

APPENDIX 12 – Noise and Vibration

APPENDIX 12.1: GLOSSARY OF TERMS

Term	Definition
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10}(s_1/s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is $20\mu\text{Pa}$.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,F}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the 'average minimum' noise level and is often used to describe the background noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Residual Noise Level	The ambient noise remaining at a given position in a given situation when specified sources are suppressed to a degree such that they do not contribute to the ambient noise level ($L_{Aeq,T}$)
Specific Noise Level	The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source (the noise source under investigation) over a given time interval ($L_{Aeq,T}$)
Rating Noise Level	The specific noise level plus any adjustment for the characteristic features of the noise ($L_{Ar,Tr}$).

APPENDIX 12.2: LEGISLATION, POLICY AND GUIDANCE

National Policy: National Planning Policy Framework

6.1 The National Planning Policy Framework (NPPF) (July 2021) sets out the Government's economic, environmental and social planning policies for England. It attempts to summarise in a single document all previous national planning policy advice. Taken together, these policies articulate the Government's vision of sustainable development, which should be interpreted and applied locally to meet local aspirations.

6.2 Under Section 15; Conserving and enhancing the natural environment, the following is stated in paragraph 174:

“Planning policies and decisions should contribute to and enhance the natural and local environment by: ...

preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability...”

6.3 The NPPF goes on to state in paragraph 185 that:

“Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason”

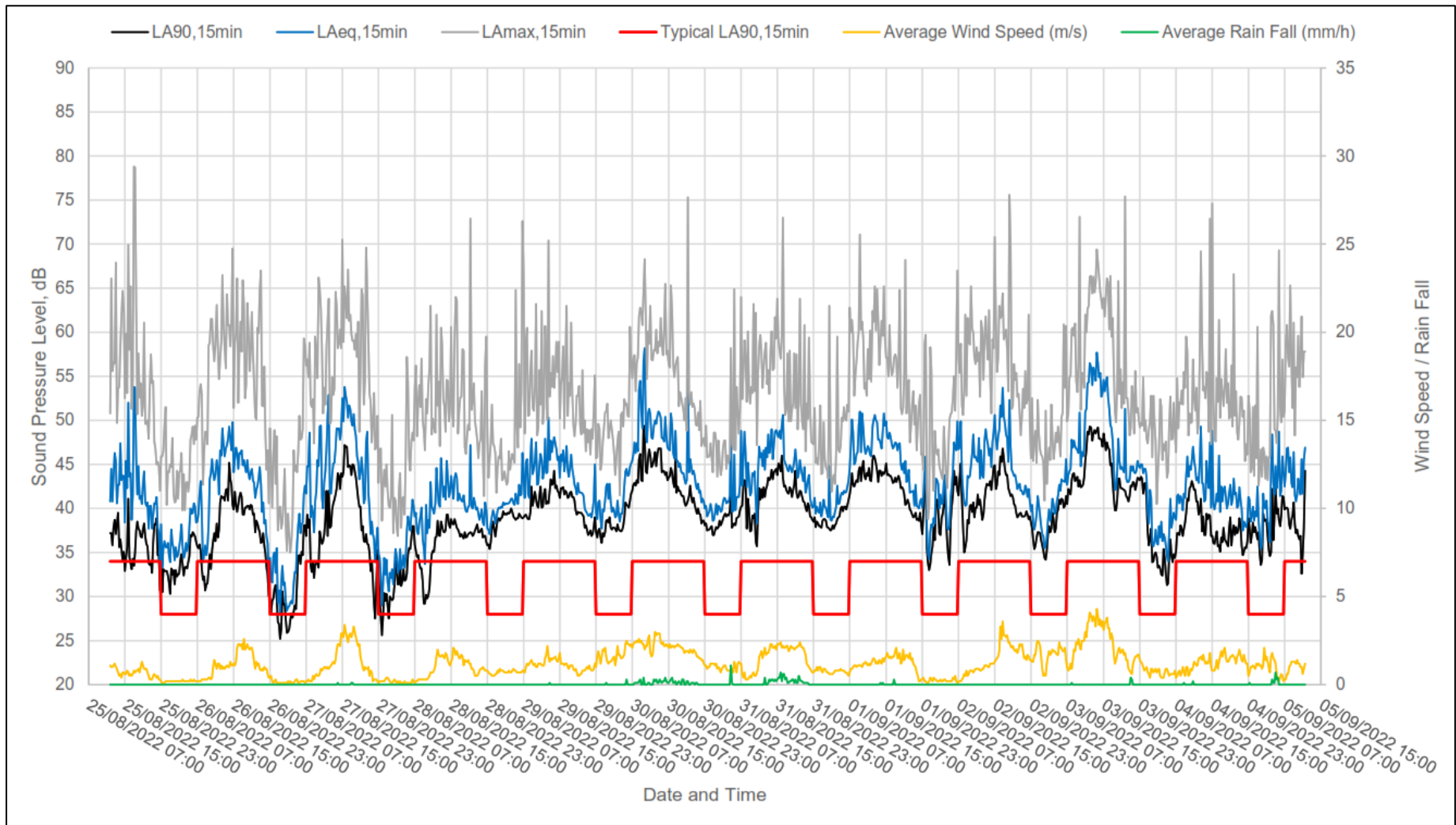
Noise Policy Statement for England, 2010 (NPSE)

- 6.4 The NPSE seeks to clarify the underlying principles and aims in existing policy documents, legislation and guidance that relate to noise. It also sets out the long-term vision of Government noise policy:
- 6.5 “To promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development”.
- 6.6 The NPSE clarifies that noise should not be considered in isolation of the wider benefits of a scheme or development, and that the intention is to minimise noise and noise effects as far as is reasonably practicable having regard to the underlying principles of sustainable development.
- 6.7 The first two aims of the NPSE follow established concepts from toxicology that are applied to noise impacts, for example, by the World Health Organisation. They are:
- NOEL – No Observed Effect Level - the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise; and
- LOAEL – Lowest Observed Adverse Effect Level - the level above which adverse effects on health and quality of life can be detected.
- 6.8 The NPSE extends these to the concept of a significant observed adverse effect level.
- SOAEL – Significant Observed Adverse Effect Level - The level above which significant adverse effects on health and quality of life occur.
- 6.9 The NPSE notes:
- “it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times”.

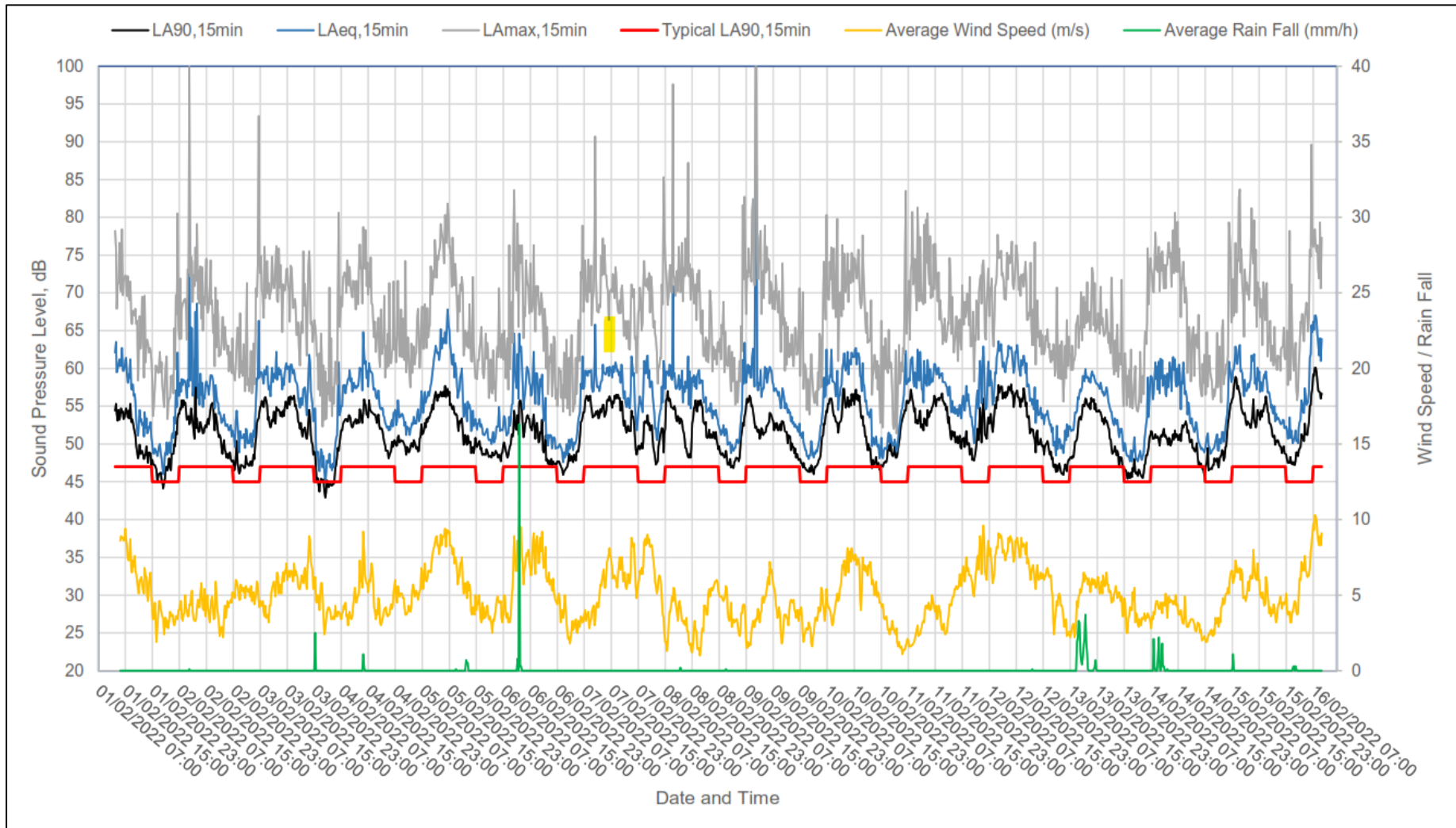
Planning Practice Guidance (PPG) – Noise

- 6.10 The Government's PPG on noise provides guidance on the effects of noise exposure, relating these to people's perception of noise, and linking them to the NOEL and, as exposure increases, the LOAEL and SOAEL.
- 6.11 As exposure increases above the LOAEL, the noise begins to have an adverse effect and consideration needs to be given to mitigating and minimising those effects, taking account of the economic and social benefits being derived from the activity causing the noise. As the noise exposure increases, it will then at some point cross the SOAEL boundary.
- 6.12 The LOAEL is described in PPG as the level above which "noise starts to cause small changes in behaviour and / or attitude e.g. turning up the volume of the television, speaking more loudly, or, where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life."
- 6.13 PPG identifies the SOAEL as the level above which "noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area."

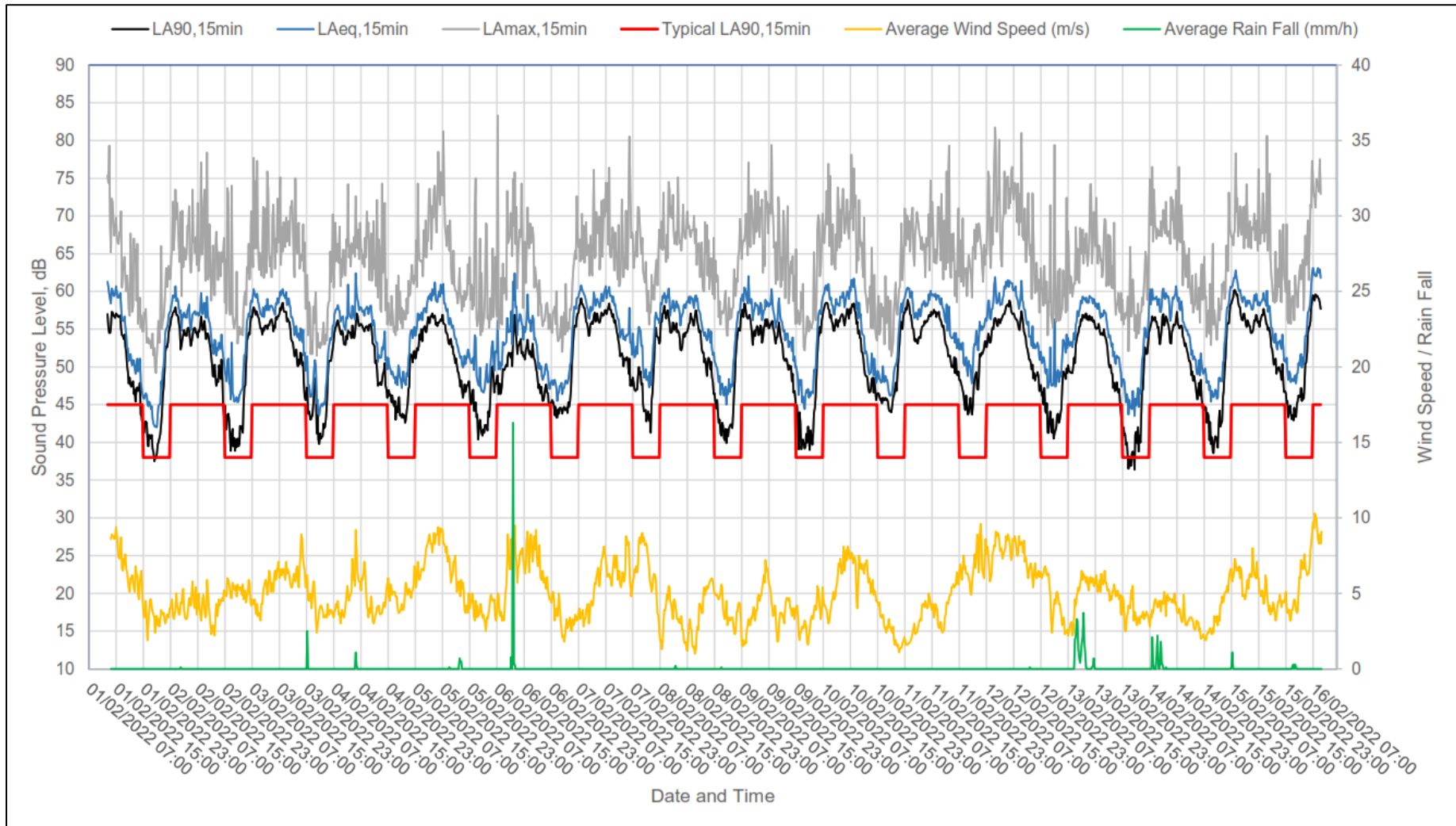
APPENDIX 12.3: UNATTENDED SURVEY RESULTS – P1



