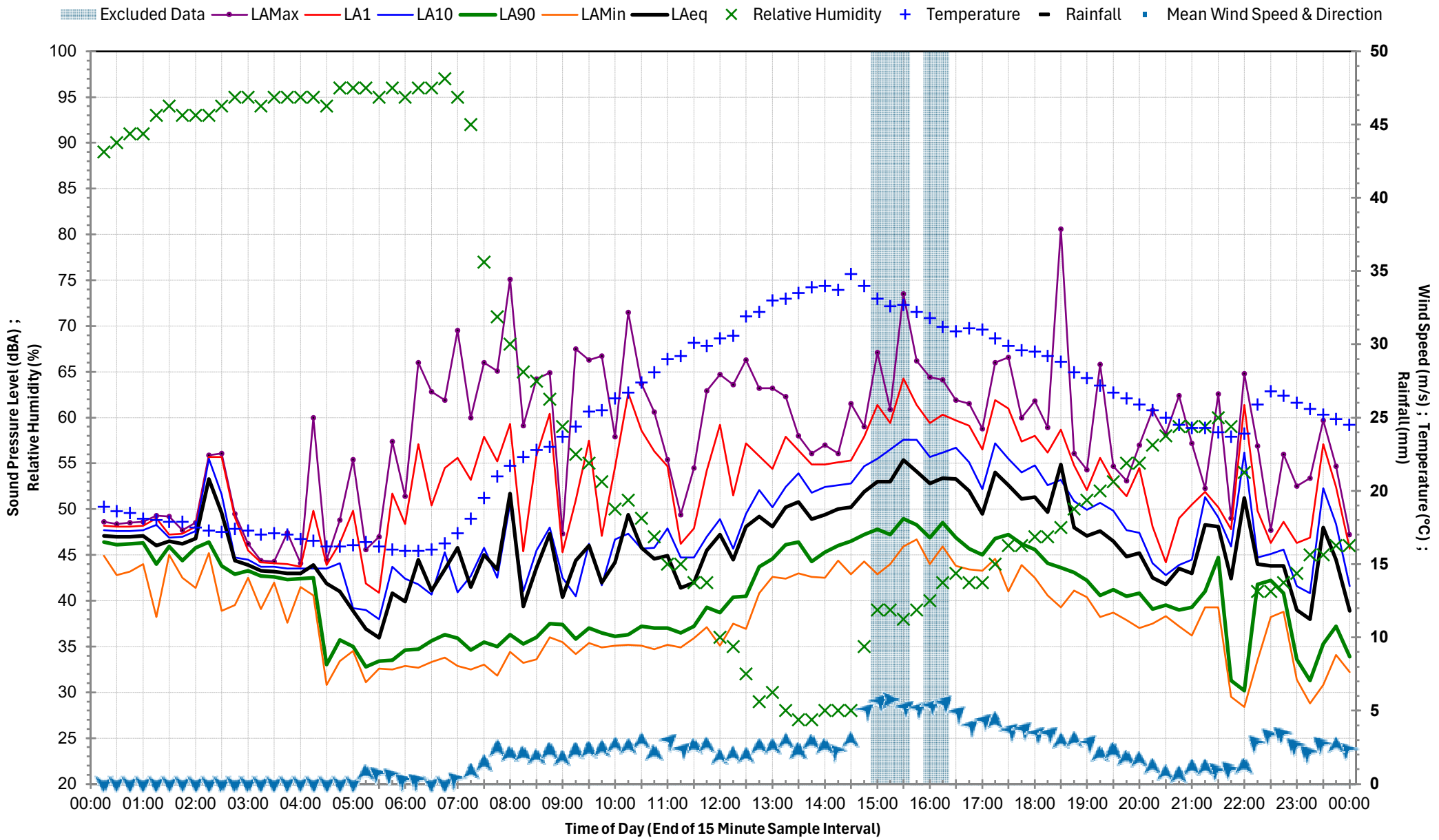


Statistical Ambient Noise Levels

Shell BESS - L1 - 35 Pollen Turn, Banksia Grove 6031 - Monday 3 February 2025



Statistical Ambient Noise Levels

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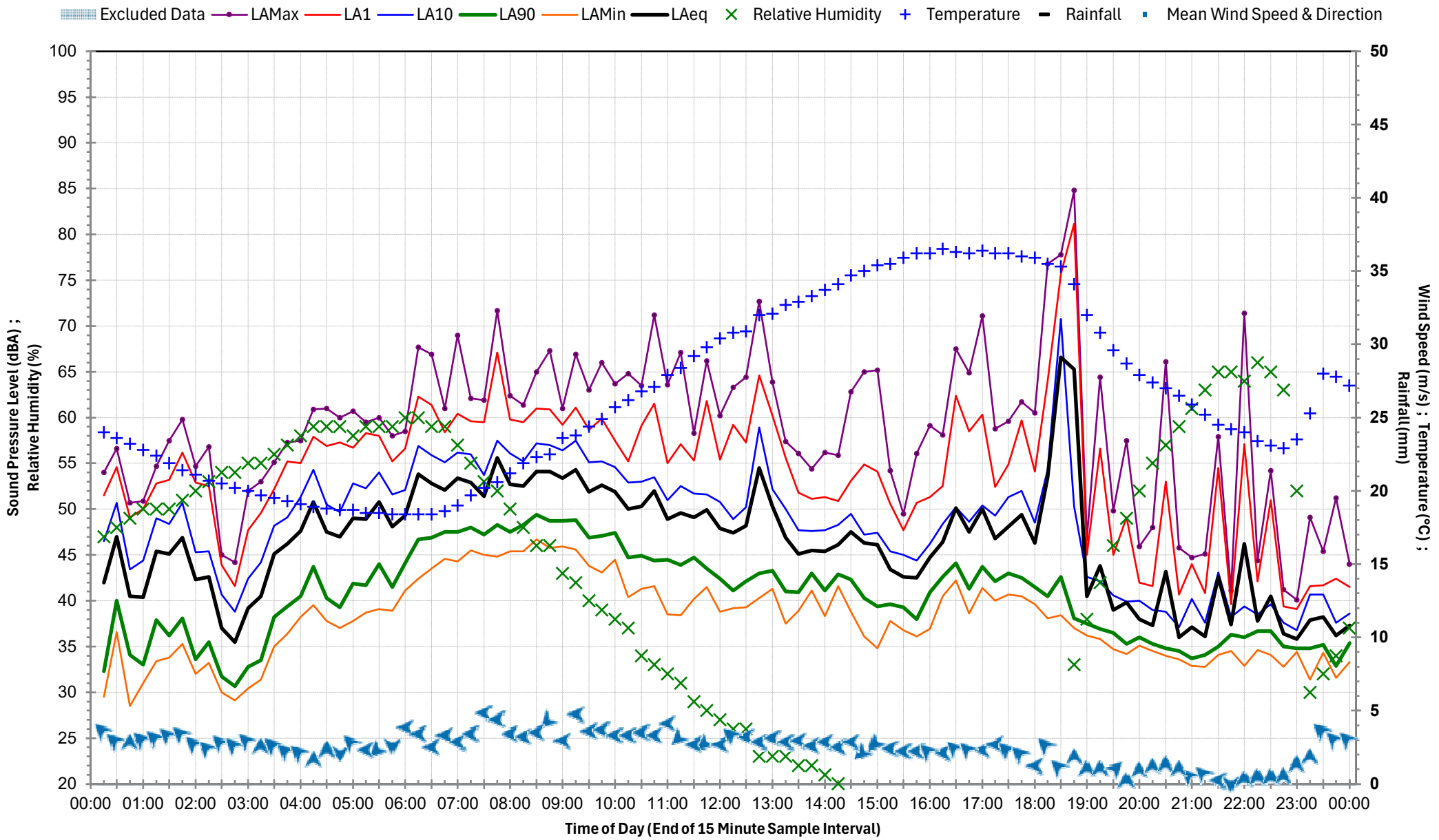
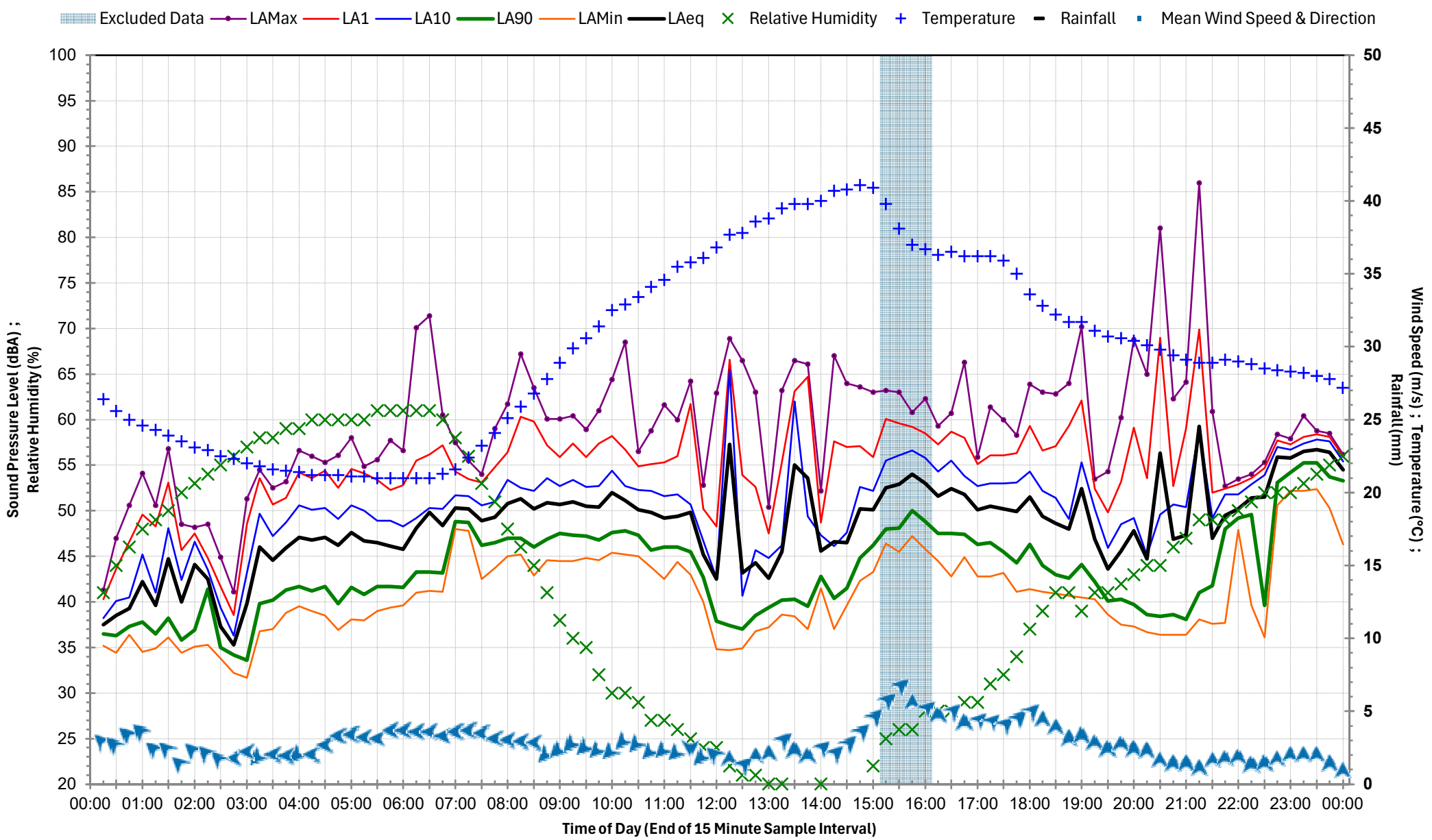


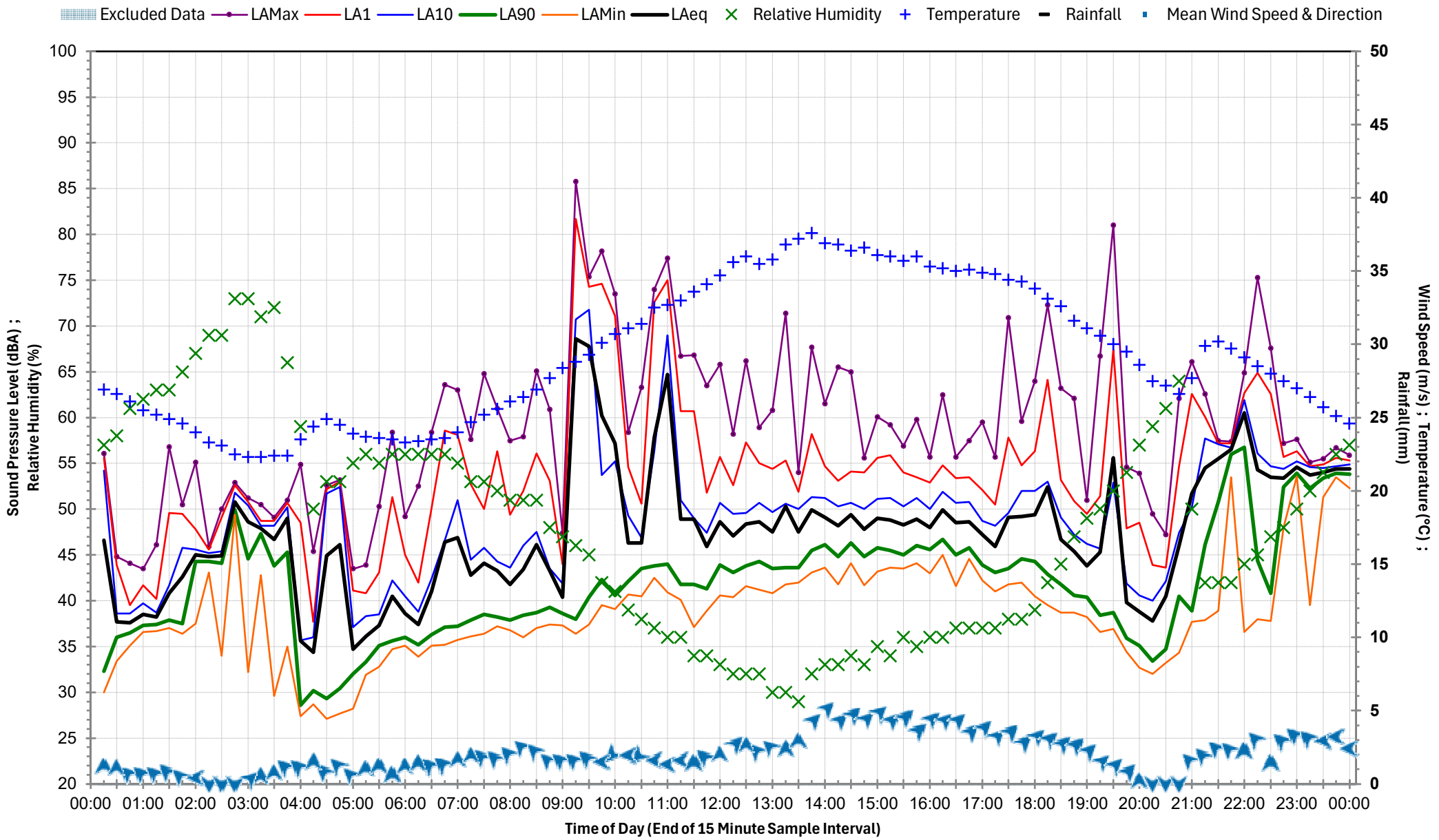
Statistical Ambient Noise Levels

Shell BESS - L1 - 35 Pollen Turn, Banksia Grove 6031 - Wednesday 5 February 2025



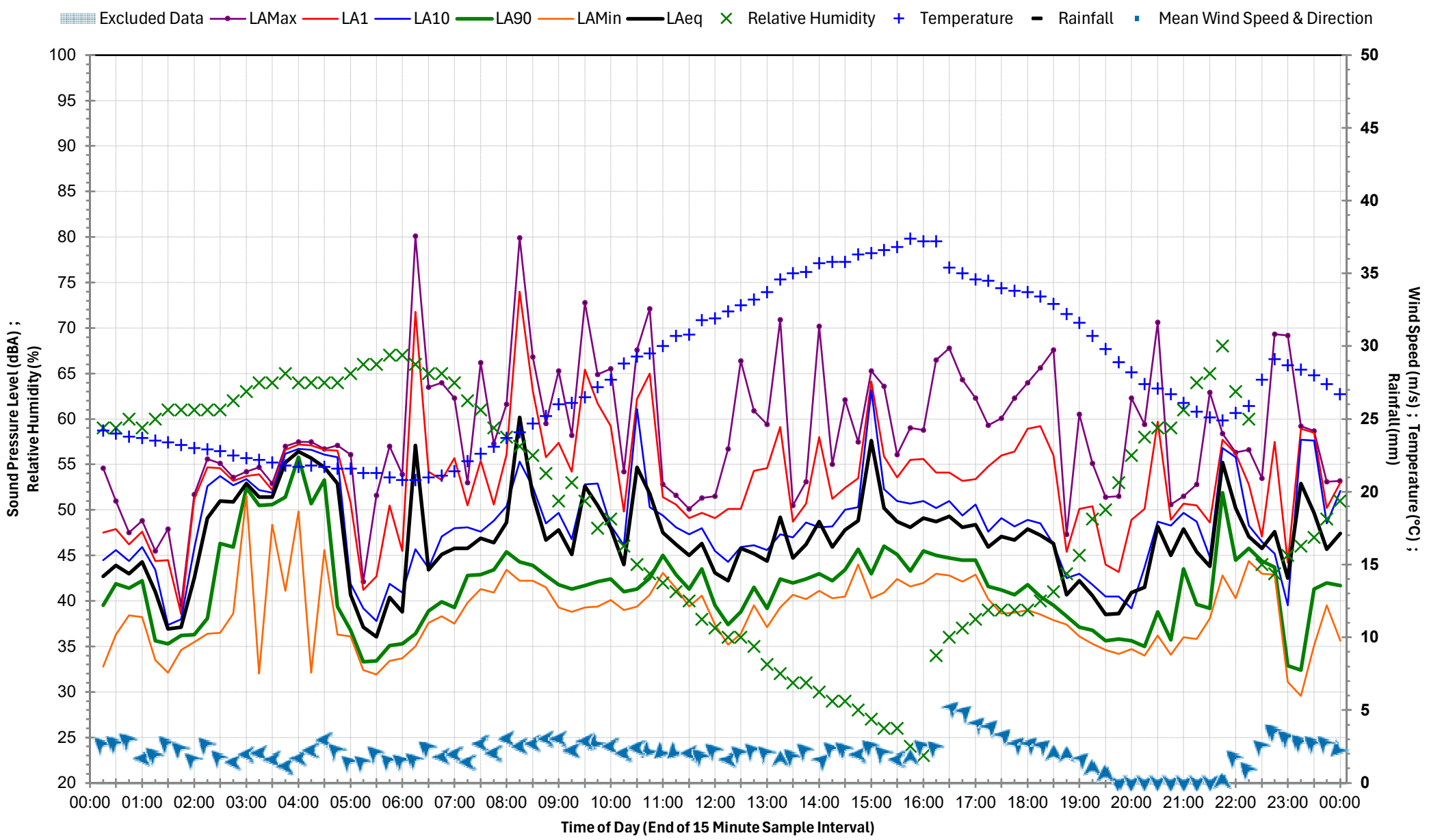
Statistical Ambient Noise Levels

Shell BESS - L1 - 35 Pollen Turn, Banksia Grove 6031 - Thursday 6 February 2025



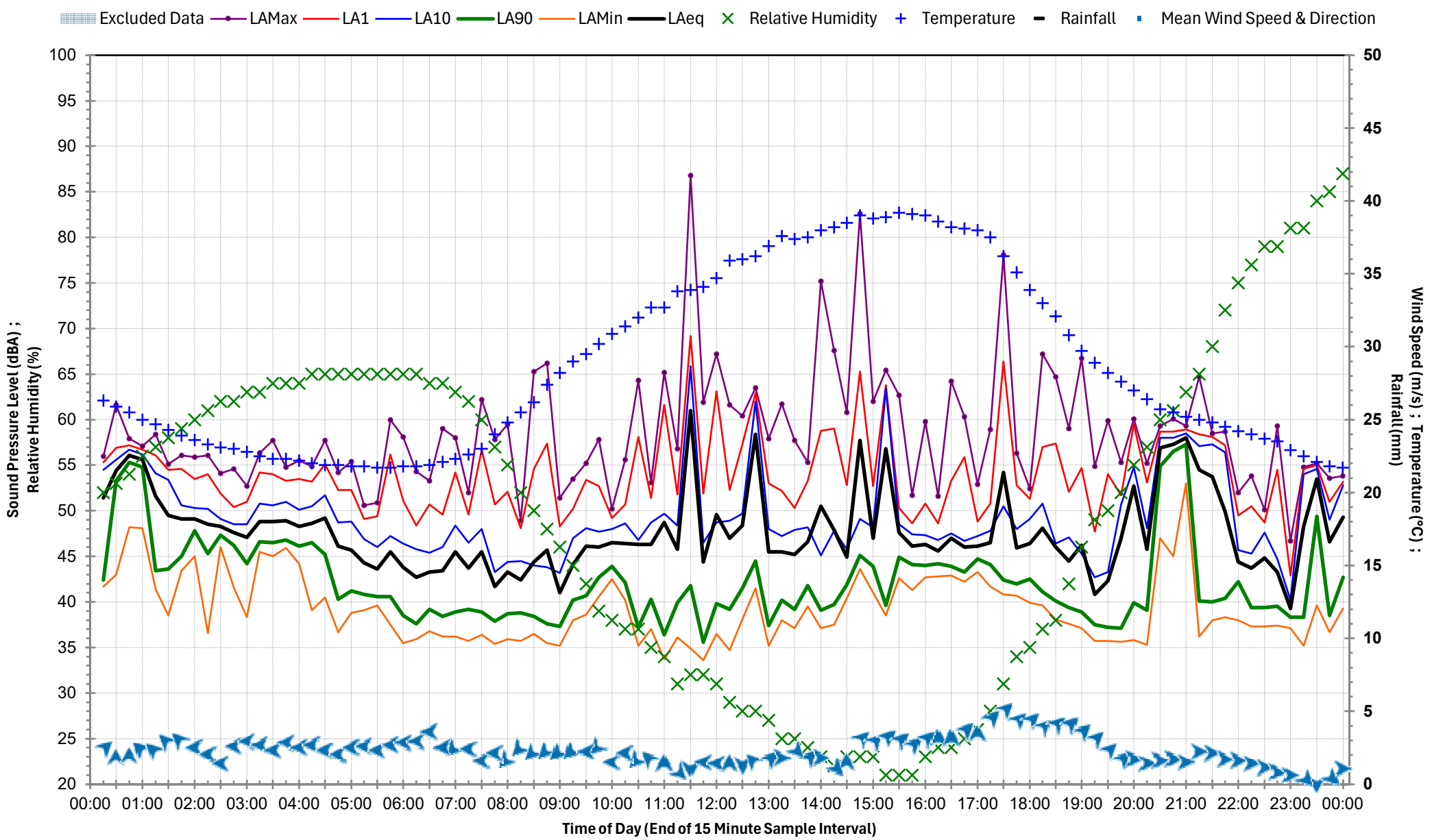
Statistical Ambient Noise Levels

Shell BESS - L1 - 35 Pollen Turn, Banksia Grove 6031 - Friday 7 February 2025



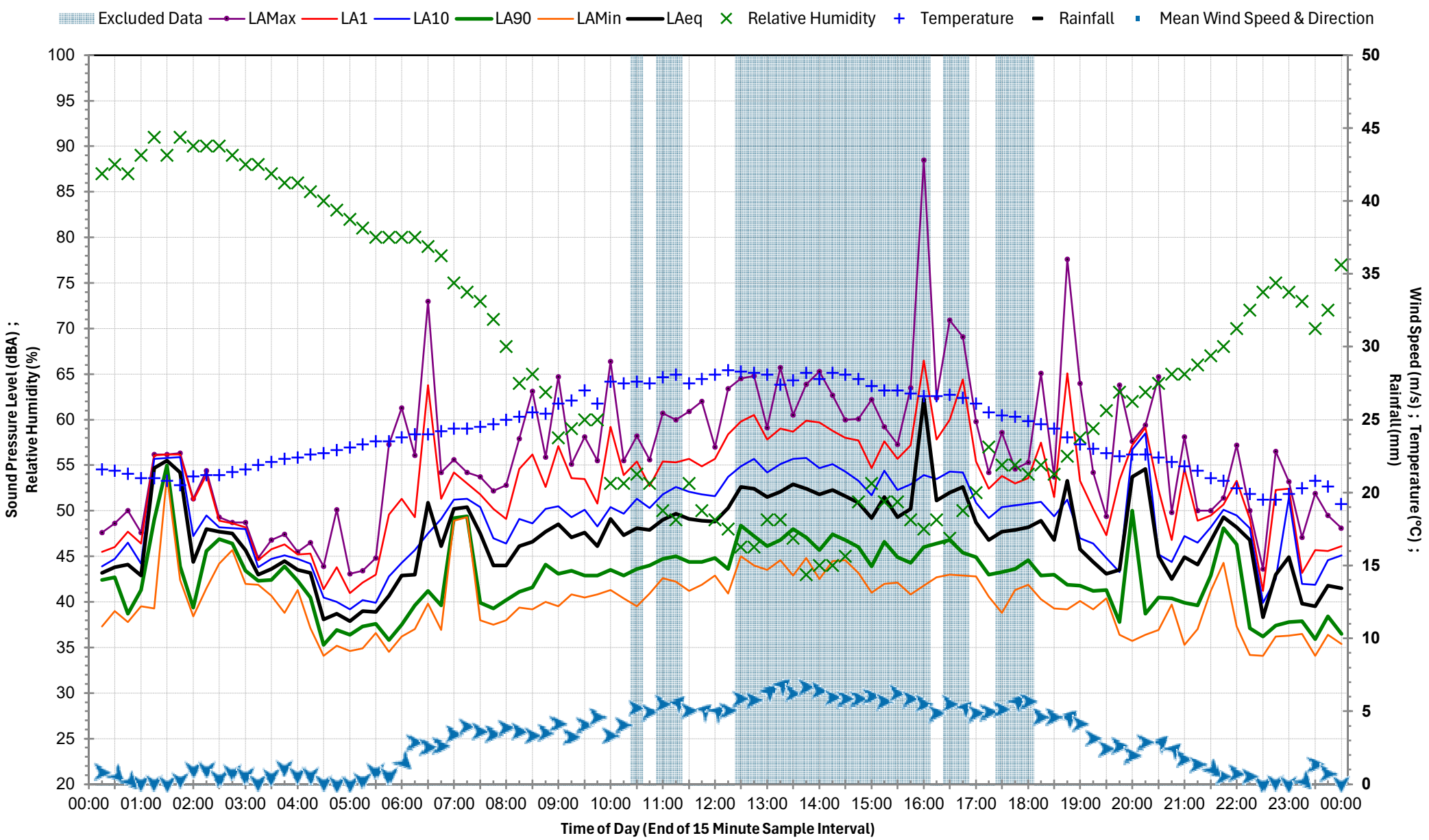
Statistical Ambient Noise Levels

Shell BESS - L1 - 35 Pollen Turn, Banksia Grove 6031 - Saturday 8 February 2025



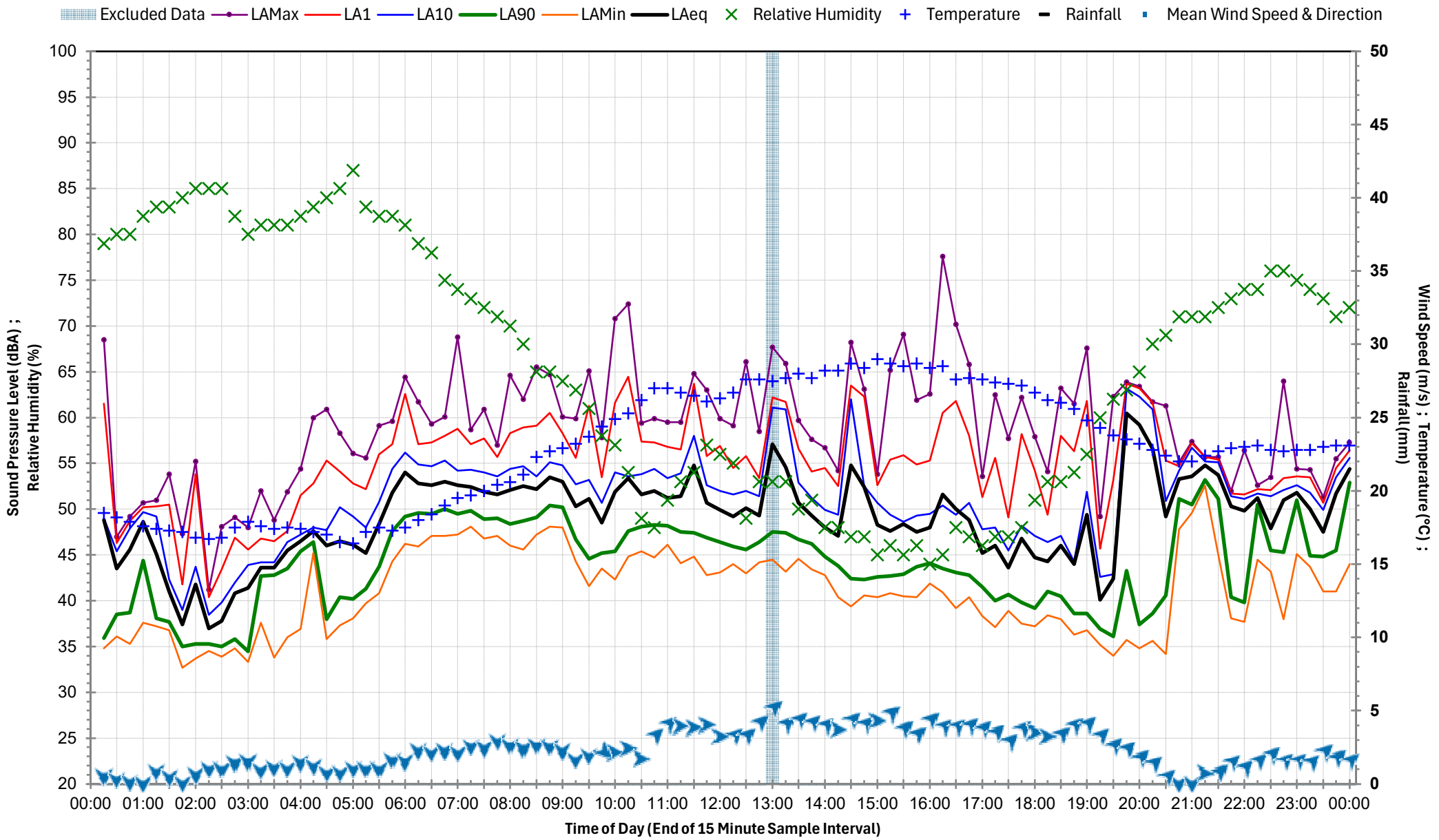
Statistical Ambient Noise Levels

Shell BESS - L1 - 35 Pollen Turn, Banksia Grove 6031 - Sunday 9 February 2025



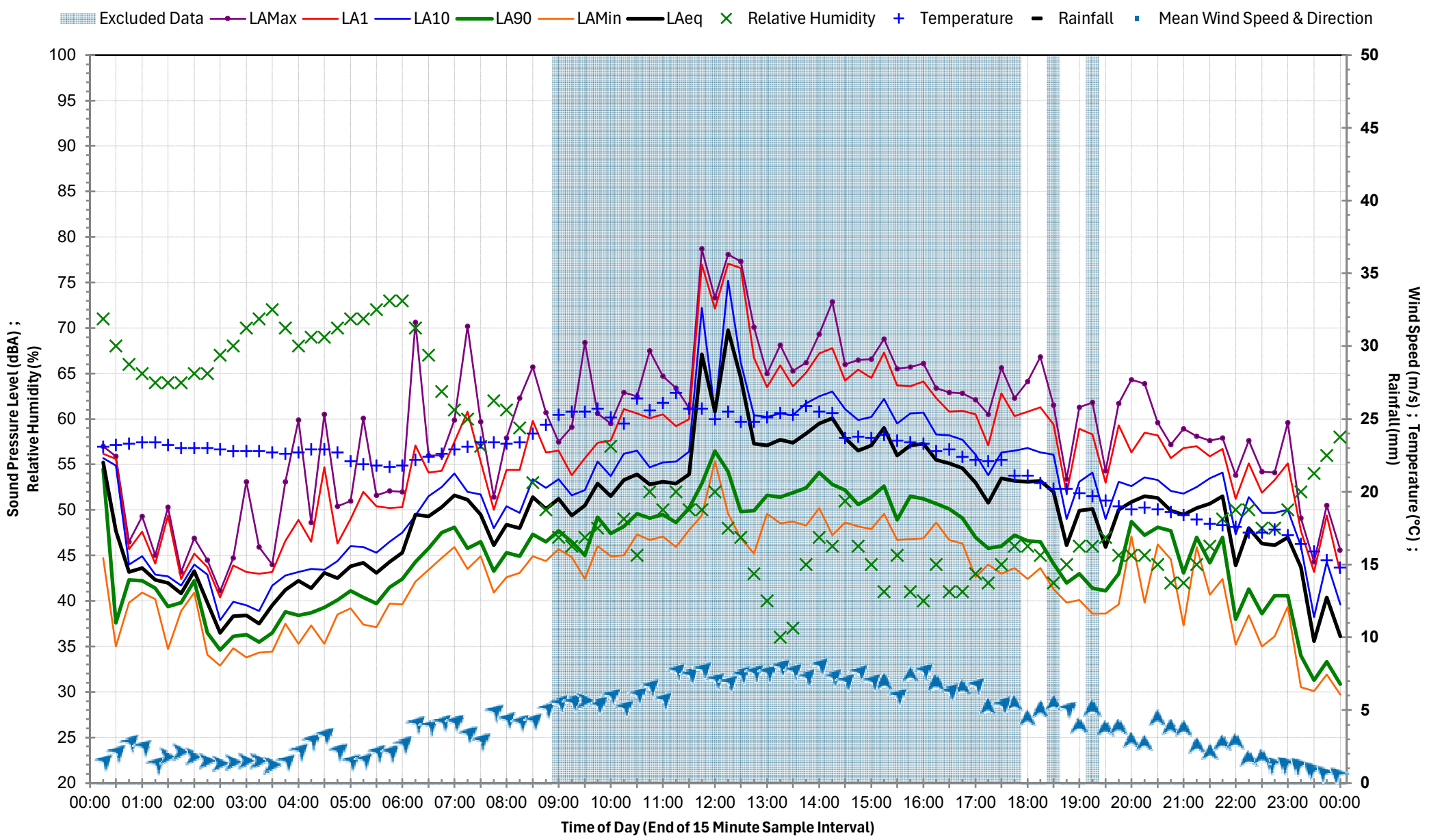
Statistical Ambient Noise Levels

Shell BESS - L1 - 35 Pollen Turn, Banksia Grove 6031 - Monday 10 February 2025



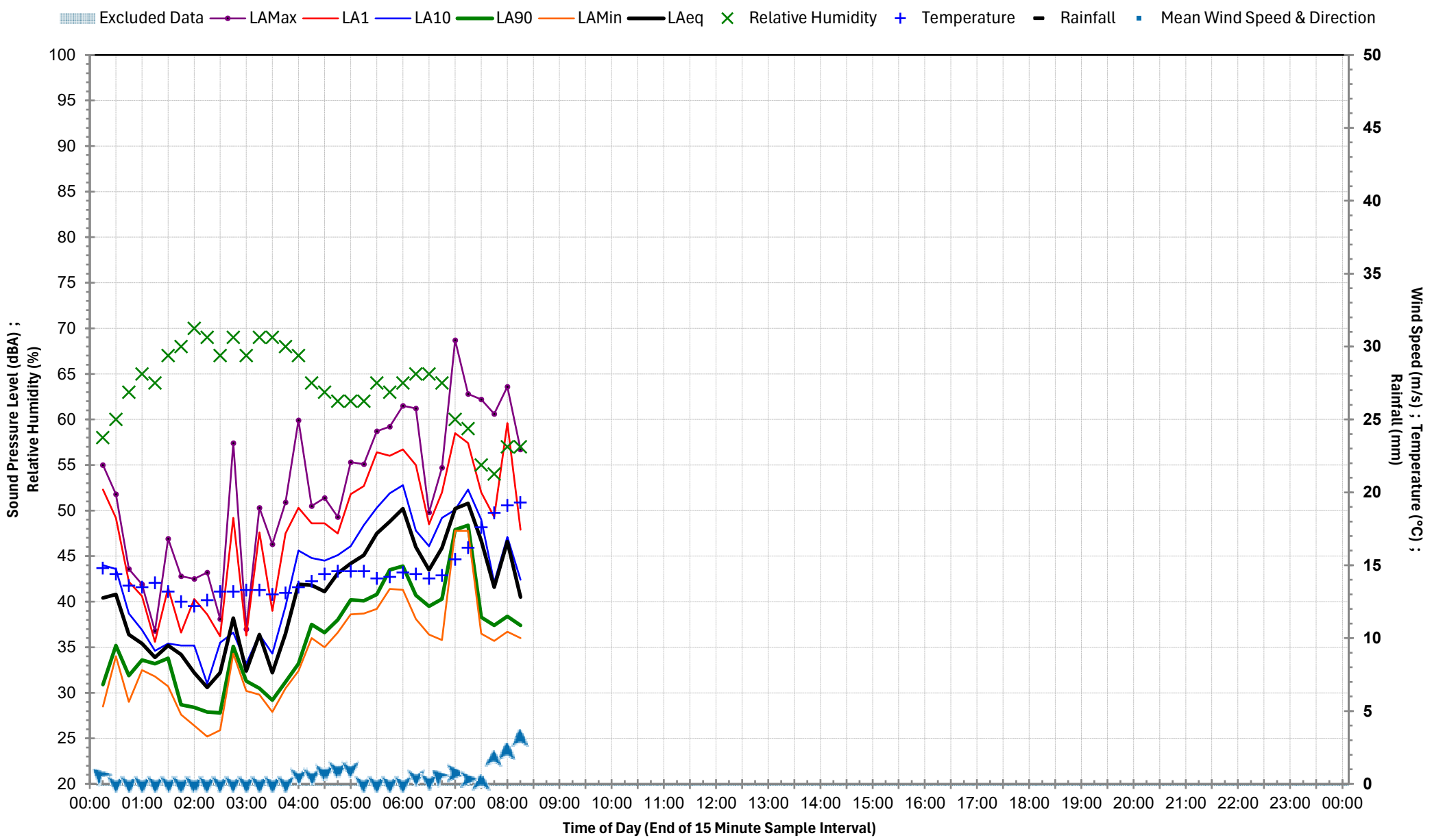
Statistical Ambient Noise Levels

Shell BESS - L1 - 35 Pollen Turn, Banksia Grove 6031 - Tuesday 11 February 2025



Statistical Ambient Noise Levels

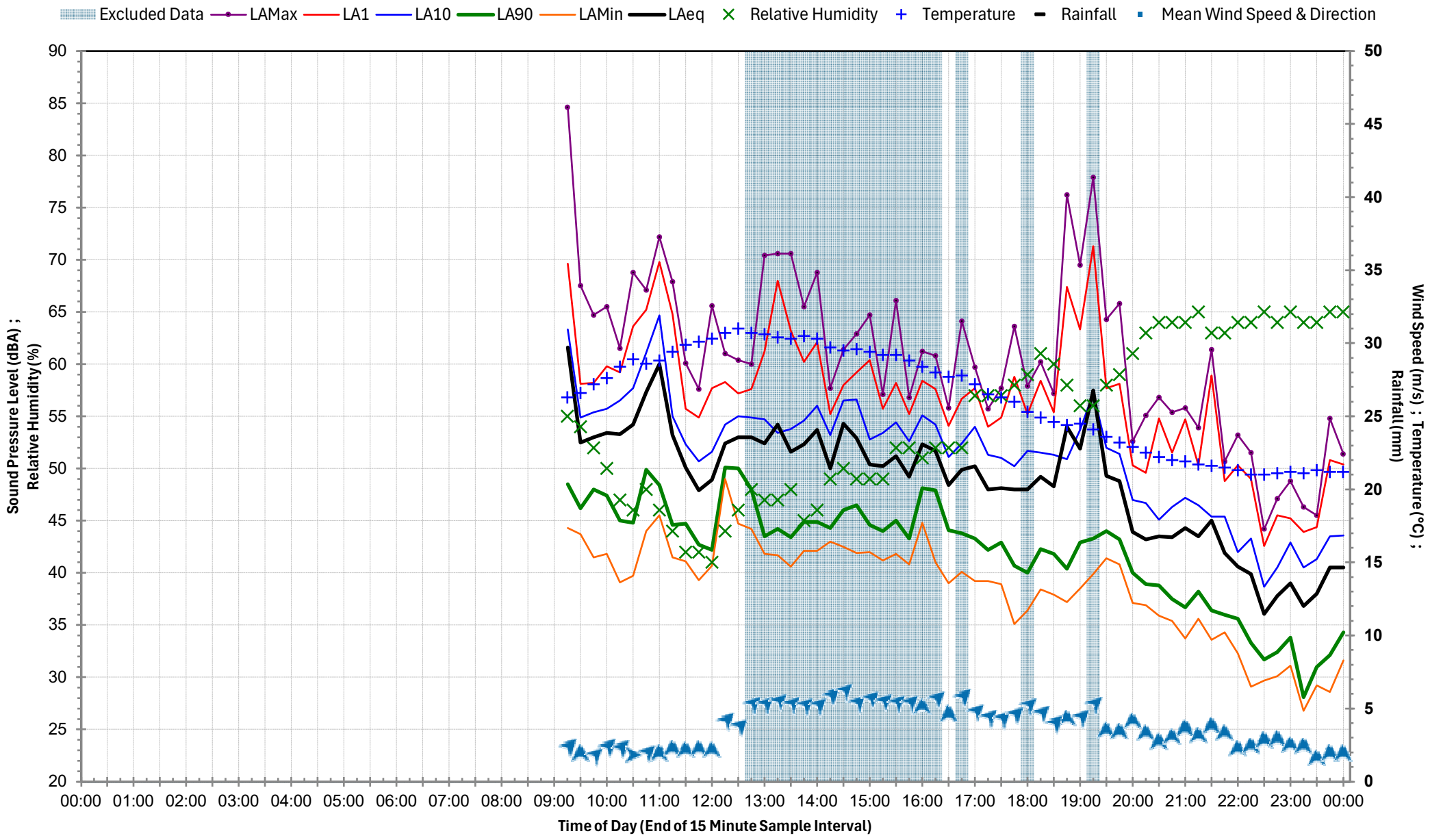
Shell BESS - L1 - 35 Pollen Turn, Banksia Grove 6031 - Wednesday 12 February 2025



Logger 2

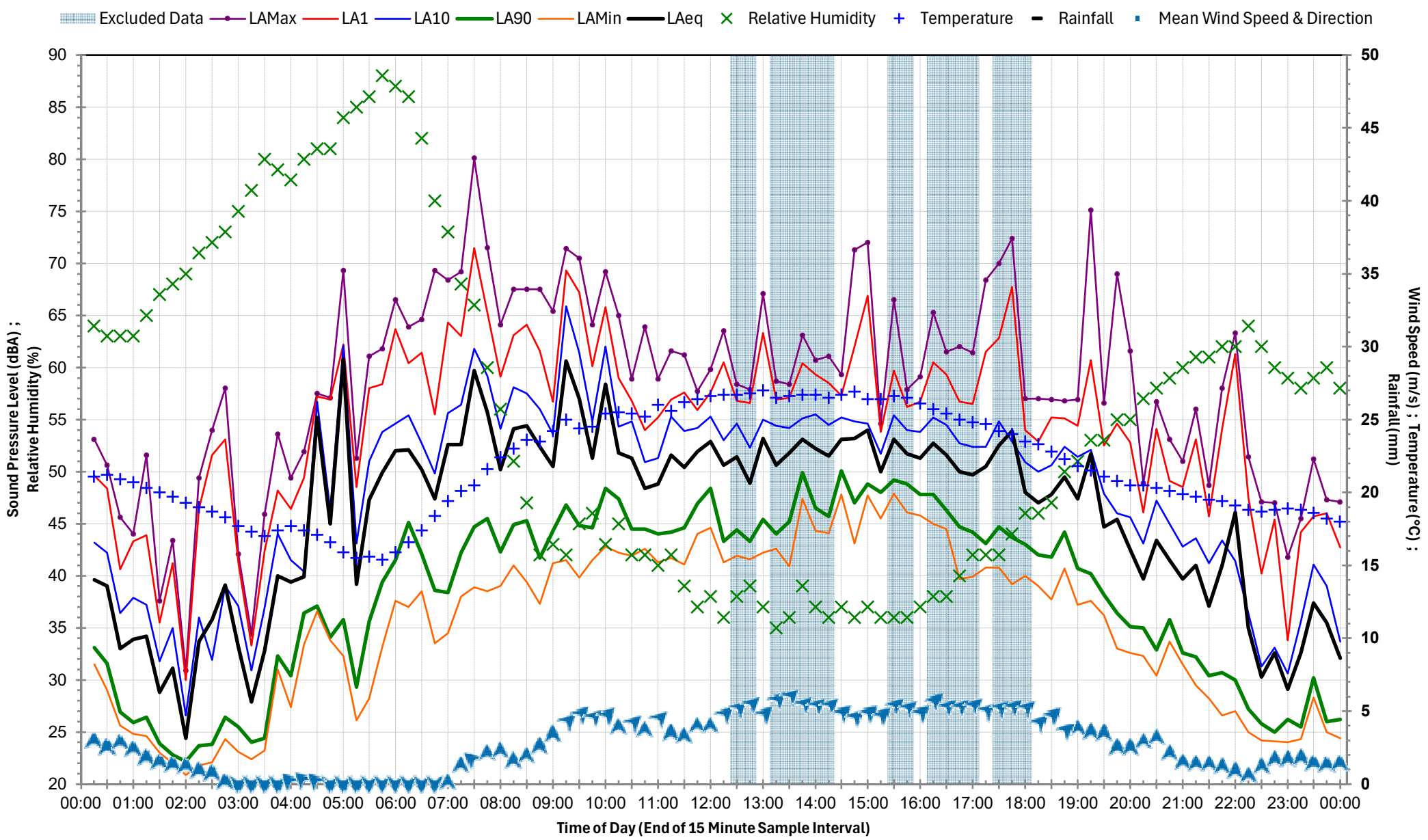
Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Monday 13 January 2025



Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Tuesday 14 January 2025



Statistical Ambient Noise Levels

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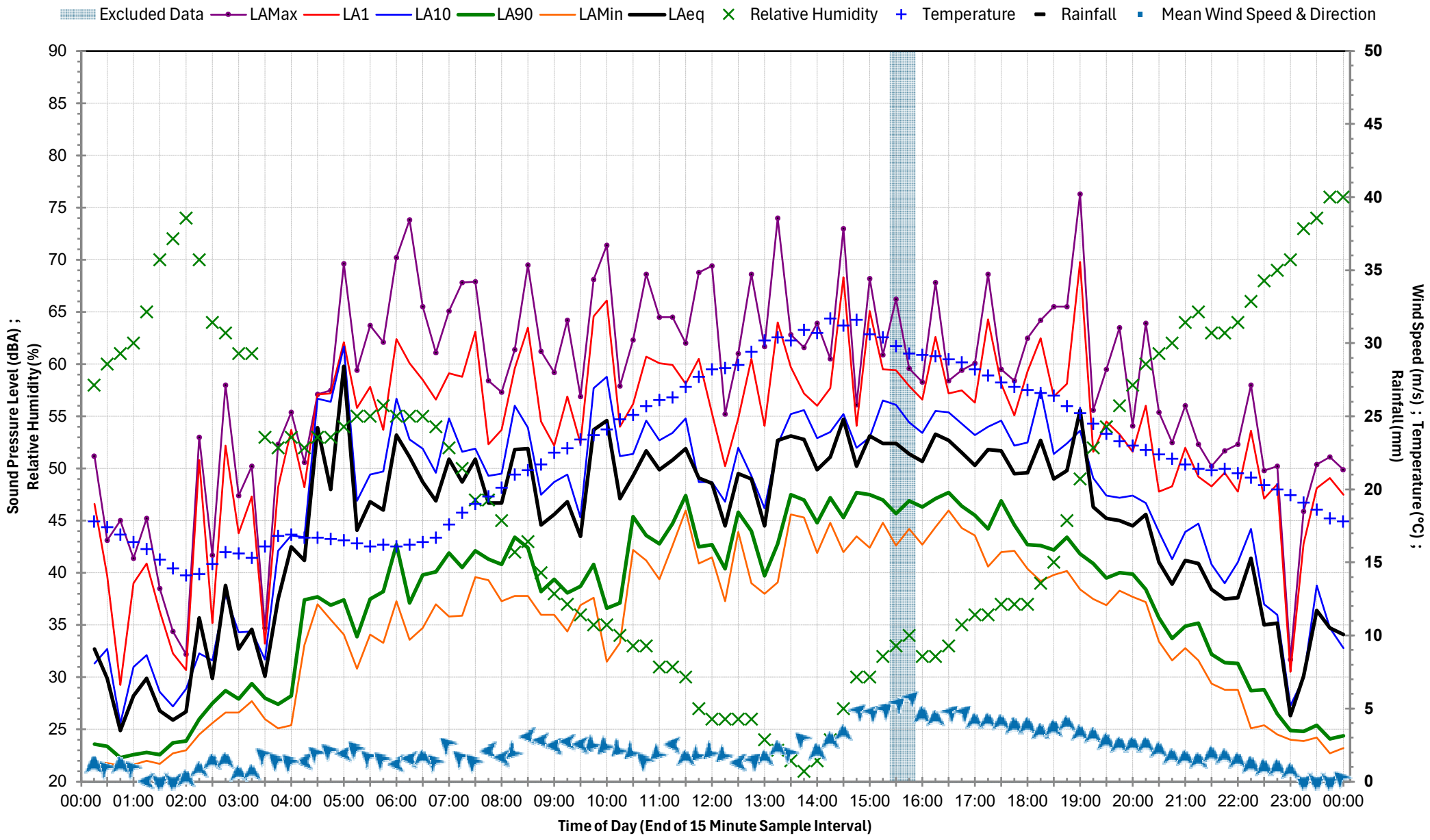
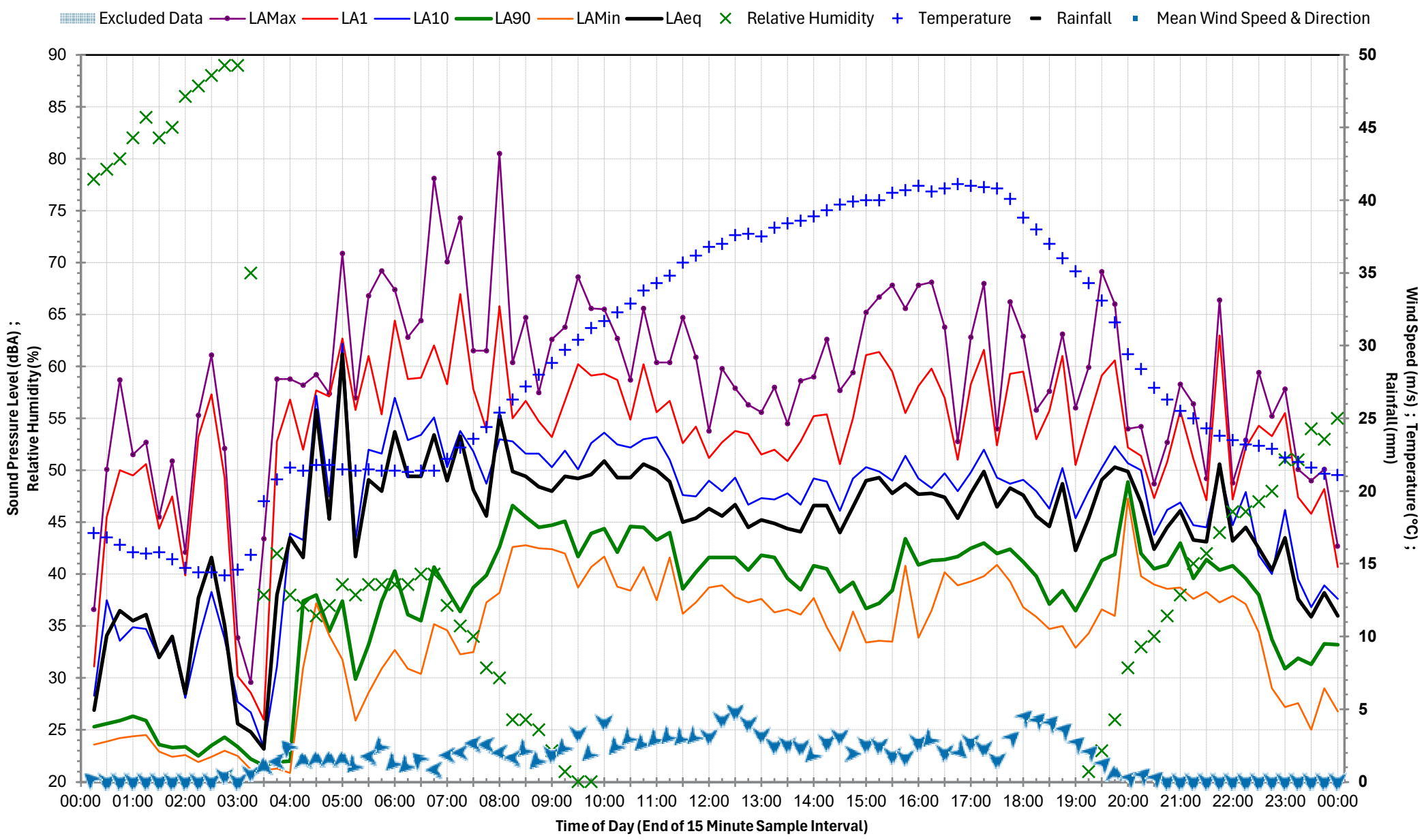
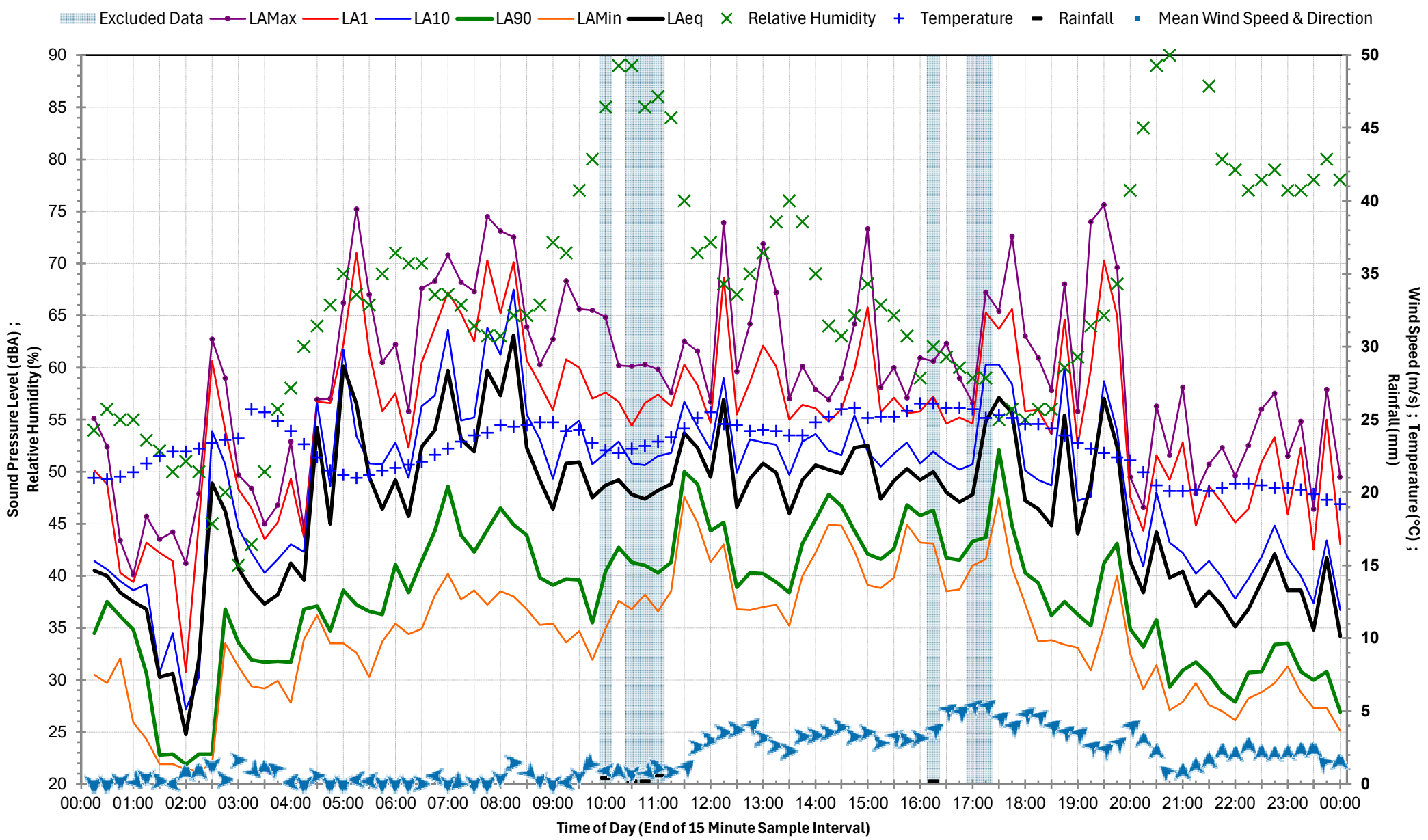


Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Thursday 16 January 2025

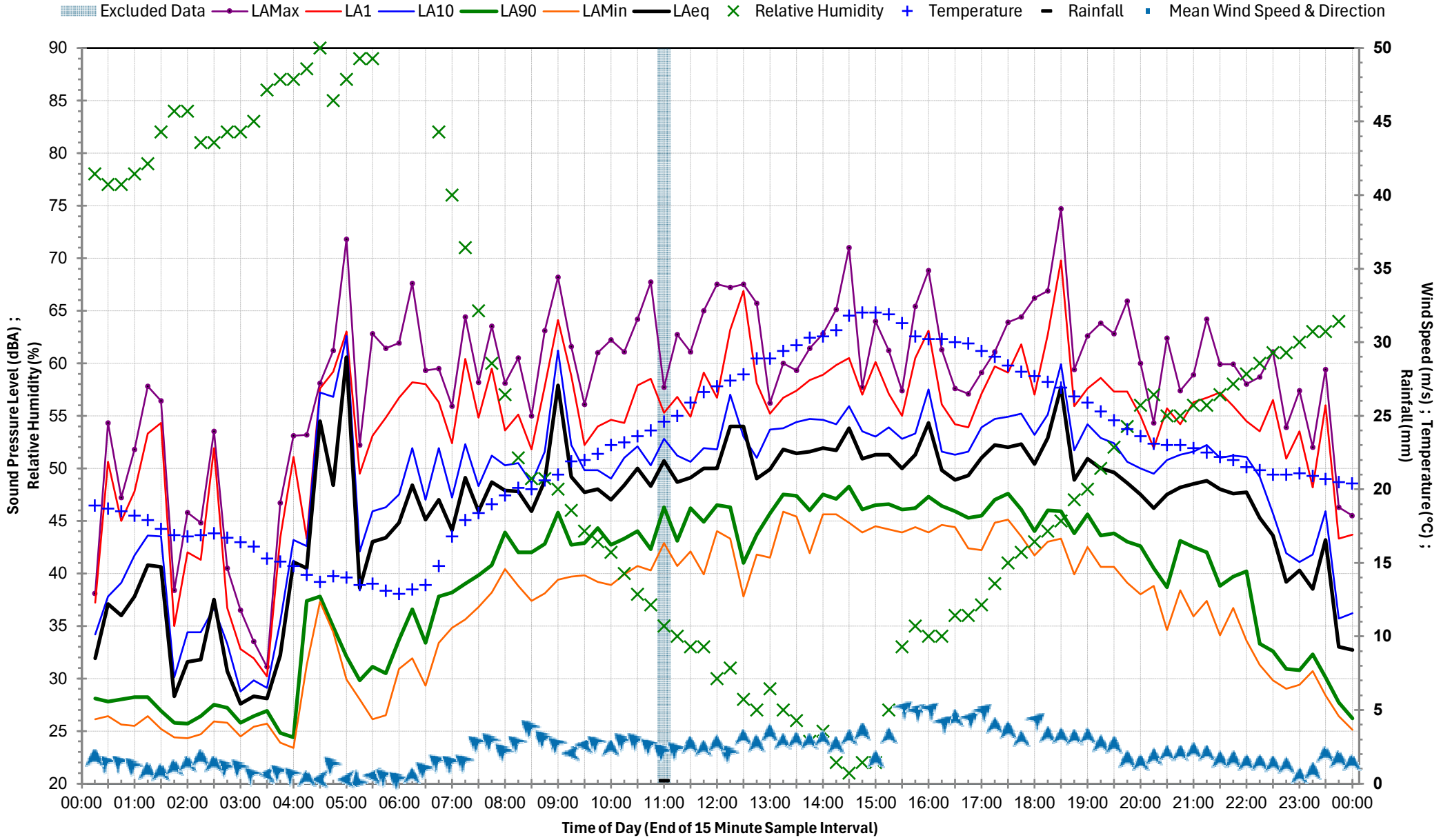


Statistical Ambient Noise Levels
Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Friday 17 January 2025



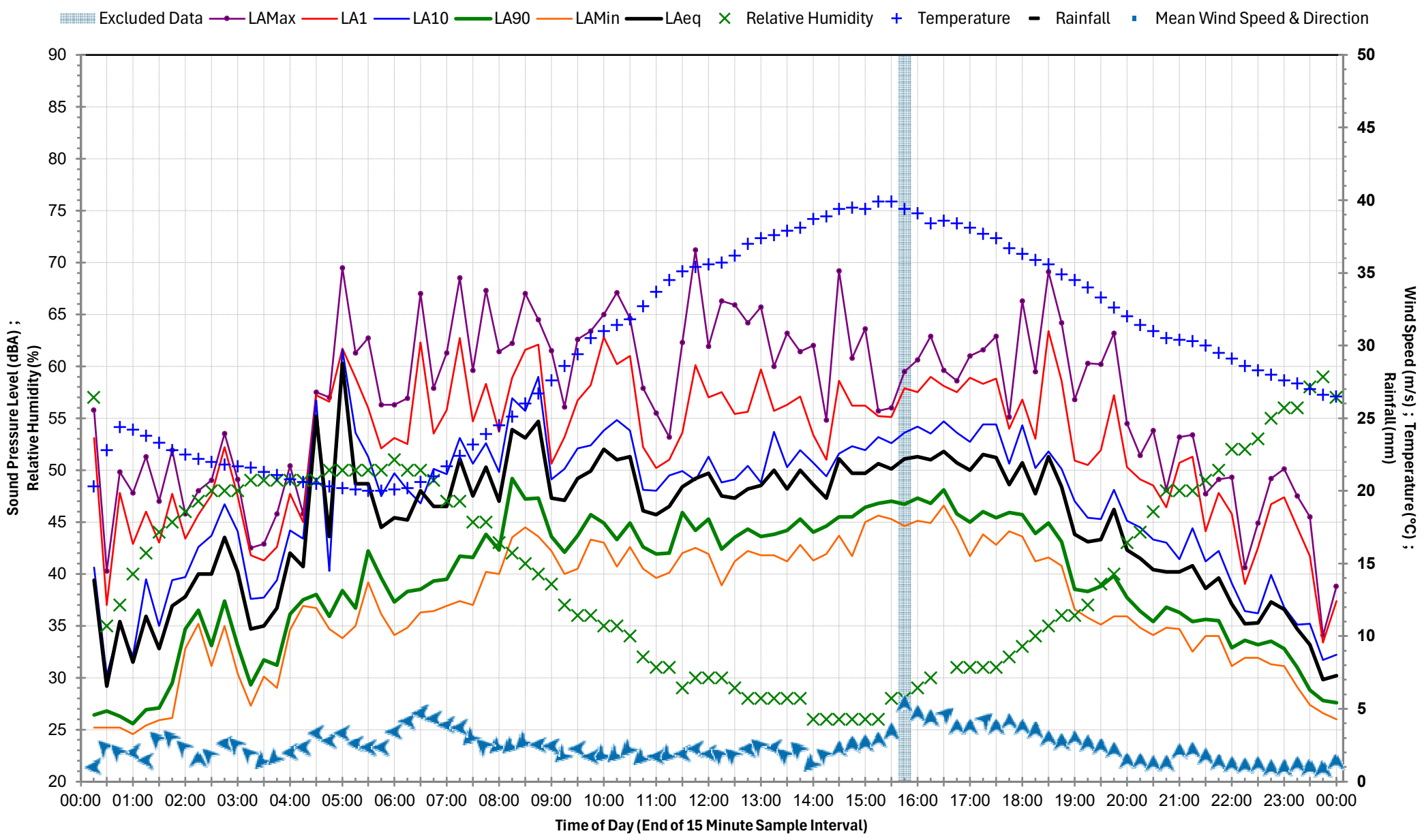
Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Saturday 18 January 2025



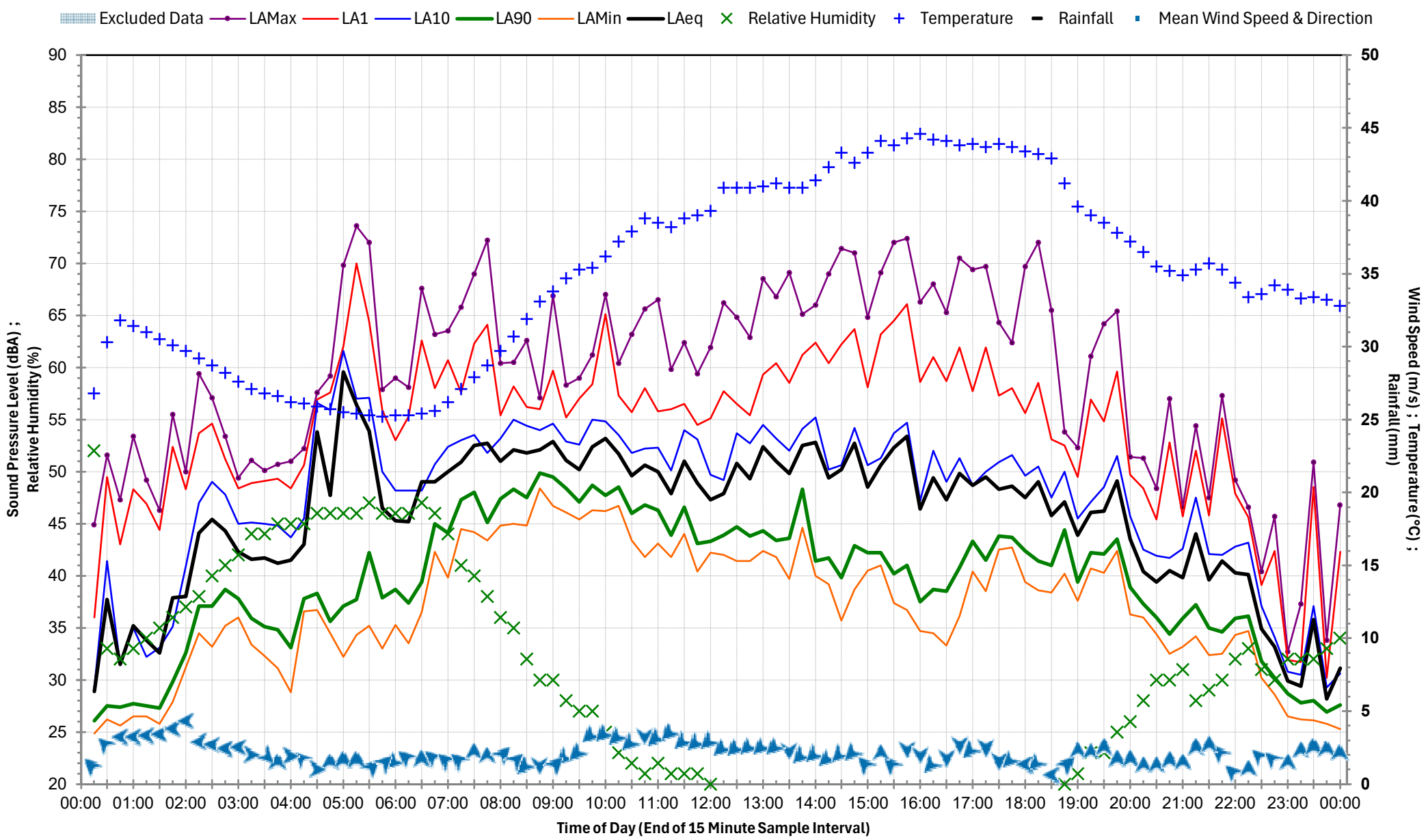
Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Sunday 19 January 2025



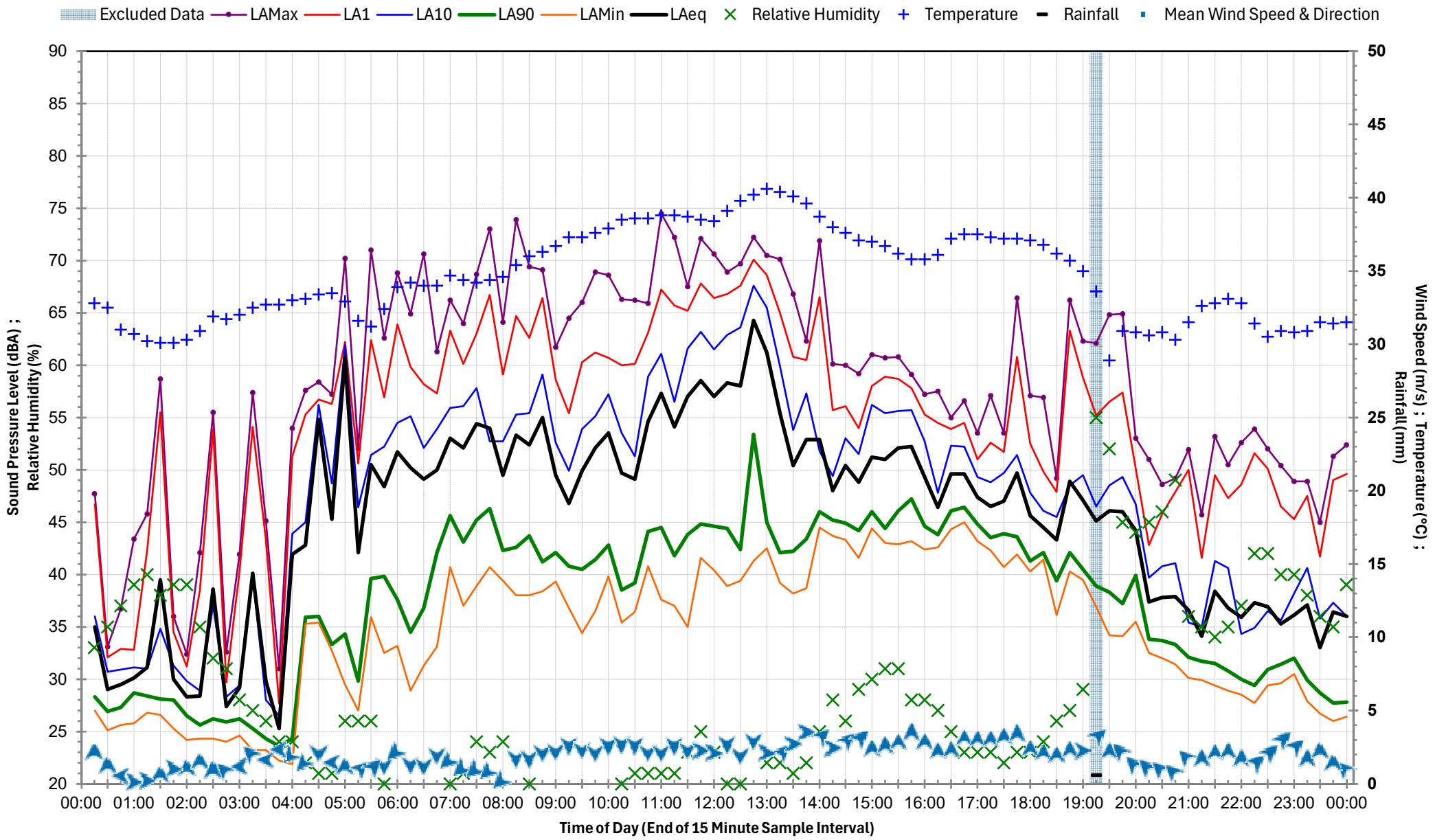
Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Monday 20 January 2025



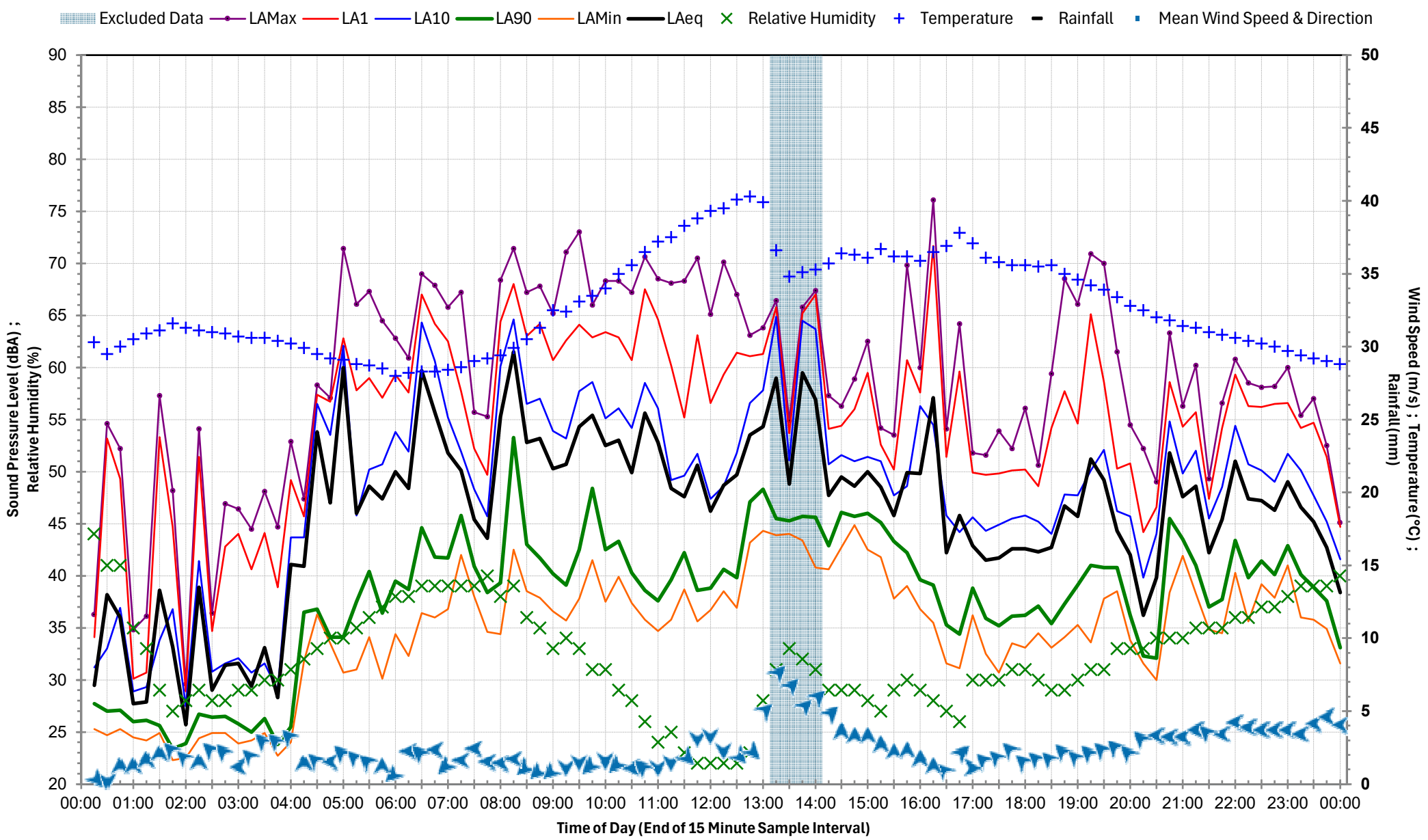
Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Tuesday 21 January 2025



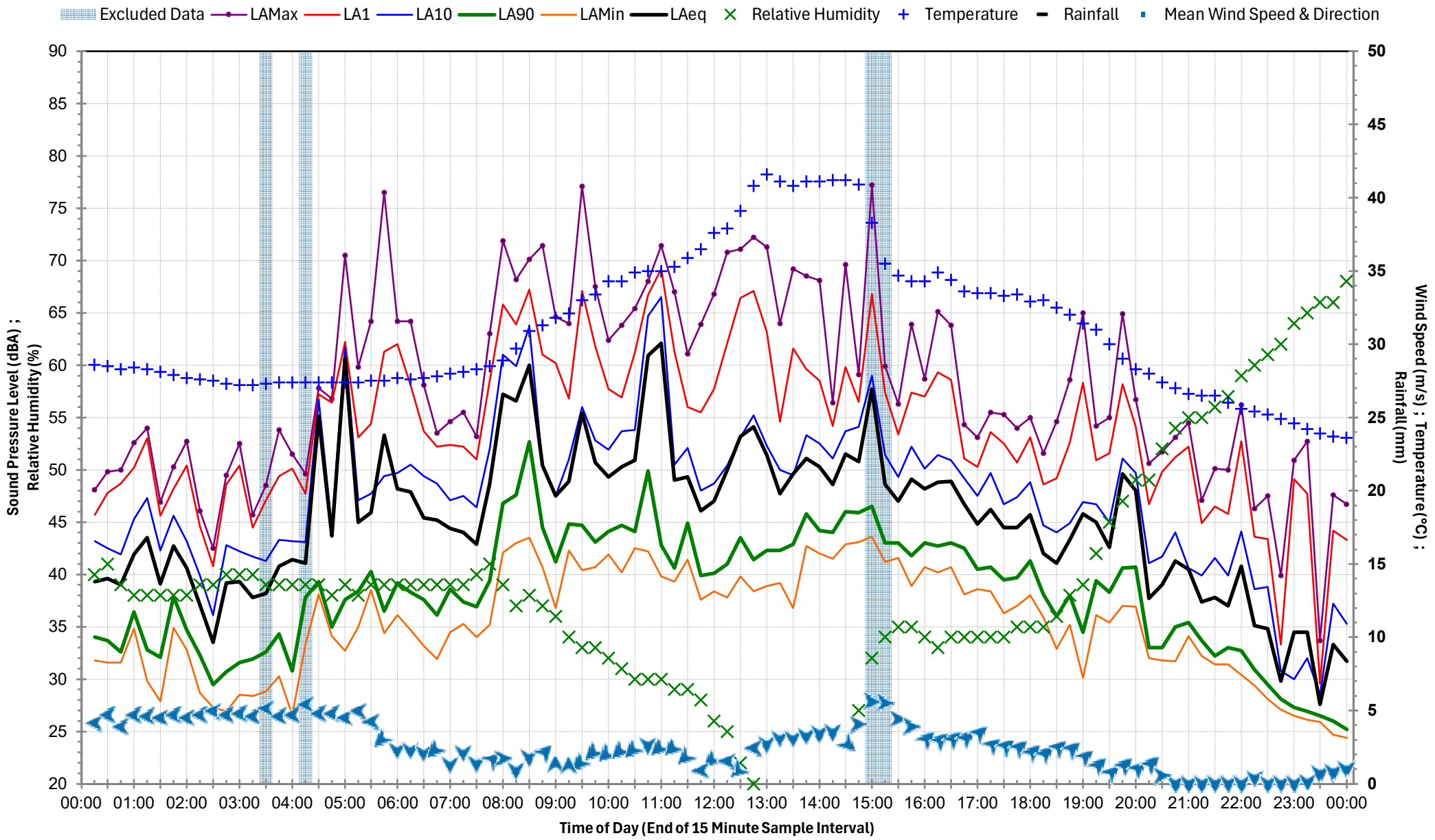
Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Wednesday 22 January 2025



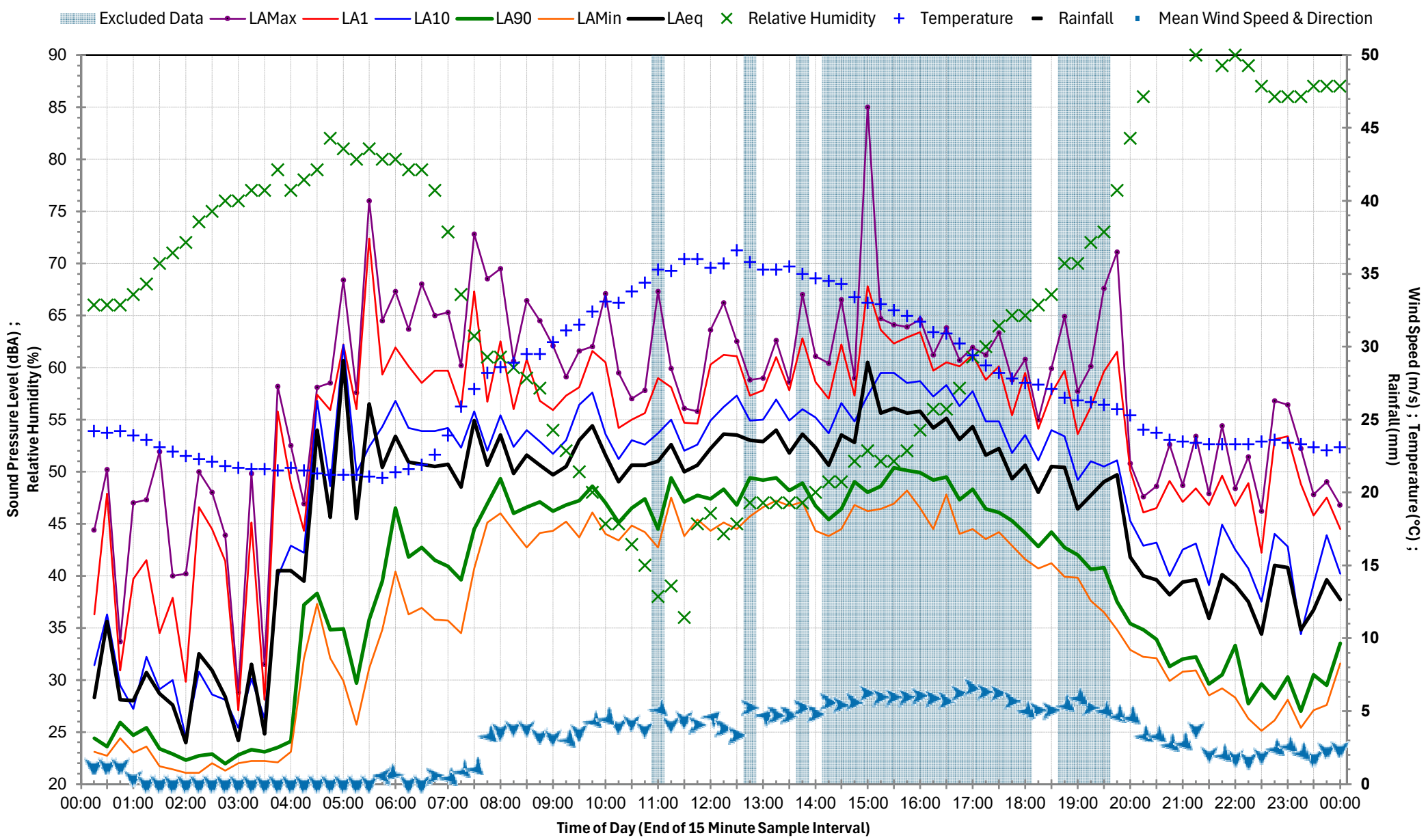
Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Thursday 23 January 2025



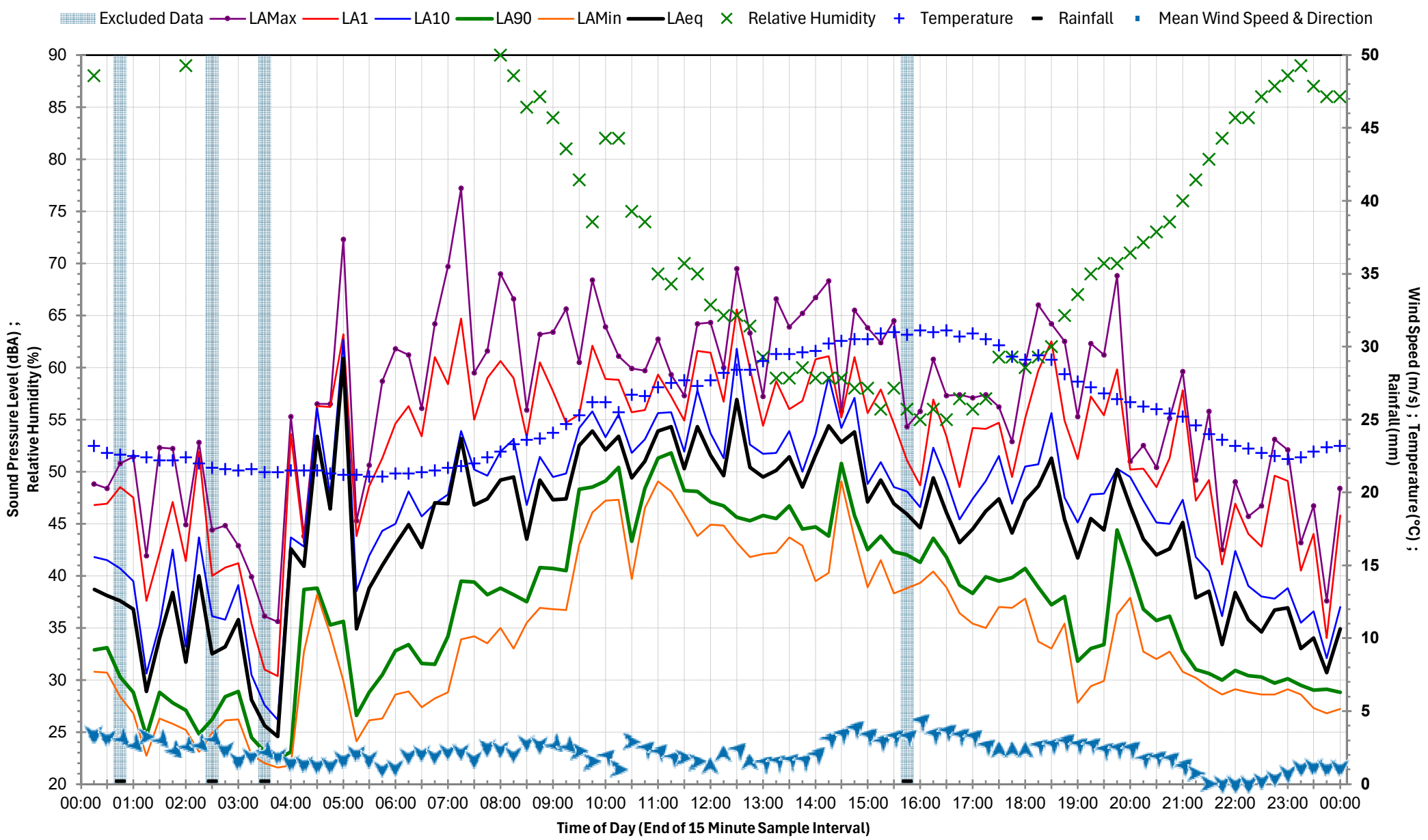
Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Friday 24 January 2025



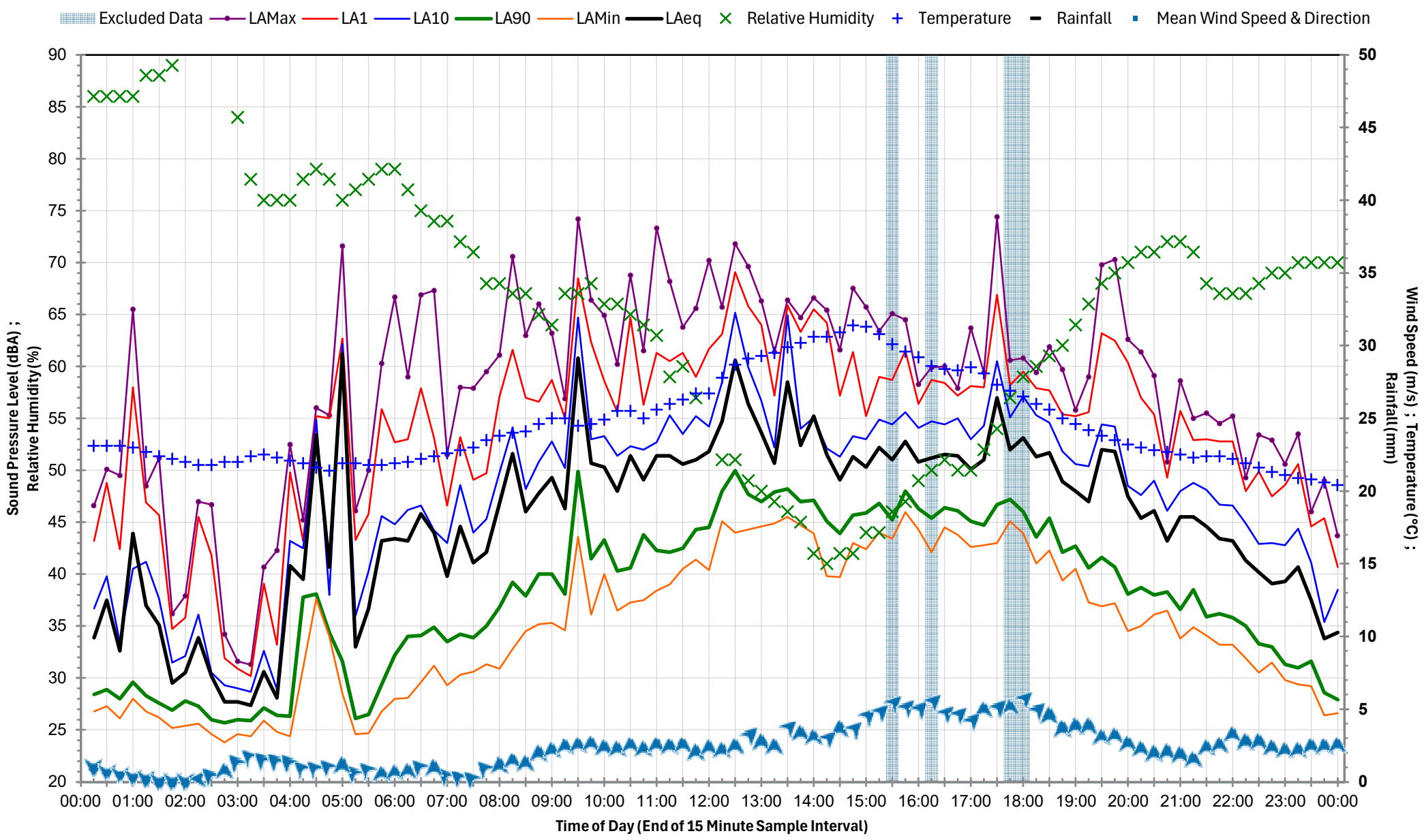
Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Saturday 25 January 2025



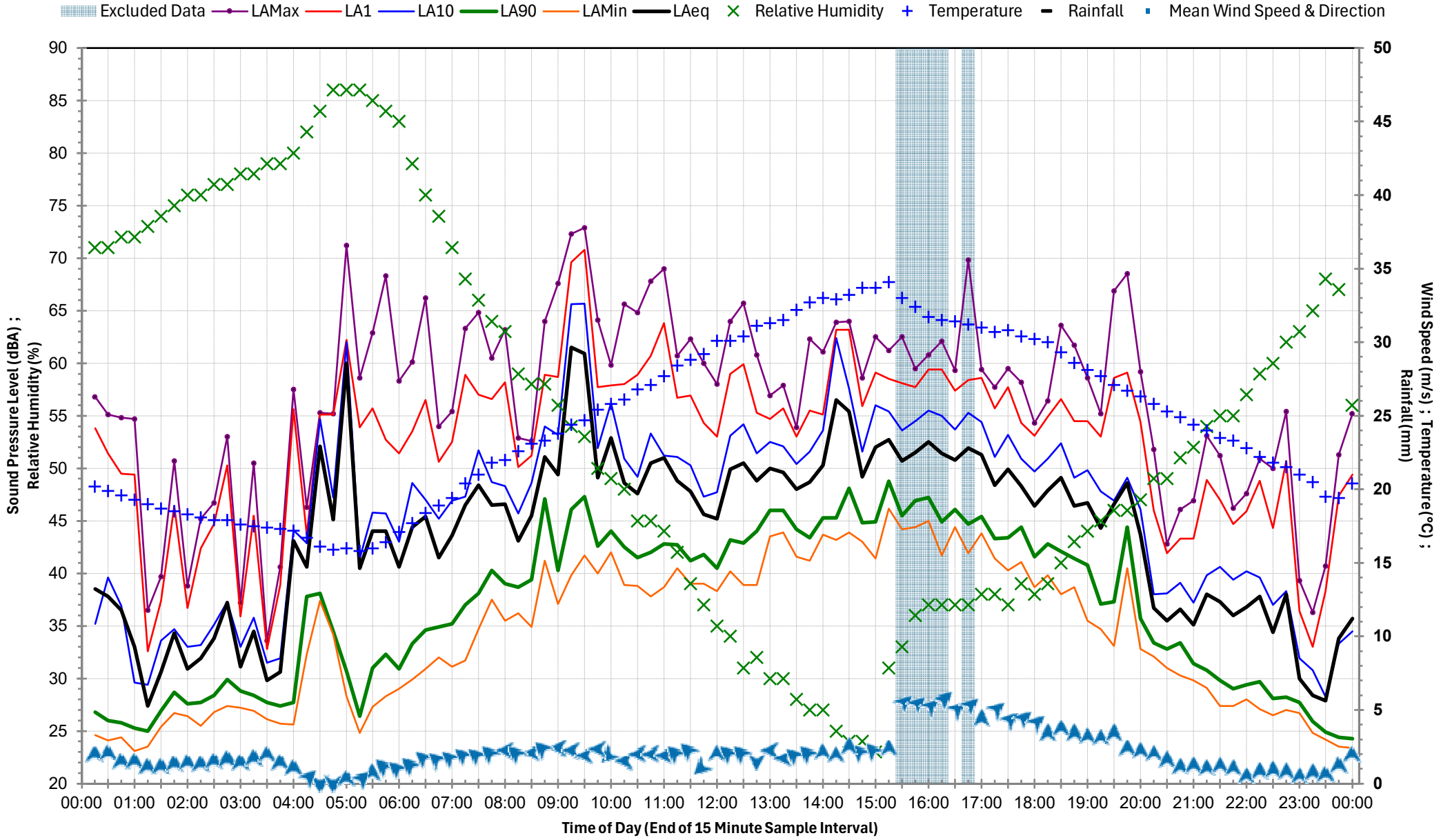
Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Sunday 26 January 2025



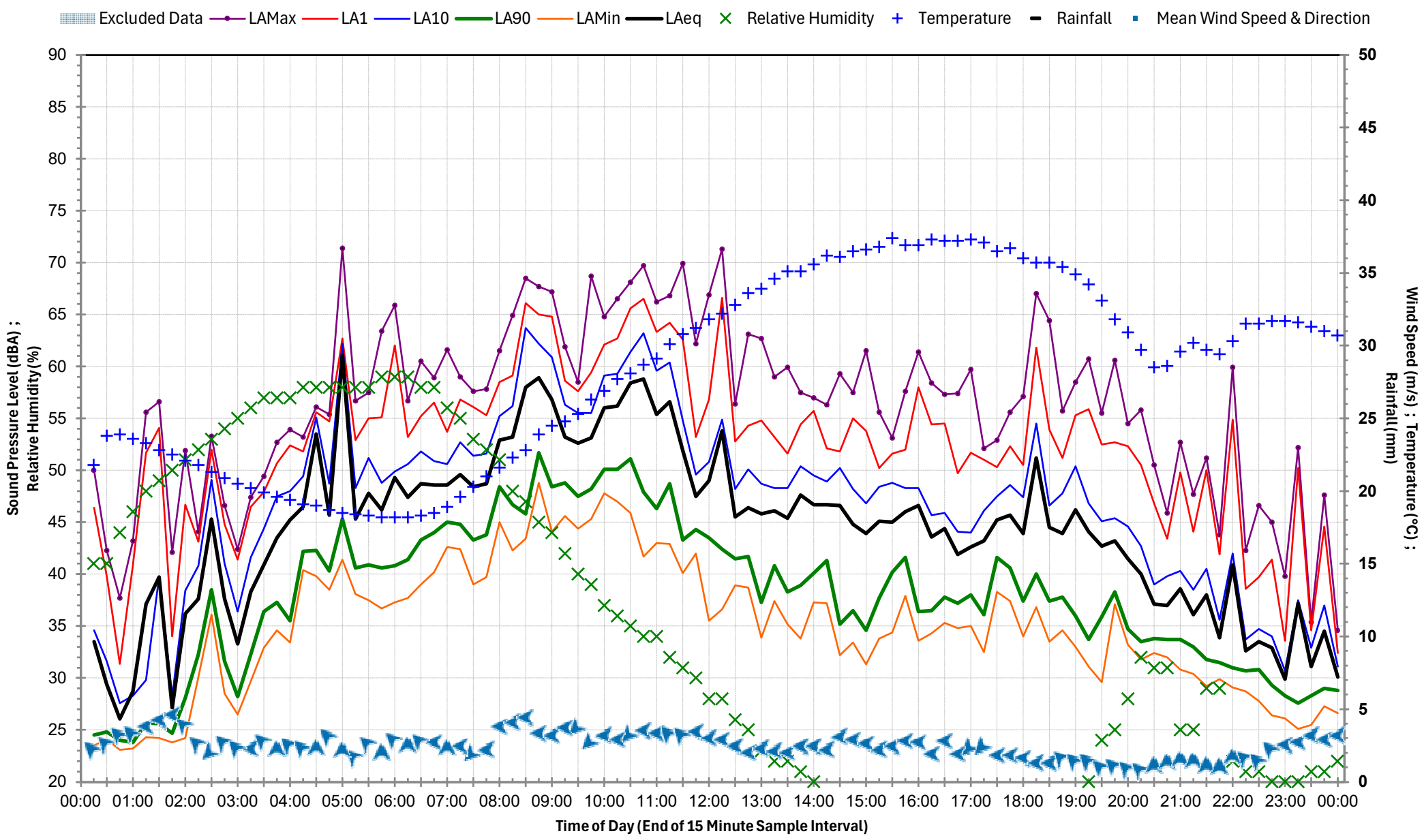
Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Monday 27 January 2025



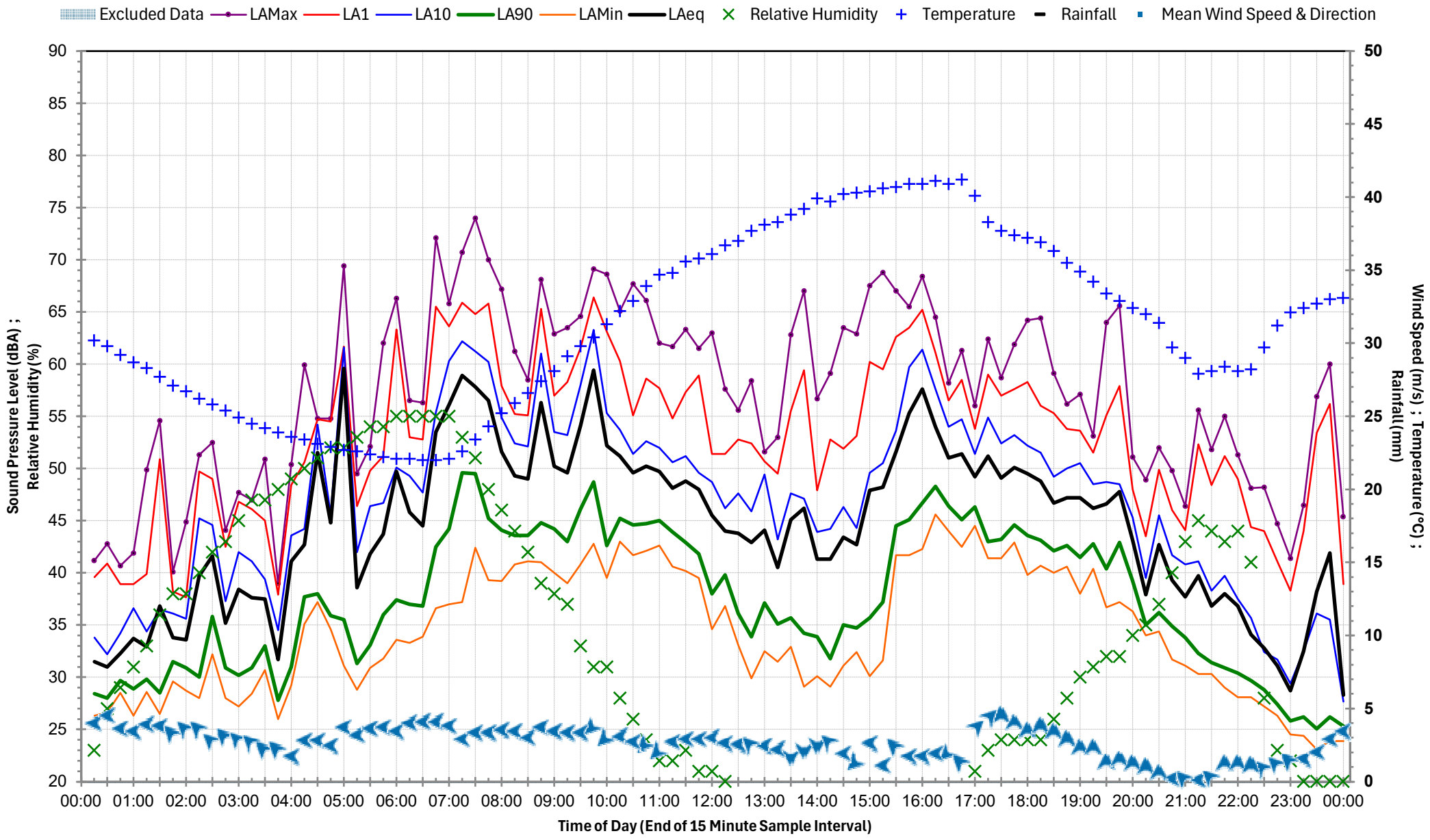
Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Tuesday 28 January 2025



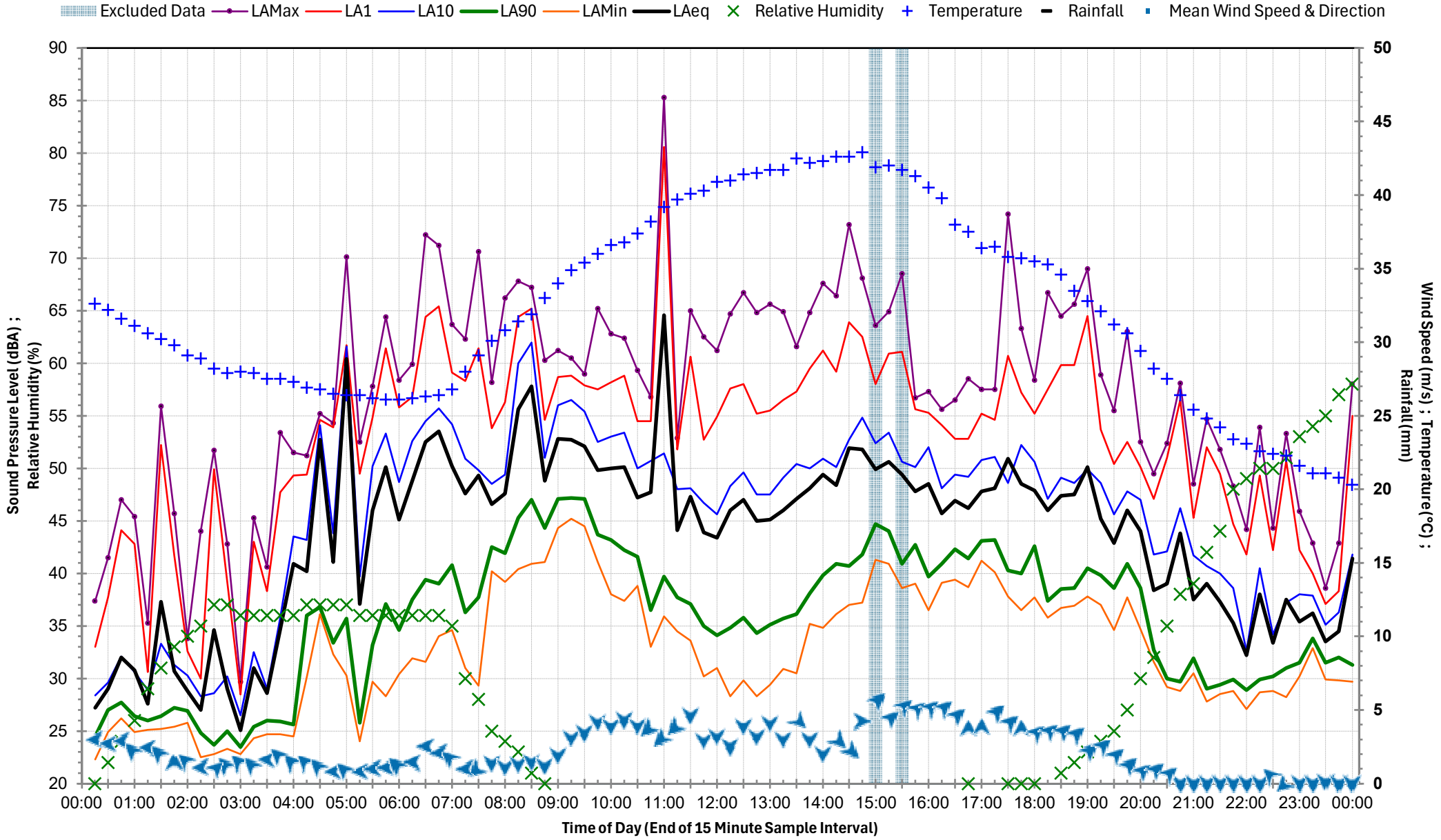
Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Wednesday 29 January 2025

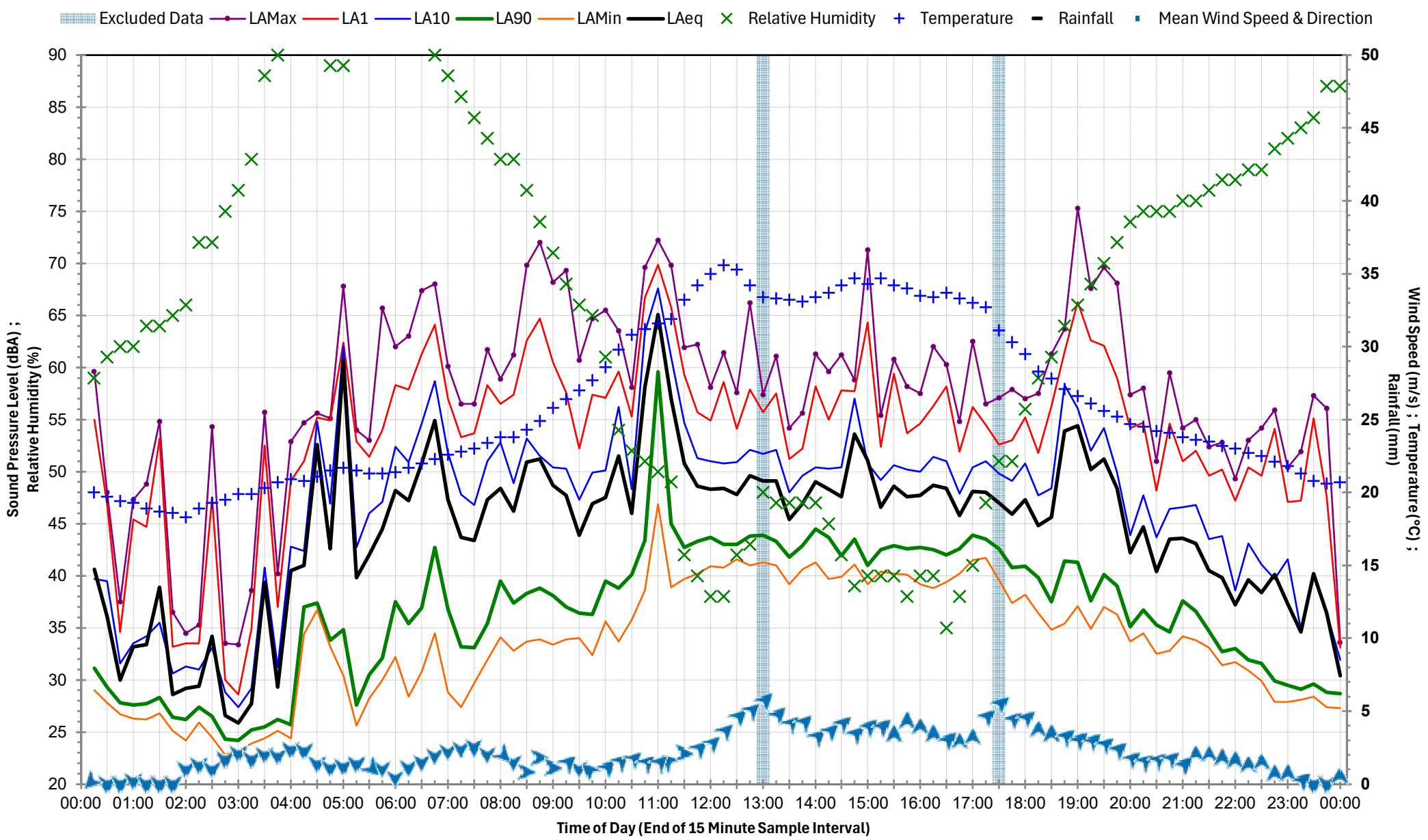


Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Thursday 30 January 2025

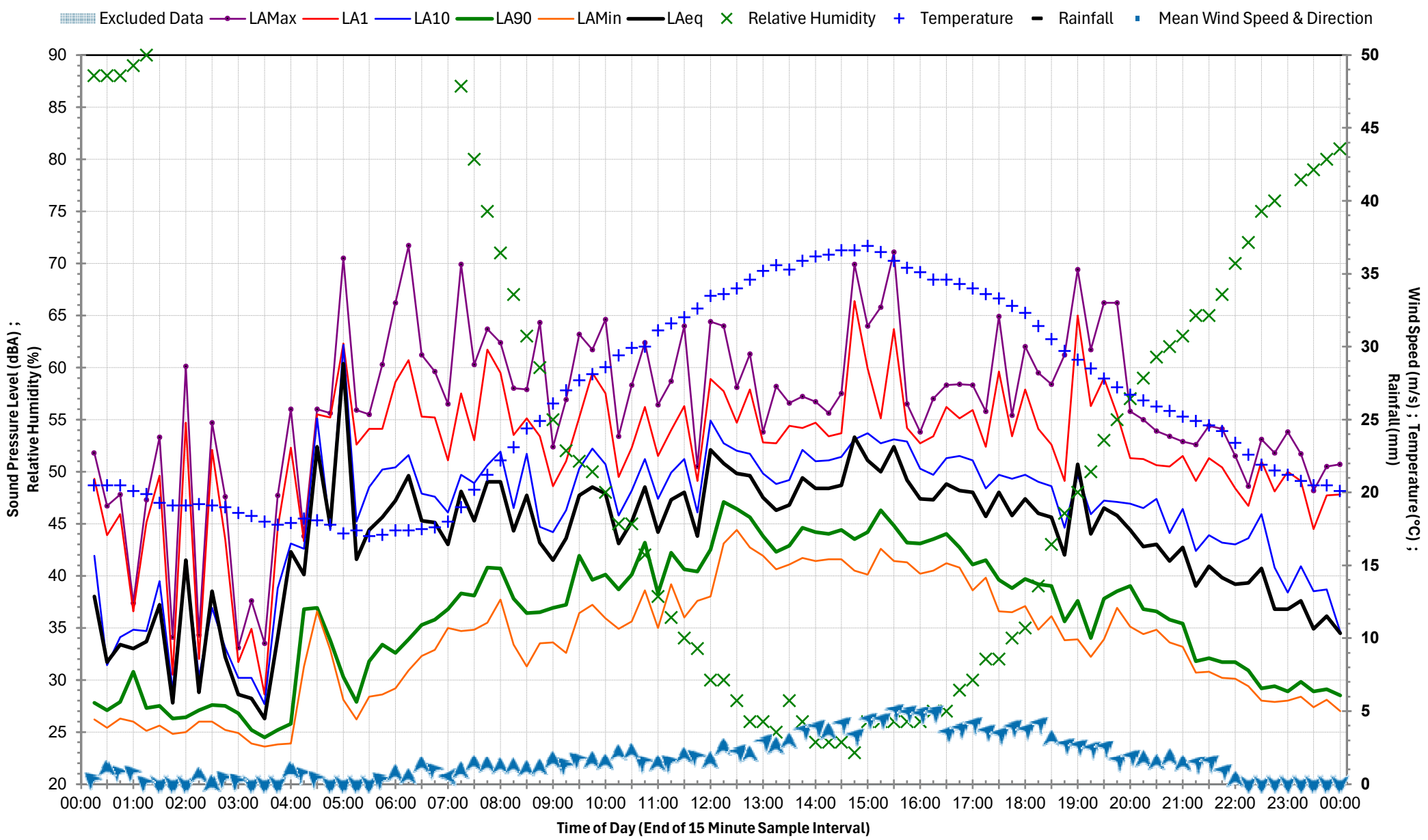


Statistical Ambient Noise Levels
Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Friday 31 January 2025



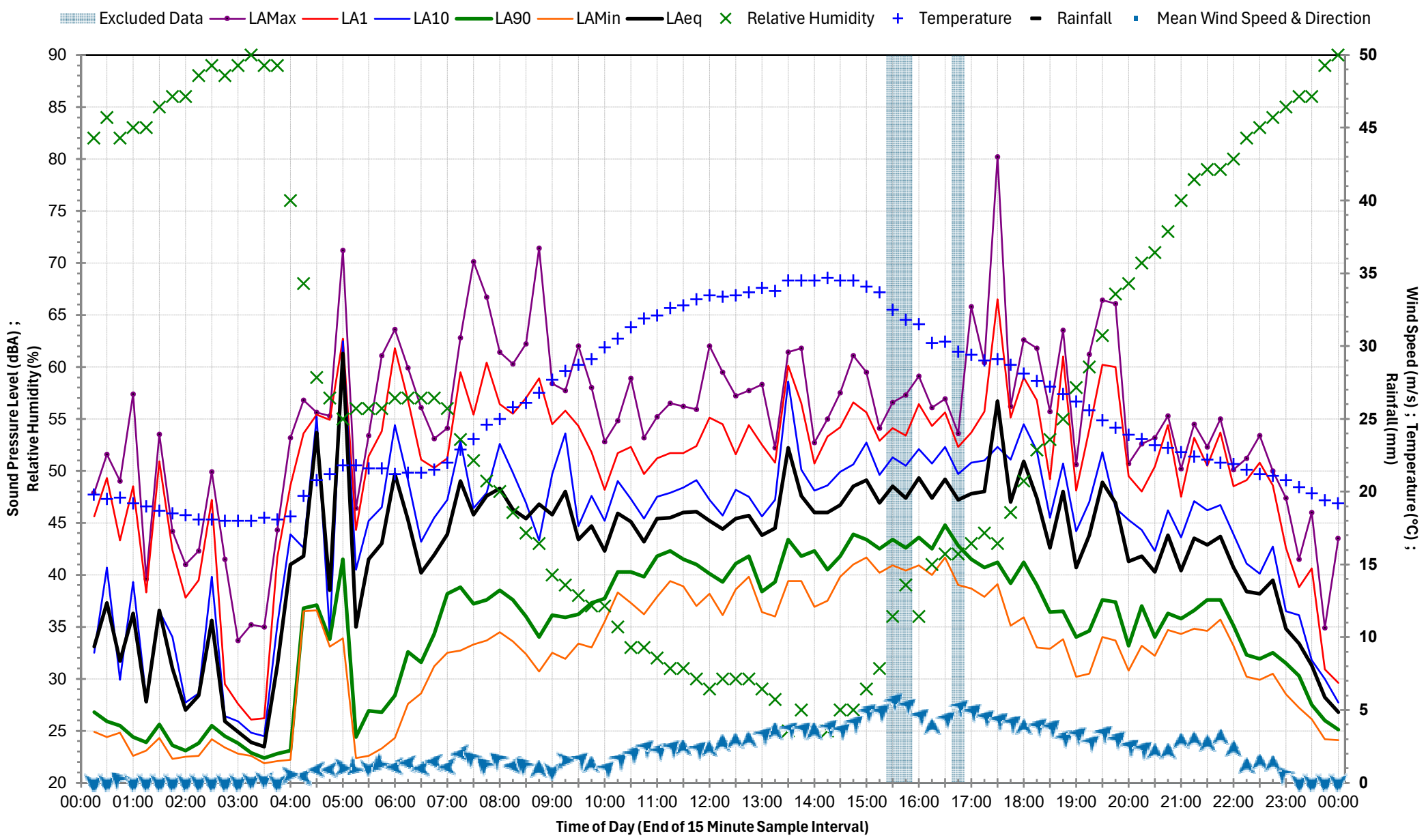
Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Saturday 1 February 2025



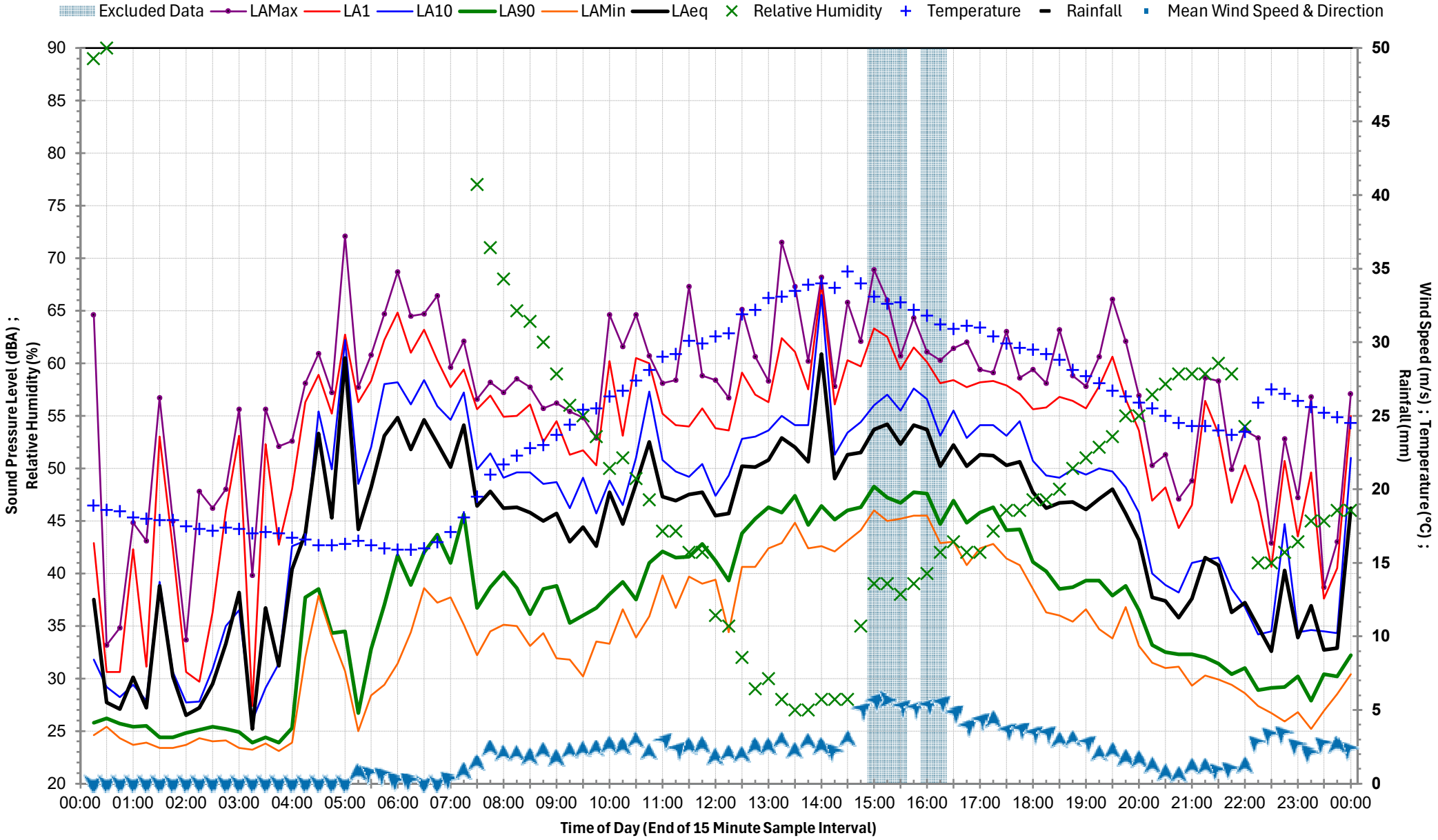
Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Sunday 2 February 2025



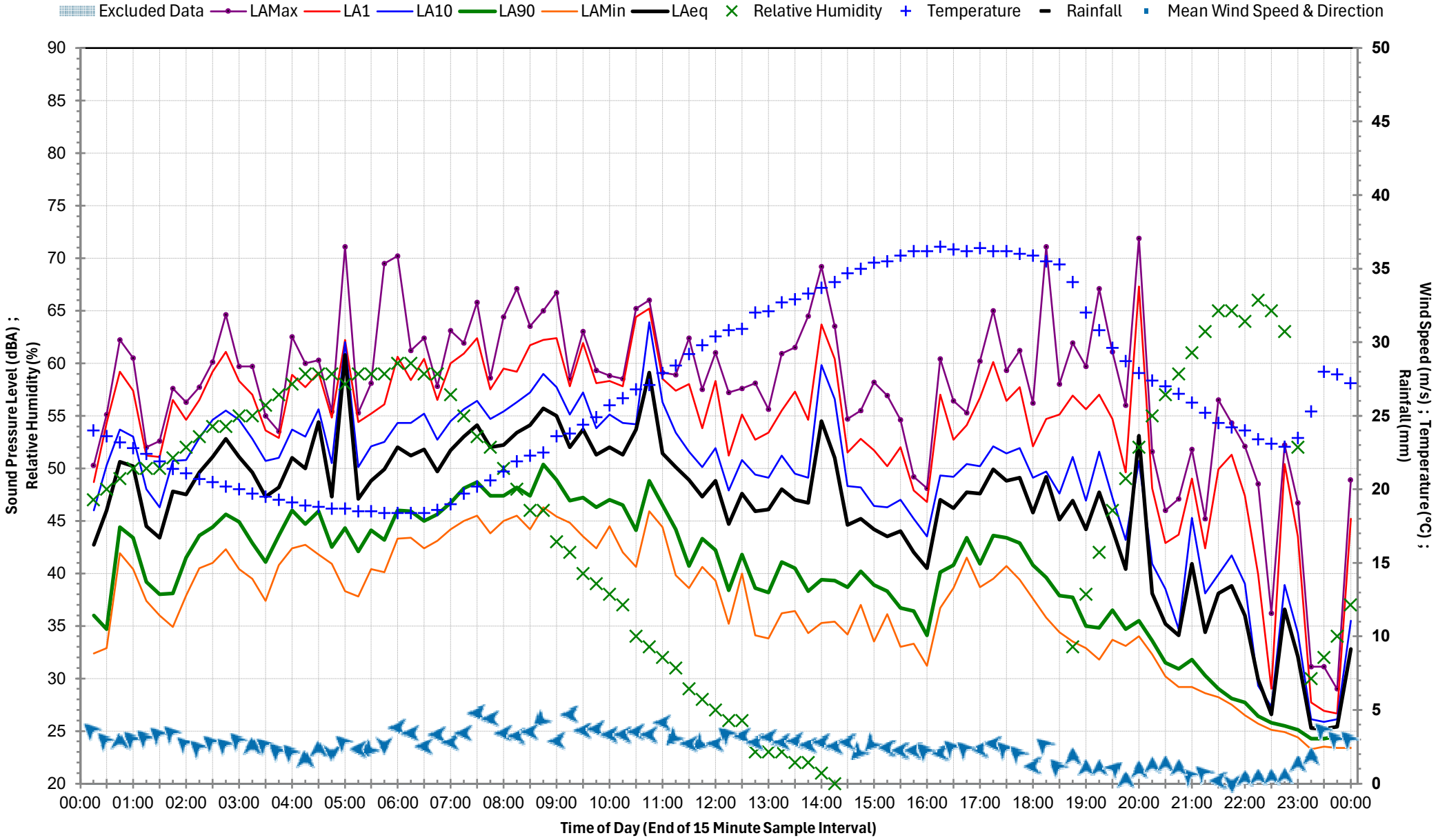
Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Monday 3 February 2025



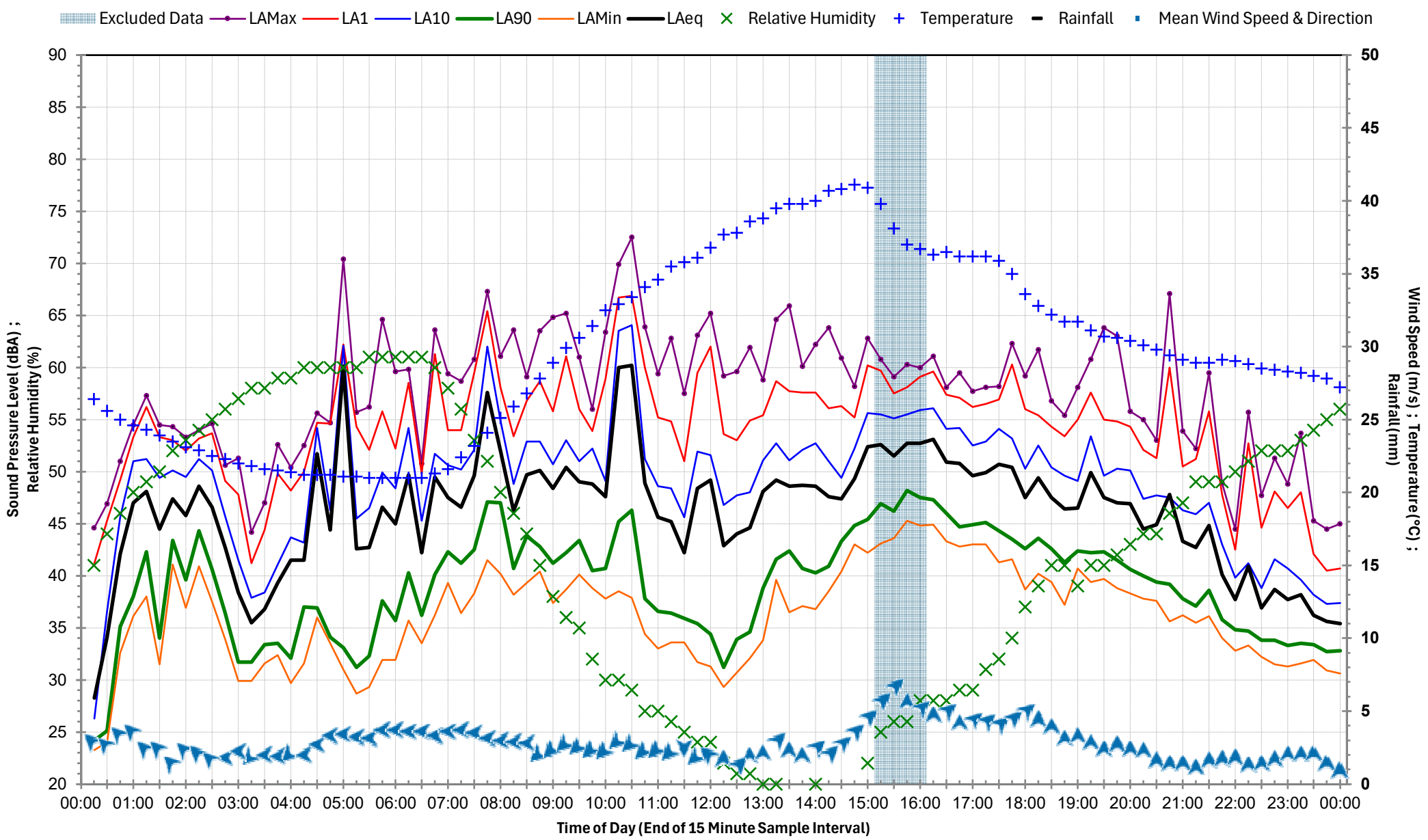
Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Tuesday 4 February 2025



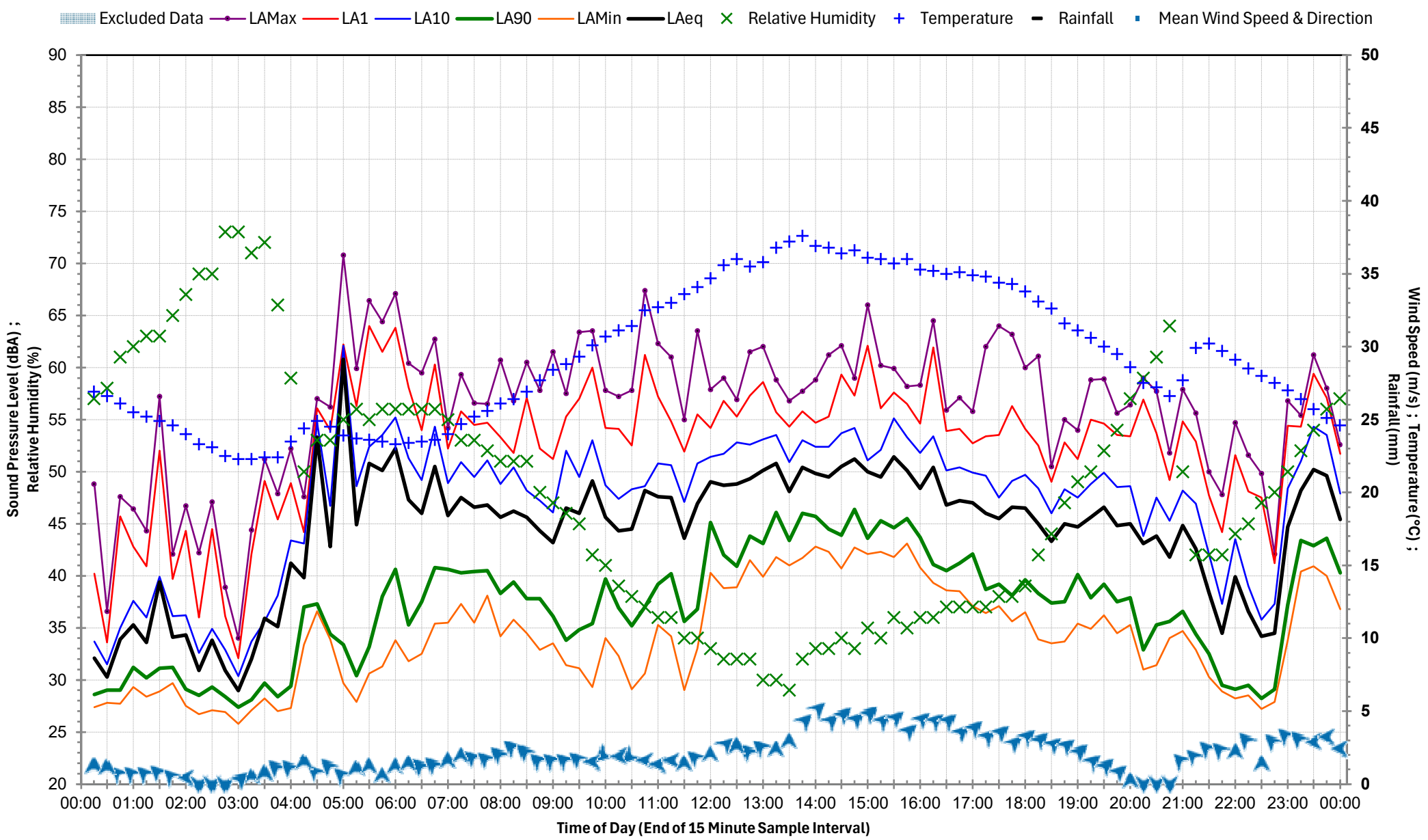
Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Wednesday 5 February 2025

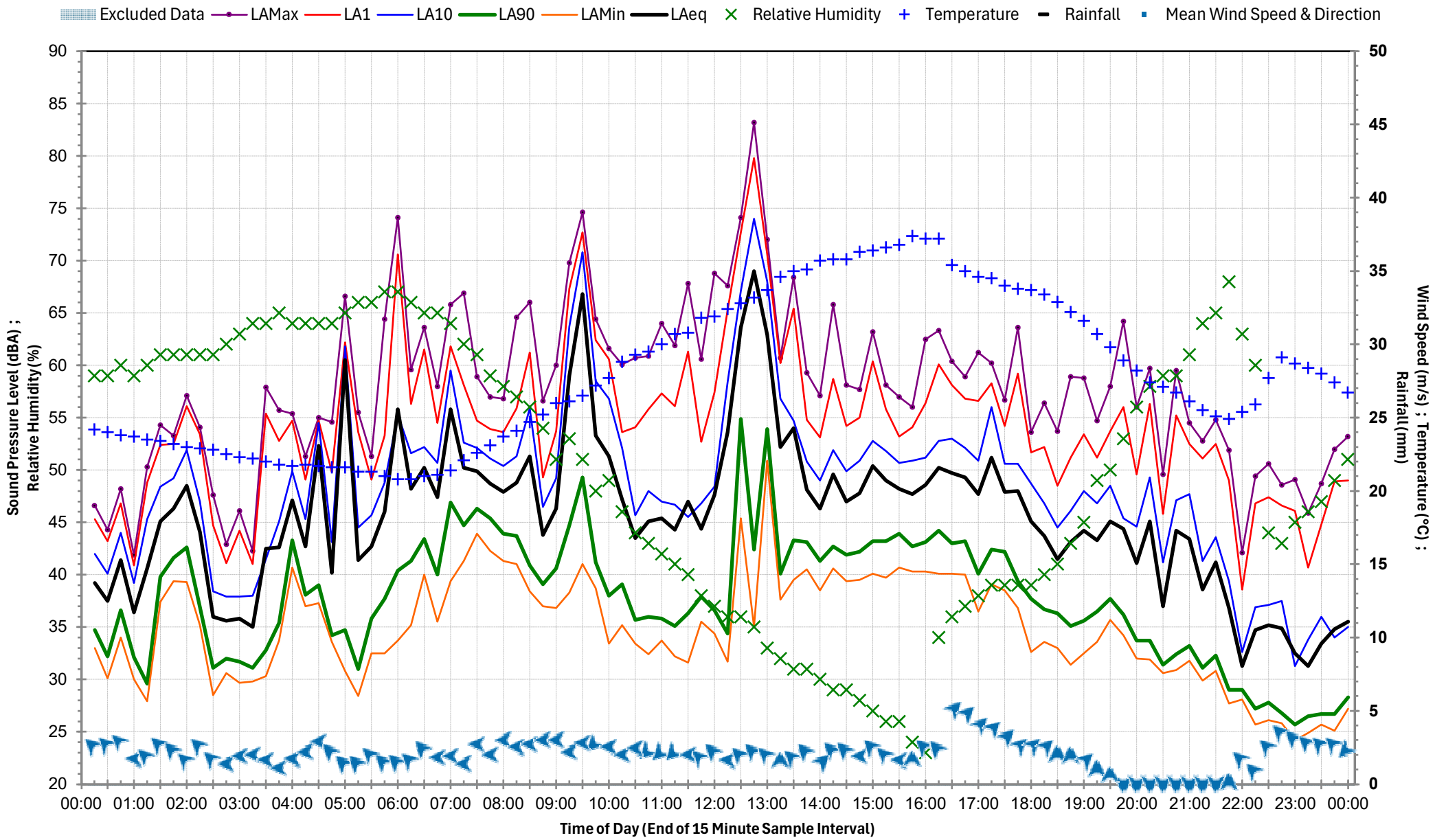


Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Thursday 6 February 2025

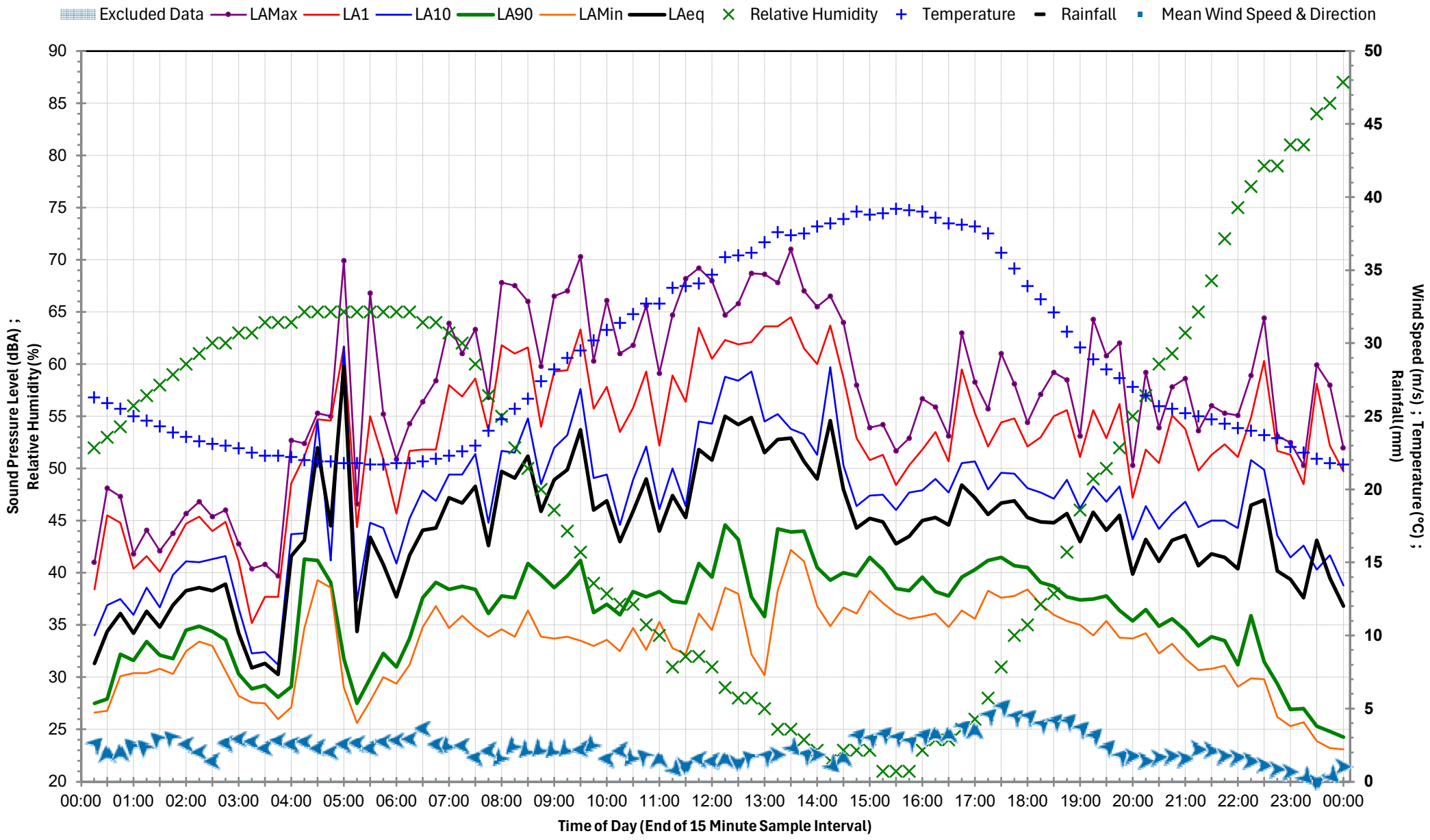


Statistical Ambient Noise Levels
Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Friday 7 February 2025



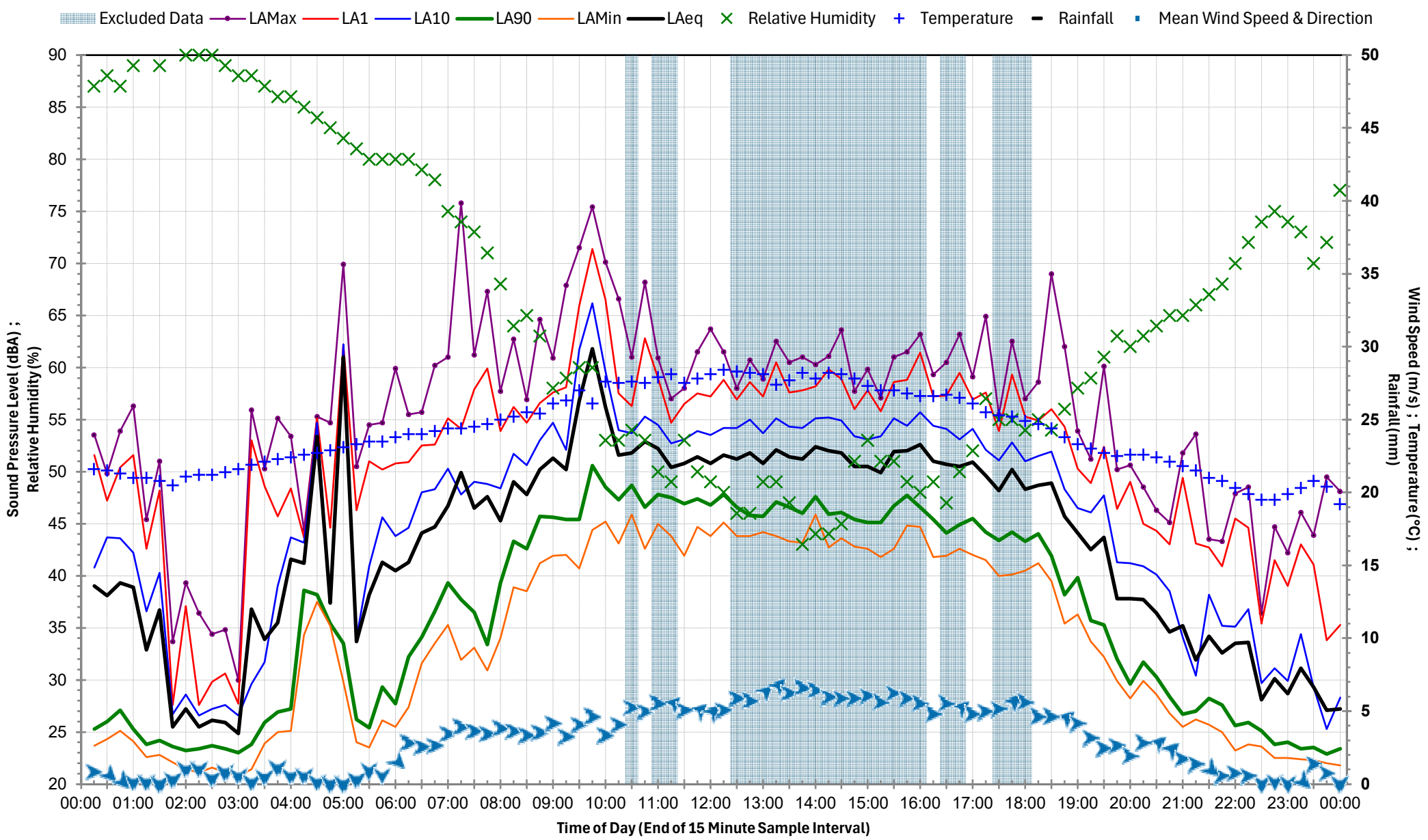
Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Saturday 8 February 2025



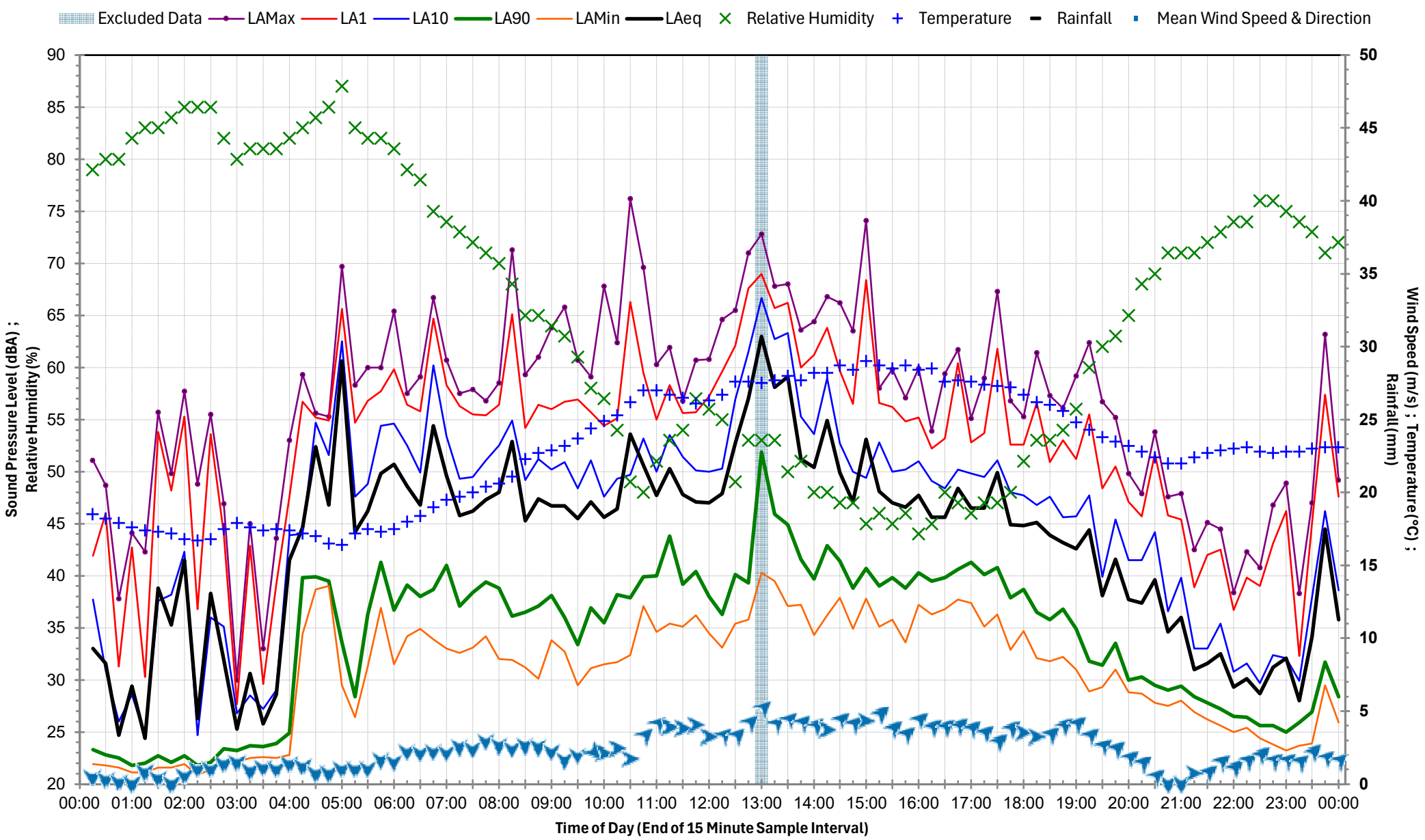
Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Sunday 9 February 2025



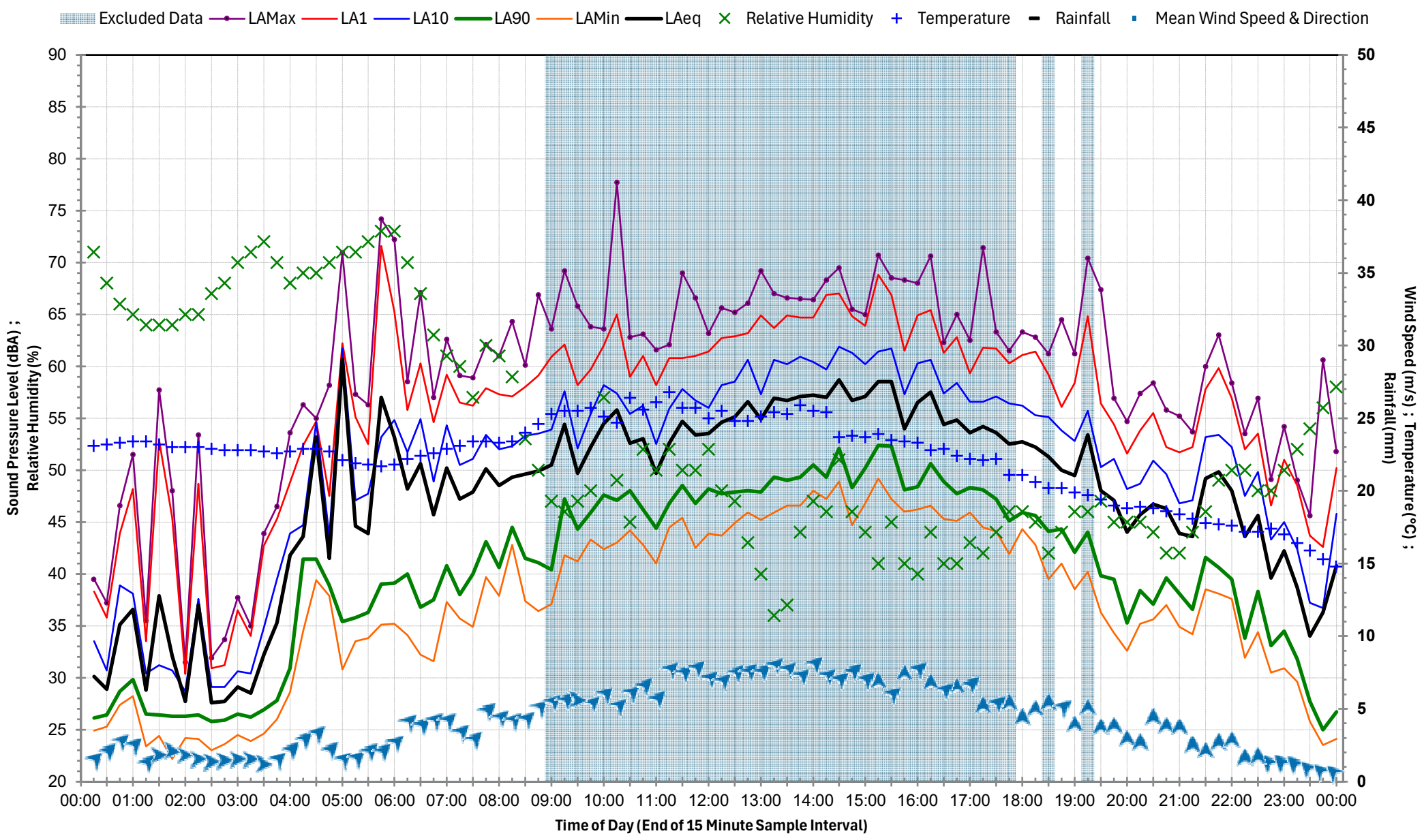
Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Monday 10 February 2025



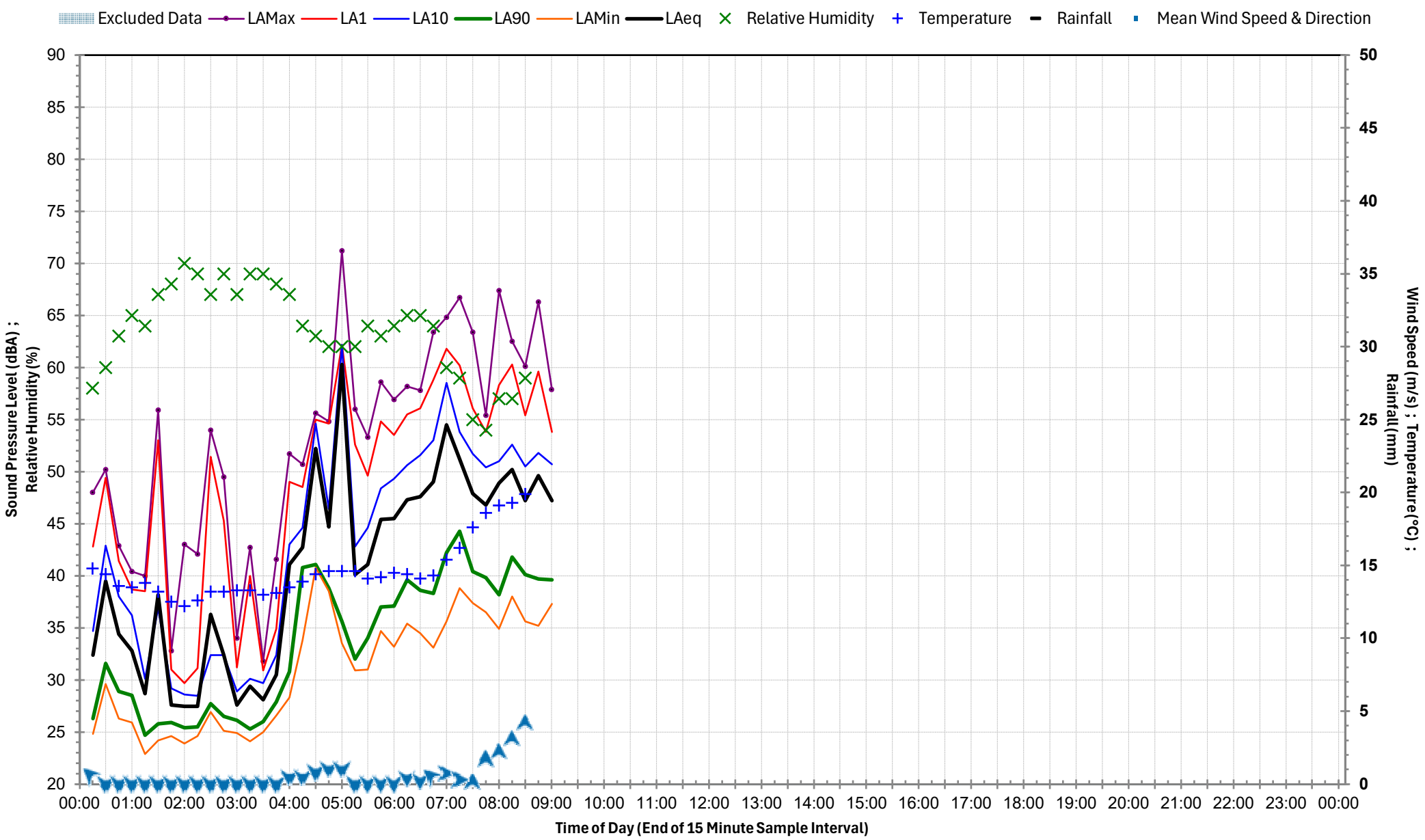
Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Tuesday 11 February 2025



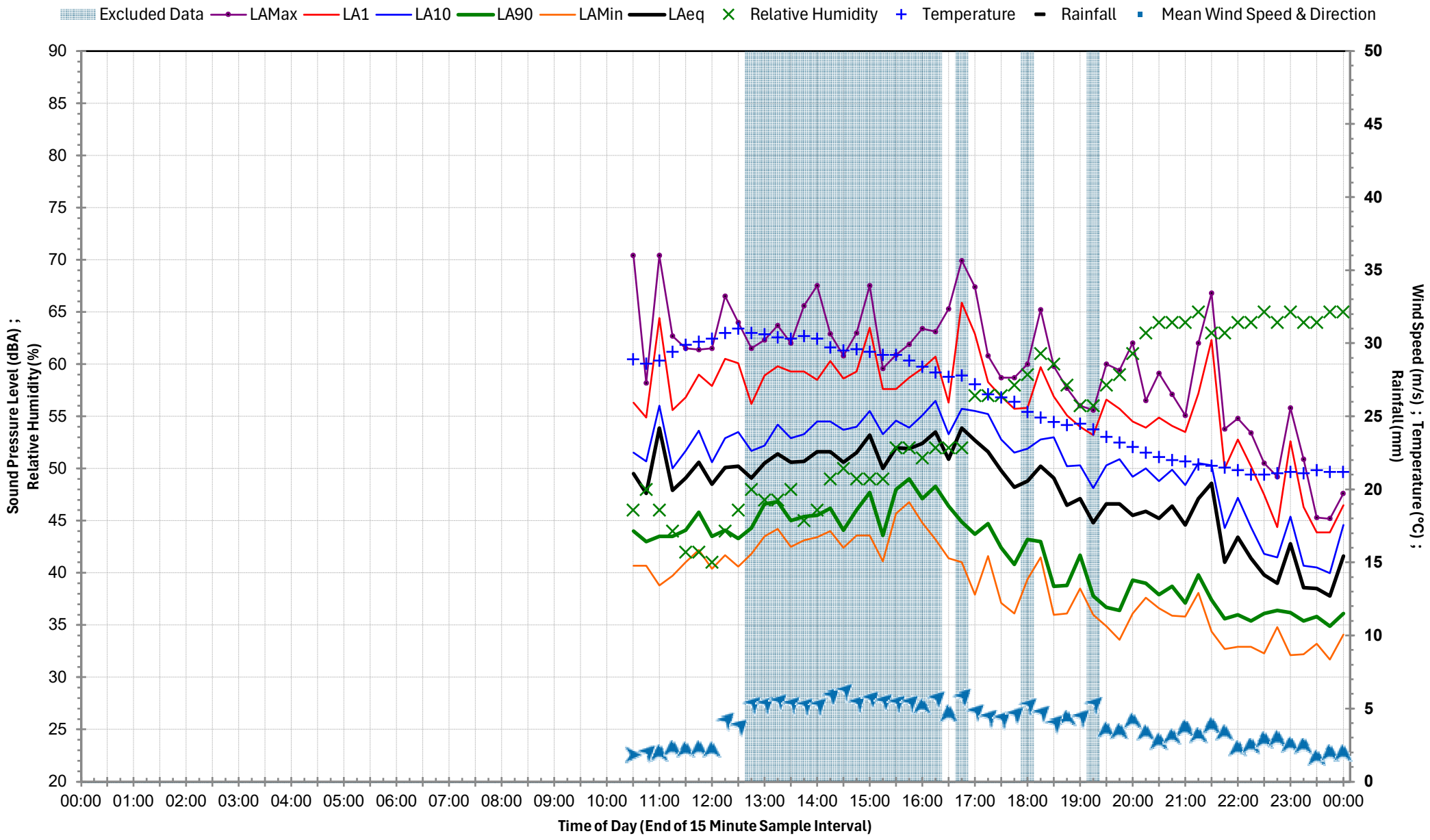
Statistical Ambient Noise Levels

Shell BESS - L2 - 1521 Old Yanchep Road, Pinjar 6078 - Wednesday 12 February 2025



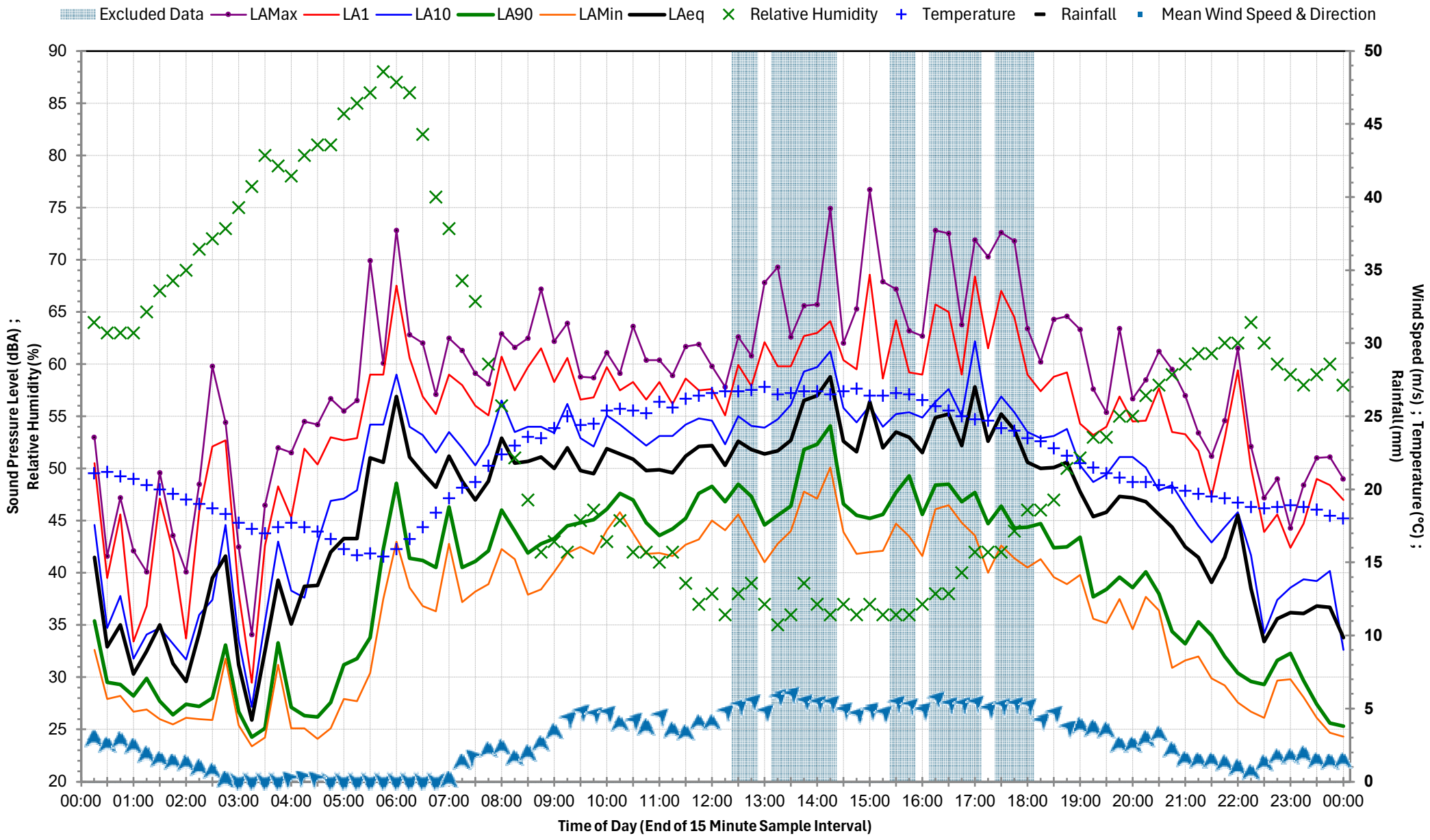
Logger 3

Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Monday 13 January 2025



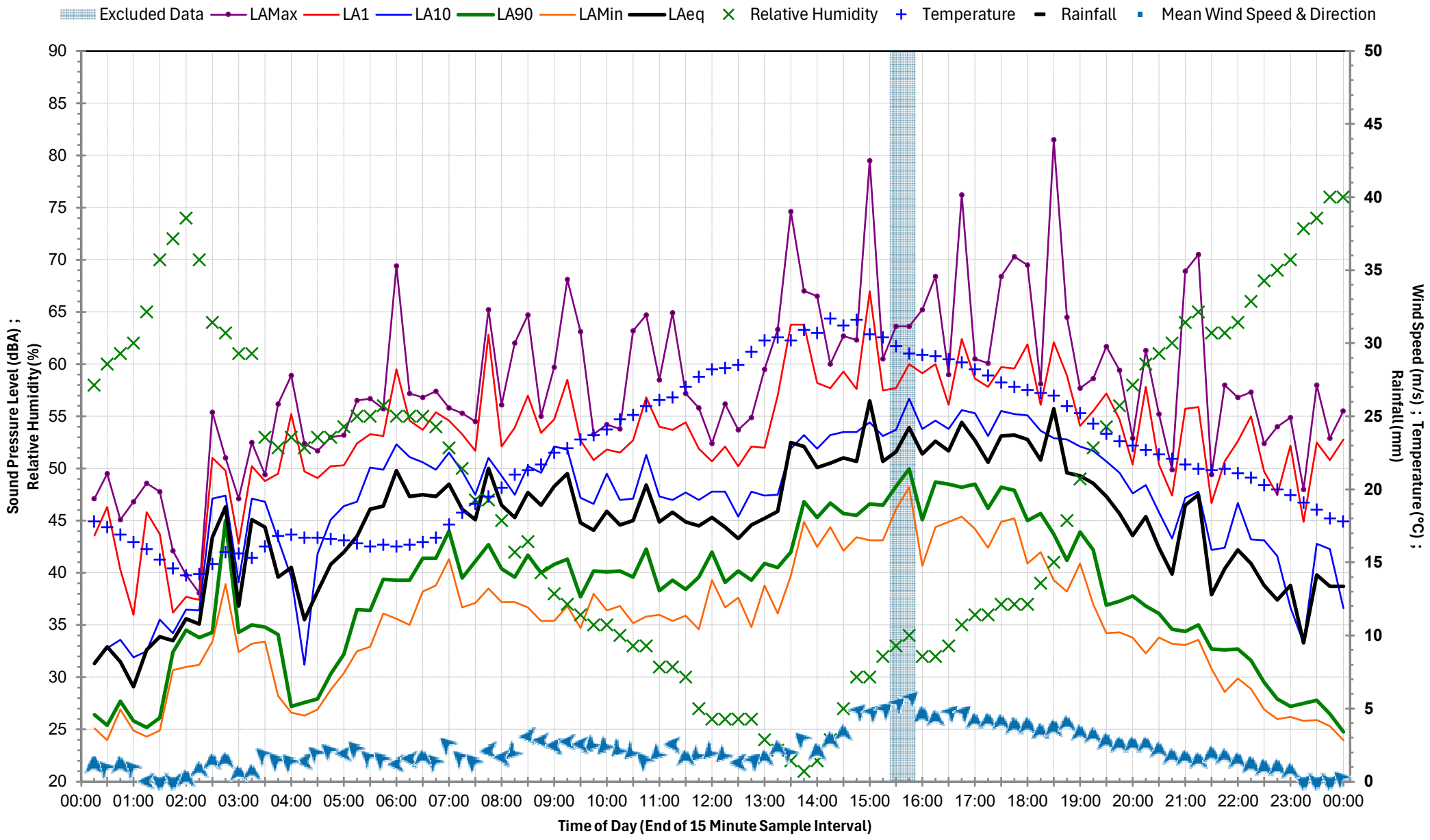
Statistical Ambient Noise Levels

Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Tuesday 14 January 2025

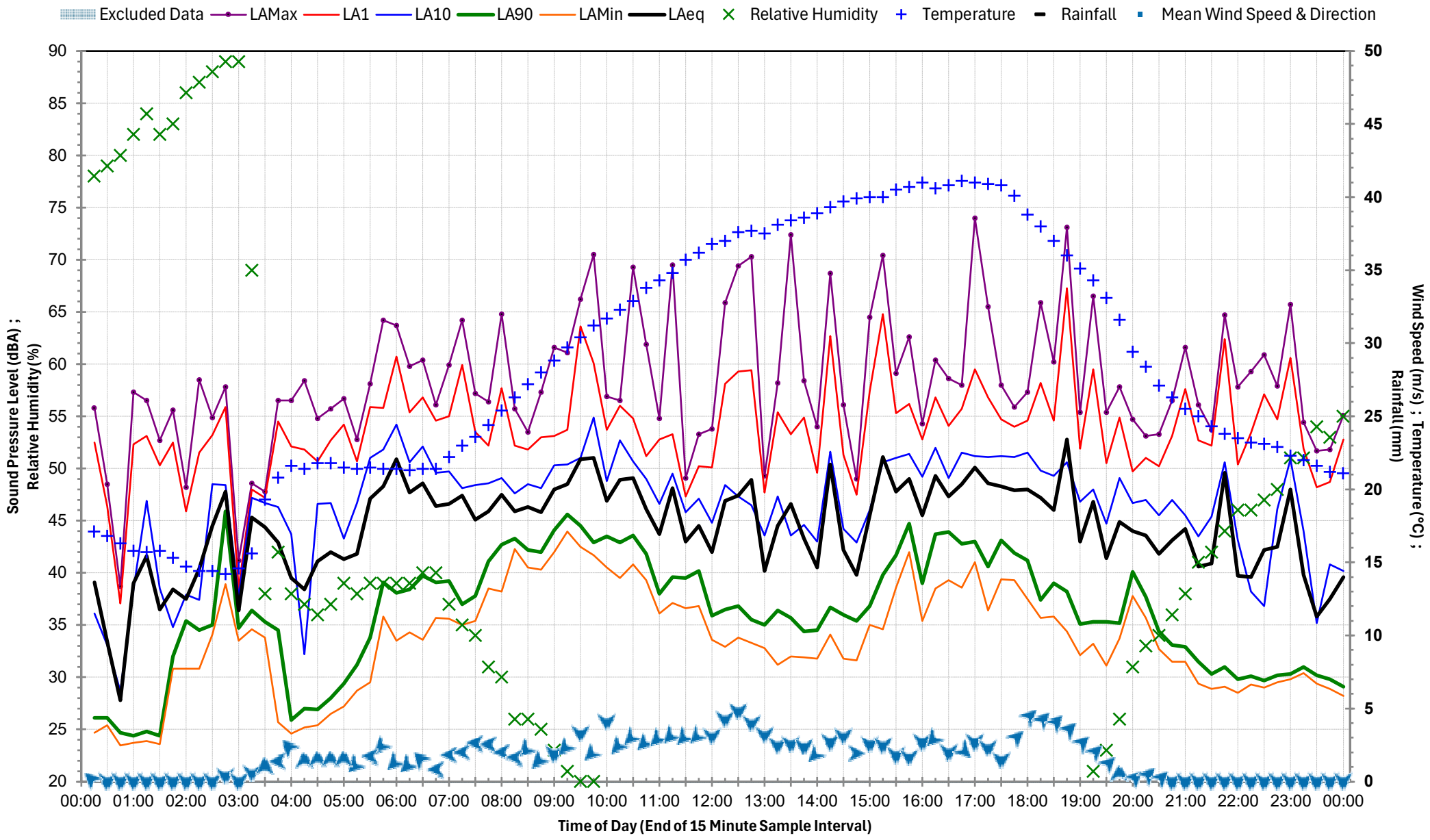


Statistical Ambient Noise Levels

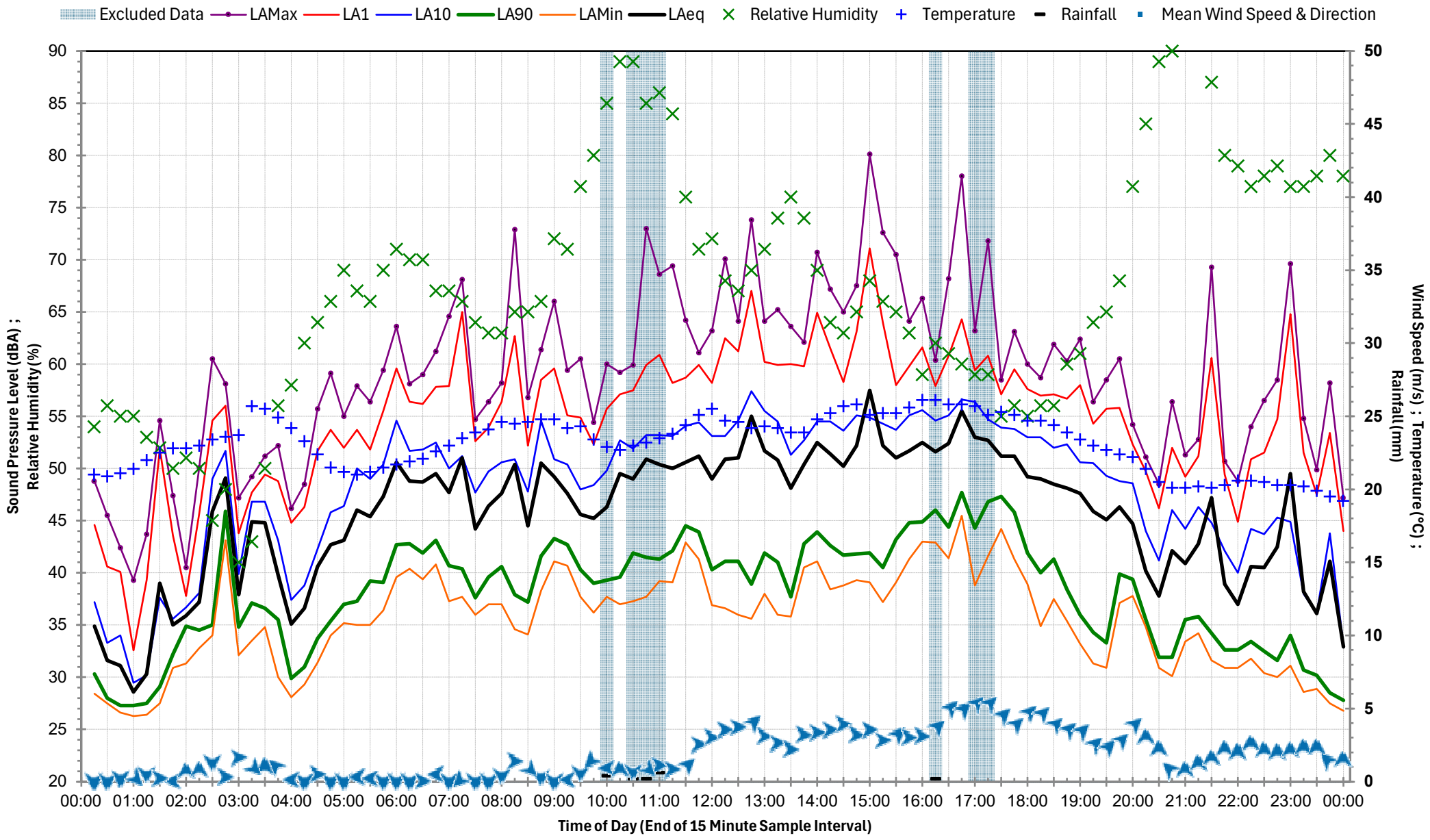
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Wednesday 15 January 2025



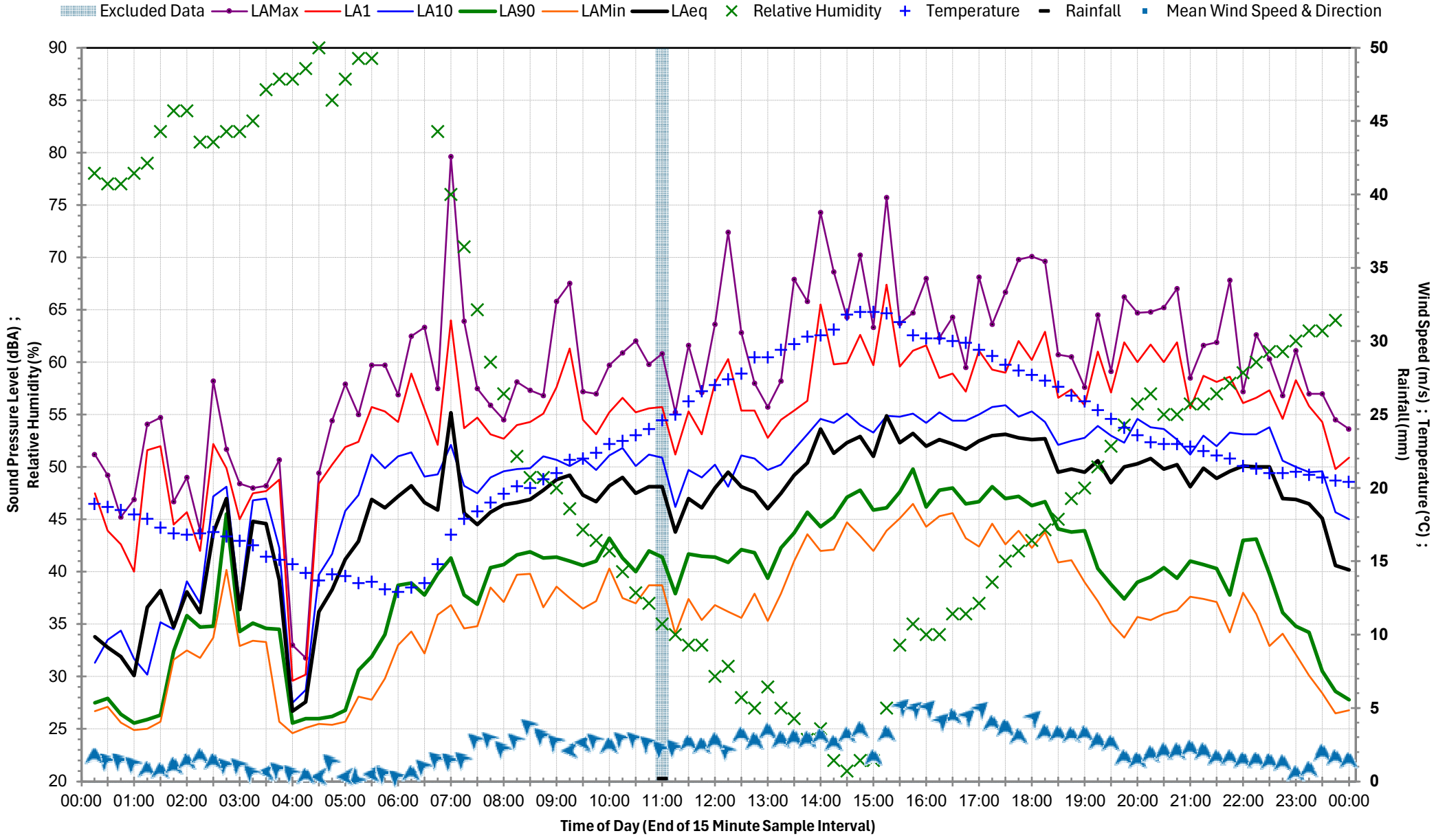
Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Thursday 16 January 2025



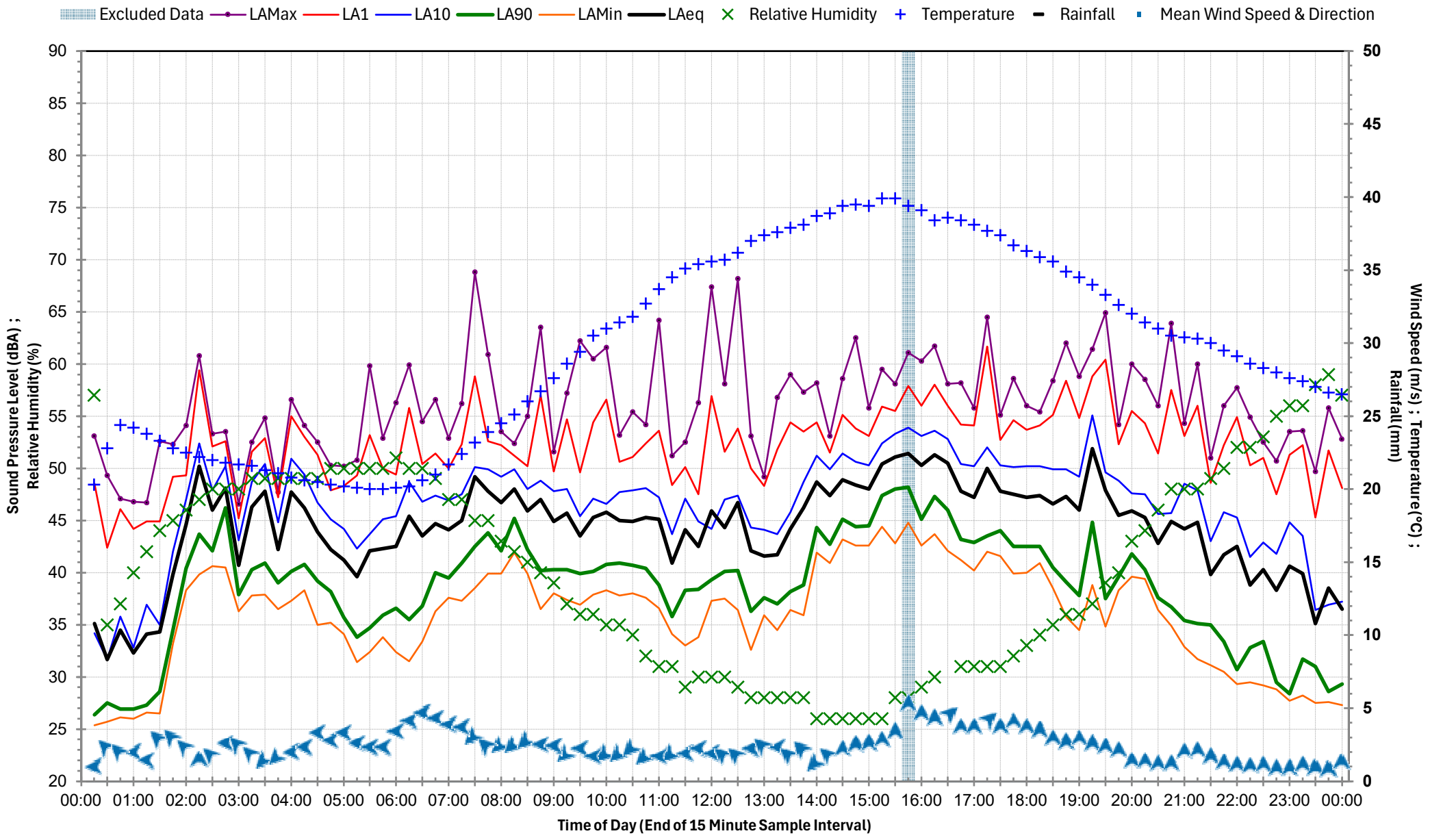
Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Friday 17 January 2025



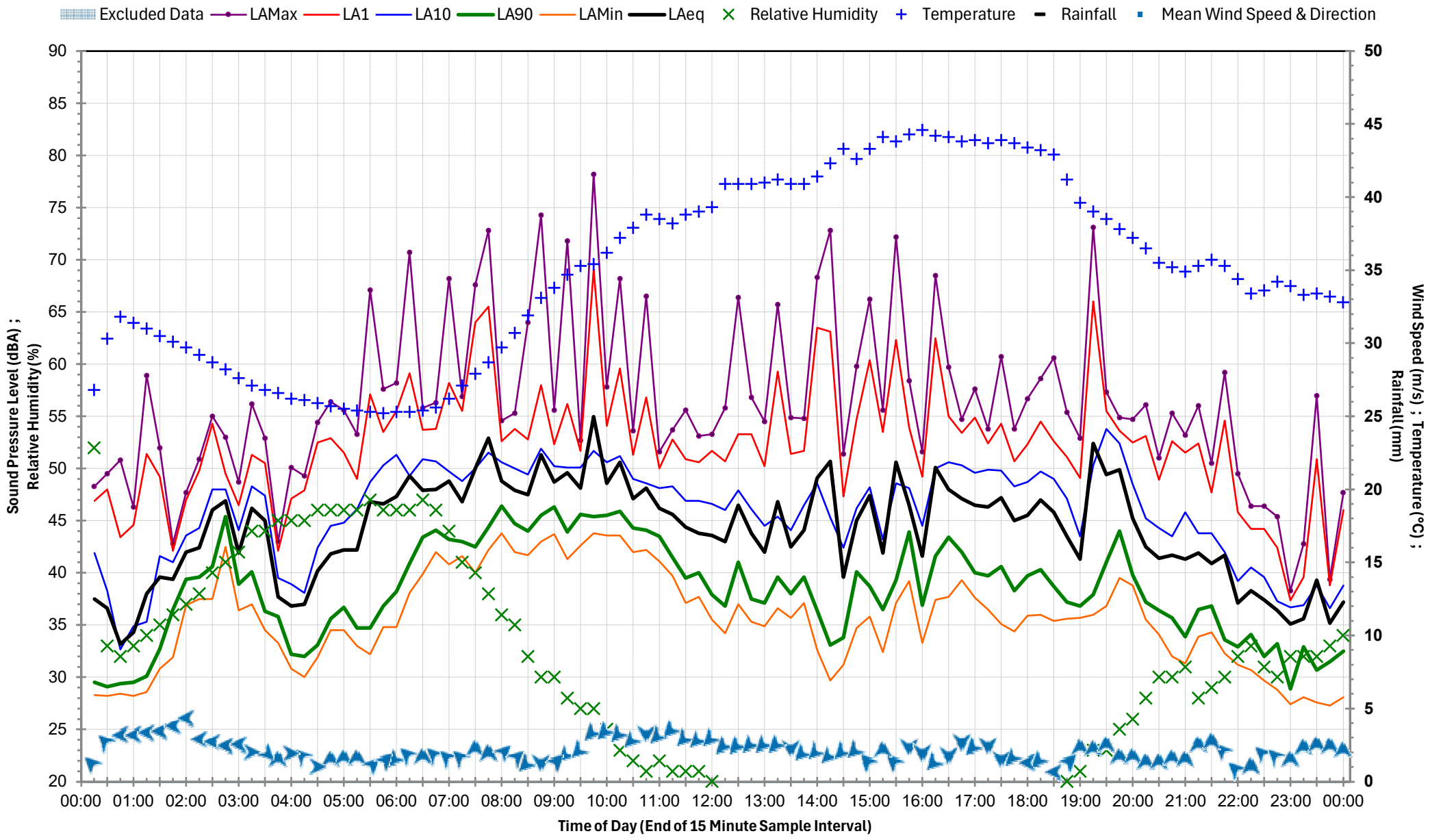
Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Saturday 18 January 2025



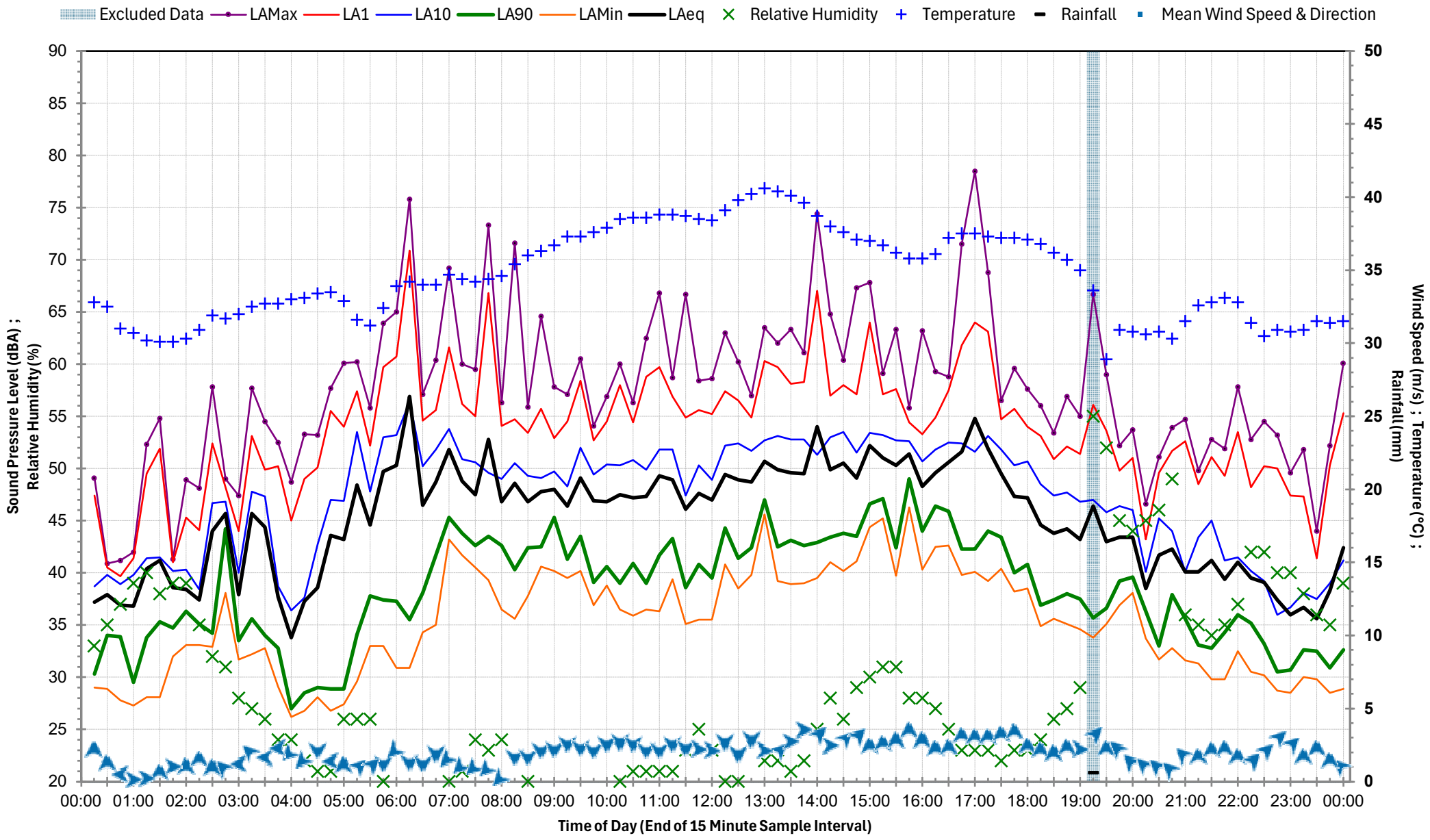
Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Sunday 19 January 2025



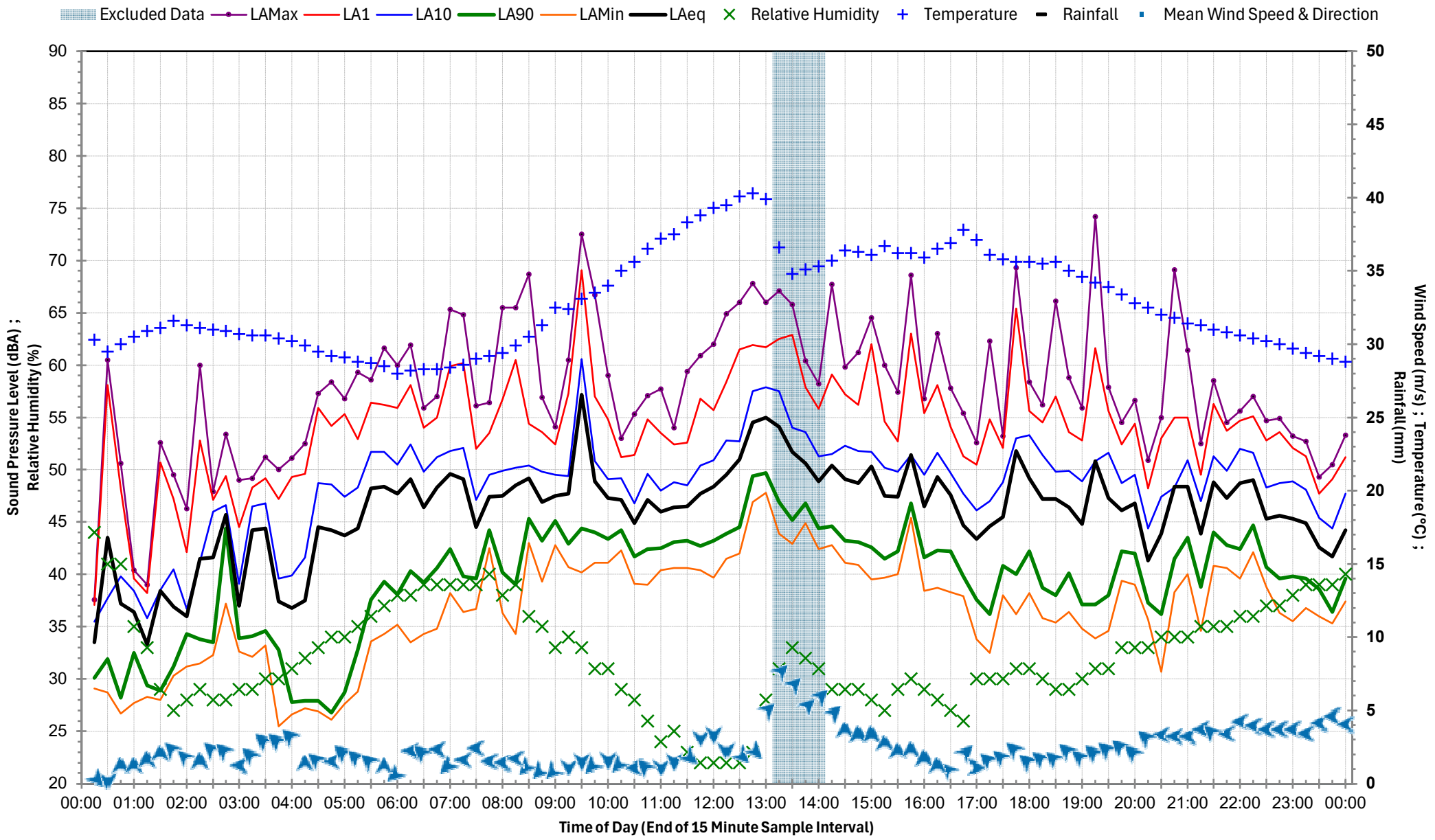
Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Monday 20 January 2025



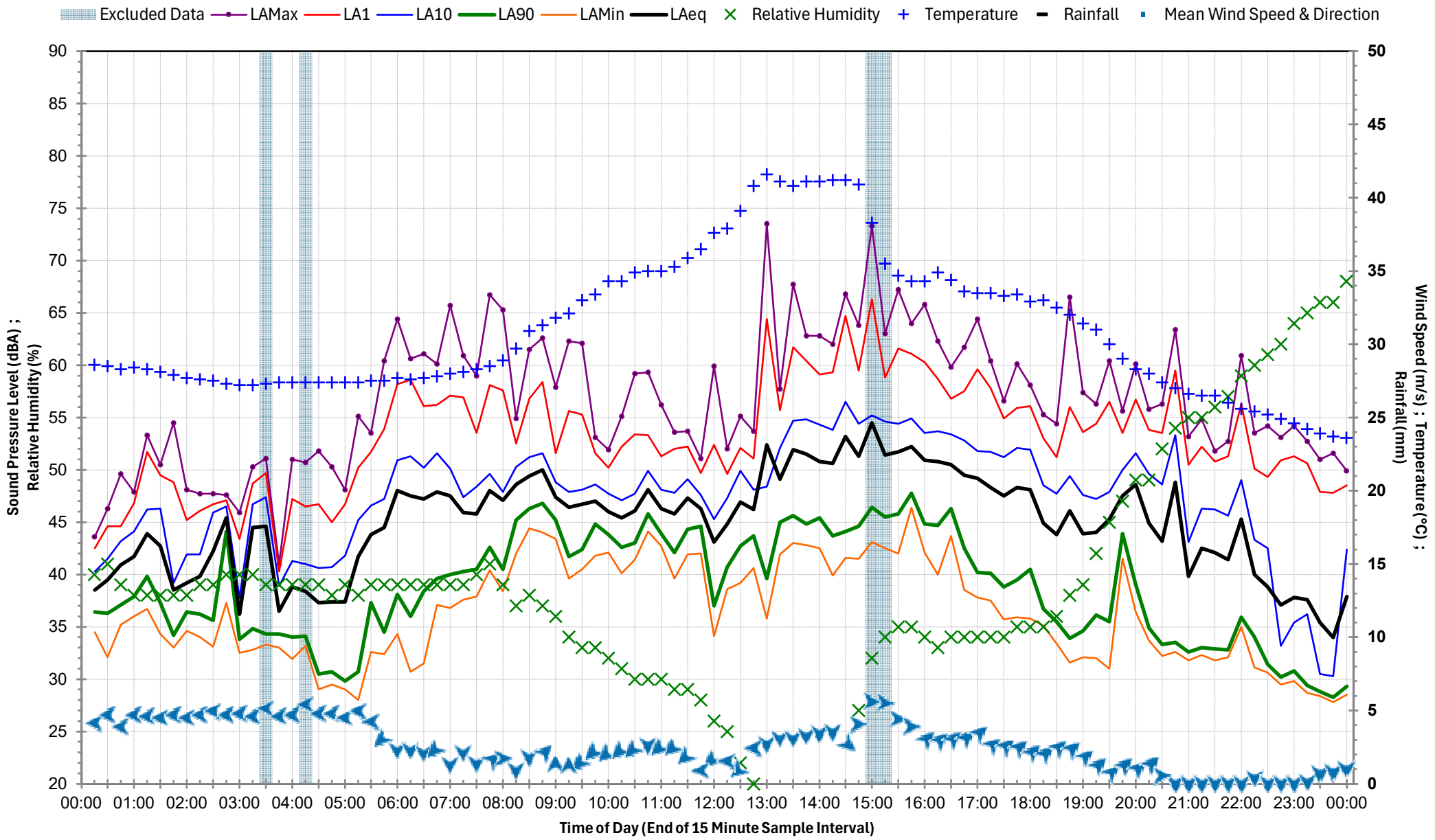
Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Tuesday 21 January 2025



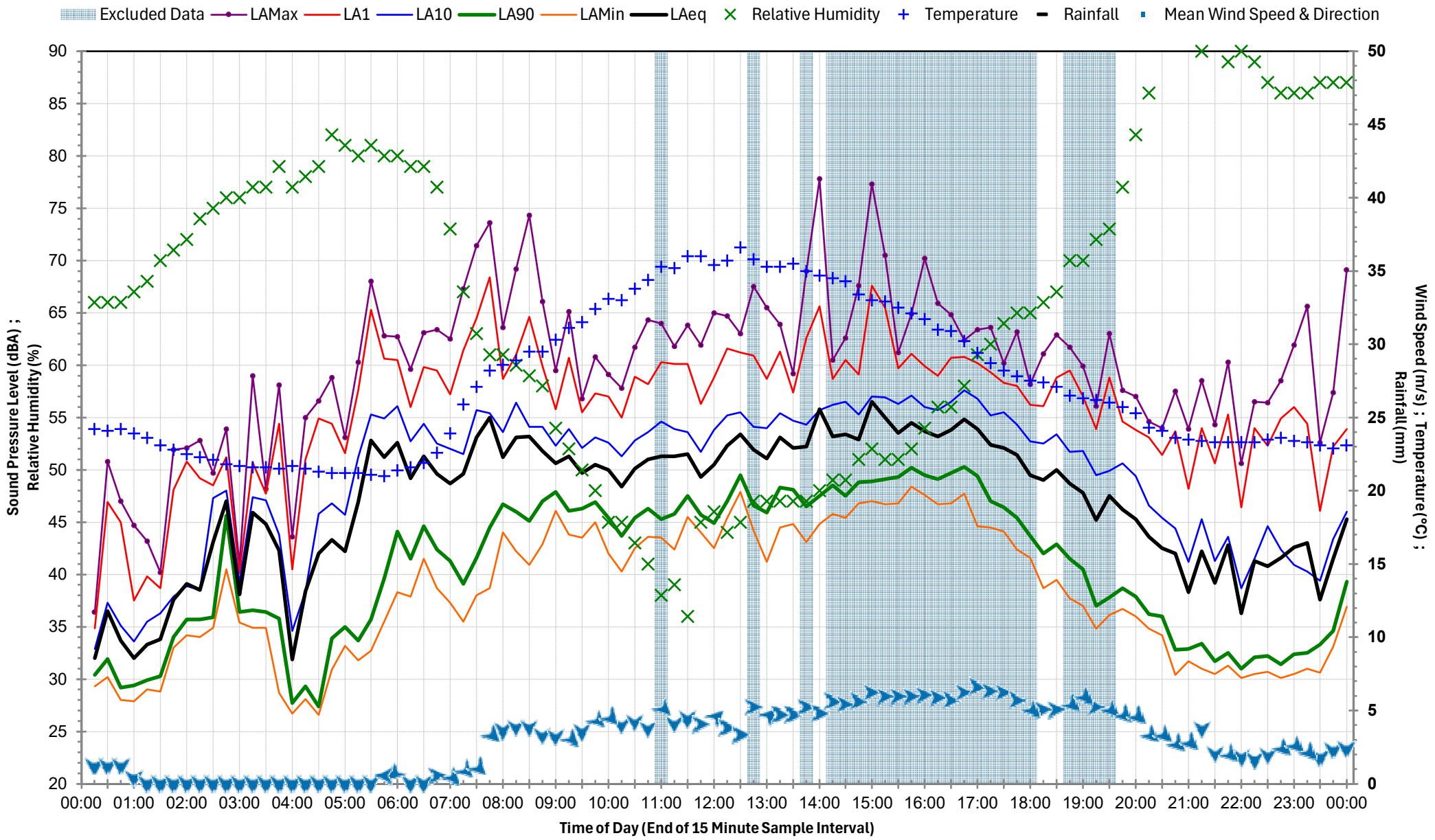
Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Wednesday 22 January 2025