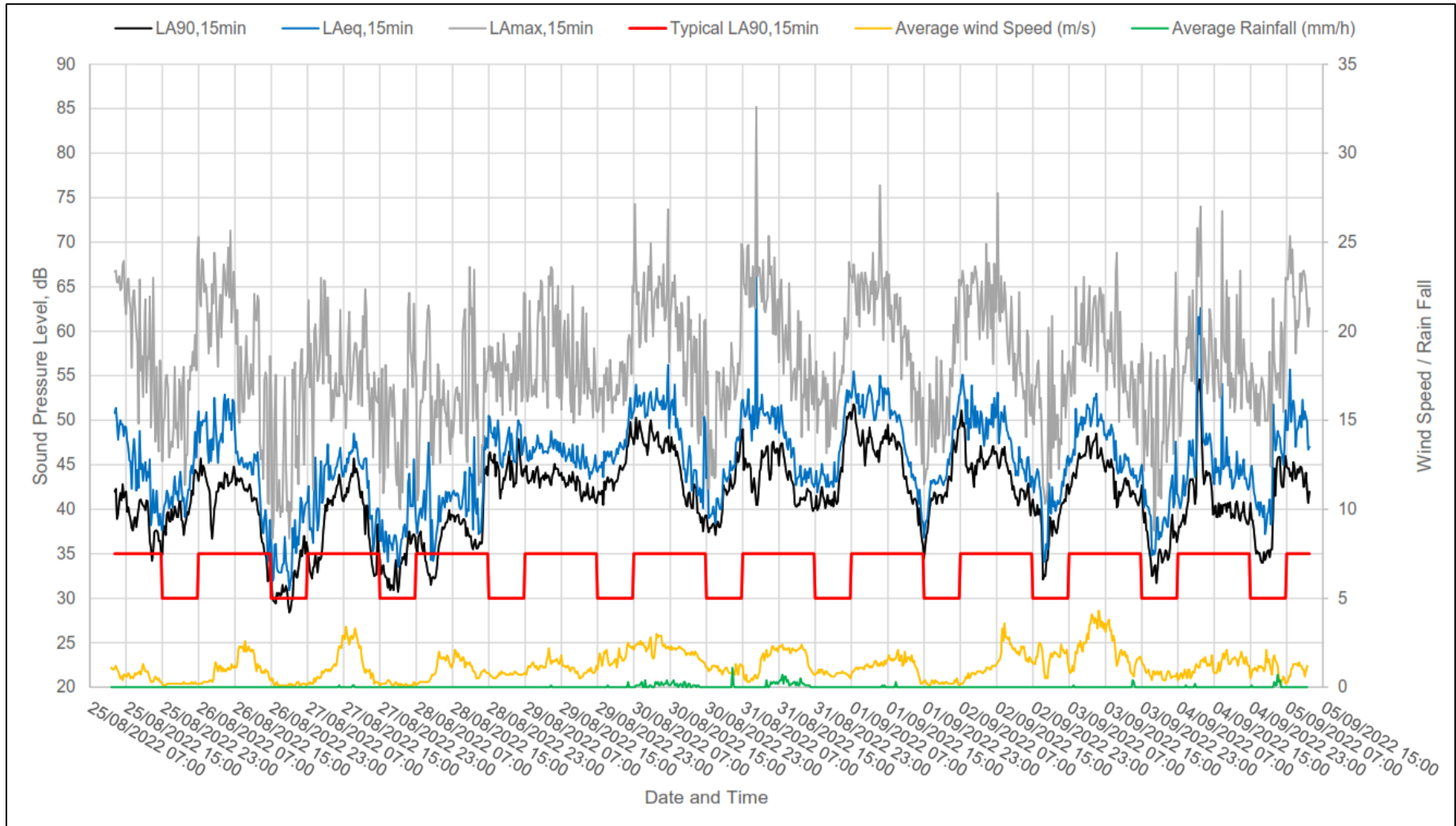
APPENDIX 12.4: UNATTENDED SURVEY RESULTS – P2



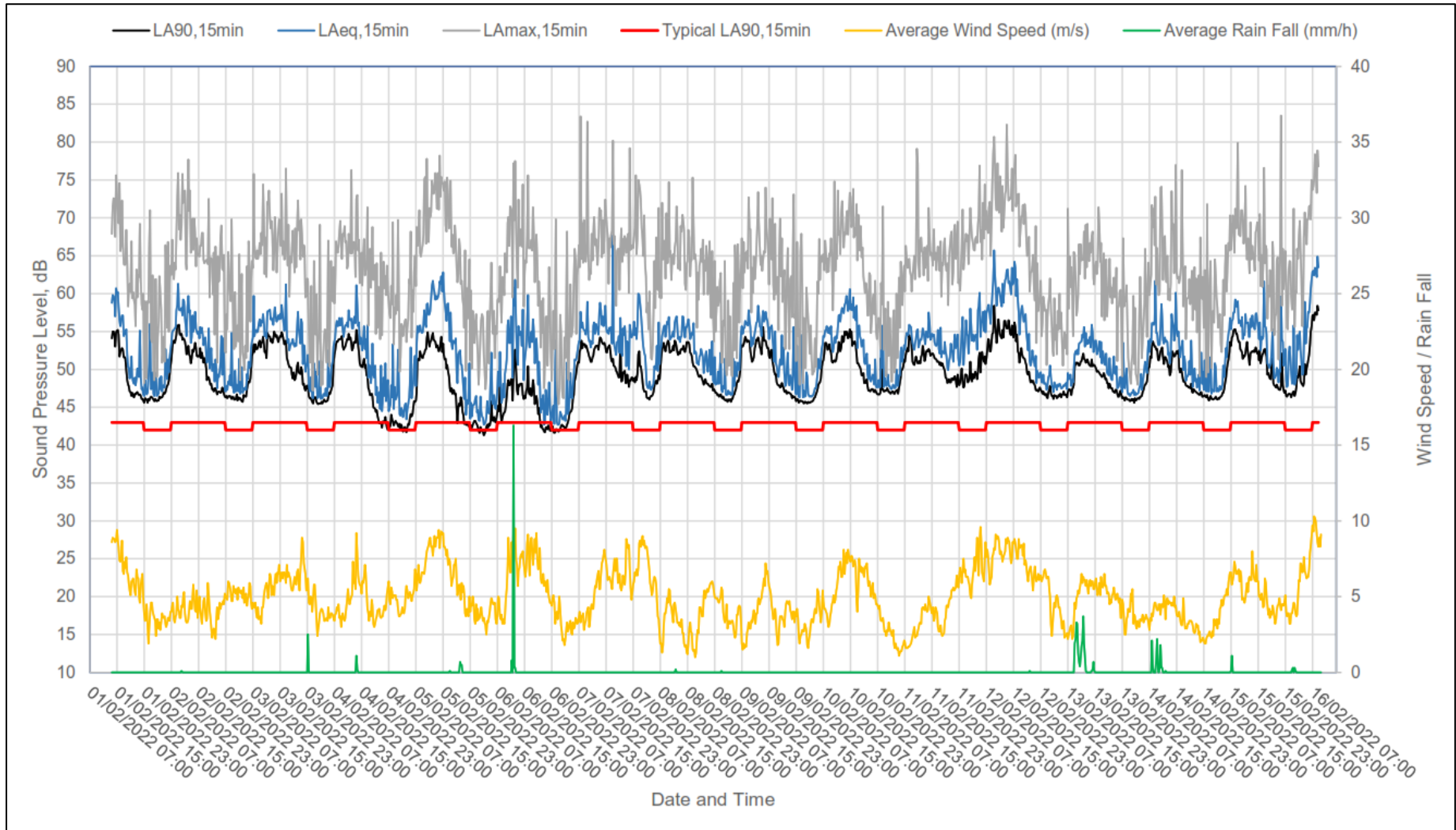
APPENDIX 12.5: UNATTENDED SURVEY RESULTS – P3



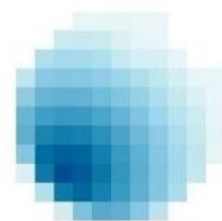
APPENDIX 12.6: UNATTENDED SURVEY RESULTS – P4



APPENDIX 12.7: UNATTENDED SURVEY RESULTS – P5



APPENDIX 12.8: ACOUSTIC DESIGN NOTE 1



03 March 2023

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Acoustic Design Note 1

Green Lithium, Middlesborough: Preliminary, Pre-Design 3D Computer Noise Modelling and Environmental Noise Benchmarking

1.0 Introduction

This Acoustic Design Note (“ADN”) presents the preliminary findings of Sol’s initial, preliminary, pre-design 3D environmental noise model of the proposed Green Lithium Plant that is to be located within the existing wider “Teesworks” site as located in South Teesside, TS6 6TX (hereinafter referred to as the “Facility”).

The main purpose of this acoustic assessment is to provide ***an initial indication*** of the maximum permitted environmental noise level emissions that are applicable to both the overall Facility, as well as the main individual constituent parts forming the Facility, and to similarly provide initial, individual environmental noise level targets for specific process areas, all in order to be capable of achieving a BS4142-defined low environmental noise level impact on the surrounding noise sensitive receptors (“NSRs”).

The initial, preliminary 3D computer noise model has been based upon the following information:

- PDF document ref. “*Green Lithium - Layout Site Plan - Buildings*”, which provides the site plan indicating the location of the proposed plant
- PDF document ref. “*02_ Green Lithium Planning Render Drawings _Site Images 2023*”, which provides 3D visuals of the site
- PDF document ref. “*10277612-DWK_001_01_DWK*”, which provides a plan and elevation of the proposed lithium calcining system
- PDF document ref. “*10277612-DWK_002_01_DWK*”, which provides an isometric view of the proposed lithium calcining system

In addition, this ADN variously makes reference to Sol’s earlier issued Environmental Noise Benchmarking report ref. P2008-REP01-BDH, dated 14 September 2022.

2.0 Noise Sensitive Receptors

The proposed location for the Facility is within the existing wider “Teesworks” site, which is located within the Teesport Docks in Teesside. The site is located within a predominantly industrial area and the nearest identified pre-existing noise sensitive receptors (“NSRs”) which could potentially be affected by the Facility are as follows:

- A. “The Haven” travellers’ site, located c.3.6km distance to the south west
- B. Housing on Jones Road, located c.2.8km distance to the south west
- C. Housing on Bevanlee Road, located c.3km distance to the south west
- D. Housing on Elgin Avenue, located c.2.6km distance to the south
- E. Housing off Broadway, located c.2km distance to the south
- F. Housing on Wilton Avenue, located c.1.8km distance to the east
- G. Housing on Tod Point Road, located c.2.6km distance to the north east
- H. Housing at Sir William Turner’s Hospital, located c.3.6km distance to the south east
- I. Housing off Pastures Lane, located c.3.4km distance to the south

Sol has been informed by Sol Environment that there are no protected ecological receptors, Sites of Special Scientific Interest (SSSIs), Special Areas of Conservation (SACs), Special Protection Areas (SPAs) nor Ramsar sites within the vicinity of the Facility (that are sensitive to environmental noise). Therefore, these have not been included within this assessment.

Figure 1 indicates the location of the Facility in relation to the identified NSRs listed above. Table 1 specifies appropriate maximum permissible noise Rating Level limits which shall be applicable to the Facility at each of the identified NSRs, in order to achieve a BS 4142: 2014+A1: 2019 defined “*Low Impact, depending on the context*” (please refer to Sol report ref. P2008-REP01-BDH, dated 14 September 2022, for further details on how these noise level limits have been derived).

Noise Sensitive Receptors	Maximum Permissible Noise Rating Level Limit, dB $L_{Ar,Tn}$, for BS4142 defined <i>Low Impact, Depending on the Context</i>	
	Daytime (07:00 hours – 23:00 hours)	Night Time (23:00 hours – 07:00 hours)
A. The Haven travellers' site (c.3.6km to the south west)	43	42
B. Housing on Jones Road (c.2.8km to the south west)	43	42
C. Housing on Bevanlee Road (c.3km to the south west)	35	30
D. Housing on Elgin Avenue (c.2.6km to the south)	35	30
E. Housing of Broadway (c.2km distance to the south)	45	38
F. Housing on Wilton Avenue (c.1.8km to the east)	47	45
G. Housing on Tod Point Road (c.2.6km to the north east)	34	28
H. Sir William Turner's Hospital (c.3.6km to the south east)	37	27
I. Housing off Pastures Lane (c.3.4km to the south)	40	30

Table 1: Maximum permissible Rating Level limits, dB $L_{Ar,Tn}$, to achieve a BS4142 defined *low impact, depending on the context*, as applicable to the Facility in its complete entirety, for all required modes of operation (excluding emergency operating conditions)

These maximum permissible noise level limits are specified in BS4142-defined noise “Rating Level” terms; they are as applicable to the entire Facility in its complete entirety (including all buildings, plant, individual processes, vehicle movements etc.), for all required modes of operation (e.g. Normal Operating Condition, NOC; Other Than Normal Operating Condition, OTNOC etc.).

The acoustic character of the environmental noise generated from the Facility must therefore be considered, and where appropriate, an acoustic character correction (i.e. penalty) must be applied to the corresponding predicted “Specific Sound Level” when assessing compliance with the above specified receptor noise level limits.

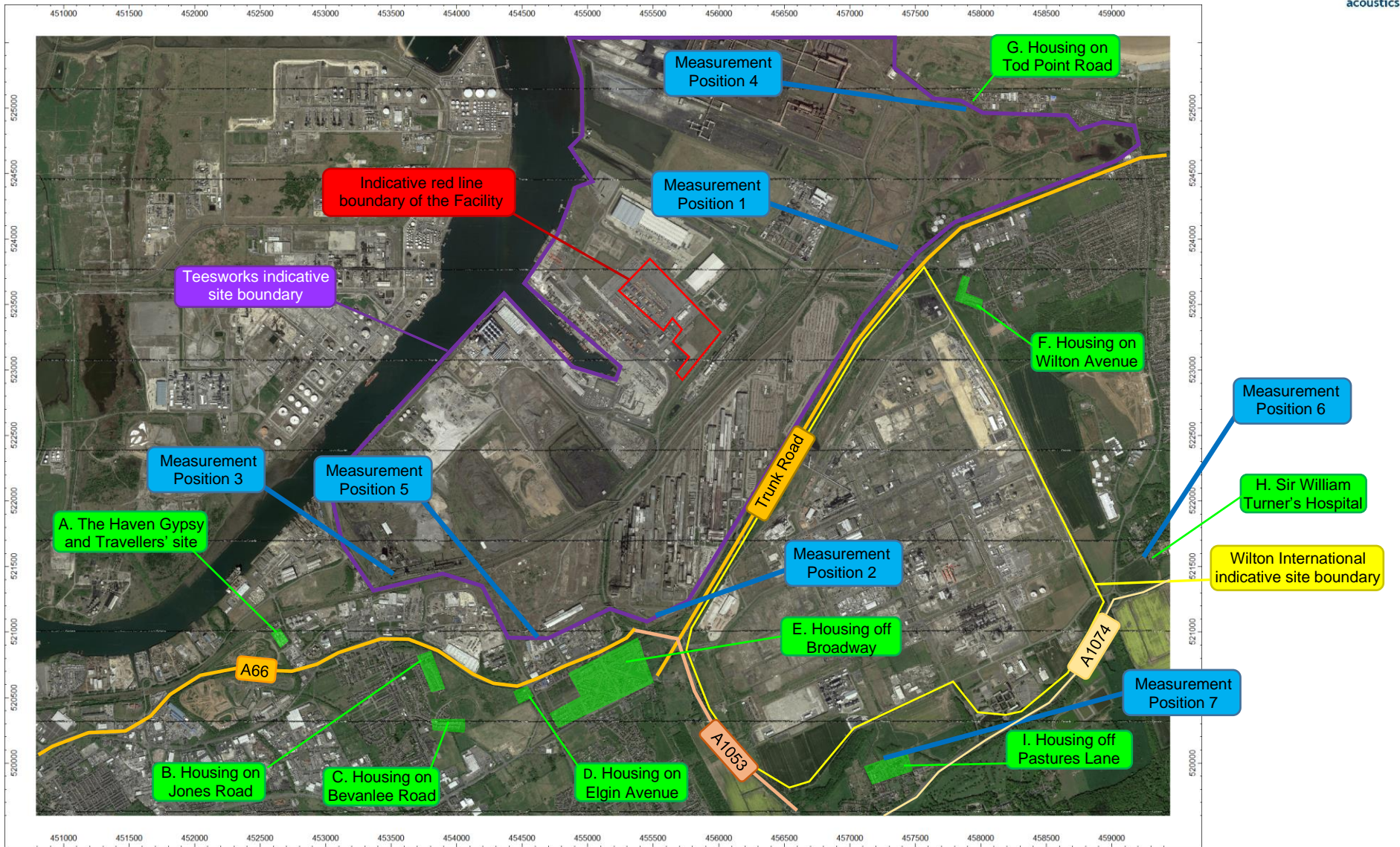


Figure 1: Aerial photo overlaid with noise sensitive receptors and monitoring locations in relation to the Facility (Google 2023)

3.0 Environmental Noise Model

3.1 Methodology and Basis of 3D Environmental Noise Models

In order to predict the potential noise levels impinging on the surrounding noise sensitive receptors, an initial, proprietary 3D computer noise model was created using the DataKustik “CadnaA” noise mapping software. The following assumptions have been made when generating the noise model:

- a) The noise model was set up to apply the noise prediction methodology set out in ISO 9613-2: ‘Acoustics – Attenuation of Sound propagation outdoors – Part 2: General Method of Calculation’.
- b) The model was set to include second order reflected noise from solid structures.
- c) Ground absorption, as defined in ISO 9613-2, has been taken into consideration. The base ground absorption for the model has been set to $G=1.0$ (soft ground). The ground absorption for large tarmacked areas has been set to $G=0.0$ (hard ground).
- d) The existing land topography of the site and surrounding area up to and including the nearest NSR has been taken into consideration in the assessment. Third party topographical information has been obtained from emapsite.com.
- e) The noise impact as expected the surrounding residential receptors has been modelled at a height of 4 metres above local ground level.
- f) Octave band noise data has not been provided by the client for the various noise source. Therefore, Sol have assumed a typical noise spectrum for each modelled noise source as based upon experience of similar plant on other projects.