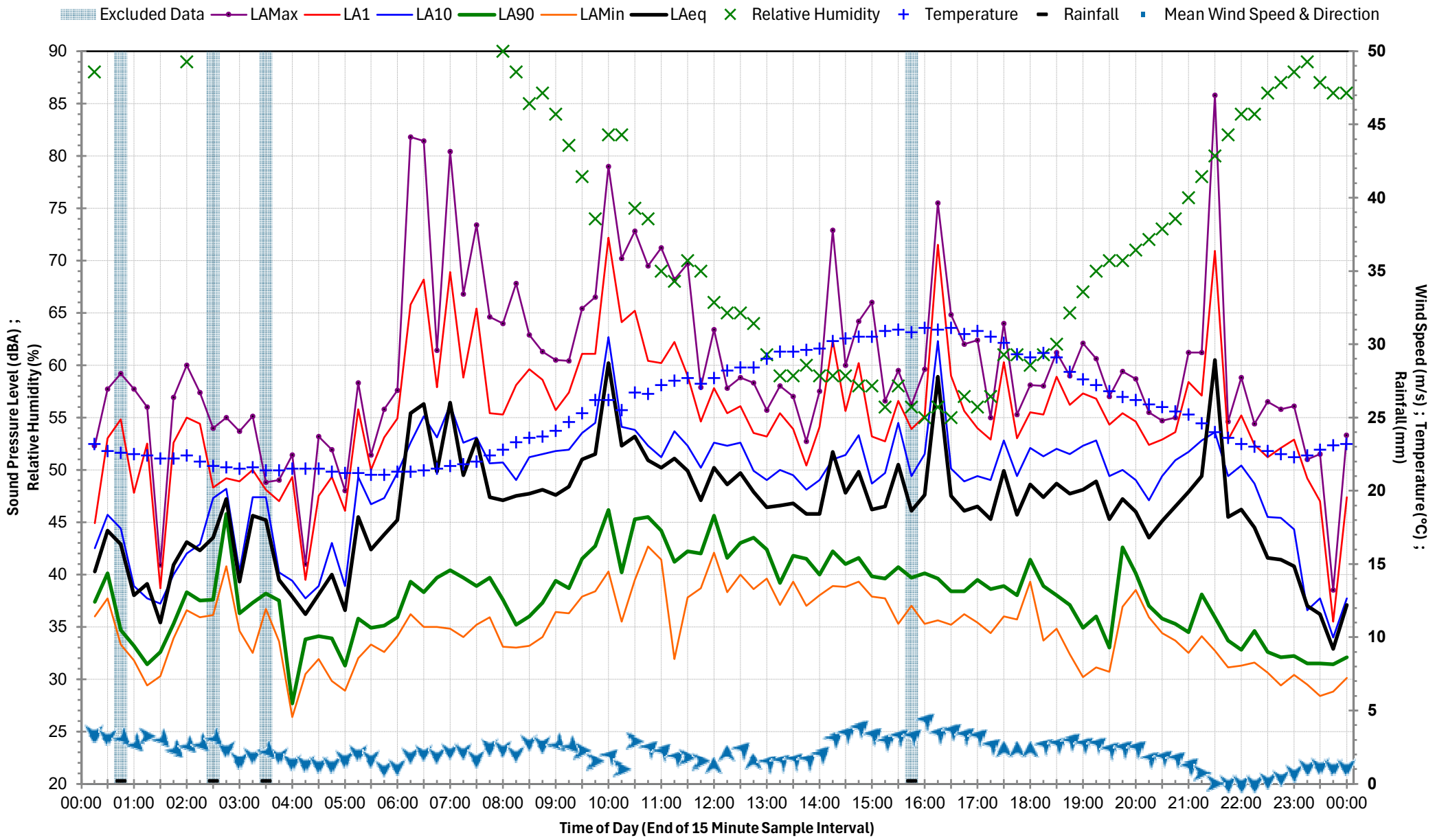
Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Thursday 23 January 2025



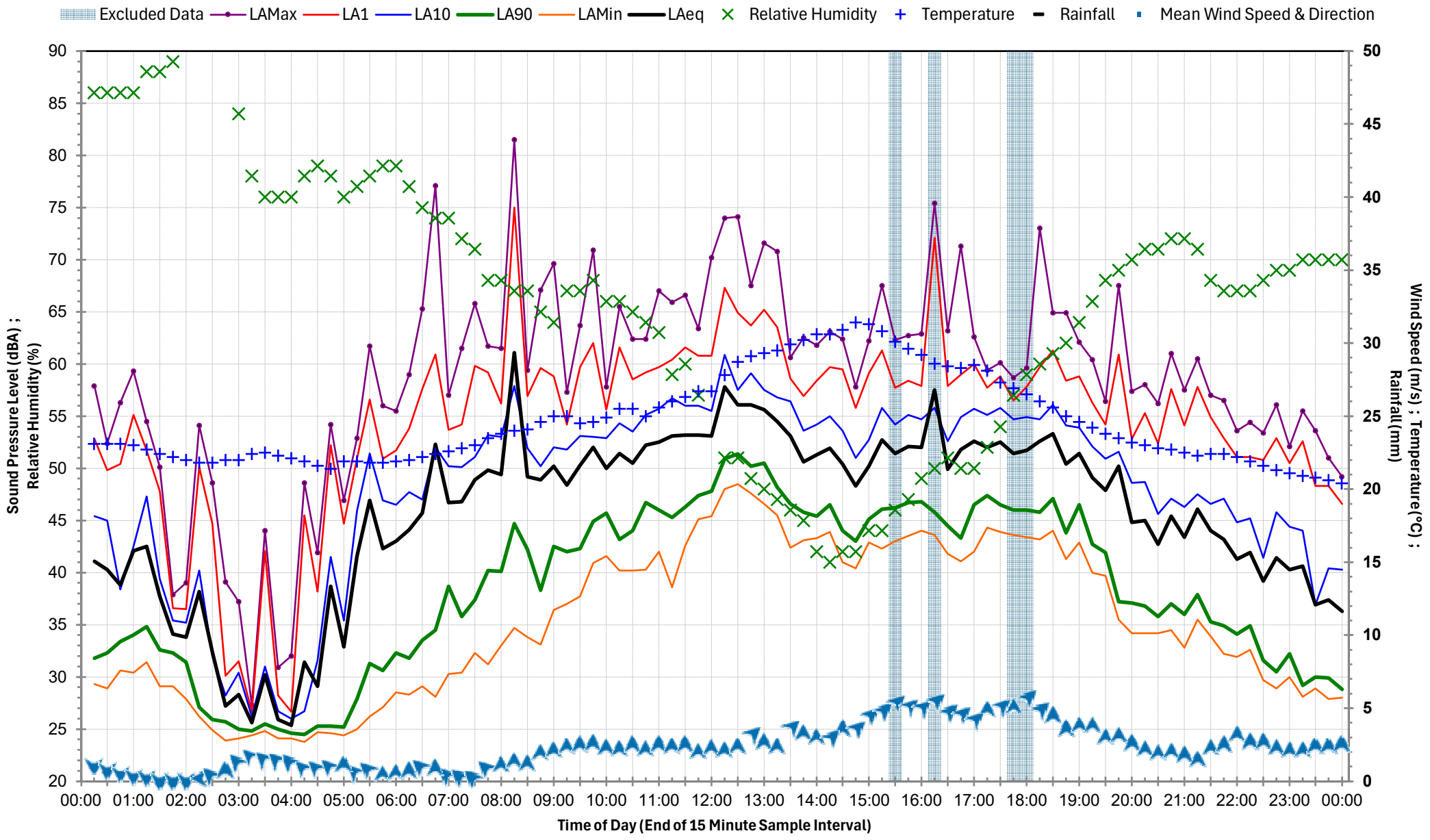
Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Friday 24 January 2025



Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Saturday 25 January 2025

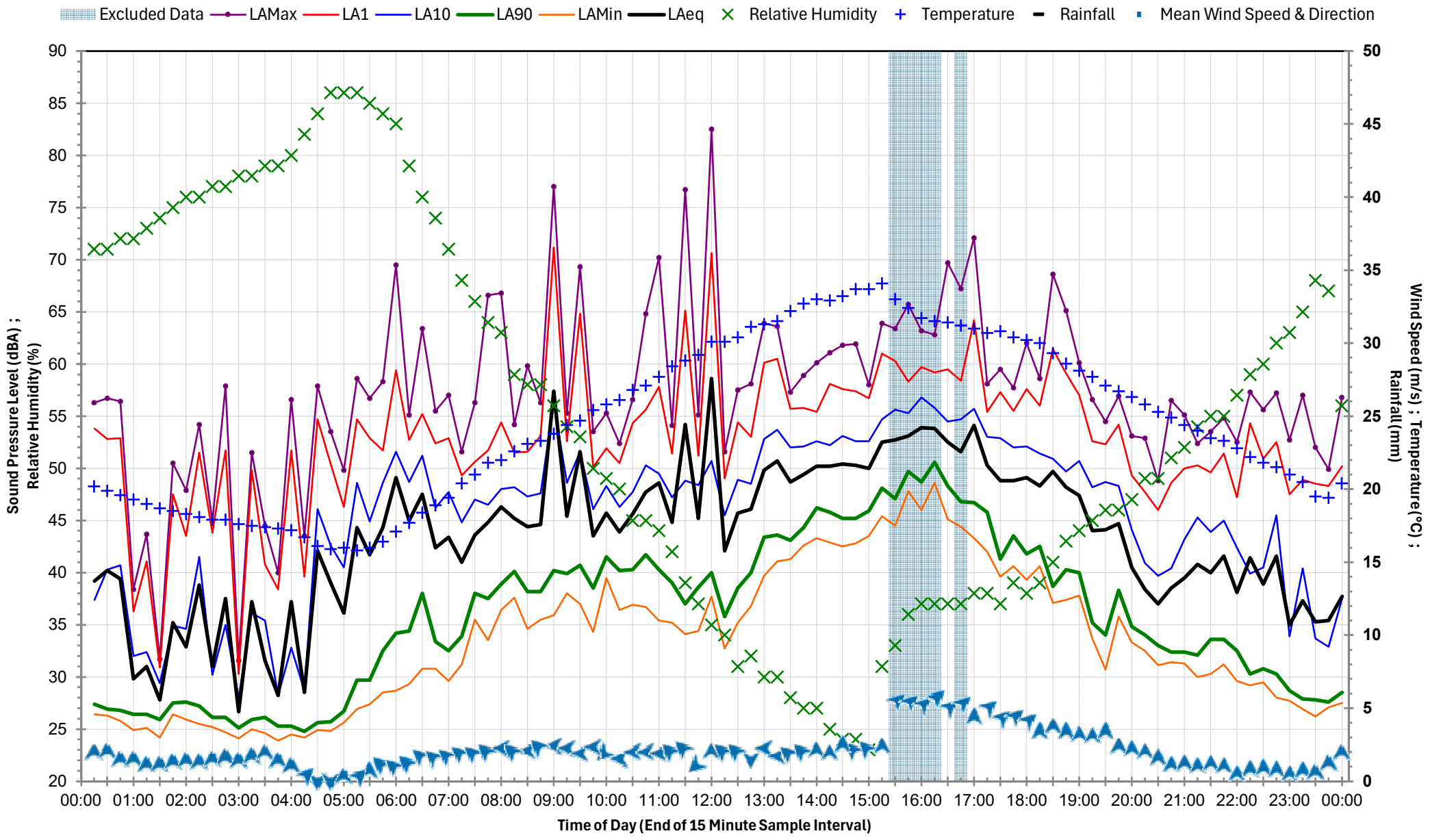


Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Sunday 26 January 2025

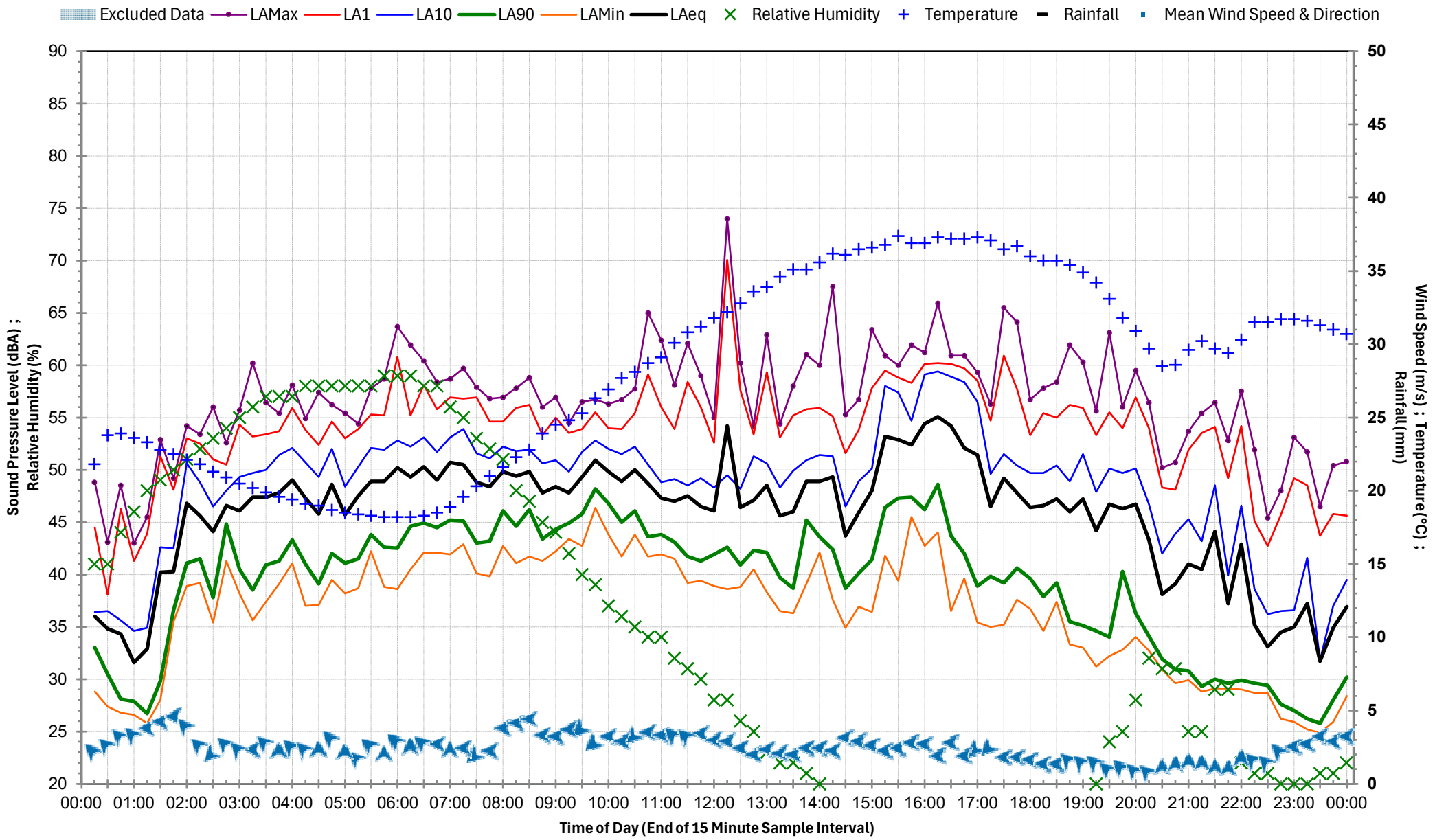


Statistical Ambient Noise Levels

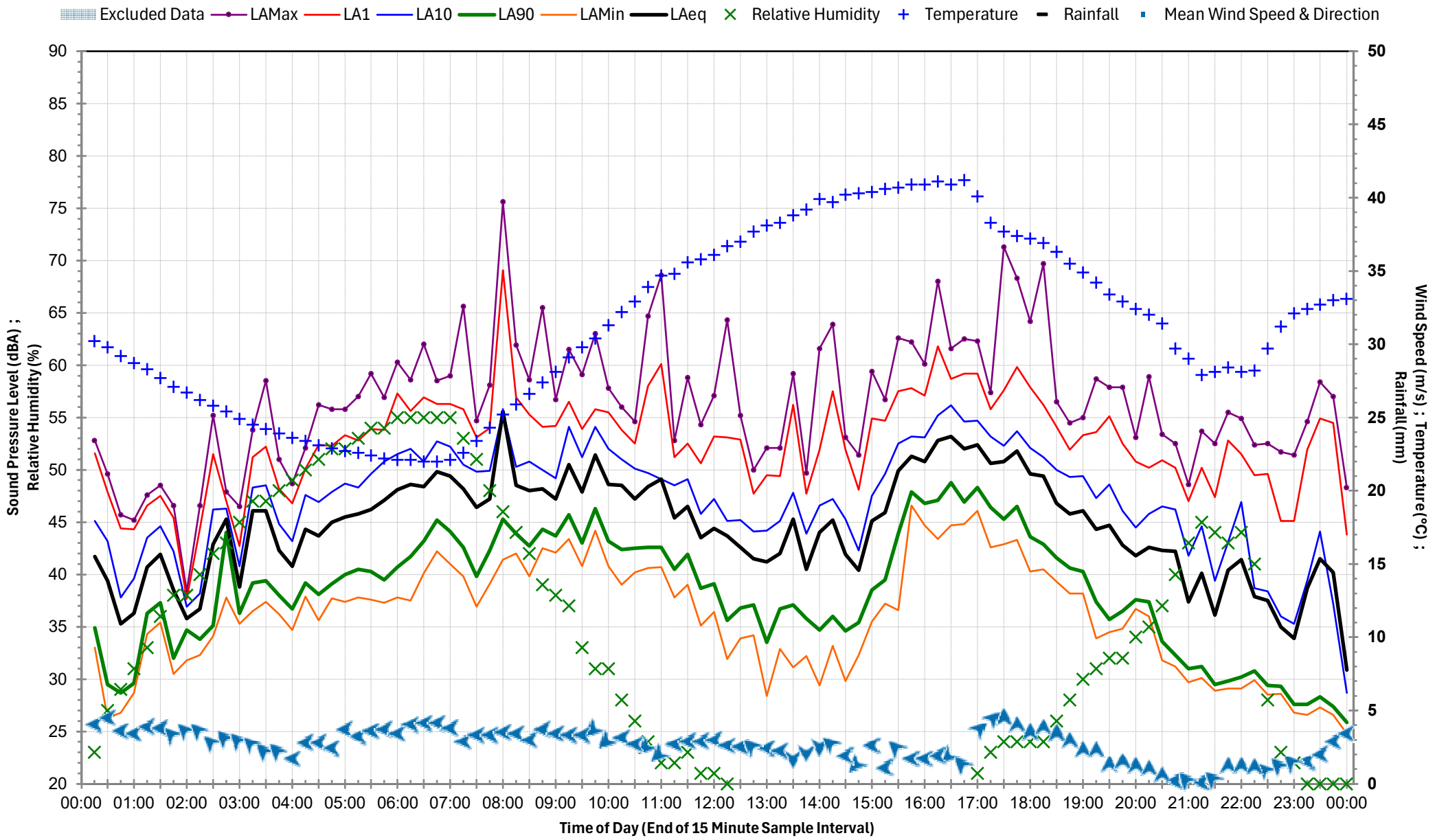
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Monday 27 January 2025



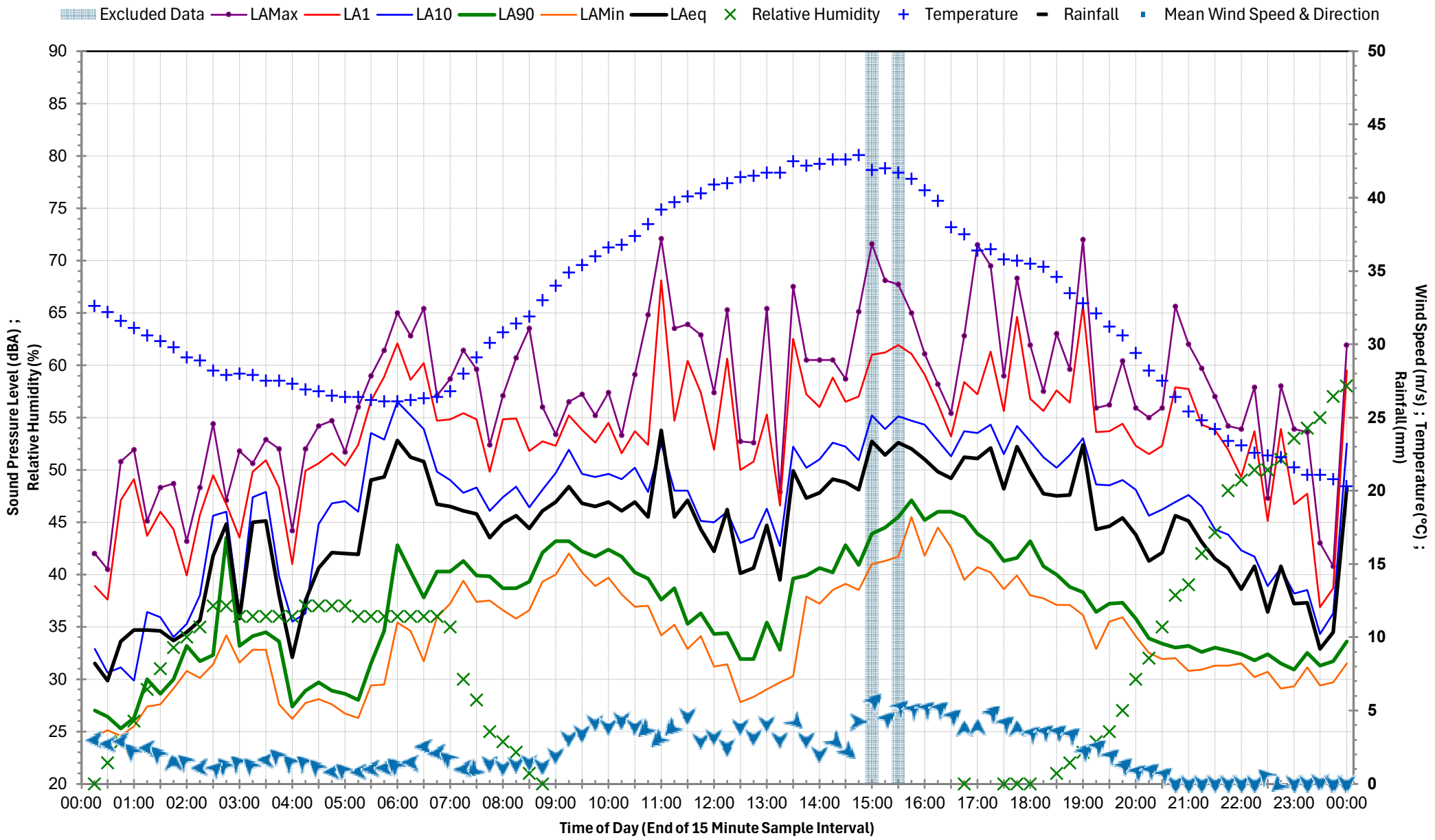
Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Tuesday 28 January 2025



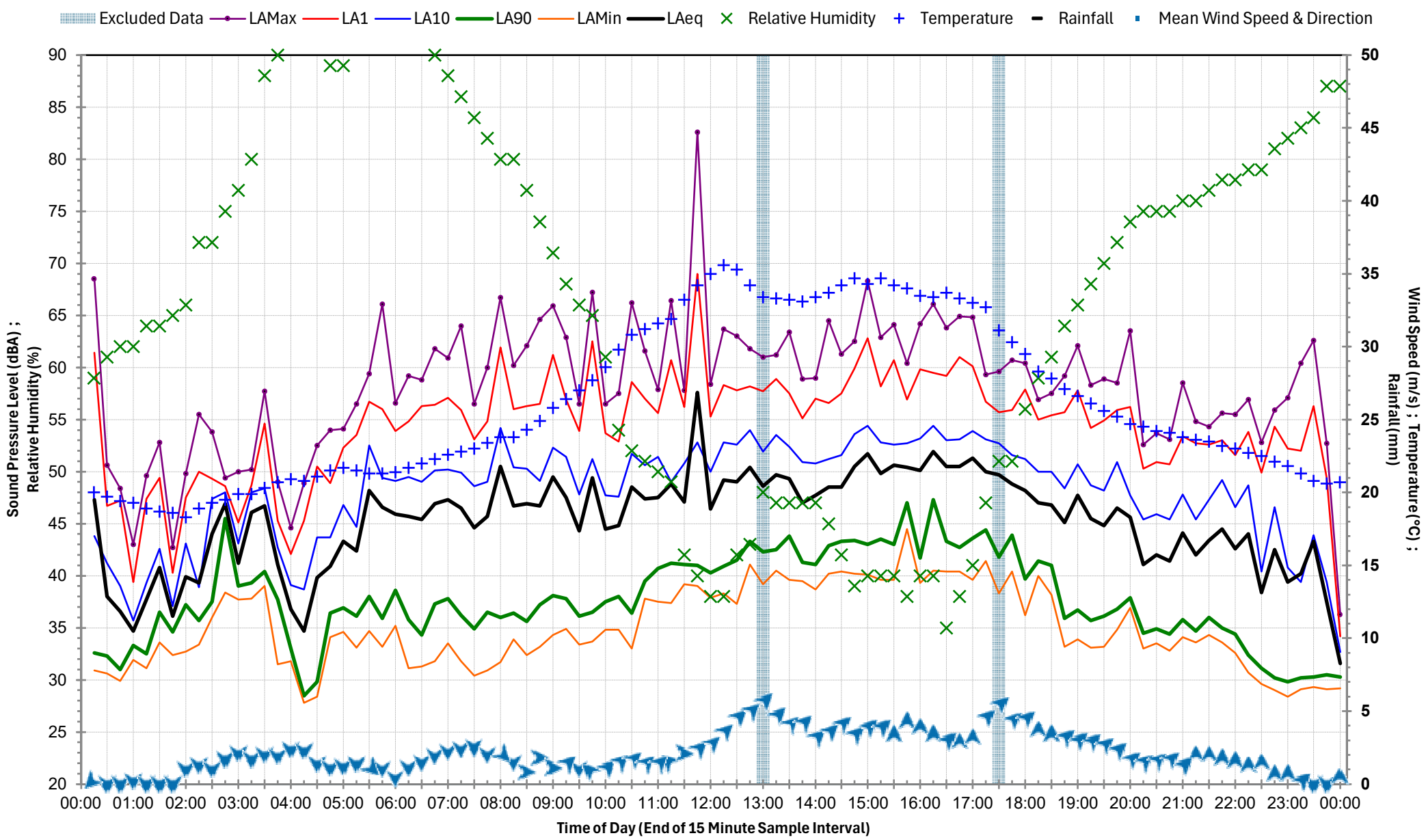
Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Wednesday 29 January 2025



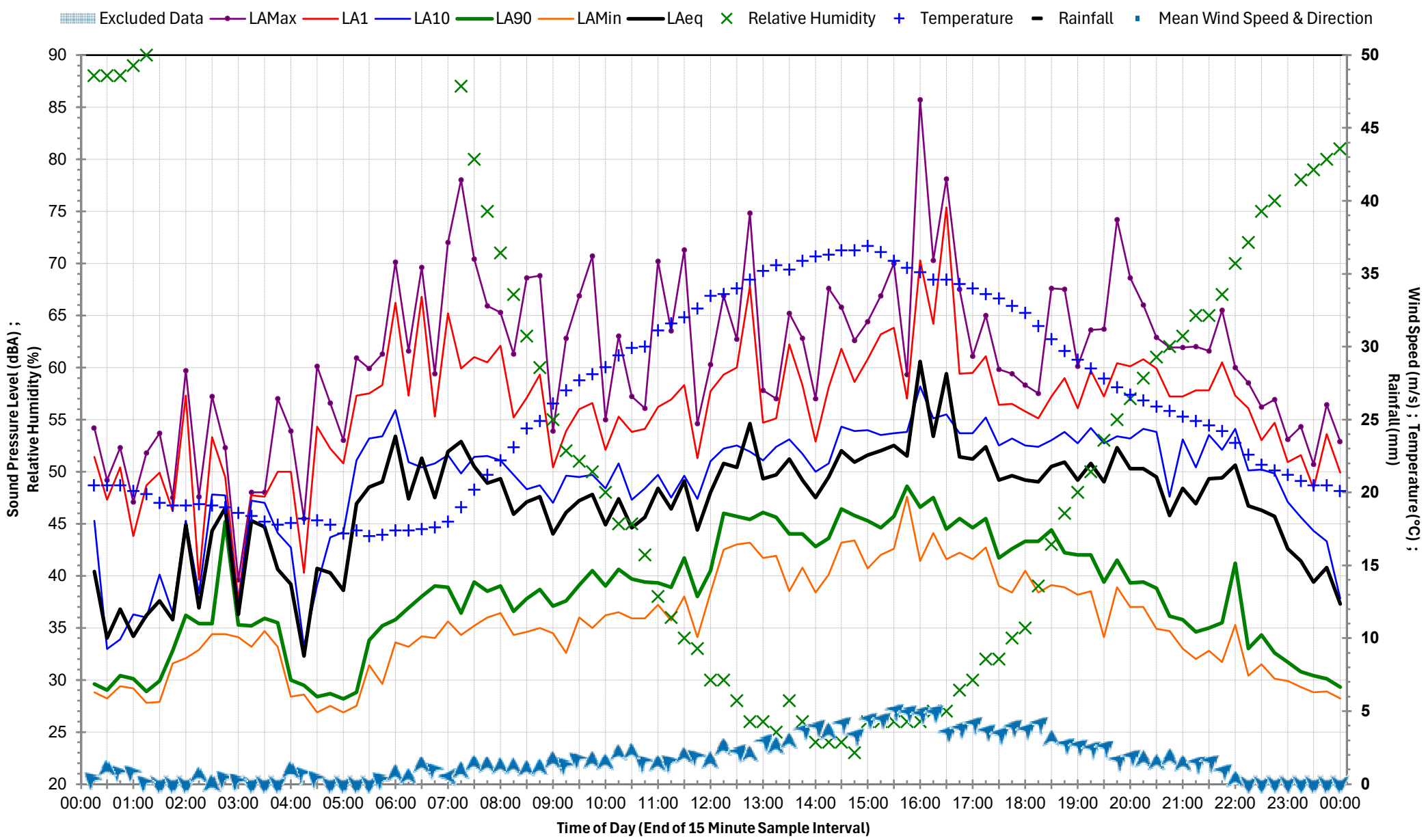
Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Thursday 30 January 2025



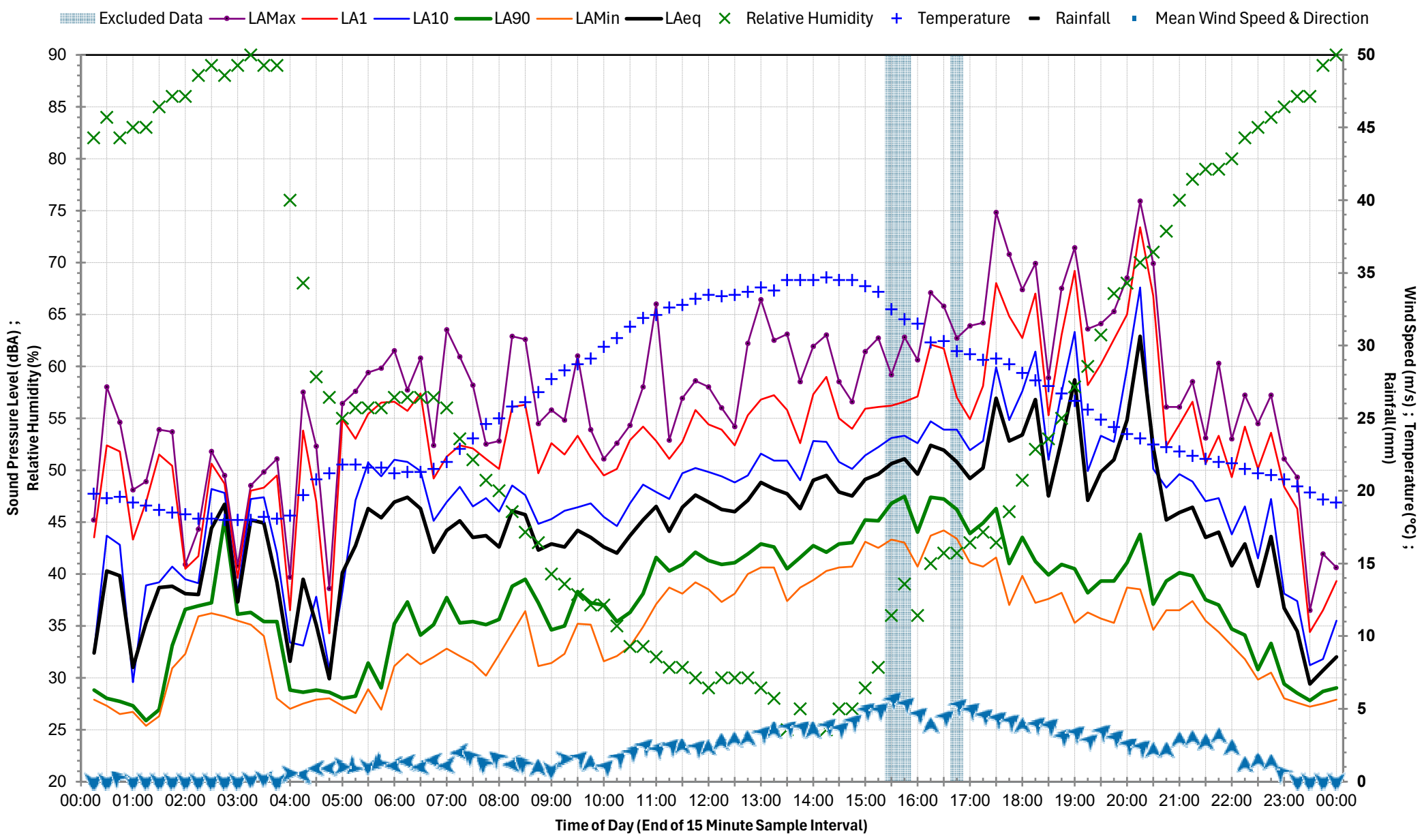
Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Friday 31 January 2025



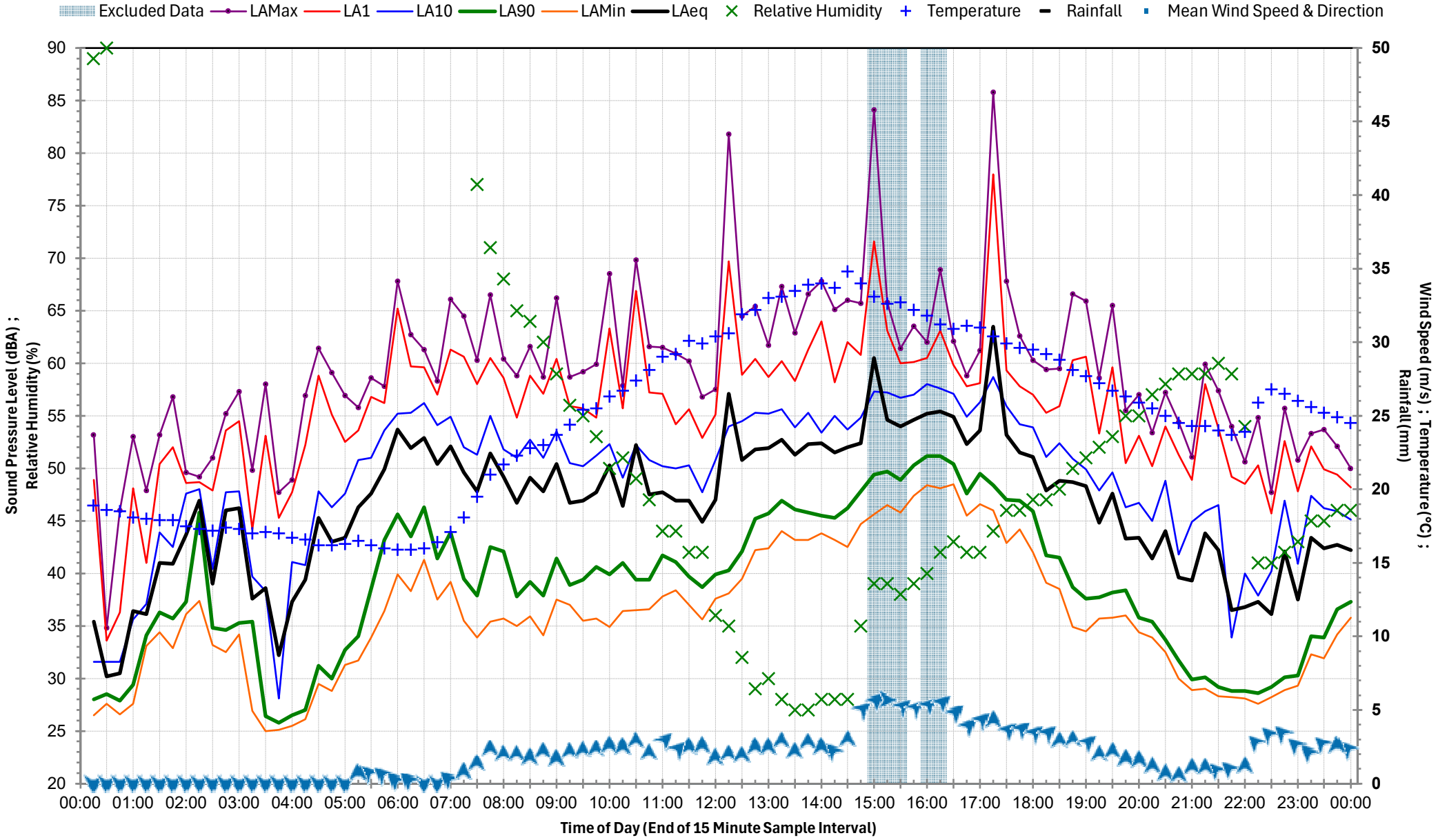
Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Saturday 1 February 2025



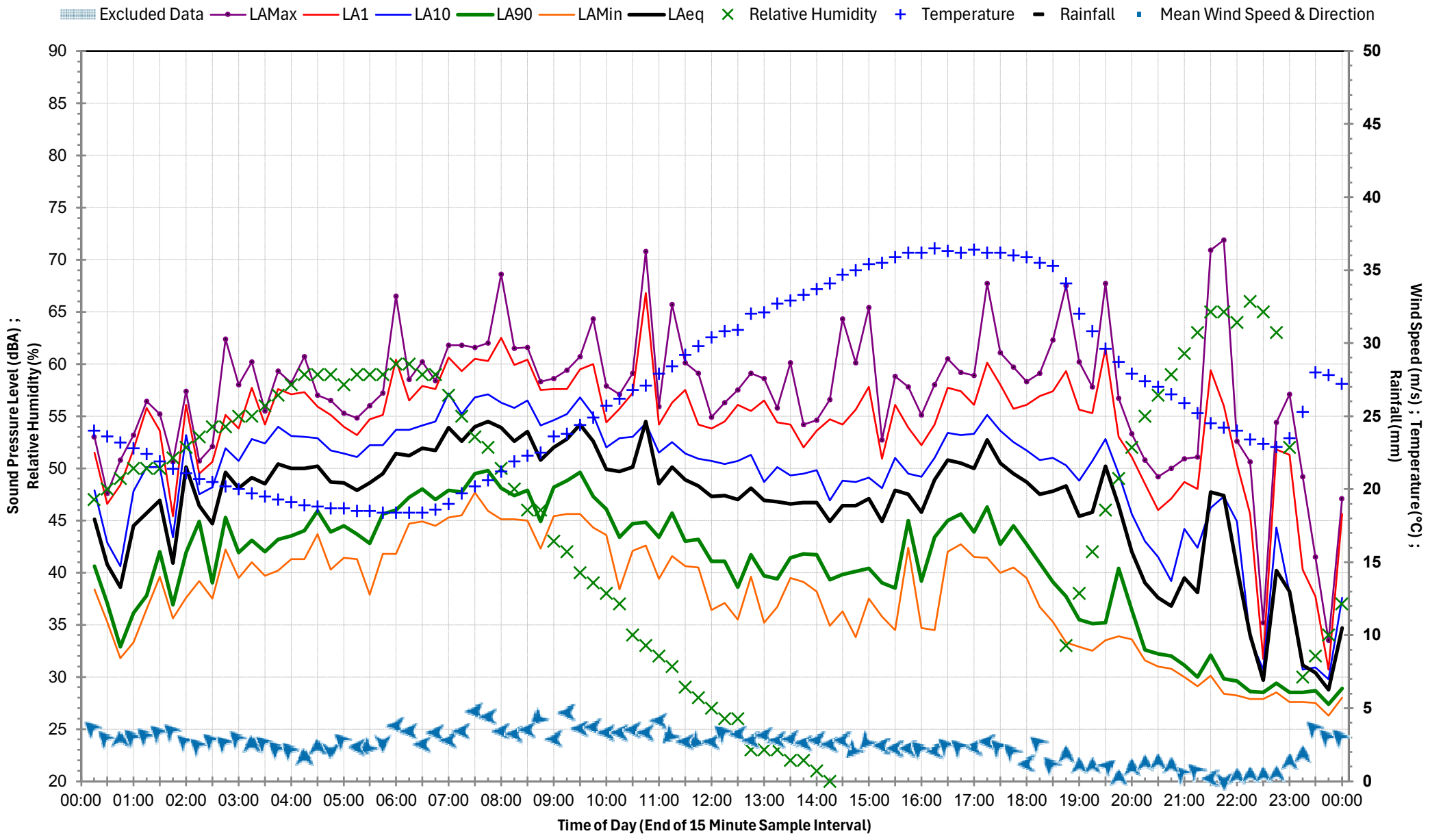
Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Sunday 2 February 2025



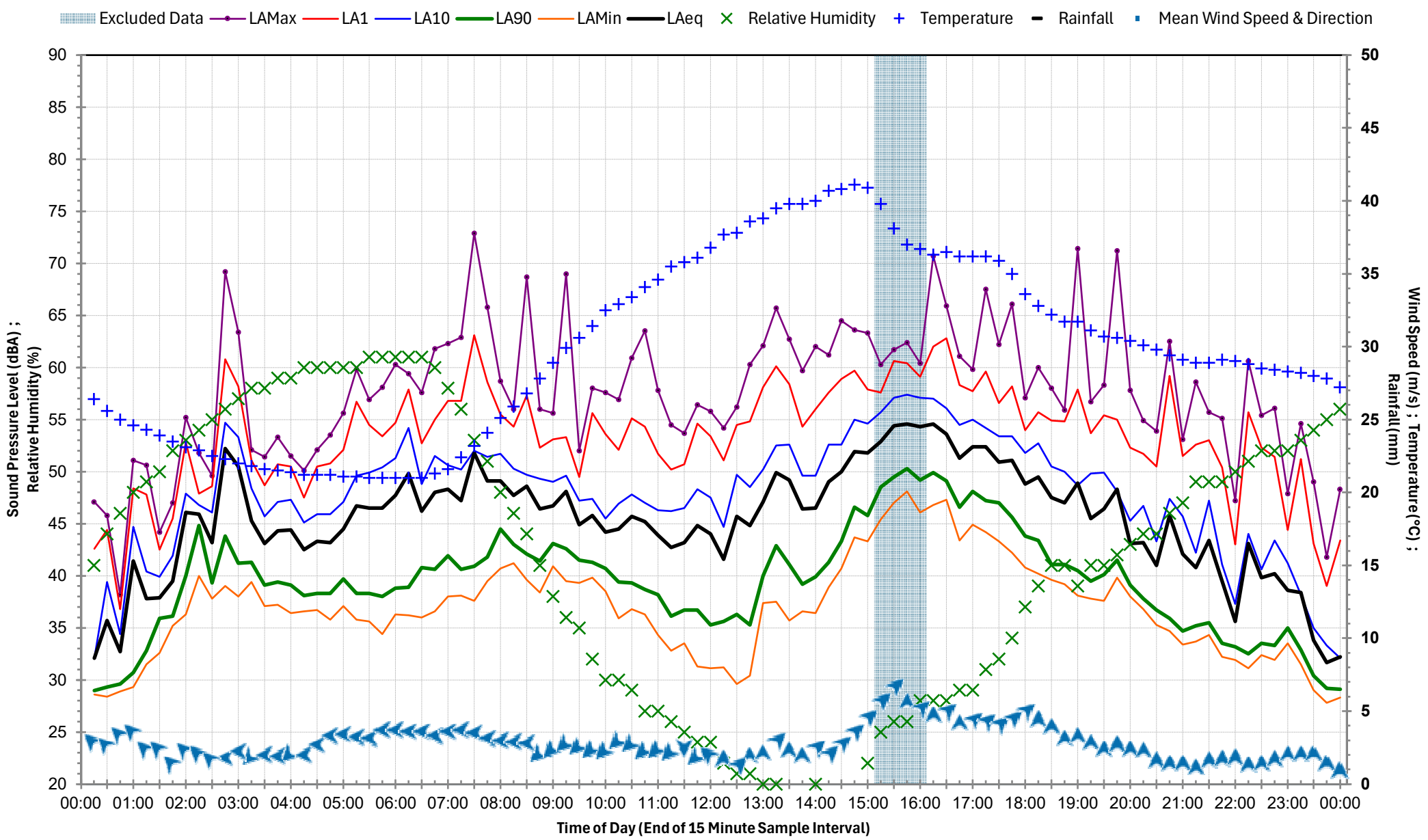
Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Monday 3 February 2025



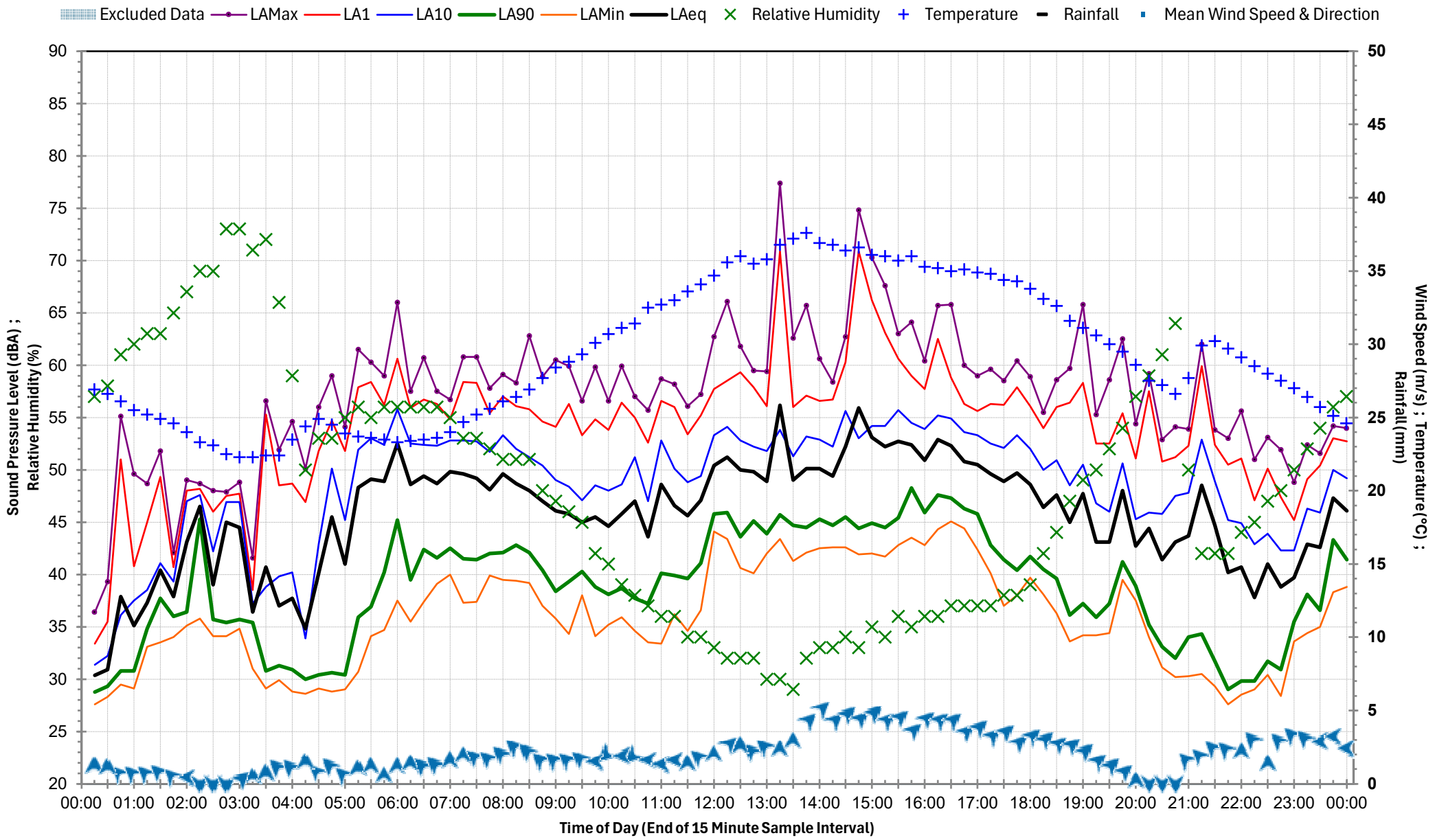
Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Tuesday 4 February 2025



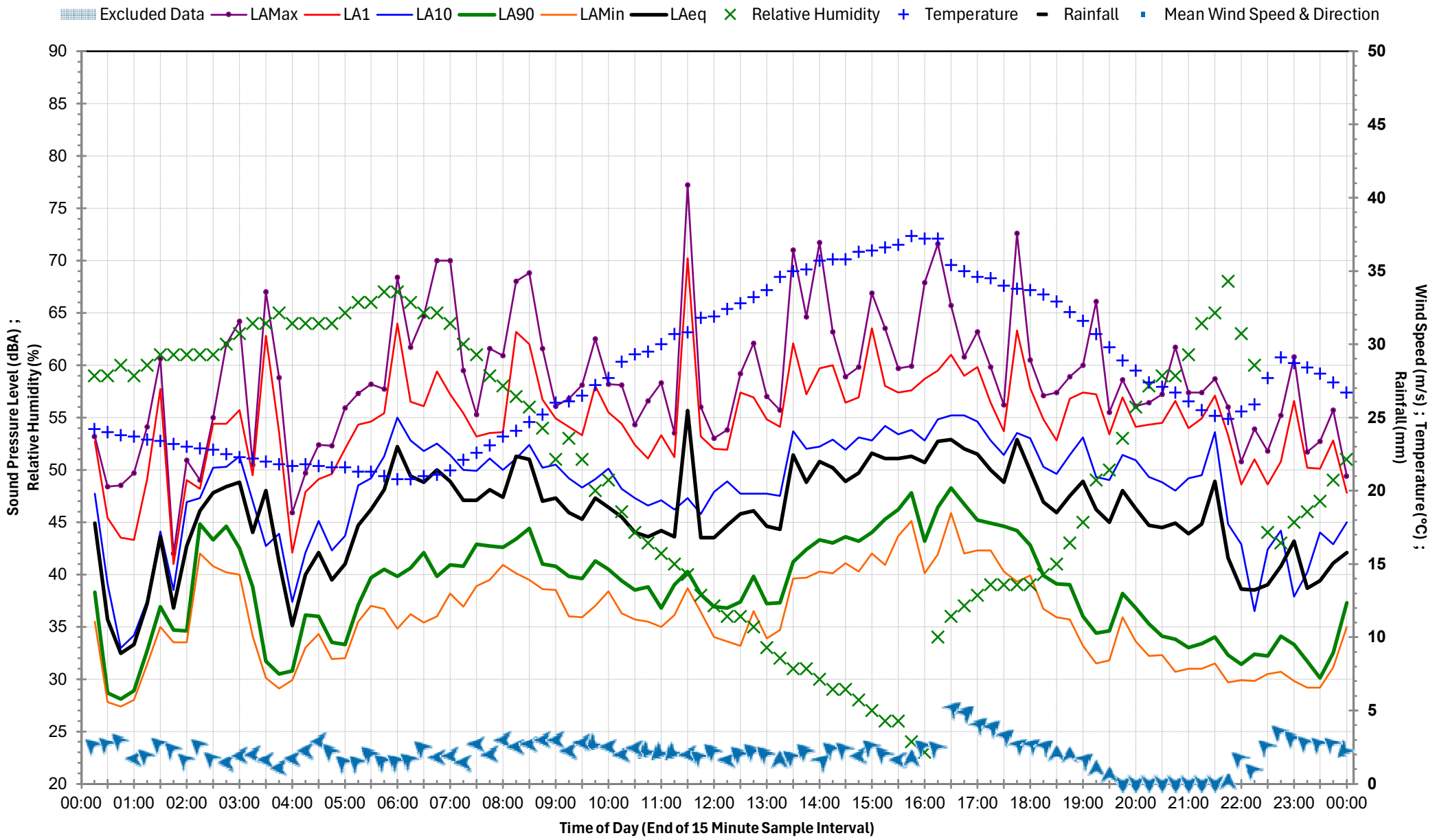
Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Wednesday 5 February 2025



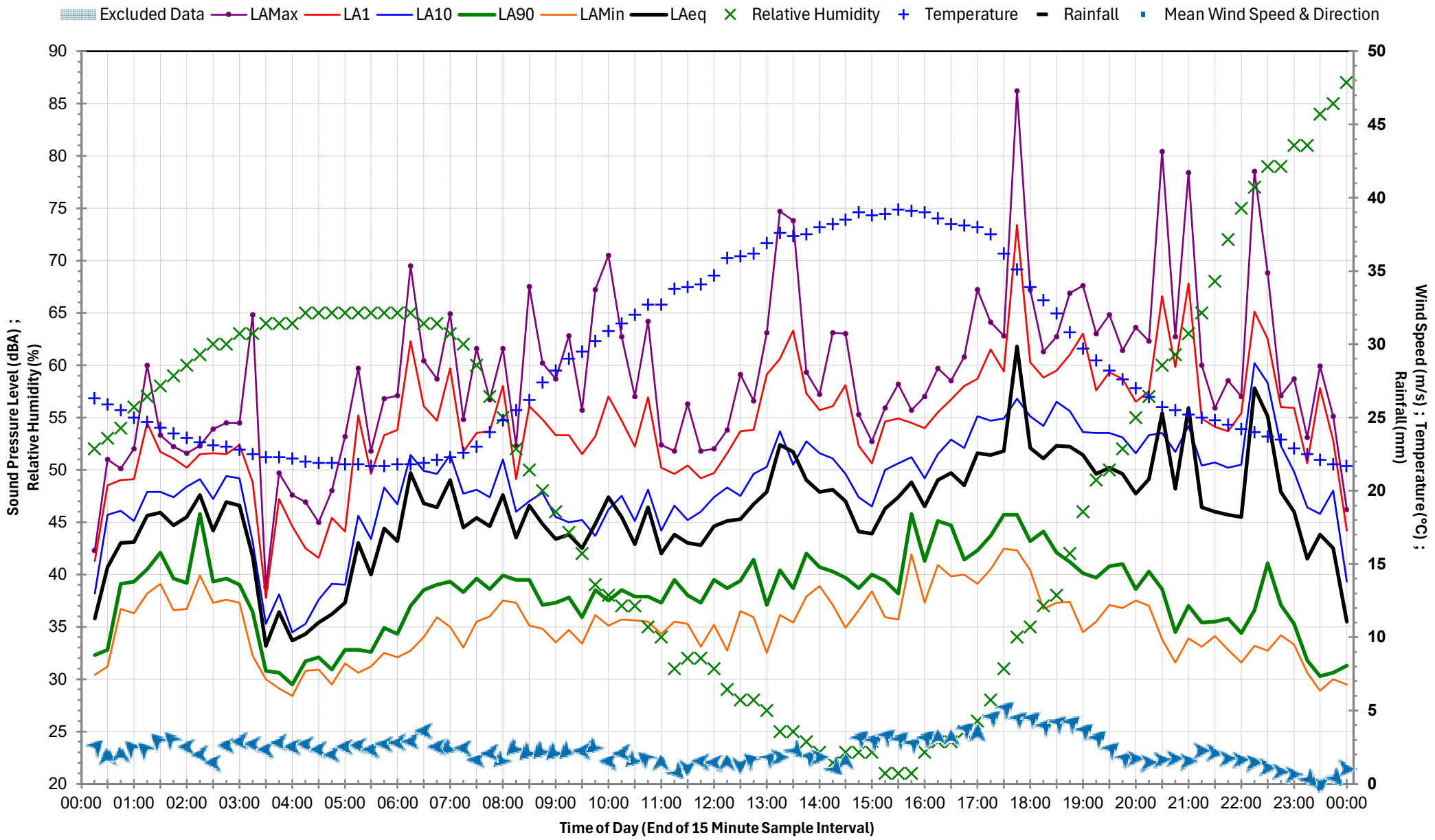
Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Thursday 6 February 2025



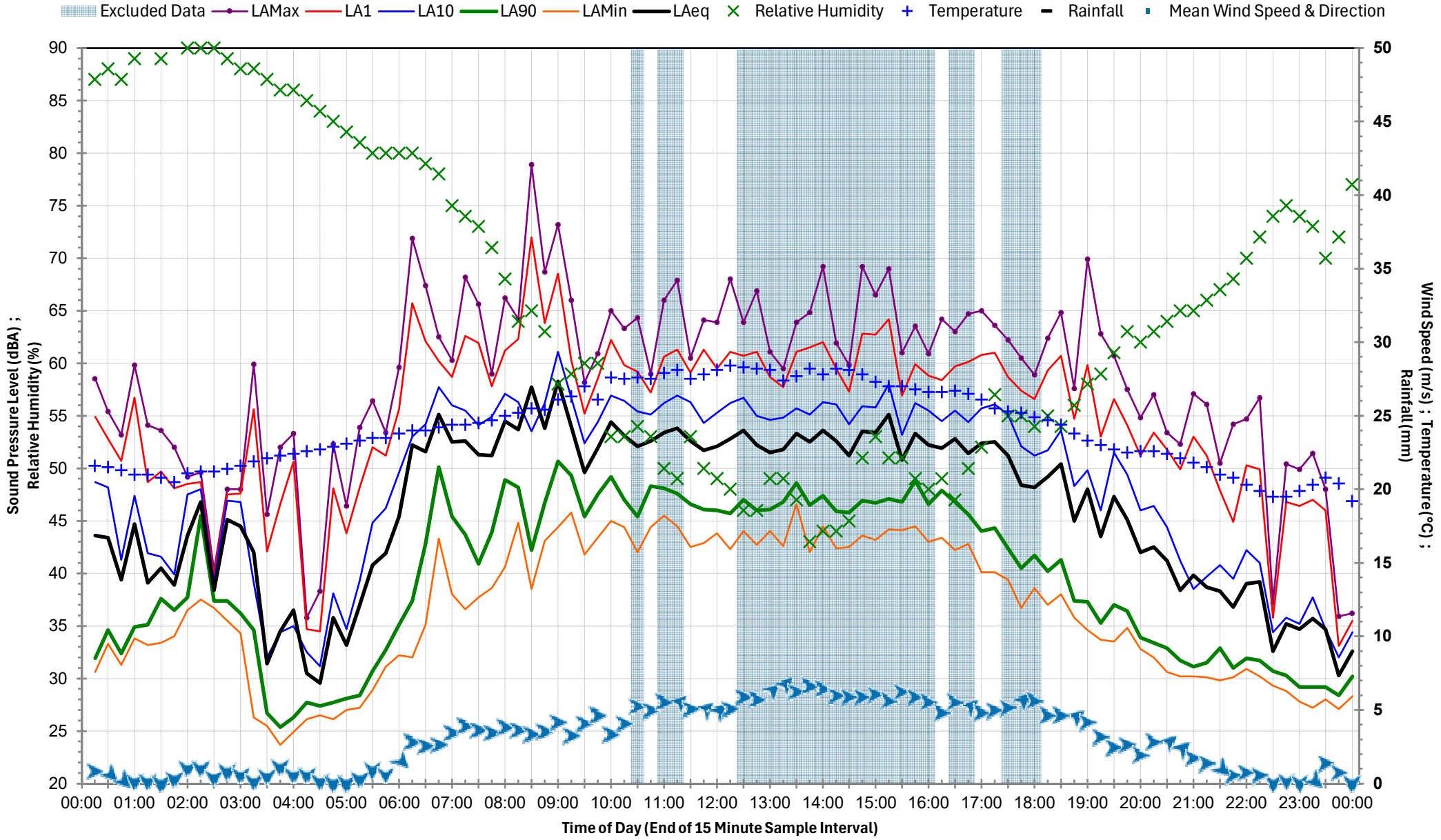
Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Friday 7 February 2025



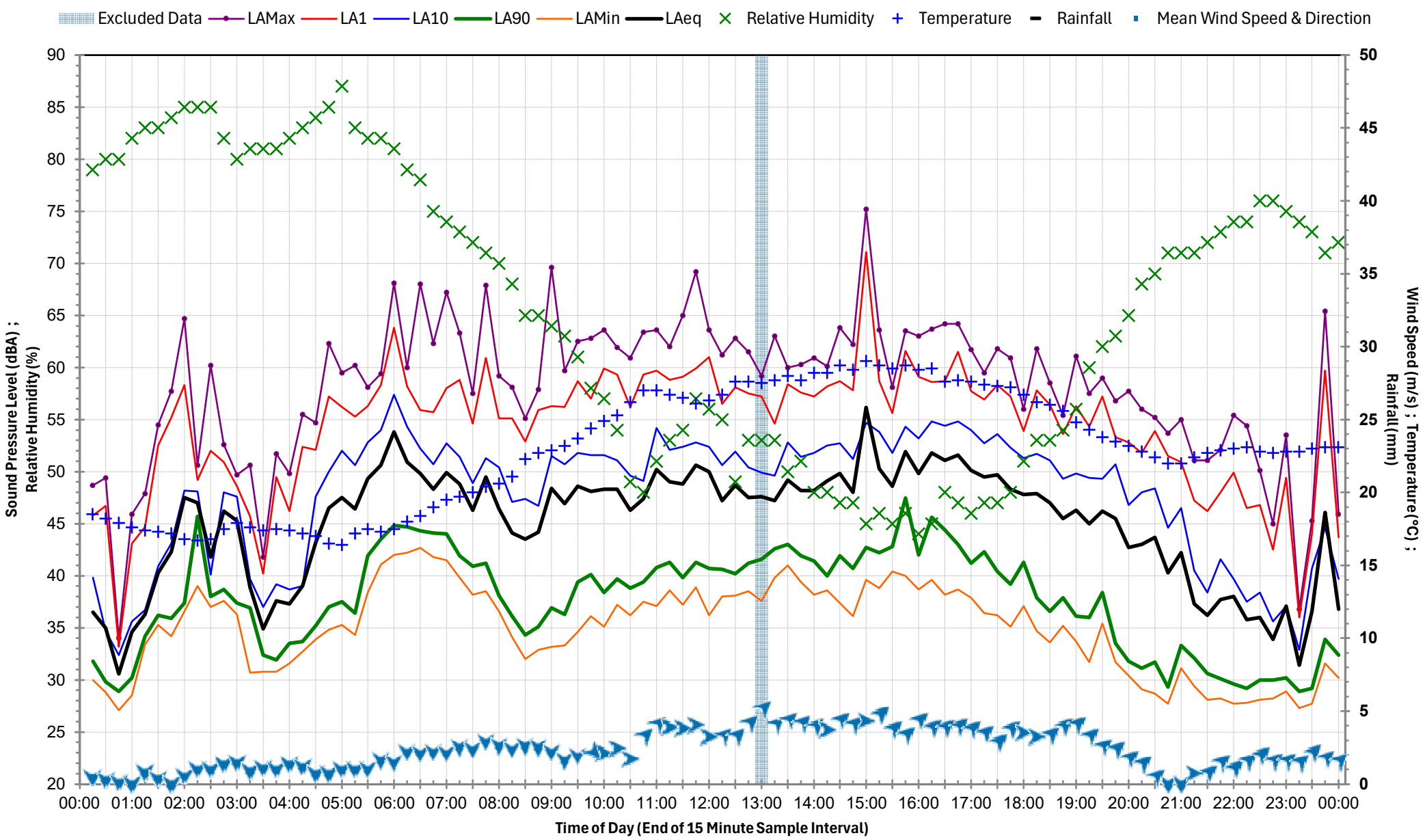
Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Saturday 8 February 2025



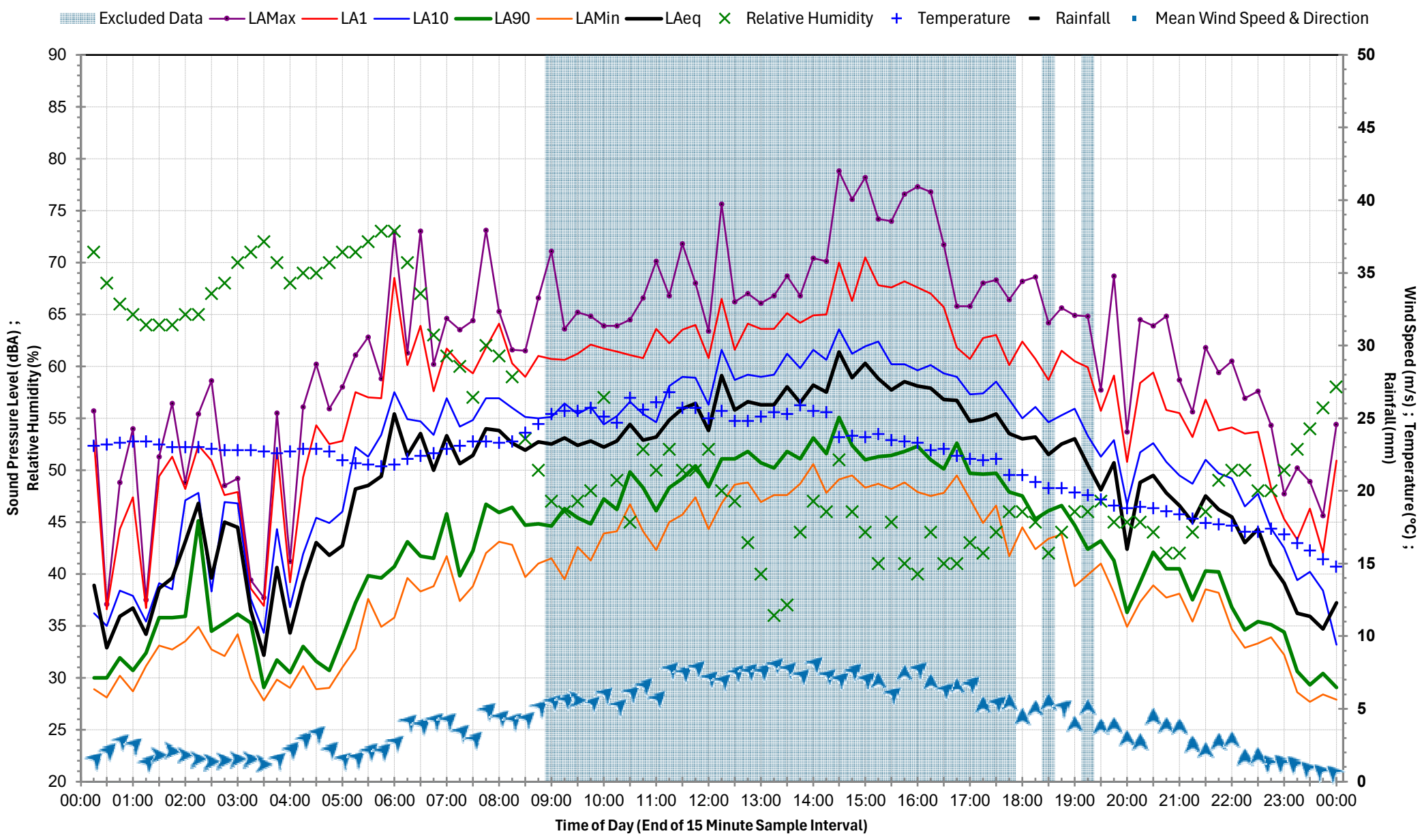
Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Sunday 9 February 2025



Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Monday 10 February 2025

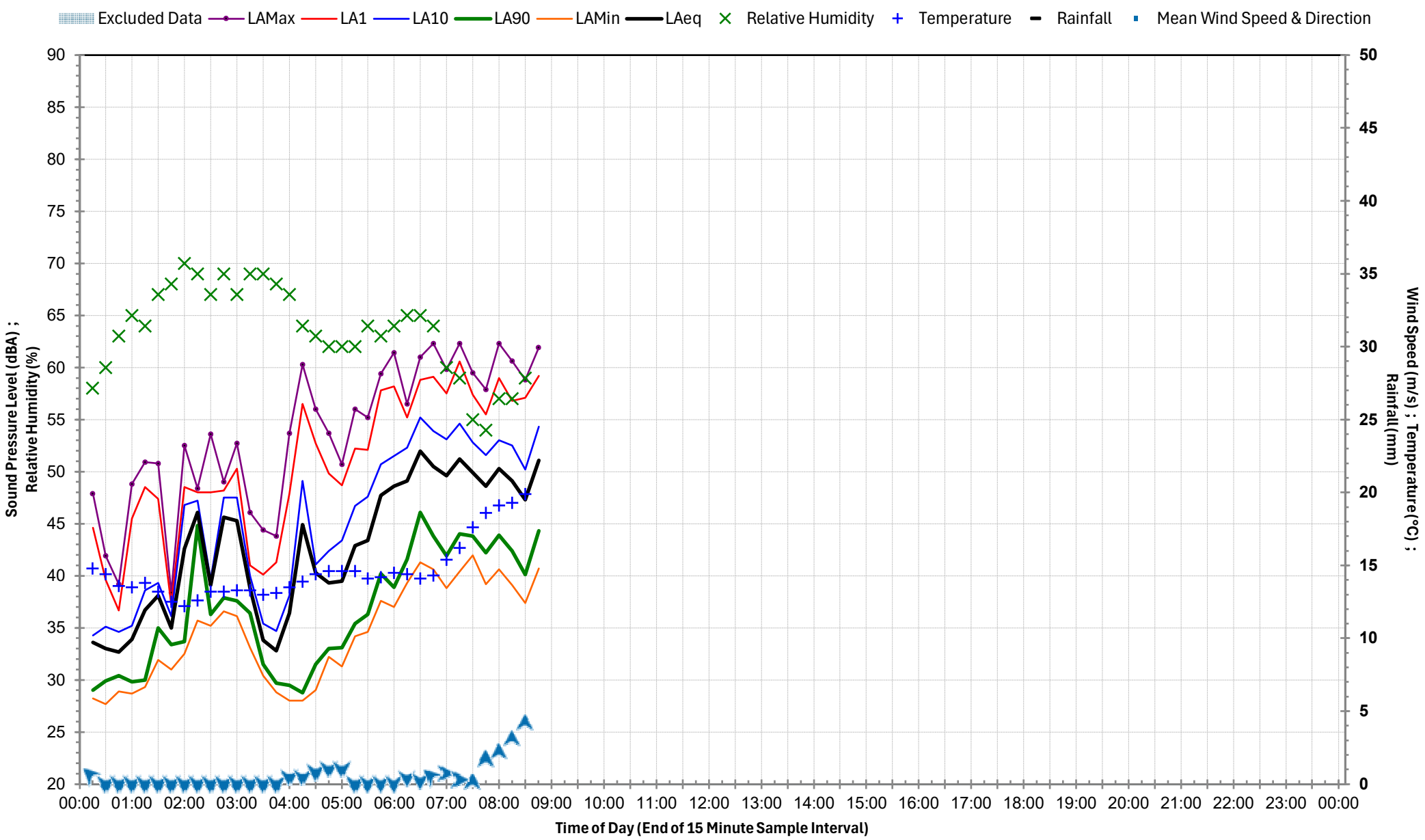


Statistical Ambient Noise Levels
Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Tuesday 11 February 2025



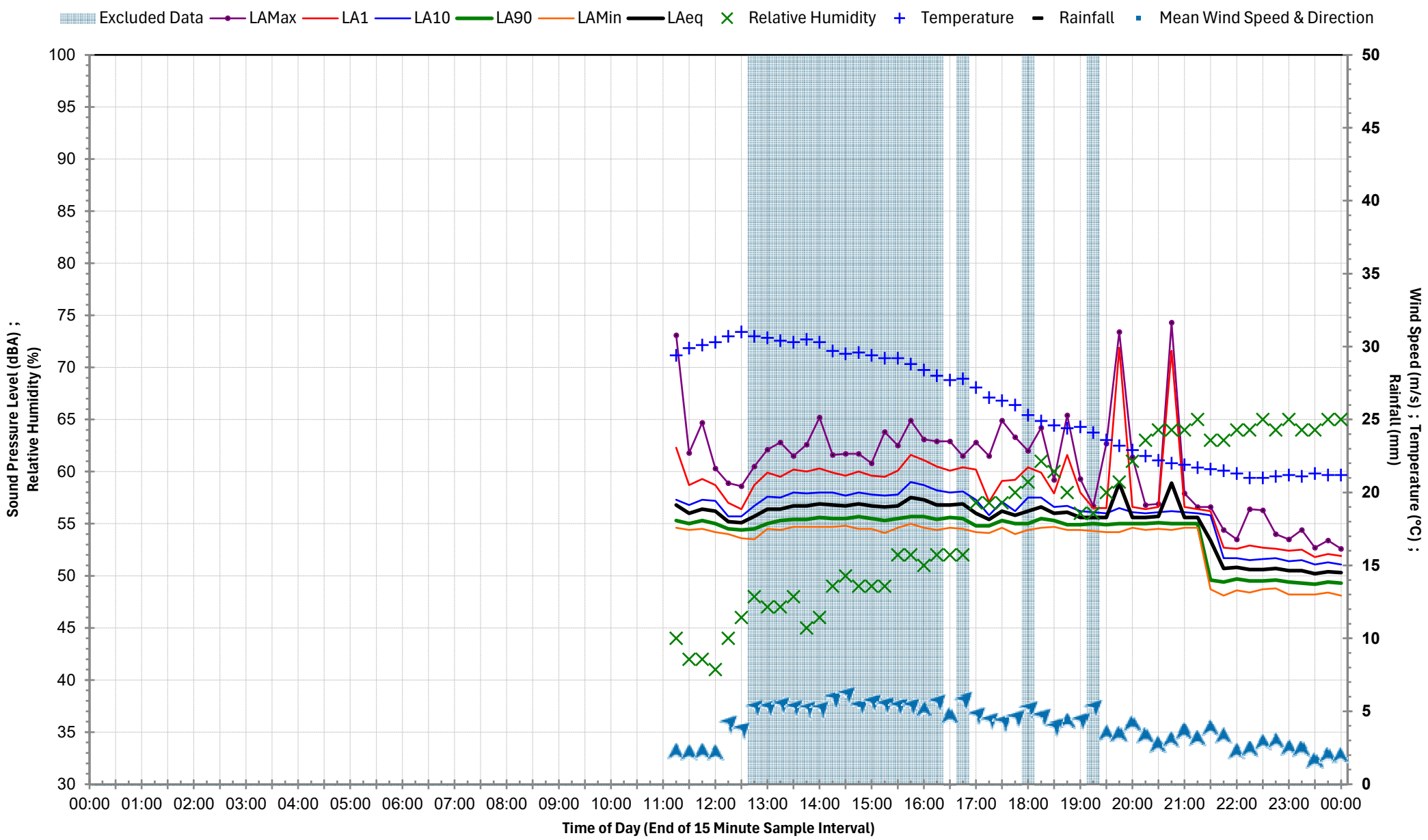
Statistical Ambient Noise Levels

Shell BESS - L3 - 1 Spence Road, Pinjar 6078 - Wednesday 12 February 2025

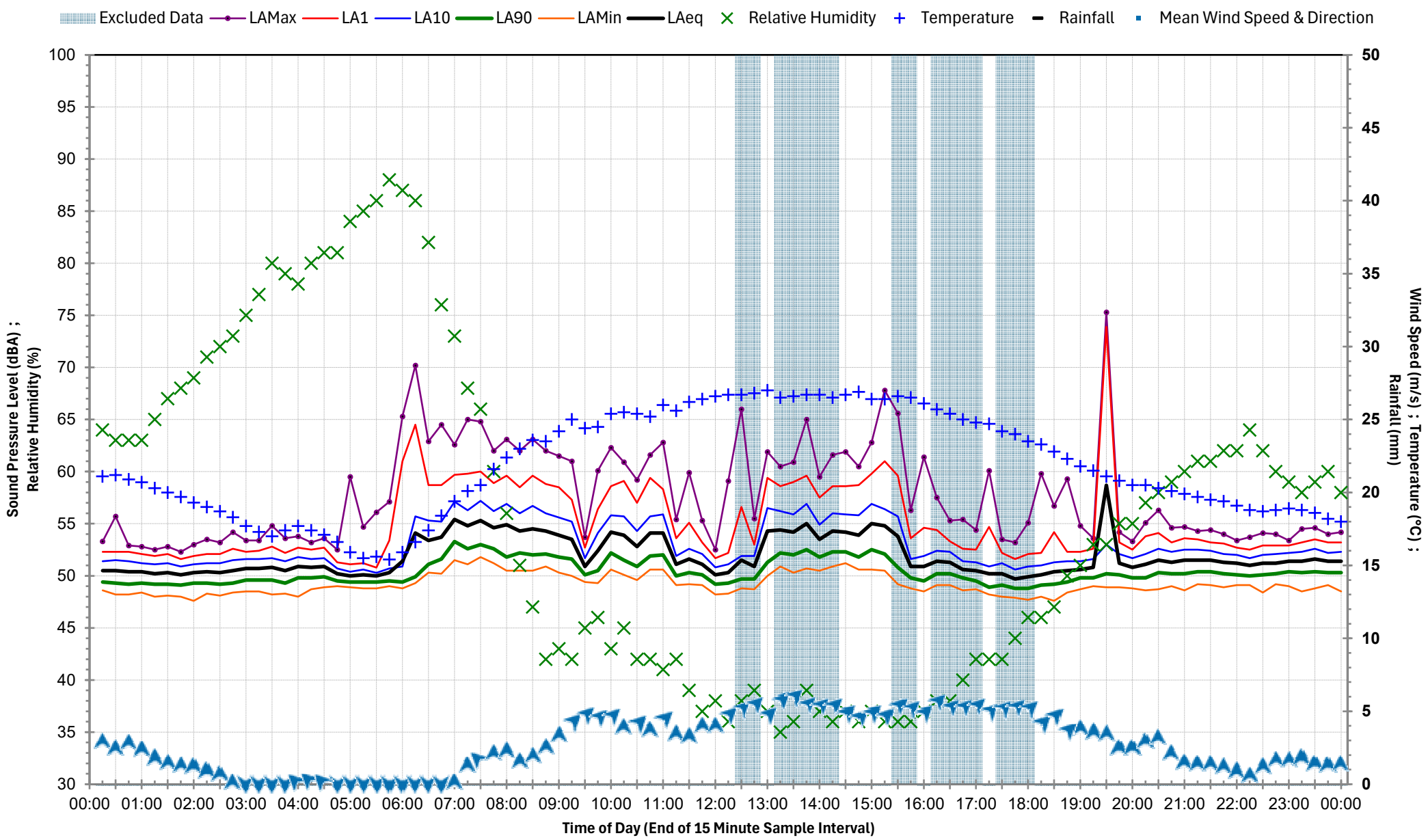


Logger 4

Statistical Ambient Noise Levels
Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Monday 13 January 2025

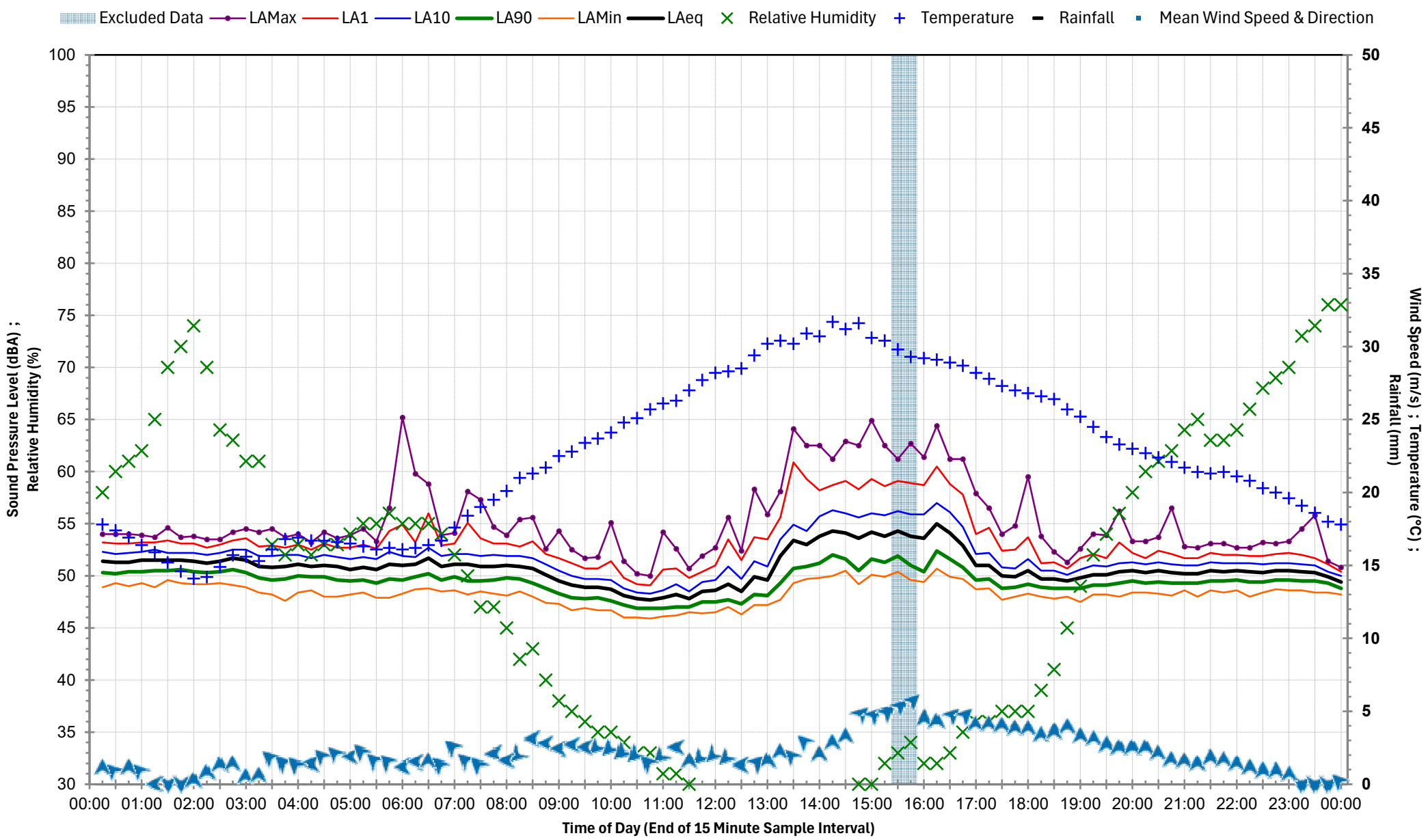


Statistical Ambient Noise Levels
Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Tuesday 14 January 2025