Figure 2 provides a three-dimensional visualisation of the noise model used to inform the noise impact assessment.

Figure 3 provides a detailed site plant showing the location of all modelled noise sources.

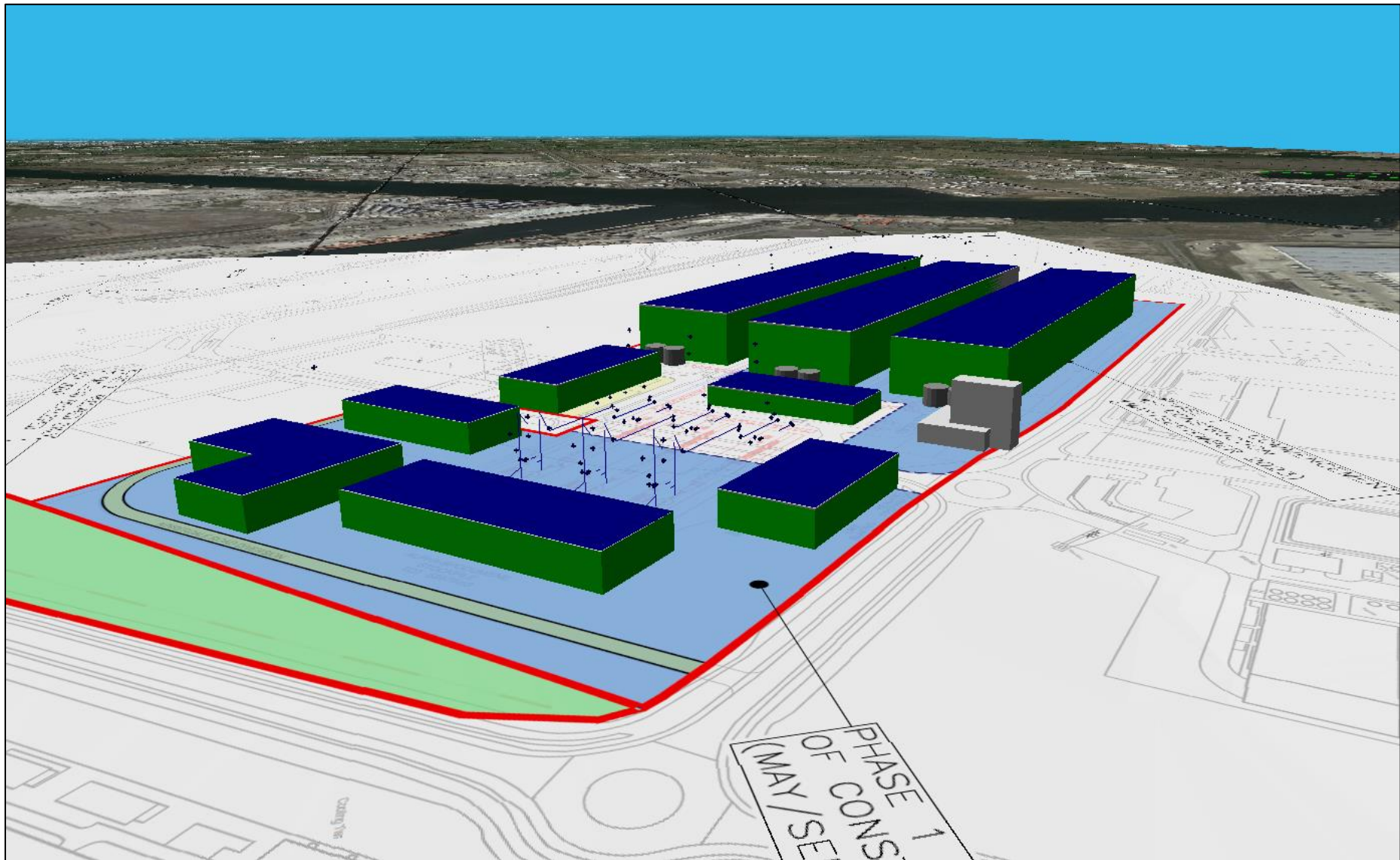


Figure 2: 3D view of the noise model of the Facility (Google 2023)

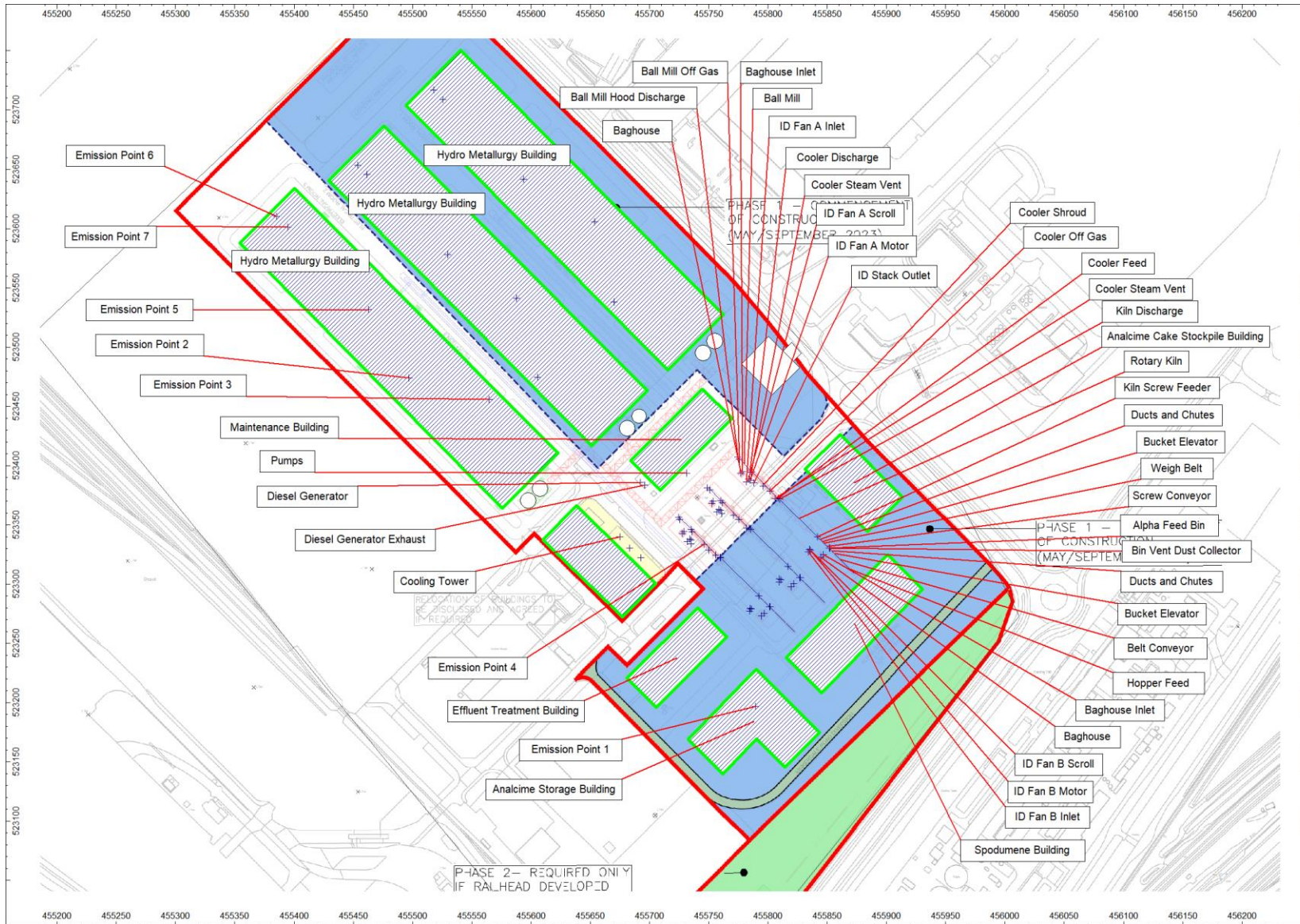


Figure 3: Site plan of the indicating x, y grid coordinate references for all external modelled noise sources (preliminary only)

4.0 Initial Maximum Permissible Plant Noise Levels

The initial, pre-design 3D noise model has been used to determine an initial acoustic specification for each constituent part of the complete Facility.

Table 2 provides an *initial* acoustic performance specification (in total, cumulative environmental noise limit terms) for all proposed external plant and provides initial guidance in terms of required noise control.

External Lithium Calcining	Quantity	Initial Maximum Permissible Sound Pressure Level at 1 Metre Distance, dB $L_{Aeq,T}$	Initial Guidance of Noise Control
Alpha feed bin	3	70	Targeted acoustic cladding or similar
Baghouse	6	70	Sound insulating envelope, attenuated pneumatic blowoffs
Baghouse inlet	6	85	ID fan suction side attenuator
Ball mill	3	75	Acoustic enclosure
Ball mill hood discharge	3	85	Targeted acoustic cladding or similar
Ball mill off gas	3	85	Attenuator or similar
Belt conveyor	3	80	TBC
Bin vent dust collector	3	80	Attenuator or similar
Bucket elevator	6	70	Targeted acoustic cladding or similar
Cooler discharge	3	85	Attenuator or similar
Cooler feed	3	80	TBC
Cooler off gas	3	85	Attenuator or similar
Cooler shroud	3	75	Targeted acoustic cladding or similar
Cooler steam vent	6	85	Attenuator or similar
Ducts and chutes	6	80	Targeted acoustic cladding or similar
Hopper feed	3	80	Targeted acoustic cladding or similar
ID fan inlet	6	80	ID fan suction side attenuator
ID fan motor	6	85	Acoustic enclosure
ID fan scroll	6	75	Acoustic enclosure
ID stack outlet	6	85	ID fan discharge side attenuator
Kiln discharge	3	85	TBC
Kiln screw feeder	3	80	TBC
Rotary kiln	3	75	Acoustic enclosure or similar
Screw conveyor	3	80	Targeted acoustic cladding or similar
Weigh belt	3	75	TBC
Emission points	21	80	TBC
Pumps	35	75	Acoustic hood or similar
Cooling towers	3	79	Attenuated enclosure or similar
Diesel Generator	1	80	Acoustic enclosure

External Lithium Calcining	Quantity	Initial Maximum Permissible Sound Pressure Level at 1 Metre Distance, dB $L_{Aeq,T}$	Initial Guidance of Noise Control
Diesel Generator Exhaust	1	80	Exhaust silencer
Spodumene Feed Conveyor	3	70	Targeted acoustic cladding or similar
CaO SLAKING Package Bin	8	70	TBC
CaO SLAKING Bag filter	6	75	Sound insulating envelope, attenuated pneumatic blowoffs
CaO SLAKING Weighted Hopper	2	75	TBC
CaO SLAKING vertical screw	2	75	Targeted acoustic cladding or similar
CaO SLAKING horizontal screw	2	75	Targeted acoustic cladding or similar
CaO SLAKING Ca(OH) ₂ slaking reactor with agitator	1	80	TBC
Reagent Preparation Crane	1	75	TBC
Na ₂ CO ₃ package bag filter	6	70	TBC
Na ₂ CO ₃ package feed system	6	75	TBC
Na ₂ CO ₃ package Solution Prep vessel/agitator	2	80	TBC

Table 2: Initial acoustic specification for all proposed external plant



It should be noted that other (as yet unlisted, unaccounted for) items of plant would be expected to form part of the overall scope of plant associated with the Facility and this further plant must be taken account of as part of subsequent, more detailed acoustic assessments, which are essential as the project design process progresses. The actual/anticipated noise level emissions as expected from the plant must also be confirmed and reviewed once available, and the required Noise Management Plan will need to be developed accordingly.

Table 3 provides an initial acoustic specification for each of the site buildings:

Building	Initial Maximum Internal Reverberant Sound Pressure Level, dB $L_{pA,rev}$
Hydro Metallurgy Building	80
Hydro Metallurgy Building	80
Hydro Metallurgy Building	80
Maintenance Building	75
Spodumene Building	80
Analcime Building	80
CO ₂ Enrichment / Utilities Building	75
Analcime Storage Building	75

Table 3: Initial acoustic specification for process buildings

5.0 Environmental Noise Impact Assessment

Table 4 presents the corresponding predicted overall A-weighted, BS4142-defined noise Rating Level at the identified NSRs. An acoustic character correction of +3dB has been applied to the calculated Specific Sound Level in each case, as arising at the noise sensitive receptors from the Facility, in order to allow for any residual “readily distinctive” acoustic features, in order to determine the BS4142 defined Rating Level for acoustic assessment purposes. This must be reviewed further as details develop.

Error! Reference source not found. provides the full CadnaA noise maps of the site and the surrounding area showing the predicted Specific Sound Levels expected as based upon the initial maximum permissible plant noise levels, as set out in Section 4.

The total, aggregate environmental noise impact as arising from the proposed operation of the Facility (*albeit in very preliminary, acoustic performance specification terms only*) is not expected to exceed the typical Background Sound Level at any NSR, subject to further acoustic design development.

This is an initial indication of a ‘... low impact, depending on the context...’ in BS4142 terms and meets the maximum permissible Noise Rating Level limits as set out in Table 1. At this very early, preliminary stage, no further correction/penalty to account for the context in which the sound occurs. The results environmental noise impact from the site is therefore provisionally low, subject to further acoustic design development.

Noise Sensitive Receptor	Assessment Period	Predicted Specific Level, dB $L_{Aeq,T}$	Acoustic Character Correction, dB	Predicted Rating Level, dB $L_{Ar,Tr}$	Typical Background Sound Level, dB L_{A90}	Rating Level sub. Background \pm dB
A. The Haven travellers' site (c.2km to the west)	Daytime (07:00hrs – 23:00hrs) T = 1 hour	22	+3	25	43	-18
	Night Time (23:00hrs – 07:00hrs) T = 15 minutes	22	+3	25	42	-17
B. Housing on Jones Road (c.1km to the south west)	Daytime (07:00hrs – 23:00hrs) T = 1 hour	25	+3	28	43	-15
	Night Time (23:00hrs – 07:00hrs) T = 15 minutes	25	+3	28	42	-14
C. Housing on Bevanlee Road (c.1.2km to the south west)	Daytime (07:00hrs – 23:00hrs) T = 1 hour	23	+3	26	35	-9
	Night Time (23:00hrs – 07:00hrs) T = 15 minutes	23	+3	26	30	-4
D. Housing on Elgin Avenue (c.800m to the south)	Daytime (07:00hrs – 23:00hrs) T = 1 hour	23	+3	26	35	-8
	Night Time (23:00hrs – 07:00hrs) T = 15 minutes	23	+3	26	30	-3
E. Housing of Broadway (c.600m to the south east)	Daytime (07:00hrs – 23:00hrs) T = 1 hour	28	+3	31	45	-14
	Night Time (23:00hrs – 07:00hrs) T = 15 minutes	28	+3	31	38	-7
F. Housing on Wilton Avenue (c.1.8km to the east)	Daytime (07:00hrs – 23:00hrs) T = 1 hour	30	+3	33	47	-14
	Night Time (23:00hrs – 07:00hrs) T = 15 minutes	30	+3	33	45	-12
G. Housing on Tod Point Road (c.2.6km to the north east)	Daytime (07:00hrs – 23:00hrs) T = 1 hour	25	+3	28	34	-6
	Night Time (23:00hrs – 07:00hrs) T = 15 minutes	25	+3	28	28	0
H. Sir William Turner's Hospital (c.3.6km to the south east)	Daytime (07:00hrs – 23:00hrs) T = 1 hour	23	+3	26	37	-11
	Night Time (23:00hrs – 07:00hrs) T = 15 minutes	23	+3	26	27	-1
I. Housing off Pastures Lane (c.3.4km to the south)	Daytime (07:00hrs – 23:00hrs) T = 1 hour	22	+3	25	40	-15
	Night Time (23:00hrs – 07:00hrs) T = 15 minutes	22	+3	25	30	-5

Table 4: BS4142 summary assessment

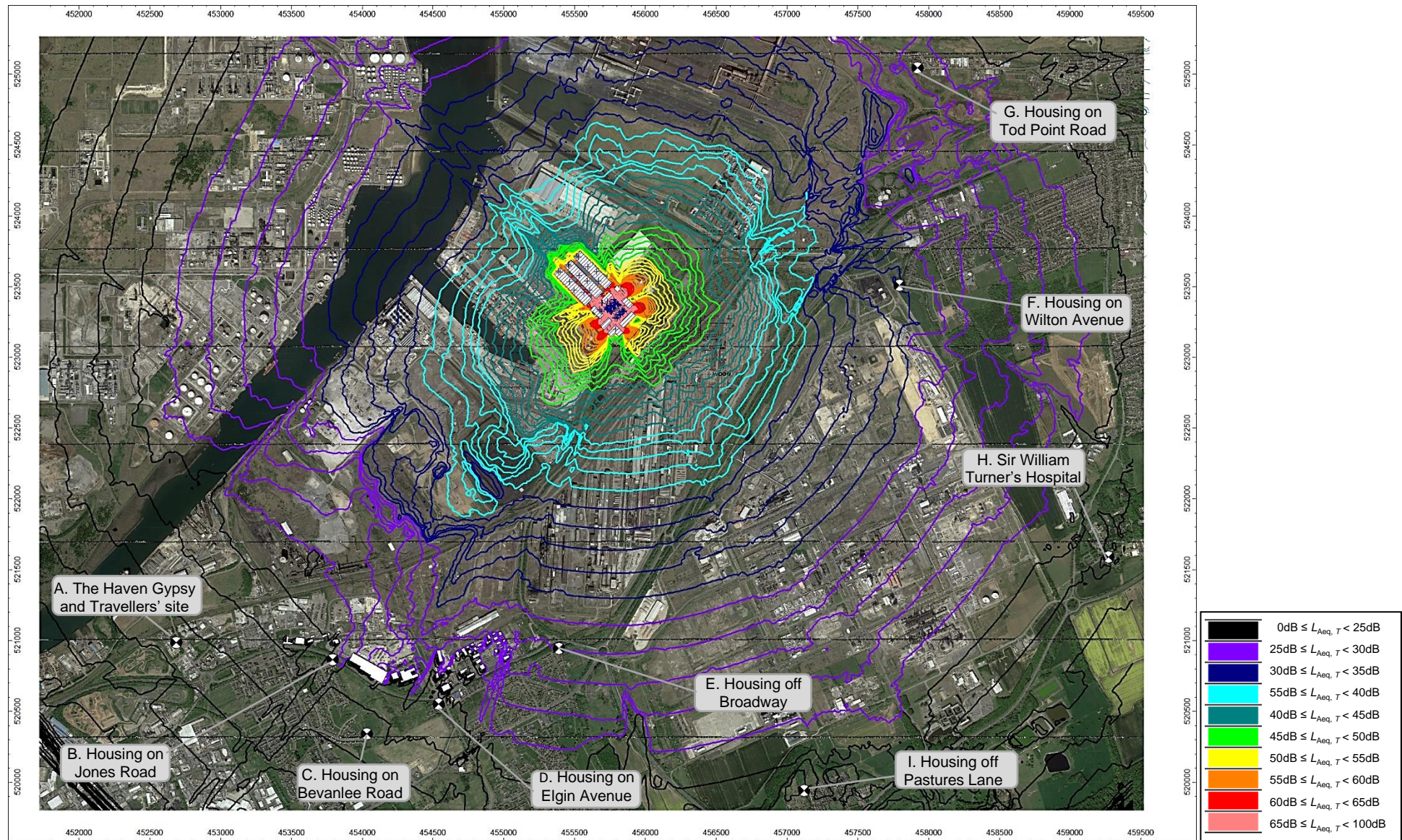


Figure 4: Predicted Specific Sound Level, dB $L_{Aeq, T}$, from the Facility, as at 4 metres grid height from local ground level (Google 2023)

6.0 Suggested Next Steps

In the first instance, we suggest we have another call to discuss the current proposed noise level targets and current scope of plant, processes, and buildings etc. to determine whether they are appropriate based upon information available to date. This will help to identify where noise mitigation is likely to be required, such that these can be factored into the site layout and cost plans. It is very important that the scope of all plant, noise sources etc. within the 3D noise model is representative, accurate and exhaustive (e.g. duly includes all plant such as heat rejection and ventilation plant, all required modes of operation including OTNOC etc.).

Sol will continually update the 3D noise model as required to reflect the current site layout and populate it with supplier noise data as this becomes available to us.

We trust that this is of assistance and await your further instruction.

Yours sincerely
For and on behalf of Sol Acoustics Limited

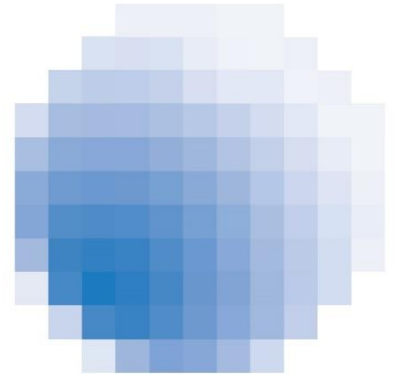


Brian Horner BSc MIOA
Associate Director

APPENDIX A GLOSSARY OF ACOUSTIC TERMS

Term	Abbreviation	Description
Decibel	dB	A scale for comparing the ratios of two quantities, including sound pressure and sound power.
A-weighting	dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the change in sensitivity of the human ear at varying frequencies.
Sound Pressure Level	L_{pA}	A measure of the sound pressure at a particular location. Typically expressed in dB(A) referenced to 2×10^{-5} Pascals.
Equivalent Continuous Sound Level	$L_{Aeq,T}$	The steady level of sound over a prescribed period of time which would contain the same total sound energy as the actual fluctuating noise under consideration in the same period of time.
Statistical Sound Levels	L_{A10} and L_{A90}	The level of noise exceeded for a percentage of the time period being sampled, namely 10% or 90% respectively.
Background Sound Level	$L_{A90,T}$	The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of the time period being sampled.
Maximum Sound Level	L_{Amax}	The maximum sound or noise level determined with instrumentation set to either a fast time weighting, L_{AFmax} , or a slow time weighting, L_{Asmax} , as occurring during the time period being sampled.
Sound Power Level	L_{wA}	A measure of the total sound energy radiated from a source. Like sound pressure levels, this is also expressed in dB(A) terms, but it is referenced to 1×10^{-12} W.
Broadband		Sound sampled over a wide range of frequencies.
Narrow band		Sound sampled over a specific, restricted frequency range. Used to ascertain the amplitude and significant of individual, audible tones, and to assist in identifying particular sources of noise within a complex, multi-source soundscape environment.
Ambient Sound	$L_{eq,T}$	Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, both near and far.
Specific Sound Level	$L_{eq,T}$	The Equivalent Continuous A-Weighted Sound Level at an assessment position produced by a specific sound over a given reference time interval, T
Rating Level	$L_{Ar,T}$	The Specific Sound Level plus any adjustment for the acoustic characteristic features of the noise (e.g. intermittency, tones etc.).
Residual Noise	$L_{Aeq,T}$	The ambient sound remaining at given position in a given situation, when the specific sound source is suppressed to such an extent that it no longer contributes to the ambient sound.
Sound Reduction Index	SRI	The reduction in sound energy when transmitted through a panel or similar planar element, typically used in relation to single octave or one-third octave frequency band values.
Weighted Sound Reduction Index	R_w	The Sound Reduction Index expressed as a single figure, as expressed against a reference curve.
Dynamic Insertion Loss	DIL	Reduction in acoustic energy resulting from the insertion of a noise control element (e.g. an attenuator, acoustic enclosure etc.).
Free Field		Noise measuring location that is free from the presence of sound reflecting objects (except the ground), usually taken to mean being at least 3.5 metres distance from reflective surface(s) or greater.

APPENDIX 12.9 ENVIRONMENTAL NOISE BENCHMARKING ASSESSMENT



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Environmental Noise Benchmarking Assessment
P2055-REP01-REV A-BDH
28 March 2023

PROJECT: Green Lithium
Teesside
Environmental Noise Benchmarking Assessment

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REFERENCE: P2055-REP01-REV A-BDH

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28 March 2023

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1 EXECUTIVE SUMMARY

Sol Acoustics Ltd (“Sol”) has been appointed by Sol Environment Ltd to provide an environmental noise benchmarking assessment for the proposed Green Lithium Facility (the “Facility”), which is to be located within the wider “Teesworks” site as located in on Kinkerdale Road, Teesport, TS6 6UE.

The purpose of this acoustic assessment is to determine appropriate, maximum permissible environmental noise “Rating Level” limits for the proposed Facility (in its entirety) which are not to be exceeded at any nearby noise sensitive residential housing, during both daytime and night time periods, as for weekdays and weekends also and all in accordance with the methodology as prescribed in relevant Standards and guidance (e.g. British Standard BS4142: 2014+A1: 2019).

These adopted environmental noise limits have been derived from the results obtained from an extensive benchmarking environmental noise survey that was conducted by Sol, as carried out between Tuesday 1 February and Wednesday 16 February 2022 (inclusive) and again between Thursday 25 August and 5 September 2022 (inclusive).

Details regarding the noise level emissions from key plant items associated with the Facility are not known at this stage and as such this report does not advise nor assess the likely noise impact that is expected to arise at the various noise sensitive receptors that have been identified.

Once further details of the anticipated noise level emissions from the Facility are known, a full environmental noise impact assessment shall be required in order to predict and assess the noise Rating Level as actually expected at the surrounding noise sensitive receptors. Where necessary, an appropriate Noise Management Plan (NMP) must also be developed at this time; this should be designed to ensure that the noise level emissions arising from the entire proposed Facility does not exceed the specified maximum permissible noise limits specified herein (in terms of Rating Levels), for each of the identified noise sensitive receptors.

Please refer to the main report and appendices for further information.

2 INTRODUCTION

Sol Acoustics Ltd (“Sol”) has been appointed by Sol Environment Ltd to provide an environmental noise benchmarking assessment for the proposed Green Lithium Facility that is to be located within the existing wider “Teesworks” site in South Teesside, TS6 6TX (hereinafter referred to as the “Facility”). The purpose of this acoustic assessment is as follows:

- To identify the nearest pre-existing noise sensitive receptors (“NSRs”) that are most likely to be affected by environmental noise arising from plant and/or process noise associated with the Facility
- To determine the prevailing, pre-existing baseline background noise climate at the worst affected NSR, through direct, environmental noise measurement
- To suggest appropriate environmental noise limits (in noise Rating Level terms) that are not to be exceeded by the Facility at the worst affected NSRs in accordance with the methodology prescribed in relevant Standards and guidance (e.g. British Standard 4142: 2014+A1: 2019)

This report does not assess the likely noise impact arising from the operation (or construction) of the Facility, nor does it advise of the requirements for environmental noise mitigation that may be needed in order to prevent exceeding the noise level limits specified herein. A further environmental noise impact assessment shall be conducted once more information regarding the proposed plant and processes associated with the Facility becomes available, including the anticipated noise emissions from the proposed scope of plant.

This acoustic report is structured as follows:

- Section 3 provides a basic description of the Facility and key surrounding NSRs
- Section 4 provides summary details of the benchmark environmental noise survey undertaken in order to determine the pre-existing environmental noise climate at the identified NSRs
- Section 5 provides the results of the benchmark environmental noise survey
- Section 6 provides a summary of the pertinent acoustic Standard, namely BS4142, for the assessment of the potential noise impact and specifies the maximum permissible Rating Level limits
- Section 7 provides a conclusion statement
- *Appendix A provides a glossary of acoustic terminology*
- *Appendix B provides details of the noise surveys undertaken and a summary of the data obtained from these*
- *Appendix C gives details and qualifications of contributing Sol Acoustics’ staff*

3 DESCRIPTION OF SITE

3.1 General Overview and Noise Sensitive Receptors (NSRs)

The proposed site for the Facility is located within the existing wider “Teesworks” site, which is located at on Kinkerdale Road, Teesport, TS6 6UE. The site is situated within a predominantly industrial area. The nearest identified existing noise sensitive premises to the Facility are as follows:

- A. “The Haven” travellers’ site, located c.3.6km distance to the south west
- B. Housing on Jones Road, located c.2.8km distance to the south west
- C. Housing on Bevanlee Road, located c.3km distance to the south west
- D. Housing on Elgin Avenue, located c.2.6km distance to the south
- E. Housing off Broadway, located c.2km distance to the south
- F. Housing on Wilton Avenue, located c.1.8km distance to the east
- G. Housing on Tod Point Road, located c.2.6km distance to the north east
- H. Housing at Sir William Turner’s Hospital, located c.3.6km distance to the south east
- I. Housing off Pastures Lane, located c.3.4km distance to the south

Sol has been informed by Sol Environment that there are no protected ecological receptors, Sites of Special Scientific Interest (SSSIs), Special Areas of Conservation (SACs), Special Protection Areas (SPAs) nor Ramsar sites within the vicinity of the Facility (that are sensitive to environmental noise). Therefore, these have not been included within this assessment.

Figure 1 overleaf indicates the location of the Facility in relation to the identified NSRs, and also the corresponding locations of the noise monitoring positions that have been used in order to inform this acoustic assessment (all as discussed in Section 4 of this report).