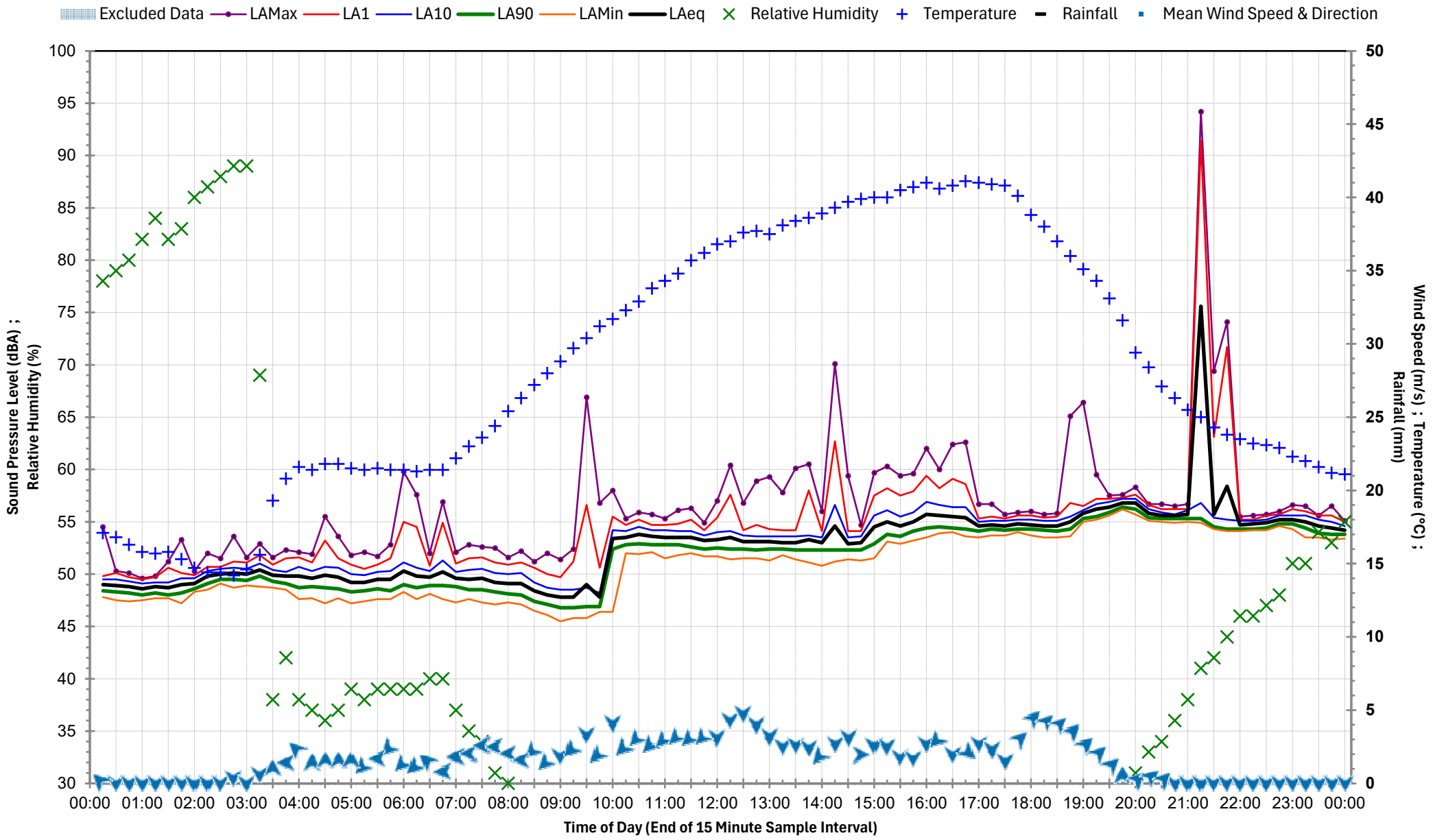
Statistical Ambient Noise Levels

Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Wednesday 15 January 2025



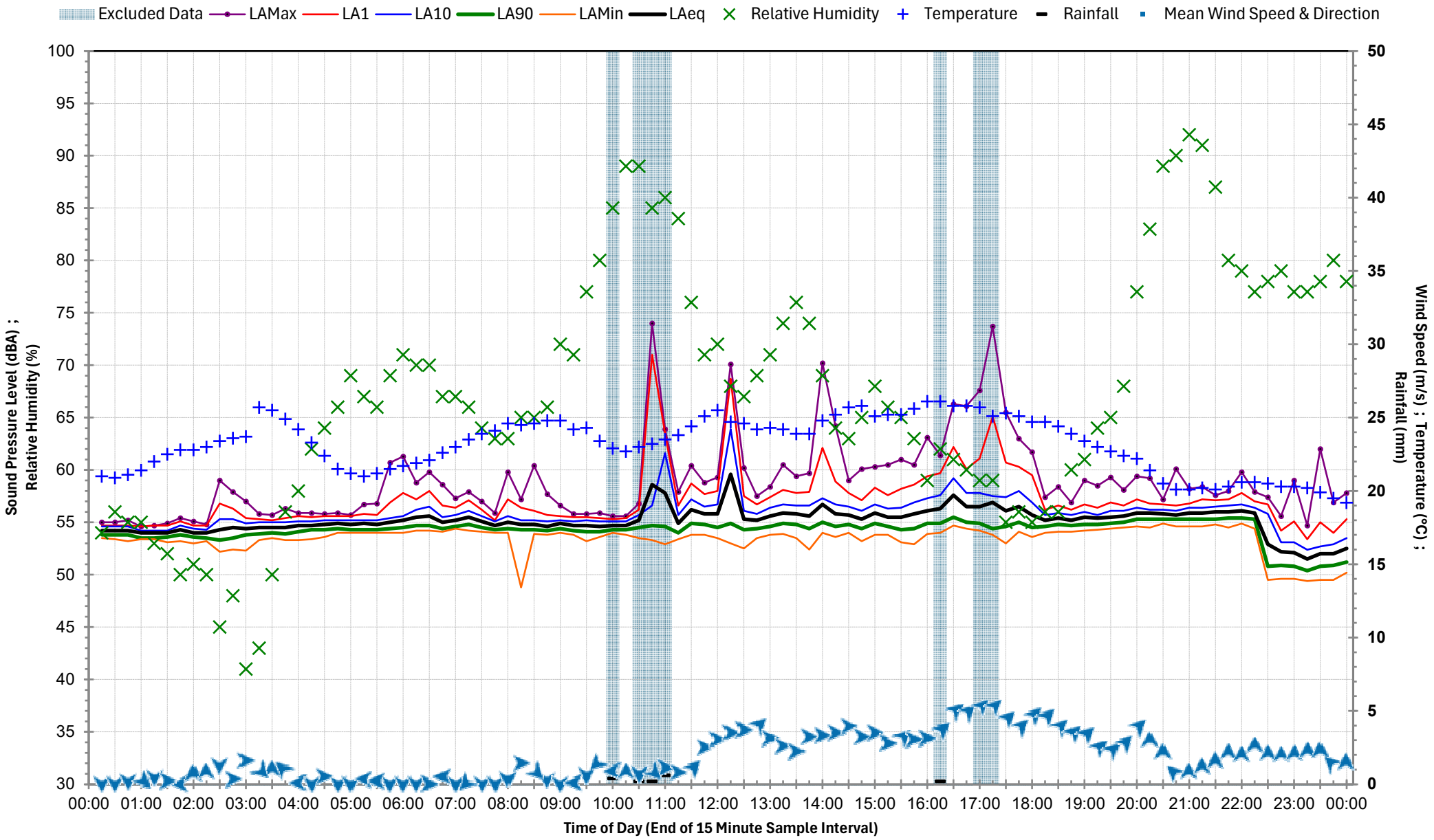
Statistical Ambient Noise Levels

Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Thursday 16 January 2025



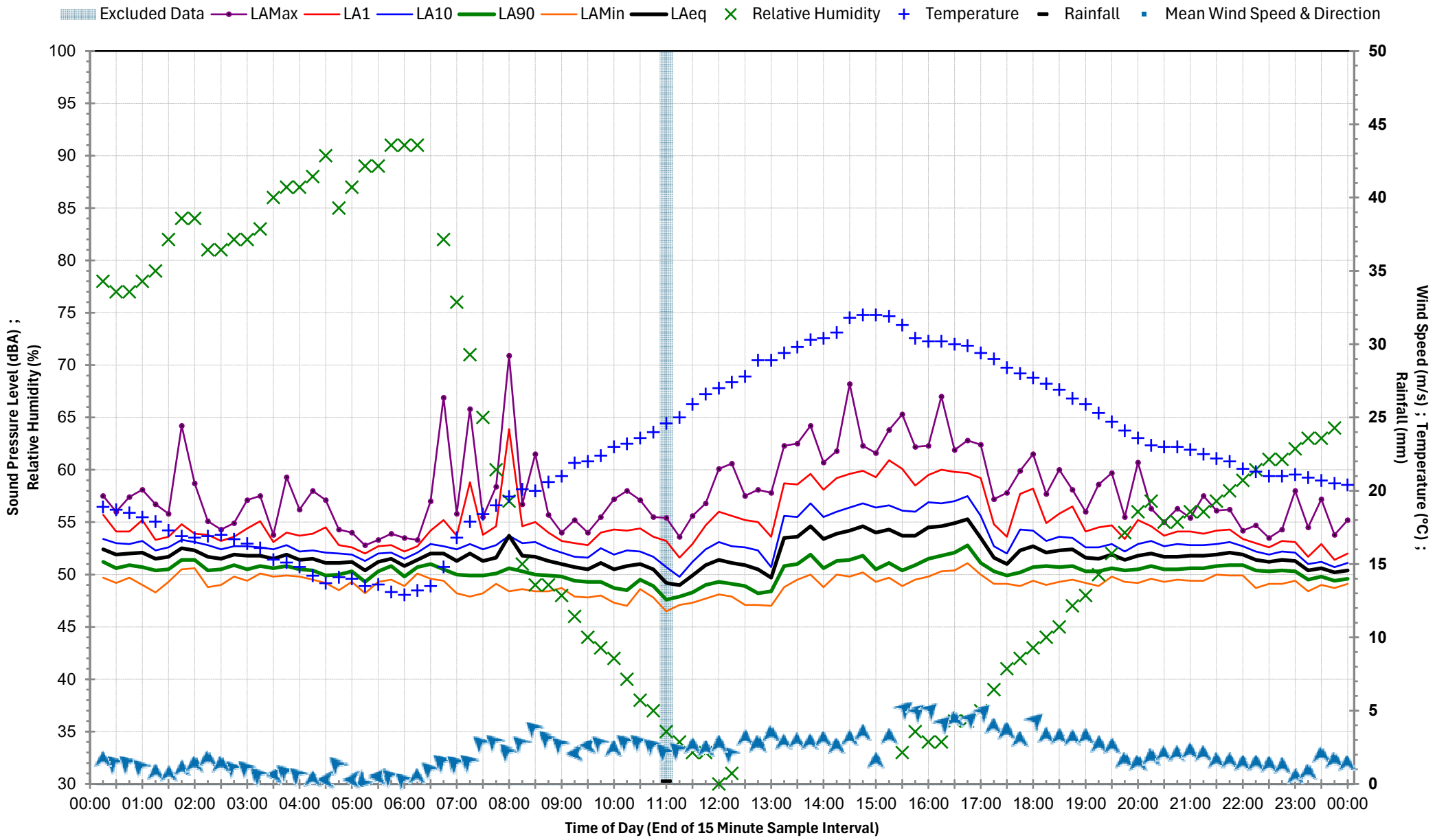
Statistical Ambient Noise Levels

Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Friday 17 January 2025



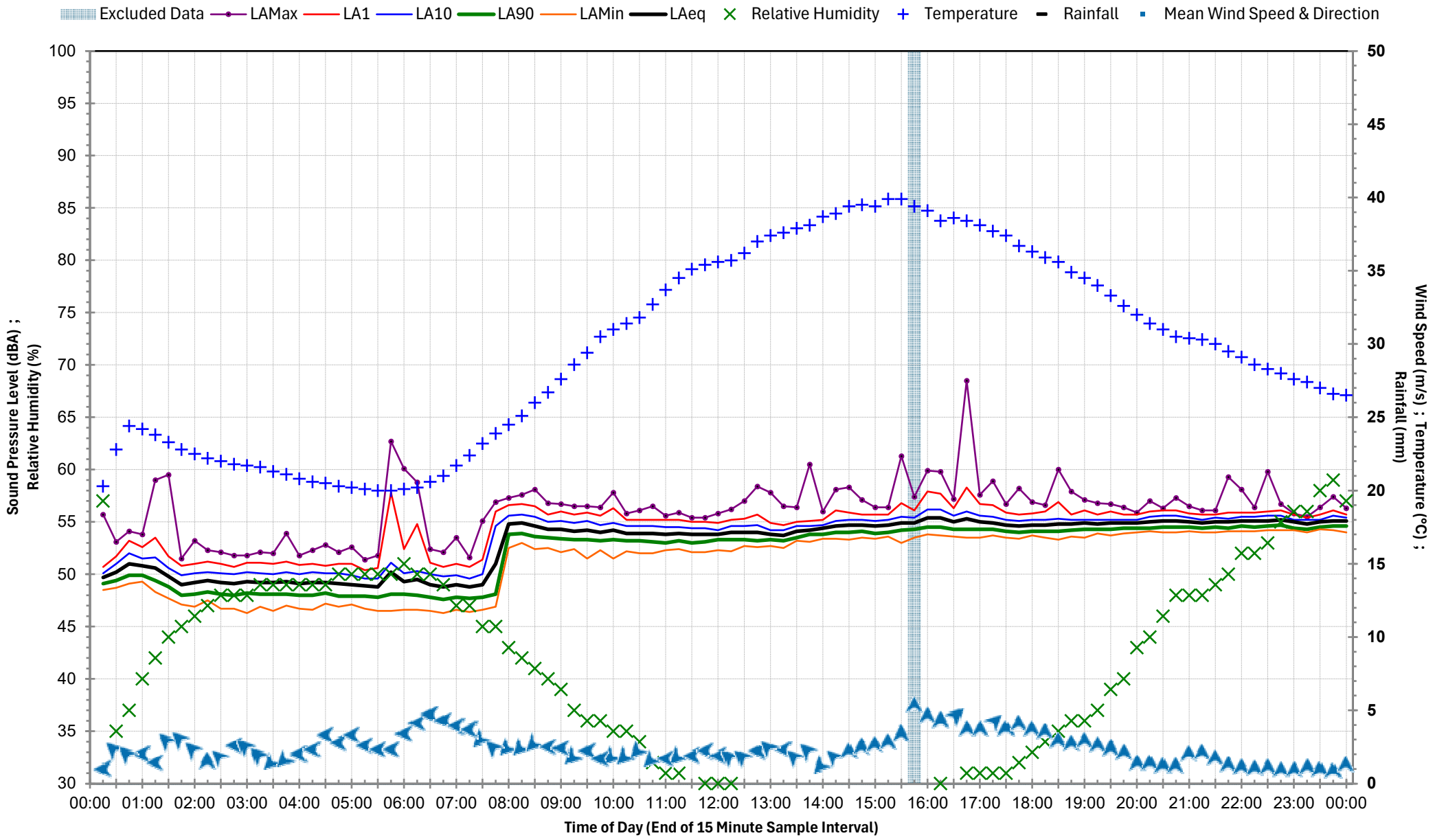
Statistical Ambient Noise Levels

Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Saturday 18 January 2025



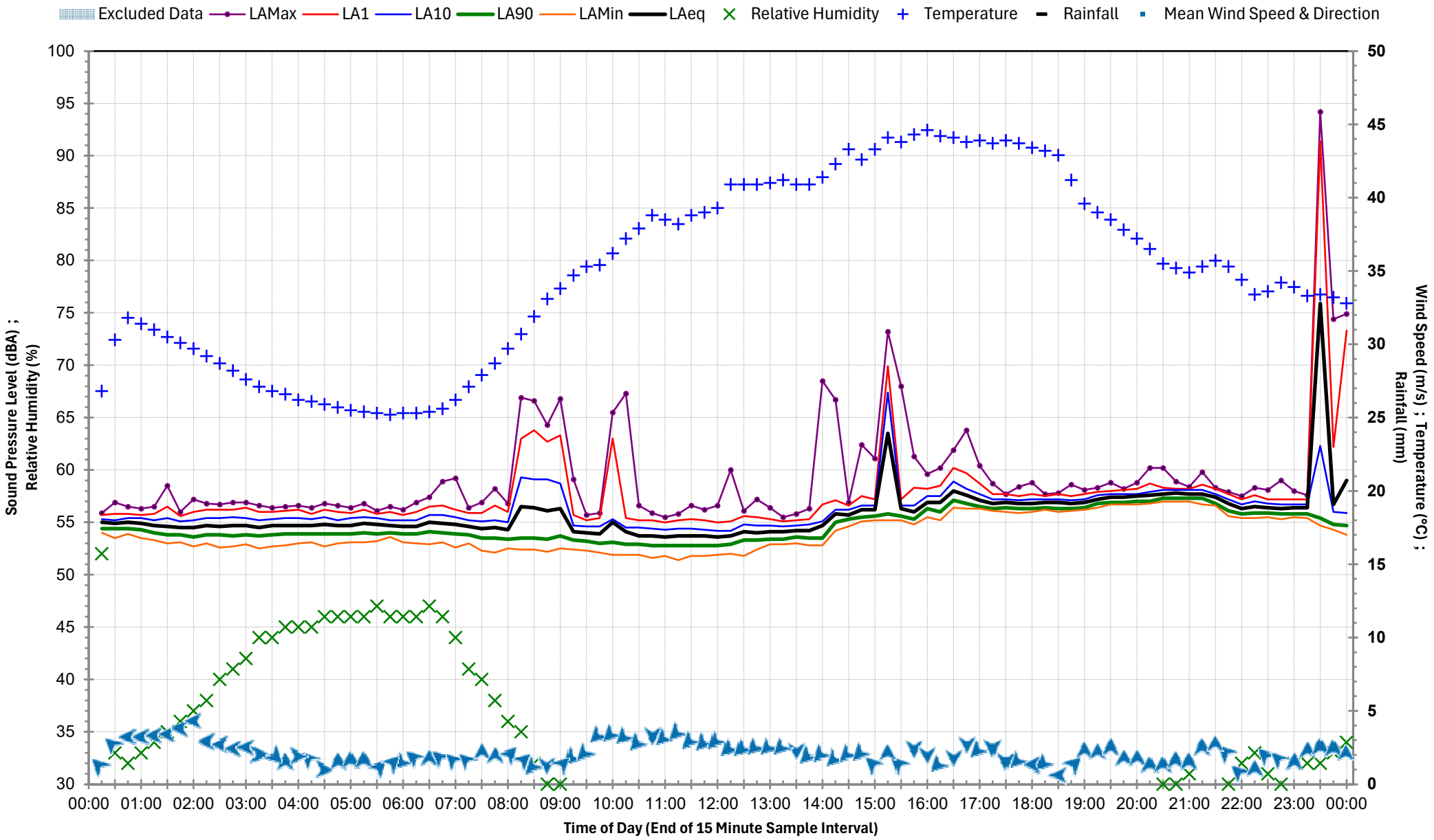
Statistical Ambient Noise Levels

Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Sunday 19 January 2025



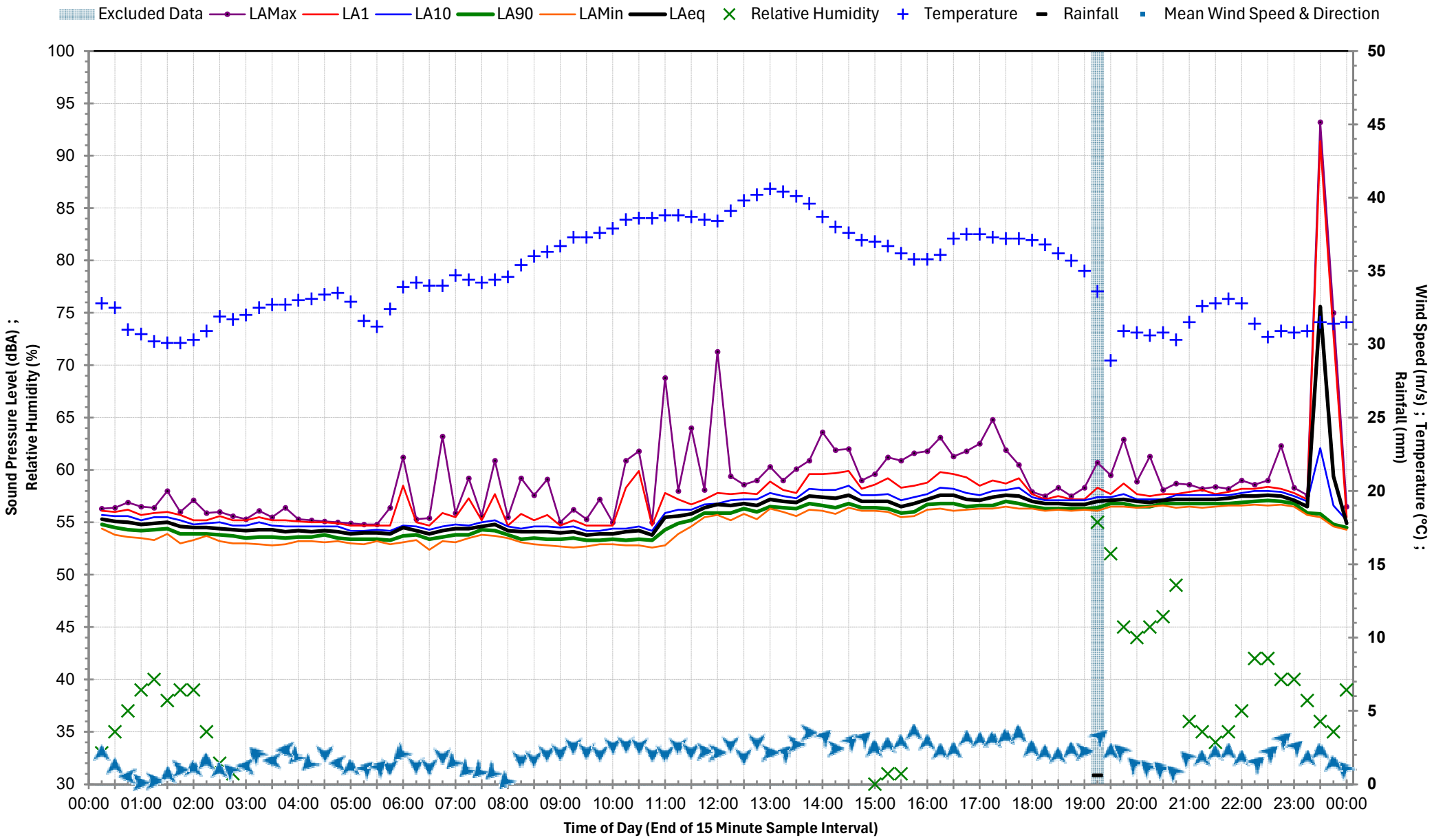
Statistical Ambient Noise Levels

Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Monday 20 January 2025



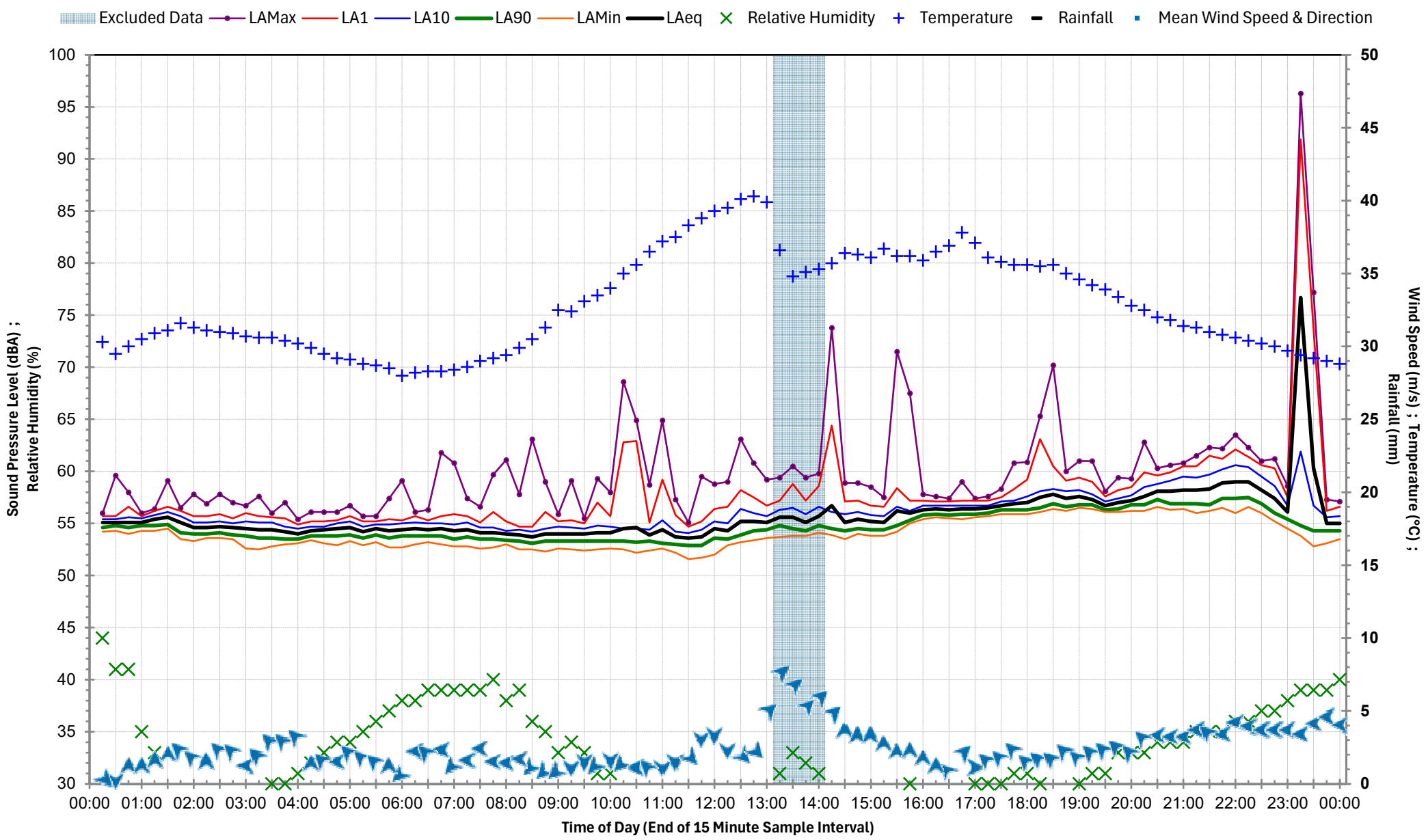
Statistical Ambient Noise Levels

Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Tuesday 21 January 2025



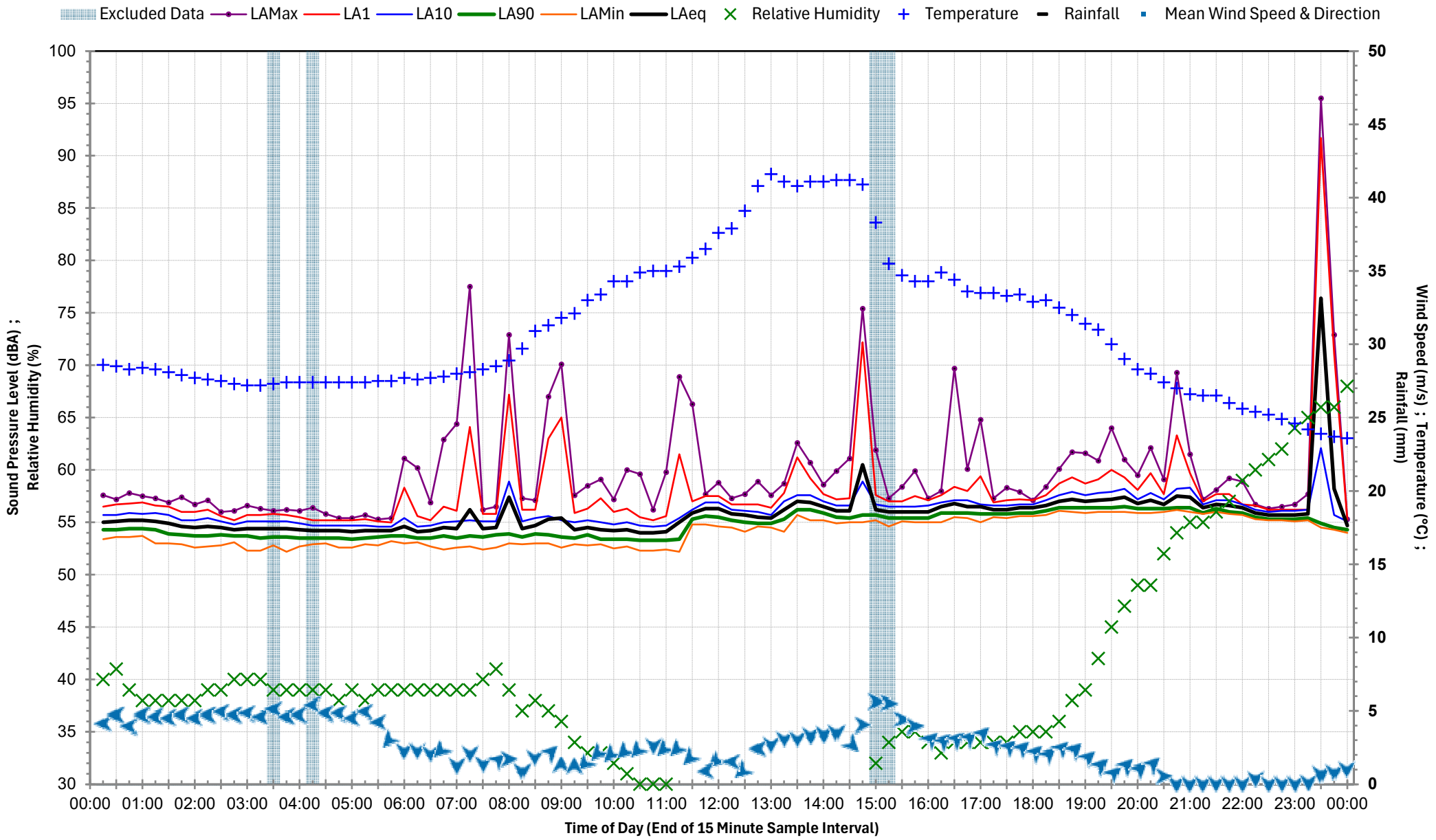
Statistical Ambient Noise Levels

Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Wednesday 22 January 2025



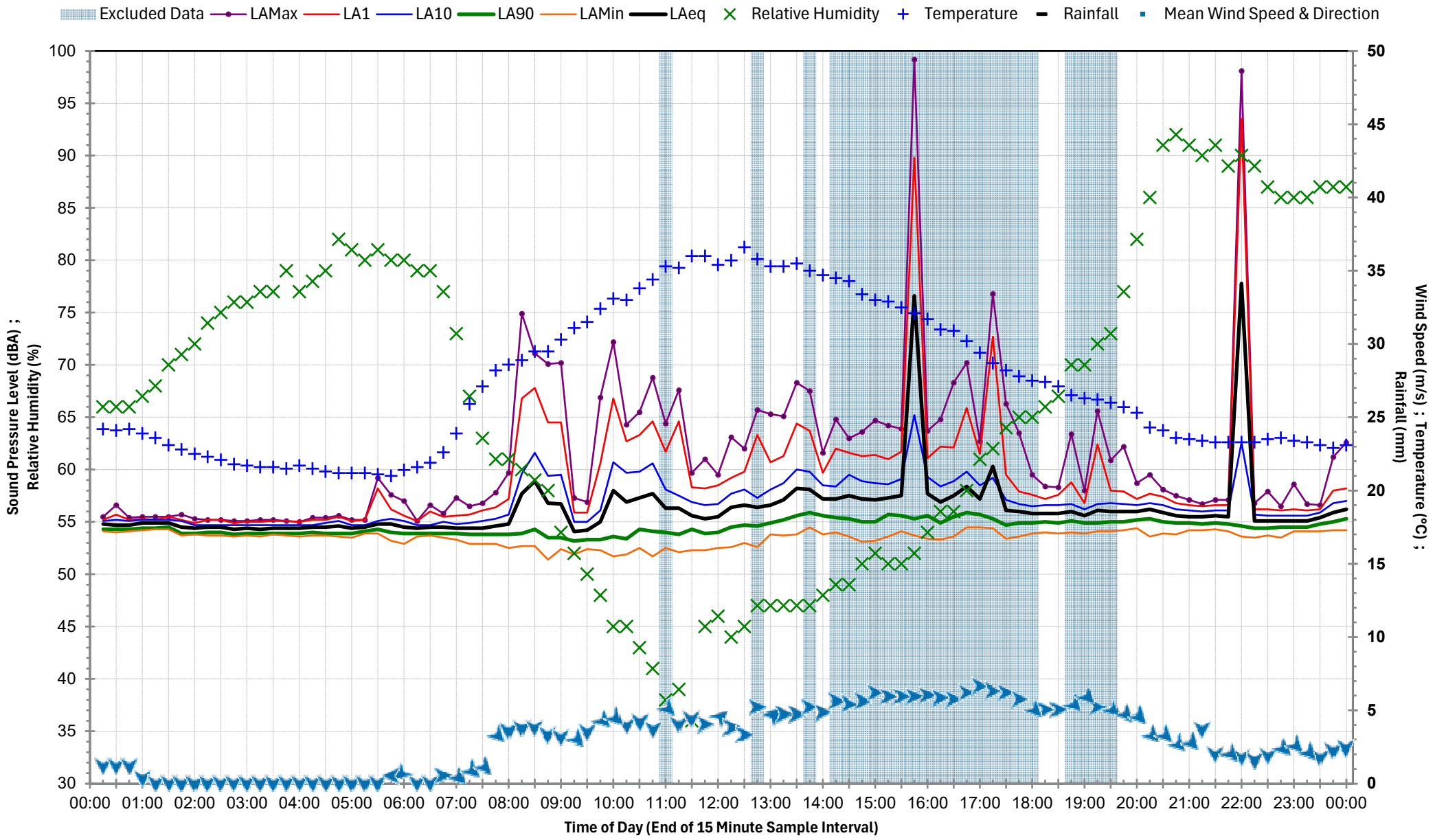
Statistical Ambient Noise Levels

Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Thursday 23 January 2025

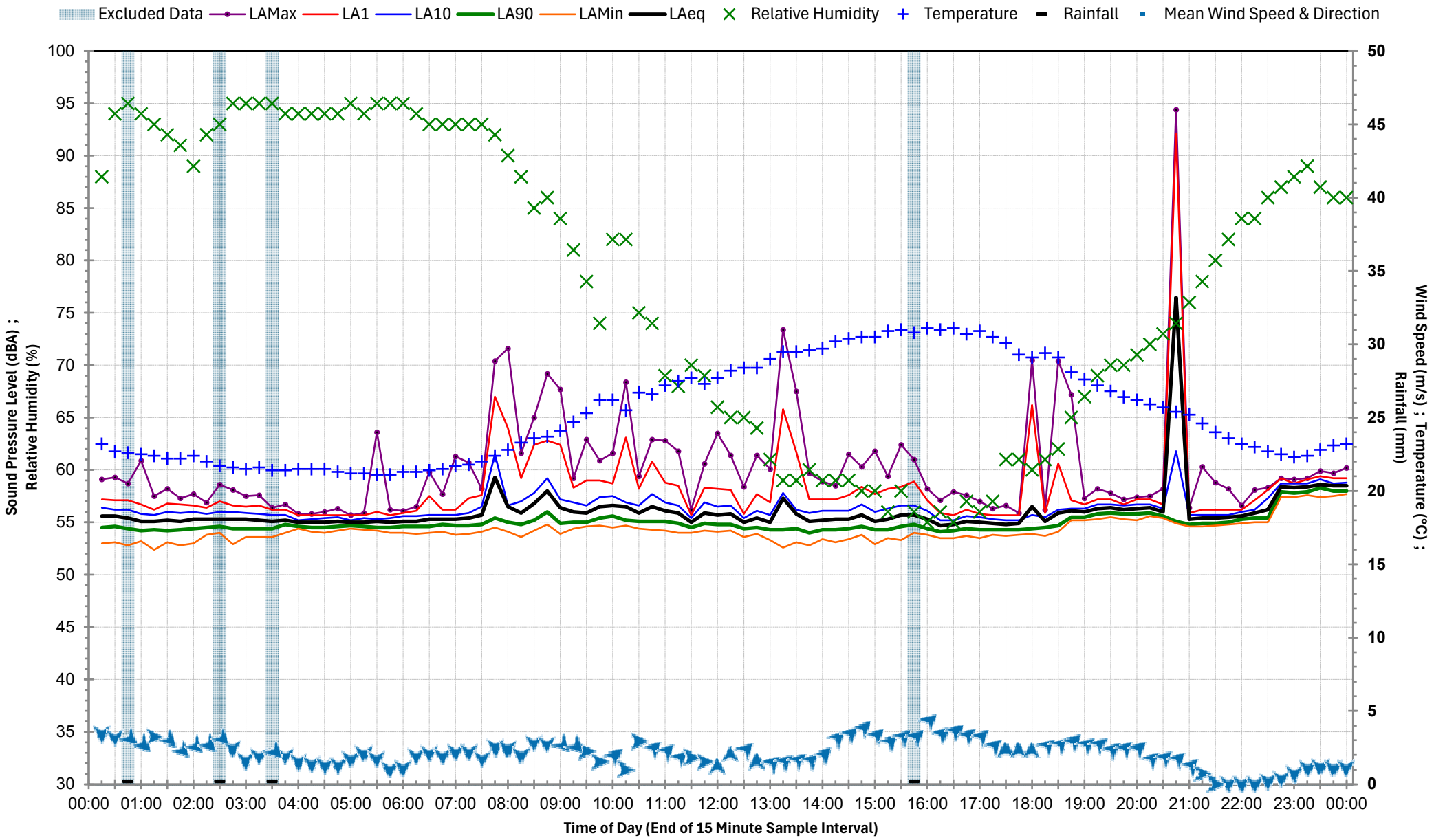


Statistical Ambient Noise Levels

Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Friday 24 January 2025

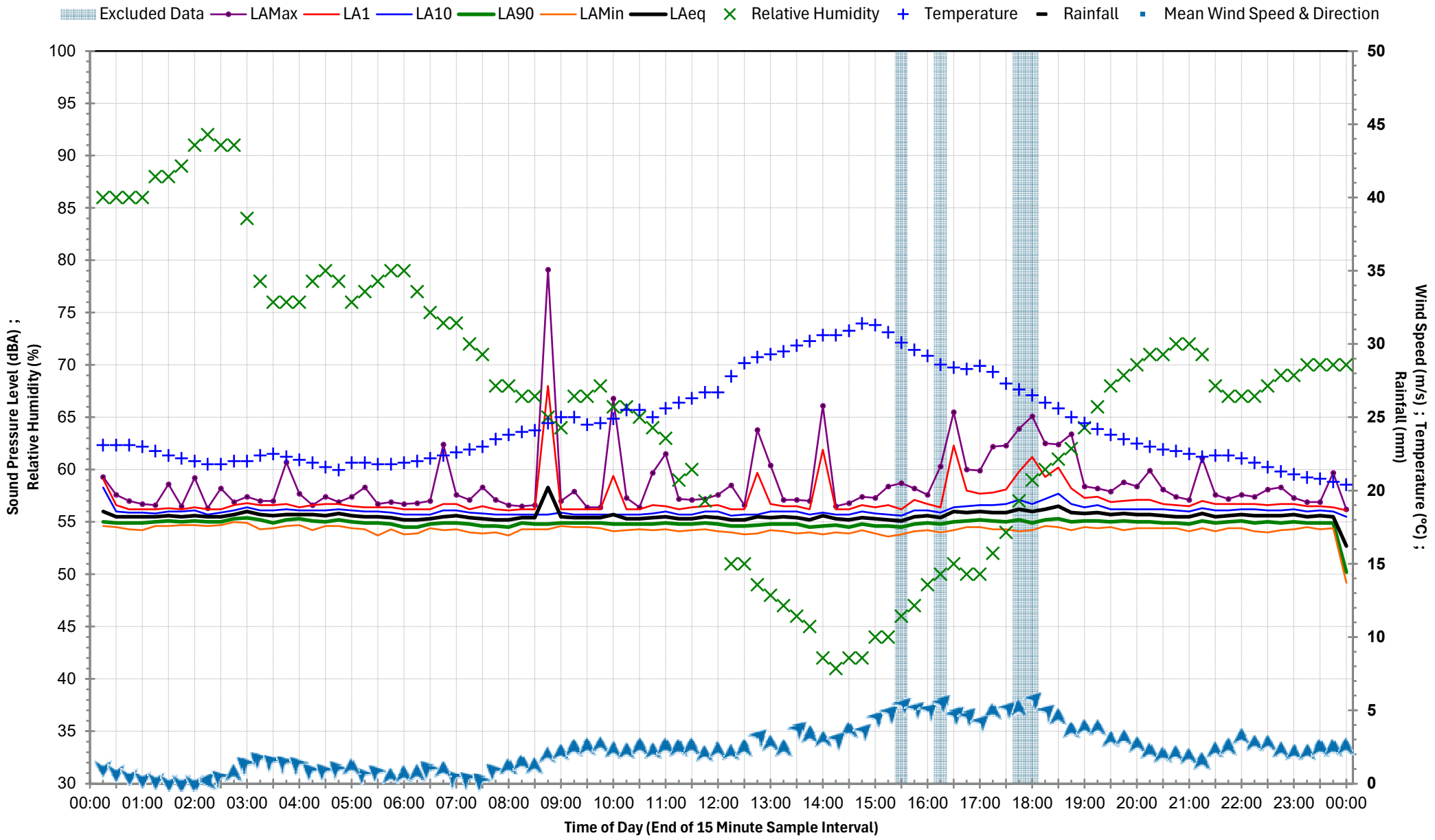


Statistical Ambient Noise Levels
Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Saturday 25 January 2025

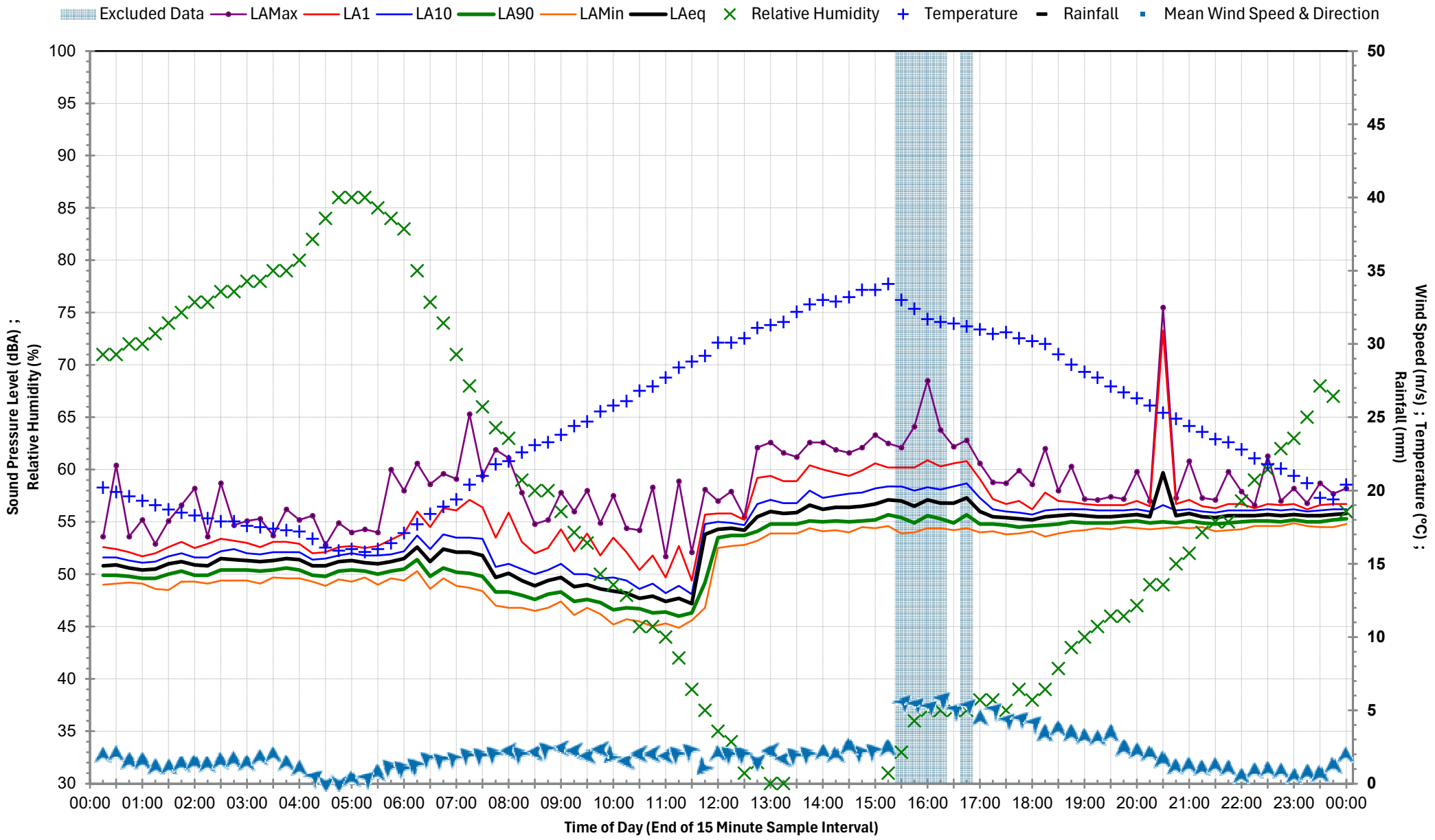


Statistical Ambient Noise Levels

Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Sunday 26 January 2025

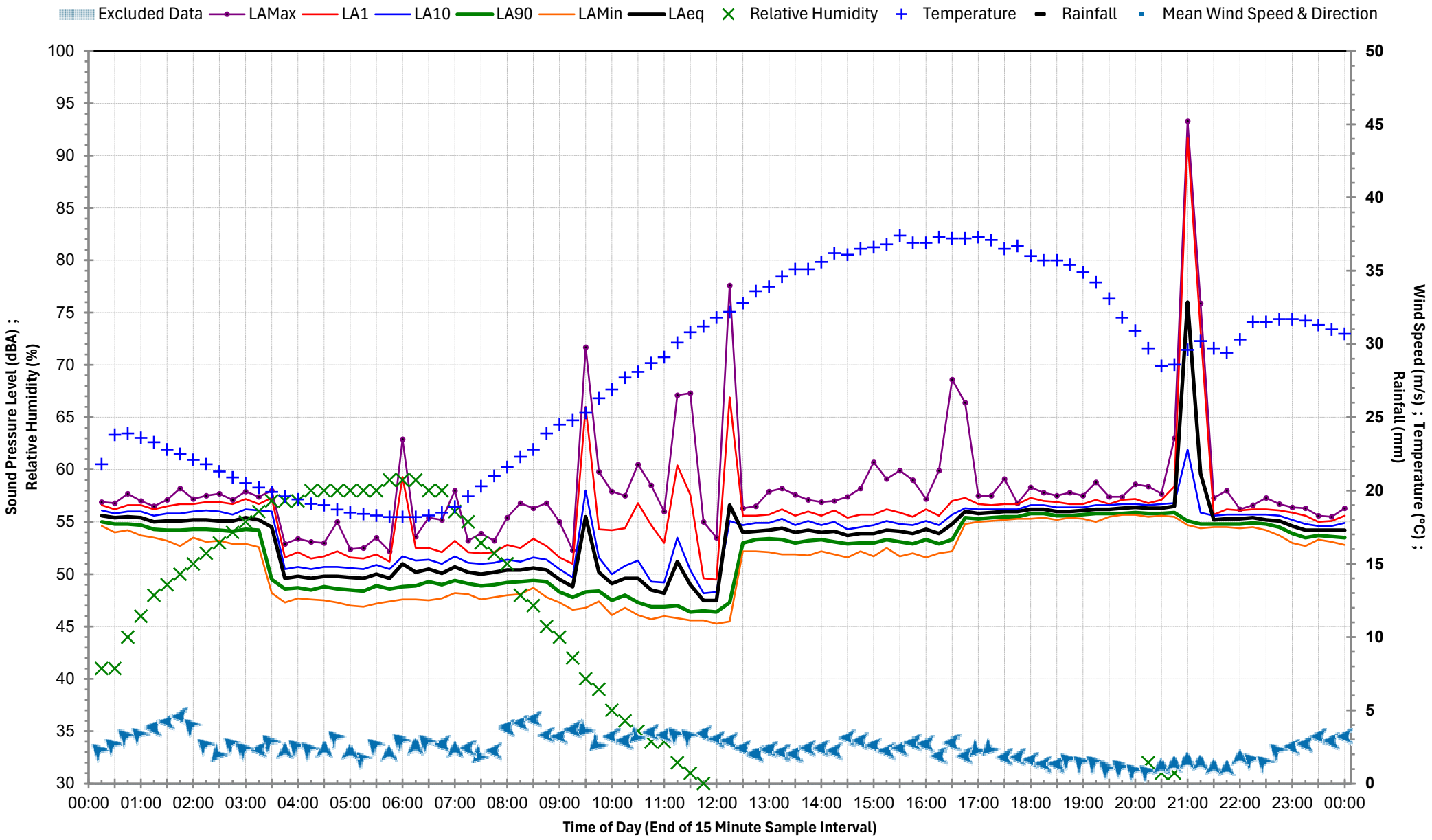


Statistical Ambient Noise Levels
Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Monday 27 January 2025



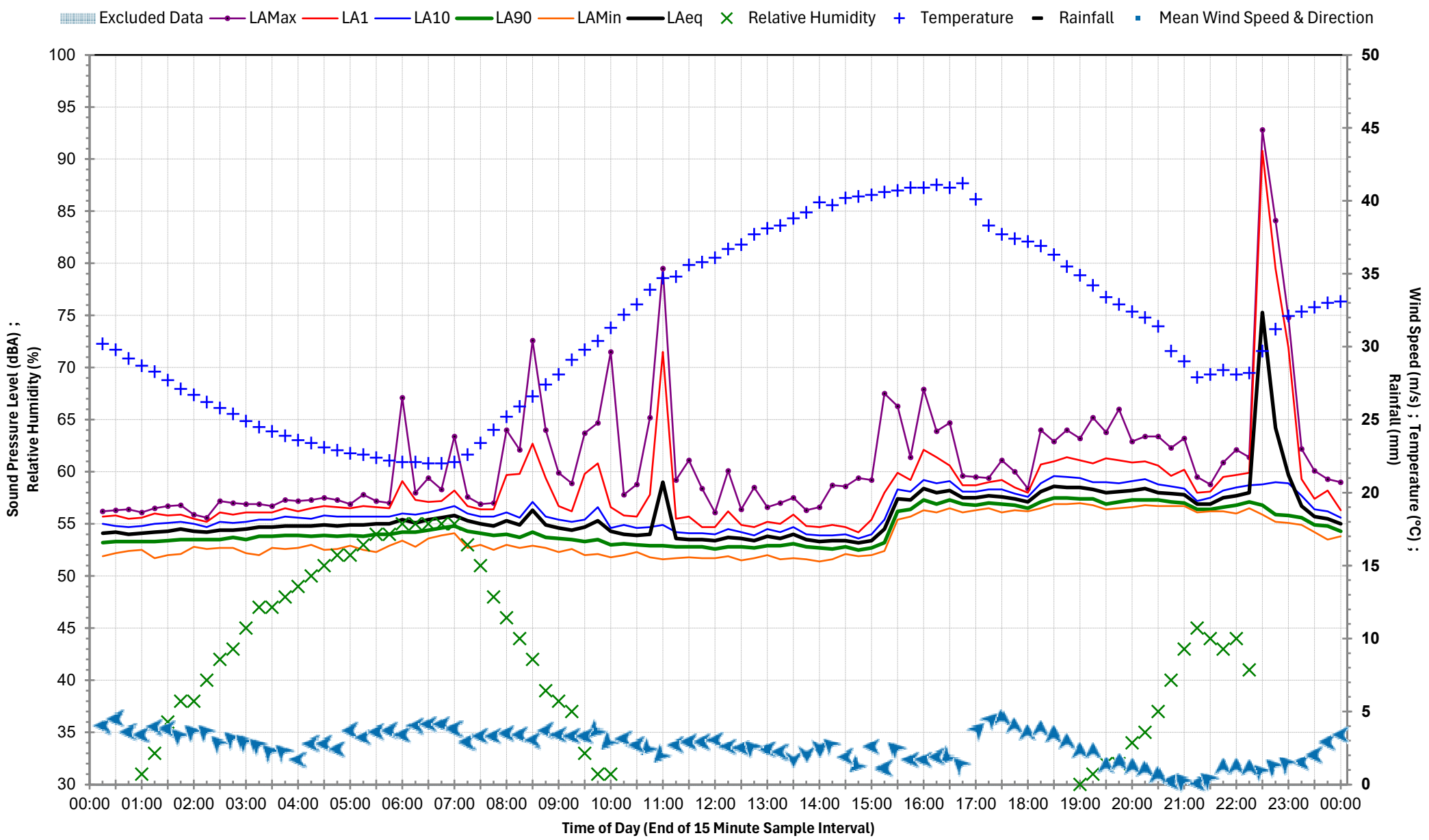
Statistical Ambient Noise Levels

Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Tuesday 28 January 2025



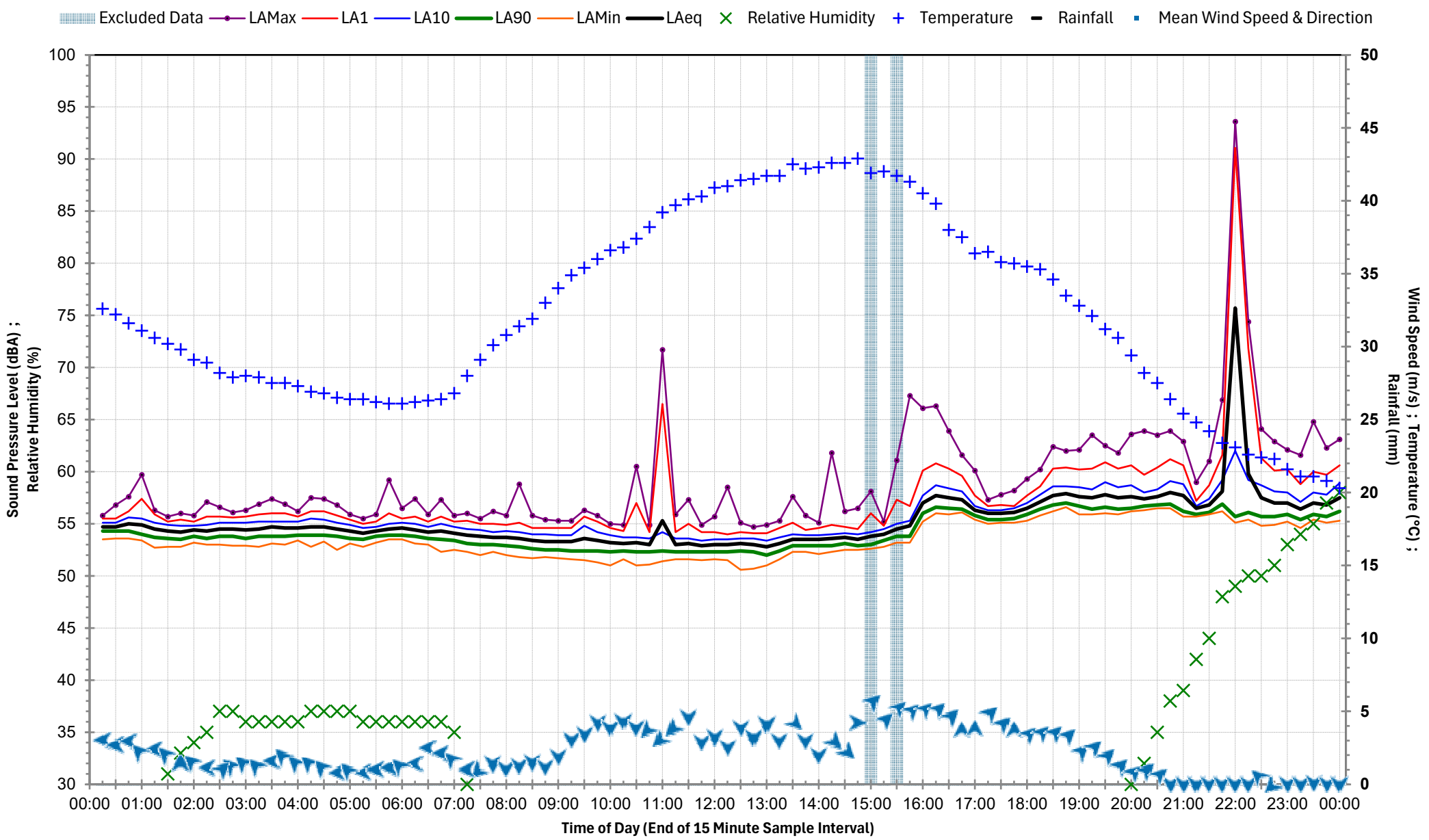
Statistical Ambient Noise Levels

Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Wednesday 29 January 2025



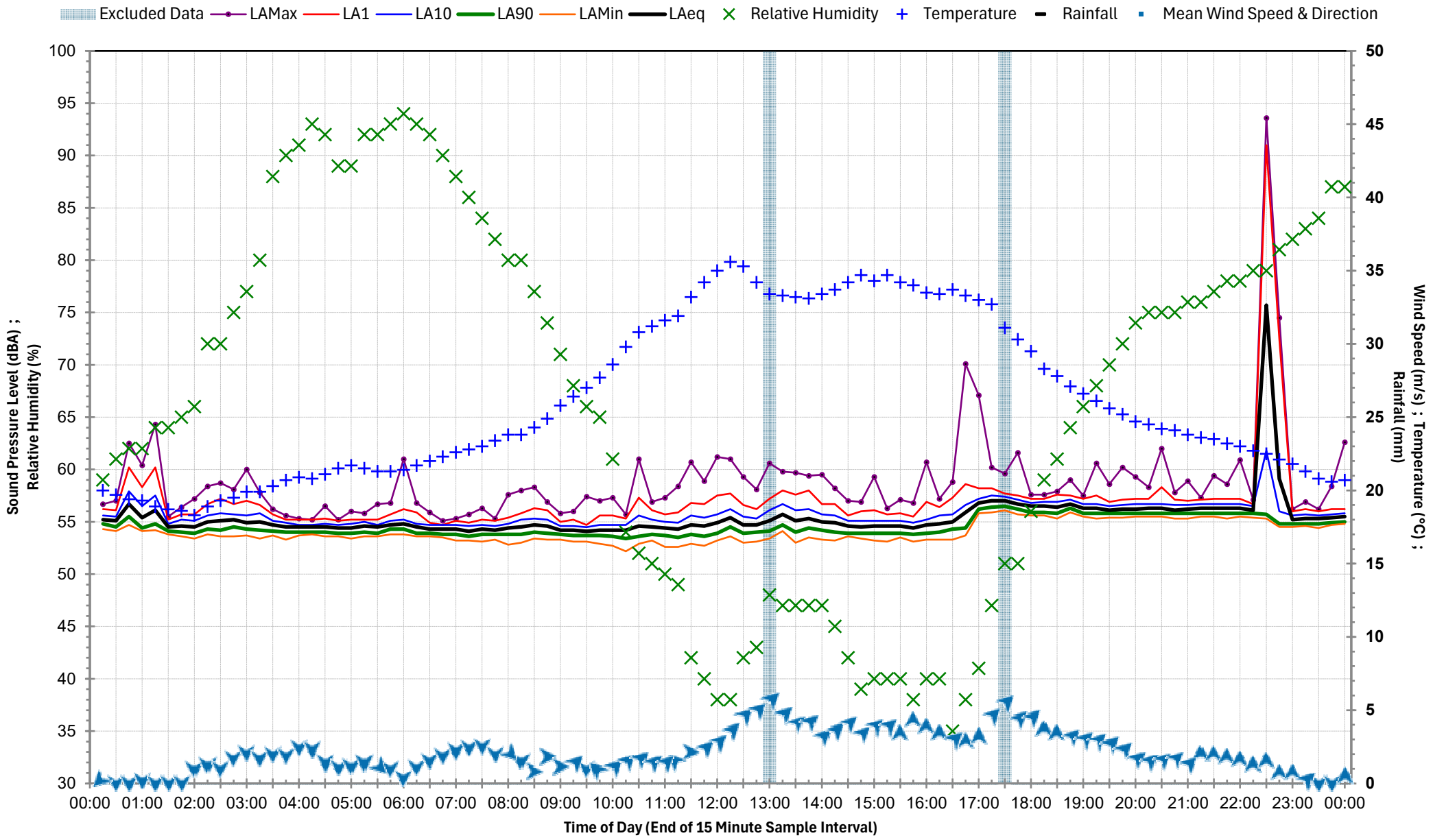
Statistical Ambient Noise Levels

Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Thursday 30 January 2025



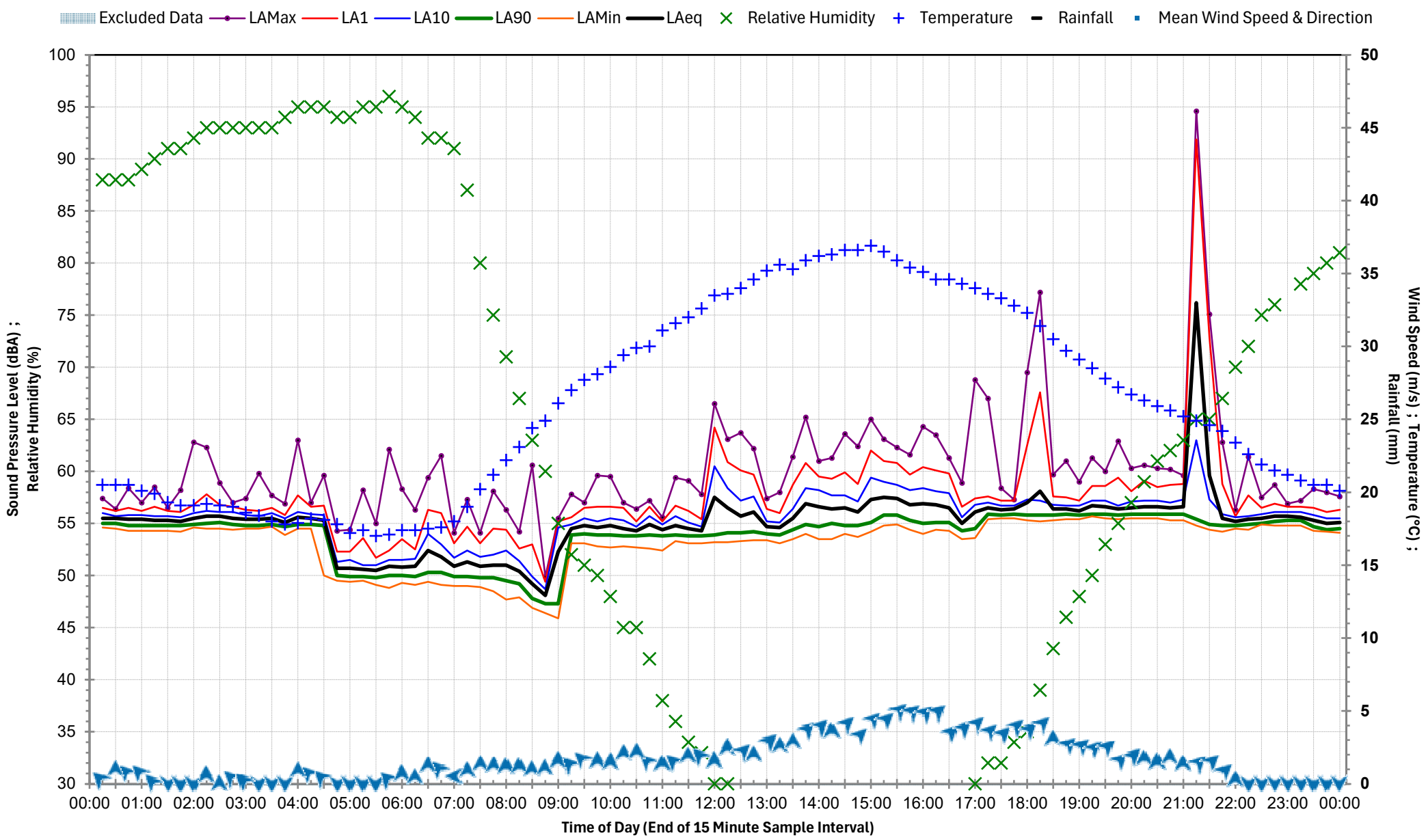
Statistical Ambient Noise Levels

Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Friday 31 January 2025



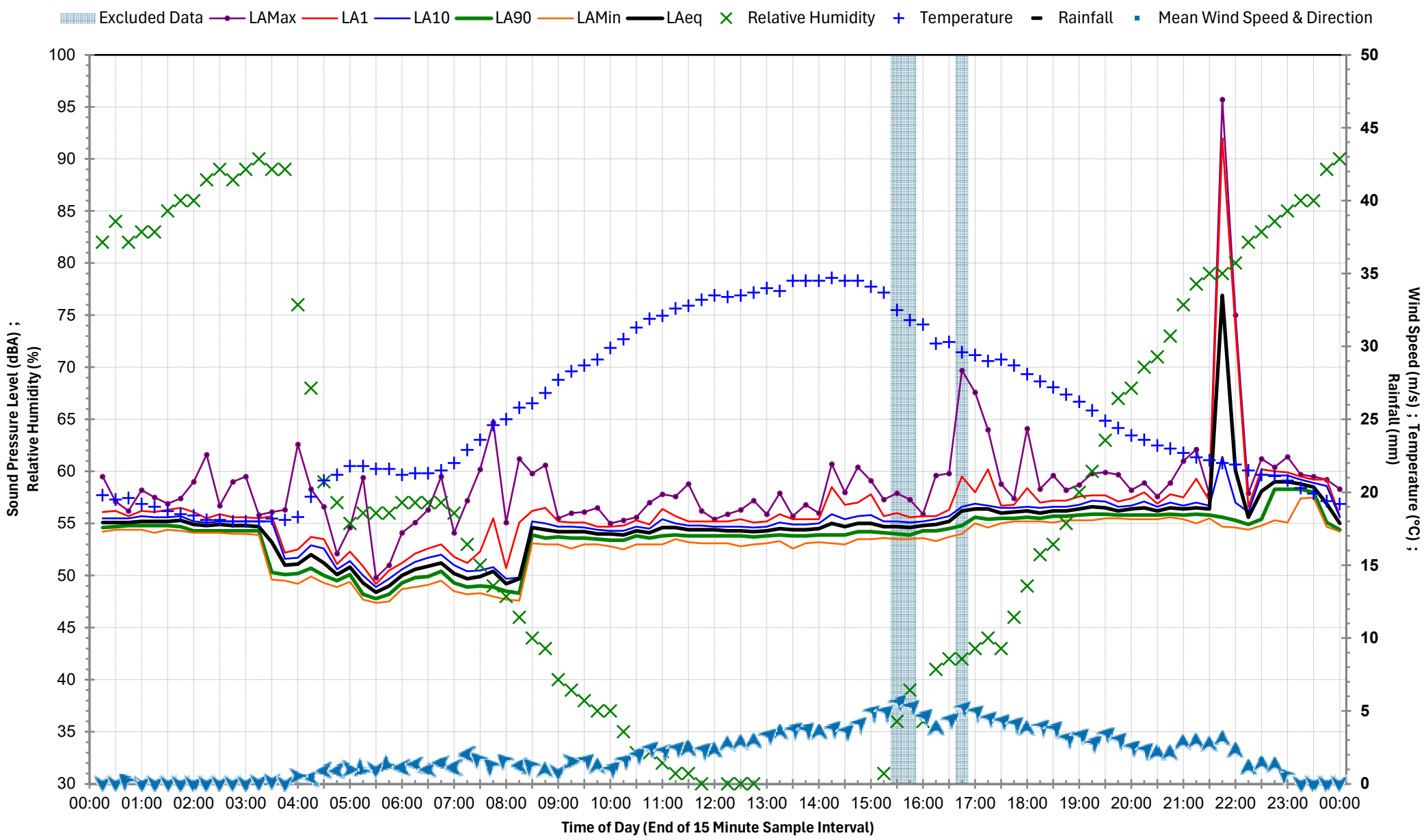
Statistical Ambient Noise Levels

Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Saturday 1 February 2025

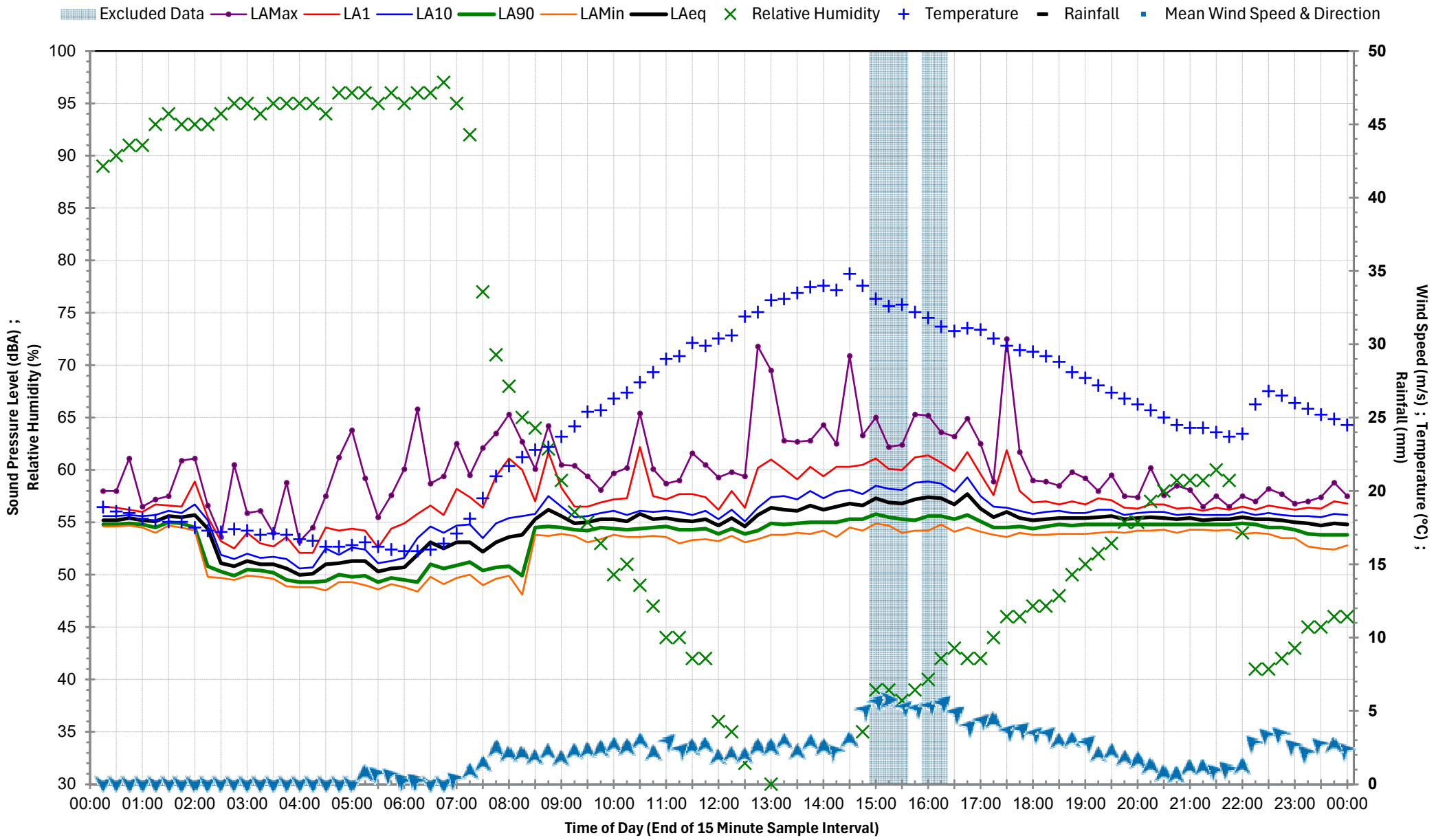


Statistical Ambient Noise Levels

Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Sunday 2 February 2025

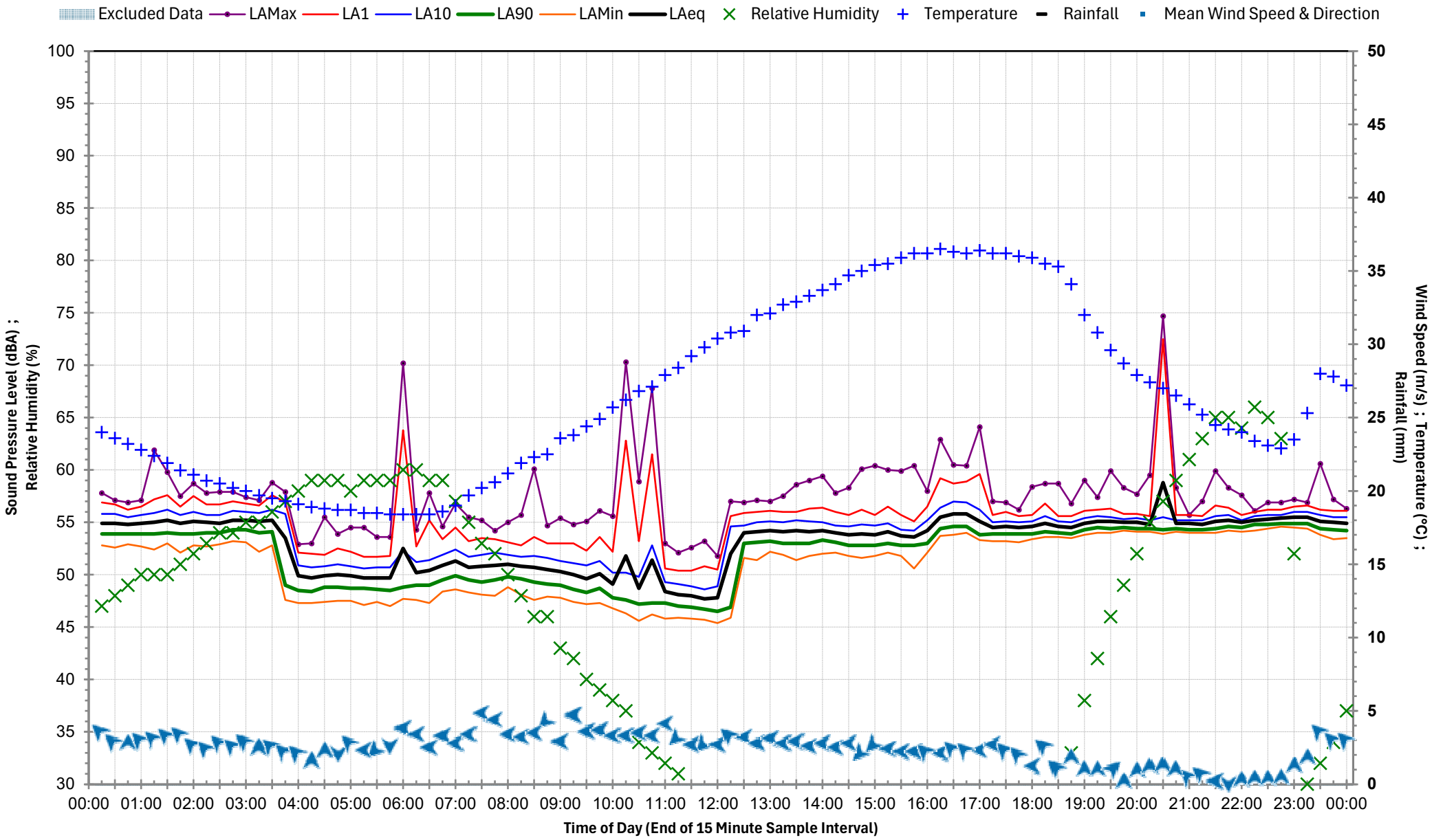


Statistical Ambient Noise Levels
Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Monday 3 February 2025



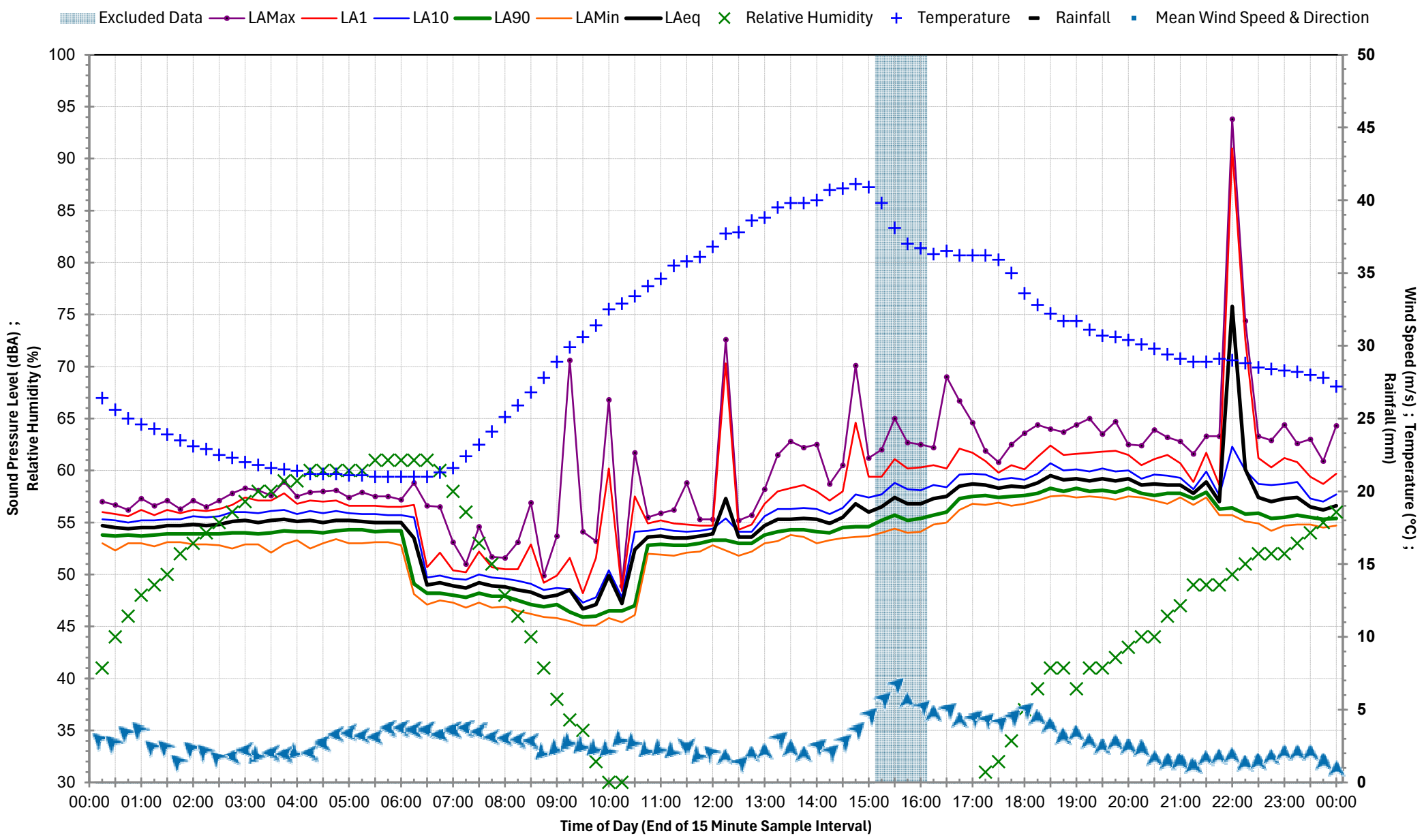
Statistical Ambient Noise Levels

Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Tuesday 4 February 2025



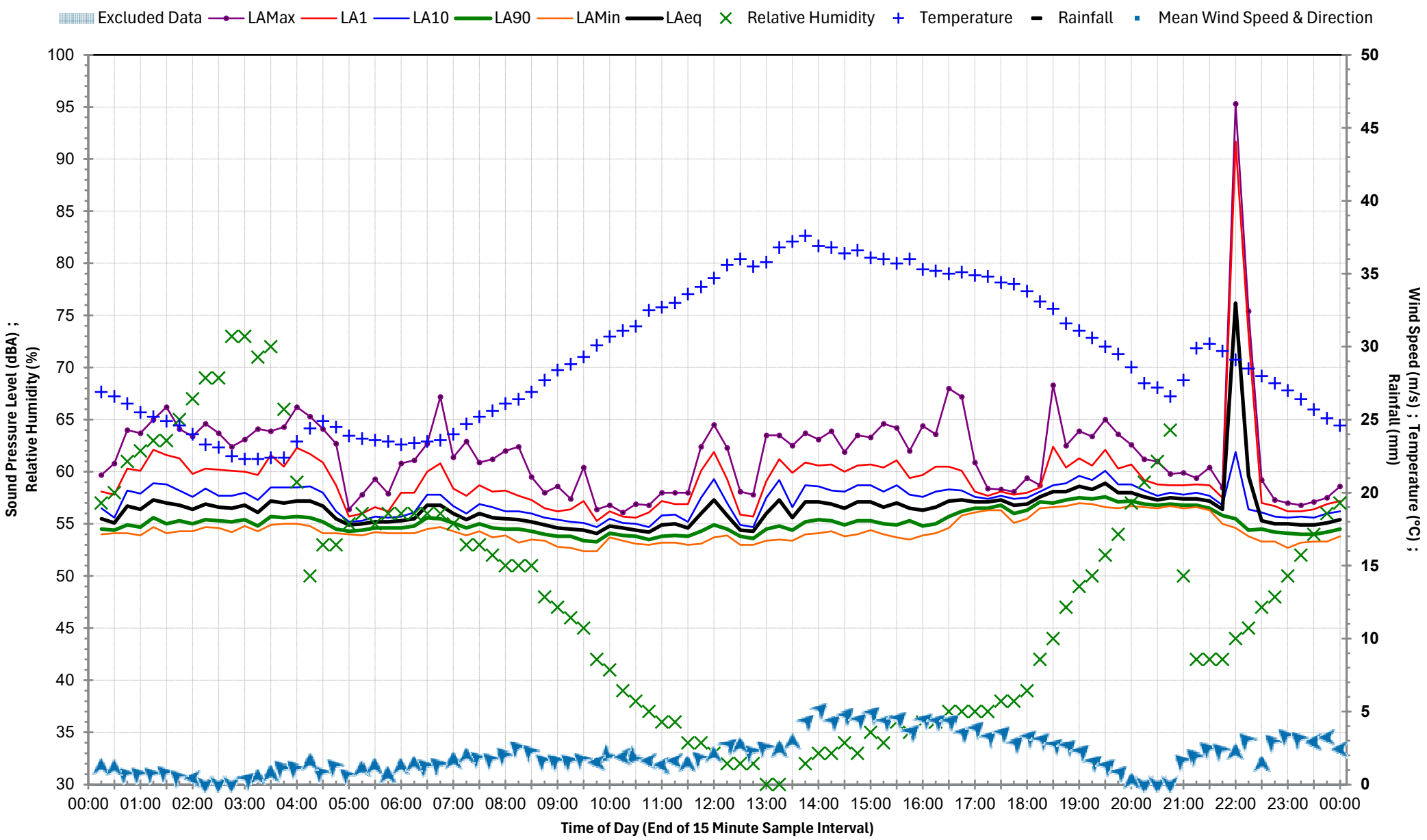
Statistical Ambient Noise Levels

Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Wednesday 5 February 2025



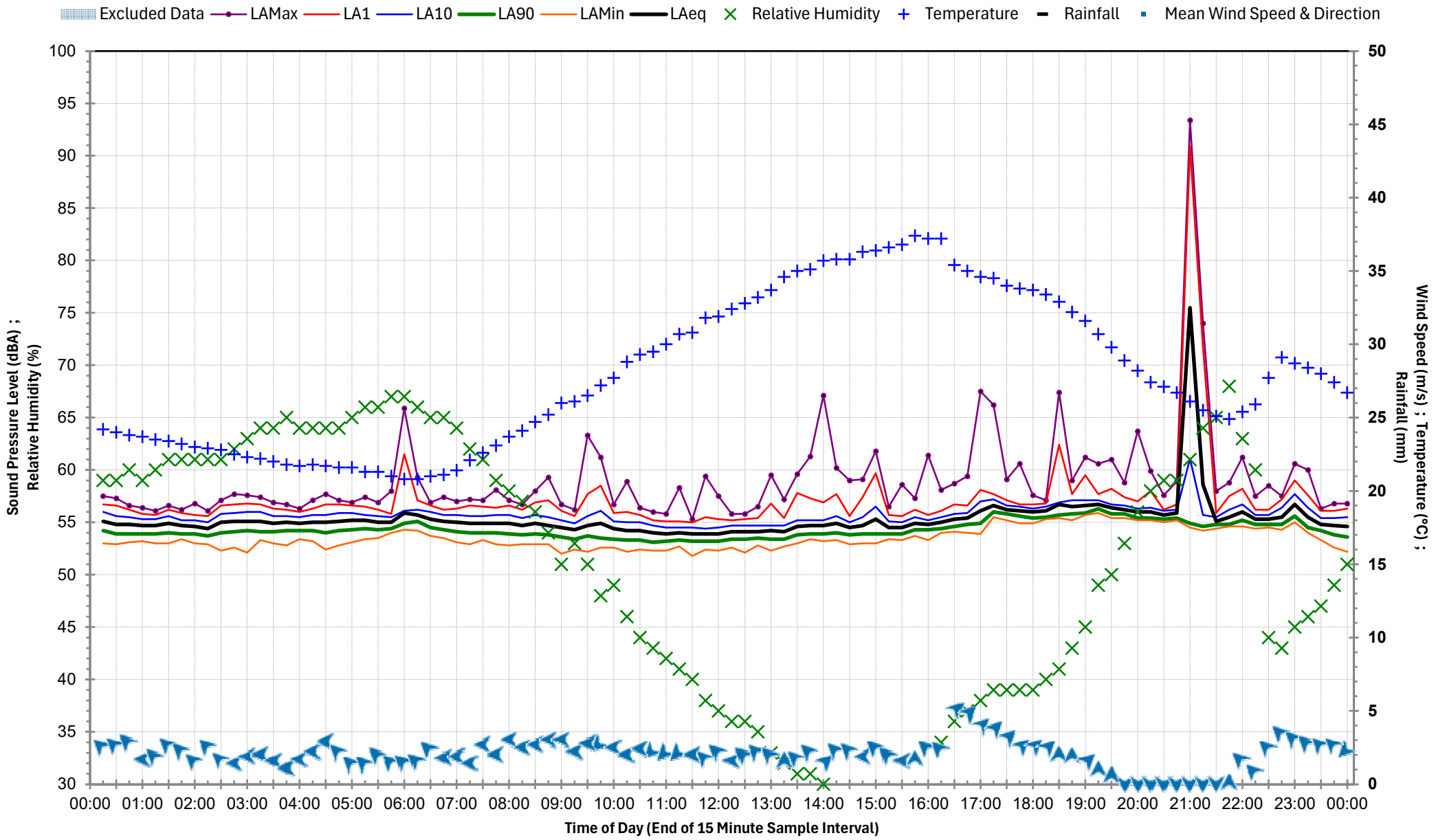
Statistical Ambient Noise Levels

Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Thursday 6 February 2025



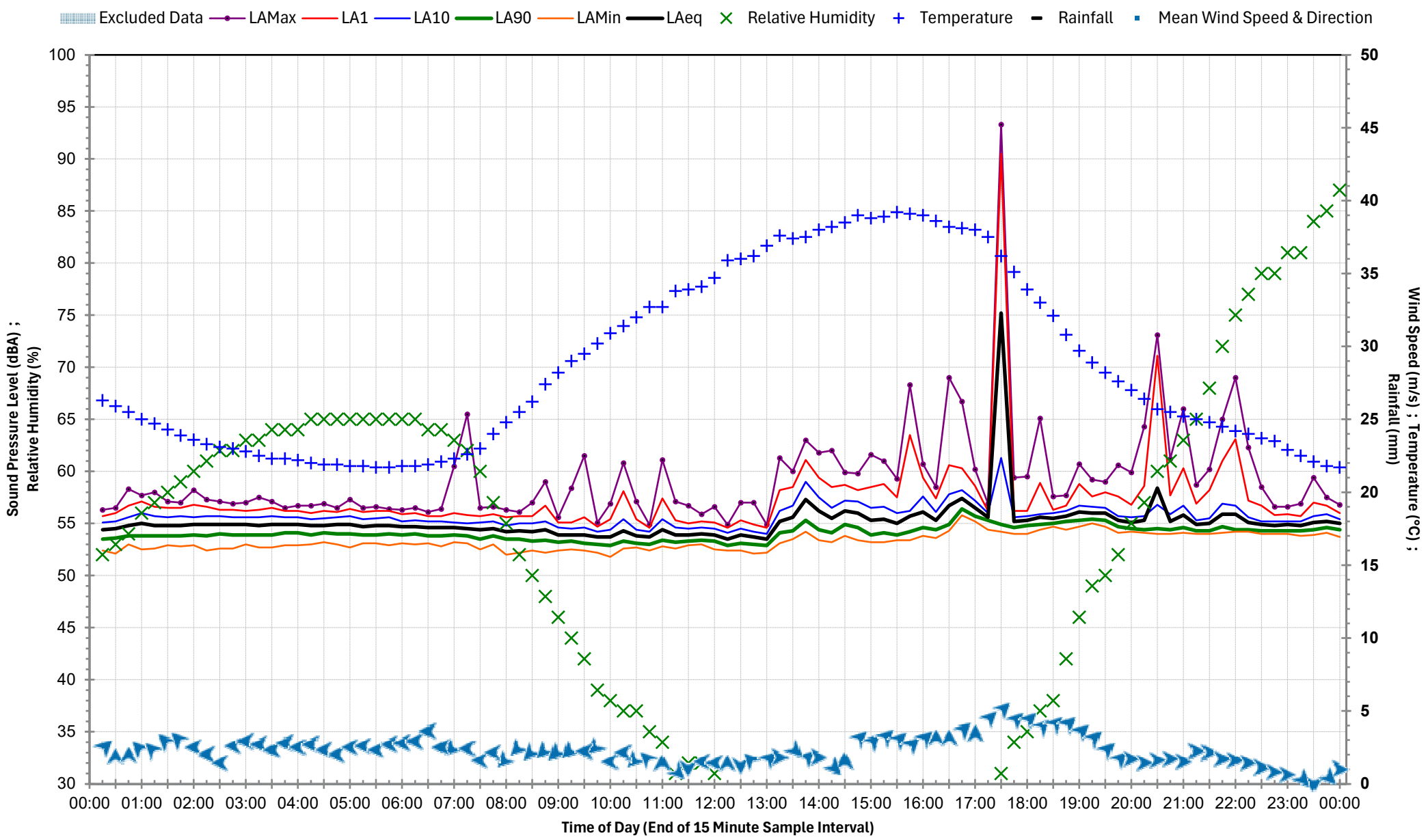
Statistical Ambient Noise Levels

Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Friday 7 February 2025



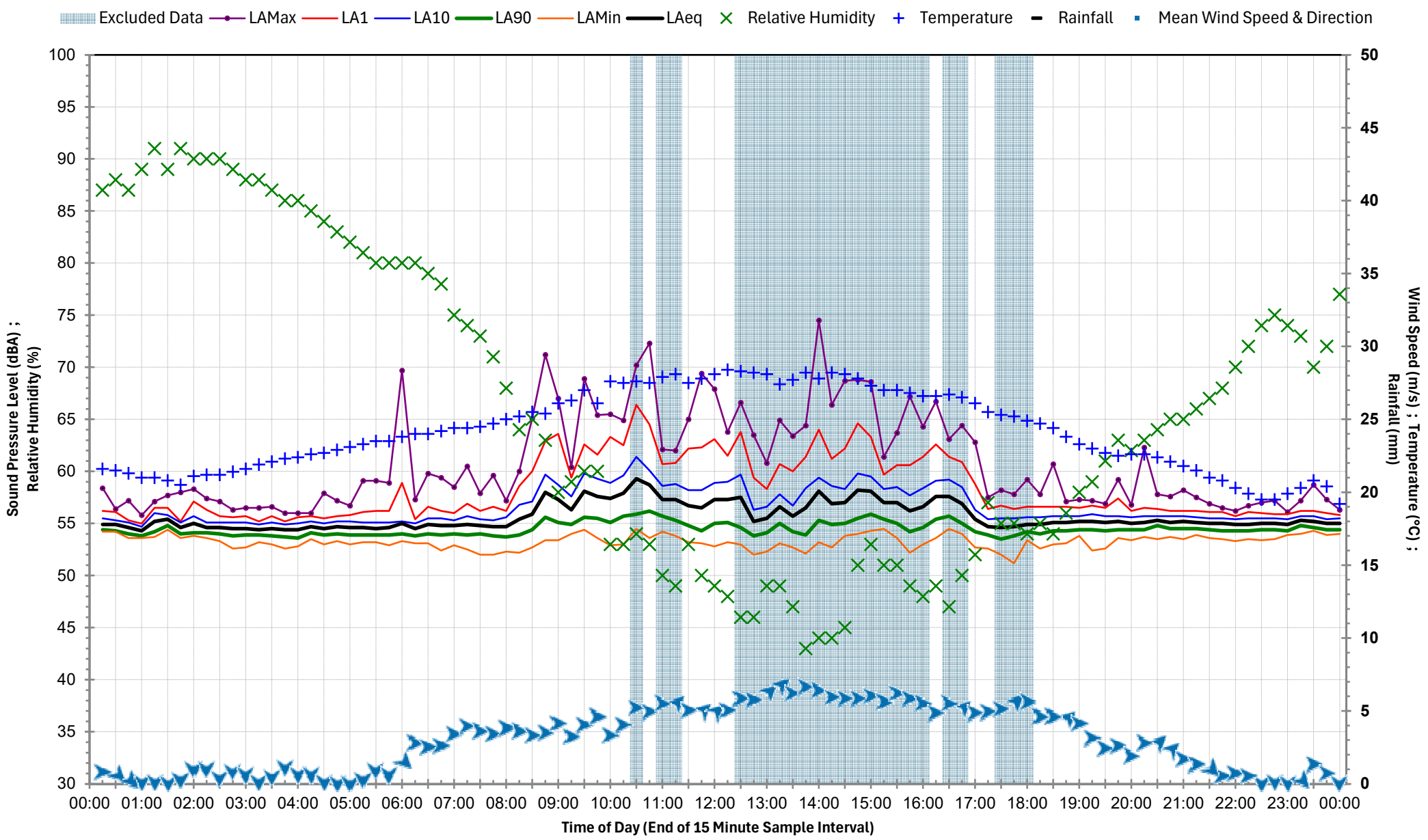
Statistical Ambient Noise Levels

Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Saturday 8 February 2025



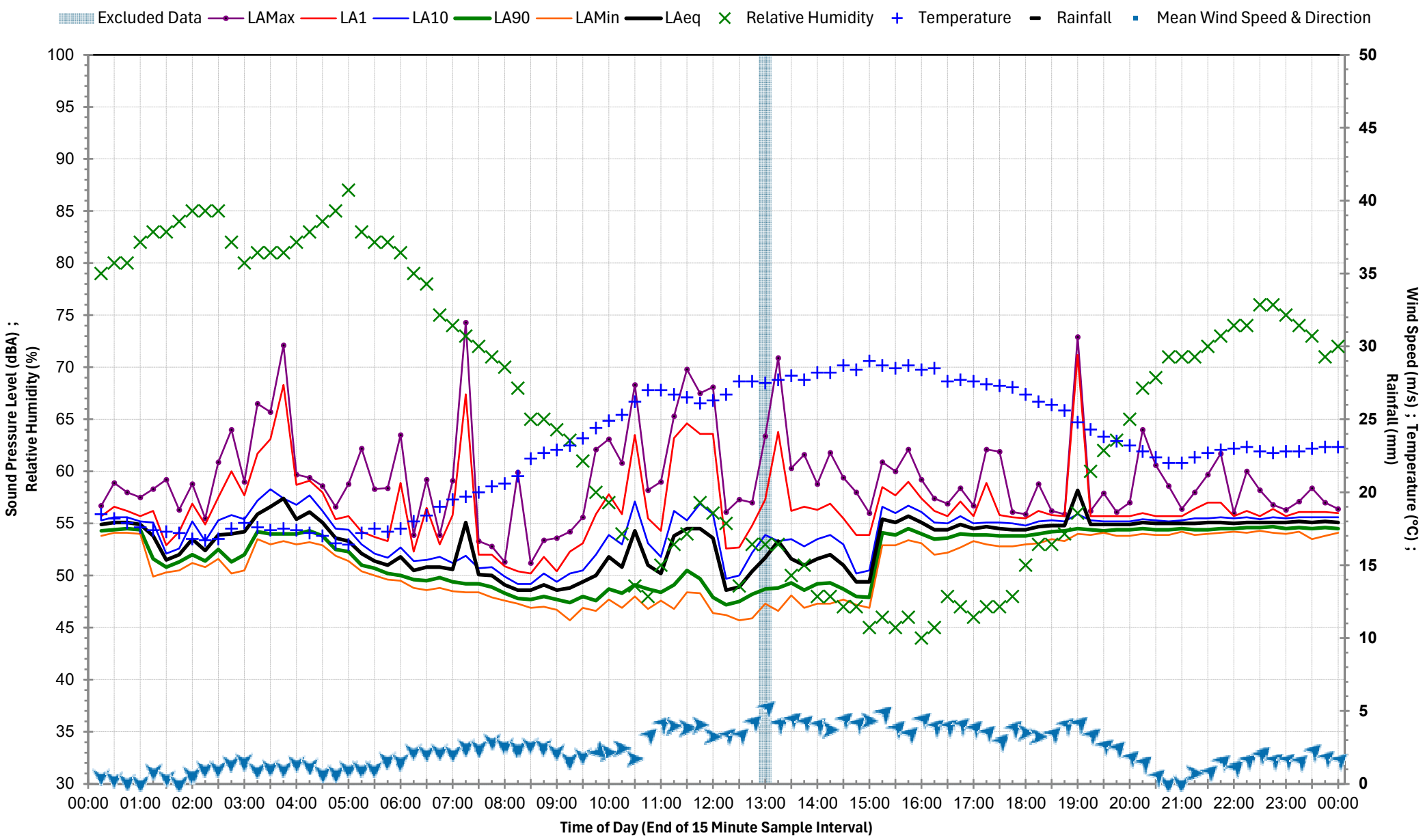
Statistical Ambient Noise Levels

Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Sunday 9 February 2025



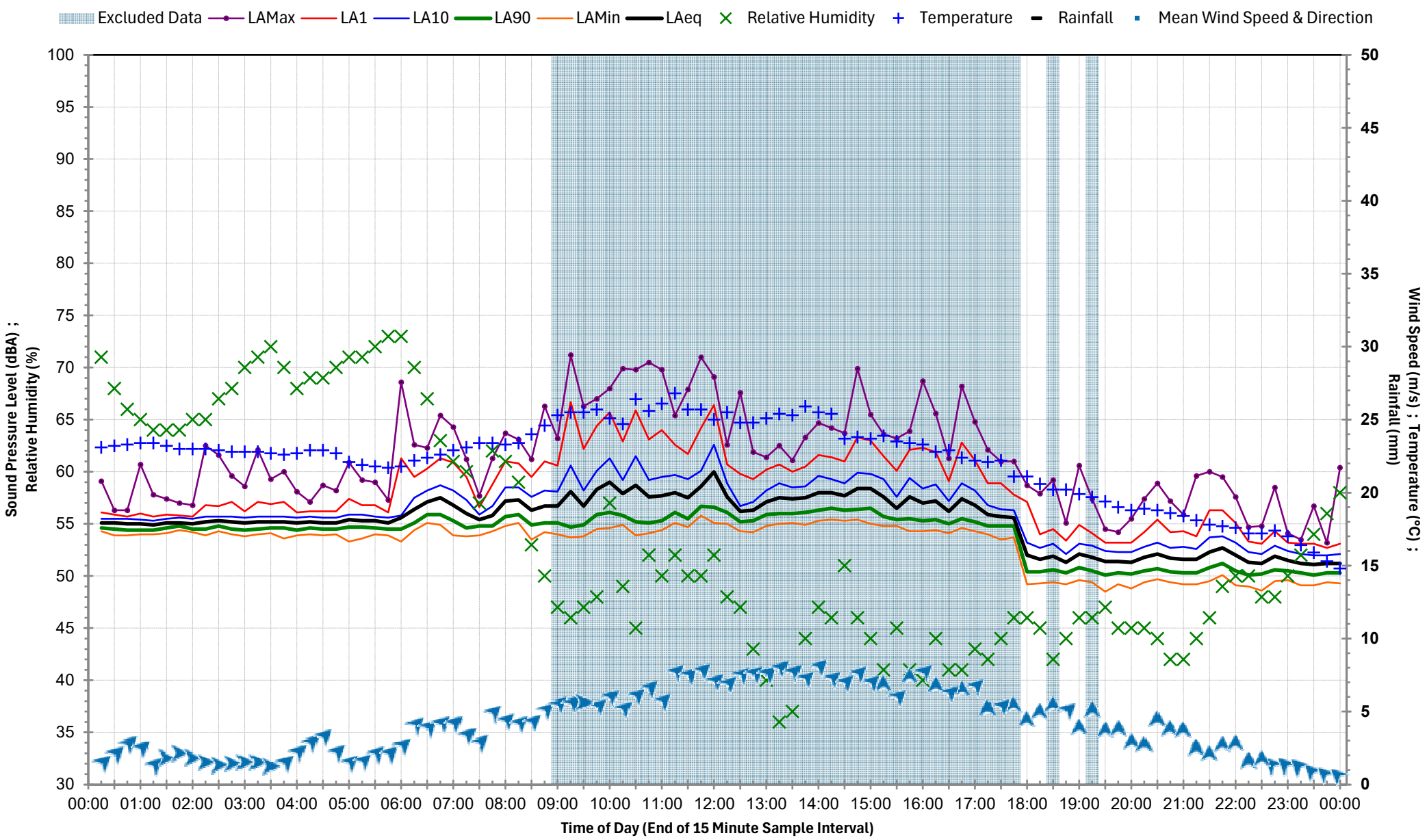
Statistical Ambient Noise Levels

Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Monday 10 February 2025



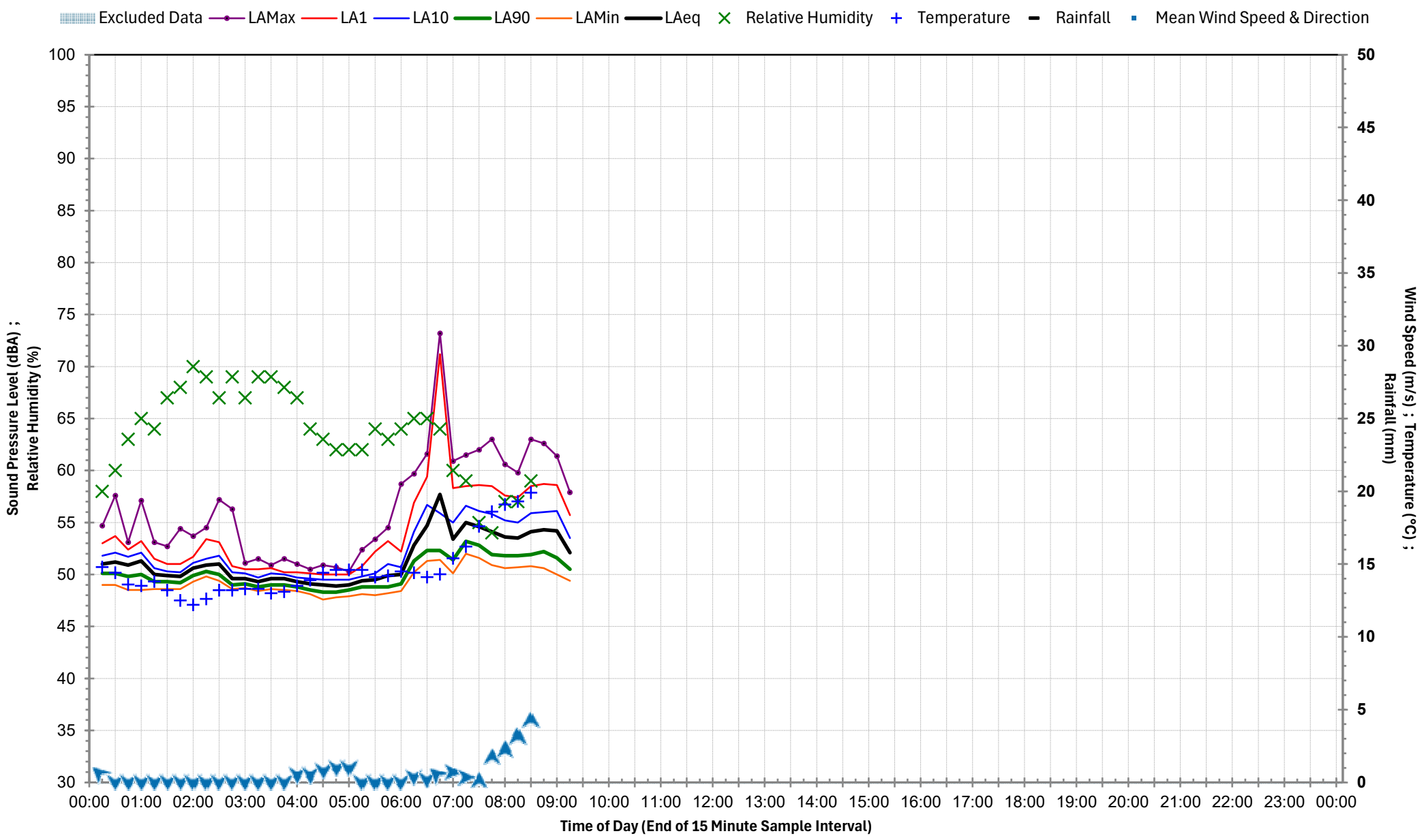
Statistical Ambient Noise Levels

Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Tuesday 11 February 2025

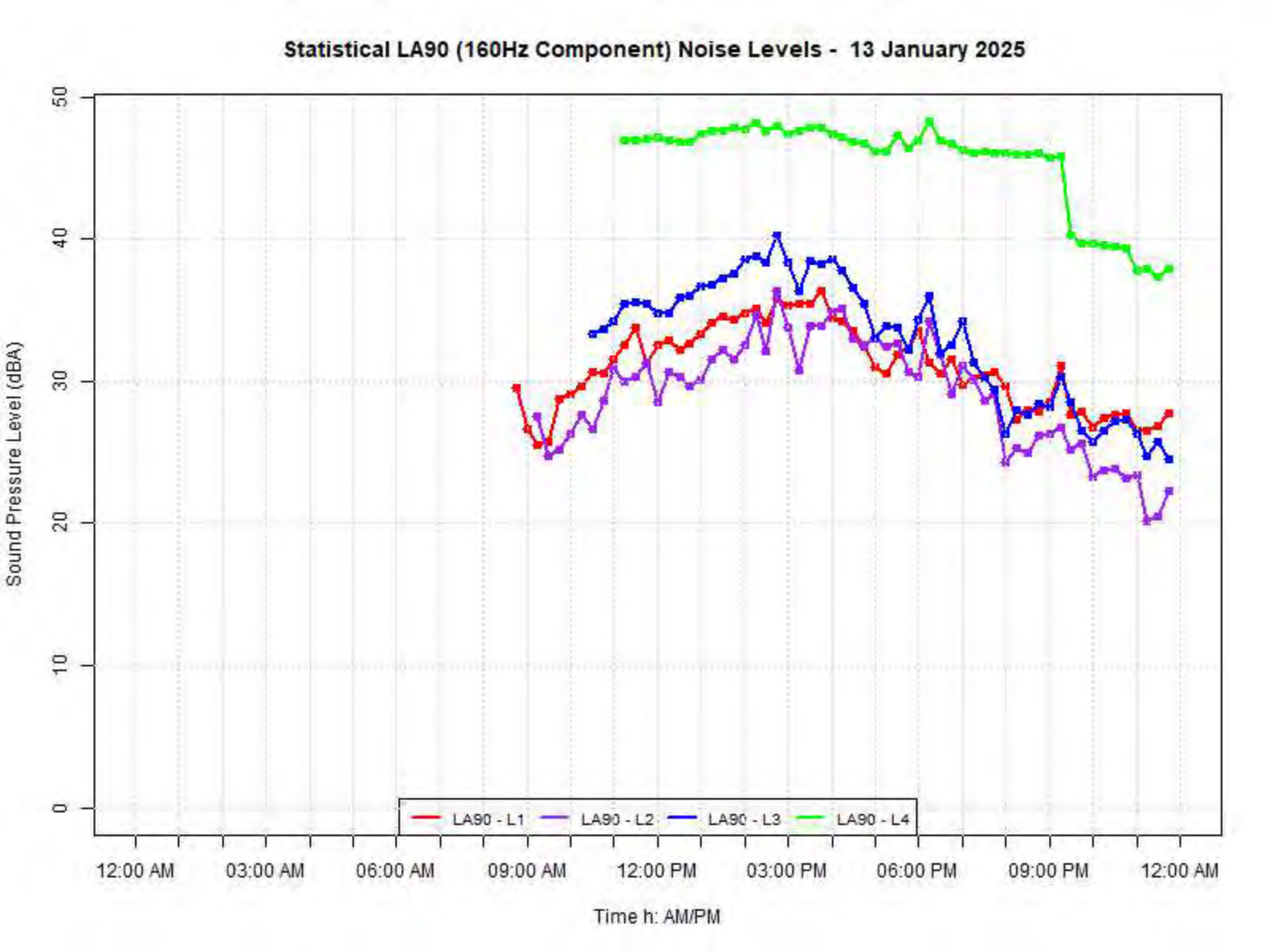


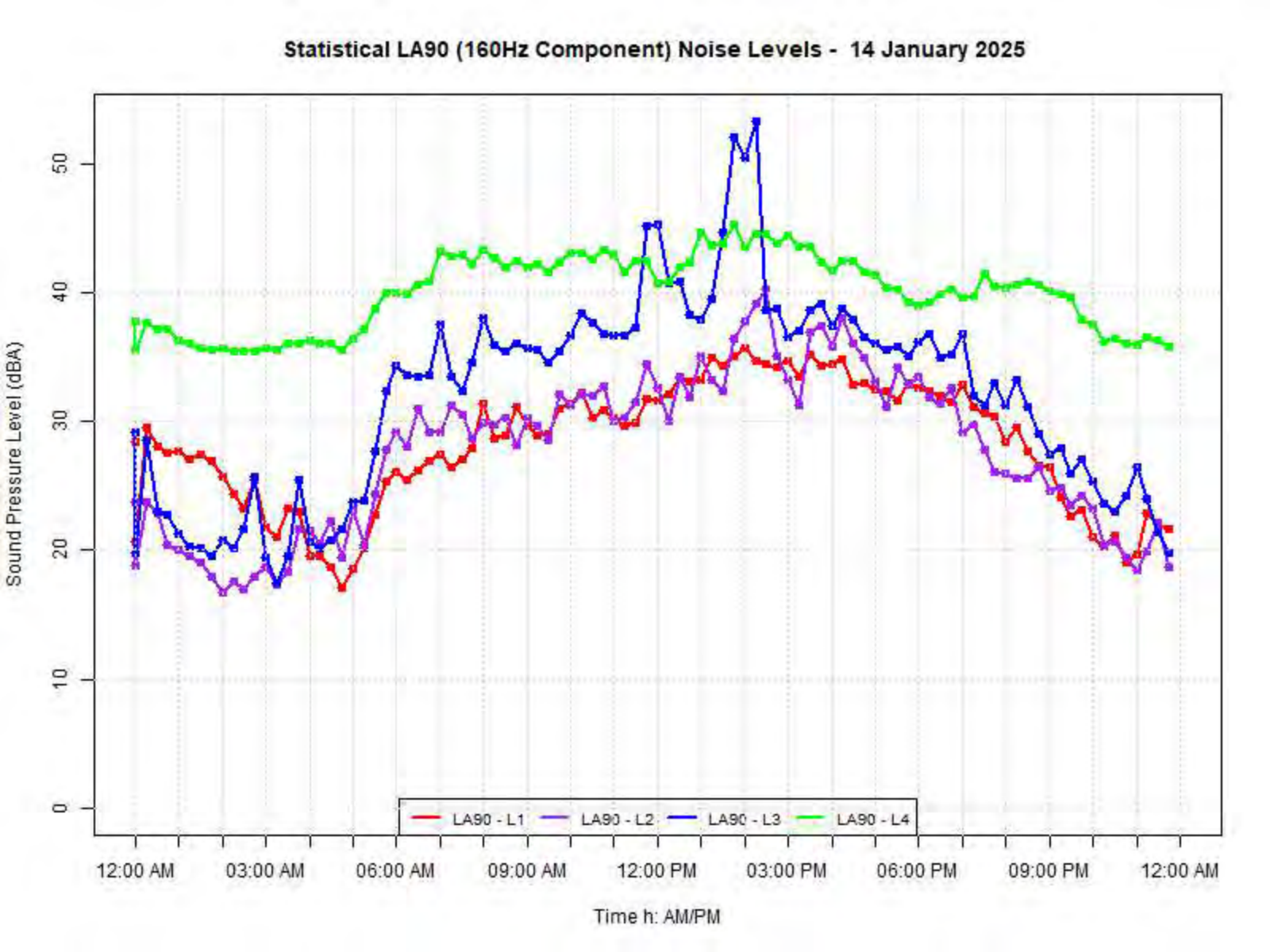
Statistical Ambient Noise Levels

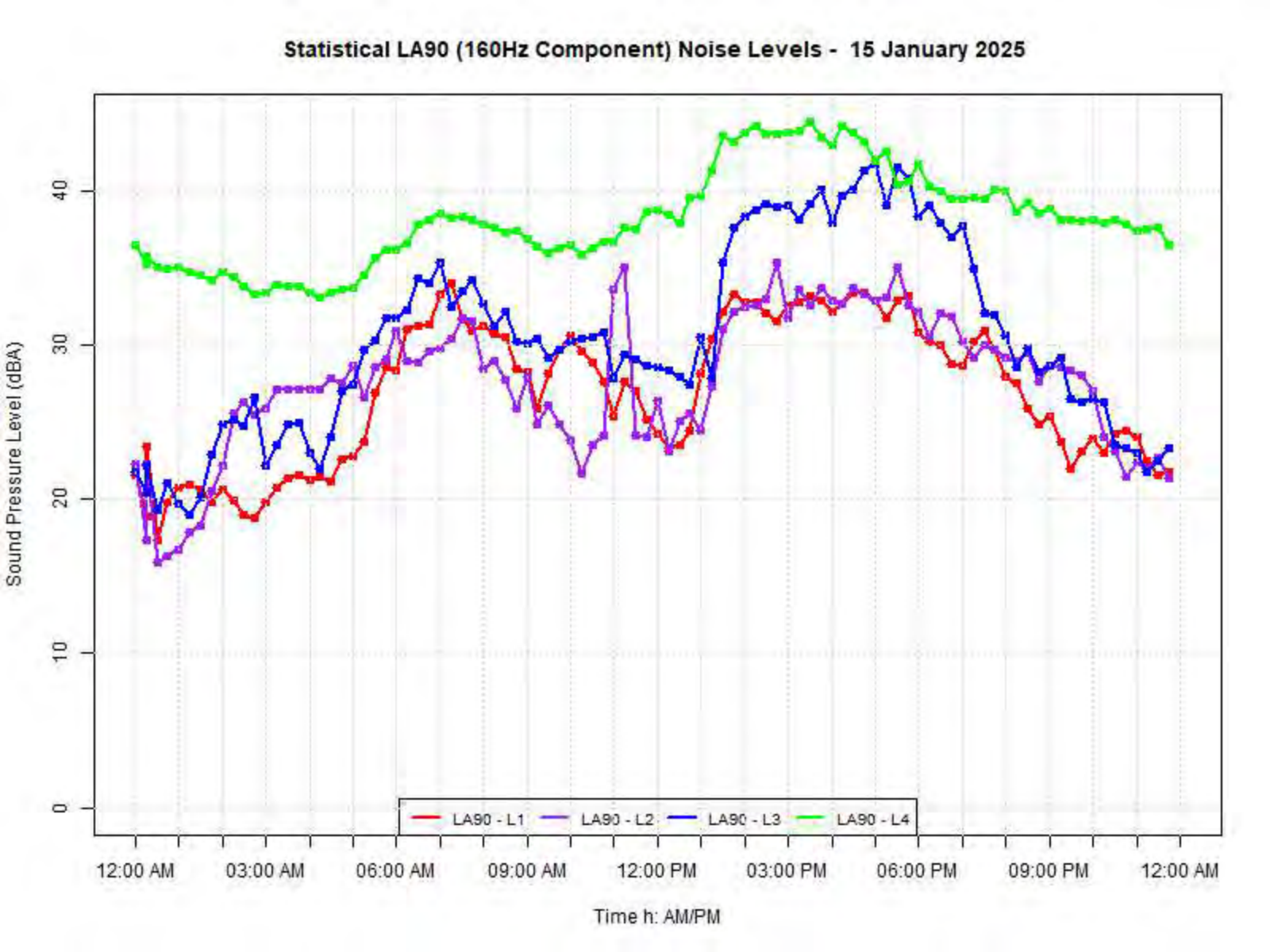
Shell BESS - L4 - 45 Trandos Rd Neerabup WA 6031 - Wednesday 12 February 2025