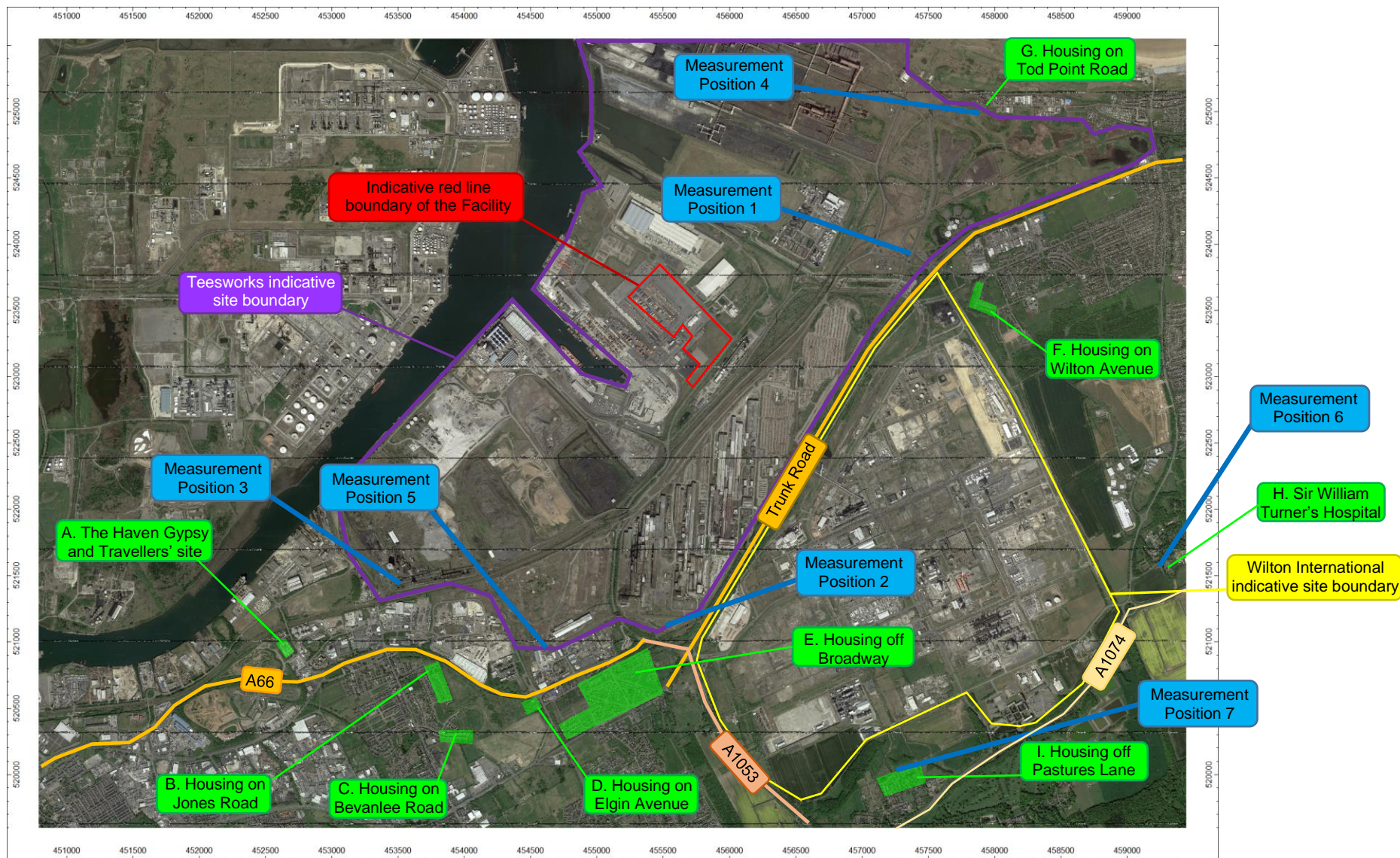


Figure 1: Aerial photo overlaid with noise sensitive receptors and monitoring locations in relation to the Facility (Google 2022)

3.2 Characteristics of the Facility

The Facility comprises of a of a low carbon lithium refinery and associated dockside reception, handling, storage, and manufacturing activities for the production of high purity lithium hydroxide monohydrate and associated by-products.

The site will be constructed across two production lines, with a developed area (buildings and enclosed plant and structures) of approximately 90,000m² – 100,000m² area. A future third line may be developed.

The Facility will import and process approximately 350,000 tonnes per annum of mineral ore material and undertake an organo-alkali metal production process to manufacture approximately 50,000 tonnes per annum of Lithium Hydroxide.

Details of the anticipated noise emissions from the Facility are not known at this stage.

Figure 2 shows the proposed site plan of the Facility.

GREEN LITHIUM
 ENVIRONMENTAL NOISE BENCHMARKING ASSESSMENT
 P2055-REP01-REV A-BDH

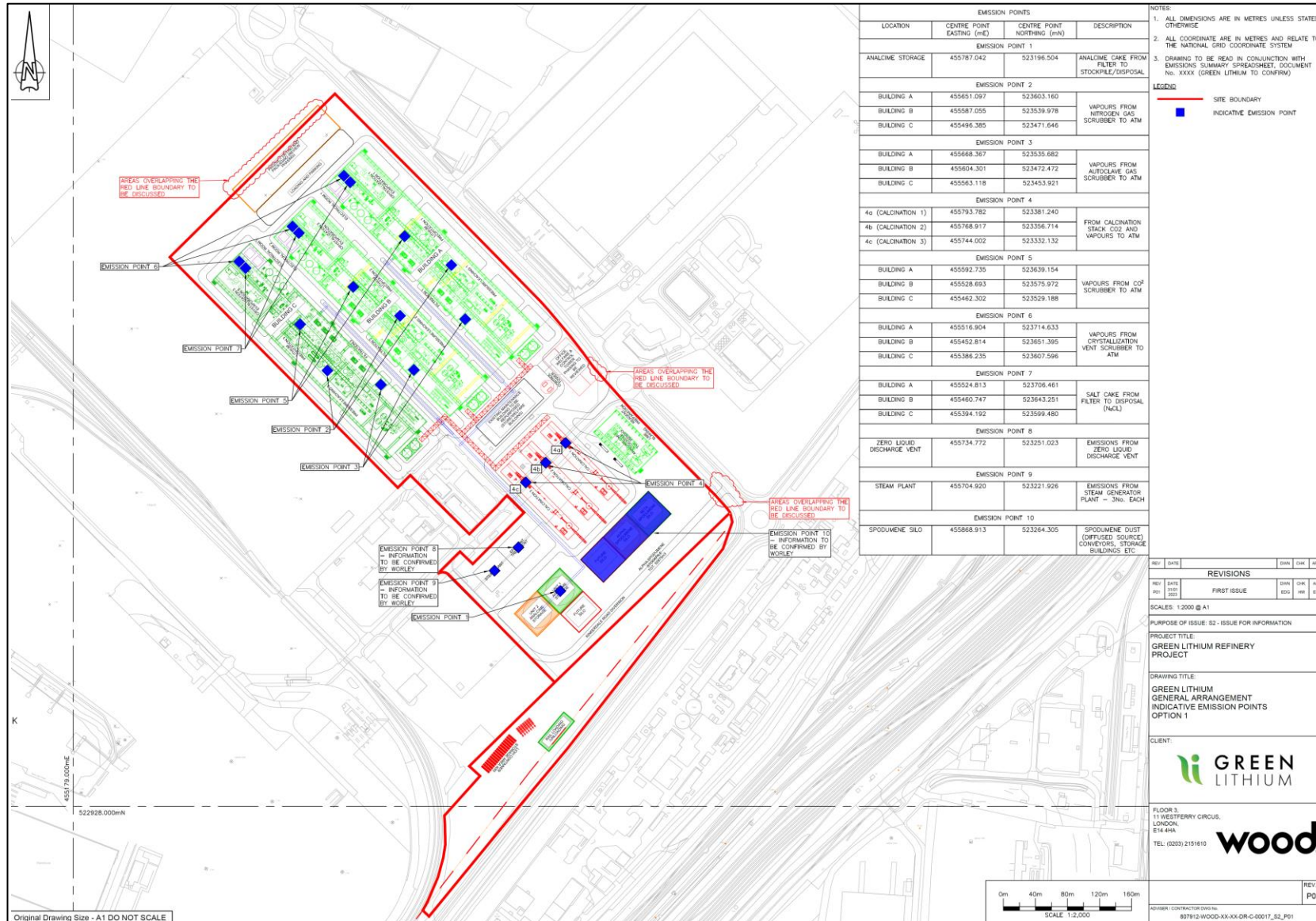


Figure 2: Proposed site plan of the Facility

4 DETAILS OF INVESTIGATION

4.1 Pre-Existing Environmental Noise Climate

In order to inform this environmental noise benchmarking assessment, environmental noise surveys have been conducted by Sol between c.12:00 hours during Tuesday 1 February and c.10:00 hours during Wednesday 16 February 2022 (i.e. a 15-day duration survey period) and between Thursday 25 August and 5 September 2022 (i.e. a 11-day duration survey period).

The purpose of the surveys was to determine the prevailing pre-existing Background Sound Levels at the nearest noise sensitive premises to the Facility, as during typical weekend and weekday, daytime and night time periods for environmental noise benchmarking and subsequent acoustic impact assessment purposes.

The environmental noise surveys consisted of seven environmental noise measurement positions. For a number of measurement positions, the noise monitoring equipment was installed within the wider Teesworks site such that the equipment remained secure. Other than daytime-only construction works and intermittent road traffic, there were no other significant industrial noise sources operating within the Teesworks site and therefore the results obtained from the environmental noise survey provides a robust environmental noise benchmark. There are a number of other industrial premises outside the Teesworks site (including along the A66, Tod Point Road and at the Wilton international Industrial Estate, see Figure 1) which were operational during the surveys.

The adopted noise measurement positions are as follows:

- **Noise Monitoring Position 1:** Mast mounted microphone at c.2 metres above local ground level and c.550 metres distance to the west of the housing on Wilton Avenue. The microphone was mounted in so-called “free-field” acoustic conditions. Continuous long term unattended environmental noise level measurements were undertaken at this position between c.12:00 hours during Tuesday 1 February and c.10:00 hours during Wednesday 16 February 2022. Key noise sources included noise from road traffic on Trunk Road (c.180 metres distance to the east) and the surrounding road network. The Background Sound Levels as recorded at this position are deemed to be representative of those as expected at the housing on Wilton Avenue.
- **Noise Monitoring Position 2:** Mast mounted microphone at c.2.5 metres above local ground level and c.320 metres distance to the north east of the housing off Broadway. The microphone was mounted in free-field acoustic conditions. Continuous long term unattended environmental noise level measurements were undertaken at this position between c.12:15 hours during Tuesday 1 February and c.09:30 hours during Wednesday 16 February 2022. Key noise sources included noise from road traffic on Trunk Road (c.100 metres distance to the south east) and the A1053 (c.180 metres distance to the south west). During the daytime period, noise from the demolition of existing buildings within the Teesworks site was also audible.

- **Noise Monitoring Position 3:** Mast-mounted microphone at c.2.5 metres above local ground level and c.600 metres distance to the north of the housing on Jones Road. The microphone was mounted in free-field acoustic conditions. Continuous long term unattended environmental noise level measurements were undertaken at this position between c.13:20 hours during Tuesday 1 February and c.09:15 hours during Wednesday 16 February 2022. Key noise sources included noise from road traffic on the A66 Road (c.430 metres to the south) and infrequent passing road traffic on the existing access roads within the Teesworks site.
- **Noise Monitoring Position 4:** Tripod-mounted microphone at c.1.2 metres above local ground level and c.90 metres distance to the west of the housing on Tod Point Lane. The microphone was mounted in “free-field” acoustic conditions. Continuous long term unattended environmental noise level measurements were undertaken at this position between c.11:45 hours during Thursday 25 August and c.11:45 hours during Monday 5 September 2022. Key noise sources included industrial noise from the existing industrial premises as located on Tod Point Road. The Background Sound Levels as recorded at this position are deemed to be representative of those as expected at the housing on Tod Point Road.
- **Noise Monitoring Position 5:** Tripod-mounted microphone at c.1.2 metres above local ground level and c.240 metres distance to the north of the housing off Broadway. The microphone was mounted in free-field acoustic conditions. Continuous long term unattended environmental noise level measurements were undertaken at this position between c.12:30 hours during Thursday 25 August and c.12:00 hours during Monday 5 September 2022. Key noise sources included noise from road traffic on Trunk Road (c.100 metres distance to the south) and intermittent noise from HGV movements within the industrial premises located off the A66. During the day time period, noise from the demolition of existing buildings within the Teesworks site was also audible.
- **Noise Monitoring Position 6:** Mast-mounted microphone at c.1.1 metres above local ground level and c.15 metres distance to the housing at Sir William Turner’s Hospital. The microphone was mounted in free-field acoustic conditions. Continuous long term unattended environmental noise level measurements were undertaken at this position between c.15:15 hours during Thursday 25 August and c.13:15 hours during Monday 5 September 2022. Key noise sources included noise from road traffic on local roads and distance road traffic on the A1074 Road (c.240 metres to the south).
- **Noise Monitoring Position 7:** Mast-mounted microphone at c.2.5 metres above local ground level within the front garden of 28 Pasture Lane. The microphone was mounted in free-field acoustic conditions. Continuous long term unattended environmental noise level measurements were undertaken at this position between c.14:15 hours during Thursday 25 August and c.12:45 hours during Monday 5 September 2022. Key noise sources included industrial noise from the Wilton International industrial estate, located c.310 metres to the north and noise from residents in nearby residential premises.

The location of the noise monitoring positions in relation to key existing environmental noise sources is shown in Figure 1. *The full measurement results are as presented in Appendix B.*

The noise surveys were carried out using Type 1 Precision Grade noise monitoring equipment. The complete sound measuring systems were field calibrated immediately prior to and following the noise survey period. (Full details of all the instrumentation used are retained on file by Sol, including traceable calibration records; these are available for review if needed).

Meteorological data was recorded at Noise Monitoring Positions 1 and 4, as using a Professional Grade Vaisala “WXT530” weather station.

Significant rainfall occurred during 3 February, 6 February, and 13 February 2022 and high winds speeds (in excess of 5ms^{-1}) occurred at various times during the survey. Any noise data as recorded during periods where the measured average wind speed exceeded 5ms^{-1} and/or the rainfall exceed 1mmh^{-1} has been excluded from the dataset forming the basis of the assessment as presented within this report.

Notwithstanding the weather conditions recorded, the microphone system was entirely weatherproofed and fitted with all-weather environmental windshield, with bird spike also.

5 ENVIRONMENTAL NOISE SURVEY RESULTS

5.1 Pre-Existing Environmental Noise Climate

Appendix B provides full detailed time history for the environmental noise levels as recorded for the duration of the environmental noise survey.

Table 1 below and overleaf provides a basic summary of the typical overall, A-weighted noise levels measured at the various noise measurement positions, in $L_{Aeq,T}$ and $L_{A90,15min}$ terms. The specific, measured noise levels pertinent to the required BS 4142: 2014+A1: 2019 environmental noise assessment are highlighted in **bold, italic** text.