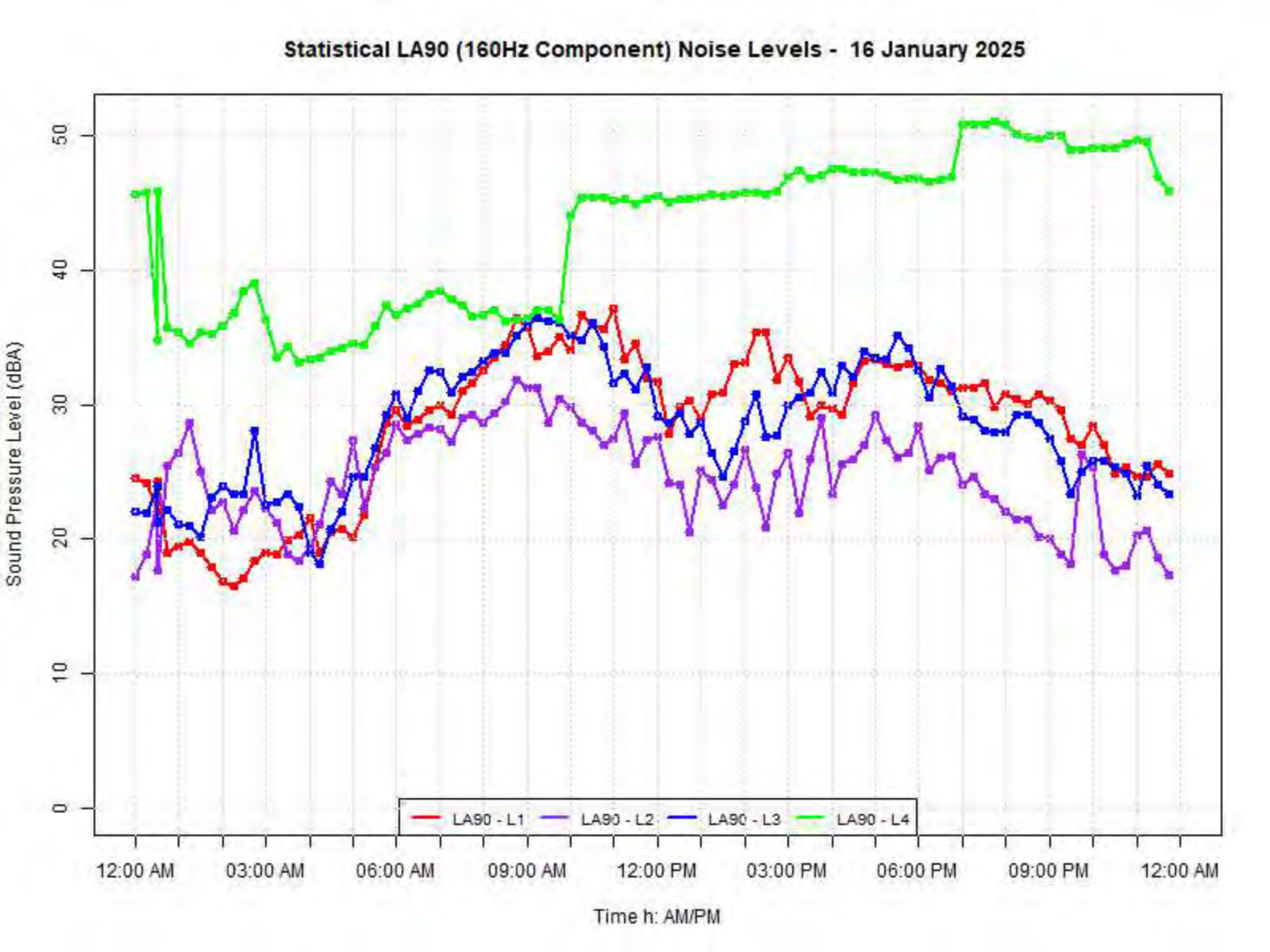


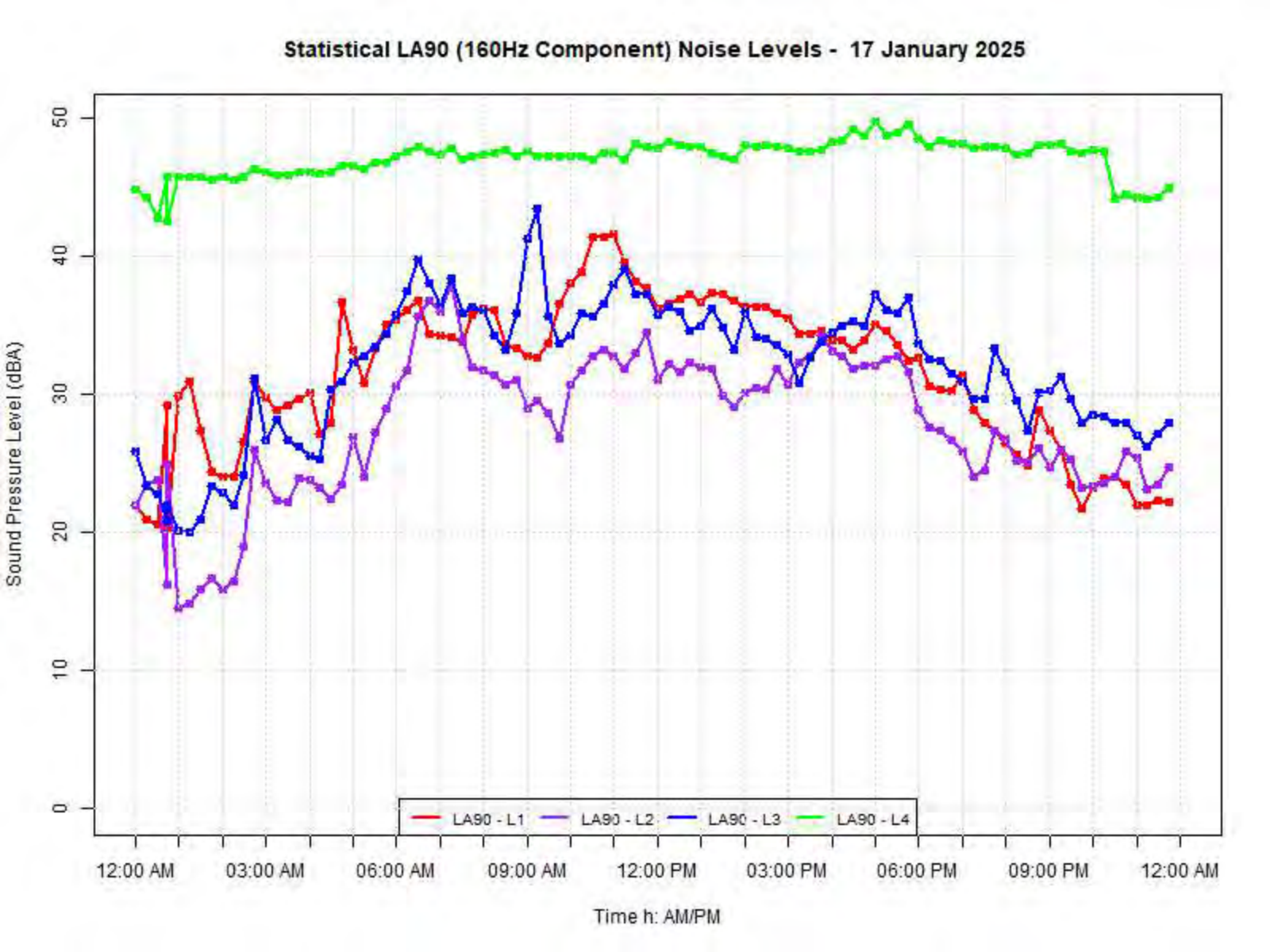
Low Frequency Noise Comparison

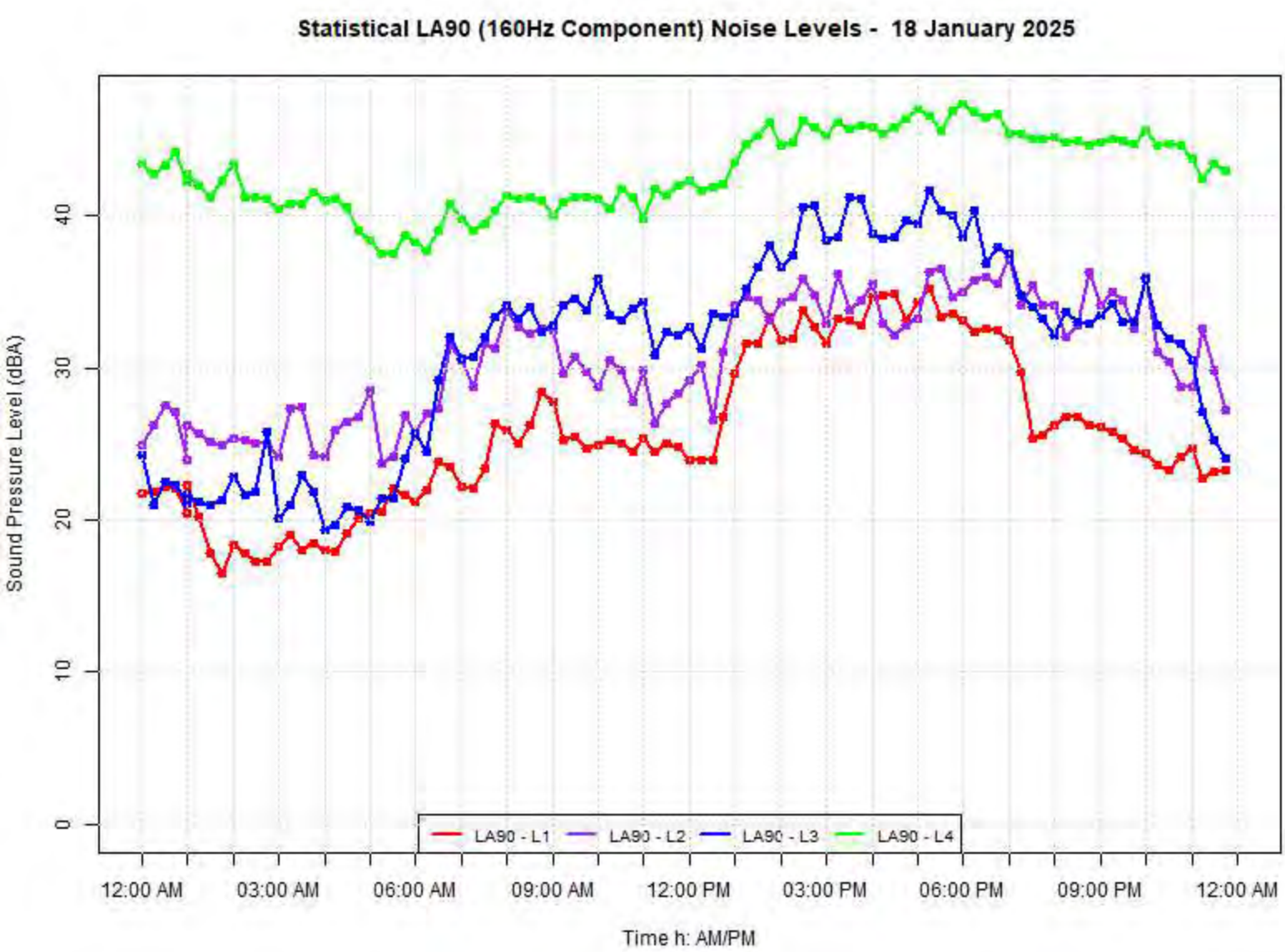

Statistical LA90 (160Hz Component) Noise Levels - 13 January 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM

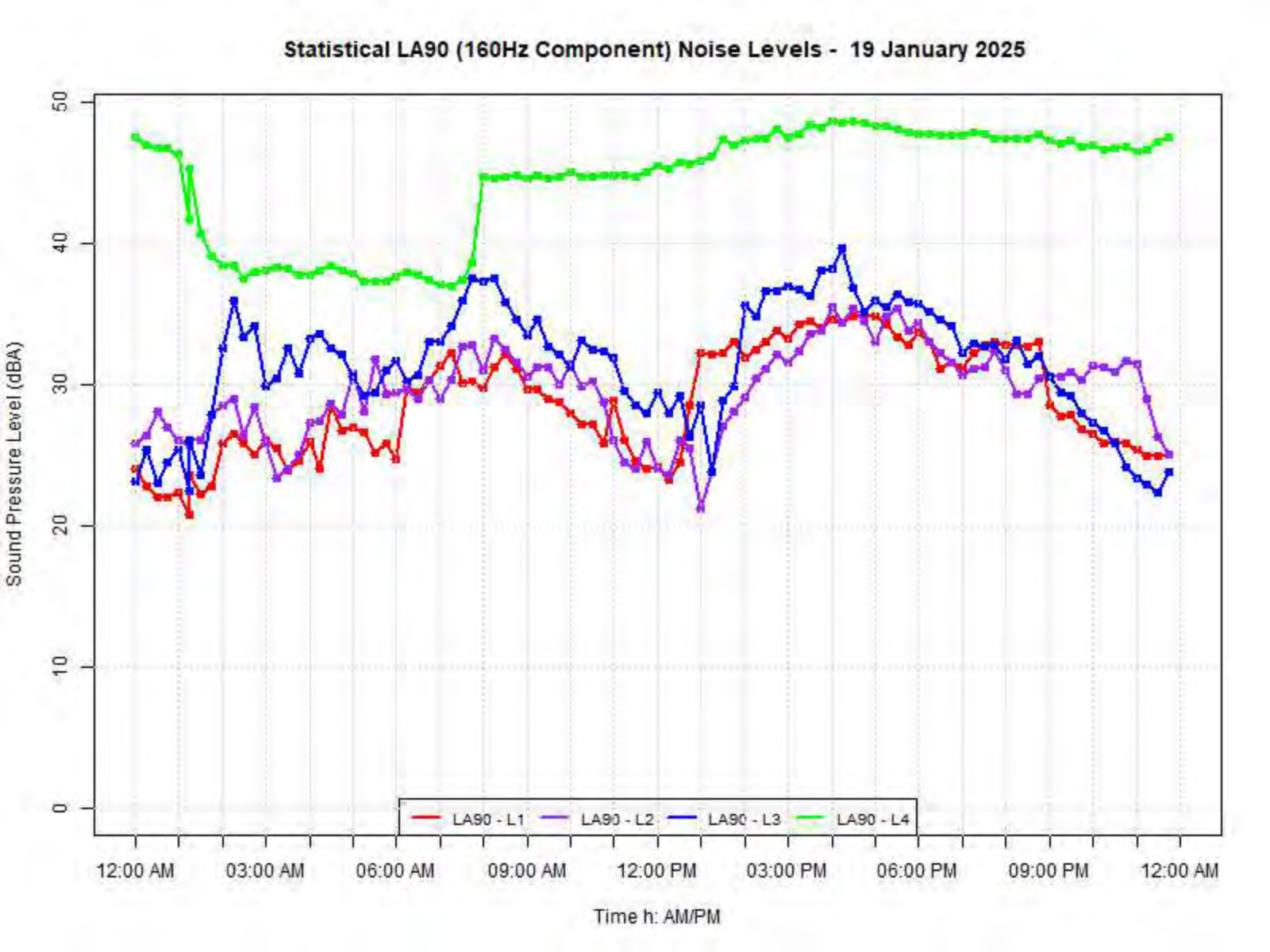

Statistical LA90 (160Hz Component) Noise Levels - 14 January 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM

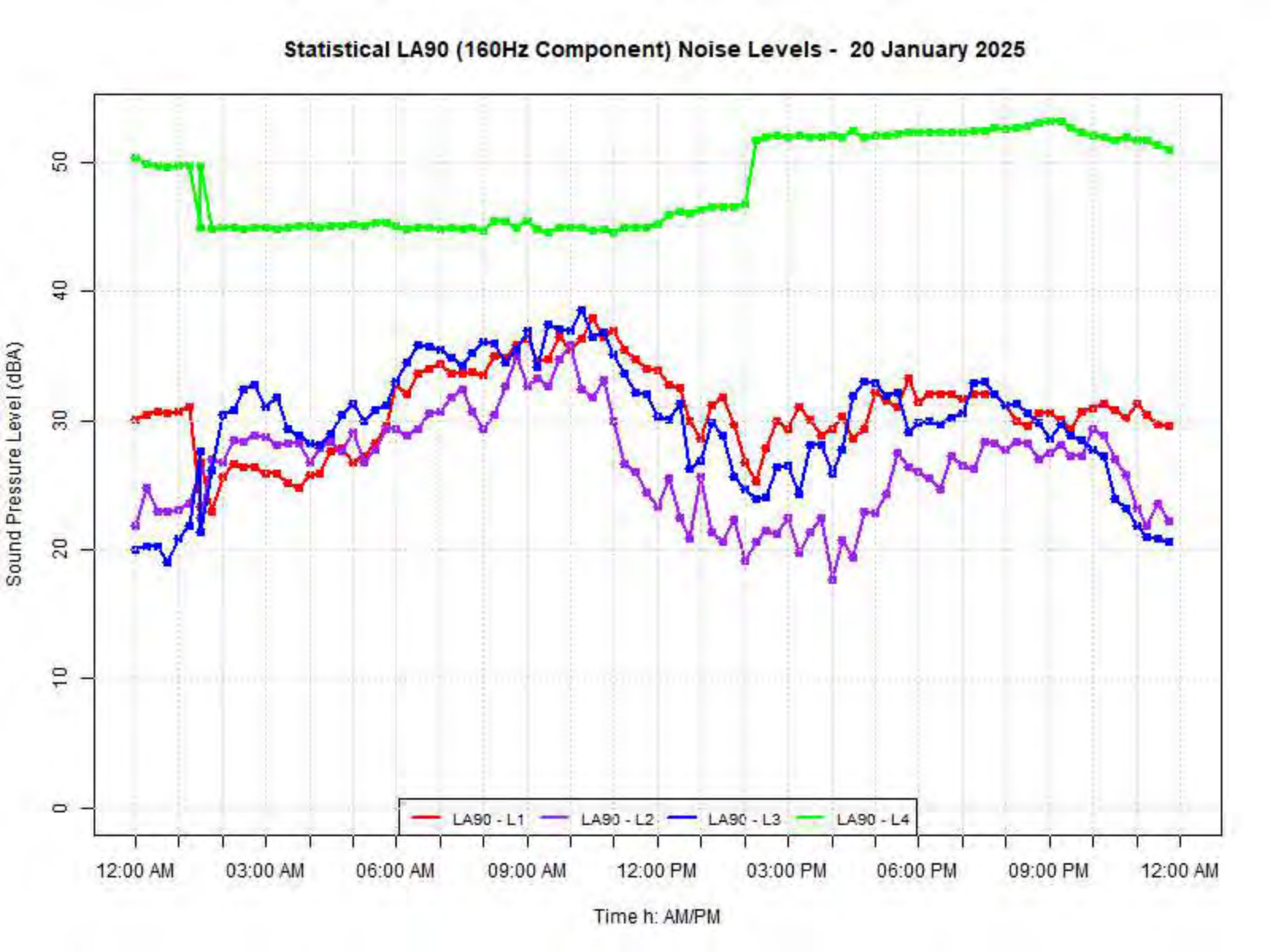

Statistical LA90 (160Hz Component) Noise Levels - 15 January 2025
Sound Pressure Level (dBA)
0
10
20
30
40
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM

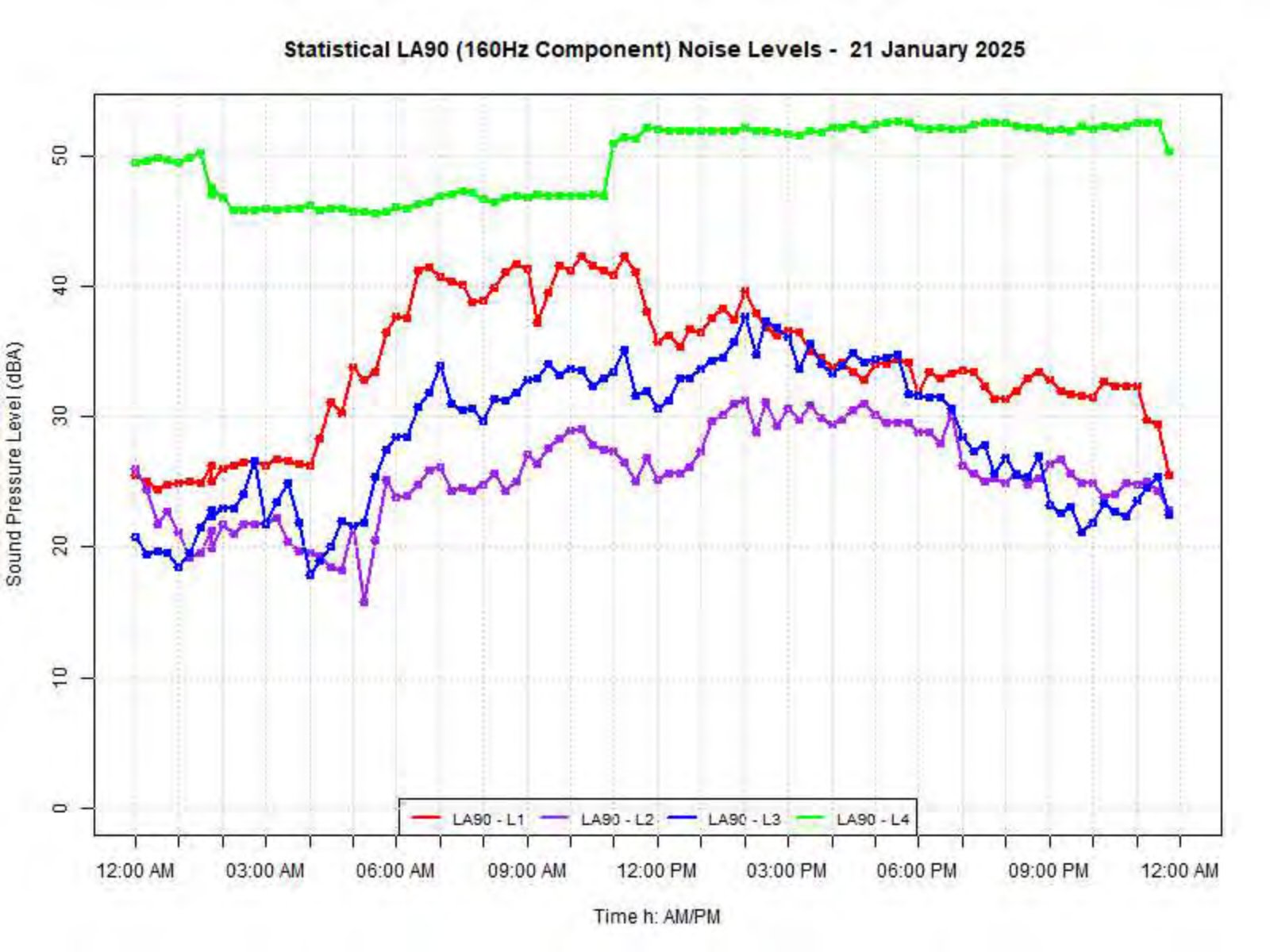

Statistical LA90 (160Hz Component) Noise Levels - 16 January 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM

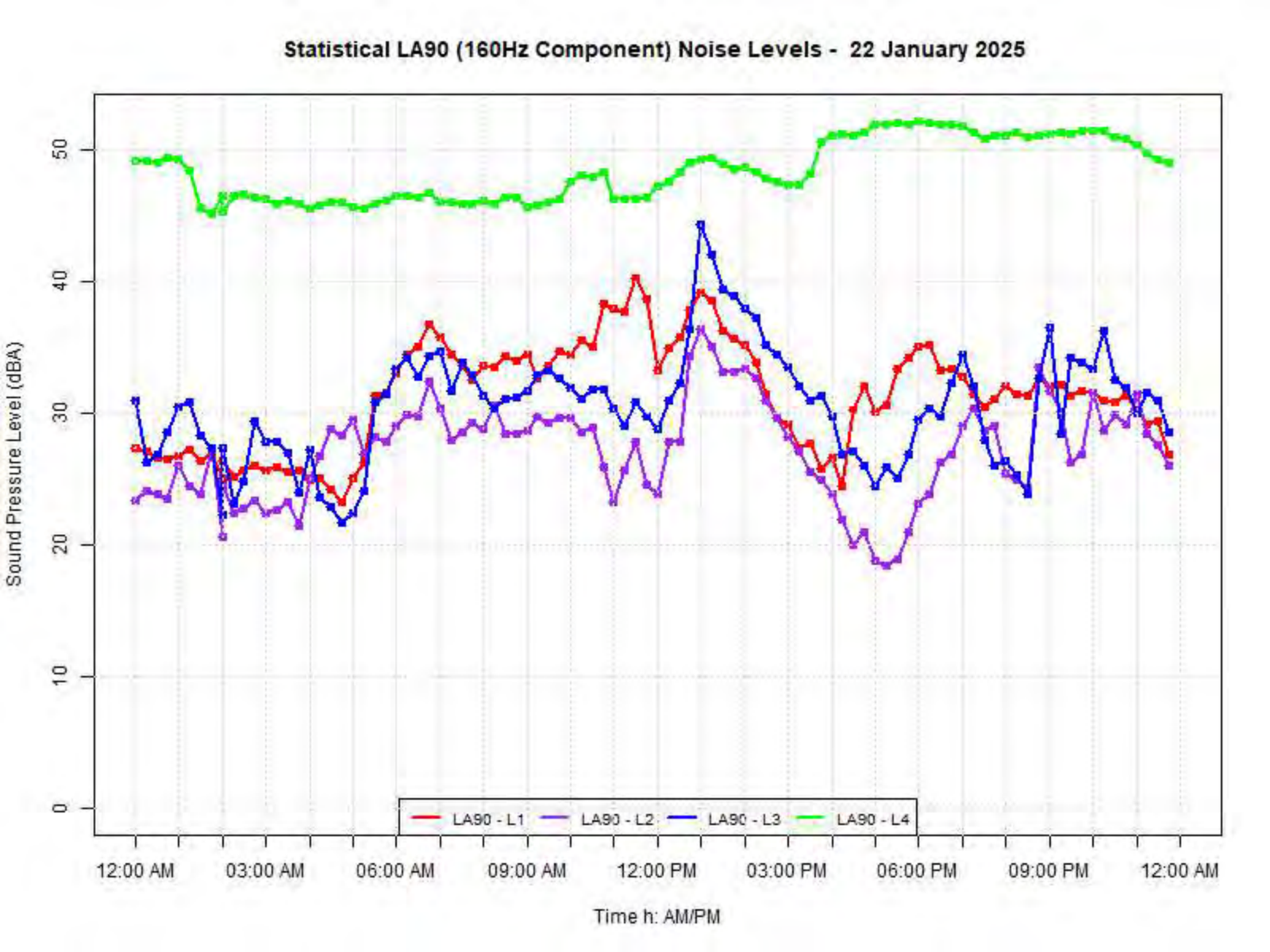

Statistical LA90 (160Hz Component) Noise Levels - 17 January 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM

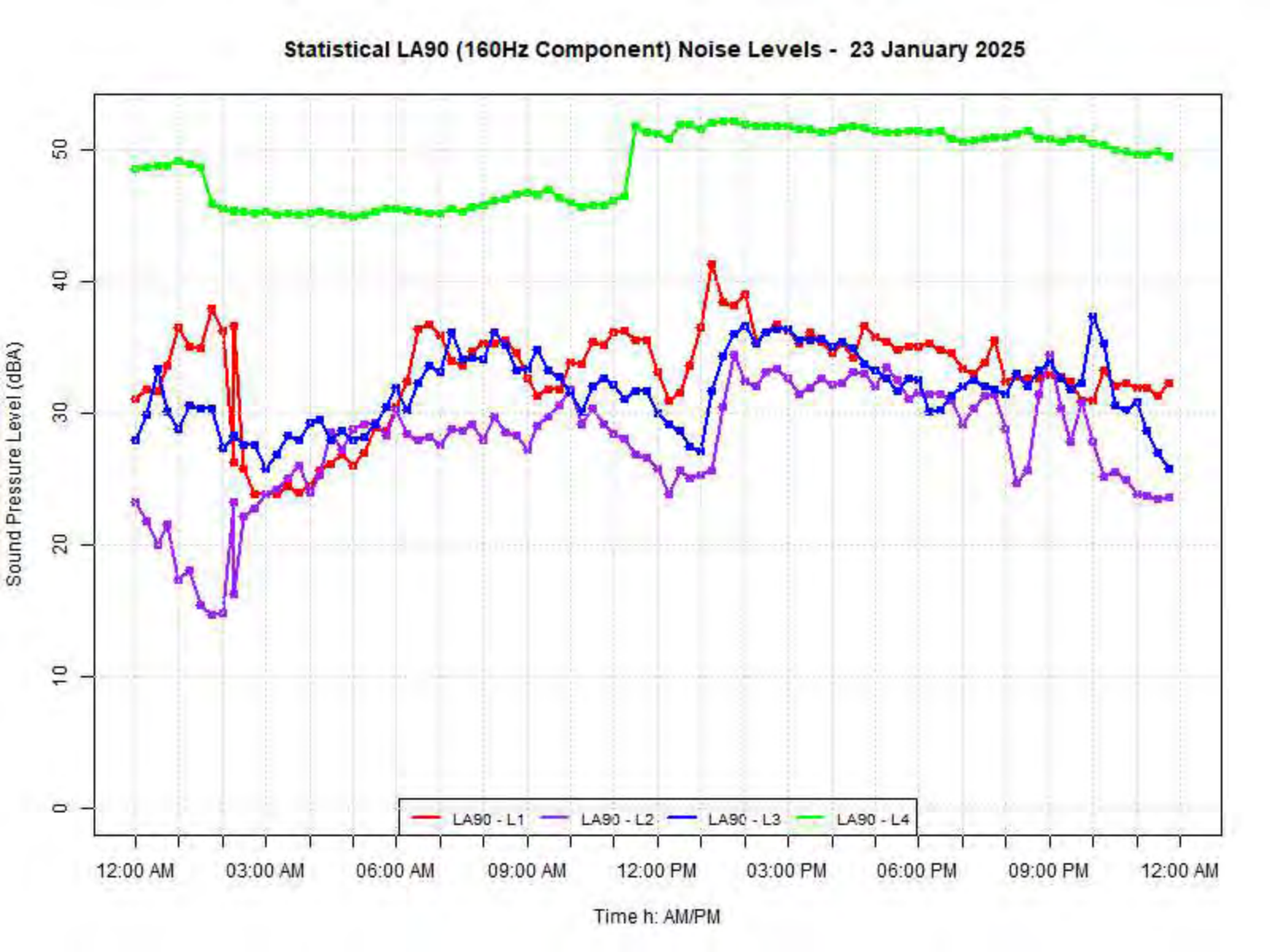

Statistical LA90 (160Hz Component) Noise Levels - 18 January 2025
Sound Pressure Level (dBA)
0
10
20
30
40
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM

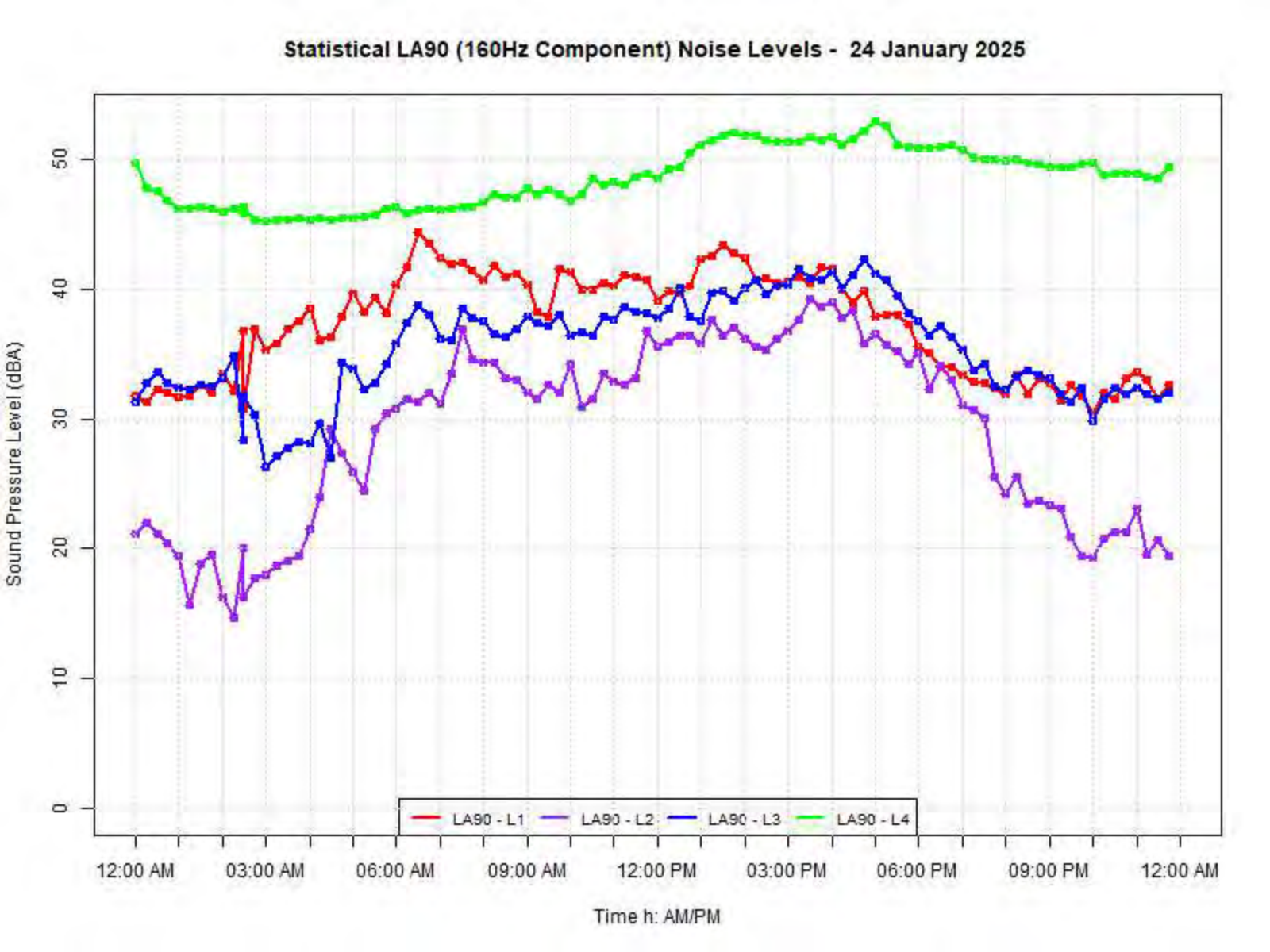

Statistical LA90 (160Hz Component) Noise Levels - 19 January 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM

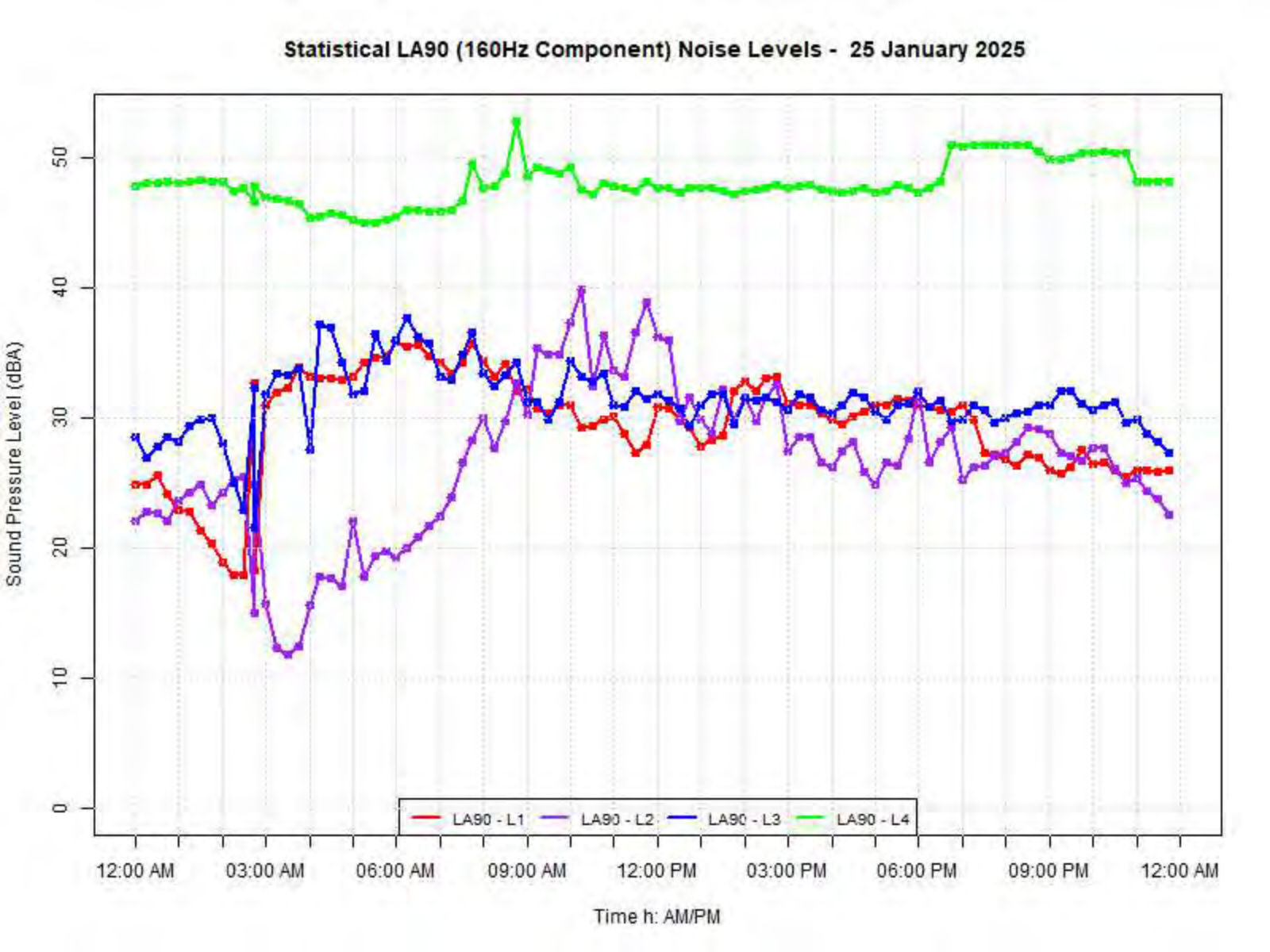

Statistical LA90 (160Hz Component) Noise Levels - 20 January 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM

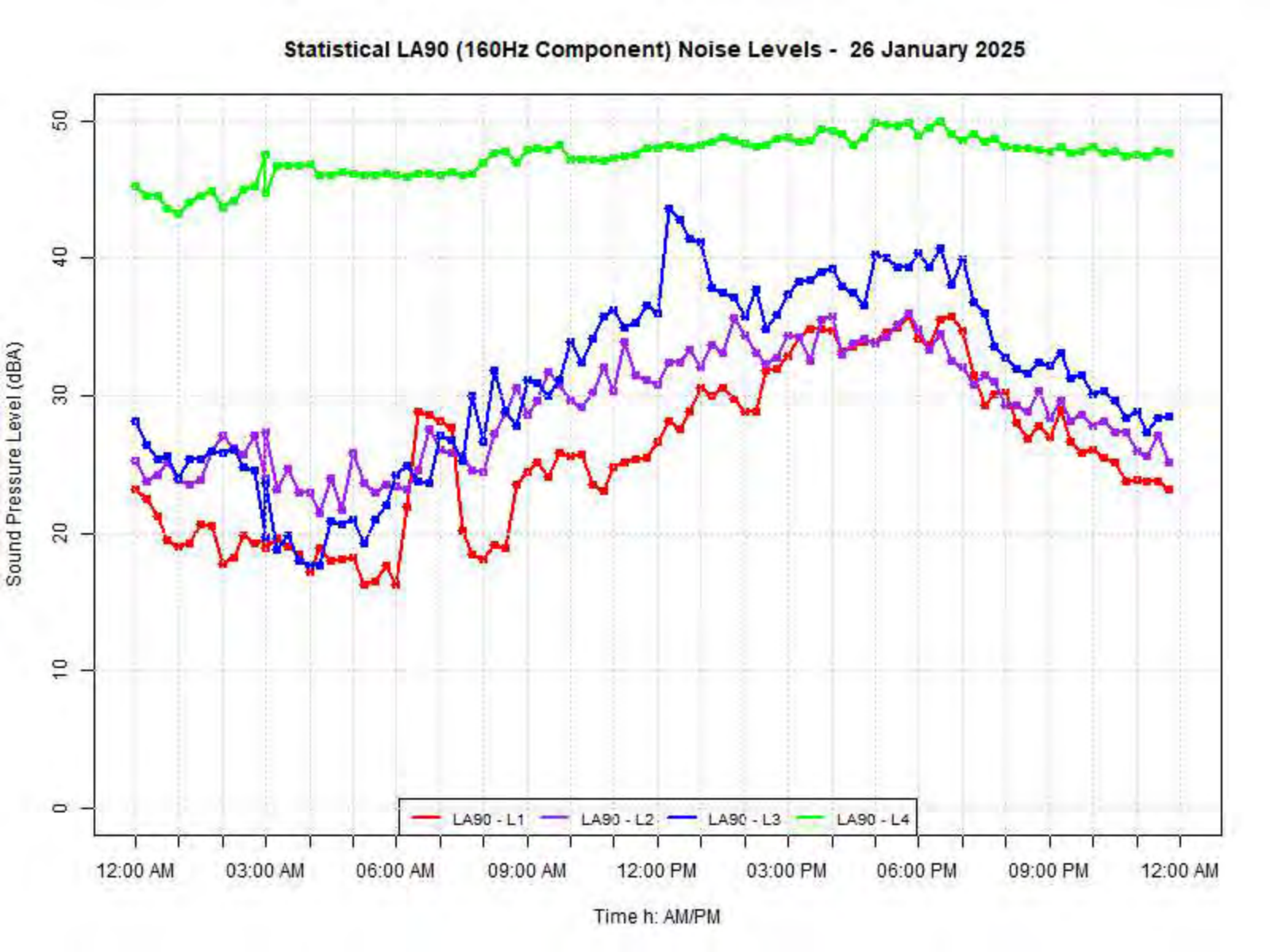

Statistical LA90 (160Hz Component) Noise Levels - 21 January 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM

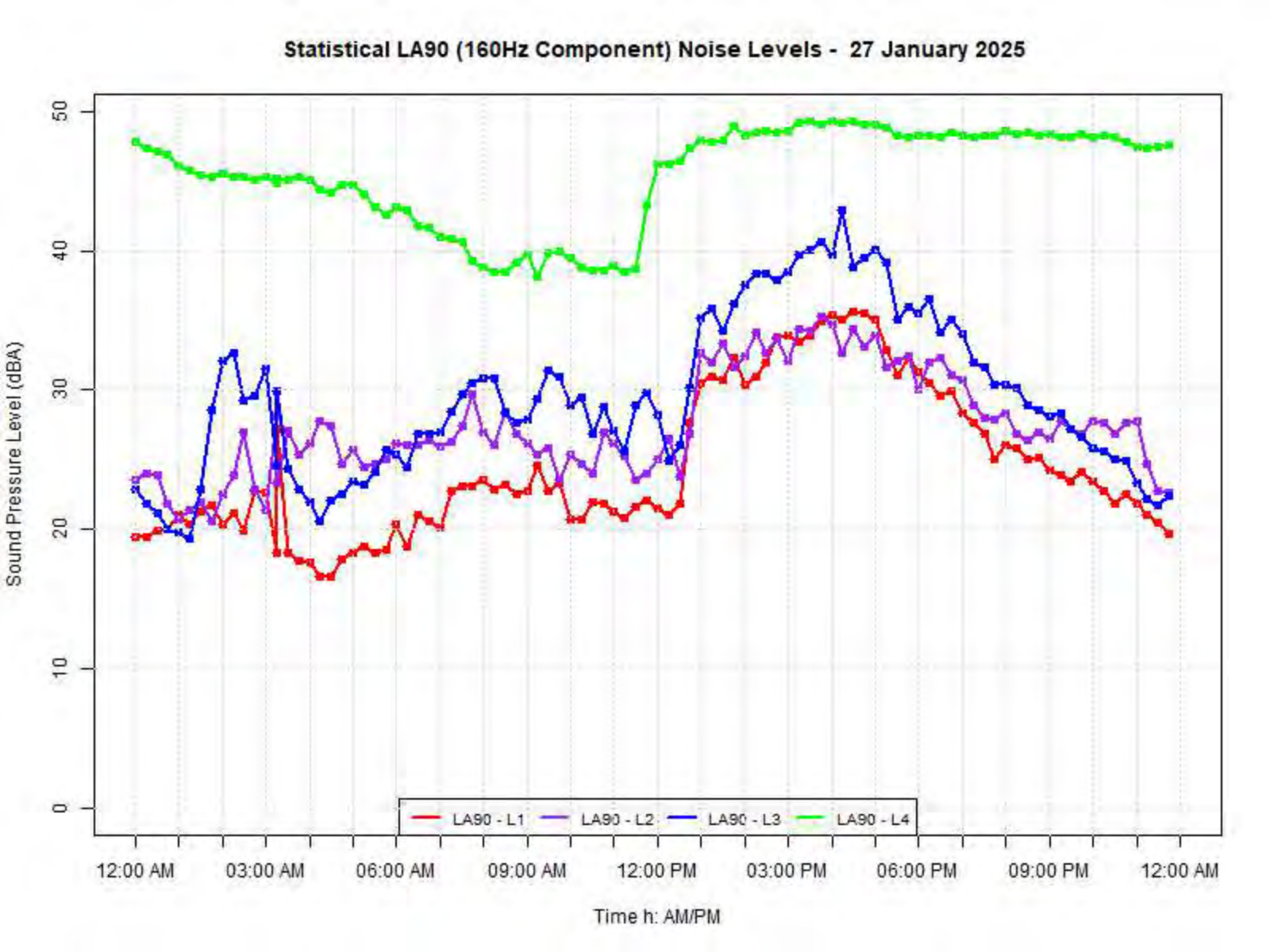

Statistical LA90 (160Hz Component) Noise Levels - 22 January 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM

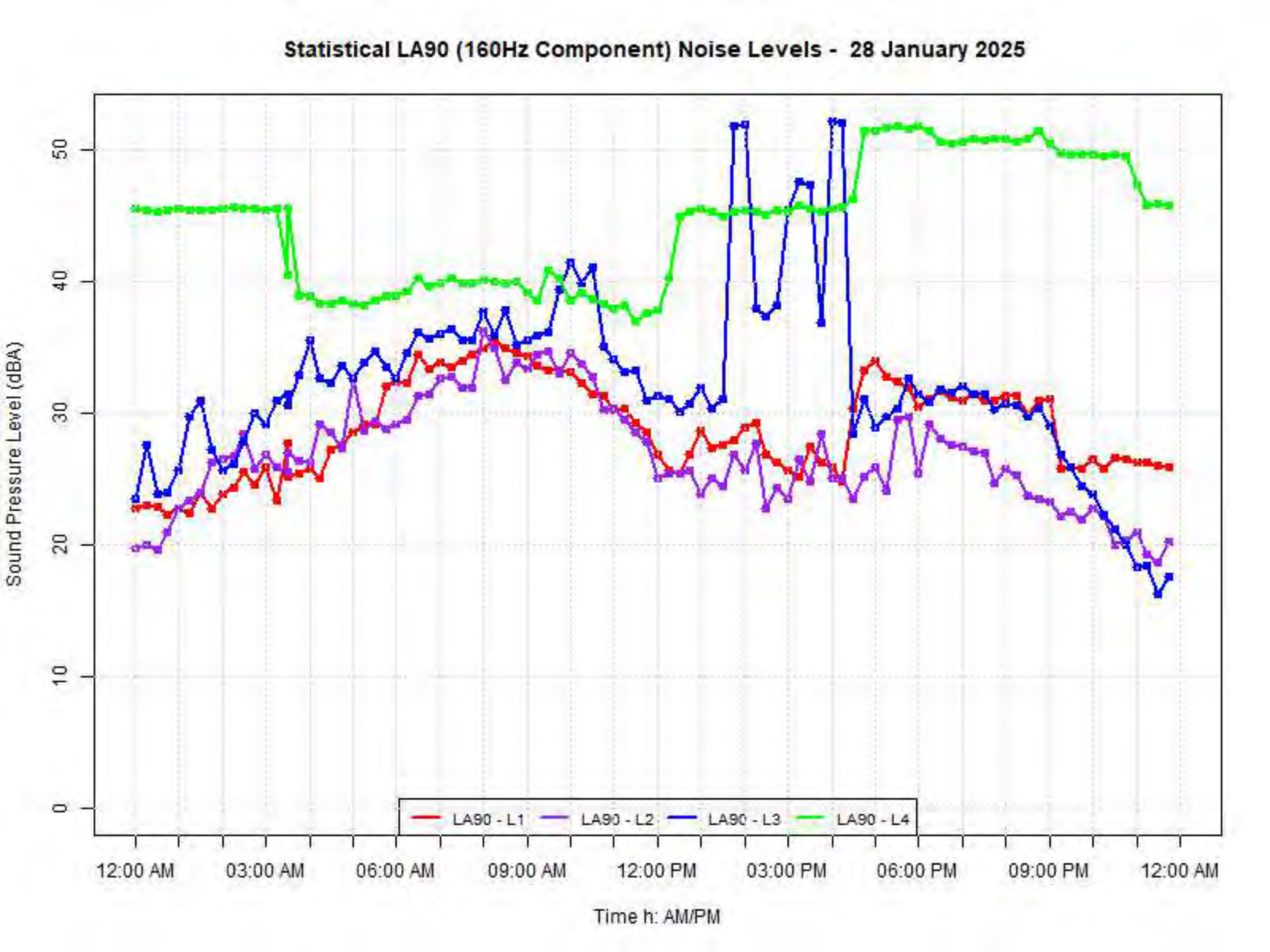

Statistical LA90 (160Hz Component) Noise Levels - 23 January 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM

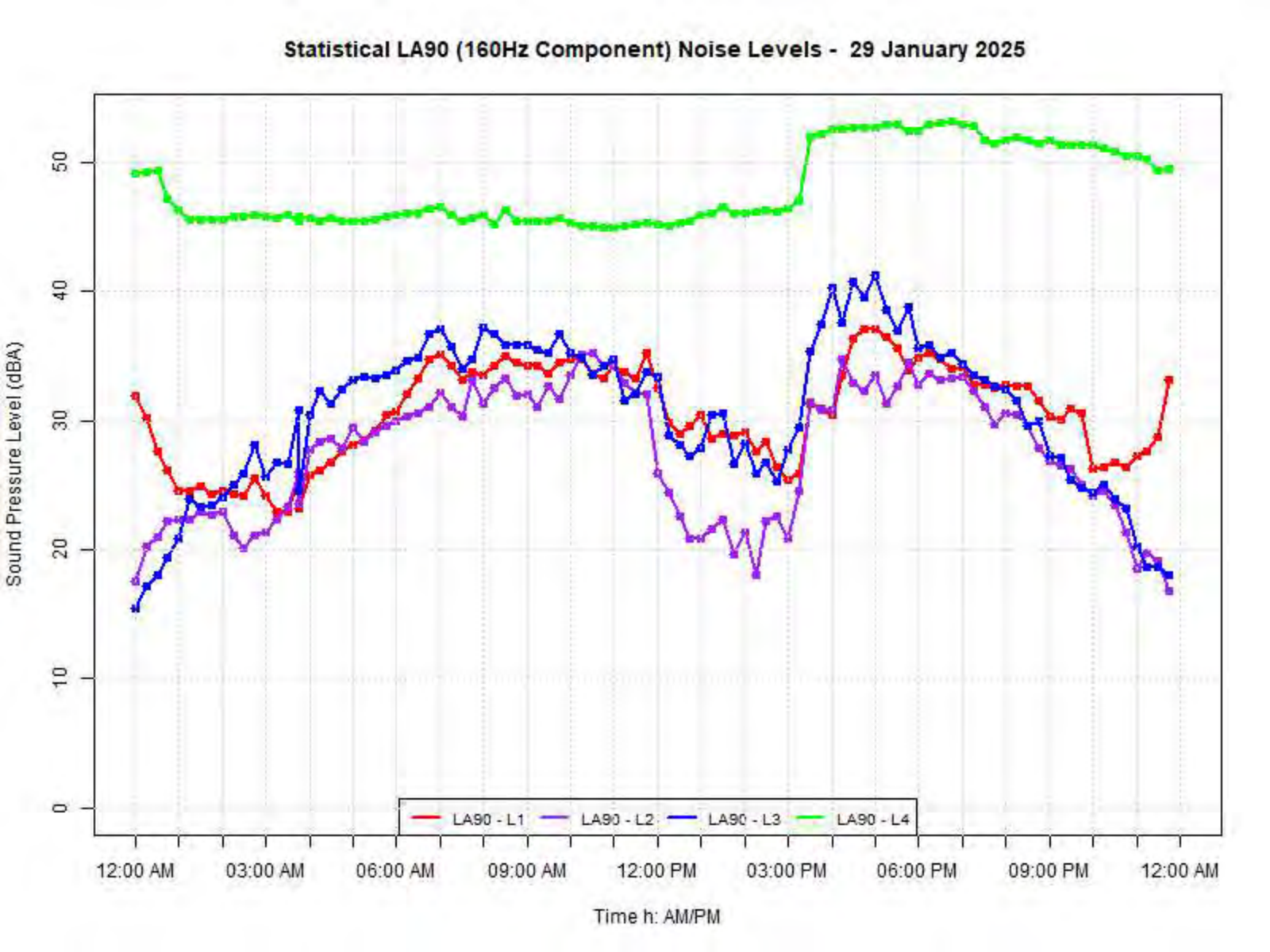

Statistical LA90 (160Hz Component) Noise Levels - 24 January 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM

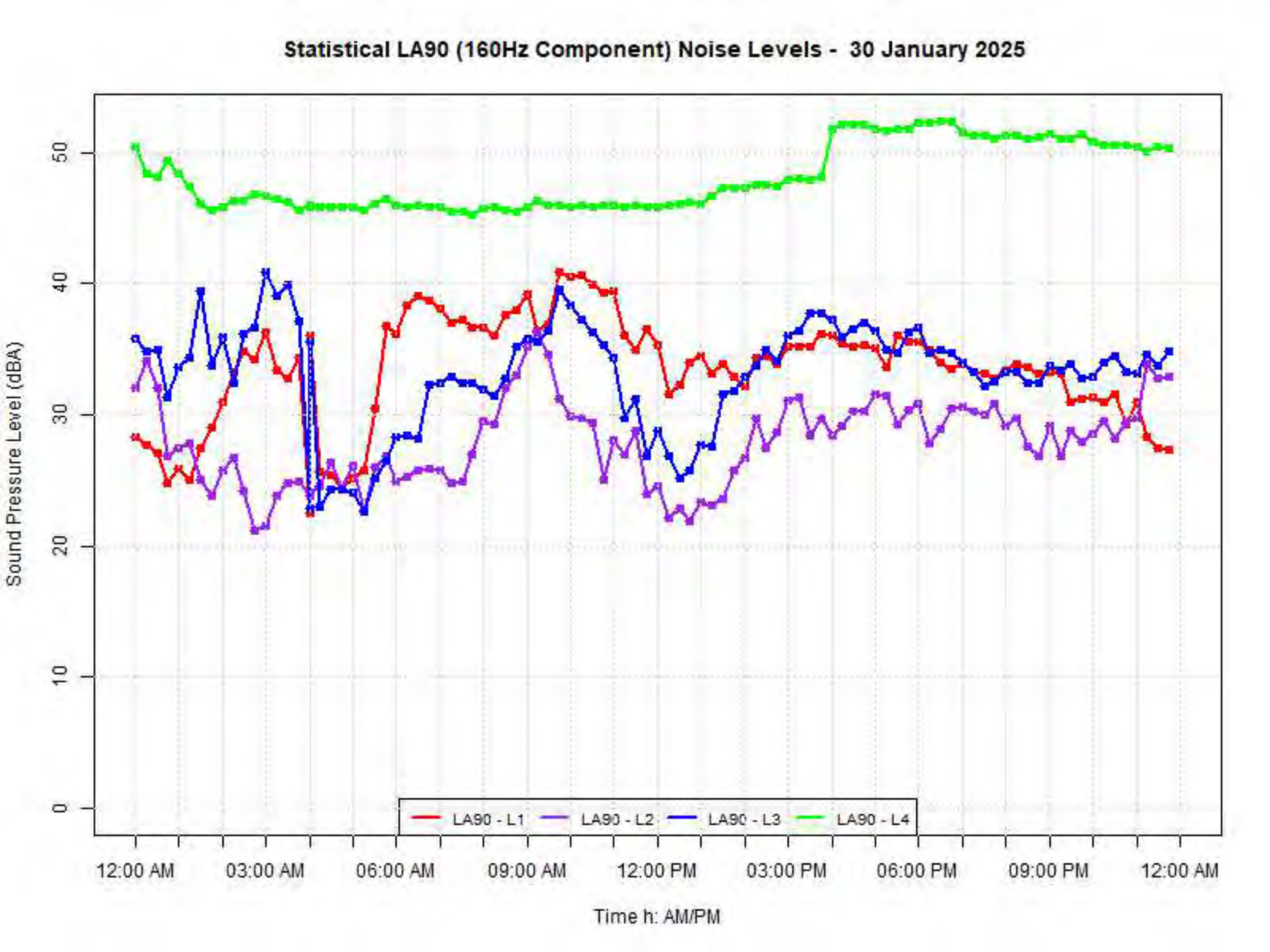

Statistical LA90 (160Hz Component) Noise Levels - 25 January 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM

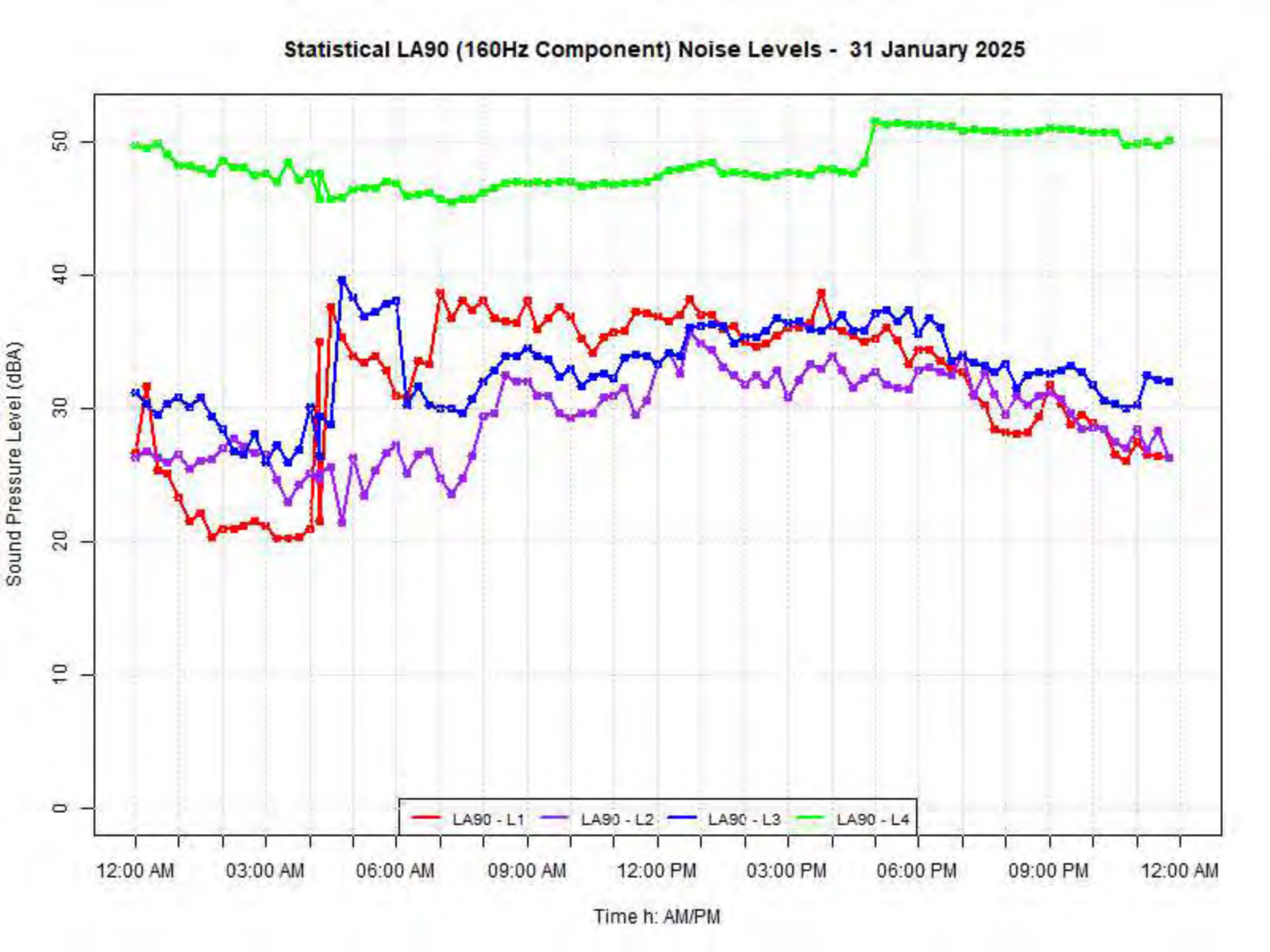

Statistical LA90 (160Hz Component) Noise Levels - 26 January 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM

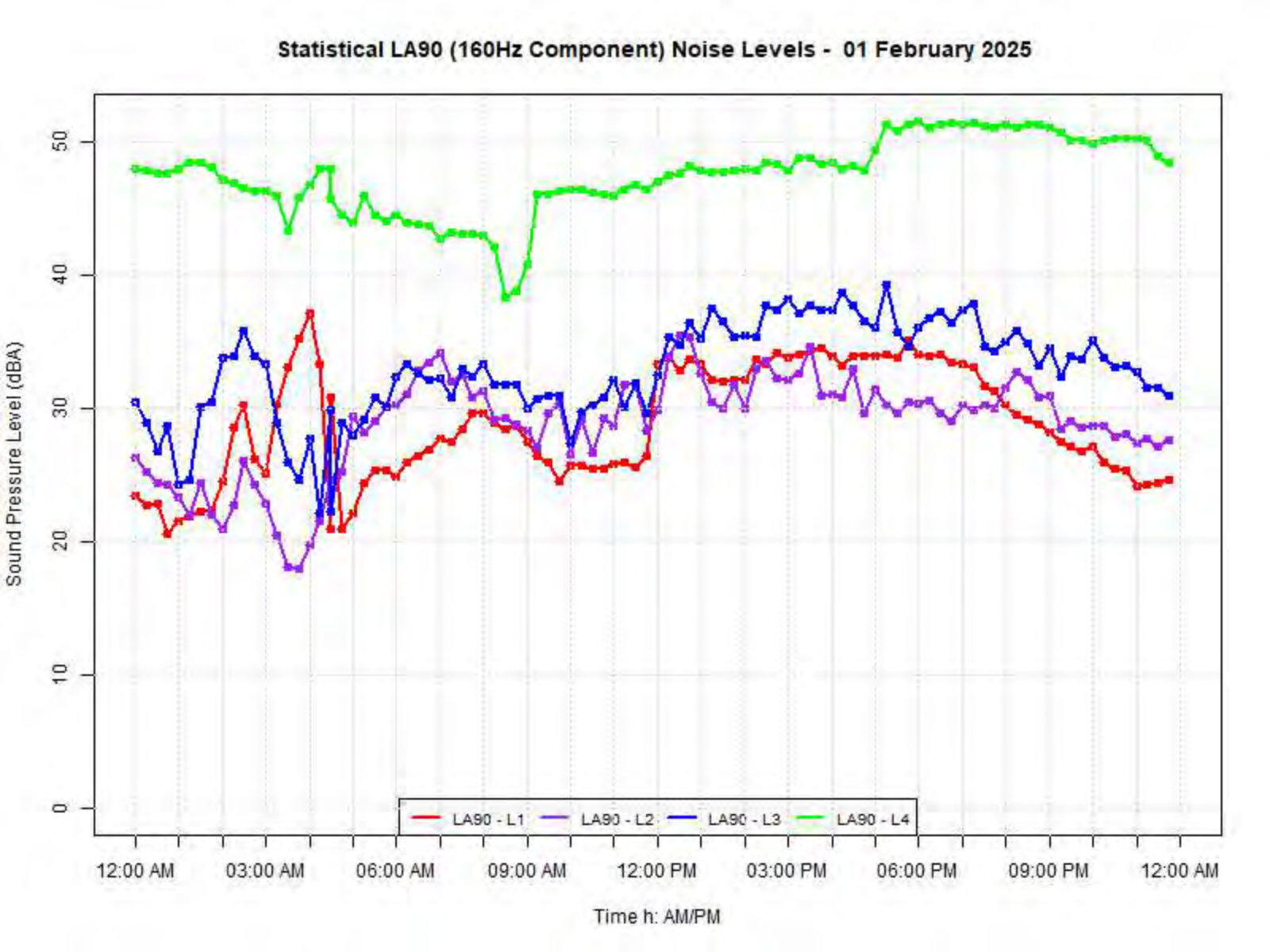

Statistical LA90 (160Hz Component) Noise Levels - 27 January 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM

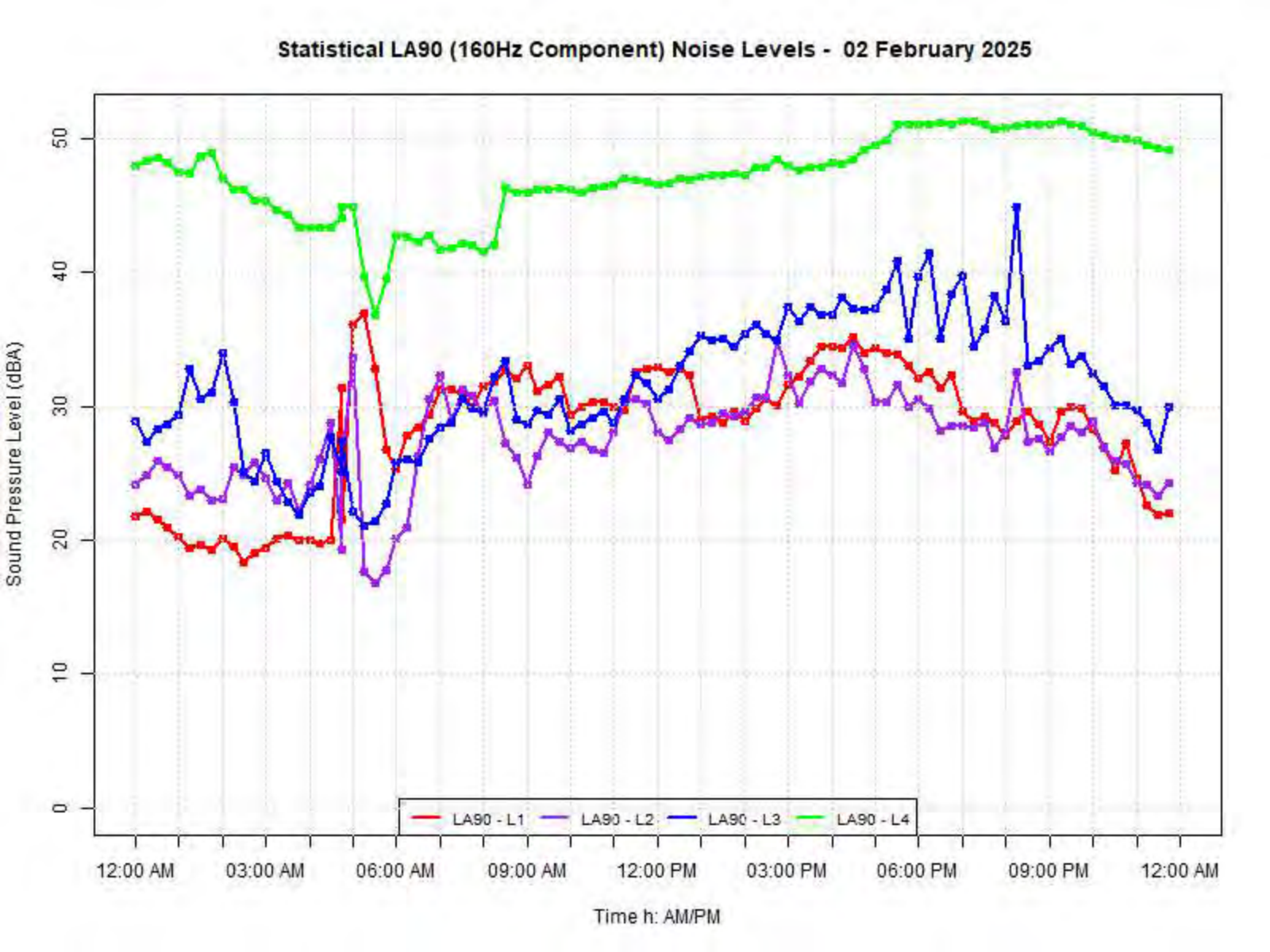

Statistical LA90 (160Hz Component) Noise Levels - 28 January 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM

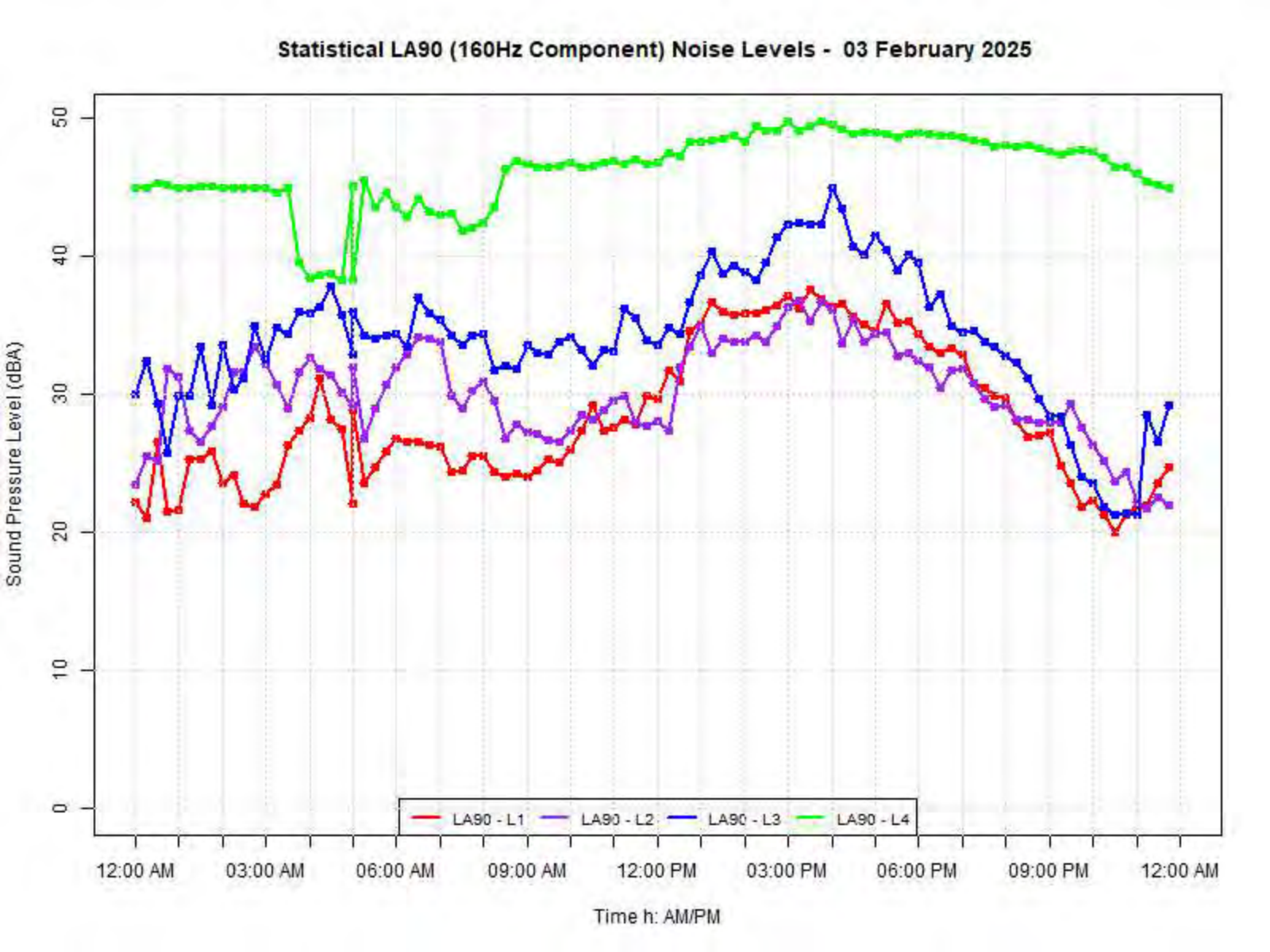

Statistical LA90 (160Hz Component) Noise Levels - 29 January 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM

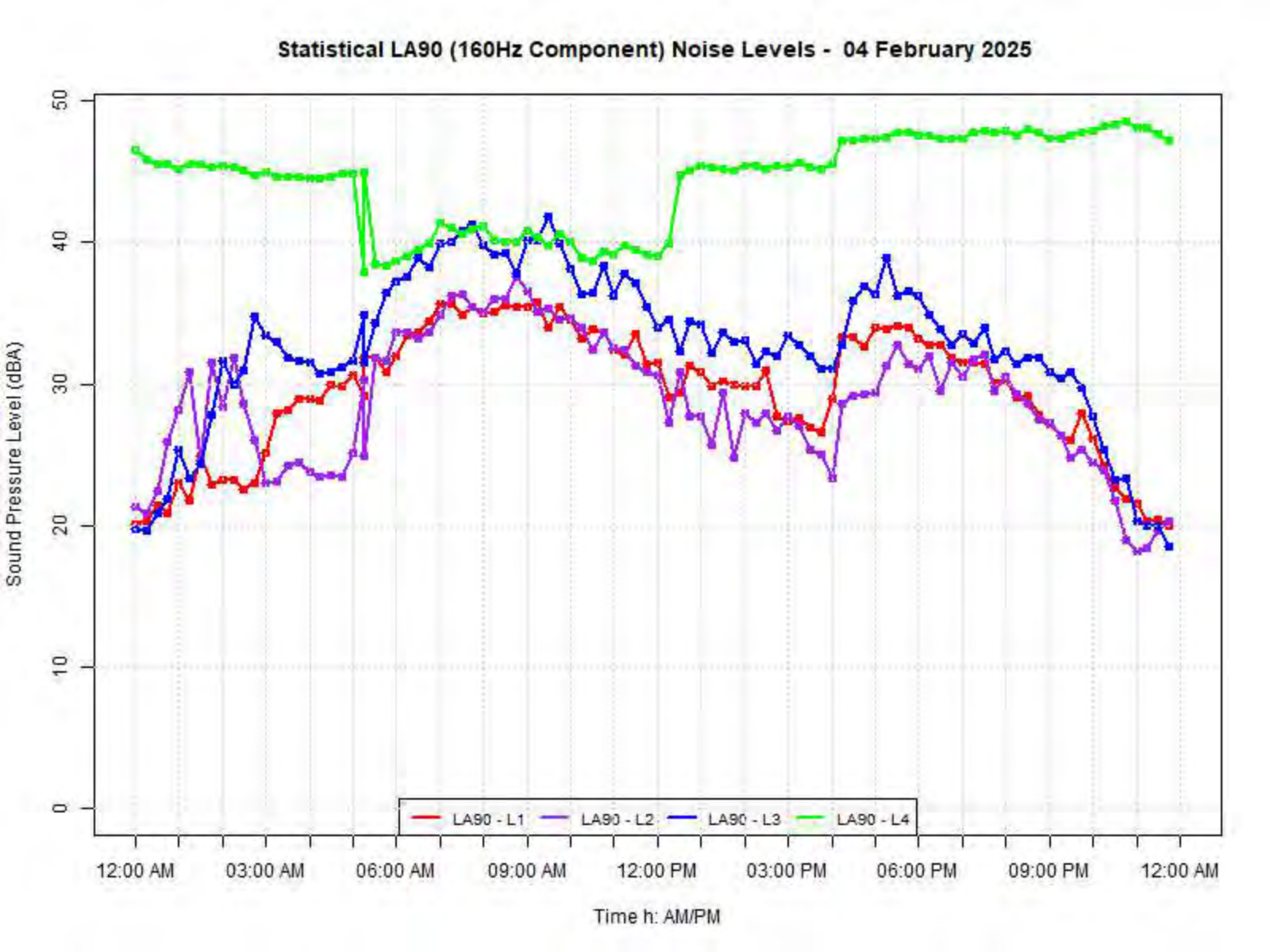

Statistical LA90 (160Hz Component) Noise Levels - 30 January 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM

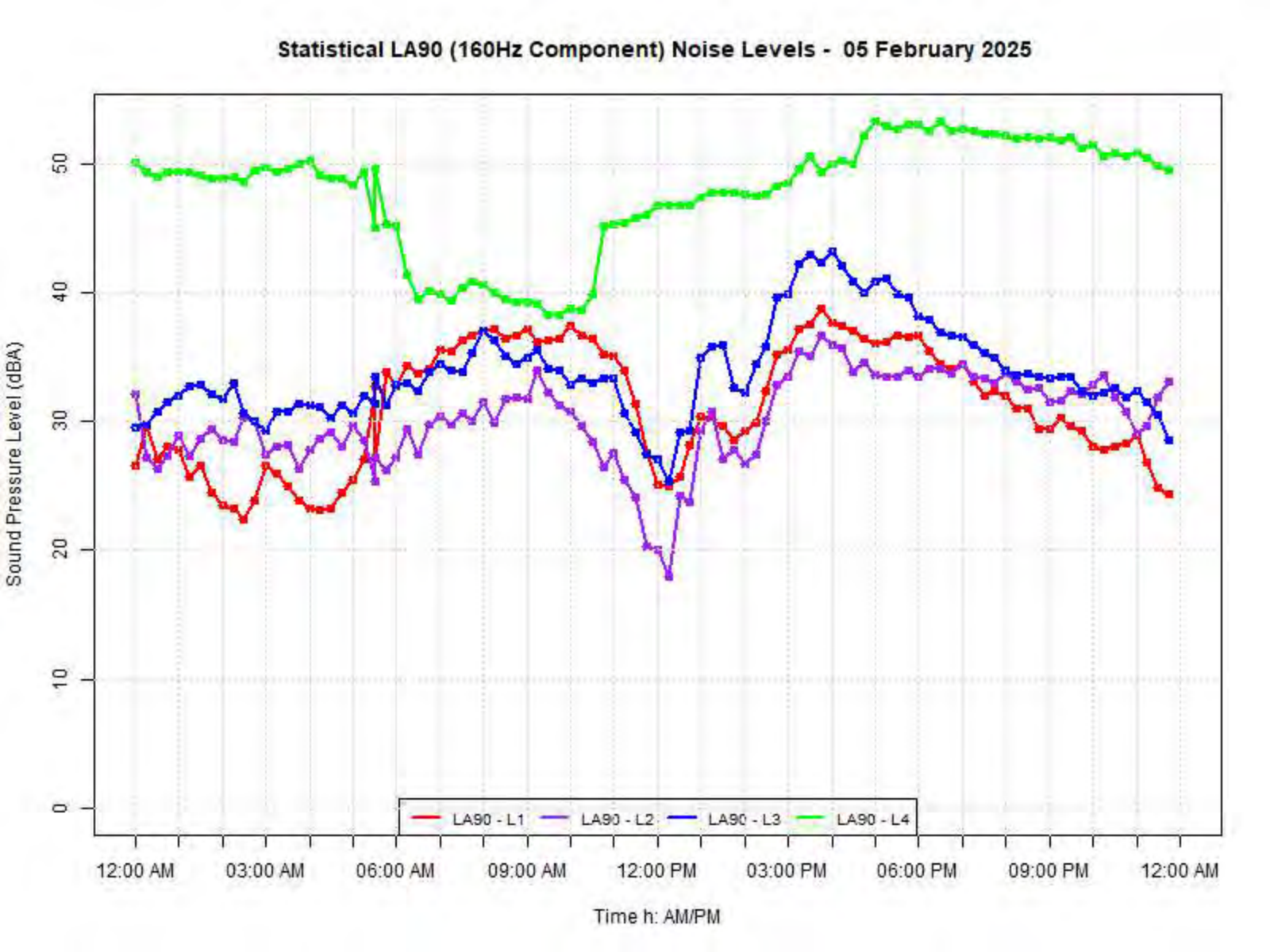

Statistical LA90 (160Hz Component) Noise Levels - 31 January 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM

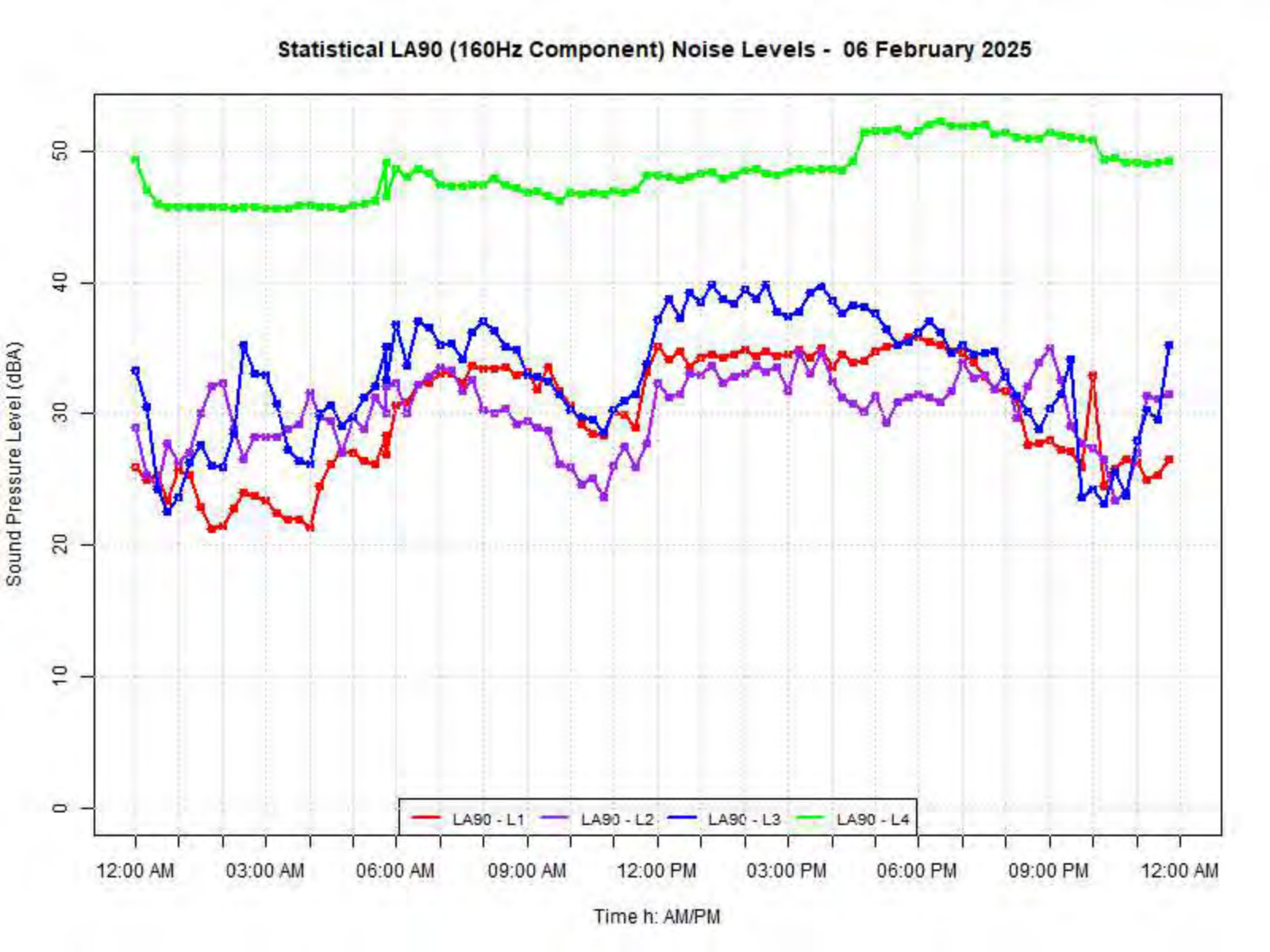

Statistical LA90 (160Hz Component) Noise Levels - 01 February 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM

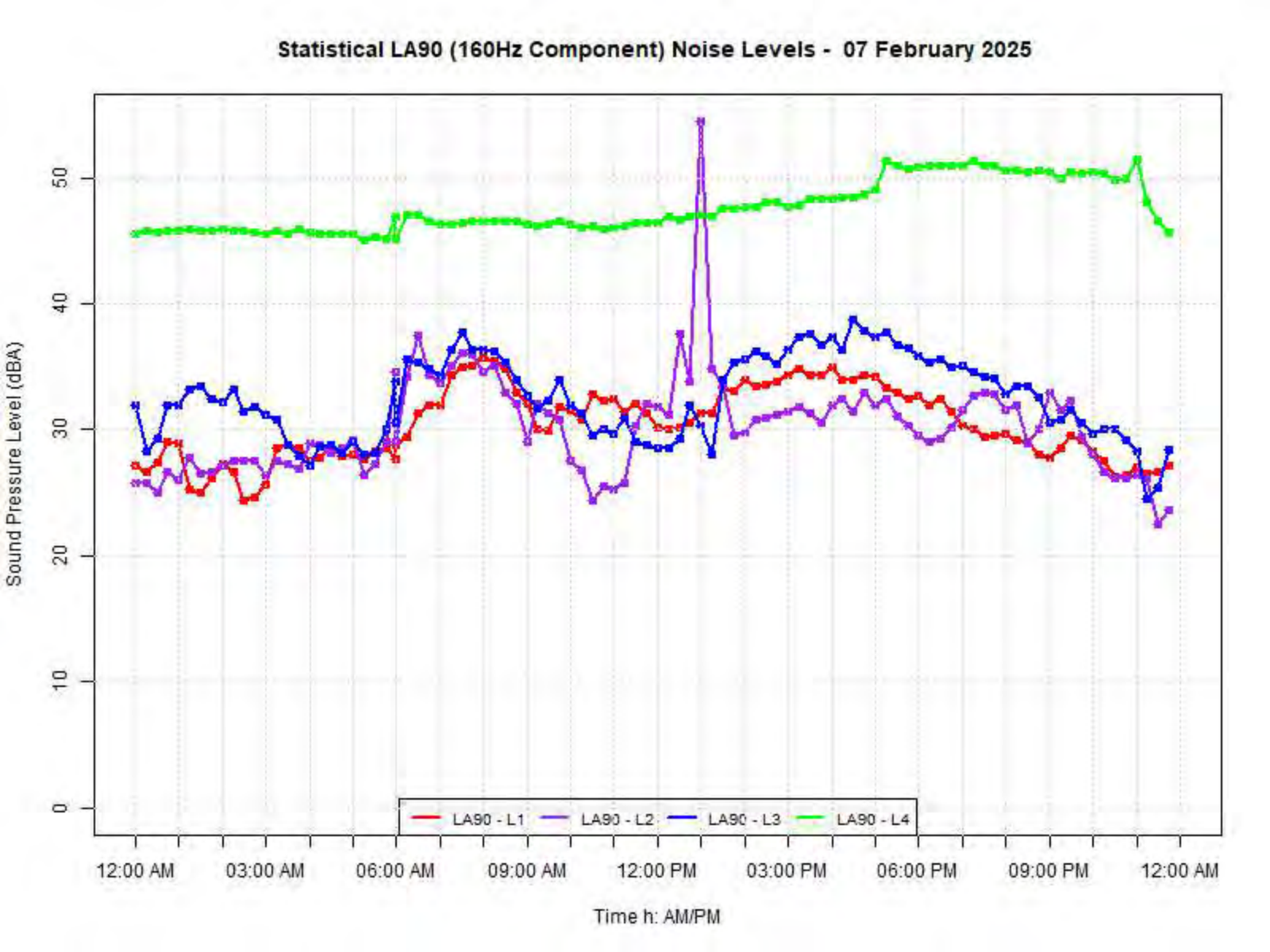

Statistical LA90 (160Hz Component) Noise Levels - 02 February 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM

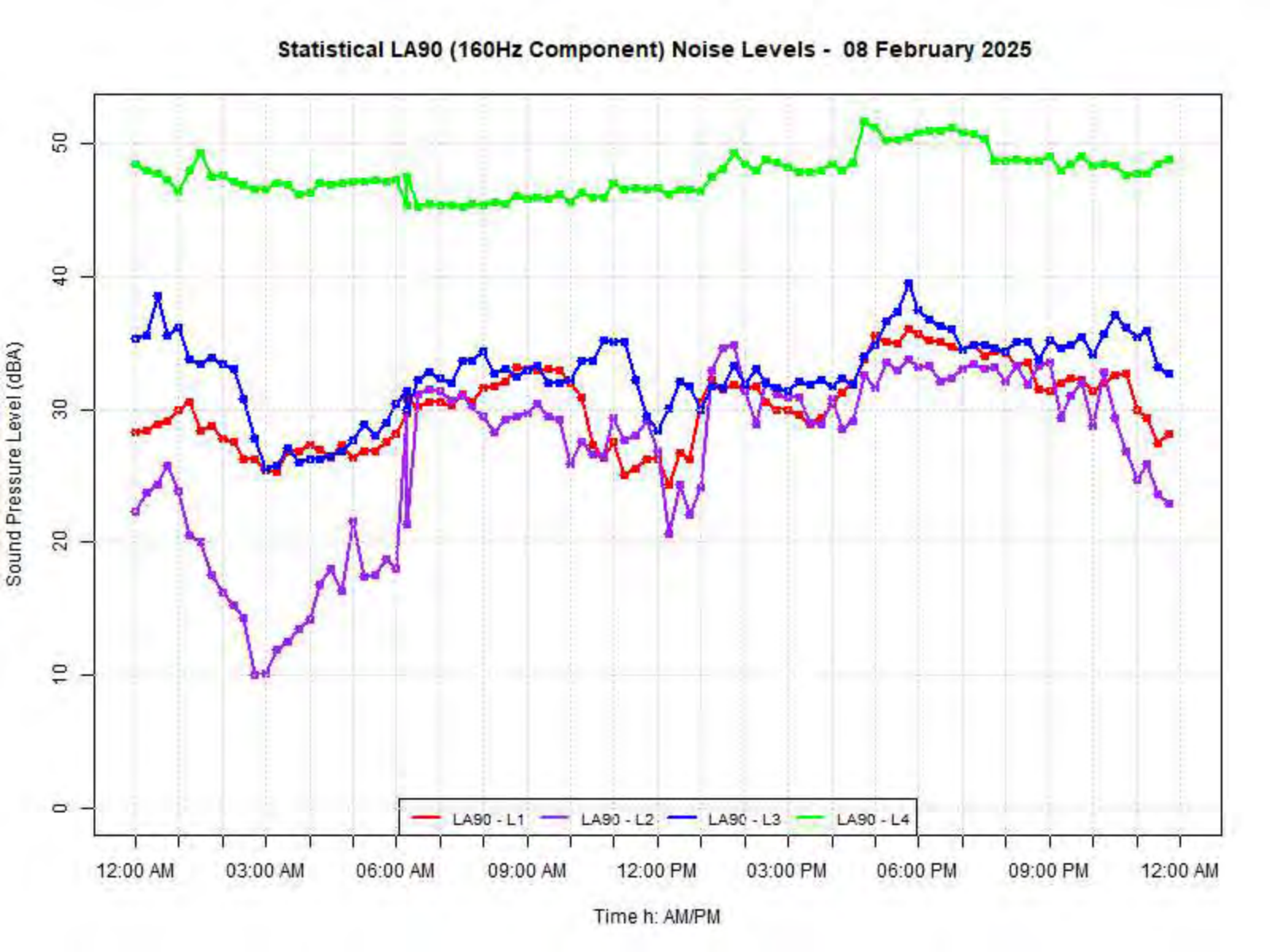

Statistical LA90 (160Hz Component) Noise Levels - 03 February 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM

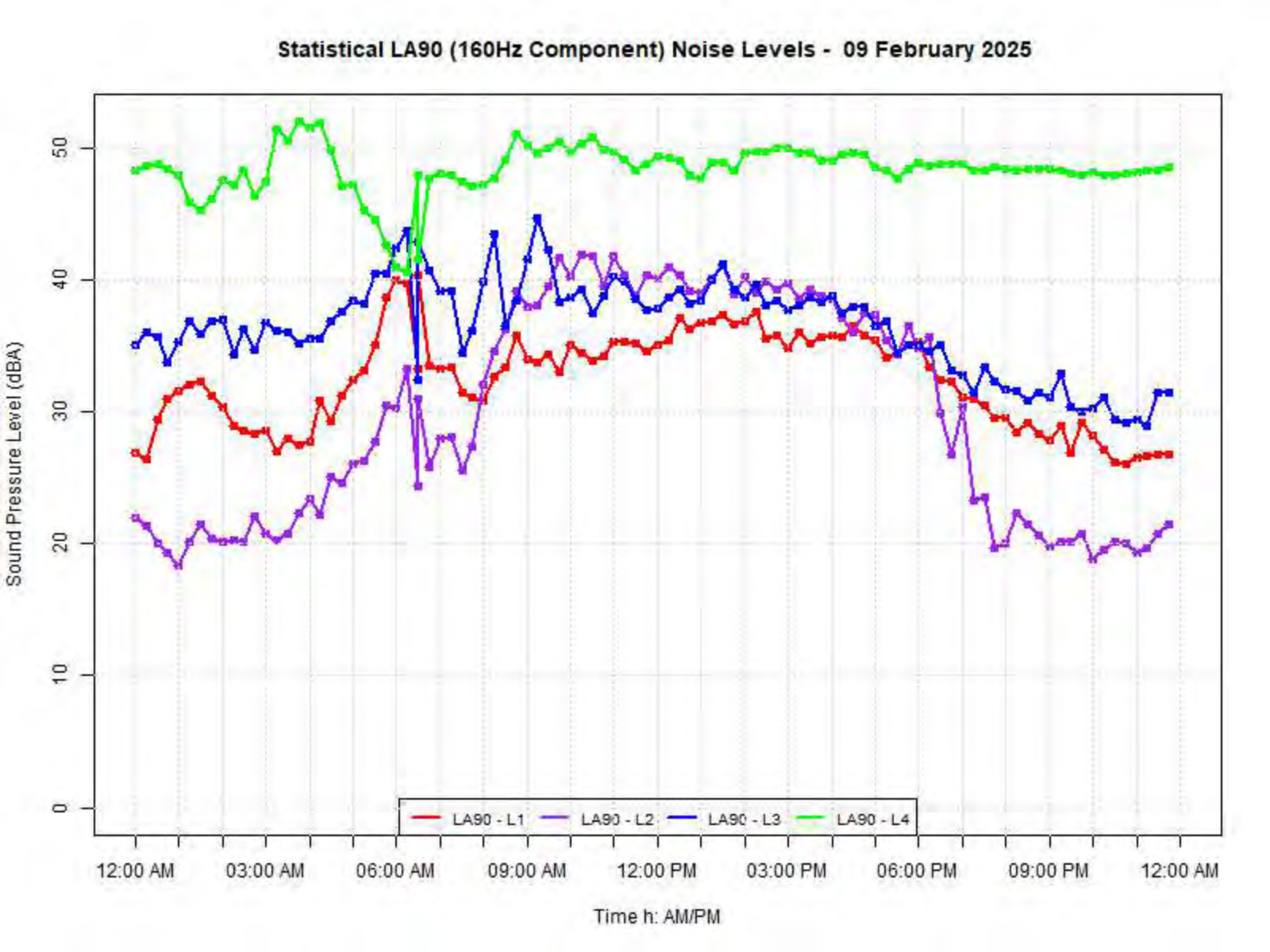

Statistical LA90 (160Hz Component) Noise Levels - 04 February 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM

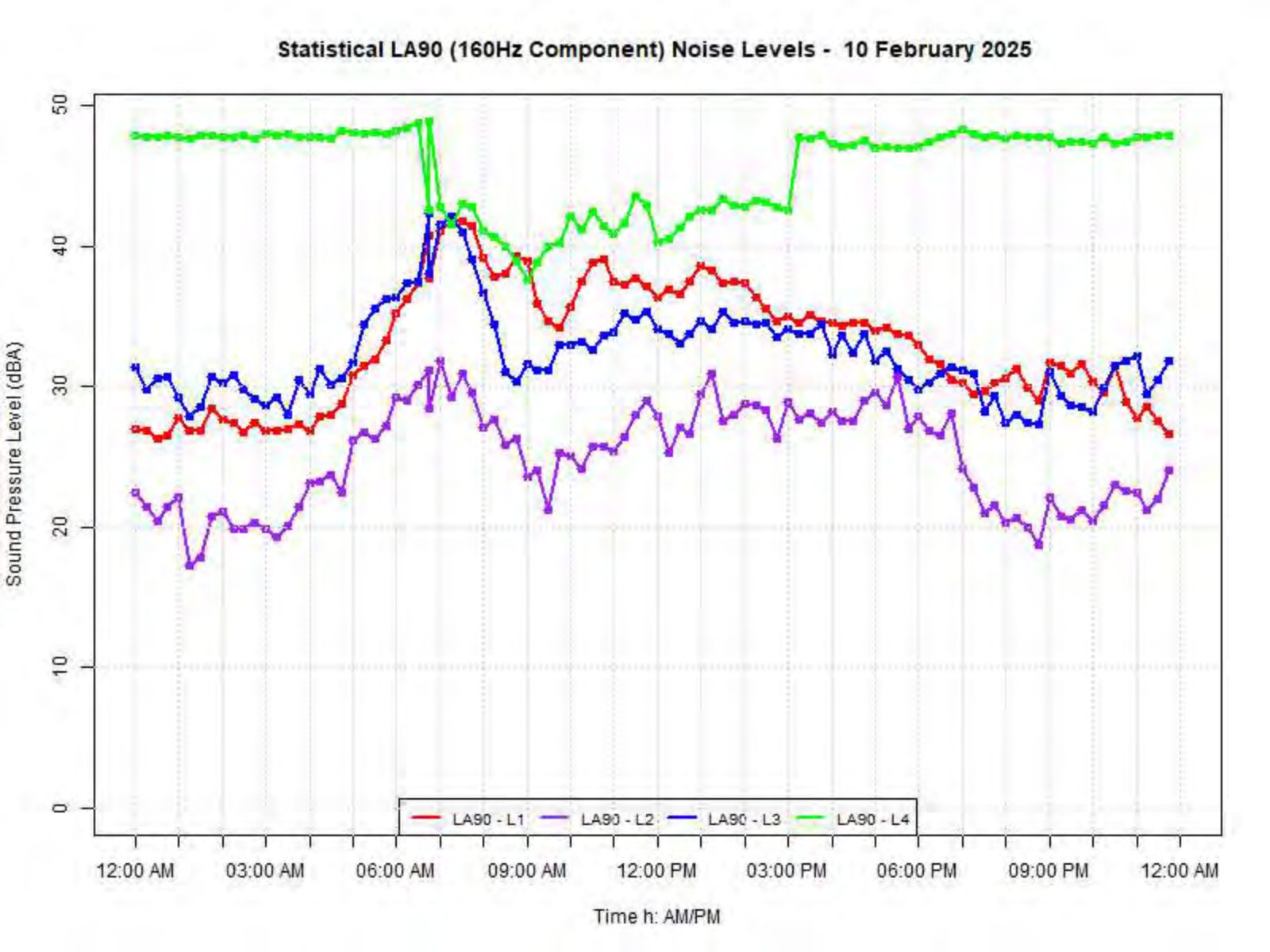

Statistical LA90 (160Hz Component) Noise Levels - 05 February 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM

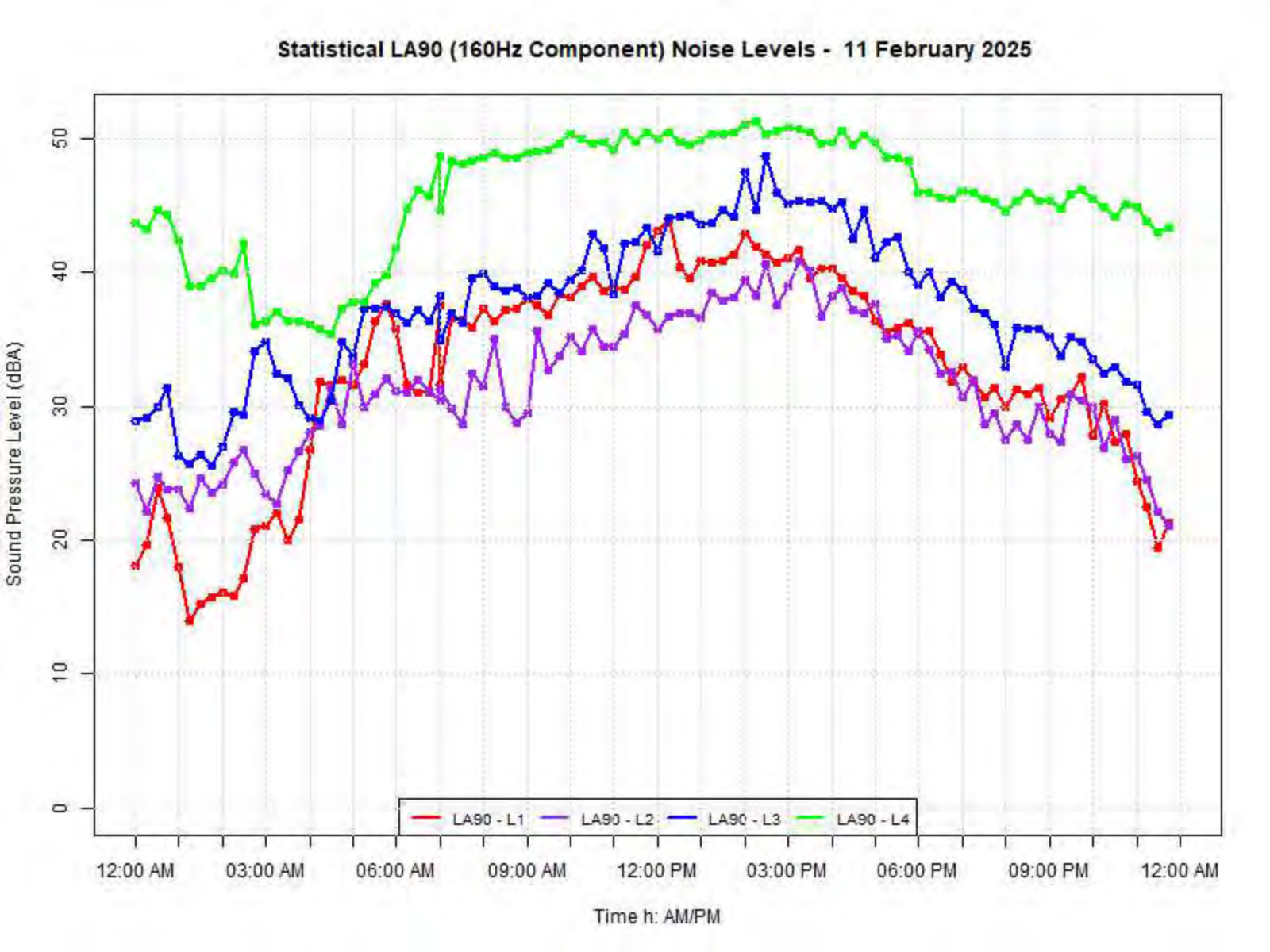

Statistical LA90 (160Hz Component) Noise Levels - 06 February 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM


Statistical LA90 (160Hz Component) Noise Levels - 07 February 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM


Statistical LA90 (160Hz Component) Noise Levels - 08 February 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM


Statistical LA90 (160Hz Component) Noise Levels - 09 February 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM


Statistical LA90 (160Hz Component) Noise Levels - 10 February 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM


Statistical LA90 (160Hz Component) Noise Levels - 11 February 2025
Sound Pressure Level (dBA)
0
10
20
30
40
50
LA90 - L1
LA90 - L2
LA90 - L3
LA90 - L4
12:00 AM
03:00 AM
06:00 AM
09:00 AM
12:00 PM
03:00 PM
06:00 PM
09:00 PM
12:00 AM
Time h: AM/PM

Appendix C

Noise monitoring result tables

Table C.1 Unattended noise monitoring at logger location L1

Date	L_{A10}			L_{A90}		
	Day	Evening	Night	Day	Evening	Night
Monday-13-Jan-25	53	46	44	40	36	29
Tuesday-14-Jan-25	52	48	38	40	35	26
Wednesday-15-Jan-25	52	46	44	42	34	32
Thursday-16-Jan-25	53	47	44	44	36	28
Friday-17-Jan-25	52	46	41	39	35	23
Saturday-18-Jan-25	52	49	49	36	35	34
Sunday-19-Jan-25	54	49	49	45	37	32
Monday-20-Jan-25	54	48	46	47	37	38
Tuesday-21-Jan-25	55	49	44	45	37	33
Wednesday-22-Jan-25	52	48	46	44	36	36
Thursday-23-Jan-25	54	43	47	47	36	39
Friday-24-Jan-25	60	47	44	48	39	38
Saturday-25-Jan-25	49	40	38	37	33	24
Sunday-26-Jan-25	54	50	38	35	37	26
Monday-27-Jan-25	53	41	47	37	35	32
Tuesday-28-Jan-25	55	37	48	44	34	34
Wednesday-29-Jan-25	54	42	47	45	34	32
Thursday-30-Jan-25	53	50	46	42	36	32
Friday-31-Jan-25	50	49	37	41	37	27
Saturday-1-Feb-25	49	53	43	36	38	35
Sunday-2-Feb-25	47	47	46	37	37	34
Monday-3-Feb-25	50	48	49	36	31	32
Tuesday-4-Feb-25	51	40	46	39	34	35
Wednesday-5-Feb-25	52	50	46	39	38	30
Thursday-6-Feb-25	50	49	52	38	35	35
Friday-7-Feb-25	49	47	50	39	36	38
Saturday-8-Feb-25	48	56	47	37	37	37
Sunday-9-Feb-25	50	47	47	42	39	35
Monday-10-Feb-25	52	55	46	40	37	36
Tuesday-11-Feb-25	52	53	44	43	41	29
Wednesday-12-Feb-25	47	-	-	37	-	-
Typical (50th percentile)	**52**	**48**	**46**	**40**	**36**	**33**

Table C.2 Unattended noise monitoring at logger location L2

Date	L_{A10}			L_{A90}		
	Day	Evening	Night	Day	Evening	Night
Monday-13-Jan-25	54	47	42	42	36	24
Tuesday-14-Jan-25	55	44	36	42	30	23
Wednesday-15-Jan-25	53	44	37	39	31	22
Thursday-16-Jan-25	49	47	42	37	40	23
Friday-17-Jan-25	53	43	42	38	29	26
Saturday-18-Jan-25	53	51	45	42	39	27
Sunday-19-Jan-25	52	44	45	42	35	28
Monday-20-Jan-25	52	43	37	40	35	25
Tuesday-21-Jan-25	54	41	37	41	31	25
Wednesday-22-Jan-25	51	49	46	36	32	32
Thursday-23-Jan-25	51	43	36	38	33	23
Friday-24-Jan-25	54	43	42	44	30	25
Saturday-25-Jan-25	52	46	39	38	31	26
Sunday-26-Jan-25	54	48	41	42	36	26
Monday-27-Jan-25	52	40	41	39	29	24
Tuesday-28-Jan-25	50	41	38	36	32	28
Wednesday-29-Jan-25	52	41	33	35	31	25
Thursday-30-Jan-25	50	42	39	35	29	26
Friday-31-Jan-25	51	47	41	36	33	26
Saturday-1-Feb-25	50	46	41	37	32	23
Sunday-2-Feb-25	49	46	37	36	34	24
Monday-3-Feb-25	51	41	52	37	31	29
Tuesday-4-Feb-25	51	41	46	38	28	24
Wednesday-5-Feb-25	52	47	39	35	36	28
Thursday-6-Feb-25	51	47	46	36	30	30
Friday-7-Feb-25	51	45	38	36	29	27
Saturday-8-Feb-25	50	45	43	37	33	24
Sunday-9-Feb-25	54	39	36	40	27	22
Monday-10-Feb-25	50	40	38	36	27	26
Tuesday-11-Feb-25	53	50	43	40	37	25
Wednesday-12-Feb-25	51	-	-	38	-	-
Typical (50th percentile)	**52**	**44**	**41**	**38**	**31**	**25**

Table C.3 Unattended noise monitoring at logger location L3

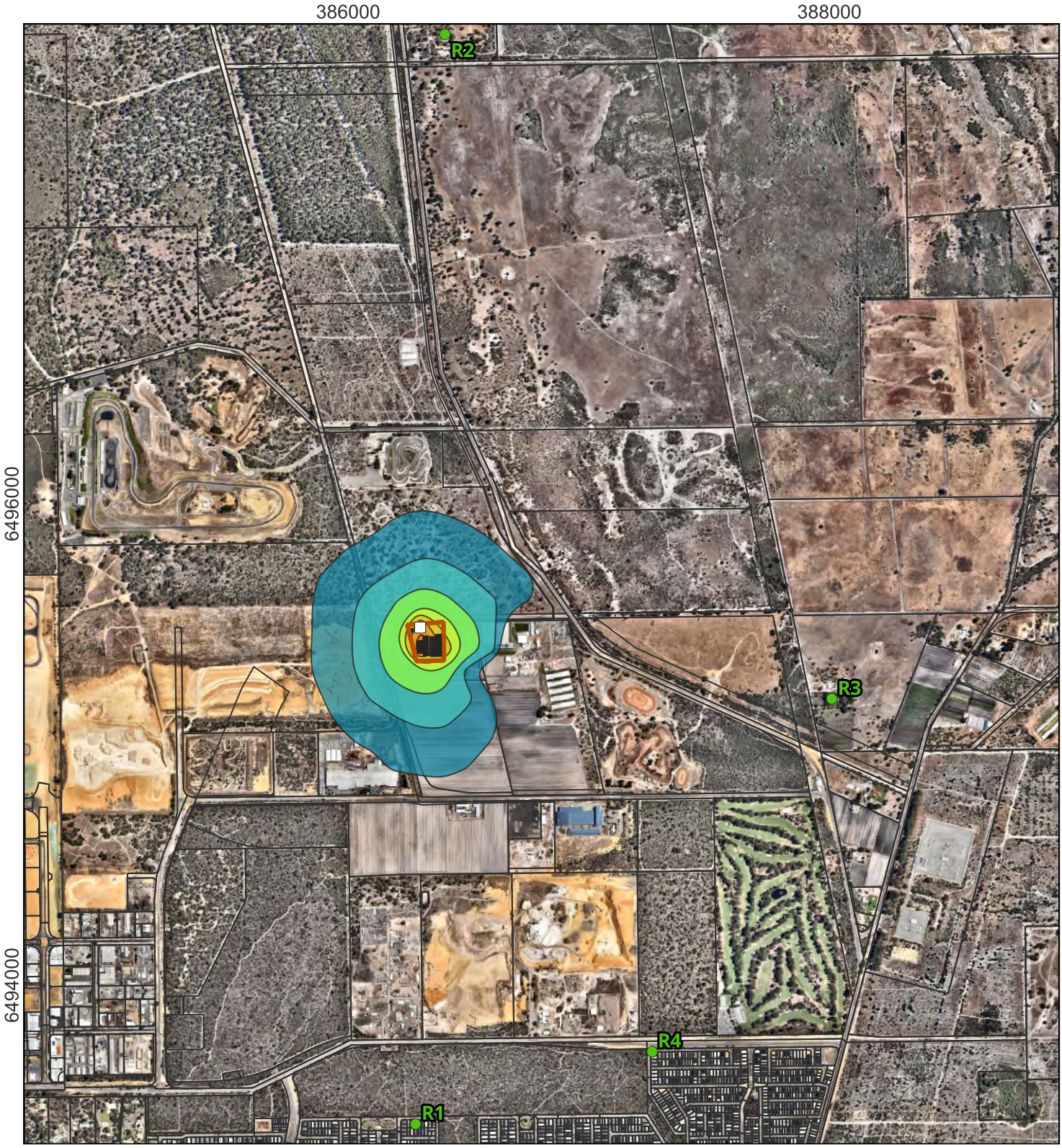
Date	L_{A10}			L_{A90}		
	Day	Evening	Night	Day	Evening	Night
Monday-13-Jan-25	53	50	42	39	36	26
Tuesday-14-Jan-25	54	48	40	42	32	26
Wednesday-15-Jan-25	52	47	43	39	33	25
Thursday-16-Jan-25	49	46	43	35	30	28
Friday-17-Jan-25	53	45	43	38	32	26
Saturday-18-Jan-25	52	53	47	40	38	28
Sunday-19-Jan-25	49	48	44	38	33	29
Monday-20-Jan-25	49	45	40	37	34	29
Tuesday-21-Jan-25	51	44	41	39	33	28
Wednesday-22-Jan-25	50	50	46	39	37	31
Thursday-23-Jan-25	50	48	42	37	33	29
Friday-24-Jan-25	54	45	43	42	31	31
Saturday-25-Jan-25	52	50	45	37	33	25
Sunday-26-Jan-25	55	47	40	43	35	25
Monday-27-Jan-25	51	44	49	38	32	28
Tuesday-28-Jan-25	51	47	45	39	30	28
Wednesday-29-Jan-25	50	46	39	36	30	26
Thursday-30-Jan-25	50	47	43	34	33	31
Friday-31-Jan-25	51	48	44	36	34	29
Saturday-1-Feb-25	52	53	45	38	35	28
Sunday-2-Feb-25	51	50	43	37	37	27
Monday-3-Feb-25	53	46	51	39	29	30
Tuesday-4-Feb-25	51	45	46	39	30	29
Wednesday-5-Feb-25	50	46	42	36	34	29
Thursday-6-Feb-25	52	46	46	38	30	30
Friday-7-Feb-25	51	49	45	37	32	31
Saturday-8-Feb-25	49	52	47	37	35	28
Sunday-9-Feb-25	55	43	41	37	31	29
Monday-10-Feb-25	52	47	41	36	30	29
Tuesday-11-Feb-25	55	51	42	42	37	29
Wednesday-12-Feb-25	53	-	-	40	-	-
Typical (50th percentile)	**51**	**47**	**43**	**38**	**33**	**28**

Table C.4 Unattended noise monitoring at logger location L4

Date	L_{A10}			L_{A90}		
	Day	Evening	Night	Day	Evening	Night
Monday-13-Jan-25	57	56	51	55	50	49
Tuesday-14-Jan-25	56	52	52	49	50	50
Wednesday-15-Jan-25	51	51	50	47	49	48
Thursday-16-Jan-25	54	56	55	47	54	54
Friday-17-Jan-25	56	56	53	54	55	50
Saturday-18-Jan-25	53	53	50	49	50	48
Sunday-19-Jan-25	55	55	55	53	54	54
Monday-20-Jan-25	56	58	55	53	56	53
Tuesday-21-Jan-25	57	58	55	53	57	54
Wednesday-22-Jan-25	56	59	55	53	56	54
Thursday-23-Jan-25	57	58	55	53	56	54
Friday-24-Jan-25	58	56	56	53	55	54
Saturday-25-Jan-25	56	56	56	54	55	55
Sunday-26-Jan-25	56	56	52	55	55	50
Monday-27-Jan-25	55	56	56	47	55	49
Tuesday-28-Jan-25	55	57	55	47	55	53
Wednesday-29-Jan-25	55	59	55	53	56	54
Thursday-30-Jan-25	54	59	55	52	56	54
Friday-31-Jan-25	55	57	56	54	56	50
Saturday-1-Feb-25	57	57	55	50	55	49
Sunday-2-Feb-25	55	57	55	54	56	49
Monday-3-Feb-25	56	56	56	51	55	49
Tuesday-4-Feb-25	55	55	56	47	54	49
Wednesday-5-Feb-25	55	60	58	47	56	55
Thursday-6-Feb-25	57	58	56	54	56	54
Friday-7-Feb-25	55	56	56	53	55	54
Saturday-8-Feb-25	56	56	55	53	54	54
Sunday-9-Feb-25	58	56	55	54	54	50
Monday-10-Feb-25	54	55	56	48	54	54
Tuesday-11-Feb-25	57	53	51	50	50	49
Wednesday-12-Feb-25	56	-	-	51	-	-
Typical (50th percentile)	**56**	**56**	**55**	**53**	**55**	**53**

Appendix D

Noise contours



Legend

- Development envelope
- Battery sources
- Inverter sources
- Power Transformer

Predicted noise level

- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- 65 - 70
- 70 - 75
- >75

Paper Size ISO A4

0 0.25 0.5 0.75 1 km

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA94
Grid: GDA94 / MGA zone 50

Shell Energy
BESS Noise Impact Assessment

Noise contours dB L_{A10}
Scenario 1 - Sunday Day / Evening

Project No. **12649071**
Revision No. **1**
Date. **21/03/2025**

FIGURE D.1

Document Path: \\ghdnet\ghd\AU\Perth\Projects\61\12649071\Tech\Noise\12649071_working.qgz
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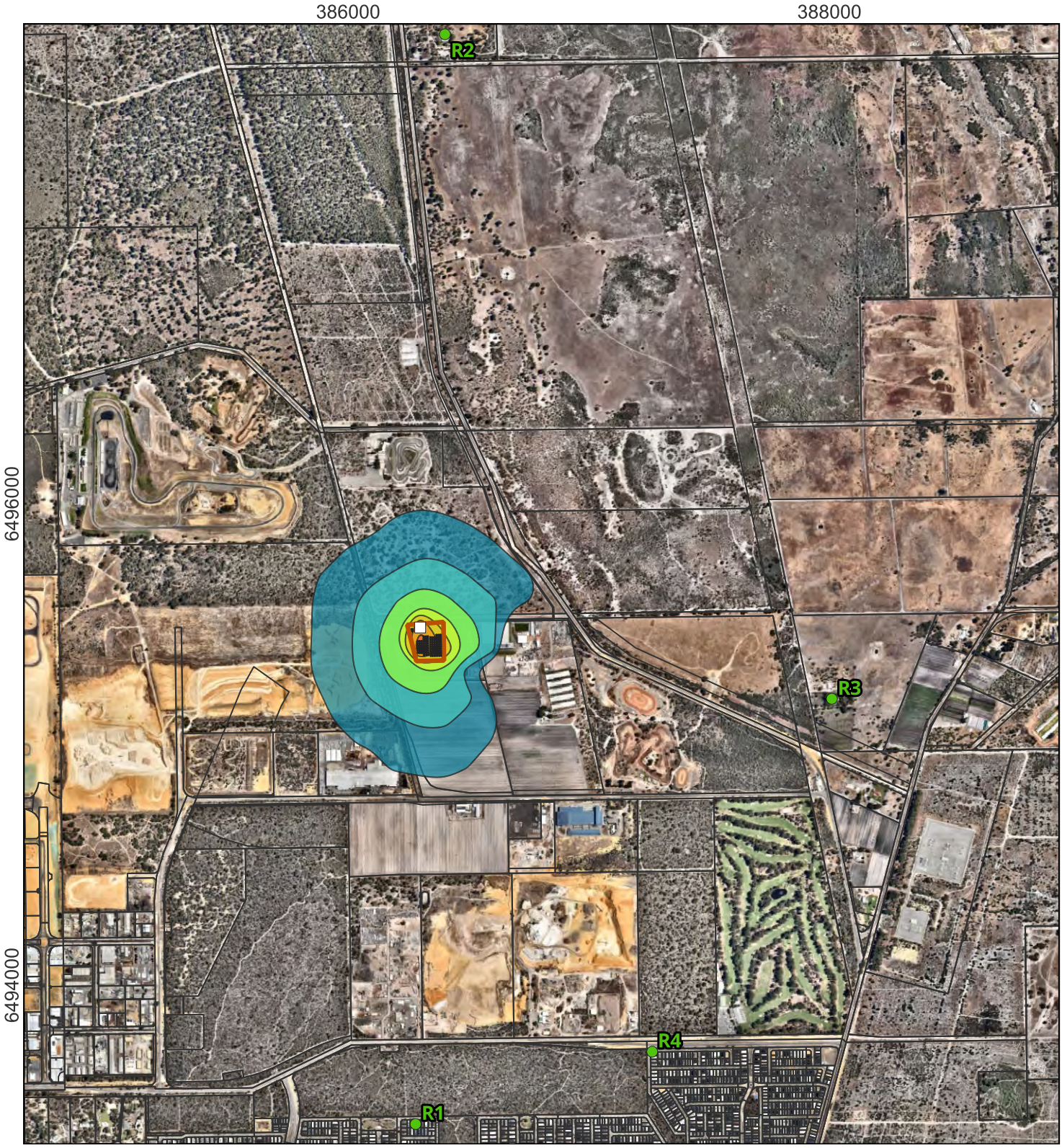

Legend

- Development envelope
- Battery sources
- Inverter sources
- Power Transformer

Predicted noise level

- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- 65 - 70
- 70 - 75
- >75

Paper Size ISO A4

0 0.25 0.5 0.75 1 km

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA94
Grid: GDA94 / MGA zone 50

Shell Energy
BESS Noise Impact Assessment

Noise contours dB L_{A10}
Scenario 2 - Night

Project No. **12649071**
Revision No. **1**
Date. **21/03/2025**

FIGURE D.2

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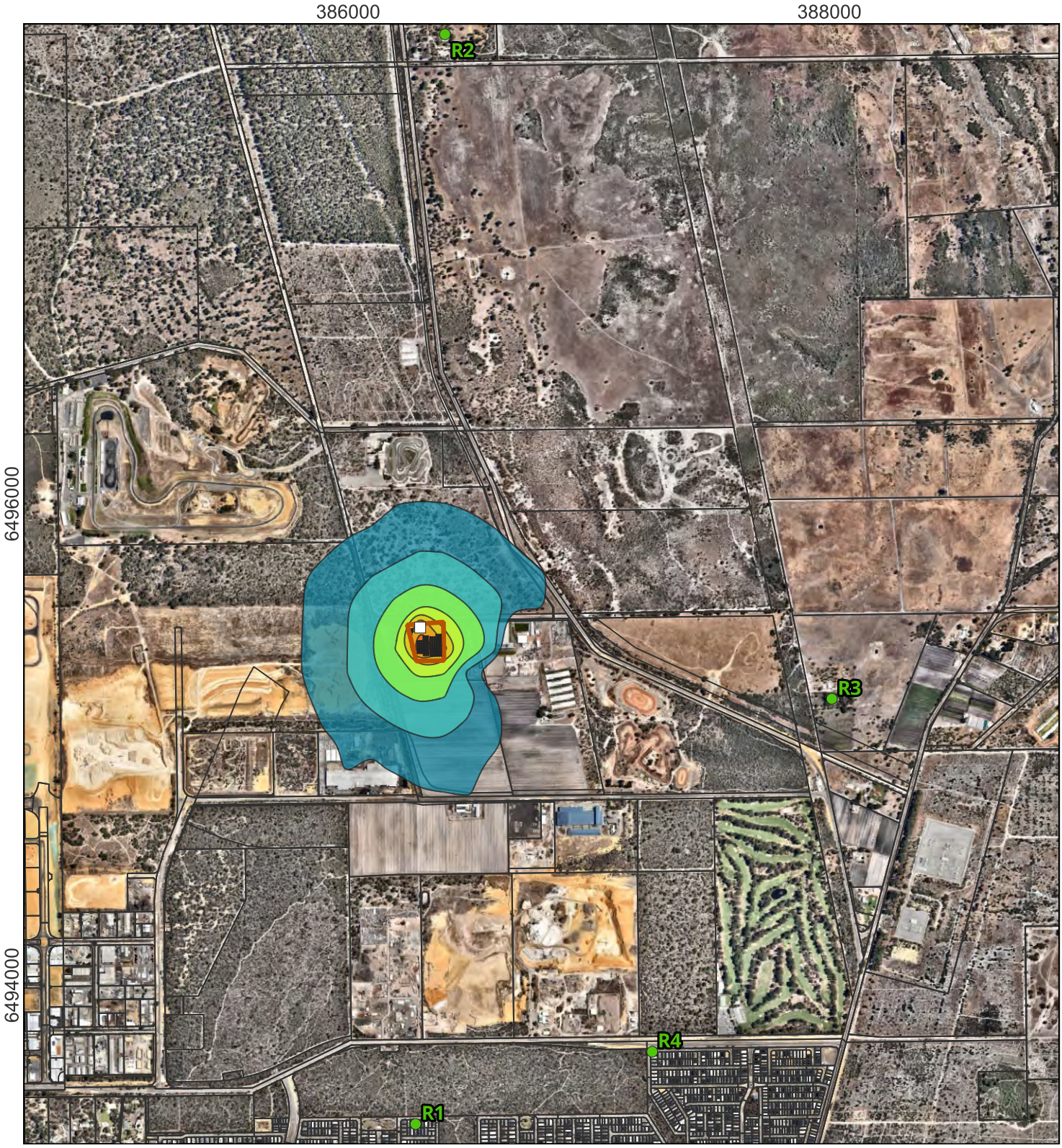

Legend

- Development envelope
- Battery sources
- Inverter sources
- Power Transformer

Predicted noise level

- 35 - 40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- 65 - 70
- 70 - 75
- >75

Paper Size ISO A4

0 0.25 0.5 0.75 1 km

N

Map Projection: Transverse Mercator
Horizontal Datum: GDA94
Grid: GDA94 / MGA zone 50

Shell Energy
BESS Noise Impact Assessment

Noise contours dB L_{A10}
Scenario 3 - Absolute worst case

Project No. **12649071**
Revision No. **1**
Date. **21/03/2025**

FIGURE D.3

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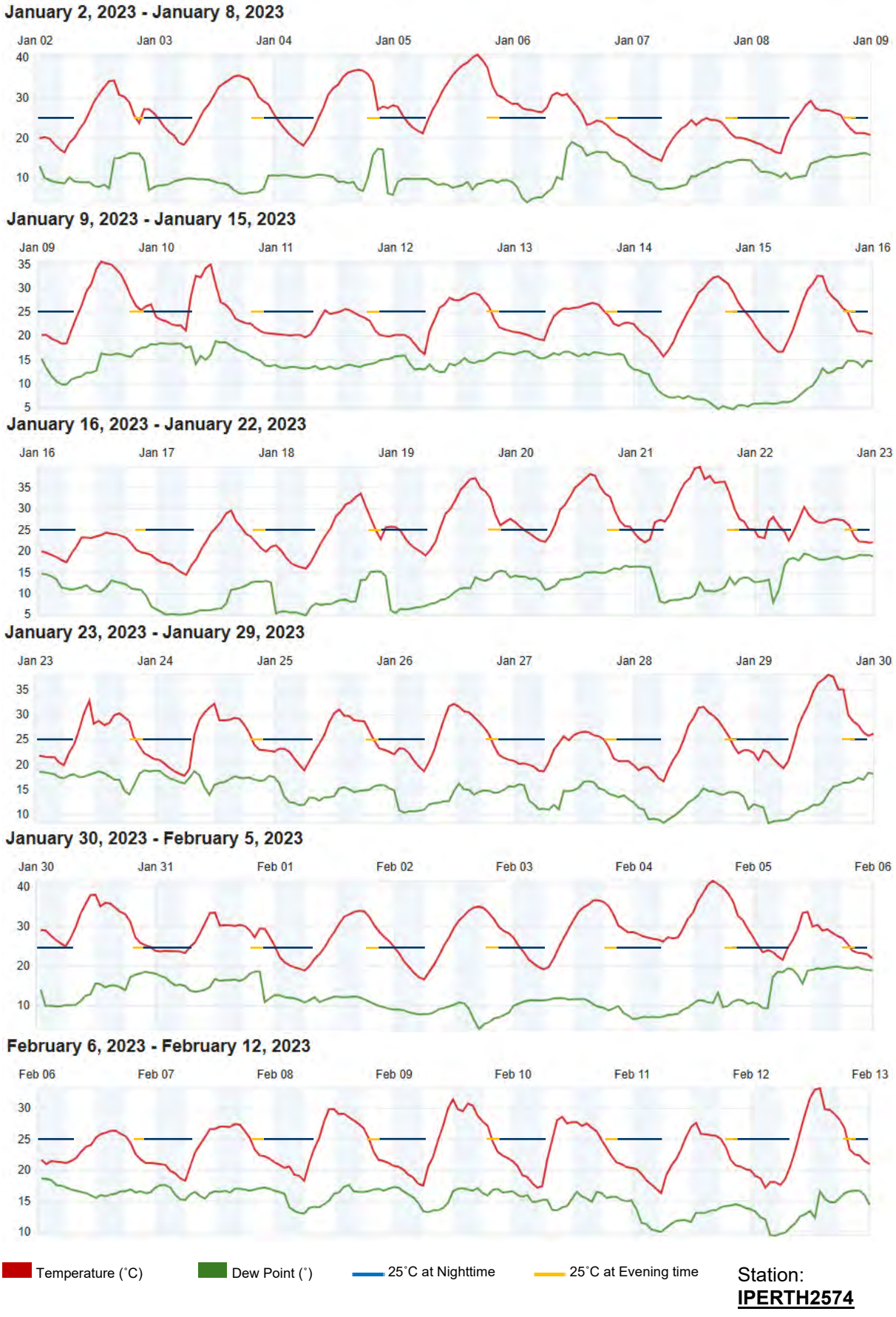
Appendix E

Historical temperature graphs

Temperature exceedance of 25˚C at evening and nighttime for typical summer months



Station:
IPERTH2574

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→ The Power of Commitment

Report

Bushfire Management Plan

LOCATION: SHELL ENERGY BATTERY ENERGY STORAGE SYSTEM

CLIENT: GHD PTY LTD

Project Ref 243929/ N25-0047 Issue A

14 March 2025

DOCUMENT ISSUE APPROVAL

Project Title:	Bushfire Management Plan
Project Location:	Shell Energy BESS
Project Address:	Lot 100 (No.45) Trandos Road, Neerabup
Client:	GHD Pty Ltd
Project No:	243929
Report No:	N25-0047
Issue:	B
Date:	14 March 2025
Distribution:	Client
	Covey Associates

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Abbreviations Used in Report

Abbreviation	Full Meaning
AS3959	AS 3959:2018 – Construction of Buildings in bushfire-prone areas
BAL	Bushfire Attack Level
BMP	Bushfire Management Plan
BRMP	Bushfire Risk Management Plan
FFDI	Forest Fire Danger Index
NCC	National Construction Code (Building Code of Australia)
PCS	Power Conversion System
RHF	Radiant Heat Flux
SPP	State Planning Policy
WAPC	Western Australia Planning Commission

Supporting Documentation	
Document	**Prepared by**
Shell Energy BESS – General Arrangement	*GHD Pty Ltd*

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1 Introduction

1.1 Proposed Development

Shell Energy Operations Pty Ltd (Shell Energy; the Proponent) is seeking to lodge a development application for the new Battery Energy Storage System (BESS) development, on the vacant portion of Lot 100 (No. 45) Trados Road, Neerabup (the subject site) in the City of Wanneroo.

The proposed 142 MW BESS development is expected to include the following infrastructure (see Figure 1-1):

- Operations and Maintenance (O&M) building
- Network Service Provider (NSP) Room
- Switchroom/Control Room
- Battery Energy Storage System (BESS) Containers
- Power Conversion System (PCS) modules
- Auxiliary Skids (providing LV power to BESS)
- Emergency Generator
- Substation (with 330 kV distribution transformer)
- Below ground cabling and cable pits
- Firewater tanks
- Below ground contaminated firewater storage tanks
- Onsite parking
- Internal roads
- Fencing and gates

Regarding onsite personnel, once operational, the following is expected:

- Occupant numbers may be either 1-2 staff, 5 days a week (business hours), or the facility may be unmanned.
- There will be at least one on-call technician allocated to the facility for all other times it is not manned.

1.2 Site description

The proposed development is to occur within a vacant portion of Lot 100 (No.45) Trandos Road, Neerabup, which has been cleared of vegetation for previous uses (see Figure 1-2). The subject site is surrounded by the following:

- Neerabup Power Station within Lot 100 to the east which is completely cleared of vegetation other than a vegetated stormwater basin in the northern part of the lot.
- Existing water collection dam to the south within Lot 100, with existing horticultural land further to the south within 140 Pederick Road.
- Undeveloped land within Lot 100 to the west, which is mostly unmanaged grassland vegetation, with undeveloped public road reserve (Orchid Road) further west.
- Trandos Road reserve to the north, which is largely cleared of vegetation and contains the existing sealed public road extending to the north-eastern boundary of the subject site. Further north of

Trandos Road is remnant vegetation within 570 Wattle Avenue East, which also contains a number of informal tracks used for kart and bike racing.

Public road access to the subject site is via Trandos Road along the northern boundary, which extends 530 m east to Old Yanchep Road.

There is no known reticulated town main water supply currently provided to the project area, nor is there any existing street hydrants along Trandos Road.

1.3 Purpose

1.3.1 Current Bushfire Regulatory Requirements

As the northern portion of the subject site is designated as bushfire prone as per the *Map of Bush Fire Prone Areas* (DFES 2024; see Figure 1-3), any permanent buildings proposed as part of the development that are sited within this area, would trigger a need to assess the proposal against *State Planning Policy 3.7: Bushfire* (SPP 3.7; Western Australia Planning Commission (WAPC) 2024) and the *Planning for Bushfire Guidelines* (the WA Guidelines; WAPC 2024), in accordance with the Planning and Development (Local Planning Schemes) Regulations 2015 (the Regulations).

In accordance with Bushfire Protection Criteria 7 (BPC 7; Development – Commercial and Industrial) of the WA Guidelines, application of SPP 3.7 and the WA Guidelines applies only to buildings that are designated bushfire prone, and have a pre-development radiant heat impact of BAL-40/FZ (i.e., prior to management measures such as Asset Protection Zones). The proposed buildings are sited in a designated bushfire prone area in the northern part of the subject site, and a pre-development rating of BAL-40/FZ which could occur without appropriate vegetation management measures.

Application of SPP3.7 and the WA Guidelines is only required for "habitable buildings" as defined in WA Planning Regulations, and given the renewable energy infrastructure (e.g. BESS) are not considered "habitable building", assessment is not triggered, however the following is noted:

- As compliance with SPP 3.7 and the WA Guidelines isn't triggered for proposed renewable energy infrastructure, there is no statutory requirement for this infrastructure to comply with any specific requirements.
    - It is noted that BPC 7 of the WA Guidelines does make reference to hazardous, flammable or combustible materials (under A2.4), which applies at some level to the proposed BESS containers which contain Li-ion batteries (or similar), however other parts of the renewable energy infrastructure are not captured under this clause.
- Current referral advice typically provided by DFES is that strict compliance is unlikely to be required or achieved with SPP 3.7 and the WA Guidelines, however application of the Country Fire Authority *Design Guidelines for Renewable Energy Facilities v4* (the CFA Guidelines; CFA 2023), provides the best design guidance for these type of renewable energy facilities at this stage.
    - It is noted that the CFA Guidelines currently has no formal status in WA, however it is understood DFES are currently in the process of drafting their own version of the CFA Guidelines, and while the timing of this is unconfirmed, the content is expected to broadly align with that from the CFA.
    - The CFA Guidelines contains guidance and what it terms "Model Requirements" for all renewable energy facilities as well as specific measures for wind, solar, battery energy storage (BESS) and substation/electric line infrastructure. It contains a number of sections pertaining

to proposed design, construction, commissioning and operational requirements for the following:
    - Fire Risk Management
    - Facility Location
    - Facility Design
    - Facility Construction and Commissioning
    - Facility Operation
    - Emergency Planning
  - A key requirement is that a Risk Management Plan (RMP) is developed for renewable energy facilities.
- The WAPC have released a Position Statement on Renewable Energy Facilities (principally wind turbine and solar array systems), providing some high-level guidance as follows:
  - The objectives of the position statement include facilitating appropriate development of renewable energy facilities while minimising any potential impact upon the environment, natural landscape, and urban areas.
  - Wind turbines and solar arrays in bushfire prone areas should be designed and maintained so they are not a bushfire risk to surrounding bushland, and where possible should not be in bushfire prone areas with an 'extreme' bushfire hazard level or bushfire attack level (BAL) - 40 or BAL- Flame Zone.
  - A minimum 10 metres clearance to combustible vegetation in the form of an Asset Protection Zone (APZ) is recommended, which should be managed in a low threat state, in accordance with the WA Guidelines.

1.3.2 Bushfire Compliance Approach

Based on the regulatory requirements detailed in Section 1.3.1, the following bushfire compliance approach is proposed:

- Proposed buildings need to be assessed against, and demonstrate compliance with SPP 3.7 and the WA Guidelines, which is undertaken in this Bushfire Management Plan (BMP). Further information on the BMP is detailed below;
- A Bushfire Risk Management Plan (BRMP) that accompanies this BMP, assesses the level of compliance of the proposed renewable infrastructure, against the relevant Model Requirements of the CFA Guidelines, to demonstrate the bushfire risk has been appropriately managed.
  - While the Risk Management Plan required by the CFA Guidelines is expected to address both structural fires and bushfires, the focus of the BRMP is to address the bushfire-related risk to (and from) the proposed renewable energy infrastructure.

This Bushfire Management Plan (BMP) has been prepared to address requirements for development applications under SPP 3.7 Policy Measure 7.1 (ii) and Section 2.2 the WA Guidelines, in addition to Section 7 relating to Commercial/Industrial developments, including:

- The identification of any environmental, biodiversity or conservation values on the subject site(s).
  - Where relevant, details on how the clearing of native vegetation specifically for bushfire mitigation to achieve the bushfire protection measures, can be avoided through the use of siting and design measures.
  - Where the clearing of native vegetation cannot be avoided, details on how the proposal will minimise the clearing are to be provided.
- A BAL Contour Map or BAL assessment.

- The identification of any bushfire hazard issues arising from the assessment.
- Assessment against Bushfire Protection Criteria 7 (Development – Commercial and Industrial) demonstrating compliance of the following for proposed buildings:
    - Siting of all buildings in BAL-29 or lower, including provision of suitably sized Asset Protection Zones (APZ's; low fuel zones around buildings).
    - Justification of any native vegetation clearing to implement the APZ
    - Siting of all hazardous, flammable and/or combustible materials in BAL-29 or lower, and appropriate protection from radiant heat impact.
    - Provision of compliant vehicular access
    - Provision of suitable firewater supply.

The focus of this BMP is to demonstrate compliance of the proposed buildings with SPP 3.7 and the WA Guidelines, accompanied by a summary of the bushfire management measures for the renewable energy infrastructure derived from the project BRMP, to provide a complete summary of the Proponents bushfire risk management obligations for this project.

1.4 Other plans/reports

A BMP was prepared in 2017 by Strategen Environmental, to accompany the Neerabup Industrial Area Local Structure Plan (LSP) application, which incorporated the project area. Other than the BMP supporting the LSP, there are no known bushfire reports or assessments that have been prepared previously for the project area.

Covey has prepared a Bushfire Risk Management Plan (Covey 2025) detailing the level of compliance of the proposed renewable infrastructure, against the CFA Guidelines. The resultant bushfire management measures from the BRMP, have been incorporated into Section 5 of the BMP, to provide a collated summary of all risk management measures required for the proposed development. The BRMP should be read in conjunction within this BMP.

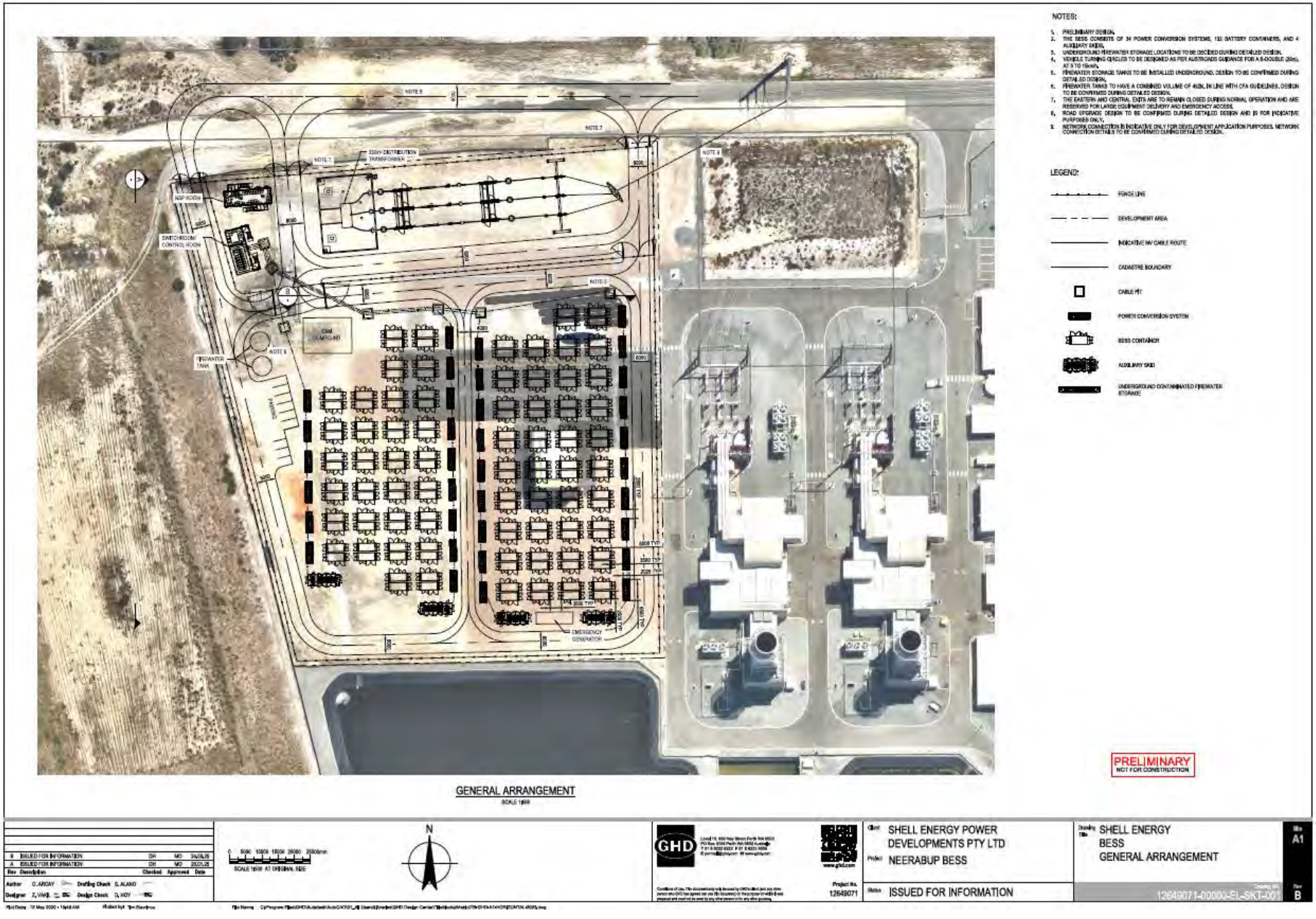

Figure 1-1: Development Plan

Legend

- Proposed Development
- Building Outline
- Project Area
- 100m
- 150m
- Cadastre

Scale 1:1,700

0 20 40 60 Metres

covey

GHD Pty Ltd

Shell Energy BESS

Figure 1-2: Site Overview

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Legend

- Proposed Development
- Building Outline
- Project Area
- 100m
- 150m
- Cadastre
- Bushfire Prone Area 2

Scale 1:2,100

0 30 60 90 Metres

covey

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Figure 1-3: Map of Designated Bushfire Prone Areas

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2 Environmental Considerations

2.1 Native vegetation - modification and clearing

The proposed development is expected to require minimal clearing of vegetation to enable construction of buildings and implementation of the nominated Asset Protection Zones, given most of the subject site is already cleared of vegetation.

While any additional clearing appears to be grassland vegetation, Covey assumes that all relevant environmental studies will be undertaken to support the project, and any State and Federal environmental referrals and approvals required, will be obtained prior to commencing on-site works.

2.2 Revegetation / Landscape Plans

No revegetation is proposed as part of the proposal.

All vegetation modification and management is to be conducted in accordance with the requirements detailed in Section 5.1 of this BMP, including compliance with the APZ standards from the WA Guidelines (see Appendix B) and requirements for low threat vegetation and managed gardens in accordance with AS 3959—2018 Clause 2.2.3.2 (f) (see Appendix C).

3 Bushfire assessment

The nominated subject site includes both proposed buildings and renewable energy infrastructure, however it is noted that it is only the proposed buildings that trigger assessment against SPP 3.7 and the WA Guidelines. Given the scope of this BMP is the proposed habitable buildings, the vegetation and BAL contour mapping could be taken from just the building extent, however given there is a measure from the project BRMP to site renewable energy infrastructure in various BAL ratings as well, the mapping has been undertaken for the entire site.

3.1 Assessment inputs

3.1.1 Vegetation classification

Covey assessed classified vegetation and exclusions within 150 m of the subject site through on-ground verification, conducted on 10 December 2024 in accordance with *AS 3959—2018 Construction of Buildings in Bushfire-Prone Areas* (AS 3959; SA 2018) and the *Visual Guide for Bushfire Risk Assessment in Western Australia* (DoP 2016).

Georeferenced site photos and a description of the vegetation classifications and exclusions are contained in Appendix A and Table 1 and depicted on Figure 3-1.

3.1.2 Effective Slope

Covey assessed effective slope under classified vegetation through on-ground verification on 10 December 2024 in accordance with AS 3959. Results were cross-referenced with Landgate 5 m contour data depicted on Figure 3-1, and are summarised in Table 1.

Site observations indicate that land is elevated to the west, and descends through the subject site to the north-east, resulting in classified vegetation typically having an assessed effective slope of either flat/upslope or downslope 0° – 5°.

3.1.3 Summary of Inputs

Table 1 illustrates the anticipated post-development vegetation classifications and exclusions following completion of development works including any modification of existing vegetation to a non-vegetated or low threat state for construction of buildings, roads, paths, or implementation of nominated Asset Protection Zones.

Table 1: Post-development vegetation classifications/exclusions and effective slope

Vegetation plot	Vegetation classification	Effective slope	Comments
1	Class G Grassland	Flat/upslope (0°)	Unmanaged grass >100 mm high within Lot 100 to the west, 140 Pederick Road to the south, and Trandos Road verge to the north-west. The horticultural land within 140 Pederick Road to the south has also been classified as unmanaged grassland, and while it could be excluded as managed low threat vegetation, it

Vegetation plot	Vegetation classification	Effective slope	Comments
			appeared slightly unmanaged at the time of inspection so has been classified for conservatism.
2	Class G Grassland	Downslope >0–5°	Unmanaged grass >100 mm high within stormwater basin to north-east of subject site but within Lot 100, and also north-east of Trandos Road reserve.
3	Class G Grassland	Downslope >5–10°	Unmanaged grass >100 mm high within stormwater basin to north-east of subject site but within Lot 100, and also west of Lot 100 within undeveloped road reserve.
4	Class C Shrubland	Flat/upslope (0°)	Vegetation <2 m in height, within undeveloped road reserve to the west of Lot 100.
5	Class D Scrub	Flat/upslope (0°)	Vegetation >2 m - < 6 m high in small plots to the north-west of the subject site, within Lot 100 and in undeveloped portion of Trandos Road verge.
6	Class B Woodland	Flat/upslope (0°)	Well-spaced trees with grassy understorey within 570 Wattle Ave north of Trandos Road.
7	Class B Woodland	Downslope >0–5°	
8	Class A Forest	Flat/upslope (0°)	Multi-layered forest vegetation within undeveloped road reserve to the west of Lot 100 and to the north-west of the subject site in 570 Wattle Ave north of Trandos Road.
9	Class A Forest	Downslope >0–5°	Multi-layered forest vegetation to the north of the subject site in 570 Wattle Ave north of Trandos Road.
10	Excluded – Clause 2.2.3.2 [a]	N/A	Unmanaged vegetation plots >100 m from subject site.
11	Excluded – Non-vegetated (Clause 2.2.3.2 [e])	N/A	Existing non-vegetated land and low threat vegetation within Lot 100 outside and adjacent to subject site.
12	Excluded – Non-vegetated (Clause 2.2.3.2 [e])	N/A	Existing non-vegetated land and low threat vegetation within subject site.
13	Excluded – Non-vegetated (Clause 2.2.3.2 [e])	N/A	Existing non-vegetated land and low threat vegetation within Lot 100 adjacent to the power station.

Vegetation plot	Vegetation classification	Effective slope	Comments
14	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])	N/A	Existing non-vegetated land and low threat vegetation within the existing power station on Lot 100.
15	Excluded – Non-vegetated (Clause 2.2.3.2 [e])	N/A	Existing non-vegetated land within Lot 100
16	Excluded – Non-vegetated (Clause 2.2.3.2 [e])	N/A	Existing non-vegetated land outside Lot 100
17	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])	N/A	Non-vegetated and low threat vegetation within Trandos Road reserve, where the verge appears to be well maintained.

3.2 Assessment outputs

3.2.1 Bushfire Attack Level (BAL) contour assessment

The BAL rating gives an indication of the level of bushfire attack (i.e. the radiant heat flux) that may be received by proposed future development and subsequently informs the standard of building construction and/or setbacks required for proposed habitable development to potentially withstand such impacts.

Covey has undertaken a BAL contour assessment in accordance with Method 1 of AS 3959 for subject site (see Figure 3-2).

The Method 1 procedure was conducted for all plots, with the methodology incorporating the following factors:

- state-adopted FDI 80 rating;
- vegetation classification;
- effective slope; and,
- distance maintained between proposed development areas and the classified vegetation.

The BAL contours are based on the resultant vegetation exclusions and separation distances from:

- the vegetation classifications and effective slope observed at the time of inspection; and,
- the anticipated post-development vegetation based on proposed vegetation modification and management proposed to implement the development including bushfire management measures.

The results of the BAL contour assessment are detailed in Table 2, Table 3 and illustrated in Figure 3-2. Given the scope of the BMP is for the proposed buildings (O&M building, NSP and Switchroom/Control Room), the measurements on Table 2 are taken from classified vegetation to the buildings and the firewater tanks, with Table 3 summarising those for the renewable energy infrastructure (BESS, PCS, Aux. Skids, Generator and substation).

Table 2: BAL contour assessment results (to all proposed buildings)

Plot	Vegetation classification	Effective slope	Calculation method	Separation (m)	BAL
1	Class G Grassland	Flat/upslope (0°)	Method 1	13 m	BAL–19

Plot	Vegetation classification	Effective slope	Calculation method	Separation (m)	BAL
2	Class G Grassland	Downslope >0–5°	Method 1	>50 m	BAL–Low
3	Class G Grassland	Downslope >5–10°	Method 1	>50 m	BAL–Low
4	Class C Shrubland	Flat/upslope (0°)	Method 1	>100 m	BAL–Low
5	Class D Scrub	Flat/upslope (0°)	Method 1	47.5 m	BAL–12.5
6	Class B Woodland	Flat/upslope (0°)	Method 1	41.5 m	BAL–12.5
7	Class B Woodland	Downslope >0–5°	Method 1	41.5 m	BAL–12.5
8	Class A Forest	Flat/upslope (0°)	Method 1	60 m	BAL–12.5
9	Class A Forest	Downslope >0–5°	Method 1	87 m	BAL–12.5
10	Excluded – Clause 2.2.3.2 [a]	N/A	N/A	N/A	N/A
11	Excluded – Non-vegetated (Clause 2.2.3.2 [e])	N/A	N/A	N/A	N/A
12	Excluded – Non-vegetated (Clause 2.2.3.2 [e])	N/A	N/A	N/A	N/A
13	Excluded – Non-vegetated (Clause 2.2.3.2 [e])	N/A	N/A	N/A	N/A
14	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])	N/A	N/A	N/A	N/A
15	Excluded – Non-vegetated (Clause 2.2.3.2 [e])	N/A	N/A	N/A	N/A
16	Excluded – Non-vegetated (Clause 2.2.3.2 [e])	N/A	N/A	N/A	N/A
17	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])	N/A	N/A	N/A	N/A

Table 3: BAL contour assessment results (to all renewable energy infrastructure)

Plot	Vegetation classification	Effective slope	Calculation method	Separation (m)	BAL
1	Class G Grassland	Flat/upslope (0°)	Method 1	13.5 m	BAL–19
2	Class G Grassland	Downslope >0–5°	Method 1	26 m	BAL–12.5
3	Class G Grassland	Downslope >5–10°	Method 1	26 m	BAL–12.5
4	Class C Shrubland	Flat/upslope (0°)	Method 1	>100 m	BAL–Low
5	Class D Scrub	Flat/upslope (0°)	Method 1	78 m	BAL–12.5
6	Class B Woodland	Flat/upslope (0°)	Method 1	45.5 m	BAL–12.5
7	Class B Woodland	Downslope >0–5°	Method 1	39 m	BAL–12.5
8	Class A Forest	Flat/upslope (0°)	Method 1	74 m	BAL–12.5
9	Class A Forest	Downslope >0–5°	Method 1	83.5 m	BAL–12.5
10	Excluded – Clause 2.2.3.2 [a]	N/A	N/A	N/A	N/A

Plot	Vegetation classification	Effective slope	Calculation method	Separation (m)	BAL
11	Excluded – Non-vegetated (Clause 2.2.3.2 [e])	N/A	N/A	N/A	N/A
12	Excluded – Non-vegetated (Clause 2.2.3.2 [e])	N/A	N/A	N/A	N/A
13	Excluded – Non-vegetated (Clause 2.2.3.2 [e])	N/A	N/A	N/A	N/A
14	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])	N/A	N/A	N/A	N/A
15	Excluded – Non-vegetated (Clause 2.2.3.2 [e])	N/A	N/A	N/A	N/A
16	Excluded – Non-vegetated (Clause 2.2.3.2 [e])	N/A	N/A	N/A	N/A
17	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])	N/A	N/A	N/A	N/A

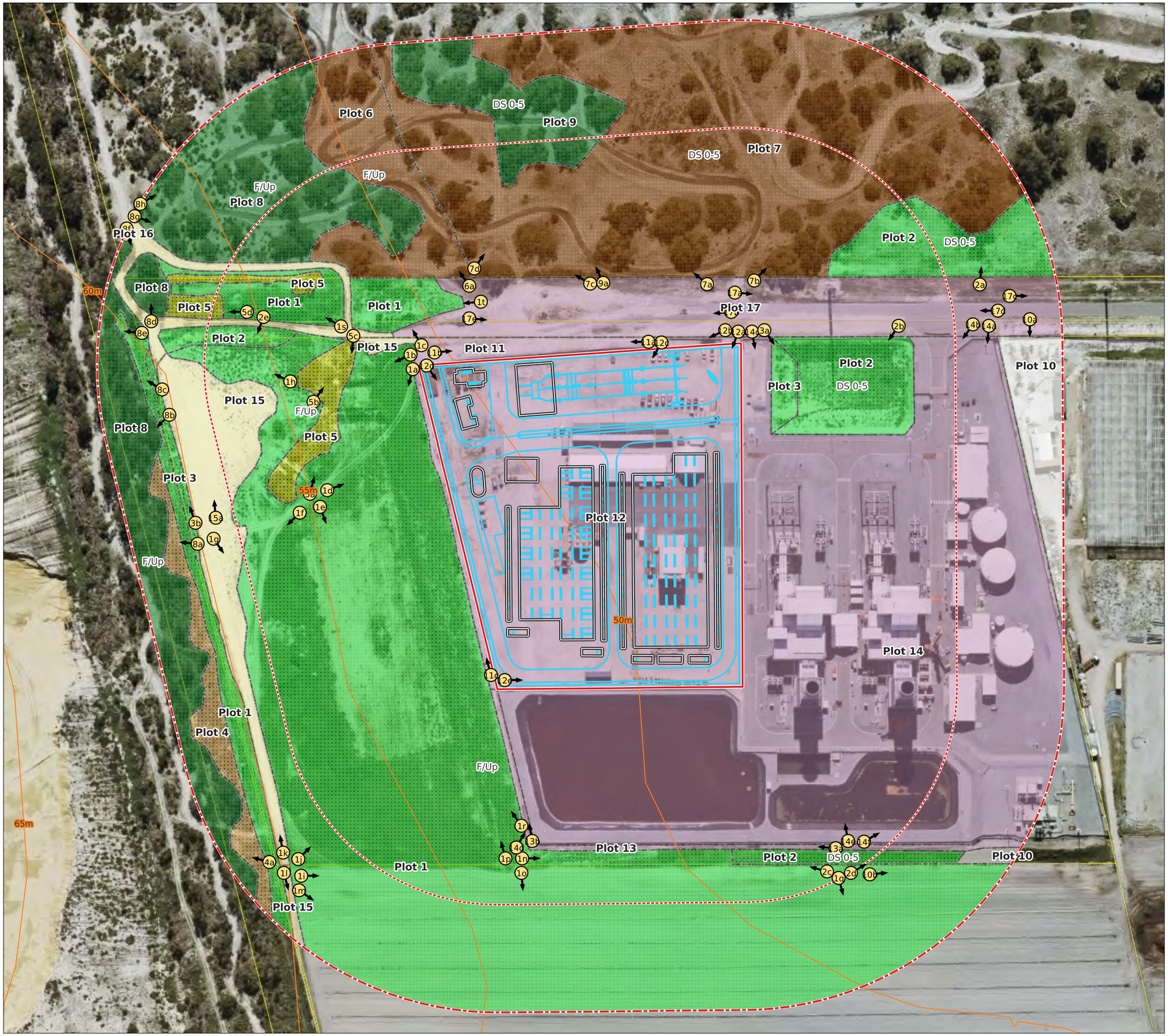
Table 4 below lists the BAL applicable to each proposed building and the firewater tanks within the proposed development, demonstrating that the highest BAL applicable to the proposed buildings is BAL–29 or less. In addition to the buildings, Table 4 also summarises the BAL impacts on proposed renewable energy infrastructure for discussion in the project BRMP.

Table 4: BAL applicable to each proposed building/element

Building / element	Initial BAL	Asset Protection Zones and Vegetation Management	Revised BAL
Proposed Buildings and Firewater Tanks			
O&M Building	BAL–12.5	• 10 m wide NVZ/APZ around building perimeter • Plots 11 and 12 are to be kept in non-vegetated state, or as managed low threat vegetation	BAL–12.5
Switchroom/Control Room	BAL–19	• 8 m wide NVZ/APZ around building perimeters • Plots 11 and 12 are to be kept in non-vegetated state, or as managed low threat vegetation	BAL–19
NSP Room	BAL–12.5		BAL–12.5
Firewater tanks	BAL–19	• 10 m wide NVZ/APZ around perimeter if tank/s • Plots 11 and 12 are to be kept in non-vegetated state, or as managed low threat vegetation	BAL–19
Proposed Renewable Energy Infrastructure			
Substation	BAL–12.5	• 8 m wide NVZ/APZ around substation perimeter • Land within substation to be non-vegetated • Plots 11 and 12 are to be kept in non-vegetated state, or as managed low threat vegetation	BAL–12.5
BESS 1	BAL-12.5 to BAL-Low	• 17 m wide NVZ/APZ around BESS cluster perimeters • Land within BESS clusters to be non-vegetated • Plots 11 and 12 are to be kept in non-vegetated state, or as managed low threat vegetation	BAL-12.5 to BAL-Low
BESS 2	BAL-12.5 to BAL-Low		BAL-12.5 to BAL-Low

Building / element	Initial BAL	Asset Protection Zones and Vegetation Management	Revised BAL
Power Conversion System (PCS) 1	BAL-19 to BAL-12.5	• 8 m wide NVZ/APZ around PCS cluster perimeters • Land within BESS clusters to be non-vegetated • Plots 11 and 12 are to be kept in non-vegetated state, or as managed low threat vegetation	BAL-19 to BAL-12.5
PCS 2	BAL-12.5 to BAL-Low		BAL-12.5 to BAL-Low
PCS 3	BAL-12.5 to BAL-Low		BAL-12.5 to BAL-Low
PCS 4	BAL-12.5 to BAL-Low		BAL-12.5 to BAL-Low
Auxiliary Skid 1	BAL–12.5	• 8 m wide NVZ/APZ around Auxiliary Skid perimeters • Plots 11 and 12 are to be kept in non-vegetated state, or as managed low threat vegetation	BAL–12.5
Auxiliary Skid 2	BAL–12.5		BAL–12.5
Auxiliary Skid 3	BAL–Low		BAL–Low
Auxiliary Skid 4	BAL–Low		BAL–Low
Generator Pad	BAL–Low	• 8 m wide NVZ/APZ around Generator Pad perimeters • Plots 11 and 12 are to be kept in non-vegetated state, or as managed low threat vegetation	BAL–Low

Should there be any changes in development design or classified vegetation extent that results in a modified BAL outcome, then the BAL contours will need to be reassessed.



Legend

- Photo Location
- Proposed Development
- Contours
- Building Outline
- Project Area
- 100m
- 150m
- Cadastre
- Vegetation Plot

Classified Vegetation

- A. Forest
- B. Woodland
- C. Shrubland
- D. Scrub
- G. Grassland
- Excluded Clause 2.2.3.2(a)
- Excluded Clause 2.2.3.2(e)
- Excluded Clause 2.2.3.2(e&f)

Scale 1:1,700

0 20 40 60 Metres

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Figure 3-1: Post-Development Vegetation and Effective Slope

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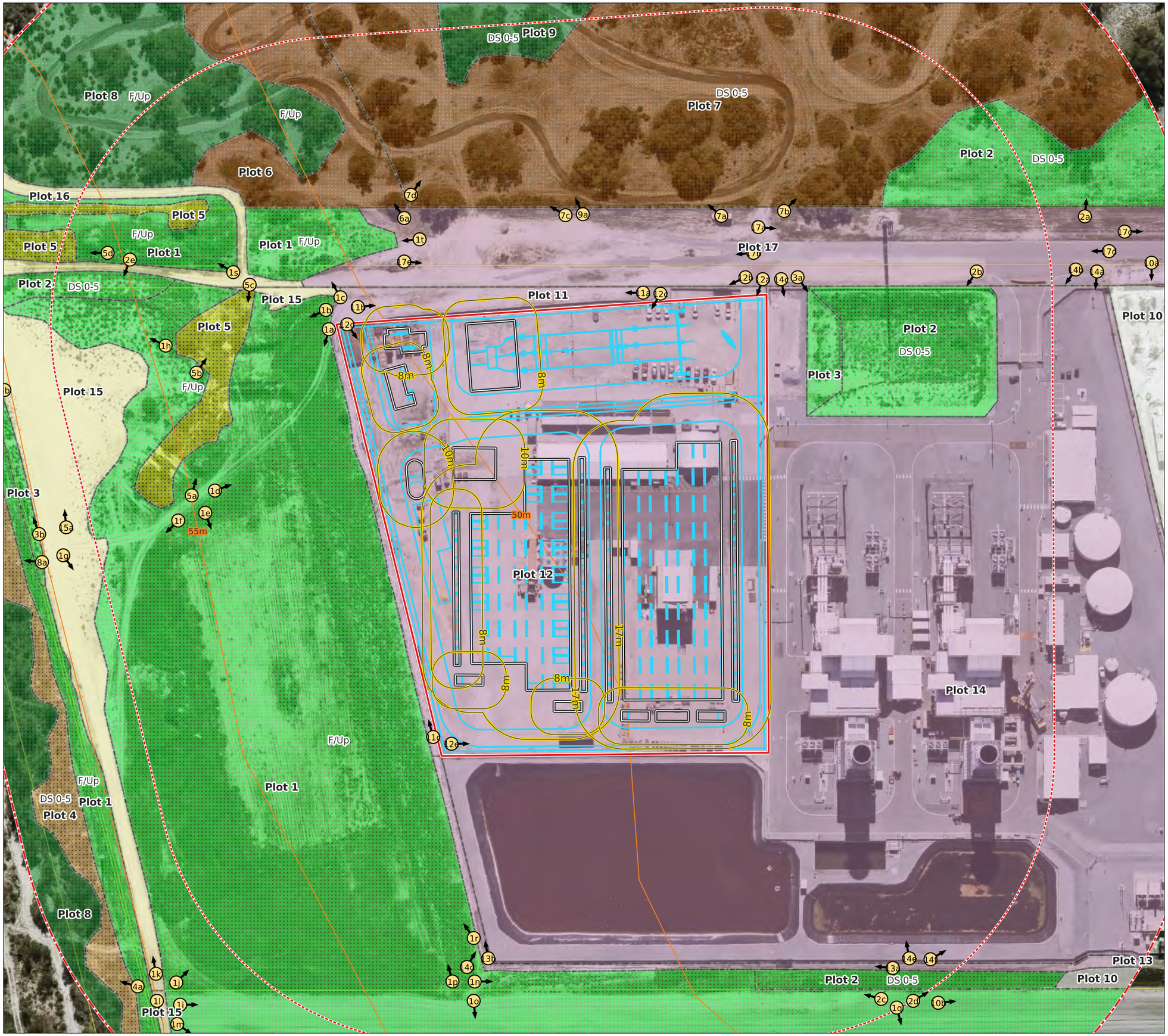

Legend

- Photo Location
- Proposed Development
- Contours
- Building Outline
- Project Area
- 100m
- 150m
- Cadastre
- Vegetation Plot
- Asset Protection Zone

Classified Vegetation

- A. Forest
- B. Woodland
- C. Shrubland
- D. Scrub
- G. Grassland
- Excluded Clause 2.2.3.2(a)
- Excluded Clause 2.2.3.2(e)
- Excluded Clause 2.2.3.2(e&f)

Scale 1:1,200

0 20 40 60 Metres

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Figure 3-1: Post-Development Vegetation and Effective Slope - zoomed

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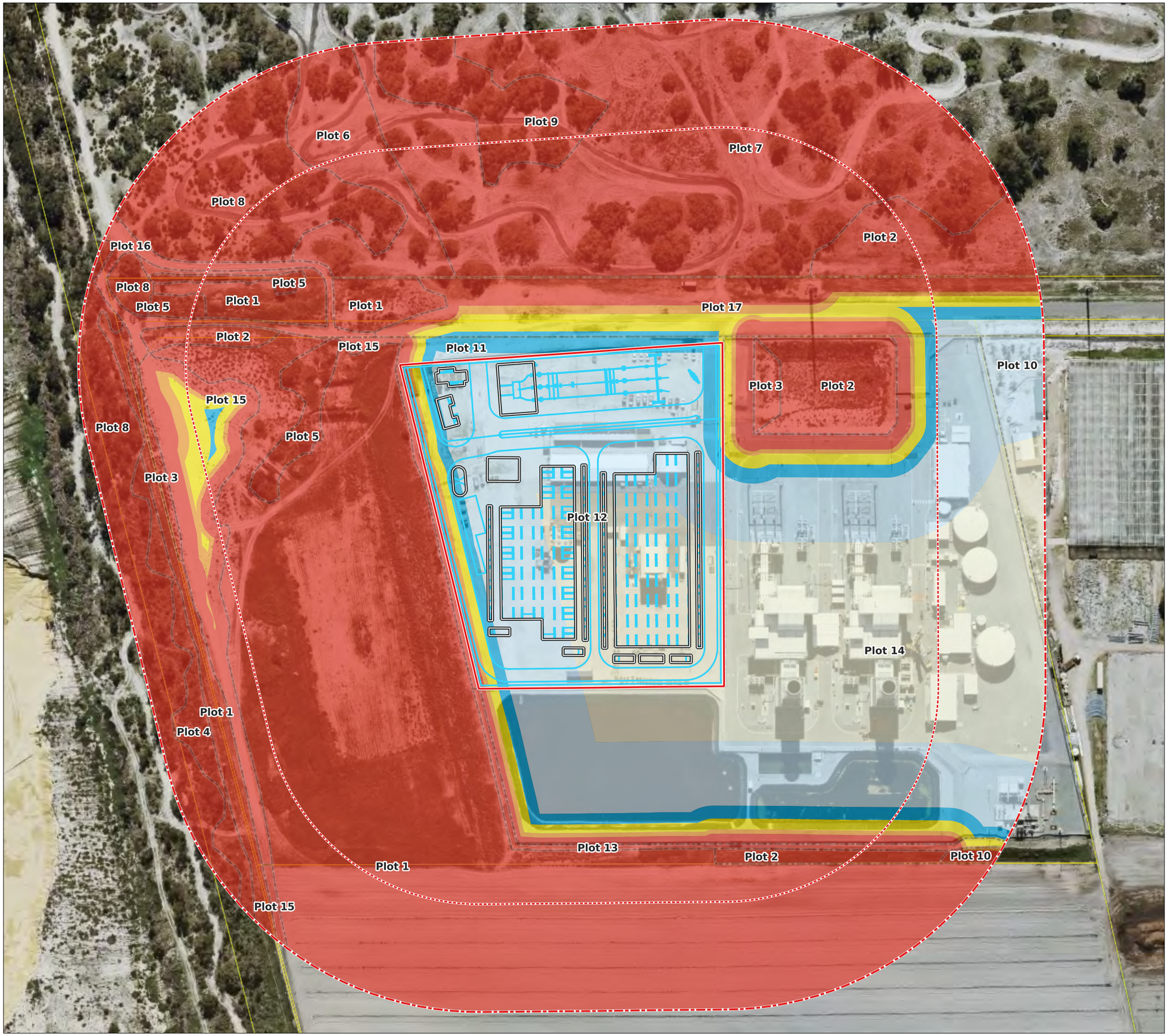

Legend

- Proposed Development
- Building Outline
- Project Area
- 100m
- 150m
- Cadastre
- Vegetation Plot

BAL Contours

- BAL FZ
- BAL 40
- BAL 29
- BAL 19
- BAL 12.5
- BAL Low

Scale 1:1,700

0 20 40 60 Metres

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Figure 3-2: BAL Contour Plan

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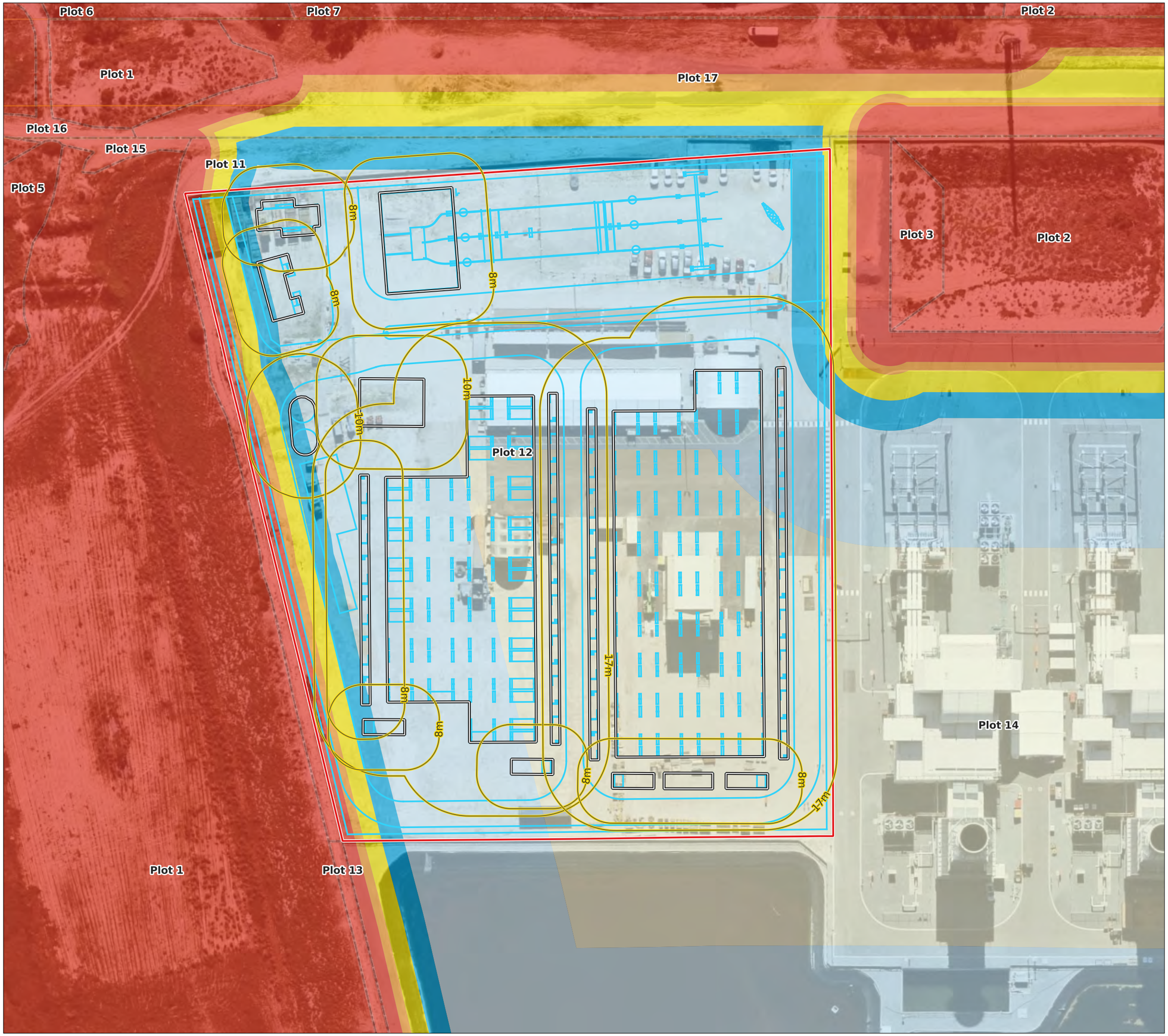

Legend

- Proposed Development
- Building Outline
- Project Area
- 100m
- 150m
- Cadastre
- Vegetation Plot
- Asset Protection Zone

BAL Contours

- BAL FZ
- BAL 40
- BAL 29
- BAL 19
- BAL 12.5
- BAL Low

Scale 1:800

0 10 20 30 Metres

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Figure 3-2: BAL Contour Plan - zoomed

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4 Identification of bushfire hazard issues

4.1 Bushfire context

The greatest bushfire threat to the proposed development is from the north-east, north, north-west and west of the subject site, largely through scrub and forest vegetation, with fire runs 1.3 km to the west, up to tens of kilometres long to the north-east and north. While bushfire could approach the site with extended fire runs in some directions and display fully-developed bushfire behaviour, there is significant existing non-vegetated elements and low threat vegetation to the east, south and south-west of the site, to provide reasonable separation from unmanaged vegetation along these interfaces, and moderate anticipated bushfire impact.

Notwithstanding, any bushfire approaching the development, especially from the northerly directions, can be expected to produce elevated radiant heat and ember attack, and represent a threat to the proposed buildings and occupants, if not appropriately managed.

4.2 Bushfire hazard issues

Examination of the environmental considerations and the bushfire risk assessment (Section 3) has identified the following bushfire hazard issues:

1. Proposed buildings could have pre-development BAL rating of BAL-40/FZ (if regrowth in not managed through vegetation management measures). Onsite vegetation management will be required to ensure sufficient separation between proposed buildings and unmanaged vegetation, to limit the impact of bushfires on the development and prevent ignition and spread of a fire from proposed infrastructure.
2. Ensuring sufficient internal vehicular access to the proposed development, to enable egress by onsite staff, but as importantly, providing sufficient access to the infrastructure to enable attending bushfire fighting appliances to control or suppress any fires.
3. Ensuring a compliant bushfire fighting water supply for fire brigade is provided to protect the proposed development will be crucial.
4. The proposed development contains renewable energy infrastructure (including BESS), a separate BRMP has been prepared to demonstrate compliance with the CFA Guidelines (refer to Covey, 2025).

4.3 Bushfire safety strategy

The following bushfire safety strategy is proposed to demonstrate compliance with the Bushfire Protection Criteria of the Guidelines and address the bushfire hazards identified above:

1. Create sufficient separation between buildings from surrounding classified vegetation by establishing suitably sized APZs to achieve a compliant rating of BAL-29 or less.
2. Provide compliant vehicular access to the proposed buildings, from the surrounding public road network, to enable occupant egress and to facilitate firefighter access.
3. Provide a secure bushfire fighting water supply, including use of firewater storage tanks as required, to enable refill of bushfire fighting appliances.
4. Incorporate the bushfire risk management measures for the proposed renewables infrastructure detailed in the project BRMP, including appropriate bushfire emergency management procedures, into this BMP.

Based on the above, Covey considers the bushfire hazards within and adjacent to the subject site, and the associated bushfire risks, are manageable through standard management responses outlined in the WA

Guidelines and AS 3959. These responses will be factored into proposed development as early as possible at all stages of the planning process to ensure a suitable, compliant and effective bushfire management outcome is achieved for protection of future life, property and environmental assets.

5 Bushfire Management Measures

The following bushfire management measures, informed by the compliance assessment in this BMP and the project BRMP for renewable energy infrastructure (Covey, 2025), and are required to be implemented as part of the development and increase the level of bushfire risk mitigation across the site.

Where possible, the bushfire management measures for both the buildings (from BMP) and renewable energy infrastructure (from BRMP) have been depicted on Figure 5-1 in this BMP.

5.1 Vegetation Modification and Management

The BAL contour plan assumes that the entire project area (Plot 12) and the existing non-vegetated and low threat vegetation adjacent to the project area on the north and west interfaces (Plot 11), are assumed to be maintained as non-vegetated land or low threat vegetation by the Proponent, in perpetuity (or for the life of the project).

In order to manage the bushfire risk to the development, additional guidance is provided to ensure sufficient separation is to be provided between proposed buildings and infrastructure, and unmanaged vegetation, including the following requirements:

- Non-Vegetated Zone (NVZ) and Asset Protection Zone (APZs) around the perimeter of the following:
  - The O&M building
  - The switchroom/control room and NSP building
  - The firewater tank/s
- NVZ/APZ around the perimeter of all renewable energy infrastructure, especially the BESS units and substation.
- Non-vegetated land within BESS, PCS and substation perimeter NVZ/APZ

Where stipulated, the NVZ/APZ must be non-vegetated, however outside this they can be either non-vegetated or managed low threat landscaping established in accordance with the APZ standards from the WA Guidelines (see Appendix B) and AS 3959 Clause 2.2.3.2 (e) and (f) (see Appendix C), however would preferably be non-vegetated where possible across the entirety of Plots 11 and 12.

All onsite vegetation modification and management (including NVZ/APZ) is to be conducted and maintained by the Proponent in perpetuity (or for the life of the facility).

Further information on vegetation management is provided in the sections below.

5.1.1 Non-Vegetated Zone/Asset Protection Zone– Buildings and Firewater Tank/s

In order to ensure sufficient separation is maintained between proposed buildings and firewater tank/s, and surrounding unmanaged vegetation, the following NVZ/APZs will be required:

- The O&M building is to have a 10 m wide NVZ/APZ to achieve BAL-29 or lower, and provide separation from firewater tanks and renewable energy infrastructure.
  - No firewater tanks or BESS or PCS units are permitted in the 10 m NVZ/APZ
- The switchroom/control room and NSP building associated with the substation, will have a compliant 8 m wide APZ to achieve BAL-29 or lower on these buildings.
- The firewater tank/s will have a 10 m wide NVZ/APZ to achieve BAL-29 or lower, and provide separation from buildings and renewable energy infrastructure.
  - No buildings or BESS or PCS units are permitted in the 10 m NVZ/APZ

5.1.2 Non-Vegetated Zone/Asset Protection Zone – Renewable Energy Infrastructure

In order to ensure sufficient separation is maintained between proposed renewable energy infrastructure, and surrounding unmanaged vegetation, to protect infrastructure from approaching bushfire impact, while also reducing the potential for onsite infrastructure fires to ignite a bushfire, the following NVZ/APZs will be required:

- The BESS units are to have a 17 m wide perimeter NVZ/APZ to achieve BAL-12.5 or lower, consisting of the following:
    - A 10 m wide NVZ adjacent to the BESS units, that is non-combustible (constructed of concrete, mineral earth or non-combustible mulch etc) and free of vegetation and obstructions at all times, with no plant or equipment unless totally non-combustible.
    - Otherwise comply with the APZ standards from the WA Guidelines, with the following clarifications:
        - Have no trees located close enough to BESS's such that any falling branches or trees could mechanically damage the BESS
        - Largely consist of managed grassland (<100 mm in height) or low groundcovers
- The ancillary equipment (PCS, Auxiliary Skids, Generator) is to have an 8 m wide perimeter NVZ/APZ to achieve no less than BAL-29.
- The substation is to have an 8 m wide perimeter NVZ/APZ to achieve no less than BAL-29.
    - In order to limit the chance of electrical faults in the substation from igniting a bushfire, all within the substation NNVZ/APZ consisting entirely of non-vegetated elements.
- All land within the BESS, PCS and substation perimeter APZs, are to be non-combustible (constructed of concrete, mineral earth or non-combustible mulch etc) and free of vegetation and obstructions at all times, with no plant or equipment unless totally non-combustible.

5.2 Vehicular access

Vehicular access requirement to the proposed facility from Trandos Road, as well as within the development, is broadly divided into requirements for access to the buildings as per WA Guidelines, and access to the renewable energy infrastructure as per CFA Guidelines. While these requirements are detailed in separate sections below, to avoid confusion, the vehicular access specifications will largely comply with WA Guidelines, with additional guidance provided from CFA Guidelines where required.

The internal roads, site entrances, gates and signage are to be constructed and maintained by the Proponent in perpetuity (or for the life of the facility).

5.2.1 Vehicular access – Buildings and Firewater Tank/s

The internal road accessing the future buildings is to comply with the requirements of A3.1, including the following:

- Comply with the requirements in Appendix B.3 Table 10, Column 5 (see Appendix D)
    - While the preference is that internal roads are at least 6 m wide, where >4 m wide but <6m wide, passing bays are to be provided every 200 m that are 6m wide x 20m long.
- Provide compliant turnarounds (see Appendix D) or loop roads within 30 m of each permanent buildings.
- Provide access to within 4 m of the firewater tanks (or tank suction connection, to enable attending fire appliances to refill, and provide hardstand adjacent to tank suction connection and sufficient locations for fire appliance turnaround.

- Any gates, including those at site entrances, are to have clear opening of no less than 6 m.
    - If any site entrances are to be locked, keys are to be provided to DFES/local fire brigades prior to operation.

5.2.2 Vehicular access – Renewable Energy Infrastructure

The internal road network accessing the renewable energy infrastructure is to comply with the private driveway specifications of WA Guidelines as detailed in Section 5.2.2, with the following additional guidance provided from the CFA Guidelines:

- At least 2 site entrances are to be provided to the facility from Trandos Road into the development
- At least 2 entrance/exit gates are to be provided to the BESS yard, and the internal road to be configured as loop road, to avoid creation of any internal dead-end roads.
- The perimeter road around the BESS units is to be 6 m minimum width, with other internal roads to comply with private driveway standards.
- All gates are to comply with the requirements detailed in Section 5.2.1.
- Emergency Information Book and Signage (see Section 5.6) is to be provided at the nominated site entrance for attending emergency services personnel.

5.3 Firewater supply

The following assumes that there is no reticulated water supply to the site as is currently the case, and onsite firewater will be as follows:

- Provided for proposed buildings in accordance with WA Guidelines, in static firewater tank/s
- Provided for renewable energy infrastructure as follows:
    - The Proponent is proposing a lesser amount of firewater storage than stipulated by CFA Guidelines, as determined once the final operation and design elements of the project have been finalised.
    - Based on outcomes of the above, all firewater tanks are comply with the WA Guidelines and nominated requirements of the CFA Guidelines.

Where appropriate, the requirements of the CFA Guidelines have been substituted with those of the WA Guidelines for ease of application.

All firewater system infrastructure, and associated NVZ/APZs, are to be constructed, filled and maintained for the life of the project by the Proponent.

5.3.1 Firewater – Buildings

Bushfire fighting water supply for proposed buildings, is to be from static firewater tank/s as follows:

- The capacity of the firewater tanks for the buildings is to be at least 10 kL per building (nominally 30 kL in total based on O&M building, switchroom/control room and NSP building)
- This firewater requirements for the proposed buildings, can either be stored in a separate firewater tank, or combined with (i.e. added to) the firewater tank/s required for the renewable energy infrastructure (see Section 5.3.2).

The firewater tank is to comply with the relevant technical requirements from the WA Guidelines (see Appendix E) and the requirements from the CFA Guidelines including:

- Must be an above-ground water tank constructed of concrete or steel and must comply with AS 2419.1 and signage indicating 'FIRE WATER' (or similar approved) and the tank capacity must be fixed to each tank.
- The static water storage tanks must be located at vehicle access points to the facility and must be positioned at least ten (10) metres from any infrastructure (e.g. BESS units etc.).
- The hard-suction point must be positioned within 4 m to a hardstand area or internal road, and protected from mechanical damage where necessary, and provide a clear access for emergency services personnel.

The firewater tank is to be sited within the building envelope to ensure it is an area of BAL-29 or lower.

5.3.2 Firewater – Renewable Energy Infrastructure

- While the CFA Guidelines require the significant firewater for BESS facilities, the Proponent has been advised that manufacturers are typically not recommending use of firewater on BESS fires, and it appears that evidence from recent BESS fires (e.g. Bouldercombe) that the firefighting response is evolving toward this practice.
- Given the above, the Proponent is proposing a lesser amount of firewater storage, as determined once the final operation and design elements of this BESS facility have been finalised, in consultation with DFES, be provided on site.
- Notwithstanding the above, any firewater tanks required onsite will need to comply with the standards from the WA Guidelines, and the following from the CFA Guidelines:
    - Must be an above-ground water tank constructed of concrete or steel and must comply with AS 2419.1 and signage indicating 'FIRE WATER' (or similar approved) and the tank capacity must be fixed to each tank.
    - The tank suction point must be within 4 m of a road or hardstand
- All firewater tanks are to be sited further than 10 m from infrastructure and buildings, as well as in an area of BAL-29 or lower
    - To ensure this is implemented, a 10 m wide NVZ/APZ around the perimeter of the tank/s
    - No infrastructure or buildings are permitted in the 10 m NVZ/APZ, and all land between the tank/s and nearby infrastructure or buildings is to be non-vegetated.
- Vehicular access to the firewater tank/s is to be via proposed internal roads.
    - Access is to be provided to within 4 m of the tank suction point.
- Emergency Information Book and Signage (see Section 5.6) is to be provided at the site entrance, for attending emergency services personnel.
    - This is to include the location of all onsite firewater systems and tanks and the internal access routes to these tanks.

5.4 Renewable Energy Infrastructure Design, Construction, Installation & Commissioning

The following measures are required for the proposed renewable energy infrastructure to manage the risk of fires.

5.4.1 BESS Units

- Ensure the following elements are included in the BESS:
    - External container is to be non-combustible material (e.g. metal).

- Use suitable Li-ion batteries (or appropriate alternative), with sufficient cell quality and barriers, to limit potential for thermal runaway generating from internal cell defects and cascading thermal runaway.
- Battery management/monitoring systems for monitoring and managing the state of battery systems including shutdown if any of the voltage, current, or temperature changes are out of limit.
- Systems to prevent heat/fire spread within battery containers (such as thermal barriers, shut-down separators, isolation systems, cooling systems).
- Detection systems for smoke, heat (thermal), fire and toxic gas (off-gassing) within battery containers.
- Appropriate suppression systems for fire within battery containers.
- Systems to prevent explosion within battery containers by safely ventilating the system in a controlled manner to reduce the flammability of the atmosphere, such as ventilation, pressure relief and exhaust systems, including incorporation of adequate explosion prevention protection, where applicable.
- Warning and alarm systems within the battery containers, and/or the facility, to enable early warning for faults, operation of the battery energy storage system above 'normal'/safe parameters, smoke, off-gassing, and fire.
- Consideration of direct alarm monitoring to the fire brigade for BESS automatic detection systems (in liaison with DFES)
- Provide suitable ember protection (e.g. BAL-12.5 construction) to prevent embers from penetrating battery containers/enclosures including, but not limited to:
  - Battery enclosures via any external walls/roofs (if not completely sealed) and gas ventilation inlets/outlets.
  - Thermal management system (chiller) inlets and outlets
  - Any unsealed penetrations are to be appropriately sealed (with non-combustible material) or gaps/openings (>2mm) are to be screened with non-combustible (aluminium, steel, bronze) screening with maximum aperture <2mm.
- BESS installation is on a non-combustible surface (e.g. concrete)
- Where relevant and appropriate to the type of BESS installed, consider adopting:
  - Current versions of UL 9540 or FM Global Property Loss Prevention Data Sheet 5-33, for the design and operation of BESS's.

- All electrical equipment, including electrical cabling, junction boxes, inverters and transformers, must comply with relevant design, construction and installation standards of electrical equipment including relevant Australian Standards, and manufacturers recommendations.
- Separation between the BESS's, substation and any other electrical infrastructure, must be at least the distance where the radiant heat flux from a fully involved in fire in the infrastructure, does not create the potential for ignition of these site elements (adjacent battery containers/enclosures, on-site buildings, substations).
  - This is outside the bushfire scope, and is expected to be addressed by complying with relevant codes and standards, including Australian Standards, and any manufacturers recommendations.

5.4.2 Substation

- Substation infrastructure is to be designed, constructed and maintained to relevant Australian Standards and Western Power specifications.
- Ensure transformer is designed to minimise fire risk, incorporates either oil bund or flame trap, and is provided with required separation from adjacent infrastructure and the combustible vegetation, in accordance with relevant Australian Standards and manufacturer specifications.

5.4.3 Facility Monitoring

- Appropriate system monitoring for all electrical infrastructure must be provided, especially the BESS unit BMS and fire/gas detection, to ensure that any electrical or equipment failures with the potential to ignite or propagate fire are rapidly identified and relevant site personnel notified to enable early fire brigade notification.
    - Monitoring is to be configured to provide warning to relevant onsite and offsite personnel.

5.4.4 Additional Design, Construction and Commissioning Requirements

The proposed facility will need to incorporate these design, commissioning and construction requirements to manage the risk of onsite fire and bushfire from the development:

- Ensure an emergency communication system must be provided that is reliable and will operate in the event of power failure
- Ensure all electrical equipment (e.g. electrical cabling, junction boxes, inverters and transformers) must comply with relevant design, construction and installation standards of electrical equipment including relevant Australian Standards, and manufacturers recommendations.
- Install and commission fire detection, alarm and suppression systems at the earliest possible stage of construction.
- Provide first response firefighting equipment (e.g. extinguishers) at all construction portables/buildings onsite, in the vicinity of all construction activities, and in site-based vehicles.
- Ensure sufficient training provided to relevant personnel on the use of on-site firefighting equipment and first-aid, and responsibilities during emergencies
- Provide required fire protection equipment for Dangerous Goods as per relevant Australian Standards.
- Ensure tight ignition source control, including hot works and restriction of smoking to prescribed areas.
- Conduct any required vegetation management.
- Undertake all required infrastructure, equipment and vehicle maintenance.
- Incorporate emergency management procedures into the Construction Management Plan (or other relevant document) for the construction and commissioning phase of the facility which includes:
    - Adhere to restrictions and guidance during days of Fire Danger Rating of High to Catastrophic, and Total Fire Ban days and Harvest Movement Ban days
    - Emergency procedures for identified risks and hazards of the renewable energy infrastructure, including but not limited to
        - Onsite fire in renewable energy infrastructure (e.g. electrical infrastructure faults and fire in BESS or substation)
        - Bushfires
    - Emergency procedures for bushfires (adopting similar concepts to those detailed in Section 5.8)
    - Emergency procedures for fires within the renewable energy infrastructure and buildings.
- Notification of fire brigade at least seven days prior to the commissioning of any renewable energy infrastructure at the facility, especially the BESS units.

- Engage with fire brigade to offer a familiarisation visit prior to commissioning, as detailed in Section 5.7.

5.5 Renewable Energy Infrastructure Operation, Maintenance and Housekeeping

The following shall be conducted as part of ongoing operation and maintenance phases:

- Ensure ongoing compliance with the endorsed BMP and BRMP is achieved, especially prior to, and during, bushfire season. This includes all vegetation management, internal road access, fire system and firewater obligations.
- Ensure all Dangerous Goods (if any) comply with all relevant legislation, Australian Standards and requirements detailed in Section 5.9.
- Develop, implement and review Emergency Information Book and Signage (see Section 5.6) for attending emergency services personnel.
- Develop, implement and review the Emergency Management Plan (see Section 5.8)
- Regular and ongoing inspection and auditing is to be conducted by the Proponent, with any routine maintenance and any required repair activities to be conducted for all infrastructure, equipment, vehicles and fire detection and suppression systems at the facility. With respect to the BESS units, this should include the following:
    - A schedule, list of activities and accountabilities for the inspecting, testing, monitoring and servicing of the battery and its monitoring, safety and protective systems.
    - Monthly inspections of battery enclosures/ containers and related infrastructure for physical damage. Any damage must be immediately assessed and rectified by a suitably qualified person.
    - Regular inspection and removal of all combustible materials near the battery enclosures/containers and related infrastructure.

5.6 Emergency Information Book and Signage

An Emergency Information Book and/or signage must be located at the nominated site entrance to the facility, with any plans or information books provided in a weatherproof container (unless otherwise agreed with DFES).

The Emergency Information Book and/or signage is intended to provide to emergency responders with an overview of the facility. This information should be developed in liaison with relevant emergency services representatives (if possible) and should seek to include the following:

- A description of the premises, its infrastructure and operations.
- Up-to-date contact details for site personnel, regulatory authorities and site neighbours.
- Site plans that depict the entire site layout, including:
    - Buildings, substations and renewable energy infrastructure (including BESS units),
    - Internal roads and surrounding public roads
    - Fire protection systems and equipment, including firewater tanks
    - Grid connections, drains and isolation valves,
    - Dangerous goods storage areas
    - Neighbours and
    - North direction and scale

- The following BESS details and plans
    - Schematics and technical data for BESS units, the number of units on-site, and the number of battery racks or modules within each unit.
    - Details of the hazards for the BESS, including thermal events/runaway, electrical safety hazards, explosion hazards, dangerous goods hazards (including off-gassing), and the effects of fire on the BESS (e.g., explosion, release of toxic gases).
    - Details of all provided battery failure/safety and protective systems, including a description, the activation process/automatic trigger, and any hazards associated with these systems.
    - Specifications for safe operating conditions for temperature.
    - Details of the elements monitored/controlled by the Battery Management System (BMS), including internal temperature, state of charge, voltage, etc. and the locations this information is available.
    - The shutdown and/or isolation procedures if the BESS are involved in fire or emergency incident, and appropriate personnel contact details for verifying that the battery enclosure/container system has been isolated/shutdown and de-energised during emergencies.
- Details of any emergency equipment, including the type and location of fire and gas detection systems.
- A manifest of dangerous goods (if required) and Safety Data Sheets (SDS) for dangerous goods stored on-site.
- Procedures for the management of emergencies, including evacuation, shelter-in-place (for facilities at risk of bushfire), containment of spills and leaks, and fire procedures (including infrastructure/plant fires, vehicle fires, bushfire)

A review of the information contained within the facility's Emergency Information Book and signage must be undertaken prior to commencement of bushfire season annually.

5.7 Emergency Services Familiarisation

Prior to commissioning of the facility, a familiarisation visit and explanation of the proposed facility, the specific hazards, the proposed fire safety systems and management measures, and the emergency procedures, is to be offered to local fire brigades and other emergency services.

The opportunity should be taken to ensure that the information in the proposed Emergency Information Book/Signage (see Section 5.6) is appropriate for their needs, and that they are familiar with where this will be located.

Additionally, it should be confirmed that any required keys or access codes to any secured parts of the site have been (or will be) supplied to the relevant fire brigade personnel.

A schedule for ongoing site familiarisation to account for changing personnel, facility infrastructure and hazards, and emergency exercises should be developed in conjunction with the local fire brigade.

5.8 Emergency Management Plan

The Proponent is to develop an emergency management plan for the facility, which comprehensively details the procedures for preparing for, and responding to, hazards to the facility, including the following for off-site bushfire, and on-site fire, emergencies:

- Facility details including:

- Facility description, including infrastructure details, operations, number of personnel, and operating hours.
- Up-to-date contact details for facility personnel, and any relevant off-site personnel that could provide technical support during an emergency including contact information for 24/7/365 specialist technical support for the renewable energy infrastructure.
- Site plans that depict the entire site layout, including:
  - Buildings, substations and renewable energy infrastructure (including BESS units),
  - Internal roads and surrounding public roads
  - Fire protection systems and equipment, including firewater tanks
  - Grid connections, drains and isolation valves,
  - Dangerous goods storage areas
  - Neighbours and
  - North direction and scale
- The following BESS details and plans
  - Schematics and technical data for BESS units, the number of units on-site, and the number of battery racks or modules within each unit.
  - Details of the hazards for the BESS, including thermal events/runaway, electrical safety hazards, explosion hazards, dangerous goods hazards (including off-gassing), and the effects of fire on the BESS (e.g. explosion, release of toxic gases).
  - Details of all provided battery failure/safety and protective systems, including a description, the activation process/automatic trigger, and any hazards associated with these systems.
  - Specifications for safe operating conditions for temperature.
  - Details of the elements monitored/controlled by the Battery Management System (BMS), including internal temperature, state of charge, voltage, etc. and the locations this information is available.
  - The shutdown and/or isolation procedures if the BESS are involved in fire or emergency incident, and appropriate personnel contact details for verifying that the battery enclosure/container system has been isolated/shutdown and de-energised during emergencies.
- Details of any emergency resources, including fire detection and suppression systems and equipment; gas detection; emergency eye-wash and shower facilities; spill containment systems and equipment; emergency warning systems; communication systems; personal protective equipment; first aid.
- A manifest of dangerous goods (if required under the applicable Dangerous Goods legislation and codes, and relevant Australian Standards), including Safety Data Sheets (SDS).

- The identified risks and hazards associated with the renewable energy infrastructure, including but not limited to:
  - Electrical faults and renewable energy infrastructure fire (especially BESS fire)
  - Bushfire
- Detail preparedness and pre-emptive actions to address the above hazards, including the following for bushfire:
  - Ongoing compliance with BMP and conducting regular bushfire housekeeping inspections.
  - Ensuring ongoing maintenance of all buildings, especially the onsite O&M building.
  - Ensuring ongoing maintenance of all fire and communication systems.

- Determining forecast Fire Danger Rating, Total Fire Bans and Harvest Vehicle Movement Bans, during bushfire season
- Modifying Site Activities (based on Forecast FDR and TFB/HVMB)
- Monitoring DFES Bushfire Emergency Warnings (and/or bushfire activity within 50km of the facility, during bushfire season.

- Detail emergency response procedures to address the nominated hazards, including for:
  - Bushfire and
  - Onsite fire in renewable energy infrastructure
    - BESS damage or faults, including battery monitoring faults, temperature increases above normal operating parameters, electrical faults, chemical spills or reactions, off-gassing, thermal events/runaway, smoke and fire.
  - The management of fire water runoff.

5.8.1 Bushfire preparedness and pre-emptive activities

5.8.1.1 Year-round (with focus on the month prior to bushfire season)

- Ensure ongoing compliance with endorsed BMP including:
  - Vegetation management must be conducted as per the BMP including maintenance of NVZs and APZs.
  - Gutters, roof surfaces and valleys, kerbs, traps, sumps, bunds, drains, rooves or any other accumulation points for leaf litter, dry vegetation, or any other combustible materials must be cleared, and the debris removed from site.
  - Extraneous or unnecessary materials (fuel loads) must be removed from site (e.g. dilapidated/stored vehicles, plant or equipment; excess fuel/chemicals; any combustible waste materials).
- Bushfire preparedness housekeeping inspections:
  - Vegetation management as per BMP
  - Ensure all vehicle site access points, including emergency access points, are clear and accessible.
  - Ensure that all fire protection systems and equipment is unobstructed, in service and performing optimally.
- Fire detection, alarm and suppression systems, and any other communication and emergency equipment must be maintained in accordance with relevant codes and standards, and be in effective working order at all times
  - Any defects, faults or matters affecting the performance of systems must be identified through routine testing and servicing, with any maintenance activities and rectifications to be closed-out prior to bushfire season.
- Ensure local fire brigade is engaged with on an ongoing basis, to ensure they are familiar with the site layout, specific hazards and fire detection and suppression systems as detailed in Section 0.

5.8.1.2 During the bushfire season

Monitor Forecast Fire Danger Rating (FDR) and Total Fire Ban Days (TFB)

- A nominated person/role is to be responsible for identifying, responding to and communicating the Fire Danger Rating, ideally four days ahead:
  - http://www.bom.gov.au/wa/forecasts/fire-danger-ratings.shtml [4 day FDR forecast] or
  - https://www.emergency.wa.gov.au/index.html#firedangerratings [current/next day FDR]

  - https://www.emergency.wa.gov.au/#totalfirebans [Total Fire Ban]
- This information must be communicated to everyone likely to be present on-site, and relevant off-site personnel.
- Undertaken any modification of site activities based on forecast FDR or TFB (see below).

Modifying Site Activities (based on Forecast FDR and TFB)

- ***Moderate FDR or No Rating***
  - No specific daily monitoring or actions unless conditions change.
- ***High FDR***
  - Alert all site personnel and visitors of bushfire risk
  - No specific daily monitoring but remain vigilant to potential bushfires through visual checks, occasional check of online resources for emergency warnings and bushfires in the local area.
  - Conduct daily checks of vegetation, rubbish and extraneous storage accumulation, vehicular access routes, and fire systems to ensure they are fit-for-purpose in a bushfire emergency.
- ***Extreme FDR***
  - Alert all site personnel and visitors of elevated bushfire risk and communicate modified activities including requirement to be prepared for site shutdown and offsite evacuation, if required.
  - Conduct regularly visual checks throughout the day
  - Regularly check online resources for emergency warnings and bushfires in the local area.
  - Consider minimisation of site personnel and visitation requiring travel to and from the facility, as well as non-essential activities and high-risk maintenance activities.
  - Include bushfire ignition hazards in any Job Hazard Analysis or similar activity-based risk management process for site activities.
  - Conduct daily checks of vegetation, rubbish and extraneous storage accumulation, vehicular access routes and fire systems to ensure they are fit-for-purpose in a bushfire emergency.
- ***Catastrophic FDR and TFB declared days***
  - Alert all site personnel and visitors of elevated bushfire risk and communicate modified activities including requirement to be prepared for rapid site shutdown and offsite evacuation, if required
  - Conduct hourly visual checks throughout the day
  - Conduct hourly check online resources for emergency warnings and bushfires in the local area.
  - Postpone non-essential activities or high-risk maintenance activities at the facility.
  - Minimise site personnel and visitation to only essential personnel.
  - Include bushfire ignition hazards in any Job Hazard Analysis or similar activity-based risk management process for site activities.
  - Conduct daily checks of vegetation, rubbish and extraneous storage accumulation, vehicular access routes and fire systems to ensure they are fit-for-purpose in a bushfire emergency.
  - Comply with all Total Fire Ban requirements including:
    - no fire or flames allowed in the open air
    - no open fires for the purpose of cooking or camping are not allowed
    - no ‘hot work’ such as metal work, grinding, welding, soldering, gas cutting or similar is allowed unless a formal exemption has been obtained
    - no use of chainsaws, plant or grass trimmers or lawn mowers in bushland areas
    - no other activities that may start a fire
    - ensure equipment or machinery is mechanically sound

- ensure all reasonable precautions are taken to prevent a bushfire igniting, including postponing any activity that could result in a bushfire ignition.

5.8.2 Bushfire Monitoring, Triggers and Decision-Making

5.8.2.1 Bushfire Monitoring

Bushfire monitoring involves the identification of the DFES Bushfire Emergency Warnings (ADVICE, WATCH & ACT AND EMERGENCY) and/or bushfire activity within 50km of the facility, through the use of the Emergency WA website app (https://www.emergency.wa.gov.au/), or ABC local radio.

- ***If ADVICE warning or bushfire is within 25 km – 50 km of the site***
  - If possible, liaise with the DFES if fire travelling toward the site.
  - Consider reducing numbers of onsite personnel to essential staff only, and relocate all other staff and visitors to nominated offsite safer location (e.g. Banksia Grove, Yanchep or Alkimos/Butler/Clarkson residential areas depending on direction of fire travel).
  - Make preparations to shutdown facility and conduct offsite evacuation procedures, depending on bushfire location and direction of spread, including:
    - Reducing the facility to a low energy state (including discharging the BESS), in consultation with authorised DFES personnel (where possible)
    - Ensure onsite O&M building is properly prepared for onsite shelter, should it be required (NOTE: The O&M building is not a bushfire refuge building and should only be used as a last resort if offsite evacuation is not possible).
    - Ensure all other buildings and plant are properly secured.
    - Ensure all vehicular access routes are open and available for use.
    - Ensure all fire and communications systems are ready for use.
  - Continue monitoring and re-evaluating situation depending on bushfire behaviour, and liaising with DFES as required.
- ***If WATCH & ACT warning or bushfire is within 10 km – 25 km of the site***
  - If possible, liaise with the DFES if fire travelling toward the site.
  - Prepare or commence shutdown facility, depending on bushfire location and direction of spread, including:
    - Reducing the facility to a low energy state (including discharging the BESS), in consultation with authorised DFES personnel (where possible)
    - Ensure onsite O&M building is properly prepared for onsite shelter, should it be required (NOTE: The O&M building is not a bushfire refuge building and should only be used as a last resort if offsite evacuation is not possible).
    - Ensure all other buildings and plant are properly secured.
    - Ensure all vehicular access routes are open and available for use.
    - Ensure all fire and communications systems are ready for use.
  - Prepare or commence offsite evacuation procedures depending on bushfire location and direction of spread, including:
    - Early reduction of numbers of onsite personnel to essential staff only, and relocate all other staff and visitors to nominated offsite safer location, if safe to do so, otherwise they are to remain onsite.
    - If possible, relocate of all personnel to the offsite safer location ahead of any bushfire impact on road network (including smoke impact), as there is no bushfire refuge building onsite.

- Continue monitoring and re-evaluating situation depending on bushfire behaviour, and liaising with DFES as required.

- ***If EMERGENCY warning or if bushfire is <10km or impact is imminent:***
  - If possible, liaise with the DFES.
  - If safe to do so, commence or conduct facility shutdown depending on bushfire location and direction of spread, ideally in consultation with authorised DFES personnel (where possible), including:
    - Reducing the facility to a low energy state (including discharging the BESS)
    - Ensure onsite O&M building is properly prepared for onsite shelter, should it be required (NOTE: The O&M building is not a bushfire refuge building and should only be used as a last resort if offsite evacuation is not possible).
    - Ensure all other buildings and plant are properly secured.
    - Ensure all vehicular access routes are open and available for use.
    - Ensure all fire and communications systems are ready for use.
  - Urgently undertake offsite evacuation procedures (if safe to do so) depending on bushfire location and direction of spread, including:
    - Relocate all site personnel and visitors to nominated offsite safer location ahead of any bushfire impact on road network.
  - If unsafe to evacuate offsite, urgently commence onsite shelter in place procedures including:
    - Prepare onsite O&M building for onsite shelter
    - Relocate all site personnel and visitors to the O&M building on conduct all shelter in place actions.
  - Continue monitoring and re-evaluating situation depending on bushfire behaviour, and liaising with DFES as required.

5.8.3 Offsite Evacuation and Onsite Shelter-in-Place Procedures

Ahead of deciding to evacuate offsite or remain onsite to shelter-in-place (which is the last resort response if unsafe to evacuate offsite), the following should be conducted:

- Assess the bushfire situation:
  - Review available information to determine bushfire location, direction and speed of travel
  - Determine if there are any DFES Bushfire Warnings issued
  - Contact and liaise with DFES for further information and guidance
  - Make a decision whether it is safe to evacuate to nominated offsite safer location (e.g. Banksia Grove, Yanchep or Alkimos/Butler/Clarkson residential areas depending on direction of fire travel), or whether it is safer to shelter onsite in the O&M building (which should be a last resort action only).
  - Advise DFES of the decision, if possible.

5.8.3.1 Offsite Evacuation (and Facility Shutdown)

- Assemble all site personnel and visitors at the O&M building
  - Brief them of the bushfire situation and the plan to shutdown facility (if sufficient time) and evacuate to nominated offsite safer location.
  - Ensure sufficient transport is available for all personnel to travel to nominated offsite safer location with sufficient fuel to travel 100 km, water, fire extinguishers (if possible)
- Conduct facility shutdown actions (if sufficient time) including
  - Reducing the facility to a low energy state (including discharging the BESS)

- Ensure all vehicular access routes are open and available for use.
- Ensure all fire systems are ready for use.
- Ensure all other buildings and plant are properly secured.

- Brief evacuees on offsite evacuation particulars including:
  - Confirm the offsite safer location (e.g. Banksia Grove, Yanchep or Alkimos/Butler/Clarkson residential areas depending on direction of fire travel)
  - The evacuation route to travel to the off-site safer location
  - The need to travel in convoys in case of vehicle failure
  - Ensure final evacuating personnel are in no less than 2 vehicles.
- Monitor the leaving of site and arrival at nominated offsite safer location, and if anyone is missing, notify DFES immediately.

5.8.3.2 Onsite Shelter-in-place (and Facility Shutdown) – Last Resort Action Only

- Assemble all site personnel and visitors at the onsite O&M building
  - Brief them of the bushfire situation and the plan to shutdown facility (if sufficient time) but remain onsite to shelter in place.
- Prepare onsite O&M building for shelter (NOTE: The O&M building is not a bushfire refuge building and should only be used as a last resort if offsite evacuation is not possible)
  - Check the perimeter of building and put away all external combustible items and any loose items that could be projectiles
  - Close all doors and windows
  - Ensure all firefighting, emergency communication equipment and first aid supplies are available and ready for use, including hose reel coverage around the building (if any).
  - Ensure all internal access routes within the building are open to enable people move to the available spaces
  - If installed, ensure any evaporative air-conditioning (HVAC) can be easily shutdown ahead of the fire impact. If possible, keep the water running and turn off the fan, otherwise shutdown completely.
  - Begin storing water for drinking (in containers) and review food stores
  - Consider collecting any blankets and fire extinguishers from other buildings
  - Soak towels and rugs in water and lay them along the inside of external doorways or block any other gaps for embers or smoke
- Conduct facility shutdown actions (if sufficient time and safe to do so) including
  - Reducing the facility to a low energy state (including discharging the BESS)
  - Ensure all vehicular access routes are open and available for use.
  - Ensure all fire systems are ready for use.
  - Ensure all other buildings and plant are properly secured.
- As bushfire impacts the facility:
  - All remaining occupants are to be within the O&M building
  - Immediately before the fire arrives, wet down building exterior, decks and landscaping close to the building. Turn off evaporative air-conditioning if not already done.
  - Ensure occupants to get down low to limit exposure to smoke and drink plenty of water to avoid becoming dehydrated.
  - Regularly inspect the condition of the building including:
    - Regular inspection of the inside of the building, including the roof space for sparks and embers, and extinguish where possible and safe to do so.

        - If safe to do so, organise for regular patrols of the outside of the building to check for any signs of bushfire ignition and extinguish where possible and safe to do so. Those conducting the patrols are to wear appropriate PPE.
- Stay inside while the fire front is passing and don't leave until advised by that the fire is no longer a threat or offsite evacuation can be conducted (or decided by Chief Fire Warden).
- If the building catches fire and/or conditions inside become unbearable:
    - Leave through the door furthest from the approaching fire
    - Relocate all occupants to the following locations furthest from the fire or previously burned land.
- Once the fire has passed, and approval is provided to leave the building:
    - Go outside and extinguish any fires on the building or in adjacent landscaping.
    - Regularly inspect the inside and outside of the building for several hours.
    - Do not approach the renewable energy infrastructure (especially BESS units) until advised by DFES.

5.8.4 Onsite Renewable Energy Infrastructure Fire Response

The emergency response to any onsite fire in renewable energy infrastructure (especially BESS units), is to include the following:

- Immediately notify the following of onsite fire, including location:
    - DFES to enable rapid turnout to site
    - Relevant staff
    - Relevant neighbouring development (e.g. Power Station)
- Strongly consider full emergency shutdown of the BESS and substation unless there are mitigating circumstances. This should be conducted in consultation with authorised DFES personnel (where possible).
- If fire is within the BESS unit/s, ensure staff relocate as far as possible from the fire, and no less than 50 m away.
- If possible, ensure relevant vehicular access routes are open and available, to enable attending firefighters to gain access to the location of the fire.
- Ensure all fire and communications systems are ready for use.
- Ensure attending firefighters have access to any relevant specialist technical support personnel, to assist by providing technical advice.

5.8.5 Emergency Management Plan Review, Training and Exercises

The emergency management plan is to be reviewed regularly as follows:

- At least annually to ensure currency and effectiveness
- Following any changes to the risk on-site pertaining to site infrastructure and operations
- After any activation of the plan or incident involving notification to the emergency services.
- After emergency exercises.

In addition to the review of the emergency management plan, it is critical to regularly train relevant staff and conduct exercises to ensure everyone is fully conversant with the requirements of the plan and able to respond as required during all emergencies. It also presents an opportunity to test the effectiveness of the plan and refine as required.

- Training should be conducted annually prior to bushfire season, as a minimum, and also at the commencement of employment.
- Exercises should be conducted annually prior to bushfire season, as a minimum, but ideally on a regular basis.

5.9 Dangerous Goods

The proposed development will contain dangerous goods (BESS units), with the storage and use of these onsite potentially increasing the risk of fire ignition at the proposed development.

The Proponent will be required to ensure there are strict controls on these potential ignition sources, such as storage and handling controls in accordance with the Dangerous Goods legislation and code, relevant Australian Standards and restrictions on hot works and electrical equipment within any on-site hazardous areas.

Should the facility propose any additional significant quantities of dangerous goods onsite such that the storage and use of these could potentially increase the risk of fire ignition at the proposed development, the Proponent will be required to do the following, with the final siting and bushfire risk management to be reviewed by an accredited bushfire practitioner:

- Ensure they are sited in areas of BAL-29 or lower as a minimum, and
- Protect from bushfire impact.

5.10 Building construction standards

Bushfire construction provisions of the National Construction Code require that buildings comply with the AS 3959 construction requirements, in accordance with the assessed BAL under AS 3959, provided the building is a Class 1, 2, 3 or associated Class 10a building/deck, or a “certain Class 9” building.

The proposed buildings (O&M building, switchroom/control room or NSP building) will not be any of the classifications nominated above, therefore in accordance with the National Construction Code, and as such, there is no statutory requirement for proposed buildings to meet the construction requirements of AS 3959.

Notwithstanding, given the nature of the proposed use and location, and that like all buildings there is potential vulnerability to ember attack, it is recommended that as a minimum, the requirements of BAL-12.5 are strongly considered for voluntary implementation as the construction requirements associated with this rating are primarily related to ember protection. It is noted that this is not a mandatory requirement, and simply a recommendation for consideration.

5.11 BAL compliance and/or BAL assessment report

A BAL compliance and/or BAL assessment report may be prepared at the discretion of the City or Building Certifier, following completion of construction works and prior to issue of certificate of occupancy, to validate and confirm the accuracy of the BAL contour assessment.

5.12 Compliance with annual firebreak notice

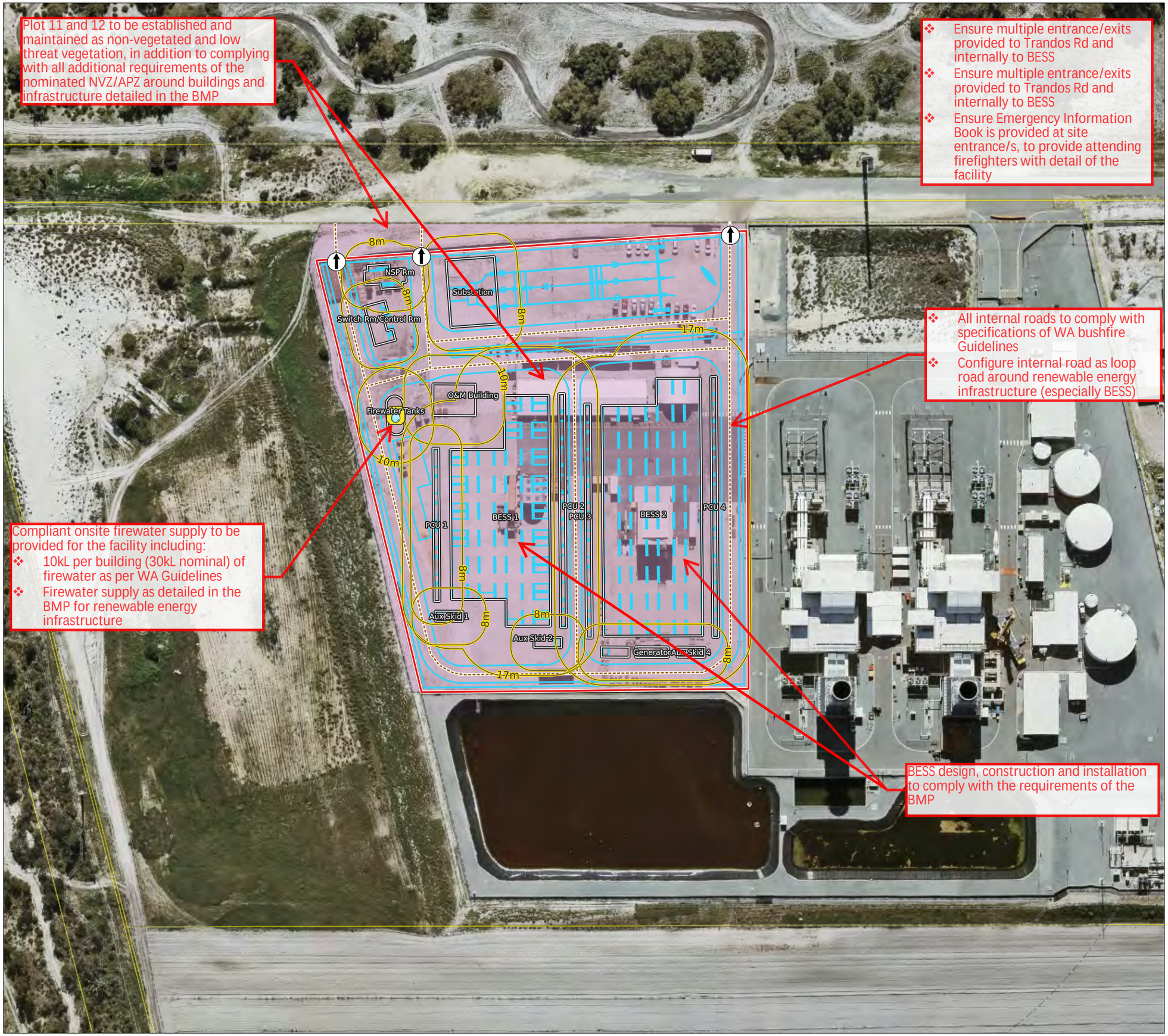
The Proponent is to comply with the current City of Wanneroo annual firebreak notice as amended (refer to Appendix F).

While the firebreak notice requires that a 3 m wide trafficable perimeter firebreak is established as close as possible to all external boundaries, the internal loop road is considered to provide this function for the

proposed development. Notwithstanding, the Proponent may need to seek variation of the firebreak notice with the City, unless they are the decision-maker who endorses the BMP. The Proponent would still need to comply with the balance of the lot outside the scope of this BMP (e.g. provision of perimeter firebreak).

The firebreak notice also provides enforceability to the Bushfire Management Plan, as it notes that properties with approved BMPs, must comply with their requirements.

The mitigation measures detailed in the firebreak notice must be in place from 1 November to 30 April each year.



Legend

Mitigation Measures

- Vehicular Exit
- Firewater Tank
- Proposed Development
- Private driveway
- Building Outline
- Project Area
- Cadastre
- Vegetation Plot
- Asset Protection Zone

Classified Vegetation

- Excluded Clause 2.2.3.2(e&f)

Scale 1:1,200

0 20 40 60 Metres

covey

GHD Pty Ltd

Shell Energy BESS

Figure 5-1: Bushfire Management Measures

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6 Assessment against the Bushfire Protection Criteria

An acceptable solutions assessment against Bushfire Protection Criteria 7 (Development – Commercial and Industrial) of the Guidelines, has been provided in Table 5.

Table 5: Compliance with the Bushfire Protection Criteria 7 (Commercial and Industrial) of the Guidelines

Bushfire protection criteria		Development response	
Outcomes	Acceptable Solutions	Method of compliance	Proposed bushfire management measures
Element 1: Location			
Not Applicable	***Area 1 (Urban):*** Not Applicable ***Area 2:*** Not Applicable	**Not Applicable**	• Not applicable
Element 2: Siting and Design			
Outcome O2 Ensure siting and design solutions: • manage or mitigate the bushfire risk to people, property and infrastructure; and • avoid, or where unavoidable, minimises the clearing of native vegetation	A2.1a Siting and Design Every habitable building achieves radiant heat impact not exceeding 29 kW/m² (BAL-29). A2.1b Siting in an area with a radiant heat impact exceeding 29 kW/m2 (BAL-40 or BAL-FZ) The siting of a commercial or industrial habitable building, with a radiant heat impact exceeding 29 kW/m2 (BAL-40 or BAL-FZ) should only be considered where: • the lot was created prior to December 2015; and • there are demonstrated site characteristics and/or biodiversity or conservation values that prevent the achievement of a radiant heat impact not exceeding 29 kW/m2 (BAL-29); and • it is demonstrated that the reduction of the building footprint or a redesign to manage or mitigate the risk, is not practical or appropriate. If the provision of an APZ in accordance with Acceptable Solution A2.2 cannot be achieved, then the vegetation immediately surrounding the building is to be managed as defendable space in accordance with Appendix B.2, Table 9 – APZ technical requirements.	**Acceptable Solution**	A2.1a Siting and Design The BAL contour plan (see Figure 3-2) assumes that the entire project area (Plot 12) and the existing non-vegetated and low threat vegetation adjacent to the project area on the north and west interfaces (Plot 11), are to be maintained as non-vegetated land or low threat vegetation by the Proponent, in perpetuity (or for the life of the project). Upon completion of development, and the vegetation management works including implementation of all nominated NVZ/APZs: • The proposed O&M building will be sited in BAL-29 or less. • The proposed NSP building will be sited in BAL-29 or less. • The proposed switchroom/control room building will be sited in BAL-29 or less. • While the following are not buildings, it is noted that the: o Firewater tanks will be sited in BAL-29 or less o Substation will be sited in BAL-29 or less o BESS containers will be sited in BAL-12.5 or less o All other renewable energy infrastructure is sited in BAL-29 or lower. All proposed buildings (and the associated firewater tank) will be sited in BAL-29 or lower, and on this basis, compliance with A2.1a is achieved. Should any habitable building be required other than that nominated above, the required separation shall be assessed by an accredited bushfire practitioner. A2.1b Siting in an area with a radiant heat impact exceeding 29 kW/m2 (BAL-40 or BAL-FZ) Not applicable as all proposed buildings will be sited in BAL-29 or lower.
	A2.2 Asset Protection Zone (APZ) Where a habitable building cannot be wholly within an area with a radiant heat impact not exceeding 29 kW/m² (BAL-29) in its predevelopment state, an APZ is to be provided and meet the following requirements: ***Width:*** the APZ is to be measured from the development site, and of sufficient size to ensure the radiant heat impact of a bushfire does not exceed 29 kW/m²	**Acceptable Solution**	The entire project area (Plot 12) and the existing non-vegetated and low threat vegetation adjacent to the project area on the north and west interfaces (Plot 11), are to be maintained as non-vegetated land or low threat vegetation by the Proponent, in perpetuity (or for the life of the project). In order to manage the bushfire risk to the development, additional guidance is provided to ensure sufficient separation is to be provided between proposed buildings and infrastructure, and unmanaged vegetation, including the following

Bushfire protection criteria		Development response	
Outcomes	Acceptable Solutions	Method of compliance	Proposed bushfire management measures
	(BAL-29) to any part of the building, in all circumstances. ***Location:*** the APZ is to be contained solely within the boundaries of the lot, except in instances where: • the vegetation on the adjoining lot(s) is, and will continue to be, low threat as per Clause 2.2.3.2 of AS 3959 or the requirements of Appendix B.2, Table 9 – APZ technical requirements, or an alternative standard in a gazetted local planning scheme, on an ongoing basis in perpetuity; or • the adjoining land is and will remain in perpetuity, non-vegetated ***Management:*** the APZ is managed in accordance with the requirements of Appendix B.2, Table 9 – APZ technical requirements, or an alternative standard in a gazetted local planning scheme.		requirements: • The O&M building is to have a 10 m wide NVZ/APZ to achieve BAL-29 or lower, and provide separation from firewater tanks and renewable energy infrastructure. o No firewater tanks or BESS or PCS units are permitted in the 10 m NVZ/APZ • The switchroom/control room and NSP building associated with the substation, will have a compliant 8 m wide APZ to achieve BAL-29 or lower on these buildings. • The firewater tank/s will have a 10 m wide NVZ/APZ to achieve BAL-29 or lower, and provide separation from buildings and renewable energy infrastructure. o No buildings or BESS or PCS units are permitted in the 10 m NVZ/APZ Where stipulated, the NVZ/APZ must be non-vegetated, however outside this they can be either non-vegetated or managed low threat landscaping established in accordance with the APZ standards from the WA Guidelines (see Appendix B) and AS 3959 Clause 2.2.3.2 (e) and (f) (see Appendix C), however would preferably by non-vegetated where possible across the entirety of Plots 11 and 12. All onsite vegetation modification and management (including NVZ/APZ) is to be conducted and maintained by the Proponent in perpetuity (or for the life of the facility). In addition to the requirements above for habitable buildings proposed as part of this development, the BRMP that accompanies this BMP also nominates additional vegetation modification and management requirements for the renewable energy infrastructure, which are summarised in Section 5.1.2.
	A2.3 Clearing of native vegetation The development avoids, or where unavoidable, minimises the clearing of native vegetation.	**Acceptable Solution**	The target BAL rating for proposed buildings is limited to BAL-29, which limits any vegetation modification and management required for bushfire risk management purposes. Additionally, as the subject site is already cleared of vegetation and the balance of Lot 100 to the east is almost all grassland, there not be any clearing of native vegetation required to implement the proposed development, and any vegetation management is to be restricted to regular slashing of grass or prevention of regrowth.
	A2.4 Storage of hazardous, flammable and/or combustible materials Where a proposed land use will include the storage of hazardous, flammable and/or combustible materials as part of its ongoing day to day operations, the materials are to be stored in an area that: • is subject to a radiant heat impact not exceeding 29 kW/m^2 (BAL-29); • is non-combustible and shields the materials to reduce their exposure to radiant heat from the bushfire to levels significantly lower than 29 kW/m^2 and prevents the entry of debris and embers; and • limits to the degree necessary and practical, the escape of sources of ignition from the stored materials into bushfire prone vegetation.	**Acceptable Solution**	The proposed BESS units will contain Li-ion batteries (or similar) that will be classified as Dangerous Goods. The project BRMP that accompanies this BMP to demonstrate the renewable energy infrastructure bushfire risk management measures comply with that of the CFA Guidelines, including reviewing and assessing the potential risk to and from the BESS units. Based on this, the BESS units are required to be sited in BAL-12.5 or lower, and 17 m wide NVZ/APZ has been nominated around both BESS cells, with all land within the cells to be non-vegetated. Additionally, the BESS containers are to be non-combustible material and ember protection is to be provided to prevent ember ingress penetrating in battery containers/enclosures and thermal management systems (see Section 5.4.1). The BESS units, and any other significant quantities of Dangerous Goods onsite (if any), will need to comply with all relevant Dangerous Goods legislation, codes and standards. Should significant quantities of dangerous goods (other than the BESS batteries) be stored or handled onsite, these should be reviewed by a BPAD Level 3 bushfire practitioner to ensure they are sited in areas of BAL-29 or lower, and appropriately protected from bushfire impact.

Bushfire protection criteria		Development response	
Outcomes	Acceptable Solutions	Method of compliance	Proposed bushfire management measures
Element 3: Vehicular access			
Outcome O3 Ensure the design and capacity of vehicular access and egress provide: • for efficient and effective evacuation to a suitable destination(s) and/or • as a contingency measure for vulnerable land uses, an on-site shelter, where demonstrated appropriate, as a last resort option.	A3.1 Private Driveway There are no private driveway technical requirements (prescribed by these Guidelines) where the private driveway is within a lot serviced by reticulated water and is no greater than 70 metres in length between the most distant external part of the habitable building and the public road. In circumstances where the above conditions are not met, the private driveway is to meet all of the following requirements: • requirements in Appendix B.3 Table 10, Column 5; and • passing bays every 200 metres with a minimum length of 20 metres and a minimum additional carriageway width of 2 metres (i.e. the combined carriageway width of the passing bay and constructed private driveway to be a minimum 6 metres); and • turn-around area (Figure 30) and within 30 metres of the habitable building (Figure 38).	**Acceptable Solution**	As detailed in Section 5.2.1, the internal road accessing the proposed buildings is to comply with the requirements of A3.1, including the following: • Comply with the requirements in Appendix B.3 Table 10, Column 5 (see Appendix D) o While the preference is that internal roads are at least 6 m wide, where >4 m wide but <6m wide, passing bays are to be provided every 200 m that are 6m wide x 20m long. • Provide compliant turnarounds (see Appendix D or loop roads within 30 m of each proposed building • Provide access to within 4 m of the firewater tanks (or tank suction connection) in accordance with A4.1, to enable attending fire appliances to refill, and provide hardstand adjacent to tank suction connection and sufficient locations for fire appliance turnaround. • Any gates, including those at site entrances, are to be double gates with clear opening of no less than 6 m. o If any site entrances are to be locked, keys are to be provided to DFES/local fire brigades prior to operation. Then proposed development currently provides three vehicular access entrances to the facility from Trandos Road, with the internal roads configured as an perimeter loop road network with several interconnecting roads also provided. The internal road network passes within 30 m of all proposed buildings, and is at least 6 m wide other than a 100 m section of road within the BESS area that is 4 m wide. All access gates are to open at least 6 m wide. The Proponent is responsible for the construction and ongoing management of internal roads and vehicular access gates. In addition to the requirements above for access to the building envelope, the project BRMP that accompanies this BMP also nominates additional internal vehicular access arrangement for the renewable energy infrastructure, which are summarised in Section 5.2.2.
Element 4: Water			
Outcome O4 Ensure that sufficient water is available to enable people, property and infrastructure to be defended from bushfire.	A4.1 Water Supply Where a reticulated water supply is existing or proposed, a hydrant connection(s) should be provided in accordance with the specifications of the relevant water supply authority. Where these specifications cannot be met, a water tank(s) should be provided in accordance with the requirements of Appendix A.4, Table 11 – Water supply dedicated for bushfire firefighting.	**Acceptable Solution**	Given there is no nearby reticulated town main water supply or street hydrants, the bushfire fighting water supply for the proposed buildings will need to be from static firewater tank/s as follows (see Section 5.3.1): • That have no less than 10 kL per building in accordance with the WA Guidelines (nominally 30 kL in total based on O&M building, switchroom/control room and NSP building) o This firewater requirements for the proposed buildings, can either be stored in a separate firewater tank, or combined with (i.e. added to) the firewater tank/s required for the renewable energy infrastructure (see Section 5.3.2). • Comply with the relevant technical requirements from the WA Guidelines (see Appendix E) and the following requirements from the CFA Design Guidelines: o Must be an above-ground water tank constructed of concrete or steel and must

Bushfire protection criteria		Development response	
Outcomes	Acceptable Solutions	Method of compliance	Proposed bushfire management measures
			comply with AS 2419.1 and signage indicating 'FIRE WATER' (or similar approved) and the tank capacity must be fixed to each tank. o The static water storage tanks must be located at vehicle access points to the facility and must be positioned at least ten (10) metres from any infrastructure (e.g. BESS etc.). o The hard-suction point must be positioned within 4 m to a hardstand area, and protected from mechanical damage where necessary, and provide a clear access for emergency services personnel. The firewater tank is to be sited within the subject site in an area of BAL-29 or lower. The firewater tank is to be installed, filled and maintained for the life of the project by the Proponent. In addition to the requirements above for firewater to the building envelope, the project BRMP that accompanies this BMP also nominates additional firewater tanks around the project area for the renewable energy infrastructure, which are summarised in Section 5.3.2.

7 Responsibilities for implementation and management of the bushfire measures

Implementation of the BMP and BRMP applies to the Proponent to ensure bushfire management measures are adopted and implemented on an ongoing basis. A bushfire responsibilities table is provided in Table 6 to drive implementation of all bushfire management works associated with this project.

Table 6: Responsibilities for implementation and management of the bushfire measures

Implementation/management table	
No	***Implementation action***
Proponent (Buildings) - prior to building occupation	
1	Establish non-vegetated and low threat vegetation across Plots 11 and 12, and additional requirements of NVZ/APZ around proposed buildings and firewater tanks, in accordance with the dimensions and standards detailed in Section 5.1 of the BMP.
2	Construct the internal driveway from the site entrance to proposed buildings and firewater tank/s, in accordance with the dimensions and standards detailed in Section 5.2.1 of the BMP. Construct the site entrance gates to the standards stated in the BMP, and ensure keys to any locked gates are provided to all relevant staff and onsite personnel, as well as being made available to DFES and local fire brigade.
3	Install the static firewater tank for the buildings in accordance with the requirements detailed in Section 5.3.1 and relevant Australian Standards. Alternatively, this bushfire fighting water supply could be added to the firewater tanks for the renewable energy infrastructure as detailed in Section 5.3.2.
4	Should any significant quantity of Dangerous Goods be proposed as part of development (other than proposed BESS batteries), comply with all relevant Dangerous Goods legislation, codes and relevant Australian Standards, as detailed in Section 5.9 of the BMP.
5	If required by the City or Building Certifier, undertake individual BAL assessments prior to issuing of building permits.
6	Comply with the City of Wanneroo firebreak notice as it applies to the BESS facility, as detailed in Section 5.12 of the BMP. Seek any necessary firebreak notice variations, if required.
Proponent (Renewable Energy Infrastructure) - prior to commissioning and facility occupation	
1	Establish non-vegetated and low threat vegetation across Plots 11 and 12, and additional requirements of NVZ/APZ around proposed renewable energy infrastructure, in accordance with the dimensions and standards detailed in Section 5.1 of the BMP.
2	Construct the internal driveway network to the renewable energy infrastructure (BESS, skids, substation), in accordance with the dimensions and standards detailed in Section 5.2.2 of the BMP. Construct the site entrance gates to the standards stated in the BMP, and ensure keys to any locked gates are provided to all relevant staff and onsite personnel, as well as being made available to DFES and local fire brigade.
3	Install the firewater system for the renewable energy infrastructure in accordance with the requirements detailed in Section 5.3.2 of the BMP and relevant Australian Standards.
4	Incorporate all the renewable energy infrastructure design, construction, installation and commissioning requirements detailed in Section 5.4 of the BMP for the facility.
5	Ensure any facility operation, maintenance and housekeeping requirements are in place prior to operation, as detailed in Section 5.5 of the BMP.

Implementation/management table	
No	***Implementation action***
6	Prepare and install the Emergency Information Book and signage in accordance with the requirements of Section 5.6 of the BMP.
7	Conduct the emergency services familiarisation site visit, in accordance with the requirements of Section 0 of the BMP.
8	Develop and implement the site emergency management plan, incorporating the recommended procedures for bushfire and onsite fire, detailed in Section 5.8 of the BMP
9	Comply with the City of Wanneroo firebreak notice as it applies to the BESS facility, as detailed in Section 5.12 of the BMP.
Proponent (Buildings)– ongoing (for life of project)	
1	Maintain non-vegetated and low threat vegetation across Plots 11 and 12, and additional requirements of NVZ/APZ around proposed buildings and firewater tanks, in accordance with the dimensions and standards detailed in Section 5.1 of the BMP.
2	Maintain the internal driveway from the site entrance to proposed buildings and firewater tank/s, in accordance with the dimensions and standards detailed in Section 5.2.1 of the BMP.
3	Install the firewater tank for the buildings in accordance with the requirements detailed in Section 5.3.1 and relevant Australian Standards. Ensure the firewater tank remains filled at all times, especially during bushfire season.
4	Review whether there are any introduced Dangerous Goods to the facility, and comply with all relevant Dangerous Goods legislation, codes and relevant Australian Standards, and the additional requirements detailed in Section 5.9 of the BMP.
5	Comply with the City of Wanneroo firebreak notice as it applies to the BESS facility, as detailed in Section 5.12 of the BMP.
Proponent (Renewable Energy Infrastructure)– ongoing (for life of project)	
1	Maintain non-vegetated and low threat vegetation across Plots 11 and 12, and additional requirements of NVZ/APZ around proposed renewable energy infrastructure, in accordance with the dimensions and standards detailed in Section 5.1 of the BMP.
2	Maintain the internal driveway network to the renewable energy infrastructure (BESS, skids, substation), in accordance with the dimensions and standards detailed in Section 5.2.2 of the BMP..
3	Maintain the firewater system for the renewable energy infrastructure in accordance with the requirements detailed in Section 5.3.2 of the BMP and relevant Australian Standards. Ensure the firewater tanks remains filled at all times, especially during bushfire season.
4	Maintain any relevant renewable energy infrastructure requirements detailed in Section 5.4 of the BMP for the facility.
5	Ensure ongoing compliance with operation, maintenance and housekeeping requirements, as detailed in Section 5.5 of the BMP.
6	Review, and if required update, the Emergency Information Book and signage in accordance with the requirements of Section 5.6 of the BMP.
7	Continue the emergency services familiarisation visits, in accordance with the requirements of Section 0 of the BMP.
8	Review, and if required updated, the site emergency management plan, incorporating the recommended procedures for bushfire and onsite fire, detailed in Section 5.8 of the BMP

Implementation/management table	
No	***Implementation action***
9	Conduct ongoing review of the project Bushfire Risk Management Plan (BRMP), to ensure it still accurately reflects the risks posed by the development.
10	Comply with the City of Wanneroo firebreak notice as it applies to the BESS facility, as detailed in Section 5.12 of the BMP.

8 References

Department of Fire and Emergency Services (DFES) 2024, *Map of Bush Fire Prone Areas*, [Online], Government of Western Australia, available from: https://maps.slip.wa.gov.au/landgate/bushfireprone/,

Department of Planning (DoP) 2016, *Visual guide for bushfire risk assessment in Western Australia*, Department of Planning, Perth.

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Western Australian Planning Commission (WAPC) 2024, *State Planning Policy 3.7: Bushfire*, November 2024, Western Australian Planning Commission, Perth.

Western Australian Planning Commission (WAPC) 2024, *Planning for Bushfire Guidelines*, November 2024, Western Australian Planning Commission, Perth.

Appendix A

Vegetation plot photos and description

Photo ID: 1a

Photo ID: 1b

Photo ID: 1c

Photo ID: 1d

Photo ID: 1e

Photo ID: 1f

Photo ID: 1g

Photo ID: 1h

Plot number	Plot 1
Vegetation classification	Class G Grassland
Description / justification	Grassland greater than 100 mm in height

Photo ID: 1i

Photo ID: 1j

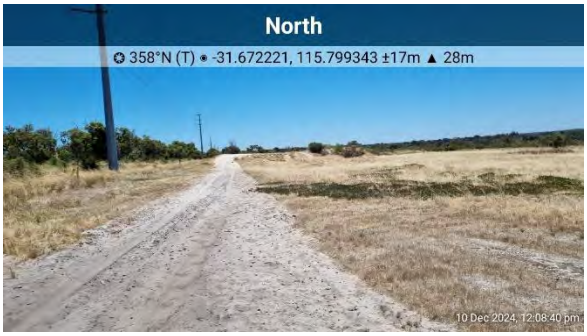

Photo ID: 1k

Photo ID: 1l

Photo ID: 1m

Photo ID: 1n

Photo ID: 1o

Photo ID: 1p

Plot number	Plot 1
Vegetation classification	Class G Grassland
Description / justification	Grassland greater than 100 mm in height

Photo ID: 1q

Photo ID: 1r

Photo ID: 1s

Photo ID: 1t

Plot number	Plot 1
Vegetation classification	Class G Grassland
Description / justification	Grassland greater than 100 mm in height

Photo ID: 2a

Photo ID: 2b

Photo ID: 2c

Photo ID: 2d

Photo ID: 2e

Plot number	Plot 2
Vegetation classification	Class G Grassland
Description / justification	Grassland greater than 100 mm in height

Photo ID: 3a

Photo ID: 3b

Plot number	Plot 3
Vegetation classification	Class G Grassland
Description / justification	Grassland greater than 100 mm in height

Photo ID: 4a

Plot number	Plot 4
Vegetation classification	Class C Shrubland
Description / justification	Shrub vegetation less than 2 m high at maturity

Photo ID: 5a

Photo ID: 5b

Photo ID: 5c

Photo ID: 5d

Plot number	Plot 5
Vegetation classification	Class D Scrub
Description / justification	Vegetation with a continuous horizontal and vertical structure, greater than 2 m high at maturity

Photo ID: 6a

Plot number	Plot 6
Vegetation classification	Class B Woodland
Description / justification	Trees 2-30 m at maturity, dominated by trees with a grassy understorey (lacks shrubby middle layer and deep surface litter)

Photo ID: 7a

Photo ID: 7b

Photo ID: 7c

Photo ID: 7d

Plot number	Plot 7
Vegetation classification	Class B Woodland
Description / justification	Trees 2-30 m at maturity, dominated by trees with a grassy understorey (lacks shrubby middle layer and deep surface litter)

Photo ID: 8a

Photo ID: 8b

Photo ID: 8c

Photo ID: 8d

Photo ID: 8e

Photo ID: 8f

Photo ID: 8g

Photo ID: 8h

Plot number	Plot 8
Vegetation classification	Class A Forest
Description / justification	Trees 10-30 m high at maturity, dominated by Eucalypts, multi-tiered structure comprising tall canopy layer, shrubby middle layer and grass/herb/sedge understorey

Photo ID: 9a

Plot number	Plot 9
Vegetation classification	Class A Forest
Description / justification	Trees 10-30 m high at maturity, dominated by Eucalypts, multi-tiered structure comprising tall canopy layer, shrubby middle layer and grass/herb/sedge understorey

Photo ID: 10a

Photo ID: 10b

Plot number	Plot 10
Vegetation classification	Excluded – Clause 2.2.3.2 [a]
Description / justification	Unmanaged vegetation plots >100 m from subject site.

Photo ID: 11a

Photo ID: 11b

Photo ID: 11c

Plot number	Plot 11
Vegetation classification	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])
Description / justification	Existing non-vegetated land and low threat vegetation within Lot 100 outside and adjacent to subject site.

Photo ID: 12a

Photo ID: 12b

Photo ID: 12c

Photo ID: 12d

Photo ID: 12e

Plot number	Plot 12
Vegetation classification	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])
Description / justification	Existing non-vegetated land and low threat vegetation within subject site.

Photo ID: 13a

Photo ID: 13b

Plot number	Plot 13
Vegetation classification	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])
Description / justification	Existing non-vegetated land and low threat vegetation within Lot 100 adjacent to the power station.

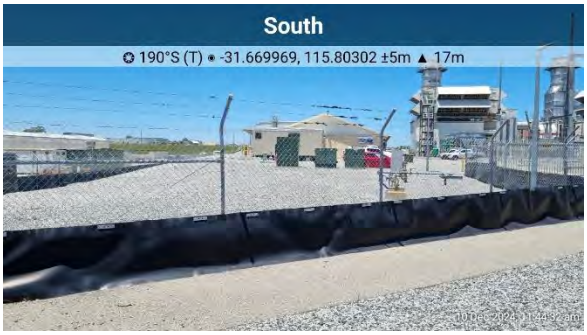

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Photo ID: 14b

Photo ID: 14c

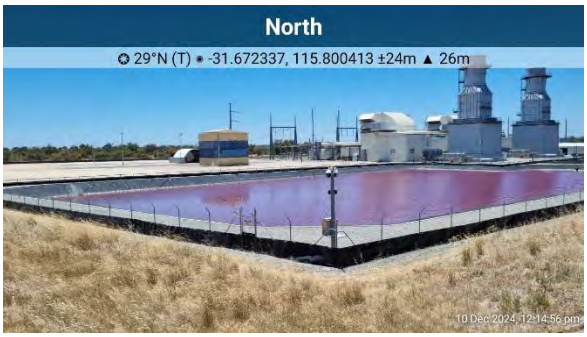


Photo ID: 14d

Photo ID: 14e

Photo ID: 14f

Plot number	Plot 14
Vegetation classification	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])
Description / justification	Existing non-vegetated land and low threat vegetation within the existing power station on Lot 100

Photo ID: 15a

Plot number	Plot 15
Vegetation classification	Excluded – Non-vegetated (Clause 2.2.3.2 [e])
Description / justification	Existing non-vegetated land within Lot 100

Photo ID: 17a

Photo ID: 17b

Photo ID: 17c

Photo ID: 17d

Photo ID: 17e

Plot number	Plot 17
Vegetation classification	Excluded – Non-vegetated and Low threat (Clause 2.2.3.2 [e] and [f])
Description / justification	Non-vegetated and low threat vegetation within Trandos Road reserve, where the verge appears to be well maintained.

Appendix B

APZ Standards from WA Guidelines

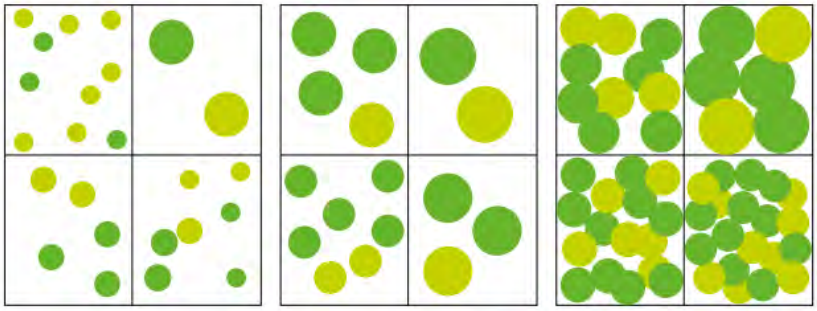
An APZ is a low fuel area maintained around a habitable building to increase the likelihood that it will survive a bushfire, by providing a defendable space and reducing the potential for direct flame contact, radiant heat exposure and ember attack. The APZ allows emergency services access and provides an area for firefighters and home-owners to defend their property.

An APZ should not be seen as an area entirely cleared of vegetation, but as a strategically designed space that considers how existing and future mature vegetation, and combustible and non-combustible features interact with and affect the building's resilience to bushfire.

Vegetation management within an APZ should provide defendable space and be maintained to a low threat state, in perpetuity, in accordance with the requirements outlined below.

Table 9: Asset Protection Zone Technical Requirements

- **Trees* (> 6 metres in height)**
  - Trunks at maturity should be a minimum distance of six metres from all elevations of the building.
  - Branches at maturity should not touch or overhang a building or powerline.
  - Lower branches and loose bark should be removed to a height of two metres above the ground and/or surface vegetation.
  - Canopy cover within the APZ should be <15 per cent of the total APZ area.
  - Tree canopies at maturity should be at least 5 metres apart to avoid forming a continuous canopy. Stands of existing mature trees with interlocking canopies may be treated as an individual canopy provided that the total canopy cover within the APZ will not exceed 15 per cent and are not connected to the tree canopy outside the APZ.



- **Shrub* and Scrub* (0.5 metres to 6 metres in height)**
  - Should not be located under trees or within three metres of buildings.
  - Should not be planted in clumps >5 square metres in area.
  - Clumps should be separated from each other and any exposed window or door by at least 10 metres.
  - Shrub and scrub >6 metres in height are to be treated as trees.
- **Ground covers (<0.5 metres in height)**
  - Can be planted under trees but must be maintained to remove dead plant material, as prescribed in 'Fine fuel load'.
  - Can be located within two metres of a structure, but three metres from windows or doors if >100 millimetres in height.
  - Ground covers >0.5 metres in height are to be treated as shrubs
- **Grass**
  - Grass should be maintained at a height of 100 millimetres or less, at all times.

Table 9: Asset Protection Zone Technical Requirements

- Wherever possible, perennial grasses should be used and well-hydrated with regular application of wetting agents and efficient irrigation.

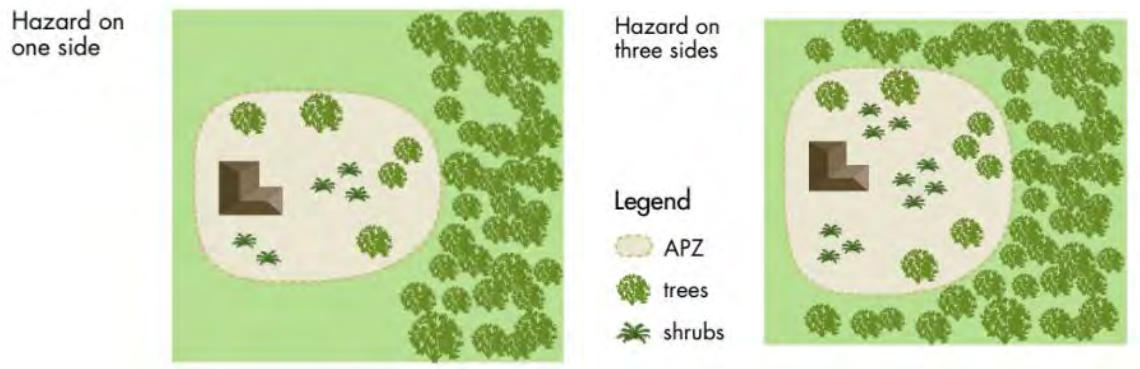
- **Fine Fuel load (combustible dead vegetation mater <6 mm in thickness)****
  - Should be managed and removed on a regular basis to be maintained as low threat vegetation.
  - Should be maintained at <2 tonnes per hectare (on average).
  - Mulches should be non-combustible such as stone, gravel, shells, rock or crushed mineral earth or wood mulch >5 millimetres in thickness.
- **Defendable Space**
  - Within three metres of each wall or supporting post of a habitable building, the area is kept free from vegetation, but can include ground covers, grass and non-combustible mulches as prescribed above.
- **Fences within the APZ**
  - Should be constructed from non-combustible materials (for example, iron, brick, limestone, metal post and wire, or bushfire-resisting timber referenced in Appendix F of AS 3959)
- **LPG Cylinders**
  - Should be located on the side of a building furthest from the likely direction of a bushfire or on the side of a building where surrounding classified vegetation is upslope, at least one metre from vulnerable parts of a building.
  - The pressure relief valve should point away from the house.
  - No flammable material within six metres from the front of the valve.
  - Must sit on a firm, level and non-combustible base and be secured to a solid structure.

** Plant flammability, landscaping design and maintenance should be considered – refer to explanatory notes*

*** Fine fuel load:*

- *is the combustible, dead or dry vegetation matter on the ground, near ground, or elevated. Fine fuel includes grass, leaves, bark and twigs less than six millimetres in diameter that ignite readily and are burnt rapidly when dry.*
- *Fine fuel should be maintained at less than 2t/ha (100gm/m2 equates to 1t/ha).*
  - *To estimate a fuel load (in t/ha), collect the dry fine fuel from a representative one square meter and weigh (in grams using kitchen scales) and multiply the weight by 0.01.*

Figure 25: Design of an Asset Protection Zone



B.2.2 Designing an Asset Protection Zone

An APZ should not be seen as an area entirely cleared of vegetation, but as a strategically designed space that considers how existing and future mature vegetation, and combustible and non-combustible features interact with and affect the building's resilience to bushfire.

An APZ should provide the greatest level of vegetation management within at least three metres of a habitable building, to ensure adequate unobstructed defendable space for emergency services to operate. This area should contain minimal vegetation and be free of combustible materials and obstructions. Within the remainder of the APZ, planting of vegetation can increase as you move farther away from the building.

The placement of plants within an APZ is a key design technique. Separation of garden beds with areas of low fuel or non-combustible material will break up fuel continuity and reduce the likelihood of vegetation within an APZ supporting a bushfire. It is important to consider the plant density and final structure and form of plants in their mature state.

Strategic landscaping measures can be applied, such as replacing weeds with low flammability vegetation to create horizontal and vertical separations between the retained vegetation.

Mulches used within the APZ should be non-combustible. The use of stone, gravel, shells, rock and crushed mineral earth is encouraged. Very fine or light mulch (such as shredded pine bark, pine needles, or poplar woodchips) less than five millimeters in diameter should be avoided. It is recommended that wood mulch is used in garden beds or areas where the moisture level is higher by regular irrigation, and these areas are separated with non-combustible elements, such as pathways and open spaces.

Incorporation of landscaping features, such as masonry feature walls, can provide habitable buildings with barriers to wind, radiant heat and embers. These features can include noise walls or wind breaks. Use of Appendix F of AS 3959 for bushfire resistant timber selection or the use of non-combustible fencing materials such as iron, brick, limestone, metal post and wire is encouraged within an APZ

B2.3 Management of an Asset Protection Zone

Ongoing maintenance of an APZ is usually enforced through a condition of a development approval, which should refer to Table 9 APZ technical requirements within this Appendix.

In addition to regular maintenance of an APZ, further bushfire protection can be provided by:

- ensuring gutters are free from vegetation
- installing gutter guards or plugs
- regular cleaning of underfloor spaces, or enclosing them to prevent gaps
- trimming and removing dead plants or leaf litter
- pruning climbing vegetation (such as vines) on a trellis, to ensure it does not connect to a building, particularly near windows and doors
- removing vegetation in close proximity to a water tank to ensure it is not touching the sides of a tank
- following the requirements of the relevant local government firebreak notice, which may include additional provisions such as locating wood piles more than 10 metres from a building.

Preparation of a property prior to the bushfire season and/or in anticipation of a bushfire is beneficial even if your plan is to evacuate. Embers can travel up to several kilometres from a bushfire and fall into small spaces and crevices or land against the external walls of a building.

Best practice recommends objects within the APZ are moved away from the building prior to any bushfire event.

Objects may include, but are not limited to:

- door mats
- outdoor furniture
- potted plants
- shade sails or umbrellas
- plastic garbage bins
- firewood stacks
- flammable sculptures
- playground equipment and children's toys.

B2.4 Plant Flammability

There are certain plant characteristics that are known to influence flammability, such as moisture or oil content and the presence and type of bark. Plants with lower flammability properties may still burn during a bushfire event, but may be more resistant to burning and some may regenerate faster post-bushfire.

There are many terms for plant flammability that should not be confused, including:

- **Fire resistant** – plant species that survive being burnt and will regrow after a bushfire and therefore may be highly flammable and inappropriate for a garden in areas of high bushfire risk.
- **Fire-retardant** – plants that can absorb more of the heat of the approaching bushfire without burning, compared to more flammable plants.
- **Fire wise** – plants that have been identified and selected based on their low flammability properties and linked to maintenance advice and planting location within a garden.

Although not a requirement of these Guidelines, local governments may develop their own list of fire wise or fire-retardant plant species that suit the environmental characteristics of an area.

When developing a recommended plant species list, local governments should consult with ecologists, land care officers or environmental authorities to ensure the plants do not present a risk to endangered ecological communities, threatened, or endangered species or their habitat.

When selecting plants, private landholders and developers should aim for plants within the APZ that have the following characteristics:

- grow in a predicted structure, shape and height;
- are open and loose branching with leaves that are thinly spread;
- have a coarse texture and low surface-area-to-volume ratio;
- will not drop large amounts of leaves or limbs, that require regular maintenance;
- have wide, flat, and thick or succulent leaves;
- trees that have bark attached tightly to their trunk or have smooth bark;

- have low amounts of oils, waxes, and resins (which will often have a strong scent when crushed);
- do not produce or hold large amounts of fine dead material in their crowns; and/or
- will not become a weed in the area.

Appendix C

AS 3959 Clause 2.2.3.2 (e) and (f) – Low threat Vegetation and Non-Vegetated Areas

2.2.3.2 *Exclusions—Low threat vegetation and non-vegetated areas*

The following vegetation shall be excluded from a BAL assessment:

(a) Vegetation of any type that is more than 100 m from the site.

(b) Single areas of vegetation less than 1 ha in area and not within 100 m of other areas of vegetation being classified vegetation.

(c) Multiple areas of vegetation less than 0.25 ha in area and not within 20 m of the site, or each other or of other areas of vegetation being classified vegetation.

(d) Strips of vegetation less than 20 m in width (measured perpendicular to the elevation exposed to the strip of vegetation) regardless of length and not within 20 m of the site or each other, or other areas of vegetation being classified vegetation.

(e) Non-vegetated areas, that is, areas permanently cleared of vegetation, including waterways, exposed beaches, roads, footpaths, buildings and rocky outcrops.

(f) Vegetation regarded as low threat due to factors such as flammability, moisture content or fuel load. This includes grassland managed in a minimal fuel condition, mangroves and other saline wetlands, maintained lawns, golf courses (such as playing areas and fairways), maintained public reserves and parklands, sporting fields, vineyards, orchards, banana plantations, market gardens (and other non-curing crops), cultivated gardens, commercial nurseries, nature strips and windbreaks.

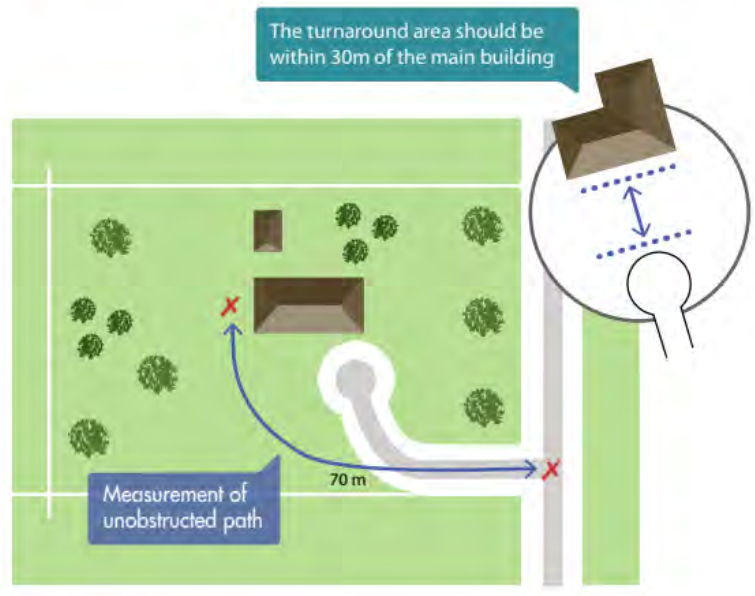
NOTES:

1 Minimal fuel condition means there is insufficient fuel available to significantly increase the severity of the bushfire attack (recognizable as short-cropped grass for example, to a nominal height of 100 mm).

2 A windbreak is considered a single row of trees used as a screen or to reduce the effect of wind on the leeward side of the trees.

Appendix D

Vehicular Access Technical Standards of the WA Guidelines

Private driveways
Acceptable Solution A3.1
There are no private driveway technical requirements (prescribed by these Guidelines) where the private driveway is within a lot serviced by reticulated water and is no greater than 70 metres in length between the most distant external part of the habitable building and the public road. In circumstances where the above conditions are not met, the private driveway is to meet all of the following requirements: • requirements in Appendix B.3 Table 10, Column 5; and • passing bays every 200 metres with a minimum length of 20 metres and a minimum additional carriageway width of 2 metres • (i.e. the combined carriageway width of the passing bay and constructed private driveway to be a minimum 6 metres); and • turn-around area (Figure 30) and within 30 metres of the habitable building (Figure 38).
Explanatory note B3.8
Emergency services vehicles typically operate from the street frontage in areas serviced by reticulated water and where the distance from the public road to the farthest part of the habitable building is no greater than 70 metres. In the event the habitable building cannot be reached by hose reel from the public road, emergency services vehicles will need to gain access via the driveway to the property. Emergency services vehicles will also need to gain access to the property where access to water is provided by onsite water tanks. In these situations, the driveway and battle-axe access leg (if applicable) will need to be wide enough for access by an emergency services vehicle and a vehicle to evacuate. It is acceptable for a private driveway to have a carriageway width of four metres with a traversable verge of one metre on either side of the carriageway. Turn-around areas (**Figure 38**) should be available for conventional two-wheel drive vehicles and type 3.4 fire appliances and should be located within 30 metres of habitable buildings. Circular and loop driveway design may also be considered. Figure 38: Design requirements for a private driveway where required 

Private driveways

Figure 30: Design requirements for a turn-around area

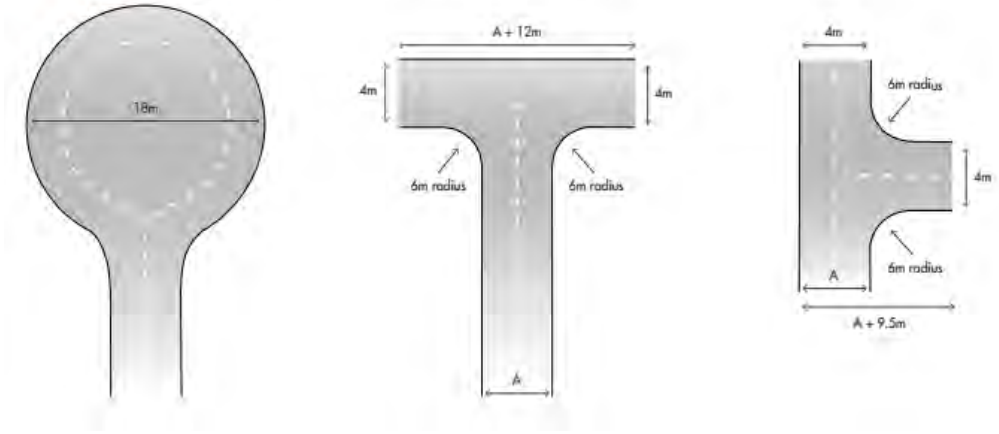


Table 10: Vehicular access technical requirements

	1		2		3		4		5	
TECHNICAL REQUIREMENTS	**PERIMETER ROADS**		**PUBLIC ROADS**		**EMERGENCY ACCESS WAY[3]**		**FIRE SERVICE ACCESS ROUTE[3]**		**BATTLE-AXE & PRIVATE DRIVEWAYS[1]**	
MAP OF BUSH FIRE PRONE AREAS DESIGNATION	**Area 2**	**Area 1**	**Area 2**	**Area 1**	**Area 2**	**Area 1**	**Area 2**	**Area 1**	**Area 2**	**Area 1**
Minimum horizontal clearance (metres)	12	8	See note 5		10	6	10	6	6	
Minimum vertical clearance (metres)	4.5									
Minimum weight capacity (tonnes)	15									
Maximum grade unsealed road[2]	See note 5		See note 5		1:10 (10% or 6°)					
Maximum grade sealed road[2,4]					1:7 (14.3% or 8°)					
Maximum average grade sealed road					1:10 (10% or 6°)					
Minimum inner radius of road curves (metres)					8.5					

Notes:

[1] Driveways and battle-axe legs to comply with the Residential Design Codes and Development Control Policy 2.2 Residential Subdivision where not required to comply with the widths in this Appendix or the Guidelines.

[2] Dips must have no more than a 1 in 8 (12.5% - 7.1 degrees) entry and exit angle.

[3] To have crossfalls between 3 per cent and 6 per cent.

[4] For sealed roads only the maximum grade of no more than 1 in 5 (20 per cent) (11.3 degrees) for no more than 50 metres is permissible, except for short constrictions to 3.5 metres for no more than 30 metres in length where an obstruction cannot be reasonably avoided or removed.

[5] As outlined in the Institute of Public Works Engineering Australasia (IPWEA) subdivision guidelines, Liveable Neighbourhoods, Austroads Standards Main Roads standard, supplement, policy or guideline and/or any applicable or relevant local government standard or policy.

Appendix E

Water Technical Standards of the WA Guidelines

Appendix B.4 – Water Supply

B4.1 Construction and Design Technical requirements

- An above-ground tank and associated stand should be constructed of non-combustible material.
- Below-ground tanks should have a 200 millimetres diameter access hole to allow tankers or emergency services vehicles to refill direct from the tank, with the outlet location clearly marked on the surface.
- Above and below ground tanks may need to comply with AS/NZS 3500.1:2018.
- An inspection opening may double as the access hole provided that the inspection opening meets the requirements of AS/NZS 3500.1:2018.
- Where an outlet for an emergency services vehicle is provided, then an unobstructed, hardened ground surface is to be supplied within four metres of any water supply.

B4.1.1 Pipes and Fittings

- All above-ground, exposed water supply pipes and fittings should be metal.
- Fittings should be located away from the source of bushfire hazard and be in accordance with the applicable section below, unless otherwise specified by the local government.

B4.1.2 Fittings for above-ground water tanks

- Commercial land uses: 125mm Storz fitting; or
- Strategic water tanks: 50mm or 100mm (where applicable and adapters are available) male camlock coupling with full flow valve; or
- Standalone water tanks: 50mm male camlock coupling with full flow valve; or
- Combined water tanks: 50mm male camlock coupling with full flow valve or a domestic fitting, being a standard household tap that enables an occupant to access the water supply with domestic hoses or buckets for extinguishing minor fires.

B4.1.3 Remote outlets

- In certain circumstances, it may be beneficial to have the outlet located away from the water supply. In instances in which a remote outlet is to be used, the applicant should consult the local government and DFES on their proposal.

B4.2 Use of Water Supply

- The combination of drinking water and water for firefighting purposes is not recommended, as stagnant water may alter the quality of the drinking water and the emergency services, by law, may not be able to take water from the water supply to suppress a bushfire.
- Combining drinking water and water for firefighting purposes is contrary to provisions within clause 4.2.3 of AS/ NZS 3500.1:2021

B4.3 Independent Water and Power Supply

- Water tank/s are to be provided in accordance with Table 11, Water supply dedicated for bushfire firefighting purposes.

B4.5 Location of Water Tanks and Hydrants

- Surrounding vegetation should be considered when locating a water tank.
- Avoid locations where the tank will be situated underneath existing vegetation or where vegetation will grow against or overhang the tank, (Figure 39). Where a tank is on the bushfire hazard side of a building, sufficient shielding for the protection of firefighters should be provided. In addition to the tank location, the fitting should be positioned and/or shielded from the bushfire hazard to allow access by emergency services.

Appendix B.4 – Water Supply

Figure 39: A good and bad example of landscaping around a water tank

Appendix F

City of Wanneroo Firebreak Notice

City of Wanneroo

IMPORTANT
Fire Mitigation Notice

Fire mitigation measures must be in place by 1 NOVEMBER and maintained until 30 APRIL EACH YEAR.

This is a requirement under the Bush Fires Act 1954 Section 33.

Failure to comply with this notice may incur penalties of up to $5,000 and the works required by this notice will be carried out at the expense of the owner/occupier.

Fire management requirements for land LESS than 4000sqm

- Maintain grasses and inflammable materials with the exception of living trees on the entire property to a height of no more than 50 millimetres. The entire property is required to be maintained below 50 millimetres from 1 November each year until 30 April the following year.

  OR

- A 3 metre wide trafficable firebreak as close as possible to all external boundaries of the property must be installed by 1 November each year and maintained until 30 April the following year.
  - If it is not possible to install the firebreak adjacent to the external boundary of the property due to naturally occurring obstacles, it is acceptable to install the firebreak around the obstacle. If this requires the firebreak to be greater than 5 metres away from the external boundary, a firebreak variation is required.
  - Ensure a minimum vertical clearance of 4 metres is maintained along the firebreaks to enable vehicles to drive along the firebreaks without access being obstructed.
- Where a property is affected by an approved bushfire management plan, property owners must still comply with all requirements in this notice and with any additional requirements outlined within that plan.
- Additional mitigation work may be required by a Fire Control Officer to maintain a 20 metre asset protection zone around buildings.

Fire management requirements for land GREATER than 4000sqm

- A 3 metre wide trafficable firebreak as close as possible to all external boundaries of the property must be installed by 1 November each year and maintained until 30 April the following year.
  - If it is not possible to install the firebreak adjacent to the external boundary of the property due to naturally occurring obstacles, it is acceptable to install the firebreak around the obstacle. If this requires the firebreak to be greater than 5 metres away from the external boundary, a firebreak variation is required.
  - Ensure a minimum vertical clearance of 4 metres is maintained along the firebreaks to enable vehicles to drive along the firebreaks without access being obstructed.
- Install and maintain a 20 metre bare earth area around all hay stacks and/or fuel storage.
- Where a property is affected by an approved bushfire management plan, property owners must still comply with all requirements in this notice and with any additional requirements outlined within that plan.
- Additional mitigation work may be required by a Fire Control Officer to maintain a 20 metre asset protection zone around buildings.

IMPORTANT Fire Mitigation Notice

City of Wanneroo

All vacant land GREATER than 4000sqm

- A 3 metre wide trafficable firebreak as close as possible to all external boundaries of the property must be installed by 1 November each year and maintained until 30 April the following year.
- Ensure a minimum vertical clearance of 4 metres is maintained along the firebreaks to ensure vehicles can drive along the firebreaks without being impeded by tree branches.
- For pastoral and grassed properties in rural and semi-rural areas, if the land is an area of 50,000sqm (5 hectares) or greater, the grass must be maintained on the land to a height of no greater than 50 millimetres for a distance of 10 metres from any firebreak.

Frequently asked questions

I live in a residential area, does this notice apply to me?

Yes. All City of Wanneroo property owners must comply with the Bush Fires Act 1954.

Please refer overleaf for fire management requirements to be in place by 1 November to ensure your property is compliant.

Most properties under 1000sqm will automatically comply if gardens are maintained.

How will inspections be carried out?

Inspections will be carried out by trained Fire Control Officers who are authorised to enter a property by foot, vehicle, quad bike and /or drone.

Do I need a Bushfire Survival Plan?

If you live in, on or near bushland, you are at risk from a bushfire and developing a bushfire survival plan is critical.

Visit the Department of Fire and Emergency Services website for information on how to develop a plan for your property **dfes.wa.gov.au**

I am concerned my neighbour's property is not compliant, what can I do?

All properties are required to be compliant by 1 November.

If you think your neighbour's property does not comply with the requirements as outlined in this notice, please contact the Community Safety and Emergency Management team on **9405 5000**.

I own a vacant lot, do I need a firebreak?

Yes. A 3 metre wide trafficable firebreak as close as possible to all external boundaries of the property must be installed by 1 November each year and maintained until 30 April the following year.

I am unable to meet the requirements outlined, what should I do?

If it is considered impracticable for any reason to implement any of the requirements of this notice, an application for a firebreak variation must be made to the City of Wanneroo by no later than 18 October of each year.

If permission is not granted, the requirements of this notice must be complied with.

Visit the City's website **wanneroo.wa.gov.au/firebreakvariation** to apply for a variation.

Where can I learn more about this notice and bushfire prevention?

Visit the City's website **wanneroo.wa.gov.au/fireandemergencymanagement** to learn more.

Please note, in addition to the requirements of this notice, if a City of Wanneroo Fire Control Officer considers further works are necessary to reduce the risk of bushfire, landowners will be notified via letter to the address shown on the City of Wanneroo rates record for the relevant land.

The City strongly recommends creating a 20 metre asset protection zone around buildings.

For further information call the City of Wanneroo Community Safety and Emergency Management Team on **9405 5000** or visit **wanneroo.wa.gov.au/fireandemergencymanagement**

TO REPORT ALL FIRES
CALL 000

000 EMERGENCY

Report

Bushfire Risk Management Plan (Renewable Energy)

LOCATION: SHELL ENERGY BATTERY ENERGY STORAGE SYSTEM

CLIENT: GHD PTY LTD

Project Ref 243929/ N25-0048 Issue A

14 March 2025

DOCUMENT ISSUE APPROVAL

Project Title:	Shell Energy BESS
Project Location:	Lot 100 (No.45) Trandos Road, Neerabup
Project Address:	Lot 100 (No.45) Trandos Road, Neerabup
Client:	GHD Pty Ltd
Project No:	243929
Report No:	N25-0048
Issue:	B
Date:	14 March 2025
Distribution:	Client
	Covey Associates

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Abbreviations Used in Report

Abbreviation	Full Meaning
AS3959	AS 3959:2018 – Construction of Buildings in bushfire-prone areas
BAL	Bushfire Attack Level
BMP	Bushfire Management Plan
BRMP	Bushfire Risk Management Plan
FFDI	Forest Fire Danger Index
NCC	National Construction Code (Building Code of Australia)
PCS	Power Conversion System
RHF	Radiant Heat Flux
SPP	State Planning Policy
WAPC	Western Australia Planning Commission

Supporting Documentation	
Document	**Prepared by**
Shell Energy BESS – General Arrangement	*GHD Pty Ltd*

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1 Introduction

1.1 Background

Shell Energy Operations Pty Ltd (Shell Energy; the Proponent) is seeking to lodge a development application for the new Battery Energy Storage System (BESS) development, on the vacant portion of Lot 100 (No. 45) Trados Road, Neerabup (the subject site) in the City of Wanneroo.

The proposed 142 MW BESS development is expected to include the following infrastructure:

- Operations and Maintenance (O&M) building
- Network Service Provider (NSP) Room
- Switchroom/Control Room
- Battery Energy Storage System (BESS) Containers
- Power Conversion System modules
- Auxiliary Skids (providing LV power to BESS)
- Emergency Generator
- Substation (with 330 kV transformer)
- Below ground cabling and cable pits
- Firewater tanks
- Below ground contaminated firewater storage tanks
- Onsite parking
- Internal roads
- Fencing and gates

A plan of the proposed development is provided in Figures 1-1 and 1-2 of the project Bushfire Management Plan (BMP) that accompanies this report.

Once operational, onsite visitation is expected to be as follows:

- Occupant numbers may be either 1-2 staff, 5 days a week (business hours), or the facility may be unmanned.
- There will be at least one on-call technician allocated to the facility for all other times it is not manned.

1.2 Relevant Legislation and Guidance

- State Planning Policy 3.7: Bushfire (SPP 3.7) and the WA Guidelines.
- WAPC Position Statement: Renewable energy facilities, 2020
- CFA Design Guidelines and Model Requirements: Renewable Energy Facilities v4, 2023
- Building Code of Australia / National Construction Codes (BCA/NCC)
- AS 3959 Construction of Buildings in Bushfire Prone Areas
- AS 3745-2010 Planning for Emergencies in Facilities
- Dangerous Goods Safety Act 2004
- Dangerous Goods Safety (Storage and Handling of Non-Explosives) Regulations 2007 (the Regulations)

- Australian Dangerous Goods Code (ADG Code) for transport by Road and Rail.

1.3 Regulatory Context

The project area is designated as bushfire prone on the *Map of Bush Fire Prone Areas* (DFES 2024), due to native vegetation located within 100 m of the site which triggers bushfire planning requirements under *State Planning Policy 3.7: Bushfire* (SPP 3.7; WAPC 2024) and the *Planning for Bushfire Guidelines* (the WA Guidelines; WAPC 2024) in accordance with the Planning and Development (Local Planning Schemes) Regulations 2015 (the Regulations).

A Bushfire Management Plan (BMP) has been prepared to accompany the development application (Covey 2025), as per SPP 3.7 Policy Measure 7(ii), given the proposed permanent buildings are sited in a designated bushfire prone area and would have a pre-development rating of BAL-40/FZ if ongoing vegetation management isn't undertaken. The BMP demonstrates how the proposed buildings comply with the bushfire protection criteria of the WA Guidelines.

Given the renewable energy infrastructure (e.g. BESS) are not considered "habitable buildings" as defined in WA Planning Regulations, compliance with SPP 3.7 and the WA Guidelines isn't triggered and the compliance pathway with respect to bushfire, is less defined. Current advice provided by DFES is that strict compliance is unlikely to be required or achieved with SPP 3.7 and the Guidelines, however application of the CFA *Design Guidelines for Renewable Energy Facilities v4* (CFA; 2023; CFA Design Guidelines) from Victoria fire brigade, is the best publication to demonstrate compliance with at this stage, albeit rationalised for WA context.

Under the *Dangerous Goods Safety (Storage and Handling of Non-Explosives) Regulations 2007*, the operator may also be required to complete a separate risk assessment that addresses risks other than bushfire for the proposed development and the associated Dangerous Goods, should the development trigger the need to do so.

Some high-level information from the following has been provided in the subsections below, regarding the following guidance documents with respect to renewable energy infrastructure bushfire risk management:

- CFA Design Guidelines for Renewable Energy Facilities
- WAPC Position Statement: Renewable Energy Facilities
- City of Wanneroo Firebreak Notice

1.3.1 CFA Design Guidelines for Renewable Energy Facilities

This guidance material developed by the CFA for renewable energy facilities, namely their publication *Design Guidelines and Model Requirements: Renewable Energy Facilities v4* (CFA 2023), requires that a Risk Management Plan is to be developed for renewable energy facilities which includes the following:

- Description of the risks and hazards at the facility to and from the facility and related infrastructure.
- Detail the following:
    - The location of the renewable energy infrastructure on-site and in the landscape.
    - Emergency vehicle access to and within the facility that:
        - Includes site access points of a number suitable to the size and hazard of the facility
        - Provides access to renewable energy infrastructure, substations and fire service infrastructure.

- Firefighting water supply for the facility.
- Asset Protection Zone/s of 10m or greater, based on radiant heat flux (output) as an ignition source:
  - Around the perimeter of the facility.
  - Between any landscape buffer/vegetation screening and renewable energy infrastructure.
- The separation distance, based on radiant heat flux (output) as an ignition source, between:
  - Renewable energy infrastructure, buildings/structures, and vegetation.
  - All other controls for the management of on and off-site hazards and risks at the facility (including all proposed safety and protective systems).

- Provide an evidence-based determination of the effectiveness of the risk controls against the identified hazards, including justification for the omission of any battery safety and protective system/s.
- Form the basis for the design of the facility

While the facility Risk Management Plan is to address both onsite fires within renewable energy infrastructure and bushfires, this BRMP provides this relevant information detailed above for the bushfire-related risk to (and from) the proposed development.

The CFA Guidelines is organised with a number of sections as follows, each section containing guidance and what it terms "Model Requirements" for all renewable energy facilities as well as specific measures for wind, solar, battery energy storage (BESS) and substation/electric line infrastructure:

- Fire Risk Management
- Facility Location
- Facility Design
- Facility Construction and Commissioning
- Facility Operation
- Emergency Planning

A summary of the CFA Guidelines sections (relevant to this project) is provided in the compliance assessment on Table 1 in Section 4.

1.3.2 WAPC Position Statement: Renewable Energy Facilities

WAPC have released a Position Statement on renewable energy facilities, in which they note the following with respect to bushfire risk management:

- Renewable energy facilities in Western Australia are principally wind turbine and solar array systems.
  - There is no specific mention of BESS facilities in this Position Statement.
- The objectives of this position statement include facilitate appropriate development of renewable energy facilities while minimising any potential impact upon the environment, natural landscape, and urban areas
- Wind turbines and solar arrays in bushfire prone areas should be designed and maintained so they are not a bushfire risk to surrounding bushland, and where possible should not be in bushfire prone areas with an 'extreme' bushfire hazard level or bushfire attack level (BAL) - 40 or BAL- Flame Zone.

- A minimum 10 metres clearance to combustible vegetation in the form of an Asset Protection Zone (APZ) is recommended.
    - The APZ should be managed in a low threat state, in accordance with the Guidelines.

This BRMP will aim to comply with the WAPC Position Statement as much as practical.

1.3.3 City of Wanneroo Firebreak Notice

The City issues a firebreak notice annually (see Appendix G in the project BMP), that include the following that may apply to this project:

- Fire management requirements for land greater than 4000sqm
    - A 3 m wide trafficable firebreak as close as possible to all external boundaries of the property.
        - If it is not possible to install the firebreak adjacent to the external boundary of the property due to naturally occurring obstacles, it is acceptable to install the firebreak around the obstacle.
        - If this requires the firebreak to be greater than 5 m away from the external boundary, a firebreak variation is required.
        - Ensure a minimum vertical clearance of 4 m is maintained along the firebreaks to enable vehicles to drive along the firebreaks without access being obstructed.
    - Install and maintain a 20 m bare earth area around all hay stacks and/or fuel storage.
    - Where a property is affected by an approved bushfire management plan, property owners must still comply with all requirements in this notice and with any additional requirements outlined within that plan.
    - Mitigation measures detailed in the firebreak notice must be in place from 1 November to 30 April each year

1.4 Purpose

Based on the information above, the purpose of this BRMP is to assesses the proposed renewable infrastructure against the relevant Model Requirements of the CFA Design Guidelines, to demonstrate the bushfire risk associated with this infrastructure has been appropriately managed. This differs to the purpose of the project BMP which is to demonstrates compliance for habitable buildings against SPP 3.7 and the WA Guidelines, however the bushfire risk management measures derived from the CFA Design Guidelines, have been incorporated into the BMP, for ease of implementation and ongoing maintenance.

The focus of this BRMP is to apply and demonstrate compliance of the proposed renewable energy infrastructure with the Model Requirements of the CFA Guidelines, with summary of the derived bushfire management measures included in the project BMP, to provide a complete summary of the Proponents bushfire risk management obligations for this project.

2 Renewable Energy Assets and Hazard Analysis

2.1 Onsite Renewable Energy Assets

The proposed development is expected to include the following onsite renewable energy infrastructure:

- Battery Energy Storage System (BESS) Containers (see Section 2.1.1 below)
- Ancillary BESS infrastructure:
    - Power Conversion System (PCS) modules
    - Auxiliary Skids
    - Emergency Generator
- Substation
    - Oil-insulated type distribution transformer (330 kV / 33 kV)
    - To be designed and constructed to relevant Australian Standards and Western Power specifications.

2.1.1 Additional BESS Information

The make/model of BESS and electrical infrastructure is still under review by the Proponent and is yet to be finalised, however the following information has been provided regarding the anticipated BESS:

- Grid-scale, industrial strength energy storage system including:
    - Housed in purpose-made steel container with various compartments (see Plate 2) including:
        - Battery compartment (containing Li-ion batteries),
        - Thermal management compartment (chiller) and
        - Electronics compartment (battery management system, associated power and electronic infrastructure)
    - Internal fire/thermal compartment barriers (internal fire rated walls), in particular separating the battery compartment from all adjacent compartments.
    - Thermal management system consisting of a chiller unit (fire separated from battery compartment)
    - Battery management system to monitor and manage battery functionality, and provide early warning of faults especially thermal runaway.
    - Internal fire and gas monitoring/detection system, connected to the plant wide control system, providing early warning of internal fire or gas accumulation.
    - Internal fire suppression system/s including aerosol suppression system within the containers, with potential internal fire sprinkler system being reviewed.
    - Ventilation system including venting panels or explosion proof fan system with low-level inlet and high-level outlet/exhaust
- Certified under UL9540A
- Will contain new rechargeable lithium-ion batteries (UN3480/ UN3481)
    - Class 9 Miscellaneous Dangerous Goods
    - HAZCHEM 4W

- Will be sited solely in the nominated BESS areas

Plate 1: Indicative BESS compartmentation

2.2 Site Description

A detailed description of the subject site is provided in Section 1.2.1 of the project BMP, which is reproduced below:

- The proposed development is to occur within a vacant portion of Lot 100 (No.45) Trandos Road, Neerabup, which has been cleared of vegetation for previous uses
- The subject site is surrounded by the following:
    - Neerabup Power Station within Lot 100 to the east which is completely cleared of vegetation other than a vegetated stormwater basin in the northern part of the lot.
    - Existing water collection dam to the south within Lot 100, with existing horticultural land further to the south within 140 Pederick Road.
    - Undeveloped land within Lot 100 to the west, which is mostly unmanaged grassland vegetation, with undeveloped public road reserve (Orchid Road) further west.
    - Trandos Road reserve to the north, which is largely cleared of vegetation and contains the existing sealed public road extending to the north-eastern boundary of the subject site. Further north of Trandos Road is remnant vegetation within 570 Wattle Avenue East, which also contains a number of informal tracks used for kart and bike racing.
- Public road access to the subject site is via Trandos Road along the northern boundary, which extends 530 m east to Old Yanchep Road.
- There is no known reticulated town main water supply currently provided to the project area, nor is there any existing street hydrants along Trandos Road.

2.3 Bushfire Hazard Assessment

While the renewable energy infrastructure is not required to achieve target BAL ratings as per the CFA Guidelines, given BAL contour mapping has been undertaken for the proposed buildings in the BMP, this has been extended to the entire proposed facility including the renewable energy infrastructure. The CFA Guidelines do provide some high-level guidance on separation of BESS from unmanaged vegetation, and this has been supplemented by additional research to establish target BAL ratings for the various renewable energy infrastructure.

The BAL contour assessment for the entire project area, has been undertaken in accordance with Method 1 of AS 3959, and is detailed in Section 3 of the project BMP, and assumes the following:

- State-adopted FDI 80 rating;
- Vegetation and effective slope classifications within the project area and 150 m assessment area, as depicted on Figure 3 1 and summarised on Table 1 of the project BMP.
    - the vegetation classifications and effective slope observed at the time of inspection; and,
    - the anticipated post-development vegetation based on proposed on-site clearing extent, and resultant vegetation exclusions and separation distances, achieved to implement the proposed development and nominated Asset Protection Zones.

Based on the above, a BAL contour map was produced for the project area on Figure 3-2 in the project BMP, and depicts the BAL contours across the site.

2.3.1 Likelihood of Bushfire Impact

The likelihood of bushfire impact on renewable energy facilities is tied to the potential for bushfires to impact the site. To provide some guidance on this, historical bushfires have been depicted on Plates 1 and 2, using the following publicly available datasets:

- Firewatch which is a Landgate service that uses satellite remote sensing imagery to detect fire hotspots and burnt areas, to track live bushfires but also to review the broad extent of past fire events from 1989 to present day.
    - Several significant fires have occurred to the north and north-east of the site in 2003, 2007, 2011 and 2015, with the large fire in 2015 spreading into the kart speedway to the north but not crossing Trandos Road.
    - The other fire near the site occurred in 2024, however this fire to the south and south-west occurred in mid-September and is likely to be a prescribed burn.
    - The neared bushfire to the west occurred in 2015, however only spread to within 1.8 km of the site.
- DBCA Fire History dataset which contains a collection of records of fire events (prescribed burns and bushfire) which were captured on departmental-managed land, and where available non-department managed land in Western Australia. The earliest records available are from 1937.
    - The majority of the larger fires indicated around the site, are prescribed burns from the 1950's to 1980's, when the landscape may been different and less developed.
    - The majority of actual bushfire events are typically the small fires, that appear to be well controlled, with the exception being the 2015 bushfire to the east of the site.

The historical data depicts that while bushfires have regularly occurred in the local area, few have ever spread into the project area. This is likely due to the improved ability to manage the bushfire fires as they spread into the agricultural land from the areas of more continuous vegetation, due to reduced fire behaviour and

increased access for attending firefighters. While there appear to be few historical bushfires within the site, this BRMP assumes that bushfire impact could occur in the future, and addresses the risk accordingly.

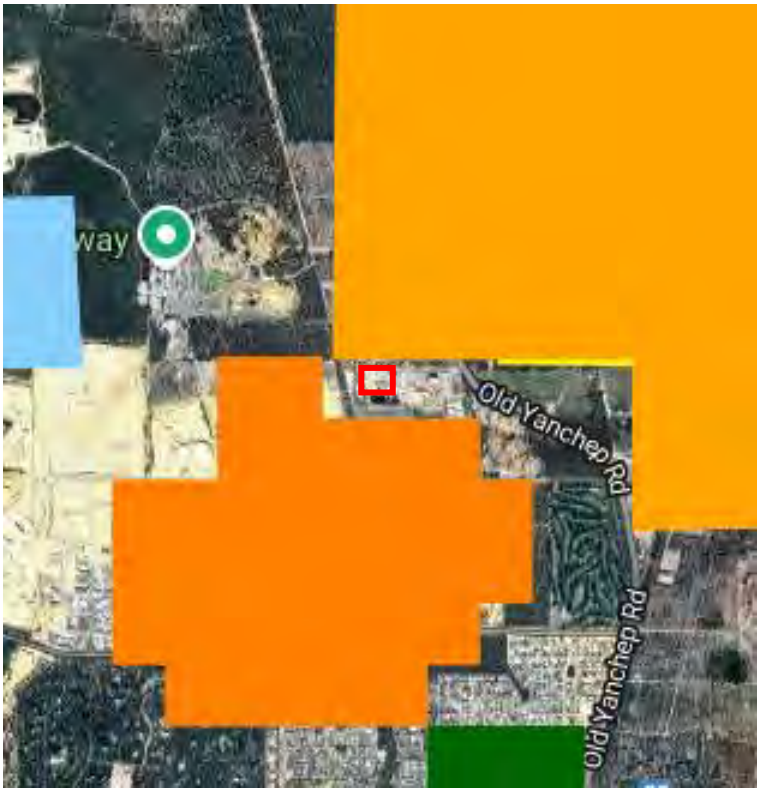

Plate 2: Bushfire History (Firewatch 2025)

Plate 3: Bushfire History (DBCA 2025)

2.3.2 Bushfire Hazard Summary

The greatest bushfire threat to the proposed development is from the north-east, north, north-west and west of the subject site, largely through scrub and forest vegetation, with fire runs 1.3 km to the west, up to tens of kilometres long to the north-east and north, all which could produce fully-developed bushfire behaviour. However, there are existing non-vegetated elements and low threat vegetation to the north, north-east, east, south-east and south of the site, which provide reasonable separation from bushfires approaching these interfaces, and should limit the radiant heat and direct flame impact on proposed development, with the main threat likely to be from ember attack through the forest and woodland fuels.

The only direct interface between unmanaged vegetation and the site is on the south-west, west and north-western interfaces, and this is predominantly grassland vegetation which will have a very quick residence time for any radiant heat impact, and with little associated ember attack.

2.4 Renewable Energy Infrastructure Hazard and Risk Analysis

The main hazard is that posed by the BESS units, with other potential hazards also associated with high-voltage energised infrastructure such as substation.

The CFA Guidelines notes that fire hazards at BESS facilities may include the following:

- Electrical hazards, such as battery faults; overcharging; rapid discharge; loss of remote monitoring systems; internal short circuits; overheating; water ingress; lightning strike (leading to thermal events/runaway).
- Chemical hazards, such as the inherent hazards of the stored dangerous goods; spills and leaks of transformer oil/diesel, refrigerant gas/coolant; chemical reactions.
- Explosions, from ignition of venting gases. Potential fire spread due to proximity of batteries (and containers/enclosures) to each other, on-site infrastructure and vegetation (including screening vegetation).
- Mechanical damage to battery containers/enclosures due to vehicular impact. Landscape hazards, such as bushfire/grassfire ignition from fire within the facility, or external ignition of site infrastructure from embers, radiant heat and flame contact.

From a bushfire risk assessment and management perspective, much of the above can be distilled into the potential impact of bushfire on the proposed renewable energy infrastructure (especially the BESS containers), and the ability for significant fires from the renewable energy infrastructure (especially the BESS containers) to ignite a bushfire.

2.4.1 Battery Energy Storage System (BESS) hazard review

BESS units are typically comprised of Lithium-ion (Li-ion) battery cells that are wired together to form modules, which have a battery management system (BMS) that prevents electrical imbalances in the battery cells, including with voltage, current and temperature. The BMS' main function is to shut down operations of the module (or system) if any of the voltage, current, or temperature changes are out of limit.

2.4.1.1 Thermal runaway in Li-ion batteries

The significant hazard posed by BESS units is primarily associated with thermal runaway occurring in the Li-ion batteries, and the fire and explosion risk that can accompany the release of flammable gases. Thermal runaway describes a process that is accelerated by increasing internal temperature, in turn releasing more energy that further increases temperature.

In Li-ion batteries thermal runaway is a condition where voltage, current or temperature instability, causes the battery cell temperature to rise which in turn increases the current with a further rise in temperature. The battery can begin to emit gases due to thermal decomposition of the electrolyte solvents, which could potentially result in fire ignition or explosion (of the flammable gas release).

Battery cells can fail at different rates under different modes of off-gassing (flammable gas release), which can be with or without flaming. Because thermal runaway can occur without flame, gases may not be consumed by an ignition source immediately after they are emitted, this can create a scenario where high heat and combustible gases can coexist without igniting, and accumulation of these gases can result in an explosive event should an ignition source be subsequently introduced.

There are differences between thermal runaway and conventional fires that are important to understand. A conventional fire (e.g. campfire) is sustained by a combination of fuel, heat, and oxygen, where if any one of them is removed, the fire may be extinguished (e.g. suffocating the fire to remove oxygen, applying water to cool it, or dispersing the wood to remove fuel).

Thermal runaway in a Li-ion battery differs from the conventional fire, as a Li-ion battery is consumed in thermal runaway is fuelled by an internal chemical reaction that releases heat and can continue without oxygen or a visible flame. As such, the management of thermal runaway differs from that of a conventional fire because starving a thermal runaway event of oxygen, may have little effect until the fuel is consumed. On this basis, stopping a thermal runaway event is more difficult and is generally addressed by either cooling to remove heat, or removing/dispersing the fuel.

While thermal runaway and fire are two different processes in a Li-ion battery failure, one can lead to the other including:

- an external fire can send a battery into thermal runaway, or
- thermal runaway can create a secondary fire as it begins to the burn plastic and remaining battery materials.

2.4.1.2 Historical failure events (Li-ion battery and BESS)

The hazard of Li-ion battery thermal runaway and off-gassing has been identified in research and public literature since the early 2000s, including extensive safety testing. Additionally, a number of failure events have created further awareness to the dangers of thermal runaway in Li-ion batteries, including the following (DNV-GL, 2020; ESV, 2021):

- **2006-2007** - Dell laptop computer battery thermal runaway from several laptops catching fire due to an internal defect in the battery cells that led to thermal runaway.
- **2011** - Chevrolet Volt battery thermal runaway after crash testing, resulting in the car catching on fire.
- **2013** - Tesla Model S after impact with road debris punctured the battery pack, causing it to go into thermal runaway.
- **2017-2018** - BESS fires in a large facility in South Korea, however there is limited reporting and there appears to be some conflict regarding the causes of the failures.
- **2019** – McMicken BESS Failure Event, Arizona
    - This involved thermal runaway of a BESS container, that resulted in off-gassing and subsequent explosion of the BESS when the container door was opened by attending firefighters.
    - Several post-incident reports have been produced since the failure event, and these are summarised in Appendix A.

- It is noted that the BESS technology and standards has progressed significantly since this event, which represents an example of BESS failure prior to many of the recent improvements in fire and explosion safety measures.

- **2021** – Victorian Big Battery fire
  - A Tesla Megapack at a facility in Geelong caught fire and spread to a neighbouring Megapack during the initial installation and commissioning, which didn't spread any further and burned out over the course of approximately six hours.
  - Several post-incident reports have been produced since the failure event, and these are summarised in Appendix A.

- **2023** – Bouldercombe Battery Project, Queensland
  - A Tesla Megapack ignited at a facility in Bouldercombe, and was allowed to burn out buy attending firefighters, without firewater, as a low intensity fire. Firefighters monitored temperatures to ensure fire didn't spread to adjacent BESS units, and monitored gas levels and conducted air sampling to manage risk to nearby residents.
  - Several post-incident news reports have been produced since the failure event, and these are summarised in Appendix A.

While there have not been many historical BESS failure events that have occurred in Australia, with the Victorian Big Battery and Bouldercome Battery Project fires the most notable to date, it is unclear if this could also be attributed to a lack of reporting. Additionally, it is worth noting that there doesn't appear be reported instances of bushfires destroying or producing a thermal runaway event within a BESS, however this could also be due to lack of opportunity given the relatively short amount of time this infrastructure has been commercially available.

2.4.1.3 Li-ion battery testing

Additionally, there has been some testing information conducted on BESS units, with summaries of the testing methodology and results provided in Appendix B.

- **2015** - Fire Protection Research Foundation conducted internal and external fire testing on a Tesla Powerpack as part of a hazard assessment of lithium-ion battery energy storage systems (FPRF, 2016).
- **2021** - Fisher Engineering Inc. performed an analysis of the Megapack energy storage system, including review of the construction, design, fire safety features and UL9540A large-scale fire test data against the regulatory requirements in International and US fire codes and standards (FEI 2020).

It is noted that the testing is primarily conducted of Tesla products, which appear to be configured somewhat differently to the larger containerised versions such as being proposed for this project, and so the outcomes may not be directly applicable.

Additionally, there is limited information is provided regarding the potential flammability of off-gassing from a Li-ion thermal runaway event, which may have been specific to the product. Notwithstanding, the potential explosive risk caused by flammable gases does appear to be becoming more of a focus, especially after events such as the BESS failure in Arizona, and definition and management of this hazard more critical, especially the release of trapped unignited gases.

2.4.1.4 BESS Standards

The main standards for BESS testing, construction and installation, include:

- UL 9540 (2023): Energy Storage Systems (ESS) and Equipment

- UL 9540A (2019): Standard for Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems
    - supplementary document to UL 9540 that defines test methods for thermal runaway.
- NFPA 855 (2023): Standard for the Installation of Stationary Energy Storage Systems
- International Fire Code (2021): Chapter 12 Energy Systems

2.4.1.5 Likelihood of BESS Facility Fire

As noted on Section 2.4.1.2, there appears to be a relatively low likelihood of BESS fires based on historical occurrences in Australia, however it is noted that these type of grid scale BESS facilities are relatively new with the opportunity for failure and fire also limited, and the statistics around fire losses are based on historical estimates and incomplete datasets. There is also varying levels of resultant damage associated with these fires, which can range from small ignition events that have minor damage, through to complete destruction of at least one BESS unit or potentially multiple units.

2.4.1.6 BESS hazard summary for bushfire

The overall hazard with the BESS units, is largely associated with the potential for thermal runaway in the Li-ion batteries to produce a fire or explosion failure event.

The rise of the BESS industry has been very quick, and the has resulted in rapid advances in the design, construction, commissioning, operation and maintenance of this technology. Notwithstanding, there hasn't seeming been a many reported historical BESS fires or explosions, and certainly not in Australia, however when they have occurred, it is clear that they result in significant firefighting challenges, primarily due to the inability to easily extinguish the fires and manage flammable gases.

The Arizona BESS failure in particular has highlighted historical issues with this for attending firefighters, as well as the potential for catastrophic failure to ignite vegetation some distance from the BESS (UL, 2020).

From a bushfire risk management perspective, the hazard related to the BESS units can be distilled to the following:

- Exacerbation of a bushfire from fire and/or explosion of the BESS's as follows:
    - A bushfire impressing significant radiant heat, or producing direct flame impingement, onto the BESS container, that could increase battery temperatures and send into thermal runaway. This could also include the damage or destruction of supporting systems (e.g. BMS, thermal management) which might affect the ability of the BESS to maintain temperatures at required levels.
    - Ember attack from a bushfire, igniting a fire within the BESS unit, that could send a battery into thermal runaway, or damage or destroy supporting systems.
    - Ember attack from a bushfire igniting flammable gases from BESS with thermal runaway condition, either within the BESS or flammable gases being ventilated.
- Ignition of a bushfire as a result of a fire or explosion within the BESS, likely to be associated with thermal runaway igniting an internal fire and/or emitting flammable gases, which could result in an explosion.

Risk management measures to address the hazards above are explored in further detail in Section 2.5.

2.4.2 Transformer Hazard

The causes of fire hazards relating to transformers are typically categorised as one of the following:

- Electrical equipment containing combustible insulating liquids may rupture due to internal failure, and there may be fire ignition or an explosion.
- Electrical equipment without combustible insulating liquids may rupture due to internal failure; there still be an explosion with a modest fire risk.
- Other plant and equipment such as cables, batteries, and drainage pipes may catch fire and spread the fire.

The risk associated with transformers, relates primarily to the oil used in transformers (where oil-filled) for insulation and cooling, which could potentially leak and be ignited. The ground mounted transformers are oil-filled and contains a hermetically sealed steel tank that contains the transformer core surrounded with windings and connecting leads which are separated, insulated and cooled by mineral oil (oil impregnated upgraded wood pulp insulation) or ester oils.

Potential failure of the transformer can occur if the ambient temperature is raised above the rating of the transformer (typically 105°-140°) for an extended time, with short-term heating able to be addressed through power supply reduction or shutdown. While overheating can result in degradation of the transformer, the main risk is the potential for cracking of the tank and resultant oil loss and potential pool fire of the flammable mineral or ester oil.

Previous correspondence from power supply providers has been there are historically very few transformer fires, with most associated with lightning strikes on pole-top transformers in non-built-up areas. They have assessed the likelihood of a transformer fire occurring as being approximately 0.1%, or with accumulated probability of 4% per transformer over its typical service life.

While there is not a high probability of transformer fires, it could result in transformer loss and/or damage to adjacent infrastructure or combustible items. As such, fire protection measures are considered a critical part of the design of transformers which include the following:

- Transformers are designed in accordance with various standards, including AS 2067 (Substations and High Voltage Installations) and AS/NZS 60079.14 (Explosive atmospheres – Electrical installations design, selection and erection) to reduce risk of fire, with a variety of measures incorporated to minimise potential for fire ignition.
- Cable clamps and support to limit leaking bushings.
- Managing limits for transformers to prevent overloading.
- Providing sufficient clearances to transformers based on oil volume, incorporation of oil containment and/or flame trap, or provision of a fire screening wall
    - The incorporation of an oil bund and/or flame trap enables a reduction in minimum separation distance as it contains the spread of any leaked oil and reduces the size of the oil pool exposed to oxygen, which is limits combustion.
    - Provision of a fire screen wall (2 hr FRL) also enables reduced minimum separation distances as it shields the transformer from adjacent buildings and combustible items and ignition risks.

2.5 Bushfire Risk Management Requirements

Based on the analysis of the bushfire hazards and risk associated with BESS facilities, and the information from testing and historical failure events, the following are considered key bushfire risk management requirements to be incorporated into the proposed development to manage bushfire risk, both to protect the renewable energy infrastructure from bushfire, and also to manage the risk of bushfire ignition from infrastructure fire.

- Considered siting of renewable energy infrastructure to minimise bushfire risk as much as practical, noting the siting of renewable energy facilities is based on a number of factors.
- Incorporating sufficient vegetation management to limit radiant heat impact and prevent direct flame impingement on the BESS, but also to ensure a BESS explosion is not able to readily ignite surrounding vegetation.
    - No trees are to be located close enough to BESS's such that any falling branches or trees could mechanically damage the BESS (which might cause thermal runaway).
- Provision of appropriate vehicular access to the BESS facility for attending firefighters
- Provision of secure firewater supply for attending firefighters.
    - It is noted that the preferred onsite response may include leaving a BESS unit to burn out rather than applying firefighting water, but this may depend on various factors.
- Appropriate BESS design and construction to:
    - Limit potential for thermal runaway and associated off-gassing.
    - Incorporates a combined strategy of fire detection (and gas monitoring) and suppression followed by ventilation (and gas ventilation) and cooling, including all required infrastructure to achieve this.
    - Incorporate remote monitoring and communications, so the status of BESS BMS and fire/gas detection systems can be monitored and any information conveyed to relevant parties including fire brigade.
- Ensure sufficient information regarding the facility, its hazards and emergency management procedures is available to assist any attending firefighters.
- Engage with local fire brigade during project development and commissioning process, to ensure they understand the system and be aware of its specific hazards.
- Develop an emergency management plan which comprehensively details:
    - The hazards associated with Li-ion battery technology including the potentially explosive nature of the gases released during Li-ion battery thermal runaway,
    - Response procedures that incorporate system monitoring, the detection of gases, ventilation practices, extinguishing methods, and information to gather before entry.