Measurement Position	Date	Daytime (07:00 – 23:00 Hours)		Night Time (23:00 – 07:00 Hours)	
		dB $L_{Aeq,T}$	dB $L_{A90,15min}$ (Typical)	dB $L_{Aeq,T}$	dB $L_{A90,15min}$ (Typical)
1	Tuesday 1 February 2022	- ^A	- ^A	52	45
	Wednesday 2 February 2022	69	48	57	47
	Thursday 3 February 2022	59	55	51	45
	Friday 4 February 2022	56	49	53	49
	Saturday 5 February 2022	53	49	52	49
	Sunday 6 February 2022	52	47	53	48
	Monday 7 February 2022	60	49	59	49
	Tuesday 8 February 2022	60	48	55	47
	Wednesday 9 February 2022	57	49	52	47
	Thursday 10 February 2022	58	47	54	48
	Friday 11 February 2022	59	51	- ^A	- ^A
	Saturday 12 February 2022	- ^A	- ^A	51	46
	Sunday 13 February 2022	53	48	52	46
	Monday 14 February 2022	58	47	50	47
	Tuesday 15 February 2022	56	50	51	48
	Wednesday 16 February 2022	- ^A	- ^A	-	-

^A Measurement period significantly affected by adverse weather conditions

Table 1: Summary of typical, measured broadband environmental noise levels

Measurement Position	Date	Daytime (07:00 – 23:00 Hours)		Night Time (23:00 – 07:00 Hours)	
		dB L _{Aeq,T}	dB L _{A90,15min} (Typical)	dB L _{Aeq,T}	dB L _{A90,15min} (Typical)
2	Tuesday 1 February 2022	..A	..A	50	40
	Wednesday 2 February 2022	57	48	54	39
	Thursday 3 February 2022	59	55	50	41
	Friday 4 February 2022	56	48	50	44
	Saturday 5 February 2022	51	47	50	42
	Sunday 6 February 2022	51	45	53	45
	Monday 7 February 2022	59	48	56	54
	Tuesday 8 February 2022	58	52	53	42
	Wednesday 9 February 2022	57	47	51	40
	Thursday 10 February 2022	59	47	53	46
	Friday 11 February 2022	59	56	..A	..A
	Saturday 12 February 2022	..A	..A	51	41
	Sunday 13 February 2022	53	47	51	38
	Monday 14 February 2022	57	56	48	39
	Tuesday 15 February 2022	56	47	49	43
	Wednesday 16 February 2022	..A	..A	-	-
3	Tuesday 1 February 2022	..A	..A	50	46
	Wednesday 2 February 2022	55	47	50	46
	Thursday 3 February 2022	56	53	49	46
	Friday 4 February 2022	54	43	47	42
	Saturday 5 February 2022	48	43	46	42
	Sunday 6 February 2022	48	44	48	42
	Monday 7 February 2022	55	52	53	48
	Tuesday 8 February 2022	55	49	49	46
	Wednesday 9 February 2022	54	47	49	46
	Thursday 10 February 2022	54	47	50	47
	Friday 11 February 2022	54	48	..A	..A
	Saturday 12 February 2022	..A	..A	48	47
	Sunday 13 February 2022	49	47	49	46
	Monday 14 February 2022	54	47	49	46
	Tuesday 15 February 2022	54	48	51	47
	Wednesday 16 February 2022	..A	..A	-	-

^A Measurement period significantly affected by adverse weather conditions

Table 1 (cont.): Summary of typical, measured broadband environmental noise levels

Measurement Position	Date	Daytime (07:00 – 23:00 Hours)		Night Time (23:00 – 07:00 Hours)	
		dB $L_{Aeq,T}$	dB $L_{A90,15min}$ (Typical)	dB $L_{Aeq,T}$	dB $L_{A90,15min}$ (Typical)
4	Thursday 25 August 2022	45	34	37	33
	Friday 26 August 2022	45	36	35	28
	Saturday 27 August 2022	47	34	35	28
	Sunday 28 August 2022	41	35	41	36
	Monday 29 August 2022	45	40	42	38
	Tuesday 30 August 2022	49	39	41	38
	Wednesday 31 August 2022	46	39	41	38
	Thursday 1 September 2022	47	39	43	35
	Friday 2 September 2022	47	39	41	37
	Saturday 3 September 2022	51	41	41	34
	Sunday 4 September 2022	43	36	42	35
Monday 5 September 2022	44	37	-	-	
5	Thursday 25 August 2022	46	38	43	39
	Friday 26 August 2022	48	38	37	30
	Saturday 27 August 2022	44	35	39	32
	Sunday 28 August 2022	42	36	48	43
	Monday 29 August 2022	46	41	47	43
	Tuesday 30 August 2022	51	39	45	38
	Wednesday 31 August 2022	53	41	48	41
	Thursday 1 September 2022	51	41	46	41
	Friday 2 September 2022	50	41	42	33
	Saturday 3 September 2022	48	42	41	34
	Sunday 4 September 2022	51	39	45	35
Monday 5 September 2022	51	43	-	-	
^A Measurement period significantly affected by adverse weather conditions					

Table 1 (cont.): Summary of typical, measured broadband environmental noise levels

Measurement Position	Date	Daytime (07:00 – 23:00 Hours)		Night Time (23:00 – 07:00 Hours)	
		dB $L_{Aeq,T}$	dB $L_{A90,15min}$ (Typical)	dB $L_{Aeq,T}$	dB $L_{A90,15min}$ (Typical)
6	Thursday 25 August 2022	50	41	51	45
	Friday 26 August 2022	51	41	53	39
	Saturday 27 August 2022	52	39	57	37
	Sunday 28 August 2022	49	39	46	27
	Monday 29 August 2022	48	37	47	36
	Tuesday 30 August 2022	51	42	52	43
	Wednesday 31 August 2022	52	37	50	32
	Thursday 1 September 2022	54	42	51	33
	Friday 2 September 2022	51	40	48	28
	Saturday 3 September 2022	52	41	49	32
	Sunday 4 September 2022	55	41	51	32
Monday 5 September 2022	55	38	-	-	
7	Thursday 25 August 2022	48	42	45	42
	Friday 26 August 2022	50	42	43	38
	Saturday 27 August 2022	48	41	43	38
	Sunday 28 August 2022	54	40	47	42
	Monday 29 August 2022	54	45	51	46
	Tuesday 30 August 2022	51	45	46	44
	Wednesday 31 August 2022	51	42	47	42
	Thursday 1 September 2022	51	40	45	40
	Friday 2 September 2022	51	42	46	31
	Saturday 3 September 2022	49	42	40	30
	Sunday 4 September 2022	51	40	44	31
Monday 5 September 2022	50	41	-	-	
^A Measurement period significantly affected by adverse weather conditions					

Table 1 (cont.): Summary of typical, measured broadband environmental noise levels

6 ENVIRONMENTAL NOISE PERFORMANCE SPECIFICATION REQUIREMENTS

6.1 BS4142: 2014+A1: 2019 '*Method for rating and assessing industrial and commercial sound*'

BS 4142: 2014+A1: 2019: '*Method for rating and assessing industrial and commercial sound*' is intended to be used to assess noise of an industrial nature, which includes sound from fixed installations comprising of mechanical and/or electrical plant and equipment. The methods prescribed in this British Standard use outdoor sound levels in order to assess the likely effects of sound on people who might be inside or outside a dwelling or premises that is used for residential purposes upon which sound is incident.

The procedure contained in BS 4142: 2014+A1: 2019 for assessing environmental noise impact is to compare the measured or predicted noise level from the source in question - the "Specific Sound Level" immediately outside the noise sensitive premises - with the corresponding "Background Sound Level". Where the noise contains attention attracting characteristics such as tonal, impulsive and/or intermittent elements, it may be appropriate to apply a correction to the Specific Sound Level in order to obtain the "Rating Level."

BS 4142: 2014+A1: 2019 states that the significance of sound arising from an industrial and/or commercial nature depends upon both the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, and also the context in which the sound occurs:

- a) Typically, the greater this difference, the greater the magnitude of the impact
- b) A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context
- c) A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context
- d) The lower the Rating Level is relative to the measured Background Sound Level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the Rating Level does not exceed the Background Sound Level, this is an indication of the specific sound source having a low impact, depending on the context

For the daytime, the assessment is conducted over a one-hour period, and over a 15-minute period at night. The daytime and night time periods are defined as occurring between 07:00 hours to 23:00 hours, and 23:00 hours to 07:00 hours, respectively.

BS 4142: 2014+A1: 2019 states that in using the Background Sound it is important to ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured Background Sound Level, but rather to quantify what is typical during particular time periods.

In full accordance with BS 4142: 2014+A1: 2019 methodology, the context in which the sound occurs must be taken into consideration when demining the magnitude of the noise impact. In this case, the site is situated within an existing port. Industrial noise from the proposed Facility is expected to be within context of the site and the surroundings. Given the presence of existing industrial uses within the vicinity of the noise monitoring positions and residential premises, the lowest measured typical Background Sound Level per daytime and night time period has been used to derive the maximum permissible Rating Level limits.

Notwithstanding however, the typical Background Sound Levels as measured as during the night time period at Noise Measurement Positions 4 and 6 are low in absolute terms. This should be considered further when further details of the likely levels of noise as generated by the Facility are known. At this stage however, no further correction/penalty to account for the *context* in which the sound occurs.

Table 2 specifies appropriate maximum permissible Rating Level limits which shall be applicable to Facility at the identified NSR in order to achieve a BS 4142: 2014+A1: 2019 defined “*Low Impact, depending on the context*”.

Noise Sensitive Receptors	Representative Noise Measurement Position	Maximum Permissible Noise Rating Level Limit, dB L_{Ar,T_r} , for BS4142 defined <i>Low Impact, Depending on the Context</i>	
		Daytime (07:00 hours – 23:00 hours)	Night Time (23:00 hours – 07:00 hours)
A. The Haven travellers’ site (c.3.6km to the south west)	3	43	42
B. Housing on Jones Road (c.2.8km to the south west)	3	43	42
C. Housing on Bevanlee Road (c.3km to the south west)	5	35	30
D. Housing on Elgin Avenue (c.2.6km to the south)	5	35	30
E. Housing of Broadway (c.2km distance to the south)	2	45	38
F. Housing on Wilton Avenue (c.1.8km to the east)	1	47	45
G. Housing on Tod Point Road (c.2.6km to the north east)	4	34	28
H. Sir William Turner’s Hospital (c.3.6km to the south east)	6	37	27
I. Housing off Pastures Lane (c.3.4km to the south)	7	40	30

Table 2: Maximum permissible Rating Level limits, dB L_{Ar,T_r} , to achieve a BS4142 defined *low impact, depending on the context*

The above maximum permissible noise level limits are specified in terms of the BS4142 defined Rating Level. The acoustic character of the sound generated from the Facility must therefore be considered and where appropriate, an acoustic character correction (penalty) must be applied to the predicted Specific Sound Level when assessing compliance with the above specified receptor noise level limits.

7 CONCLUSION

Sol has been appointed to provide an environmental noise benchmarking assessment for the proposed Green Lithium Facility which to be located at the on Kinkerdale Road, Teesport, TS6 6UE.

The pre-existing environmental noise climate has been determined by direct measurement at the existing noise sensitive receptors (NSRs). Using this benchmark environmental noise measurement data, it has been possible to set appropriate environmental noise limits for the proposed Facility, all as based on applicable BS 4142:2014+A1: 2019 guidance.

The adopted noise level limits have been determined as based upon the results of a benchmark environmental noise survey conducted by Sol between Tuesday 1 February and Wednesday 16 February 2022 (inclusive) and between Thursday 25 August and 5 September 2022 (inclusive).

Maximum permissible environmental noise level limits have been specified, as based upon the results of the benchmark environmental noise survey, such that noise from the proposed development would thereby be expected to result in a *Low Impact* at any of the identified residential receptors.

Details regarding the noise level emissions from key plant items are not known at this stage (August 2022) and as such this report does not confirm or assess the likely noise impact as expected to arise from the proposed Facility as at the identified NSRs (for construction nor operational phases). A further acoustic assessment shall be required once additional information regarding the proposed plant is available, in order to develop an appropriate Noise Management Plan (NMP), such that environmental noise emissions from the proposed Facility is not expected to exceed the specified maximum permissible Rating Level limits at any NSR.

**APPENDIX A
 GLOSSARY OF ACOUSTIC TERMS**

Term	Abbreviation	Description
Decibel	dB	A scale for comparing the ratios of two quantities, including sound pressure and sound power.
A-weighting	dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the change in sensitivity of the human ear at varying frequencies.
Sound Pressure Level	L_{pA}	A measure of the sound pressure at a particular location. Typically expressed in dB(A) referenced to 2×10^{-5} Pascals.
Equivalent Continuous Sound Level	$L_{Aeq,T}$	The steady level of sound over a prescribed period of time which would contain the same total sound energy as the actual fluctuating noise under consideration in the same period of time.
Statistical Sound Levels	L_{A10} and L_{A90}	The level of noise exceeded for a percentage of the time period being sampled, namely 10% or 90% respectively.
Background Sound Level	$L_{A90,T}$	The A-weighted sound pressure level of the residual noise at the assessment position that is exceeded for 90% of the time period being sampled.
Maximum Sound Level	L_{Amax}	The maximum sound or noise level determined with instrumentation set to either a fast time weighting, L_{AFmax} , or a slow time weighting, L_{Asmax} , as occurring during the time period being sampled.
Sound Power Level	L_{WA}	A measure of the total sound energy radiated from a source. Like sound pressure levels, this is also expressed in dB(A) terms, but it is referenced to 1×10^{-12} W.
Broadband		Sound sampled over a wide range of frequencies.
Narrow band		Sound sampled over a specific, restricted frequency range. Used to ascertain the amplitude and significant of individual, audible tones, and to assist in identifying particular sources of noise within a complex, multi-source soundscape environment.
Ambient Sound	$L_{eq,T}$	Totally encompassing sound in a given situation at a given time, usually composed of sound from many sources, both near and far.
Specific Sound Level	$L_{eq,T}$	The Equivalent Continuous A-Weighted Sound Level at an assessment position produced by a specific sound over a given reference time interval, T_r
Rating Level	L_{Ar,T_r}	The Specific Sound Level plus any adjustment for the acoustic characteristic features of the noise (e.g. intermittency, tones etc.).
Residual Noise	$L_{Aeq,T}$	The ambient sound remaining at given position in a given situation, when the specific sound source is suppressed to such an extent that it no longer contributes to the ambient sound.
Sound Reduction Index	<i>SRI</i>	The reduction in sound energy when transmitted through a panel or similar planar element, typically used in relation to single octave or one-third octave frequency band values.

**APPENDIX B
 NOISE SURVEY DETAILS AND SUMMARY RESULTS**

LOCATION

Teesworks, South Teesside

DATES, TIMES, AND WEATHER CONDITIONS

Date	Daytime (07:00 hours – 23:00 Hours)				Night Time (23:00 hours – 07:00 hours)			
	Temp, °C	Rain, mm/h	Wind Direction	Mean Wind Speed, ms ⁻¹	Temp, °C	Rain, mm/h	Wind Direction	Mean Wind Speed, ms ⁻¹
01/02/2022	11	0.0	NW	6.9	9	0.0	W	3.5
02/02/2022	11	0.1	W	4.1	9	0.0	SW	5.2
03/02/2022	10	0.0	SW	5.8	7	2.5	NW	4.1
04/02/2022	5	1.1	W	4.7	4	0.0	W	4.9
05/02/2022	8	0.7	W	7.0	7	0.0	W	3.9
06/02/2022	5	16.3	NW	6.6	2	0.0	W	3.3
07/02/2022	8	0.0	W	5.7	11	0.0	W	6.6
08/02/2022	10	0.2	W	3.6	9	0.1	W	3.9
09/02/2022	7	0.0	W	3.9	4	0.0	SW	3.3
10/02/2022	6	0.0	W	5.9	2	0.0	NW	2.5
11/02/2022	5	0.0	SW	3.6	6	0.0	SW	6.9
12/02/2022	8	0.1	SW	7.6	9	0.0	SW	4.6
13/02/2022	9	3.7	SW	5.1	7	0.0	W	3.7
14/02/2022	7	2.2	NW	3.7	5	0.0	21	3.7
15/02/2022	8	1.1	W	5.3	9	0.3	SW	5.5
16/02/2022	12	0.0	W	9.2	-	-	-	-



Date	Daytime (07:00 hours – 23:00 Hours)				Night Time (23:00 hours – 07:00 hours)			
	Temp, °C	Rain, mm/h	Wind Direction	Mean Wind Speed, ms ⁻¹	Temp, °C	Rain, mm/h	Wind Direction	Mean Wind Speed, ms ⁻¹
25/08/2022	17	0.0	N	0.7	11	0.0	SW	0.2
26/08/2022	18	0.0	NE	1.1	15	0.0	S	0.2
27/08/2022	18	0.1	NE	1.4	14	0.0	SW	0.2
28/08/2022	17	0.0	N	1.0	16	0.0	NE	0.7
29/08/2022	16	0.1	N	1.1	14	0.3	N	1.7
30/08/2022	15	0.4	NW	2.1	14	1.1	NW	1.0
31/08/2022	16	0.7	NW	1.6	15	0.0	NE	0.8
01/09/2022	18	0.3	N	1.3	13	0.0	S	0.3
02/09/2022	18	0.0	N	1.4	16	0.0	E	1.7
03/09/2022	18	0.4	NE	2.3	17	0.0	E	0.8
04/09/2022	20	0.2	E	1.2	17	0.7	NE	1.0
05/09/2022	20	0.0	E	1.0	-	-	-	-