2.6 CFA Guideline Requirements

As detailed in Sections 1.3 and 1.4, the CFA *Design Guidelines and Model Requirements: Renewable Energy Facilities v4* (CFA, 2023) are currently seen as the best guidance for renewable energy facilities available at this point in time. The CFA Guidelines provide a comprehensive suite of design, construction, operation and emergency planning measures recommended for renewable energy facilities, that address the risk of fire within the infrastructure, but also bushfire risk to the development.

CFA (2023) notes that any planning applications for all renewable energy facilities proposed in bushfire prone areas, strengthened or additional risk mitigation measures will be required to address bushfire risk, and will also need to address the following:

- The impact of any ignition events arising from the renewable energy infrastructure on nearby communities, infrastructure and assets.
- The impact of bushfire on the renewable energy infrastructure (e.g. ember attack, radiant heat impact, flame contact).

- Assessment of whether the proposal will lead to an increase in risk to adjacent land and how the proposal will reduce risks at the site to an acceptable level.

A summary of the CFA Guidelines sections (relevant to this BESS facility project) is provided in the compliance assessment on Table 1 in Section 4, which includes the following:

- BESS siting and vegetation management requirements to ensure the BESS fully involved in fire does not create the potential for ignition of vegetation, nor spread to adjacent infrastructure.
- Vehicular access provisions for emergency services vehicles
- Firewater provisions for attending firefighters
- Design, construction and commissioning requirements for renewable energy infrastructure (especially BESS and substation) and any Dangerous Goods
- Ongoing operation, maintenance and housekeeping requirements for renewable energy infrastructure (especially BESS)
- Familiarisation visits and emergency information for attending firefighters and emergency services personnel
- Development and preparation of comprehensive Emergency Management Plan for the facility, with relevant prevention, preparedness and response information for bushfires and onsite infrastructure fires.

3 Bushfire Risk Strategy and Management Measures - Renewable Energy Assets

Based on the guidance from the review of the renewable energy assets, hazards, testing and historical fires in Section 2, and informed by the relevant Model Requirements of the CFA Guidelines, the following bushfire safety strategy and associated risk management measures are to be incorporated into the proposed facility to manage bushfire risk to the renewable energy infrastructure, while also managing the escape of fire within the infrastructure to ignite a bushfire.

It is noted that while most management measures relate to management of bushfire impact on the proposed renewable energy infrastructure, some also relate to internal hazards which is also critical to avoid ignition of bushfires.

The subsections below detail the proposed bushfire risk management measures to be adopted by the project, with a compliance assessment in Section 4 demonstrating how these measures align with the principles from the CFA Guidelines.

The risk management measures have also been summarised in the BMP, to provide a comprehensive list of the Proponents bushfire risk management obligations for this project. Where possible, the bushfire management measures for both the buildings and renewable energy infrastructure have been depicted on Figure 5-1 in the BMP.

3.1 Vegetation management and separation

- Establish NVZ/APZs around renewable energy infrastructure as follows, to protect infrastructure from approaching bushfire impact, while also reducing the potential for onsite infrastructure fires to ignite a bushfire.
- All land within the BESS and substation perimeter APZs, are to be non-combustible (constructed of concrete, mineral earth or non-combustible mulch etc) and free of vegetation and obstructions at all times, with no plant or equipment unless totally non-combustible.
- Perimeter APZs around BESS, substation and other renewable energy infrastructure is to comply with the following:
    - Have NVZ of 10 m wide from infrastructure, that is non-combustible (constructed of concrete, mineral earth or non-combustible mulch etc) and free of vegetation and obstructions at all times, with no plant or equipment unless totally non-combustible.
    - Otherwise comply with the APZ standards from the WA Guidelines, with the following clarifications:
        - Have no trees located close enough to BESS's such that any falling branches or trees could mechanically damage the BESS
        - Largely consist of managed grassland (<100 mm in height) or low groundcovers
- Separation between the BESS's, substation and any other electrical infrastructure, must be at least the distance where the radiant heat flux from a fully involved in fire in the infrastructure, does not create the potential for ignition of these site elements (adjacent battery containers/enclosures, on-site buildings, substations).
    - This is outside the bushfire scope, and is expected to be addressed by complying with relevant codes and standards, including Australian Standards, and any manufacturers recommendations.

- All onsite vegetation modification and management (including NVZ and APZ) is to be conducted and maintained by the Proponent in perpetuity (or for the life of the facility).

3.1.1 NVZ/APZ - BESS units

- Given the potential for BESS units to react to elevated temperatures, NVZ/APZ to achieve no less than BAL-12.5 is considered appropriate.
- While historical BESS explosion has ignited vegetation 23 m from the container, it is noted that this didn't have explosion management system nor many of the fire and safety features currently required. On this basis, the provision of BAL-12.5 NVZ/APZ is considered appropriate so the radiant heat flux from the BESS fully involved in fire does not create the potential for ignition of vegetation, especially given the current approach to let BESS containers burn out and control spread of fire, rather than suppress the fire itself.

3.1.2 NVZ/APZ – Substation and Ancillary Equipment

- The substation and ancillary equipment (PCS, Auxiliary Skids, Generator) at the site are also to implement NVZ/APZs to achieve no less than BAL-29.

3.2 Vehicular access

- The provision of at least two (2) access points to the facility, to ensure access to/from the facility to the greater road network, can be achieved during a bushfire emergency.
- All nominated site entrances are be fitted with gates as follows:
    - Provide at least 6m clear horizontal width
    - If locked, any keys are issued to DFES and any local fire brigade.
- Ensure suitable vehicular access to all areas of facility, including to BESS's, substations and fire service infrastructure as follows:
    - All internal roads are to comply with private driveway specifications of WA Guidelines
    - Include a perimeter road around the BESS yards with 6 m minimum width.
    - All other internal road dimensions are to be at least 4 m wide, but if <6m wide, passing bays are to be provided every 200 m that are 6m wide x 20m long.
- The internal road network needs to provide vehicular access to each proposed firewater tank, with access is to be provided to within 4 m of the tank suction point.
- Emergency Information Book and Signage (see Section 3.8) is to be provided at the nominated site entrance, for attending emergency services personnel.
- The internal road network, site entrances, gates and signage are to be constructed and maintained by the Proponent in perpetuity (or for the life of the facility).

3.3 Firewater supply

- The following assumes that there is no reticulated water supply to the site as is currently the case.
- While the CFA Guidelines require the significant firewater for BESS facilities, the Proponent has been advised that manufacturers are typically not recommending use of firewater on BESS fires, and it appears that evidence from recent BESS fires (e.g. Bouldercombe) that the firefighting response is evolving toward this practice.
- Given the above, the Proponent is proposing a lesser amount of firewater storage, as determined once the final operation and design elements of this BESS facility have been finalised, in consultation with DFES, be provided on site.

- Notwithstanding the above, any firewater tanks required onsite will need to comply with the standards from the WA Guidelines, and the following from the CFA Guidelines:
    - Must be an above-ground water tank constructed of concrete or steel and must comply with AS 2419.1 and signage indicating 'FIRE WATER' (or similar approved) and the tank capacity must be fixed to each tank.
    - The tank suction point must be within 4 m of a road or hardstand
- All firewater tanks are to be sited further than 10 m from infrastructure and buildings, as well as in an area of BAL-29 or lower
    - To ensure this is implemented, a 10 m wide NVZ/APZ around the perimeter of the tank/s
    - No infrastructure or buildings are permitted in the 10 m NVZ/APZ, and all land between the tank/s and nearby infrastructure or buildings is to be non-vegetated.
- Vehicular access to the firewater tank/s is to be via proposed internal roads.
    - Access is to be provided to within 4 m of the tank suction point.
- Emergency Information Book and Signage (see Section 3.8) is to be provided at the site entrance, for attending emergency services personnel.
    - This is to include the location of all onsite firewater tanks and the internal access routes to these tanks.
- All firewater system infrastructure, and associated NVZ/APZs, are to be constructed and maintained for the life of the project by the Proponent.

3.4 BESS and Electrical Infrastructure Design

- Ensure the following elements are included in the BESS:
    - External container is to be non-combustible material (e.g. metal).
    - Use suitable Li-ion batteries (or appropriate alternative), with sufficient cell quality and barriers, to limit potential for thermal runaway generating from internal cell defects and cascading thermal runaway.
    - Battery management/monitoring systems for monitoring and managing the state of battery systems including shutdown if any of the voltage, current, or temperature changes are out of limit.
    - Systems to prevent heat/fire spread within battery containers (such as thermal barriers, shut-down separators, isolation systems, cooling systems).
    - Detection systems for smoke, heat (thermal), fire and toxic gas (off-gassing) within battery containers.
    - Appropriate suppression systems for fire within battery containers.
    - Systems to prevent explosion within battery containers by safely ventilating the system in a controlled manner to reduce the flammability of the atmosphere, such as ventilation, pressure relief and exhaust systems, including incorporation of adequate explosion prevention protection, where applicable.
    - Warning and alarm systems within the battery containers, and/or the facility, to enable early warning for faults, operation of the battery energy storage system above 'normal'/safe parameters, smoke, off-gassing, and fire.
    - Consideration of direct alarm monitoring to the fire brigade for BESS automatic detection systems

- Provide suitable ember protection (e.g. BAL-12.5 construction) to prevent embers from penetrating battery containers/enclosures including, but not limited to:
  - Battery enclosures via any external walls/roofs (if not completely sealed) and gas ventilation inlets/outlets.
  - Thermal management system (chiller) inlets and outlets
  - Any unsealed penetrations are to be appropriately sealed (with non-combustible material) or gaps/openings (>2mm) are to be screened with non-combustible (aluminium, steel, bronze) screening with maximum aperture <2mm.
- BESS installation is on a non-combustible surface (e.g. concrete)
- Where relevant and appropriate to the type of BESS installed, consider adopting:
  - Current versions of UL 9540 or FM Global Property Loss Prevention Data Sheet 5-33, for the design and operation of BESS's.

- All electrical equipment, including electrical cabling, junction boxes, inverters and transformers, must comply with relevant design, construction and installation standards of electrical equipment including relevant Australian Standards, and manufacturers recommendations.
- Ensure transformer is designed to minimise fire risk, incorporates either oil bund or flame trap, and is provided with required separation from adjacent infrastructure and the combustible vegetation, in accordance with relevant Australian Standards and manufacturer specifications.
- Appropriate system monitoring for all electrical infrastructure must be provided, especially the BESS unit BMS and fire/gas detection, to ensure that any electrical or equipment failures with the potential to ignite or propagate fire are rapidly identified and relevant site personnel notified to enable early fire brigade notification.
  - Monitoring is to be configured to provide warning to relevant onsite and offsite personnel.

3.5 Bushfire resilient construction

- Bushfire construction provisions of the National Construction Code require that buildings comply with the AS 3959 construction requirements, in accordance with the assessed BAL under AS 3959, provided the building is a Class 1, 2, 3 or associated Class 10a building/deck, or a "certain Class 9" building.
  - The renewable energy infrastructure (BESS, PCS, substation) will not be any of the classifications nominated above, therefore in accordance with the National Construction Code, and as such, there is no statutory requirement to meet the construction requirements of AS 3959.
- As detailed in Section 3.4, BESS construction is to comply with the CFA Guidelines and incorporate the following:
  - Container construction is to be non-combustible material (e.g. metal).
  - Ember protection is to be provided to parts of the BESS container, in accordance with AS 3959 BAL-12.5 specifications

3.6 Construction and Commissioning

- Ensure an emergency communication system must be provided that is reliable and will operate in the event of power failure
- Ensure all electrical equipment (e.g. electrical cabling, junction boxes, inverters and transformers) must comply with relevant design, construction and installation standards of electrical equipment including relevant Australian Standards, and manufacturers recommendations.

- Install and commission fire detection, alarm and suppression systems at the earliest possible stage of construction.
- Provide first response firefighting equipment (e.g. extinguishers) at all construction portables/buildings onsite, in the vicinity of all construction activities, and in site-based vehicles.
- Ensure sufficient training provided to relevant personnel on the use of on-site firefighting equipment and first-aid, and responsibilities during emergencies
- Provide required fire protection equipment for Dangerous Goods as per relevant Australian Standards.
- Ensure tight ignition source control, including hot works and restriction of smoking to prescribed areas.
- Conduct any required vegetation management.
- Undertake all required infrastructure, equipment and vehicle maintenance.
- Incorporate emergency management procedures into the Construction Management Plan (or other relevant document) for the construction and commissioning phase of the facility, adopting similar concepts to those in Section 3.10, for the operational BESS facility, which includes:
    - Adhere to restrictions and guidance during days of Fire Danger Rating of High to Catastrophic, and Total Fire Ban days and Harvest Movement Ban days.
    - Regularly monitor for, and otherwise be aware of, bushfires in the local area, and evacuate offsite prior to bushfire impact onsite.
    - Emergency procedures for identified risks and hazards of the renewable energy infrastructure, including but not limited to
        - Onsite fire in renewable energy infrastructure (e.g. electrical infrastructure faults and fire in BESS or substation)
        - Bushfires
    - Emergency procedures for bushfires
    - Emergency procedures for fires within the renewable energy infrastructure and buildings, including immediate notification of DFES.
- Notification of fire brigade at least seven days prior to the commissioning of any renewable energy infrastructure at the facility, especially the BESS units.
- Engage with fire brigade to offer a familiarisation visit prior to commissioning, as detailed in Section 3.9.

3.7 Operation, Maintenance and Housekeeping

- Ensure ongoing compliance with the endorsed BMP and BRMP is achieved, especially prior to, and during, bushfire season. This includes all vegetation management, internal road access, fire system and firewater obligations.
- Ensure any Dangerous Goods (if any) comply with all relevant legislation, Australian Standards and the requirements of the BMP.
- Ensure the Emergency Information Book and/or signage is appropriately stored at all nominated site entrances, and reviewed on an annual basis (see Section 3.8).
- Develop, implement and review the Emergency Management Plan including all preparedness, pre-emptive and response actions, as required, and ensure ongoing liaison with DFES and regular staff training and exercises are conducted (see Section 3.10 below).

- Ensure inspection, maintenance and any required repair activities are conducted for all renewable energy infrastructure (BESS, substation), associated equipment, fire systems, communication systems, and vehicles at the facility, in line with relevant Australian Standards and manufacturers requirements.

3.8 Emergency Information Book and Signage

An Emergency Information Book and/or signage must be located at the nominated site entrance to the facility, with any plans or information books provided in a weatherproof container (unless otherwise agreed with DFES).

The Emergency Information Book and/or signage is intended to provide to emergency responders with an overview of the facility. This information should be developed in liaison with relevant emergency services representatives (if possible) and should seek to include the following:

- A description of the premises, its infrastructure and operations.
- Up-to-date contact details for site personnel, regulatory authorities and site neighbours.
- Site plans that depict the entire site layout, including:
    - Buildings, substations and renewable energy infrastructure (including BESS units),
    - Internal roads and surrounding public roads
    - Fire protection systems and equipment, including firewater tanks
    - Grid connections, drains and isolation valves,
    - Dangerous goods storage areas
    - Neighbours and
    - North direction and scale
- The following BESS details and plans
    - Schematics and technical data for BESS units, the number of units on-site, and the number of battery racks or modules within each unit.
    - Details of the hazards for the BESS, including thermal events/runaway, electrical safety hazards, explosion hazards, dangerous goods hazards (including off-gassing), and the effects of fire on the BESS (eg., explosion, release of toxic gases).
    - Details of all provided battery failure/safety and protective systems, including a description, the activation process/automatic trigger, and any hazards associated with these systems.
    - Specifications for safe operating conditions for temperature.
    - Details of the elements monitored/controlled by the Battery Management System (BMS), including internal temperature, state of charge, voltage, etc. and the locations this information is available.
    - The shutdown and/or isolation procedures if the BESS are involved in fire or emergency incident, and appropriate personnel contact details for verifying that the battery enclosure/container system has been isolated/shutdown and de-energised during emergencies.
- Details of any emergency equipment, including the type and location of fire and gas detection systems.
- A manifest of dangerous goods (if required) and Safety Data Sheets (SDS) for dangerous goods stored on-site.

A review of the information contained within the facility's Emergency Information Book and signage must be undertaken prior to commencement of bushfire season annually.

3.9 Emergency Services Familiarisation

Prior to commissioning of the facility, a familiarisation visit and explanation of the proposed facility, the specific hazards, the proposed fire safety systems and management measures, and the emergency procedures, is to be offered to local fire brigades and other emergency services.

The opportunity should be taken to ensure that the information in the proposed Emergency Information Book/Signage (see Section 3.8) is appropriate for their needs, and that they are familiar with where this will be located.

Additionally, it should be confirmed that any required keys or access codes to any secured parts of the site have been (or will be) supplied to the relevant fire brigade personnel.

A schedule for ongoing site familiarisation to account for changing personnel, facility infrastructure and hazards, and emergency exercises should be developed in conjunction with the local fire brigade.

3.10 Emergency Management Plan

An Emergency Management Plan is to be developed for the facility, which comprehensively details the following (noting this plan it to be for all emergencies and not specifically just to bushfire risk management):

- Facility details including technical support during an emergency, details of emergency resources and a manifest of dangerous goods.
- The identified risks and hazards associated with the BESS , Li-ion batteries and related infrastructure.
- Detail preparedness and pre-emptive actions to address the above hazards, including the following for bushfire:
    - Ongoing compliance with the approved BMP and BRMP, including ensuring regular vegetation management requirements are achieved, vehicular access routes and firewater systems are maintained and available, and conducting regular bushfire housekeeping inspections.
    - Ensuring ongoing maintenance of all fire and communication systems.
    - Determining forecast Fire Danger Rating Total Fire Bans (TFB) and Harvest Vehicle Movement Bans (HVMB), during bushfire season
    - Modifying Site Activities (based on Forecast FDR and TFB/HVMB) including limiting activities which may introduce bushfire ignition (hot works, unnecessary vehicle movement etc).
    - Monitoring DFES Bushfire Emergency Warnings (and/or bushfire activity within 50 km of the facility, during bushfire season, and the decision-making triggers
- Detail emergency response procedures to address the nominated hazards.
- For a bushfire emergency, the response should include the following:
    - The immediate response to any onsite bushfire, or bushfire observed in the local area, is to notify DFES and local fire brigade immediately.
    - Conducting early offsite evacuation of all staff away from the bushfire if safe to do (preferred response), ideally to Banksia Grove residential area, however Yanchep or Alkimos/Butler/Clarkson residential areas may also be considered.
        - Essential staff should only remain onsite if directed by authorised DFES/local fire brigade personnel.

- If safe to do so prior to staff evacuation:
  - Reduce the facility to a low energy state (including discharging the BESS), in consultation with authorised DFES personnel (where possible)
  - Ensure all other buildings and plant are properly secured.
  - Ensure all vehicular access routes are open and available for use.
  - Ensure all fire and communications systems are ready for use.
- If there is insufficient time to safely travel offsite without being impacted by bushfire, conduct onsite shelter in place in the O&M building.
  - It is noted that this building is not constructed for onsite refuge from bushfire and should only be considered as a last resort option only if offsite evacuation is not possible.

- Response to onsite fire, including thermal runaway at the BESS, is to include:
  - Immediately notify DFES to enable a rapid turnout
  - Notify neighbouring development such as Neerabup Power Station.
  - Ensure no staff approach the BESS (if there are any onsite). Staff should move to safe distance from the project area, no less than 50 m.
  - Strongly consider full emergency shutdown of the BESS and substation unless there are mitigating circumstances. This should be conducted in consultation with authorised DFES personnel (where possible).
  - If possible, contact Specialist Technical Support for further guidance.

The emergency management plan is to be reviewed regularly and the relevant staff will need appropriate training and to conduct regular exercises to ensure everyone is fully conversant with the requirements of the plan and able to respond as required during all emergencies. Training should be conducted annually prior to bushfire season, and regular exercises conducted throughout the year.

Further specific detail on the requirements of the emergency management plan is provided in Section 5 of the project BMP.

3.11 Bushfire Management Measures for Proposed Buildings (from Project BMP)

In addition to the measures detailed above for the renewable energy infrastructure, it is noted that the project BMP requires the following measures to be incorporated into the design to address bushfire risk to the proposed habitable buildings to comply with SPP 3.7 and the WA Guidelines:

- The O&M building is to have a compliant 10 m wide APZ to achieve BAL-29 or lower, containing no other buildings or infrastructure.
  - The APZ width has been nominated to ensure this building is sited at least 10 m from proposed BESS units or other infrastructure.
- Several buildings are associated with the substation (e.g. switchroom/control room, NSP building) will have a compliant 9 m wide APZ to achieve BAL-29 or lower on these buildings.
- The firewater tank/s will have a compliant 10 m wide APZ to achieve BAL-29 or lower, containing no other buildings or infrastructure.
  - The 10 m APZ has been nominated to ensure these tanks are no closer than 10 m to the BESS units or other infrastructure.

- Vehicular access to the buildings and associated firewater tank/s, is to be compliant with the private driveway standards from the WA Guidelines including:
    - If less than 6m wide, shall have 6 m wide by 20 m long passing bays every 200 m
    - Has compliant turnaround or loop road access, within 30 m of building/s.
    - Provides access to within 4 m of the firewater tank suction.
- The capacity of the firewater tanks for the buildings is to be at least 10 kL per building (nominally 30 kL in total), which will be added to the capacity required for the renewable energy infrastructure as per the CFA Guidelines.
    - All firewater tank/s are to comply with WA Guidelines specifications, and be sited in BAL-29 or lower.
- No specific bushfire construction required for buildings as per National Construction Code given they are not Class 1, 2, 3, associated Class 10a or a “certain Class 9”.

4 CFA Guidelines Compliance Assessment

As detailed previously, the project is applying the Model Requirements from the CFA Guidelines to the renewable energy infrastructure of the project as much as possible as part of the bushfire risk management strategy, albeit rationalised for a WA context where required (e.g. use of WA standards for APZs, roads, firewater tanks etc).

The proposed bushfire management strategy and mitigation measures have been detailed above in Section 3, with a compliance assessment of these measures against the Model Requirements of the CFA Guidelines provided below in Table 1.

The assessment demonstrates that compliance has been achieved with all Model Requirements, other than:

- The Proponent is proposing to rationalise the firewater requirements in line with evolution of BESS firefighting practices and current manufacturer recommendations
- Some rationalisations for the WA context, in lieu of Victorian practices.

As previously noted, not all Model Requirements relate to bushfire impact on the proposed development, however the management of many of these internal hazards is also critical to avoid ignition of bushfires, so have been discussed as much as relevant.

Table 1: Summary of Renewable Energy Facility requirements relating to bushfire and the development response (CFA, 2023)

CFA Guideline Section	Requirement	Type	Development Response
Section 2: Consultation	***Consulting with CFA*** • Early consultation with DFES, before developing a planning permit application.	***All Facilities***	• The Proponent has commenced preliminary liaison with DFES with further consultation expected to be undertaken during the planning and building approval process.
Section 3: Fire Risk Management	***Risk Management Plan*** • A Risk Management Plan must be developed for the facility, before development starts. *Additional Guidance from CFA Guidelines* • A Risk Management Plan (RMP) is critical in informing fire risk management in the design and operation of facilities, particularly where infrastructure or operations pose additional hazards to the landscape, occupants and emergency responders.	***All Facilities***	• This Bushfire Risk Management Plan assesses the bushfire hazards and risks for the proposed renewable energy infrastructure against the requirements of the CFA Guidelines, and details how the risk has been appropriately managed. • The required mitigation measures for the renewable energy infrastructure, has been incorporated into the project Bushfire Management Plan, to ensure they are implemented and maintained for the life of the project. • ***Based on the above, all requirements with the CFA Guidelines have been met.***
Section 4: Facility Location	***Landscape Risk to Facility*** • An assessment that considers: o The impact of any ignitions arising from the infrastructure on nearby communities, infrastructure and assets. o The impact of bushfire on the infrastructure (e.g. ember attack, radiant heat impact, flame contact).	***All Facilities***	• As detailed in Sections 2.3 and 2.4.1.5, the site is largely surrounded by non-vegetated/managed land, with grassland immediately to the west, and while bushfires have historically been a regular occurrence in the local area, any bushfire impact on the facility is likely to be from a grassfire with very quick residence time (10-15 seconds). There will likely be some ember attack on the facility from nearby forest and woodland vegetation, however this vegetation is separated from renewable energy infrastructure by 40 m (substation) to 80 m (BESS). • The focus on addressing landscape risk of bushfire to the facility, is primarily through the provision of the following: o Onsite vegetation management, including NVZ/APZs around renewable energy infrastructure, to reduce bushfire impact to moderate levels, especially on the basis that the BESS units are non-combustible and the anticipated bushfire behaviour will be a rapid grassfire with limited residence time. ▪ The sizing of the NVZ/APZ is commensurate with the surrounding bushfire hazard (i.e. increasing in width to provide more separation from the hazard where it presents greater potential for significant bushfire behaviour), and the resilience of the renewable energy infrastructure. ▪ The BESS units are more susceptible to elevated heat which could potentially trigger thermal runaway, and on this basis, the NVZ/APZ has been sized to achieve a target of BAL-12.5. ▪ The remainder of the renewable energy infrastructure (PCS, skids, substation) has greater resilience to bushfire and as such, the NVZ/APZ has been sized to achieve a target of BAL-29. o Vehicular access and firewater requirements for the renewable energy infrastructure have been determined through application of the CFA Guidelines and provide significant resources for attending firefighters to fight bushfires approaching the site, and also fire within the facility: ▪ The internal road network enables attending firefighters to access all proposed BESS and PCS infrastructure, and the substation, including the provision of multiple entrances to the site and the use of loop perimeter roads. ▪ The onsite firewater supplies, provide a significant quantity of firewater for attending firefighters to refill appliances, without extended travel time. o The BESS containers are designed to incorporate bushfire resilience through non-combustible construction and targeted ember protection. Additionally, the BESS units are designed with a number of fire and safety systems to limit the potential for thermal runaway, fire and explosion from the unit, including ▪ Battery management/monitoring systems ▪ Thermal management/monitoring systems ▪ Fire detection, alarm and suppression systems ▪ Explosion management systems o System monitoring for all electrical infrastructure must be provided, especially the BESS unit BMS and fire/gas detection, to ensure that any electrical or equipment failures with the potential to ignite or propagate fire are rapidly identified and relevant site personnel notified to enable early fire brigade notification.

CFA Guideline Section	Requirement	Type	Development Response
			o Strong liaison with DFES and local fire brigade from facility commissioning and for the duration of operation o Emergency Management Plan that addresses bushfire preparedness, prevention and response activities, including notification of DFES, facility shutdown and offsite evacuation. • ***Based on the above, all requirements with the CFA Guidelines have been met.***
	Facility Risk to Landscape • As assessment of the fire risk from the proposed facility to the landscape	***All Facilities***	• As detailed in Sections 2.4.1.2 and 2.4.1.5, based on historical occurrences in Australia, there appears to be a relatively low likelihood of BESS fires. It is noted that these type of grid scale BESS facilities are also relatively new, therefore the opportunity for fire damage and loss is limited. BESS fires in Australian appear to have generally been contained to 1 or 2 BESS units, with limited spread across adjacent BESS. • The focus on addressing risk to the landscape is primarily through prevention of uncontrolled BESS fire and explosion, in order to prevent fire spread to vegetation, through the provision of the following: o The BESS containers are designed to incorporate bushfire resilience through non-combustible construction and targeted ember protection. Additionally, the BESS units are designed with a number of fire and safety systems to limit the potential for thermal runaway, fire and explosion from the unit, including ▪ Battery management/monitoring systems ▪ Thermal management/monitoring systems ▪ Fire detection, alarm and suppression systems ▪ Explosion management systems o Appropriate separation of renewable energy infrastructure (in particular BESS units) to avoid spread of fire between infrastructure. o System monitoring for all electrical infrastructure must be provided, especially the BESS unit BMS and fire/gas detection, to ensure that any electrical or equipment failures with the potential to ignite or propagate fire are rapidly identified and relevant site personnel notified to enable early fire brigade notification. o Onsite vegetation management, including NVZ/APZs around renewable energy infrastructure, to limit the ability of onsite fire in the renewable energy infrastructure to escape to surrounding unmanaged vegetation. o Vehicular access and firewater requirements for the renewable energy infrastructure have been determined through application of the CFA Guidelines and provide significant resources for attending firefighters to fight fire within the facility: ▪ The internal road network enables attending firefighters to access all proposed BESS and PCS infrastructure, and the substation, including the provision of multiple entrances to the site and the use of loop perimeter roads. ▪ The onsite firewater supplies, provide a significant quantity of firewater for attending firefighters to control or suppress onsite fires. o Strong liaison with DFES and local fire brigade from facility commissioning and for the duration of operation o Emergency Management Plan that addresses bushfire preparedness, prevention and response activities, including notification of DFES, facility shutdown and offsite evacuation. • ***Based on the above, all requirements with the CFA Guidelines have been met.***
Section 4: Facility Design	***Non-Vegetated Zones (NVZ) and Asset Protection Zones (NVZ)*** • The provision of NVZ and/or APZ: o Around the perimeter of control rooms, electricity compounds, substations and all other buildings onsite. o Of a width of at least 10m, and at least the distance where radiant heat flux (output) from the vegetation does not create the potential for ignition of on-site infrastructure • A NVZ must be:	***All Facilities BESS***	• Vegetation modification and management requirements for the renewable energy infrastructure has been determined through application of the CFA Guidelines and detailed in Section 3.1 of this BRMP. o The BESS units are to have a 17 m wide perimeter NVZ/APZ to achieve BAL-12.5 or lower, consisting of the following: ▪ A 10 m wide NVZ adjacent to the BESS units, that is non-combustible (constructed of concrete, mineral earth or non-combustible mulch etc) and free of vegetation and obstructions at all times, with no plant or equipment unless totally non-combustible.

CFA Guideline Section	Requirement	Type	Development Response
	o Non-combustible, constructed of concrete, mineral earth or non-combustible mulch such as crushed rock. o Free of vegetation and obstructions at all times. o No plant or equipment of any kind is to be stored in fire breaks. *Additional Requirements for BESS* • The provision of a NVZ and/or APZ around battery energy storage systems and related infrastructure.		▪ Otherwise comply with the APZ standards from the WA Guidelines, with the following clarifications: • Have no trees located close enough to BESS's such that any falling branches or trees could mechanically damage the BESS • Largely consist of managed grassland (<100 mm in height) or low groundcovers o The ancillary equipment (PCS, Auxiliary Skids, Generator) are to have an 8 m wide perimeter NVZ/APZ to achieve no less than BAL-29. o The substation is to have an 8 m wide perimeter NVZ/APZ to achieve no less than BAL-29. ▪ In order to limit the chance of electrical faults in the substation igniting a bushfire, all land within the substation NVZ/APZ is to be entirely non-vegetated. o All land within the BESS, PCU and substation perimeter APZs, are to be non-combustible (constructed of concrete, mineral earth or non-combustible mulch etc) and free of vegetation and obstructions at all times, with no plant or equipment unless totally non-combustible. • These vegetation modification and management requirements have been incorporated into Section 5.1 of the project BMP, which are to be maintained in perpetuity (or for the life of the facility). • ***Based on the above, the requirements with the CFA Guidelines have been met although it is noted that some NVZ/APZ have been reduced to 8 m on the basis of exposure to grassland vegetation.***
	Emergency Vehicle Access • Construction of a minimum four (4) metre perimeter road within the perimeter fire break. • Roads must be of all-weather construction and capable of accommodating a vehicle of fifteen (15) tonnes (e.g., no compacted earth). • Constructed roads should: o Be a minimum of four (4) metres in trafficable width with a four (4) metre vertical clearance for the width of the formed road surface. o Incorporate passing bays at least every 600 metres, which must be at least twenty (20) metres long and have a minimum trafficable width of six (6) metres. Where roads are less than 600 metres long, at least one passing bay must be incorporated. o Otherwise comply with the private driveway specifications of the WA Guidelines o Ensure any fencing along access routes allows for width of fire trucks. • Road networks must enable responding emergency services to access all areas of the facility, including fire service infrastructure, buildings, and related renewable energy infrastructure. • The provision of at least two (2) but preferably more access points to each part of the facility. *Additional Requirements for BESS* • The provision of at least two access points into each section where battery energy storage systems are located.	***All Facilities*** ***BESS***	• Vehicular access requirements for the renewable energy infrastructure have been determined through application of the CFA Guidelines and detailed in Section 3.2 of this BRMP. o At least 2 site entrances are to be provided to the facility from Trandos Road into the development o At least 2 entrance/exit gates are to be provided to the BESS yard, and the internal road to be configured as loop road, to avoid creation of any internal dead-end roads. o To align with local expectations, the internal road specifications are to comply with the private driveway specifications of the WA Guidelines, rather than the CFA Guidelines from Victoria. • These vehicular access requirements have been incorporated into Section 5.2 of the project BMP. • ***Based on the above, the requirements of CFA Guidelines have been met, albeit adopting the internal road specifications from the WA Guidelines.***
	Firefighting Water Supply • Water access points must be clearly identifiable and unobstructed to ensure efficient access. • Static water storage tank installations must comply with relevant Australian Standards (including AS 2419.1) and the technical requirements of the WA Guidelines: o The static water storage tank(s) must be an aboveground water tank constructed of concrete or steel. o An external water level indicator must be provided to the tank and be visible from the hardstand area. o Signage indicating 'FIRE WATER' and the tank capacity must be fixed to each tank. o Signage must be provided at each vehicle entrance to the facility, indicating the direction to the nearest static water tank(s). • The static water storage tank(s) must be capable of being completely refilled automatically or manually within	***All Facilities*** ***BESS***	• The CFA guidelines broadly require that that firewater supply for BESS facilities in areas where reticulated water is unavailable, is to be 288,000L or more, or as per the provisions for Open Yard Protection of AS 2419.1-2021, flowing for a period of no less than four hours at 20L/s, whichever is the greater • The Proponent has been advised that manufacturers are typically not recommending use of firewater on BESS fires, and it appears that evidence from recent BESS fires (e.g. Bouldercombe) that the firefighting response is evolving toward this practice. • Given the above, the Proponent is proposing a lesser amount of firewater storage, as determined once the final operation and design elements of the project have been finalised, in consultation with DFES, be provided on site. • The firewater requirements are detailed in Section 3.3 of this BRMP and Section 5.3.2 of the BMP.

CFA Guideline Section	Requirement	Type	Development Response
	24 hours. • The static water storage tanks must be located at vehicle access points to the facility and must be positioned at least ten (10) metres from any infrastructure • The hard-suction point must be provided with a 150mm full bore isolation valve equipped with a Storz connection (or approved alternative), sized to comply with the required suction hydraulic performance. o The hard-suction point must be protected from mechanical damage where necessary. o The hard-suction point must be positioned within four (4) metres to a road or hardstand area and provide a clear access for emergency services personnel. • An all-weather road access and hardstand, compliant with the private driveway specifications of the WA Guidelines and at least 6 m wide and 8 m long, must be provided to the hard-suction point. o The road access and hardstand must be kept clear at all times. • Where the access road has one entrance, an 18 metre diameter turning circle must be provided at the tank. *Additional Requirements for BESS (Centralised)* • ***Where reticulated water is available***, the provision of a fire hydrant system that meets the requirements of AS 2419.1-2021 Clause 3.9: Open Yard Protection, and Table 2.2.5(D): Number of Fire Hydrants Required to Flow Simultaneously - Open Yards. OR • ***Where no reticulated water is available***, provision of a fire water supply in static storage tanks, where: o The fire water supply must be of a quantity no less than 288,000L or as per the provisions for Open Yard Protection of AS 2419.1-2021, flowing for a period of no less than four hours at 20L/s, whichever is the greater. o The quantity of static fire water storage is to be calculated from the number of hydrants required to flow from AS 2419.1-2021: Fire hydrant installations, Table 2.2.5(D). o Fire hydrants must be provided and located so that every part of the battery energy storage system is within reach of a 10m hose stream issuing from a nozzle at the end of a 60m length of hose connected to a fire hydrant outlet. o The fire water supply must be located at vehicle entrances to the facility, at least 10m from any renewable energy infrastructure and buildings. o The fire water supply must be reasonably adjacent to the battery energy storage system and shall be accessible without undue danger in an emergency. (e.g. Fire water tanks are to be located closer to the site entrance that the battery energy storage system). o The fire water supply must comply with relevant Australian Standards (including AS 2419.1) and the technical requirements of the WA Guidelines		• ***Based on the above, while the final capacity of the tanks is yet to be confirmed (and will be done in consultation with DFES),, all other requirements with the CFA Guidelines capable of being met***
	Fire Detection and Suppression Equipment • For on-site buildings and structures, according to the requirements of the National Construction Code. • For storages of Dangerous Goods, according to the requirements of any Australian Standards for the storage and handling of Dangerous Goods. • For electrical installations, a minimum of two suitable fire extinguishers must be provided within 3m-20m of each PCU. • In all vehicles and heavy equipment, each vehicle must carry at least a nine (9)-litre water stored pressure fire extinguisher with a minimum rating of 3A, or other firefighting equipment as a minimum when on-site during the Fire Danger Period.	***All Facilities***	***National Construction Code (NCC) compliance*** • All buildings are to comply with the fire detection and suppression requirements of the NCC. • As detailed in Section 3.5 of the BRMP, from a bushfire construction perspective, the NCC requires additional resilience to be added to Class 1, 2, 3, associated 10a and “certain” Class 9 buildings. o None of these building classifications are proposed at the facility, however the Proponent may consider voluntary adoption of bushfire construction measures to some buildings. • As detailed in Sections 3.4 and 3.5 of the BRMP, BESS container construction is to comply with the CFA Guidelines and incorporate the following: o Container construction is to be non-combustible material (e.g. metal). o Ember protection is to be provided, in accordance with AS 3959 BAL-12.5 specifications)

CFA Guideline Section	Requirement	Type	Development Response
			Dangerous Goods compliance • The proposed BESS units will contain Li-ion batteries (or similar) that will be classified as Dangerous Goods. o This BRMP demonstrate the bushfire risk management measures comply with that of the CFA Guidelines, including reviewing and assessing the potential risk to and from the BESS units. o Notwithstanding, these Dangerous Goods will also need to comply with all relevant Dangerous Goods legislation, codes and standards. • Additionally, should significant quantities of dangerous goods (other than the BESS batteries) be stored or handled onsite: o These will also need to comply with all relevant Dangerous Goods legislation, codes and standards o They should be reviewed by a BPAD Level 3 bushfire practitioner to ensure they are sited in areas of BAL-29 or lower, and appropriately protected from bushfire impact. ***Portable fire extinguishers*** • Portable fire extinguishers are to be provided in (or near) the following in accordance with Australian Standards and Shell requirements: o BESS units o Each building o Substation rooms (e.g. switchroom/control room) o Onsite vehicles • ***Based on the above, all requirements with the CFA Guidelines have been met.***
	Design Specific to Facility Type *Additional Requirements for BESS* • Facility design that incorporates: o A separation distance that prevents fire spread between battery containers/enclosures and other site elements. ▪ Separation must be at least the distance where the radiant heat flux (output) from a battery energy storage system container/enclosure fully involved in fire does not create the potential for ignition of these site elements. o A NVZ and/or APZ around the battery energy storage system and related infrastructure, of a width of no less than 10m (or greater where determined). ▪ NVZ must be non-combustible, constructed of concrete, mineral earth or non-combustible mulch such as crushed rock. ▪ The width must be calculated based on the ignition source being radiant heat of surrounding vegetation, including landscaping. o A layout of site infrastructure that: ▪ Considers the safety of emergency responders. ▪ Minimises the potential for grassfire and/or bushfire to impact the battery energy storage system. ▪ Minimises the potential for fires in battery containers/enclosures to impact on-site and offsite infrastructure. • Battery energy storage systems must be: o Located so as to be reasonably adjacent to a site vehicle entrance (suitable for emergency vehicles). o Located so that the site entrance and any fire water tanks are not aligned to the prevailing wind direction (therefore least likely to be impacted by smoke in the event of fire at the battery energy storage system.)	***BESS***	***Separation Distance*** • While outside the bushfire risk management scope, the BESS related siting requirements have been nominated as per the stated CFA Guidelines requirements, in Section 3.1 of this BRMP and Section 5.4.1 of the BMP. o The expectation is this will be addressed by complying with relevant codes and standards, including Australian Standards, and any manufacturers recommendations. ***NVZ/APZ around BESS and Related Infrastructure*** • Vegetation modification and management requirements for the renewable energy infrastructure has been determined through application of the CFA Guidelines and detailed in Section 3.1 of this BRMP. • These vegetation modification and management requirements have been incorporated into Section 5.1 of the project BMP, which are to be maintained in perpetuity (or for the life of the facility). ***BESS Design Requirements*** • The BESS related design requirements have been nominated as per the stated CFA Guidelines requirements, and summarised in Section 3.4 of this BRMP and Section 5.4.1 of the BMP. • ***Based on the above, all requirements with the CFA Guidelines have been met.***

CFA Guideline Section	Requirement	Type	Development Response
	o Provided with in-built fire and gas detection systems. o Provided with explosion prevention via sensing and venting, or explosion mitigation through deflagration panels. o Provided with suitable ember protection. o Provided with suitable access roads for emergency services vehicles. o Installed on a non-combustible surface. o Provided with suitable ventilation. o Provided with suitable impact protection. o Provided with enclosed wiring and buried cabling, except where required to be above-ground for grid connection. o Provided with spill containment that includes provision for management of fire water runoff.		
Section 5: Facility Construction and Commissioning	***Emergency Plan (Construction)*** • An Emergency Plan must be developed for the construction and commissioning phase of the facility. *Additional Guidance from CFA Guidelines* • An emergency communication system must be provided that is reliable and will operate in the event of power failure. • Install and commission fire detection and suppression systems for the facility at the earliest possible stage of construction. • Provide first-aid firefighting equipment, such as fire extinguishers (and where possible, portable fire hose reels), appropriate to the identified emergency scenarios, at all construction portables/buildings onsite, in the vicinity of all construction activities, and in site-based vehicles. • Provide training for personnel in the use of on-site first-aid firefighting equipment, and responsibilities during emergencies. • Provide the required fire protection equipment for any storages of dangerous goods as per the relevant Australian Standards. • It is recommended the development of safe work procedures for the facility, encompassing but not limited to: o Electricity and chemical management. o Vegetation management. o Ignition source control, including hot works. o Infrastructure, equipment and vehicle maintenance. o Emergency management • Adhere to restrictions on Total Fire Ban or days of elevated fire danger • Restrict smoking to prescribed areas and provide suitable ash and butt disposal facilities. • Fire brigade must be notified at least seven (7) days prior to the commissioning of any high-risk infrastructure at the facility (e.g., battery energy storage systems).	***All Facilities***	• Emergency procedures for the construction phase are to be incorporated in the Construction Management Plan as mentioned in Section 3.6 of this BRMP. • It is recommended that the bushfire emergency management concepts summarised in Section 3.10 of this BRMP and detailed in Section 5.8 of the project BMP for the operational BESS facility, are incorporated into the Construction Management Plan for bushfire preparedness and response, as much as applicable. • Additional bushfire related construction and commissioning requirements for the renewable infrastructure, has been determined through application of the CFA Guidelines and documented in Section 3.6 this BRMP and Section 5.4 of the BMP, including the specific requirement to notify DFES ahead of commissioning any renewable energy infrastructure (e.g. BESS). • ***Based on the above, all requirements with the CFA Guidelines have been met.***
Section 6: Facility Operation	***Fire Management Plan*** • A Fire Management Plan must be developed for the facility, before development starts. *Additional Guidance from CFA Guidelines* • A Fire Management Plan is based on the outcomes of the Risk Management Plan and outlines the activities, processes and accountabilities for the ongoing management of fire risk at the facility including: o A summary of fire hazards and risks to and from the site, specific to its location, infrastructure, activities and occupancy. o Description of control measures to prevent fire occurring and limit the consequences of fire at the	***All Facilities***	• The bushfire related siting, design, construction and maintenance requirements for the renewable infrastructure, has been determined through application of the CFA Guidelines and summarised in Section 3.0 of this BRMP. • These bushfire risk management measures for the renewable energy infrastructure have also been summarised in Section 5.0 of the project BMP, including the nomination of responsible entities for implementation and ongoing management. • The additional BESS requirements are captured as ongoing operation, maintenance and housekeeping requirements, and required information to include in the Emergency Information Book for attending firefighters

CFA Guideline Section	Requirement	Type	Development Response
	facility. o Description of control measures to prevent and reduce the consequences of external fire impacting the facility. o Details of equipment and resources to manage fire at the facility o Policies and procedures that ensure all control measures are appropriate and effective, and remain so. o Procedures for review of the Plan *Additional Requirements for BESS* • A Fire Management Plan for a facility that incorporates a battery energy storage system must also include: o A schedule, list of activities and accountabilities for the inspecting, testing, monitoring and servicing of the battery and its monitoring, safety and protective systems. o Monthly inspections of battery enclosures/ containers and related infrastructure for physical damage. Any damage must be immediately assessed and rectified by a suitably qualified person. o Seismic activity as a trigger for inspecting, testing and servicing of the battery energy storage system and its related infrastructure. Any damages or changes in operating parameters must be immediately assessed and rectified by a suitably qualified person. o Regular inspection and removal of all combustible materials near the battery enclosures/containers and related infrastructure.		• ***Based on the above, all requirements with the CFA Guidelines have been met.***
	Bushfire and Grassfire • If your facility is at-risk of bushfire, prevention and preparedness activities must be detailed in the Fire Management Plan. *Additional Guidance from CFA Guidelines* • Your facility may be at-risk of bushfire if it is: o Located in an area close to or amongst dense or open bush, unmanaged grassland, near coastal scrub, or at an urban fringe. o Identified as being in a Designated Bushfire Prone Area. • Address bushfire prevention and preparedness activities	***All Facilities***	• Bushfire preparedness and response actions for the renewable energy infrastructure has been determined through application of the CFA Guidelines and documented in Section 3.10 of this BRMP. • These bushfire preparedness and response actions have been incorporated into Section 5.8 of the project BMP. • ***Based on the above, all requirements with the CFA Guidelines have been met.***
	Vegetation Management • Facility operators must undertake the following measures during the nominated bushfire season (as per Local Government firebreak notice): o Grass must be maintained at or below 100mm in height during the nominated bushfire season. o Long grass and/or deep leaf litter must not be present in areas where heavy equipment will be working, during construction or operation. o Restrictions and guidance must be adhered to during the nominated bushfire season, days of High (and above) fire danger and declared Total Fire Ban days *Additional Requirements for BESS* • Containers/enclosures and infrastructure for battery energy storage systems must be maintained to be clear of vegetation, including grass, for at least 10 m on all sides (or greater where determined).	***All Facilities***	• Vegetation modification and management requirements for the renewable energy infrastructure has been determined through application of the CFA Guidelines and detailed in Section 3.1 of this BRMP. • These vegetation modification and management requirements have been incorporated into Section 5.1 of the project BMP, which are to be maintained in perpetuity (or for the life of the facility). • Compliance with restrictions and guidance on days of elevated Fire Danger Rating, and Total Fire Ban days is summarised in Section 3.10 of this BRMP and expanded upon in Section 5.8 of the BMP • ***Based on the above, all requirements with the CFA Guidelines have been met.***
	Arc Flash Hazard Management *Additional Guidance from CFA Guidelines* • Where required, appropriate demarcation of arc boundaries to at least 10m from PCU arc flash outlet flaps (blow-out panels) must be provided.	***All Facilities***	• While outside the bushfire risk management scope, the Proponent has advised they will comply with relevant arc flash standards • ***Based on the above, all requirements with the CFA Guidelines have been met.***
	Facility and System Monitoring • Appropriate monitoring for facility infrastructure must be provided, to ensure that any shorts, faults or	***All Facilities***	• The proposed BESS facility is to be monitored, both onsite (during business hours) and offsite (at all times) as detailed in Section 3.4 of the BRMP and Section 5.4.3 of the BMP.

CFA Guideline Section	Requirement	Type	Development Response
	equipment failures with the potential to ignite or propagate fire are rapidly identified and controlled, and any fire is notified to 000 immediately. *Additional Requirements for BESS* • For battery energy storage systems, appropriate monitoring and intervention measures must be provided to ensure that the following are rapidly identified and notified to 000 immediately: o Any shorts, faults, temperature increases above normal parameters (eg., precursor to thermal events/runaway). o Equipment failures with the potential to ignite or propagate fire. o Off-gassing, smoke or fire. • The provision for direct alarm monitoring to the fire brigade for battery energy storage system automatic detection systems must be considered		• The substation functionality is expected to be monitored by Shell. • The following emergency response procedures for an onsite fire (in particular a BESS fire) are included in the bushfire emergency management arrangements summarised in Section 3.10 of this BRMP and expanded upon in Section 5.8 of the BMP: o Immediately notify DFES to enable a rapid turnout o Notify neighbouring development such as Neerabup Power Station. o Ensure no staff approach the BESS (if there are any onsite). Staff should move to safe distance from the project area, no less than 50 m. o Strongly consider full emergency shutdown of the BESS and substation unless there are mitigating circumstances. This should be conducted in consultation with authorised DFES personnel (where possible). o If possible, contact Specialist Technical Support for further guidance. • ***Based on the above, all requirements with the CFA Guidelines have been met.***
	Maintenance and Housekeeping • Inspection, maintenance and any required repair activities must be conducted for all infrastructure, equipment and vehicles at the facility. • Maintenance must be in line with any relevant Australian Standards, the manufacturer's requirements. • Site-wide housekeeping inspections must be conducted regularly at facility. If your facility is at-risk of bushfire, site-wide bushfire preparedness housekeeping inspections must be conducted at least three months, and again one month, prior to the Fire Danger Period.	***All Facilities***	• The bushfire related siting, design, construction and maintenance requirements for the renewable infrastructure, has been determined through application of the CFA Guidelines and documented in this BRMP, including specific requirements during the operation phase relating to maintenance and housekeeping in Section 3.7. • These bushfire risk management measures for the renewable energy infrastructure, including ongoing maintenance and management requirements, have also been summarised in the project BMP in Section 5, including the nomination of responsible entities for ongoing management on Table 6 of the BMP. • ***Based on the above, all requirements with the CFA Guidelines have been met.***
	Safe Dangerous Goods Storage and Handling *Additional Guidance from CFA Guidelines* • Signage and labelling compliant with the Dangerous Goods (Storage and Handling) Regulations 2022 and the relevant Australian Standards must be provided at the site entrance, dangerous goods storage locations, and storage tanks where applicable. • Appropriate material for cleaning up dangerous goods spills and leaks (including absorbent, neutralisers, tools, disposal containers and personal protective equipment) must be provided and available on-site. • Training must be provided for site personnel on the hazards, safe use and emergency response for spills, leaks and fire involving dangerous goods. • All dangerous goods stored on-site must have a current Safety Data Sheet (SDS). Safety Data Sheets must be provided within the facility's Emergency Information Book(s), in the Emergency Information Container(s). • The requirements of the dangerous goods legislative framework, and all relevant Australian Standards must be complied with for all facilities, including facilities with battery energy storage systems.	***All Facilities***	• The proposed BESS units will contain Li-ion batteries (or similar) that will be classified as Dangerous Goods. o This BRMP demonstrate the bushfire risk management measures comply with that of the CFA Guidelines, including reviewing and assessing the potential risk to and from the BESS units. o Notwithstanding, these Dangerous Goods will also need to comply with all relevant Dangerous Goods legislation, codes and standards. • Additionally, should significant quantities of dangerous goods (other than the BESS batteries) be stored or handled onsite: o These will also need to comply with all relevant Dangerous Goods legislation, codes and standards o They should be reviewed by a BPAD Level 3 bushfire practitioner to ensure they are sited in areas of BAL-29 or lower, and appropriately protected from bushfire impact. • The Emergency Information Book is to contain a current manifest of dangerous goods (if required) and Safety Data Sheets (SDS) for Dangerous Goods stored on-site. • ***Based on the above, all requirements with the CFA Guidelines have been met.***
	Fire Risk Review *Additional Guidance from CFA Guidelines* • Fire risk must be effectively managed at operating facilities to meet obligations for providing a safe workplace under the OHS Act. • Fire brigade recommends that facility operators consider the design guidelines and model requirements contained in this document and develop procedures to ensure that: o The Fire Management Plan is reviewed and updated regularly, in line with any reviews and changes to hazards and risk management as per the Risk Management Plan, and where there is a near-miss or incident at the facility.	***All Facilities***	• Like any BMP or BRMP, if there are significant changes to the development, they should be reviewed, and if required amended, to reflect those changes. • The Emergency Management Plan for the facility is to be reviewed and amended as summarised in Section 3.10 of the BRMP and Section 5.8 (in particular Section 5.8.5) of the project BMP. • ***Based on the above, all requirements with the CFA Guidelines have been met.***

CFA Guideline Section	Requirement	Type	Development Response
	○ The Emergency Plan is reviewed and updated to reflect any changes in the Fire Management Plan, including where fire risks emerge or change, risk controls are added or modified, or where there is a near miss or incident at the facility. • Where substantive changes are made to these documents, fire brigade recommends considering peer-review by a suitably qualified, independent third party.		
Section 7: Emergency Planning	***Emergency Plan (Operational)*** • An Emergency Plan must be developed for the operational phase, specific to the facility, before development starts. *Additional Guidance from CFA Guidelines* • An Emergency Plan (EP) details the arrangements for managing emergencies, including the facility details, structures, procedures, resources and training. EP's must be specific to the infrastructure, operations and location of facilities, and informed by a sound risk management process. • The EP should address the following for each hazard: ○ Emergency Response Procedures (including evacuation or onsite shelter-in-place as required) ○ Personnel Training ○ Emergency Exercises • The EP is a 'living document' that must be regularly reviewed to ensure their currency and effectiveness. *Additional Requirements for BESS* • Emergency Plans for facilities with battery energy storage systems must additionally include: ○ Contact information for 24/7/365 specialist technical support for the battery energy storage system. ○ Emergency response procedures based on identified risks and hazards of the battery energy storage system and related infrastructure, including but not limited to: ▪ Electrical infrastructure faults and fire. ▪ Battery energy storage system damage or faults, including battery monitoring faults, temperature increases above normal operating parameters, electrical faults, chemical spills or reactions, off-gassing, thermal events/runaway, smoke and fire. ▪ Bushfire and grassfire. ▪ The management of fire water runoff. ○ Details of the elements monitored/controlled by the Battery Management System (BMS), including internal temperature, state of charge, voltage, etc. and the locations this information is available (e.g., at the BESS containers, in an on-site control room, off-site monitoring facilities). ○ A plan for partial and full decommissioning of the battery energy storage system in the event of an emergency incident that renders the facility inoperable or unsafe, before its anticipated end-of-life. ○ Any information that supports the considerations in Appendix B: Emergency Response Considerations for Large-Scale Battery Energy Storage Systems. • This information must also be provided within the facility's Emergency Information Book.	***All Facilities***	• Bushfire emergency management preparedness and response concepts for the renewable energy infrastructure has been summarised in Section 3.10 of this BRMP. • The bushfire emergency management preparedness and response concepts detailed in Section 5.8 of the project BMP, which cover both proposed buildings and renewable energy infrastructure, are to be incorporated into the overall facility Emergency Management Plan. • The additional requirements for BESS facilities documented in the CFA Guidelines, have been included in the Emergency Information Book and signage for attending firefighters, and the site Emergency Management Plan • ***Based on the above, all requirements with the CFA Guidelines have been met.***
Section 8. Provision of Emergency Information	***Developing an Emergency Information Book*** • An Emergency Information Book must be developed and available to emergency responders, and include the following: ○ A description of the premises, its infrastructure and operations. ○ Site plans that include the layout of the entire site, including buildings, internal roads, infrastructure, fire protection systems and equipment, dangerous goods storage areas, gas detectors, battery energy storage systems, substations/terminals, grid connections, drains and isolation valves, neighbours and the direction of north.	***All Facilities***	• The Emergency Information Book and signage, and emergency service familiarisation process for the renewable energy infrastructure, has been determined through application of the CFA Guidelines and detailed in Sections 3.83.8 and 3.9 of this BRMP. • These requirements have been incorporated into Sections 5.6 and 5.7 of the project BMP. • ***Based on the above, all requirements with the CFA Guidelines have been met.***

CFA Guideline Section	Requirement	Type	Development Response
	o A manifest of dangerous goods (if required) as per Schedule 3 of the Dangerous Goods (Storage and Handling) Regulations 2022. o Procedures for the management of emergencies, including evacuation, shelter-in-place (for facilities at risk of bushfire/grassfire), containment of spills and leaks, and fire procedures (including infrastructure/plant fires, vehicle fires, grassfire/bushfire) o Details of emergency equipment, including the type and location of gas detectors. o Up-to-date contact details for site personnel, regulatory authorities and site neighbours. o Safety Data Sheets (SDS) for dangerous goods stored on-site. • Emergency Information Books must be located weatherproof container, at each vehicle entrance the facility • Prior to commissioning of the facility, a familiarisation visit and explanation of emergency procedures is to be offered to local fire brigades and other emergency services. o A schedule for ongoing site familiarisation to account for changing personnel, facility infrastructure and hazards, and emergency exercises should be developed in conjunction with the local fire brigade. o A review of the information contained within the facility's Emergency Information Book must be undertaken prior to commencement of bushfire season annually.		

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Appendix A

BESS Historical Failure Events and Testing Review

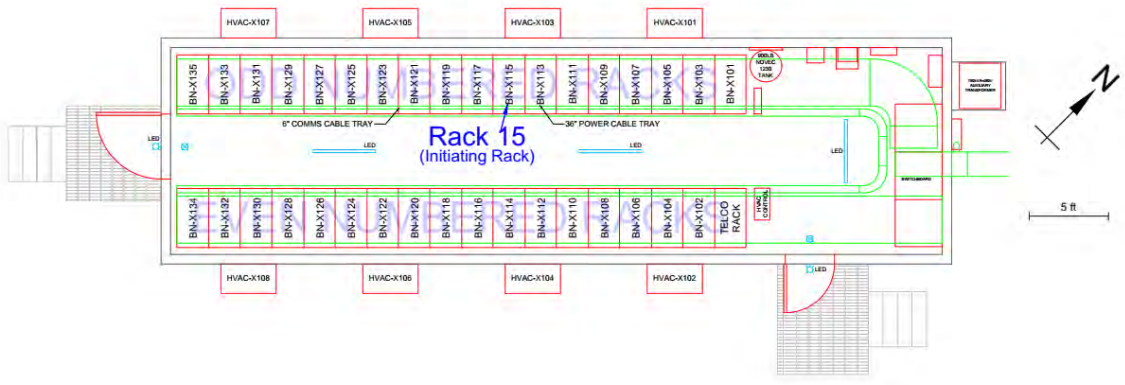
- **Arizona Containerised BESS Failure (2019)**
- **Victorian Big Battery Fire Review Findings (2021)**
- **Bouldercombe Battery Project Fire Findings (2023)**
- **Fire Protection Research Foundation Li-ion battery energy storage system fire testing (2015)**
- **Fisher Engineering Inc Megapack fire testing**

Arizona Containerised BESS Failure (2019)

On 19 April 2019, a fire was reported at an unmanned BESS containing Li-ion batteries in Arizona, which several hours later exploded, injuring several firefighters and destroying the BESS and its container (UL, 2020). The BESS was owned by the local power company, and consisted of a Li-ion battery array (capacity of 2 MWh), which was to integrate solar energy resources in an area with high rooftop solar penetration and grid services, including voltage regulation and power quality.

The BESS had the following features (DNV-GL, 2020):

- Was a containerised system in a standard shipping container (15 m long x 4 m wide x 3.6 m high).
- Internal components included all the battery modules, battery management systems (BMS), power inverters, HVAC, fire suppression, data capture and monitoring equipment, and other auxiliary components.
- Included 27 racks that each housed 14 battery modules (each with 28 lithium-ion NMC battery cells)
- Only external components were BESS interconnection apparatuses such as transformers, breakers, and switch gear.
- The BESS was monitored remotely via wireless communication.
- Fire systems consisted of:
    - Very Early Smoke Detection Apparatus (VESDA) laser-based smoke detection system to detect fine particles and diminishing visibility (due to smoke) within a room.
        - Detection of smoke or fire would sent a signal to fire alarm panel, for alarm of suppression agent discharge.
    - A Novec 1230 “total flooding” clean agent fire suppression system,
        - At the time of commissioning, these clean agent systems were a common method for managing fire suppression in BESS containers because clean agents are electrically nonconductive and do not leave a residue.



A summary of the failure event and subsequent explosion is as follows:

- On 19 April 2019 at 16.54, a battery cell in Rack 15 the BESS experienced a sudden drop in voltage during a charge cycle, equivalent to a single cell voltage drop. Moments after the voltage drop occurred, the battery cell went into thermal runaway.
    - At this time, all batteries were charged to 90% state-of-charge (SOC).

- This event generated off-gassing and smoke that activated the VESDA smoke detection system and led to the discharge of the Novec 1230 agent approximately 60 seconds following voltage drop.
- The initiating cell's thermal runaway cascaded into thermal runaway of neighbouring cells and modules. The off-gassing of battery cells from the cascading thermal runaway created a flammable atmosphere within the BESS.
- Approximately 45 mins after suppression system discharge, local fire brigade was notified by call to dispatch of the bad smell and smoke. Firefighters arrived on scene about 8-9 mins following dispatch notification.
- Remote communications with the BESS were lost just following the dispatch call, approximately 50 minutes after initial event.
- Approximately 3.25 hours after the initial voltage drop, firefighters opened the side container door, and approximately 2-3 minutes after the door was opened, an explosion occurred.
    - The doors on the side and rear of the BESS and other debris were ejected by the explosion and the HVAC systems were also significantly damaged.
    - Other firefighters outside the BESS described hearing a loud noise and seeing a jet of flame that extended 23 m outward, and 6 m vertically, from the southeast-facing door. At least one firefighter was thrown 20 m from the BESS.
    - After the explosion, there was no visible fire in the BESS, but flames were visible in the desert to the southeast of the BESS, approximately 23 m away, which were extinguished by attending firefighters.

Based on post-incident investigation, the series of events resulting in the explosion were concluded to be the following (DNV-GL, 2020):

- Internal failure in a battery cell initiated thermal runaway.
    - The failure was caused by an extensive cascading thermal runaway event, initiated by an internal cell failure within one battery cell, likely due to internal defect within battery.
- The fire suppression system was incapable of stopping thermal runaway.
    - The total flooding clean agent fire suppression system operated early in the incident, and in accordance with its design, however clean agent fire suppression systems are designed to extinguish incipient fires in ordinary combustibles, and are not capable of preventing or stopping cascading thermal runaway in a BESS.
- Lack of thermal barriers between cells led to cascading thermal runaway.
    - Thermal runaway cascaded and propagated from the incipient cell, through every cell and module in the rack, via heat transfer, which was aided by the lack of adequate thermal barrier protections between battery cells, which may have stopped or slowed the propagation of thermal runaway.
- Flammable off-gases concentrated without a means to ventilate or monitor.
    - The uncontrolled cascading of thermal runaway through the battery rack led to the production of a large quantity of flammable gases, which were assessed to be sufficient to create a flammable atmosphere within the BESS container.
    - The design of the BESS did not include explosion venting or adequate mechanical ventilation to prevent accumulation of flammable gases above an explosive

concentration, noting that this was not required by applicable codes at the time the BESS was commissioned. It is also noted that the clean agent fire suppression system does require a level of airtightness to enable retention of the agent for a period of time, although this was ineffective in arresting thermal runaway.

- The fire and smoke detection systems did not include, and were not required to include, gas detection, thus there was no way for attending firefighters to monitor gas concentration conditions inside the BESS from a physically secure location.
- The BESS communication system failed therefore there was no ability to understand the conditions inside the container.

- Emergency response plan did not have an extinguishing, ventilation, and entry procedure, nor was the necessary information available to attending firefighters.
  - Approximately three hours after thermal runaway began, the BESS door was opened by firefighters, agitating the remaining flammable gases, and allowing the gases to make contact with a heat source or spark.
  - The emergency response plan provided to firefighters, although compliant with the applicable codes and standards at the time of the incident, did not provide adequate guidance for mitigating thermal runaway, fire, and explosion hazards generated by the BESS.
  - The emergency response plan was not provided to fire brigade prior to this incident, although this was not required by the applicable codes or standards at the time of the incident.

Based on the above, the post-incident investigations have made the following recommendations (DNV-GL, 2020):

- Cell quality
  - Should be a major focus to limit potential for thermal runaway generating from internal cell defects.
- Cascading thermal runaway
  - A barrier to limit the rate, or prevent cascading altogether, would have reduced the quantity of gases in the atmosphere of the container.
- Ventilation and cooling
  - The container will need to eventually be accessed in order to regain safe control, and the flammable gases must eventually be dissipated before access is gained.
  - A means to safely ventilate the system in a controlled manner will reduce the flammability of the atmosphere, including incorporation of adequate explosion prevention protection as required in NFPA 855 or International Fire Code, where applicable.
  - Prior to ventilating, cooling of the system with water using a dry pipe system, may have decreased the pressure of an explosion if it were to occur.
- Proper monitoring, detection and extinguishing systems and strategies
  - BESS's should incorporate robust communications systems to ensure remote access to data from the BMS, sensors throughout the BESS, and the fire alarm control panel remains uninterrupted.
  - BESSs should incorporate gas monitoring that can be accessed remotely.

- A clean agent or aerosol alone is not enough to prevent cascading thermal runaway or manage the concentration of flammable gases that will follow, and that a combined strategy of fire suppression followed by ventilation and cooling strategies should be a requirement going forward.

- Response plans and entry
  - Owners/operators of the BESS should develop an emergency operations plan, ideally in conjunction with local fire brigade personnel, which comprehensively details:
    - the hazards associated with Li-ion battery technology including the potentially explosive nature of the gases released during Li-ion battery thermal runaway.
    - response procedures that incorporated system monitoring, the detection of gases, ventilation practices, extinguishing methods, and information to gather before entry.
  - If such training is conducted early in the project development and commissioning process, it permits the attending fire brigade to learn about the system and be aware of its hazards.
  - These procedures should be documented, available outside the BESS container or building, and demonstrated through training which should be refreshed and updated periodically.

The post-incident reports also note the following:

- BESS have historically been packaged into standard shipping containers, however in 2019-2020, there has been a gradual shift from these to compartmentalised, modular cabinets that have ingress protection ratings and stand-alone BMS and/or inverter capability, such that multiple cabinets can be strung together to build a large system.
- Current BESS standards better address hazard assessment and training for first responders, however the industry expectation should go even further and require that hazard assessments and training take place before and during the commissioning of the BESSs.

Victorian Big Battery Fire Review Findings (2021)

One example of thermal runaway occurring in Australia, was the Victorian Big Battery fire in 2021.

- In July 2021, a single Megapack at Victorian Big Battery (VBB) in Geelong caught fire and spread to a neighbouring Megapack during the initial installation and commissioning. The fire did not spread beyond these two Megapacks (212 Megapacks on the project in total) and they burned themselves out over the course of approximately six hours. Plate 4 depicts the timeline of events for the fire.
- There were no injuries to the general public, to site or emergency services personnel as the Megapacks failed safely (i.e., slowly burned themselves out with no explosions or deflagrations), as they are designed to do in the event of a fire.
- Fisher Engineering Inc (FEI) conducted the independent review of the fire, with Energy Safe Victoria (ESV) producing a summary of the technical findings.
- The cause was identified as being a leak within the cooling system that caused a short circuit that led to a fire in an electronic component which led to a thermal runaway and fire in an adjacent battery compartment within one Megapack, which spread to an adjacent second Megapack.

Plate 4: Victorian Big Battery Fire: Incident Timeline (Source: FEI 2022)

- Factors that contributed to this incident included:
  - The supervisory control and data acquisition (SCADA) system took 24 hours to 'map' the Megapack and provide full data and oversight functionality to operators. The

Megapack that caught fire was not mapped before being switched into an off-line mode, which prevented the receipt of alarms at the control facility.

- A key lock was operated correctly to switch the Megapack to off-line service mode (which was no longer required for ongoing commissioning) but this caused:
  - telemetry systems for monitoring the condition of the Megapack to shut down and so remove visibility of the developing event
  - the battery cooling system to shutdown
  - the battery protection system to shut down, including the high voltage controller (HVC) that could have operated a pyrotechnic fuse to disconnect the faulty battery unit.

- Based on the cause and contributory factors, the following remediation measures have been put in place to prevent a recurrence of this incident:
  - Each Megapack cooling system is to be fully functionally and pressure tested when installed on site and before it is put into service
  - Each Megapack cooling system in its entirety is to be physically inspected for leaks after it has been functionally and pressure tested on site
  - The SCADA system has been modified such that it now 'maps' in one hour and this is to be verified before power flow is enabled to ensure real-time data is available to operators
  - A new 'battery module isolation loss' alarm has been added to the firmware; this modification also automatically removes the battery module from service until the alarm is investigated
  - Changes have been made to the procedure for the usage of the key lock for Megapacks during commissioning and operation to ensure the telemetry system is operational
  - The high voltage controller (HVC) that operates the pyrotechnic fuse remains in service when the key lock is isolated
  - The proposed mitigation procedures to be rolled out to applicable Megapacks globally.
- ESV concluded that the incident was most likely initiated by a Megapack coolant leak. The absence of a number of monitoring and protection systems that would have been available had the initial Megapack not been subsequently switched to off-line service mode allowed the initial fault to go undetected and resulted in the total loss of two Megapacks. The affected Megapacks failed safely despite total loss.

Bouldercombe Battery Project Fire Findings (2023)

In September 2023, a lithium Tesla Megapack 2.0 unit ignited at the Bouldercombe Battery Project in Rockhampton in Queensland, owned and operated by Genex Power. The following information has been released regarding the fire:

- The fire ignited at 7.32pm on 26 September 2023 in one of the Megapack units (40 in total were installed)
- No-one was on site at the time of the incident.
- On advice from the Queensland fire brigade and protocols provided by Tesla:
    - The low intensity fire was allowed to burn out with no water required to be used on the fire itself.
    - Queensland fire brigade monitored temperatures within, and around, the unit to ensure visible fire didn't spread.
    - Queensland fire brigade monitored gas levels and conducted air sampling in the Bouldercombe region, and confirmed residents should have no concern about toxic gas.
        - It is noted that smoke did spread across the immediate area, and nearby residents were urged to stay indoors and keep respiratory medication close by.
- The fire did remain contained to the single initially affected Megapack unit, without propagating to other BESS units.
- While a specific time of extinguishment is not provided, it is noted that Genex re-energised the site and subsequently completed a charge across 36 Megapack units on the evening of 28 September 2023, less than 2 days following the fire.

Further information was provided in November 2023, including:

- Tesla conducted a preliminary analysis via remote diagnostics immediately following the fire
- On 13 October, the affected Megapack was transported to a testing facility in Melbourne to complete further analysis via physical inspection.
- A full cause analysis report from Tesla has not yet been made publicly available however the following is noted:
    - The fire has been blamed on a fault in the power interface with the grid, and not within the Megapack battery itself.
    - Tesla replaced the two faulty power electronics units, and conducted a physical inspection of the power electronics within the remainder of units
    - Genex implemented upgrades to breaker control setting response times to further mitigate against a potential future event

Fire Protection Research Foundation Li-ion battery energy storage system fire testing

In 2015, internal and external fire testing was undertaken on a Tesla Powerpack as part of a hazard assessment of lithium-ion battery energy storage systems conducted by the Fire Protection Research Foundation (FPRF, 2016). A high-level summary of the testing methodology and results is provided below:

External Fire Test

- *Methodology*
  - The test was conducted on a Tesla Powerpack battery pack that was at full 100% state of charge
  - The Powerpack was exposed to a 400 kW propane burner located adjacent to the steel enclosure, producing temperatures approaching 1100 °C and direct flame contact
  - The enclosure was exposed to the propane burner for a duration of 60 minutes, with monitoring occurring for 3 hours and 45 minutes from the start.
  - A variety of temperature, pressure and gas measurements were taken, in addition to video, photography and visual observations.
- *Key Results*
  - It was approximately 35 min into the test before visible signs of impact were observed, namely white smoke.
  - Sustained flaming occurred after 47 minutes, with steady popping sounds consistent with thermal runaway. Flaming from the cabinet continued until 3 hours and 41 minutes from the start of the test.
  - No projectiles or explosions were observed at any time

Internal Fire Test

- *Methodology*
  - The test was conducted on a Tesla Powerpack battery pack that was at full 100% state of charge
  - During the internal fire test, multiple battery cells were forced into thermal runaway by multiple internal ignition sources (small heaters)
  - The test is aims to overwhelm the Powerpack safety features and induce cascading thermal runaway.

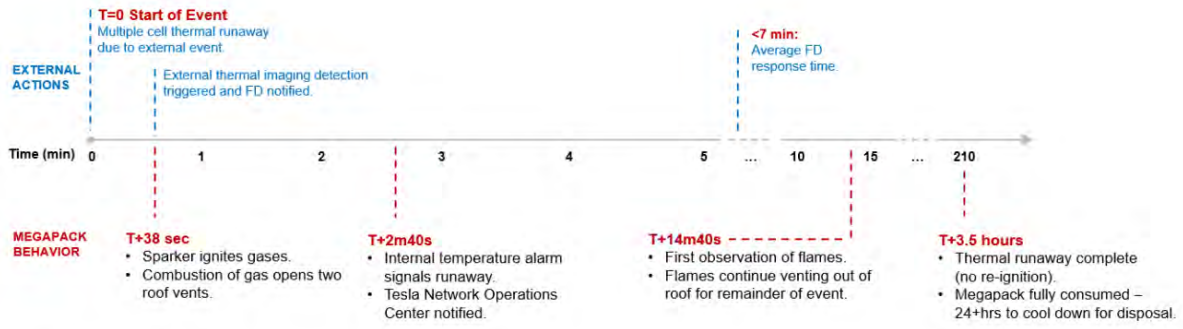
- *Key Results*
  - Popping sounds from the interior of the Powerpack were heard sporadically after 12 minutes from the start, with smoke commencing after 15 minutes and ceasing after 1 hour and 30 minutes.
  - No flames, projectiles or explosions were observed at any time
  - Thermal runaway was restricted to the module in which the runaway event was initiated, and did not propagate outside the cells where the heaters (ignition source) were installed.

Fisher Engineering Inc Megapack fire testing

- Fisher Engineering, Inc. (FEI) performed an analysis of the Megapack energy storage system, including review of the construction, design, fire safety features and UL9540A large-scale fire test data against the regulatory requirements in International and US fire codes and standards, including:
    - 2021 International Fire Code (IFC)
    - 2021 National Fire Protection Association (NFPA) 1 Fire Code
    - 2020 National Fire Protection Association (NFPA) 855, Standard for the Installation of Stationary Energy Storage Systems
    - 2019, UL9540A, Test Method for Evaluating Thermal Runaway Fire Propagation in Battery Energy Storage Systems, Edition 4
- It is noted that the FEI analysis is not specifically related to management of bushfire risk, however some observations and outcomes are considered relevant.

Analysis Results and Comments

- Suitable protection against deflagration (heating substance until it burns away rapidly) is to be provided where required (where BESS exceeds certain sizes)
- US Fire codes require areas within 10 ft (3 m) on each side of outdoor BESS shall be cleared of combustible vegetation and other combustible growth.
    - Single specimens of trees, shrubbery, or cultivated ground cover such as green grass, ivy, succulents, or similar plants used as ground covers shall be permitted to be exempt provided that they do not form a means of readily transmitting fire.
- A large-scale UL9540A fire test was conducted in May 2020, to evaluate thermal runaway and fire propagation. This is test is referenced in both the IFC and NFPA 1 as a fire test method capable of providing key fire safety information of a BESS.
    - The test was performed on a 3 MWh Megapack (with 17 battery modules which is the maximum number of battery modules), with cells fully charged.
    - This is considered the worst-case scenario of all the Megapack variations that can be installed, as they can be as few as 6 battery modules (about 1MWh) and due to the smaller capacity, would not be expected to perform worse from this worst-case scenario.
- Plate 5 summarises the key events that occurred during the UL9540A fire testing
- Radiant heat flux levels recorded during the test were as follows:
    - between minutes 38 and 43, at distances of 20 feet (6.1 m) and 30 feet (9.1 m) in front of the Megapack, the highest values measured during this 5-minute stretch of time was 28.8 kW/m^2 and 9.8 kW/m^2 respectively.
    - at 30 feet (9.1 m), the radiant heat fluxes were between 1.5 kW/m^2 and 9.8 kW/m^2 with an average value of 4.9 kW/m^2.
    - A brief secondary heat flux peak was recorded between minutes 53 and 58; however, the heat fluxes never reached as high as the initial peak that occurred between minutes 38 and 43.



Time (h:mm:ss)	Event
0:00:00	Start of test. First cells go into thermal runaway.
0:00:38	Internal sparker ignites localized concentration of flammable gases and over-pressure roof vents open.
0:00:38	External thermal imaging detector alarm goes into alarm.
0:02:40	Internal module temperature alarm signals thermal runaway at the BMS and notifies the Tesla Network Operations Center.
0:08:25	Ongoing constant stream of hot smoke and gases coming out of the over-pressure roof vents.
0:14:40	First observation of external flames. Continuous flaming event from this time until test end.
0:38:00 – 0:43:00	Peak heat flux measured 20-30 feet in front of Megapack.
3:30:00	End of test. Last observation of visible flames. Fire consumed the Megapack slowly spreading from module bay to module bay until all cells were combusted. All doors remain shut throughout the event. No projectiles, explosions or flying debris were observed.

Plate 5: UL9540A Megapack Fire Testing: Timeline of Key Event (Source: FEI 2020)

- Fire never spread to the target Megapacks installed 150 mm to the side and to the back of the Megapack nor were the cells of the neighbouring Megapacks damaged by the heat.
- During the test, and afterwards during clean-up, no liquid runoff (such as from glycol) was observed.
- The UL9540A large-scale fire testing demonstrated that in the event of a thermal runaway of the Li-ion cells, the Megapack has safety features installed to mitigate the risks of an explosion. During the test, the fire consumed the Megapack slowly, spreading from module bay to module bay until all cells were combusted. All doors remain shut throughout the event and no projectiles, explosions or flying debris were observed; only flames were observed emanating from the roof vents.

Our Ref: D39323
Your Ref: DA2025/476

Aaron Jones
City of Wanneroo
aaron.jones@wanneroo.wa.gov.au

Dear Mr Jones

RE: LOT 100 (45) TRANDOS ROAD, NEERABUP – PROPOSED NEERABUP BATTERY ENERGY SORAGE SYSTEM - DEVELOPMENT APPLICATION

I refer to your email dated 14 May 2025 regarding the submission of a Bushfire Management Plan (BMP) (Version B), prepared by Covey Associates and dated 14 March 2025, for the above proposed development. The BMP is accompanied by a Bushfire Risk Management Plan (BRMP) also from Covey Associates dated 14 March 2025 in relation to the proposal.

This advice relates to the *State Planning Policy 3.7 Bushfire* (SPP 3.7) and supporting *Planning for Bushfire Guidelines* (Guidelines), as well as DFES' role and responsibilities as Hazard Management Agency for Fire in Western Australia.

General Comment

- DFES acknowledges that the site currently accommodates the existing Neerabup Power Station, and the proposed development includes a 142-megawatt (MW) battery energy storage system (BESS) facility, operational and maintenance buildings, a substation and supporting infrastructure.
- It is noted that the BMP and the BRMP were reviewed and signed by Ms Mariza Coslan of Covey Associates. However, the author signature areas of both documents include a 'copyright notice' stating that '*parts of this document contain material originally prepared by*' Mr Linden Wear. While Mr Wears is an accredited Level 3 bushfire planning practitioner, it is unclear whether he is the author of these documents or only contributed to some of the contents.
- DFES notes that the current version of SPP 3.7 and the Guidelines no longer refers to 'high risk land use'. The decision maker has referred this proposal to DFES as a discretionary referral. DFES considers that SPP 3.7 and the Guidelines do not adequately address high risk land use such as renewable energy facilities.
- Accordingly, DFES has also assessed the proposal against the *CFA Design Guidelines and Model Requirements – Renewable Energy Facilities v4 (version 4.3, August 2023)* (REF Guidelines) which is considered best practice for the development of renewable energy facilities.
- Specific requirements of SPP 3.7 and the supporting Guidelines and the REF Guidelines are to be further addressed in the BMP as outlined in the below assessment. The assessment comments relating to the REF Guidelines have been incorporated into the below overall assessment comments for the respective issue/element.

Recommendation: Compliance with acceptable solutions not demonstrated – modifications required

DFES advises that the BMP has not demonstrated that the proposed development complies with the following requirements of SPP 3.7 and the Guidelines:

1. Element 2: Siting and Design.
2. Element 3: Vehicular Access; and
3. Element 4: Water Supply.

DFES recommends the BMP be modified as per the Assessment advice provided in Tables 1-3 to ensure it is accurate and the bushfire risk management/mitigation measures are effective and can be implemented in perpetuity to manage/mitigate the bushfire risk to people, property and infrastructure to an acceptable level and appropriate to the land use and location. The required modifications are listed in the table(s) below. Should the modified BMP affect the design of the proposal, the proposal should be amended to reflect these modifications.

Could you please forward notification of the application determination to DFES for our records.

If you require any clarification or further information regarding the below assessment, please do not hesitate to contact Sean He – Senior Land Use Planning Officer on telephone number 9395 9702.

Yours sincerely

Desmond Abel
DIRECTOR LAND USE PLANNING

25 June 2025

Table 1 – Assessment – Policy Measure 7.1 ii. c. Compliant Preparation of a BAL Contour Map

Vegetation Classification or Exclusions	BMP Modification Required
Exclusion Plots 15 and 17 – not demonstrated Evidence to support the exclusion of Plots 15 and 17 as managed to low threat in accordance with AS3959 is required. As these areas include the Trandos Road and Orchid Road reserves, confirmation from the responsible authority should be provided that the reserve areas will be managed to low threat in perpetuity. If unsubstantiated, the vegetation should be classified as per AS3959, or the resultant BAL ratings may be inaccurate.	**BAL Rating cannot be validated** Further evidence to support the proposed vegetation exclusion of Plots 15 and 17 is required.

Table 2 - Policy Measure 7.1 ii. e. Compliance with the Bushfire Protection Criteria 7: Development – Commercial and Industrial

Element	Assessment	Action
Siting and Design – Siting and Design	**A2.1a – not demonstrated** The BAL ratings cannot be validated for the reason(s) outlined in Table 1.	**BAL Rating cannot be validated** Modification to the BMP is required to address the Assessment advice in Table 1.
Vehicular Access – Private Driveway	**A3.1 – not demonstrated** The proposed vehicular access to the development site is from the unconstructed portion of Trandos Road, it is unclear whether this complies with the weight capacity requirements of Appendix B.3, Table 10 of the Guidelines and whether any road upgrade is required to facilitate emergency services vehicles operation.	**Compliance with Vehicular Access not demonstrated** Modification to the BMP is required to address the Assessment advice.

Water Supply	**A4.1 – not demonstrated** The BMP proposes fire water tanks with a combined capacity of 30,000 litres for the proposed habitable buildings; however, the fire water location and capacity for the BESS facilities have not been specified. The REF Guidelines requires as a 'model requirement' that a fire water supply of no less than 288,000 litres to be provided for BESS facilities. However, the BMP proposes a lesser amount that is to be determined at the final facility design stage, based on advice from manufacturers that fire water is not recommended on BESS fires. DFES notes that where a REF Guidelines model requirement is proposed to be reduced, it should be supported by a Fire Safety Study. DFES does not consider anecdotal manufacturers' recommendation without supporting evidence as a valid justification to reduce the model requirements. As the fire water supply is likely to impact facility design, DFES recommends that sufficient fire water provision compliant with the REF Guidelines be provided for the BESS facilities prior to the determination of the development application.	**Compliance with Water Supply for firefighting cannot be validated** Modification to the BMP is required to address the Assessment advice.

Table 3: Policy Measure 7.1 iv. and Section 9.4.2 of the Guidelines: DFES Role as Hazard Management Agency (HMA)

DFES wishes to provide the below additional advice in its role and responsibilities of HMA for Fire in Western Australia.

Renewable Energy Facilities		Action
Risk Management Plan	As per the REF Guidelines, a Risk Management Plan (RMP) describes the risk management process and its outcomes, including the specific site hazards/risks and their analysis, control measures, and the monitoring and review process. A RMP is considered to be a critical requirement of planning and informing fire risk management in the design and operation of renewable energy facilities. While DFES accepts the submitted BRMP to be a RMP prepared against the requirements of the REF Guidelines, the BRMP should be modified to address DFES Assessment advice in Table 2 under 'Water Supply', and 'DFES Regional Operations' comments below.	**Modification to the BMP and BRMP is required to address the Assessment advice**.

Consultation	In the event that an approval is granted, the DFES District Officer responsible for this region and the local fire and emergency services should be consulted during the development, construction, and leading up to the commissioning of the facility. It is considered critical for the local fire and emergency services to understand the hazards present in the facility and the measures required to ensure the safety of firefighting personnel when working in or around different parts of the facility. This may impact on how crews respond to a fire within the facility, which may in turn have ramification regarding the optimal number and location of water supplies.	**Comment only.**
DFES Other Technical Advice		**Action**
Special Operations	The proposal was referred internally to the Special Operations branch, but no response has been received within the referral timeframe. If any advice is received, it will be forwarded to the decision maker.	**Comment only.**
DFES Regional Operations	DFES' Metropolitan Operations has provided the following comments: • There is a lack of sufficient water to contain a fire and/or suppress smoke plumes (30,000 litres proposed as opposed to 288,000 litres required for BESS facilities in the REF Guidelines). • There appears to be a lack of spill containment that includes provision for management of fire water runoff. It is also unclear whether the proposed facility will have any negative impact on the groundwater aquifers. • The BMP does not provide a broader landscape map showing the potential impact on adjacent human activity areas such as the Wanneroo Raceway approximately 1.5 kilometres to the northwest, the Wesbeam factory directly adjacent to the site to the southwest, the Wanneroo Junior Motorcross Club less than 1 kilometre to the east and southeast, and the major residential development approximately 1.7 kilometres to the south. These locations could require evacuation in the event of smoke plume impact. The relevant emergency evacuation procedures should be discussed with DFES Metropolitan North Coastal Region Office.	**Modification to the BMP and BRMP is required to address the Assessment advice.** **An emergency plan should be prepared in accordance with Section 7 of the REF Guidelines.**
DFES Land Use Planning	It is the responsibility of the proponent to ensure the proposal complies with relevant planning and building requirements. This advice does not exempt the applicant/proponent from	**Comment only.**

	obtaining approvals that apply to the proposal including planning, building, environmental health or any other approvals required by a relevant authority under written laws.	

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Phone: 07 5443 7777

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3 July 2025

Ref: Project No. 243929/Document No. N25-0255

GHD
999 Hay Street
PERTH WA 6000

Attention: Naomi Thomas
Ref: DA2025/476; DFES Ref: D39323

Dear Name,

Re: **Neerabup BESS**
At: **Lot 100 (45) Trandos Road, Neerabup WA 6031**
For: **Shell**

Please find overleaf a response to the written comments received from the Department of Fire and Emergency Services (DFES) in Table 1, relating to the Bushfire Management Plan (BMP; Revision B dated 14 March 2025), and accompanying Bushfire Risk Management Plan, prepared to support the development application for the proposed future development across Lot 100 (No. 45) Trandos Road, Neerabup, in the City of Wanneroo.

Trusting the above is to your satisfaction and should further information be required please contact this office.

Yours faithfully
COVEY ASSOCIATES PTY LTD

Linden Wears
Senior Bushfire Engineer
Bsc, PostGradDip (Bushfire Protection),PostGradDip (Fire Safety Eng)
BPAD Level 3 Bushfire Practitioner

Table 1: Response to DFES Comments

Issue	Comment	Applicant response
General Comments		
General Comments	DFES acknowledges that the site currently accommodates the existing Neerabup Power Station, and the proposed development includes a 142-megawatt (MW) battery energy storage system (BESS) facility, operational and maintenance buildings, a substation and supporting infrastructure	**No change to be made to the BMP or BRMP to this address comment** • Agreed
	It is noted that the BMP and the BRMP were reviewed and signed by Ms Mariza Coslan of Covey Associates. However, the author signature areas of both documents include a 'copyright notice' stating that '*parts of this document contain material originally prepared by*' Mr Linden Wears. While Mr Wears is an accredited Level 3 bushfire planning practitioner, it is unclear whether he is the author of these documents or only contributed to some of the contents.	**No change to be made to the BMP or BRMP to this address comment** • The BMP and BRMP have been prepared, reviewed and signed off by Linden Wears.
	DFES notes that the current version of SPP 3.7 and the Guidelines no longer refers to 'high risk land use'. The decision maker has referred this proposal to DFES as a discretionary referral. DFES considers that SPP 3.7 and the Guidelines do not adequately address high risk land use such as renewable energy facilities.	**No change to be made to the BMP or BRMP to this address comment** • DFES comment noted
	Accordingly, DFES has also assessed the proposal against the *CFA Design Guidelines and Model Requirements – Renewable Energy Facilities v4 (version 4.3, August 2023)* (REF Guidelines) which is considered best practice for the development of renewable energy facilities.	**No change to be made to the BMP or BRMP to this address comment** • DFES comment noted • Covey notes that there no requirement for the proposed renewable infrastructure (i.e. not habitable buildings) to comply with SPP 3.7 or the WA Guidelines, or otherwise address bushfire risk, including no statutory requirement to comply with the CFA Guidelines. • Notwithstanding, the Proponent has voluntarily assessed the proposal against the CFA Guidelines to ensure appropriate management of bushfire risk.
	Specific requirements of SPP 3.7 and the supporting Guidelines and the REF Guidelines are to be further addressed in the BMP as outlined in the below assessment. The assessment comments relating to the REF Guidelines have been incorporated into the	**No change to be made to the BMP or BRMP to this address comment** • None of the DFES comments warrant alteration of the BMP or BRMP at this stage, however it is noted that future consultation with DFES will be required to determine final firewater requirements and

Issue	Comment	Applicant response
	below overall assessment comments for the respective issue/element.	emergency management procedures.
Policy Measure 7.1 ii (c) Compliant preparation of BAL contour map		
Vegetation Classification or Exclusions	**<u>Exclusion Plots 15 and 17 – not demonstrated</u>** Evidence to support the exclusion of Plots 15 and 17 as managed to low threat in accordance with AS3959 is required. As these areas include the Trandos Road and Orchid Road reserves, confirmation from the responsible authority should be provided that the reserve areas will be managed to low threat in perpetuity. If unsubstantiated, the vegetation should be classified as per AS3959, or the resultant BAL ratings may be inaccurate. **<u>Action</u>** **BAL Rating cannot be validated** **Further evidence to support the proposed vegetation exclusion of Plots 15 and 17 is required**	**No change to be made to the BMP to this address comment** • Plot 15 is localised non-vegetated areas within Lot 100 (i.e. not on Trandos Road) observed during the site inspection, either as access tracks or a large non-vegetated area to the west of the project area, o This land is under control of the Proponent and could be kept non-vegetated if required, however while it is acknowledged portions of Plot 15 could possibly return to a grassland state (similar to adjacent Plots 1 and 2) without management, there is already Plot 1 between the project area and Plot 15 in all instances anyway. o Given there is Plot 1 grassland between Plot 15 and the project area, there would be no effect the post-development BAL contours anyway. Given the exclusion is reasonable based on what was observed during the site inspection, and as classifying Plot 15 as grassland has no greater BAL impact, there is no reason to amend. • Plot 17 is the non-vegetated and managed portion of Trandos Road. Orchid Road is further west of Trandos Road, and as it is currently unconstructed, no part of Plot 17 extends to Orchid Road. o Photos 17a to 17e in Appendix A of the BMP show the Trandos Road surface as non-vegetated, and the verge on either side clearly managed grass. o It is understood this management is currently undertaken by the City, and unless they raise issue with the ongoing slashing of grass along the road verge, this ongoing exclusion of Plot 17 will remain. • The vegetation mapping provided in the BMP aligns with the anticipated post-development conditions. • On this basis, the vegetation classifications and implementation measures documented in the BMP will remain unchanged.

Issue	Comment	Applicant response
Policy Measure 7.1 ii (e) Compliance with the Bushfire Protection Criteria 7: Development – Commercial and Industrial		
Siting and Design – Siting and Design	**A2.1a – not demonstrated** The BAL ratings cannot be validated for the reason(s) outlined in Table 1 **Action** **BAL Rating cannot be validated** **Modification to the BMP is required to address the Assessment advice in Table 1**	**No change to be made to the BMP to this address comment** • As detailed above, the vegetation mapping in the BMP doesn't require amendment. • On this basis, the BAL contour in the BMP accurately depicts the BAL impacts on the nominated buildings, which can be compliantly located in areas of BAL-29 or lower, in compliance with A2.1a.
Vehicular Access – Private Driveway	**A3.1 – not demonstrated** The proposed vehicular access to the development site is from the unconstructed portion of Trandos Road, it is unclear whether this complies with the weight capacity requirements of Appendix B.3, Table 10 of the Guidelines and whether any road upgrade is required to facilitate emergency services vehicles operation. **Action** **Compliance with Vehicular Access not demonstrated** **Modification to the BMP is required to address the Assessment advice.**	**No change to be made to the BMP or BRMP to this address comment** • All private driveways to the site (see Section 5.2 and Figure 5-1) will need to comply with the private driveway specifications of the WA Guidelines, including weight capacity requirements • Based on the above, no amendment is proposed to the BMP or BRMP.
Water Supply	**A4.1 – not demonstrated** The BMP proposes fire water tanks with a combined capacity of 30,000 litres for the proposed habitable buildings; however, the fire water location and capacity for the BESS facilities have not been specified. The REF Guidelines requires as a 'model requirement' that a fire water supply of no less than 288,000 litres to be provided for BESS facilities. However, the BMP proposes a lesser amount that is to be determined at the final facility design stage, based on advice from manufacturers that fire water is not recommended on BESS fires. DFES notes that where a REF Guidelines model requirement is proposed to be reduced, it should be supported by a Fire Safety Study. DFES does not consider anecdotal manufacturers' recommendation without supporting evidence as a valid justification to reduce the model requirements. As the fire water supply is likely to impact facility design, DFES recommends that sufficient fire water provision compliant with the REF Guidelines be provided for the BESS facilities prior to the determination of the development application.	**No change to be made to the BMP or BRMP to this address comment** • The BMP stipulates the 30 kL of firewater required by SPP 3.7 and the WA Guidelines for the proposed habitable buildings, in firewater tanks currently depicted on the site plan • Given the evolving nature of firefighting for BESS facilities, the Proponent is seeking to have a lesser amount of firewater storage for the renewable energy infrastructure. As stated in the BMP and BRMP, they are proposing to review this in consultation with DFES once the final operation and design elements of this BESS facility have been finalised, to ensure a clear picture of the onsite hazard and management procedures, in line with the requirements of the chosen equipment (associated with renewable energy infrastructure and especially the BESS units) can be provided. Any further information and/or studies required would be discussed with DFES at that stage, in order to finalise firewater tank capacity and location.

Issue	Comment	Applicant response
	<u>Action</u> **Compliance with Water Supply for firefighting cannot be validated** **Modification to the BMP is required to address the Assessment advice**	
Policy Measure 7.1 iv. and Section 9.4.2 of the Guidelines: DFES Role as Hazard Management Agency (HMA)		
Risk Management Plan	As per the REF Guidelines, a Risk Management Plan (RMP) describes the risk management process and its outcomes, including the specific site hazards/risks and their analysis, control measures, and the monitoring and review process. A RMP is considered to be a critical requirement of planning and informing fire risk management in the design and operation of renewable energy facilities. While DFES accepts the submitted BRMP to be a RMP prepared against the requirements of the REF Guidelines, the BRMP should be modified to address DFES Assessment advice in Table 2 under 'Water Supply', and 'DFES Regional Operations' comments below. **<u>Action</u>** **Modification to the BMP and BRMP is required to address the Assessment advice.**	**No change to be made to the BMP or BRMP to this address comment** • The firewater requirements for the renewable energy infrastructure are to be determined in consultation with DFES, once the final operation and design elements of this BESS facility have been finalised. • No changes to the BMP or BRMP are proposed to address the Regional Operations comments, although it is noted that the Proponent will need to liaise with DFES regarding the emergency response to various fire emergencies (including onsite fires and bushfires), and potential impact on evacuation of the local area.
Consultation	*I*n the event that an approval is granted, the DFES District Officer responsible for this region and the local fire and emergency services should be consulted during the development, construction, and leading up to the commissioning of the facility. It is considered critical for the local fire and emergency services to understand the hazards present in the facility and the measures required to ensure the safety of firefighting personnel when working in or around different parts of the facility. This may impact on how crews respond to a fire within the facility, which may in turn have ramification regarding the optimal number and location of water supplies. **<u>Action</u>** **Comment Only**	**No change to be made to the BMP or BRMP to this address comment** • The BMP nominates the following DFES liaison being required, as a minimum, as derived from the CFA Guidelines: o Emergency Services familiarisation to be conducted prior to commissioning (see Section 5.7 of BMP), including notification seven days ahead of commissioning any renewable energy infrastructure, especially BESS units (see Section 5.4.4 of BMP). o Schedule of ongoing site familiarisation and liaison is to be determined with local fire brigade (see Section 5.7 of BMP). • Additionally, the firewater requirements for the renewable energy infrastructure are to be determined in consultation with DFES, once the final operation and design elements of this BESS facility have been finalised.

Issue	Comment	Applicant response
DFES Other Technical Advice		
Special Operations	The proposal was referred internally to the Special Operations branch, but no response has been received within the referral timeframe. If any advice is received, it will be forwarded to the decision maker. **Action** **Comment Only**	**No change to be made to the BMP or BRMP to this address comment** • DFES comment noted
DFES Regional Operations	*DFES' Metropolitan Operations has provided the following comments:* • There is a lack of sufficient water to contain a fire and/or suppress smoke plumes (30,000 litres proposed as opposed to 288,000 litres required for BESS facilities in the REF Guidelines). • There appears to be a lack of spill containment that includes provision for management of fire water runoff. It is also unclear whether the proposed facility will have any negative impact on the groundwater aquifers. • The BMP does not provide a broader landscape map showing the potential impact on adjacent human activity areas such as the Wanneroo Raceway approximately 1.5 kilometres to the northwest, the Wesbeam factory directly adjacent to the site to the southwest, the Wanneroo Junior Motorcross Club less than 1 kilometre to the east and southeast, and the major residential development approximately 1.7 kilometres to the south. These locations could require evacuation in the event of smoke plume impact. The relevant emergency evacuation procedures should be discussed with DFES Metropolitan North Coastal Region Office. **Action** **Modification to the BMP and BRMP is required to address the Assessment advice.** **An emergency plan should be prepared in accordance with Section 7 of the REF Guidelines**	**No change to be made to the BMP or BRMP to this address comment** • The firewater requirements for the renewable energy infrastructure are to be determined in consultation with DFES, once the final operation and design elements of this BESS facility have been finalised. • Spill containment is outside the scope of the BMP and BRMP, however the Proponent has previously indicated spill containment is to be provided to manage fire water runoff in the form of underground contaminated firewater storage tanks in the north-eastern corner of the BESS site (note 5 on site plan). Contaminated water will be contained on the pad beneath the BESS unit and channelled to the underground tanks – contaminated water will be kept separate from 'clean' surface water. The capacity and design of underground contaminated firewater storage tanks, including containment and channelling, will be determined at the detailed design phase. • The management of an onsite fire is outside the scope of the BMP and BRMP, which seek to incorporate the relevant Model Requirements of the CFA Design Guidelines, to demonstrate the bushfire risk associated with this infrastructure has been appropriately managed. Regarding emergency management for onsite fires, Section 5.8 of the BMP (derived from the BRMP) requires that an Emergency Management Plan is developed for the facility for various fire emergencies (including onsite fires and bushfires): o Detailed information has been provided in Section 5.8 regarding the procedures for bushfire emergencies to be incorporated into the Emergency Management Plan. o Only high-level guidance has been provided regarding onsite fire emergencies, and it is expected that this would be

Issue	Comment	Applicant response
		developed by the Proponent in detail prior to commissioning. o Sections 5.4.4 and 5.5 require that the Proponent liaise with fire brigade prior to commissioning, with the intent that they are familiarised with the onsite hazards, the proposed Emergency Management Plan and the proposed Emergency Information Book for attending emergency services (see Sections 5.6 and 5.7).
DFES Land Use Planning	It is the responsibility of the proponent to ensure the proposal complies with relevant planning and building requirements. This advice does not exempt the applicant/proponent from obtaining approvals that apply to the proposal including planning, building, environmental health or any other approvals required by a relevant authority under written laws. **Action** **Comment Only**	**No change to be made to the BMP or BRMP to this address comment** • DFES comment noted