PERSONNEL

Simon Ferenczi MIOA – Sol Acoustics
 Brian Horner BSc (Hons) MIOA – Sol Acoustics
 Dan Reeves MSc – Sol Acoustics

INSTRUMENTATION

Measurement Position 1

01dB Cube Sound level meter (serial no. 12070)
01dB Pre22 Microphone preamplifier (serial no. 1915040)
GRAS 40CD Microphone capsule (serial no. 288057)
01dB Cal21 acoustic calibrator (serial no. 34675320)
Vaisala WXT520 Weather Station

Measurement Position 2

01dB Cube Sound level meter (serial no. 12069)
01dB Pre22 Microphone preamplifier (serial no. 1936019)
GRAS 40CD Microphone capsule (serial no. 330553)
01dB Cal21 acoustic calibrator (serial no. 34675320)

Measurement Position 3

01dB Cube Sound level meter (serial no. 12068)
01dB Pre22 Microphone preamplifier (serial no. 1936010)
GRAS 40CD Microphone capsule (serial no. 292577)
01dB Cal21 acoustic calibrator (serial no. 34675320)

Measurement Position 4

01dB Cube Sound level meter (serial no. 12069)
01dB Pre22 Microphone preamplifier (serial no. 1936019)
GRAS 40CD Microphone capsule (serial no. 330553)
01dB Cal21 acoustic calibrator (serial no. 34675320)
Vaisala WXT520 Weather Station

Measurement Position 5

01dB Cube Sound level meter (serial no. 11348)
01dB Pre22 Microphone preamplifier (serial no. 1805362)
GRAS 40CD Microphone capsule (serial no. 260642)
01dB Cal21 acoustic calibrator (serial no. 34675320)

Measurement Position 6

01dB Cube Sound level meter (serial no. 11571)
01dB Pre22 Microphone preamplifier (serial no. 1805255)
GRAS 40CD Microphone capsule (serial no. 331595)
01dB Cal21 acoustic calibrator (serial no. 34675320)

Measurement Position 7

01dB Cube Sound level meter (serial no. 11495)

01dB Pre22 Microphone preamplifier (serial no. 1805327)

GRAS 40CD Microphone capsule (serial no. 331753)

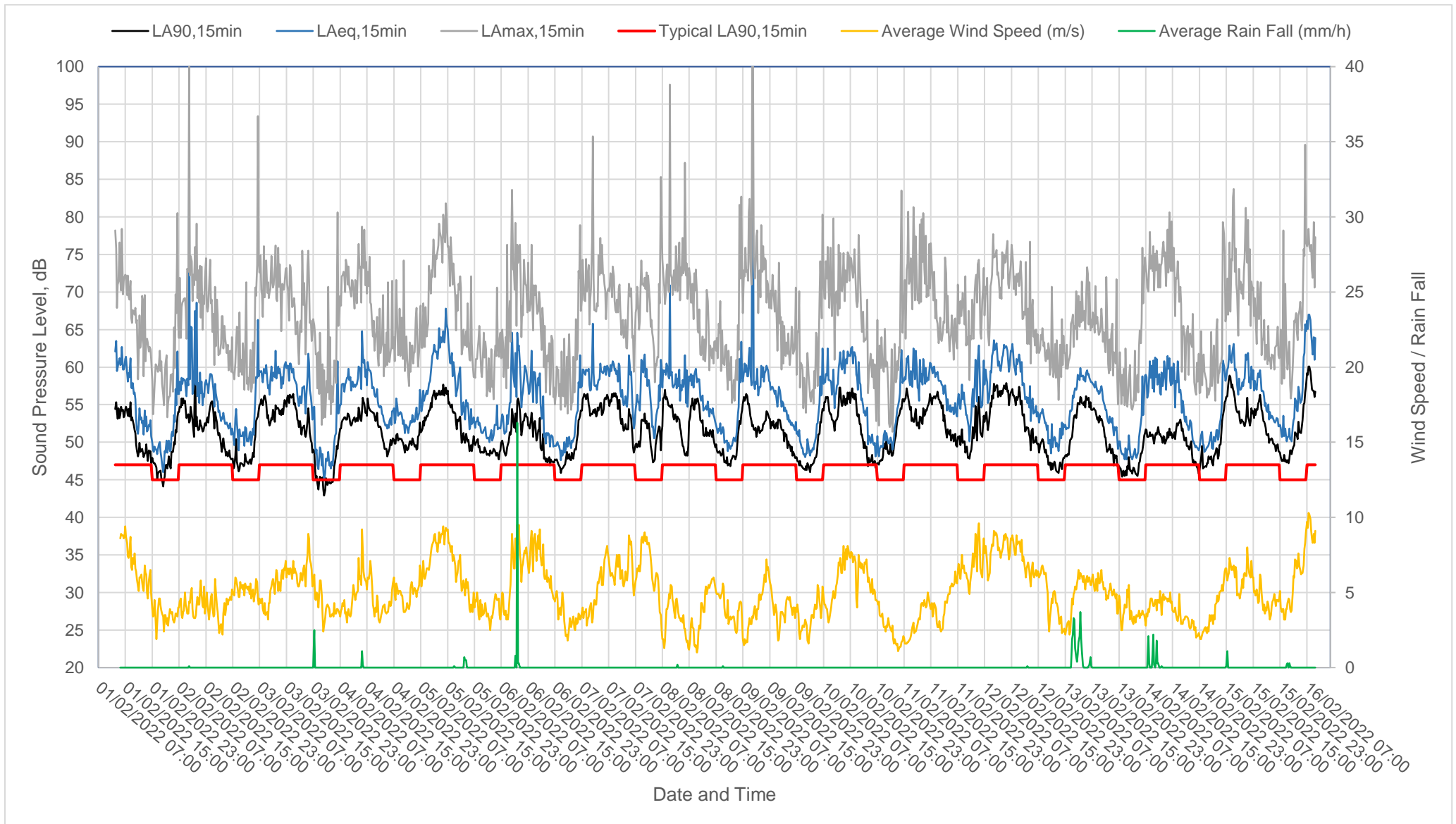
01dB Cal21 acoustic calibrator (serial no. 34675320)

METHODOLOGY

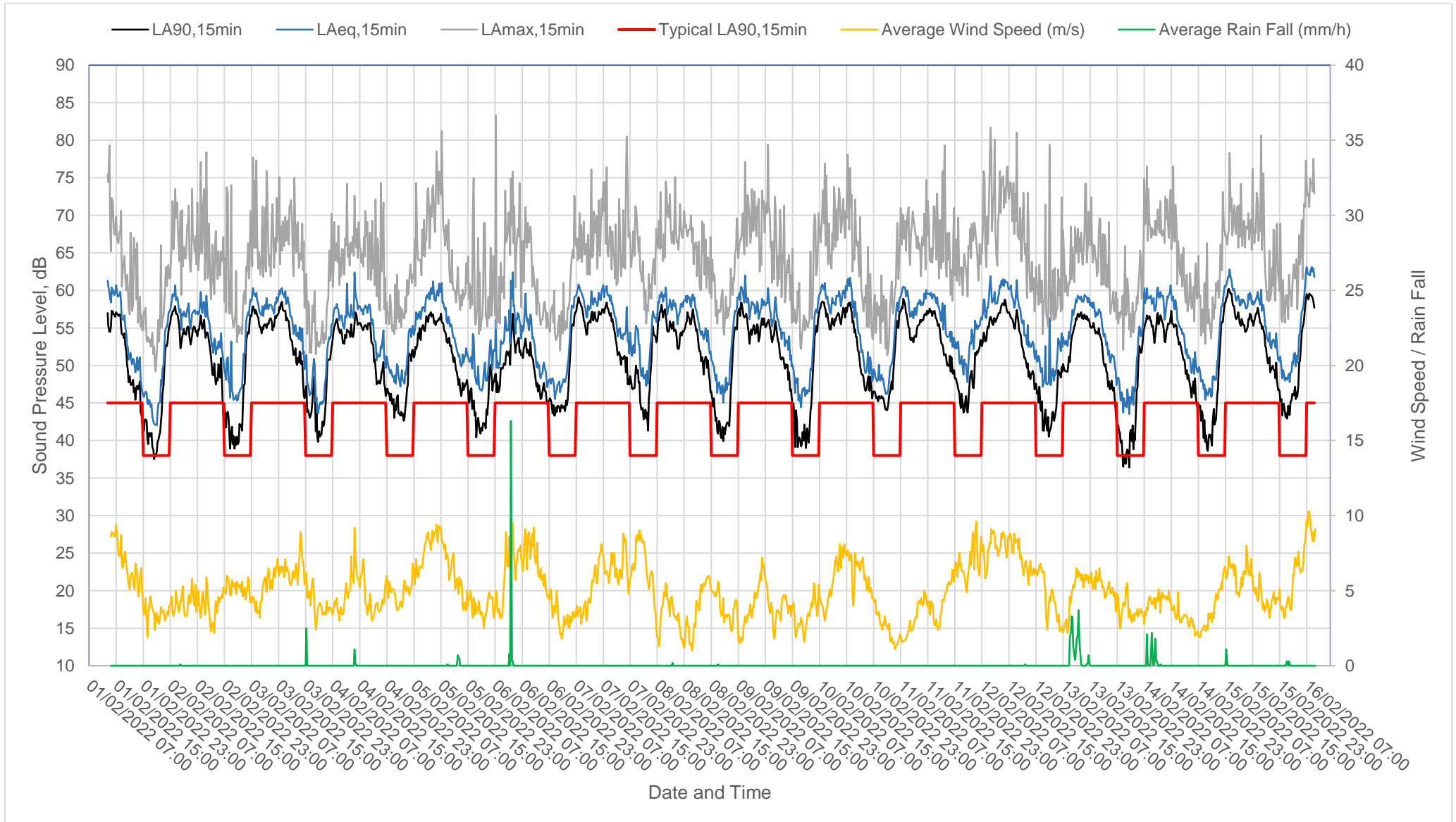
Before and after the measurements the noise monitoring equipment was calibrated to an accuracy of ± 0.1 dB using the Cal 21 Calibrator. The calibrator produces a sound pressure level of 94dB re 2×10^{-5} Pa @ 1kHz.

MEASUREMENT RESULTS

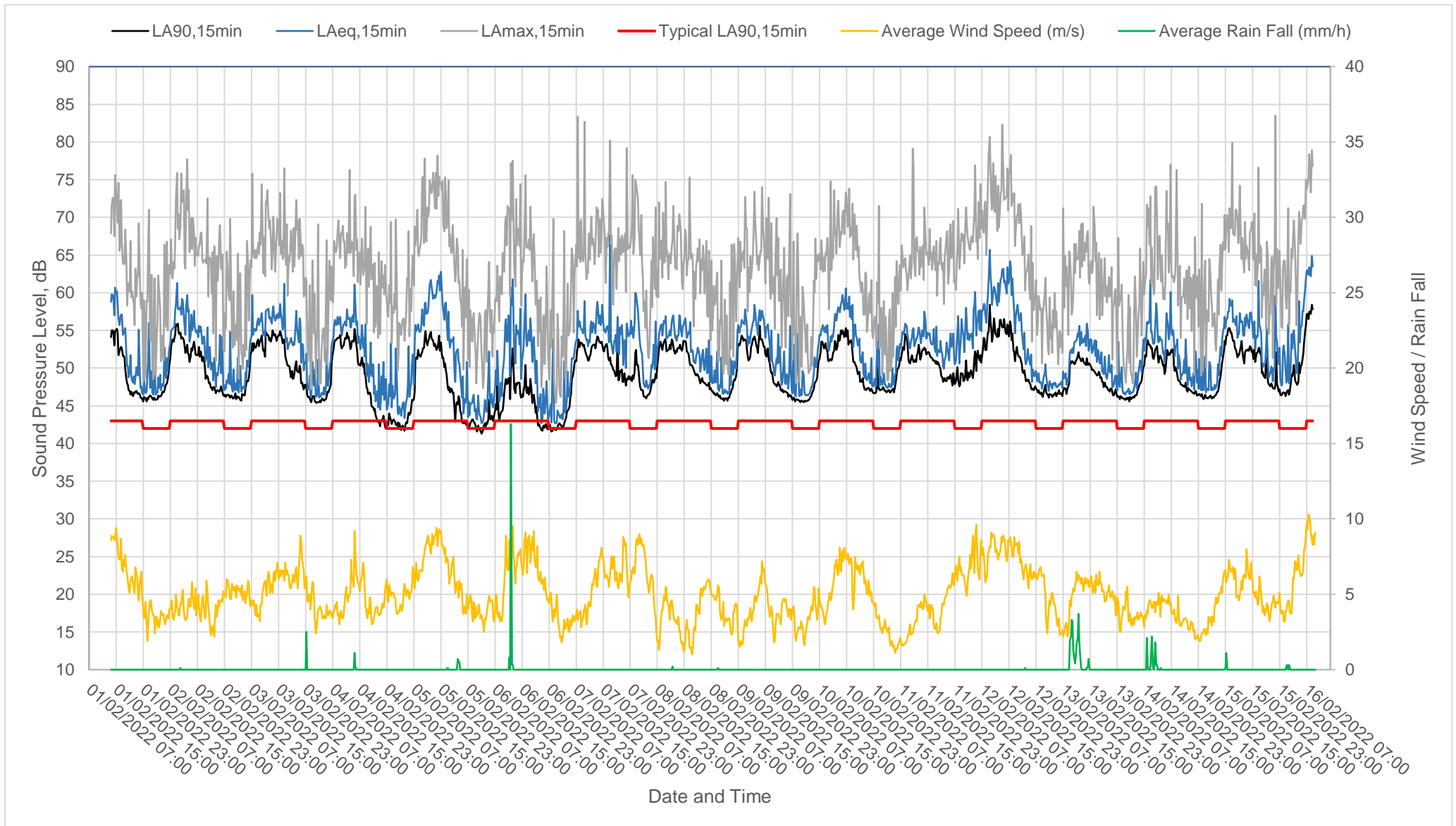
Graphs B1 to B7 summarises the broadband A-weighted results obtained at Measurement Positions 1 to 7, respectively.



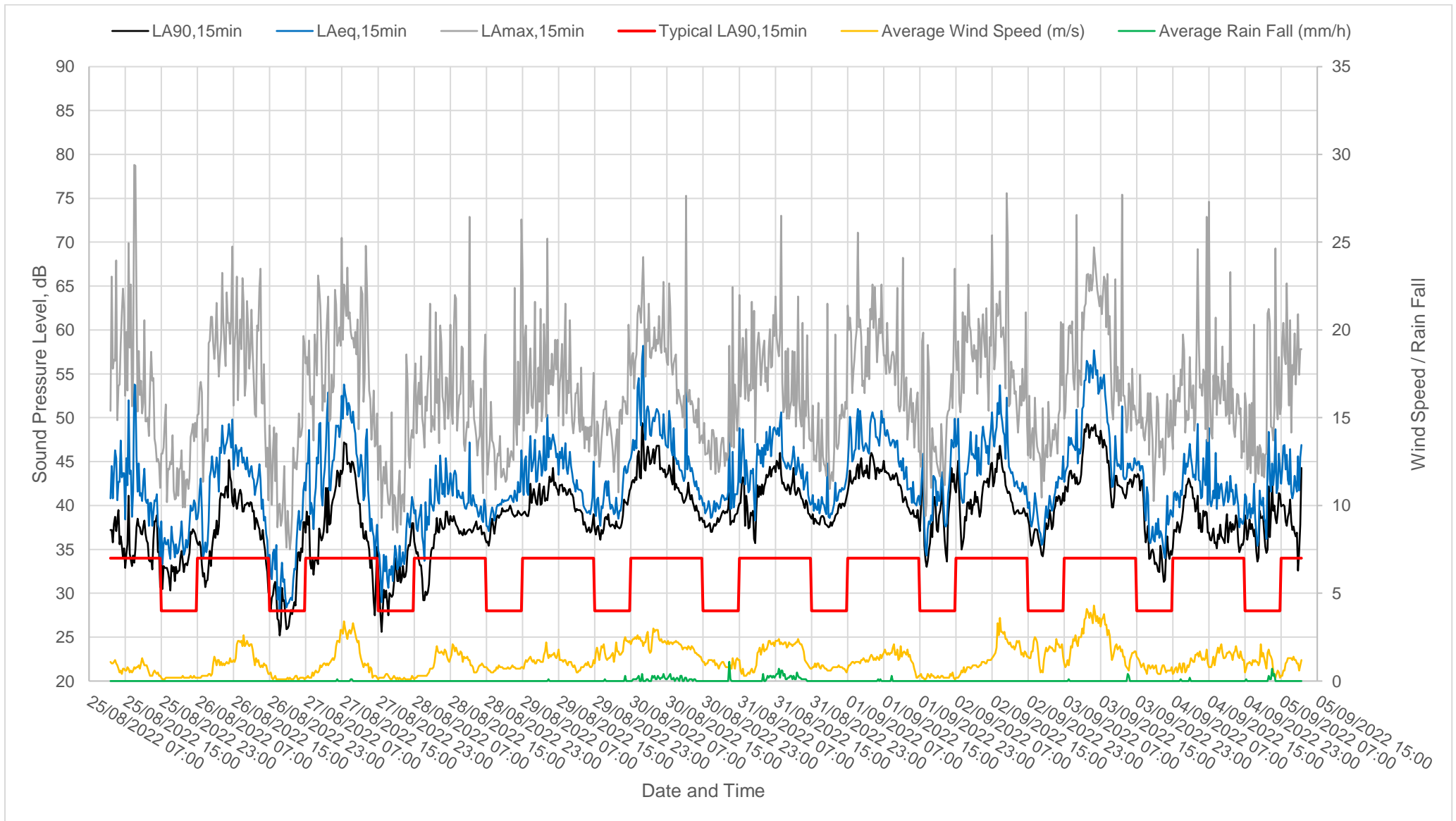
Graph B1: A-weighted environmental noise levels at Noise Monitoring Position 1, 1 to 16 February 2022



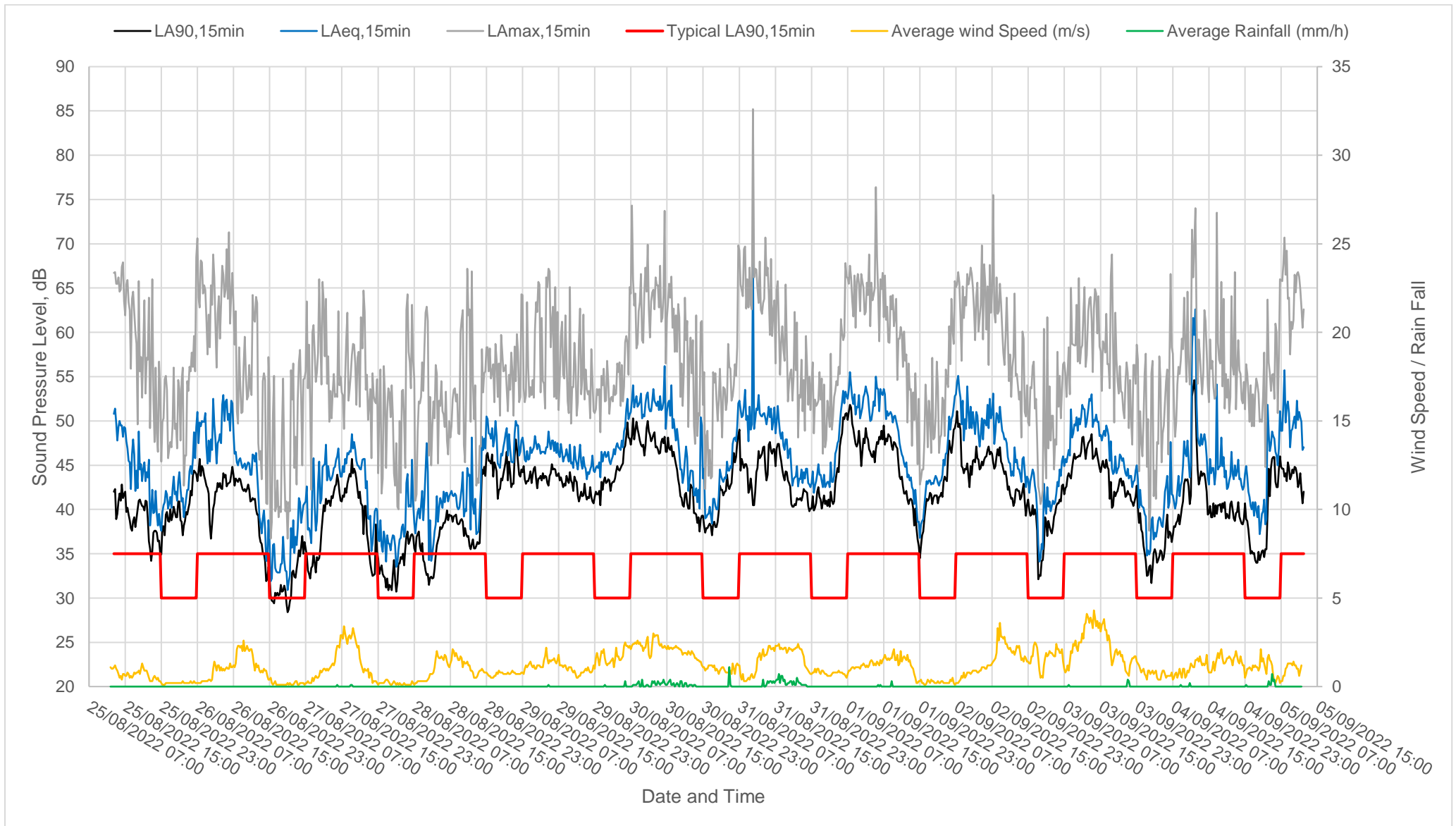
Graph B2: A-weighted environmental noise levels at Noise Monitoring Position 2, 1 to 16 February 2022



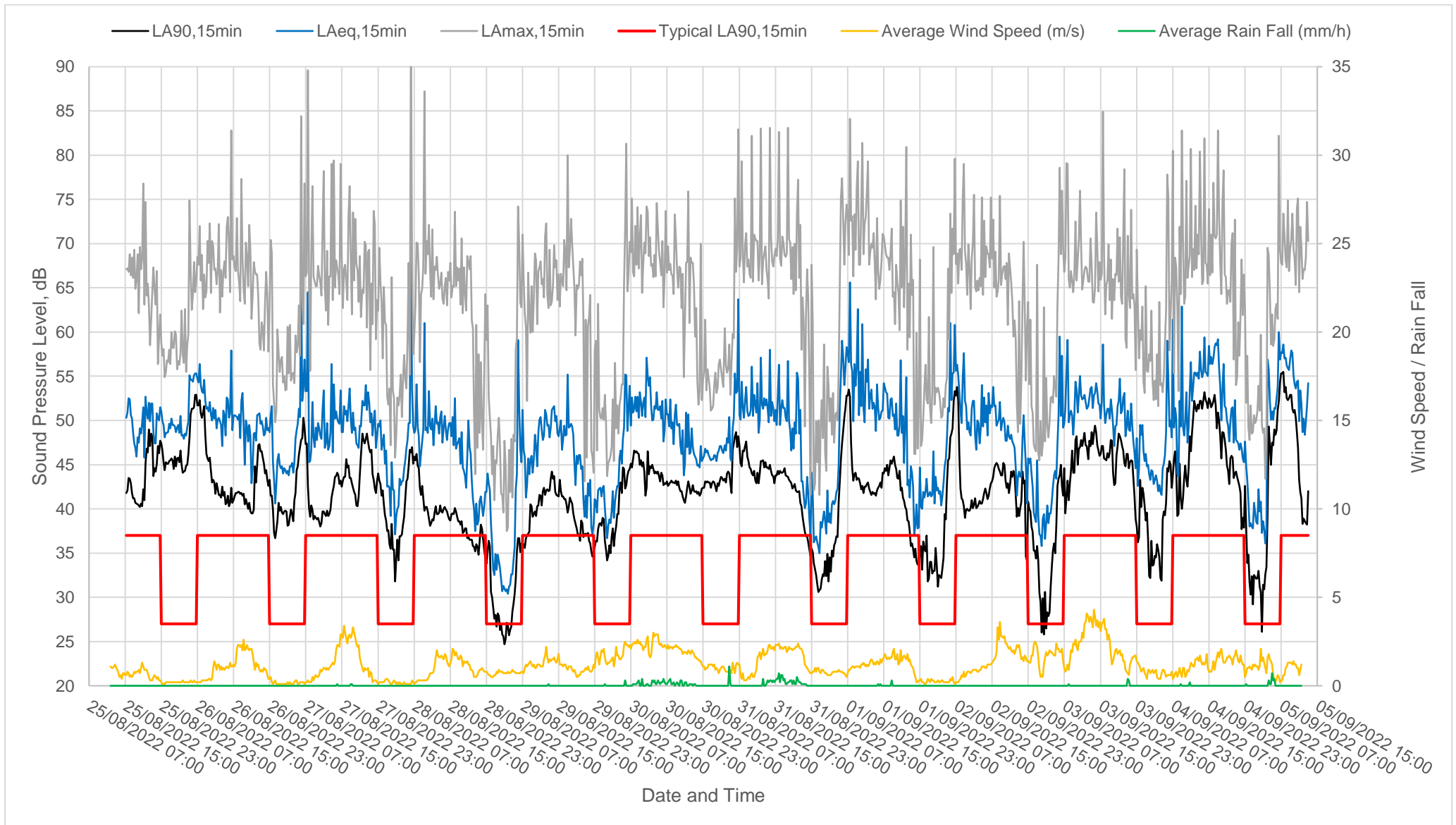
Graph B3: A-weighted environmental noise levels at Noise Monitoring Position 3, 1 to 16 February 2022



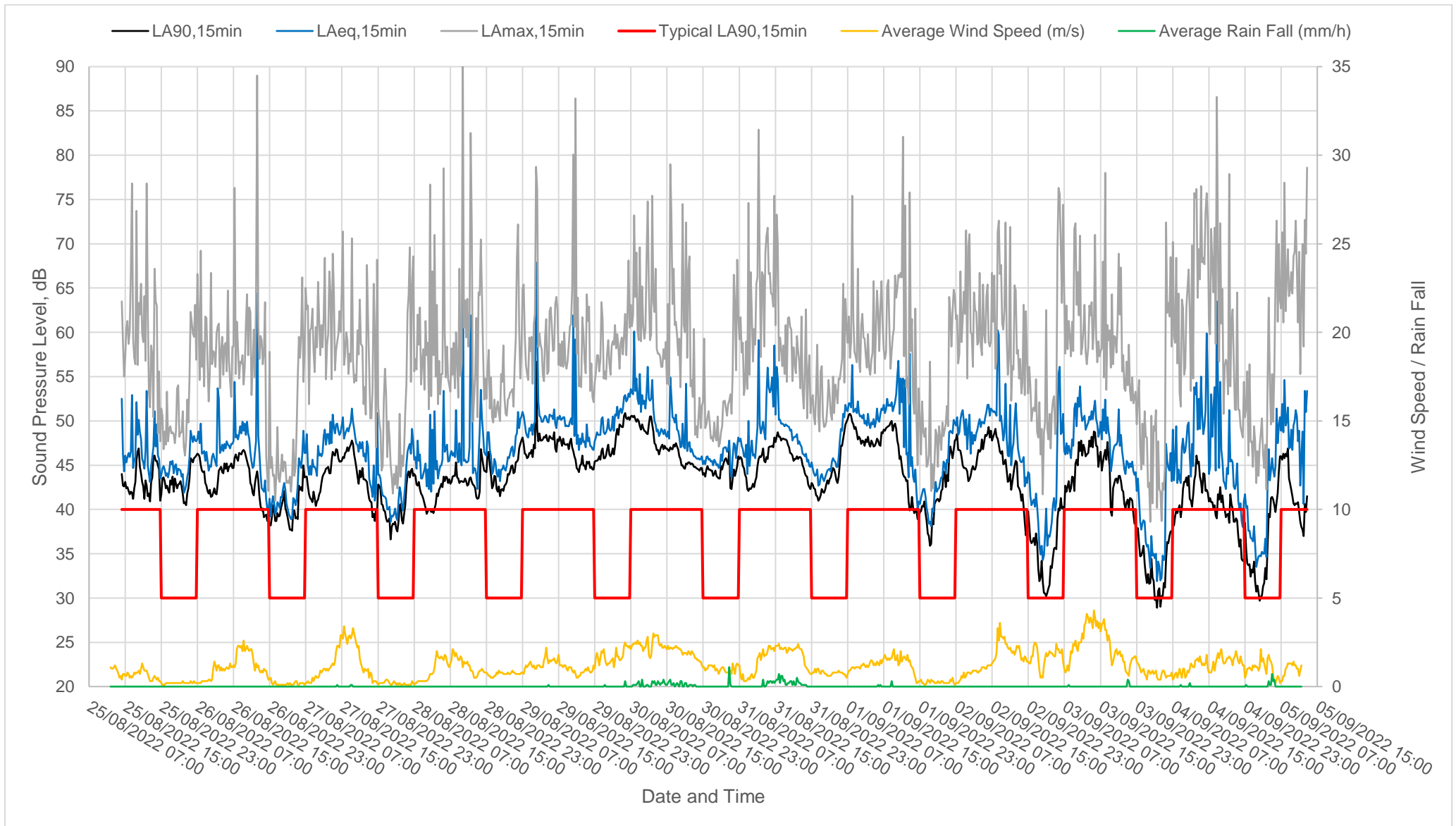
Graph B4: A-weighted environmental noise levels at Noise Monitoring Position 4, 25 August to 5 September 2022



Graph B5: A-weighted environmental noise levels at Noise Monitoring Position 5, 25 August to 5 September 2022



Graph B6: A-weighted environmental noise levels at Noise Monitoring Position 6, 25 August to 5 September 2022



Graph B7: A-weighted environmental noise levels at Noise Monitoring Position 7, 25 August to 5 September 2022

APPENDIX C
DETAILS AND PROFESSIONAL QUALIFICATIONS OF CONTRIBUTING SOL STAFF

Company Details

Name of Organisation: Sol Acoustics Limited

Status: Private Limited Company

Address: Unit 11, Brunel Court,
Gadbrook Park
CW9 7LP

Telephone Number: 01565 632535

E-Mail: info@solacoustics.co.uk

Nature of Business: Acoustic Consultancy

Directors: Simon Ferenczi

Company Registration Number: 4218702

Key Technical Personnel & Qualifications

Simon Ferenczi	Institute of Acoustics Diploma (with additional modules), MIOA
Brian Horner	BSc (Hons), MIOA

Company Accreditations

Sol Acoustics is a member of The Association of Noise Consultants (ANC) and is qualified to perform sound insulation testing under the ANC's accredited testing scheme to demonstrate compliance with the requirements of Approved Document E of the Building Regulations.