



THE SHIP INN,
LANGSTONE P09

Plant Noise Assessment

Reference: 14322.RP01.PNA.2

Prepared: 9 September 2025

Revision Number: 2

Heritage Potential

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Plant Noise Assessment



THE SHIP INN, LANGSTONE PO9

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Revision	Comment	Date	Prepared By	Approved By
0	First issue of report	1 May 2025	Toby Walton	David Johnston
1	Inclusion of EHO comments	6 June 2025	Toby Walton	David Johnston
2	Alternative criteria and assessment	9 September 2025	David Johnston	Toby Walton

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The recommendations within this report relate to acoustics performance only and will need to be integrated within the overall design by the lead designer to incorporate all other design disciplines such as fire, structural integrity, setting-out, etc. Similarly, any sketches appended to this report illustrate acoustic principles only and will need to be developed into full working drawings by the lead designer to incorporate all other design disciplines.



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1. INTRODUCTION

It is proposed to locate new items of plant at The Ship Inn, Langstone PO9. As part of the planning application, Havant Borough Council requires consideration be given to atmospheric noise emissions from the proposed equipment to the nearest noise-sensitive receptors.

RBA Acoustics have been commissioned to undertake measurements of the prevailing noise conditions at the site and to determine the atmospheric noise emission limits in accordance with Havant Borough Council's requirements. This report presents the results of the noise measurements, associated criteria and provides the required assessment.

Revision 2 follows feedback received from Havant Borough Council relating to proposed condition wording and design alterations.

2. SITE DESCRIPTION

The site is shown in relation to its surroundings in the site plan in Figure 1 (Appendix E).

The site is located to the east of Langstone Road, overlooking Emsworth Harbour to the south and east, with residential properties located to the north. The noise climate at the site is dominated by road traffic noise from the nearby A3032 Langstone Road, which is the main road serving Hayling Island, with an underlying coastal ambience which is characteristically at higher levels than typical rural environments due to the proximity of the sea and the sound of waves and wind.

3. ENVIRONMENTAL NOISE SURVEY

3.1 Survey Methodology

Monitoring of the prevailing background noise was undertaken over the following 74-hour period:

- 12:30 Friday 14 March to 14:45 Monday 17 March 2025.

As the survey was unattended it is not possible to comment with certainty regarding meteorological conditions throughout the entire survey period. However, based on observations during the site visits and weather reports for the area, conditions were generally considered suitable for obtaining representative noise measurements, being predominantly dry with little wind.

Measurements were made of the L_{A90} , L_{Amax} and L_{Aeq} noise levels over 15-minute sample periods. A summary of acoustic terminology is included in Appendix A.

3.2 Measurement Position

To determine the existing noise climate around the site measurements were undertaken at the following locations:

- **Measurement Position 1 – Rear of Pub**

The microphone was positioned on a tripod at the rear of the pub within the vicinity of the proposed plant enclosure. The microphone was at a height of approximately 1.75 m and was generally screened from Langstone Road, therefore providing a representative scenario of the worst-case residential windows located behind the pub.

The measurement position is also illustrated on the site plan attached in Figure 1 and photo in Figure 2 (Appendix E).

3.3 Instrumentation

For information regarding the equipment used for the measurements please refer to Appendix B.

The sound level meter was calibrated both prior to and on completion of the survey with no significant calibration drift observed.

3.4 Survey Noise Levels

The noise levels measured are shown as time-histories on the attached Graphs 1-3 (Appendix E).

Selection of an appropriately representative background sound level is discussed in BS 4142:2014 *Methods for Rating and Assessing Industrial and Commercial Sound* as follows:

"In practice, there is no "single" background sound level as this is a fluctuating parameter. However, the background sound level used for the assessment should be representative of the period being assessed.

[...] A representative level should account for the range of background sound levels and should not automatically be assumed to be either the minimum or modal value."

Graph 3 in Appendix E presents the range of background sound levels measured and, on this occasion, the 'typical-lowest' level has been chosen as representative for all periods. The 'typical-lowest' level can be determined statistically as the lowest $L_{A90, 15\text{mins}}$ level which is exceeded for 90% of the assessment period, or alternatively termed the 10th percentile of the measured $L_{A90, 15\text{mins}}$ levels.

The representative background L_{A90} and the period averaged L_{Aeq} noise levels measured are summarised in Table 1.

Table 1 - Measured Baseline Noise Levels

Measurement Period	Measurement Position 1 (MP1) – Rear of Pub	
	Representative Background Noise Level $L_{A90, 15\text{min}}$ (dB)	Period-Averaged Noise Level $L_{Aeq,T}$ (dB)
Daytime (07:00 – 19:00)	50	54
Evening (19:00 – 23:00)	47	52
Night-time (23:00 – 07:00)	37	48

4. PLANT NOISE CRITERIA

4.1 LPA Proposed Condition

Following submission of the proposals to the Local Planning Authority, Havant Borough Council have confirmed that they raise no objections to the proposal but have requested that any planning approval is subject to the following design amendment and condition:

Design Requirement:

The two 750 x 550 mm ventilation louvres on the rear (north) elevation of Enclosure 2, which represent the acoustically weakest points of the enclosure, must be reorientated away from the noise-sensitive residential properties to the north.

Planning Condition:

Enclosure 1 and Enclosure 2 shall be designed and constructed to ensure that one-third-octave band noise emissions ($L_{eq,5min}$) from all associated plant and equipment, in the frequency range 20 Hz to 8 kHz, are controlled to at least 5 dB below the lowest representative existing daytime (07:00-19:00), evening (19:00-23:00) and night-time (23:00-07:00) background sound level ($L_{90,5min}$) over the same frequency range. This requirement shall be achieved at a position 5 m from the enclosures and applies to the cumulative noise emissions from all plant and equipment associated with the development operating during any given period.

Reason:

To protect the amenity and quality of life of residents in the local area from undue noise disturbance.

Whilst RBA Acoustics agrees that potential issues of tonality need to be addressed to protect residential amenity, we are of the opinion that the condition proposed is not based on established guidance or standards and is potentially overly onerous to the extent that it serves as a barrier to the feasibility of the proposal. At the planning stage, final plant selections have not been made and therefore the plant-specific noise levels are not available for detailed analysis. Some assumptions must therefore be made with a view to demonstrating the feasibility of the proposals and providing certainty that any noise impacts will be appropriately controlled. This would be provided by including a condition on any planning permission setting enforceable noise limits, which then drive the final selection of plant and choice of mitigation measures if required. The details of the final plant can then be reserved for submission and approval by the local planning authority by a condition attached to any planning permission.

We therefore propose below an alternative condition incorporating the principles of BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound which includes methods for evaluating tones based on psychoacoustic research on the audibility of tones and is in line with widely accepted noise policy and is, we believe, both reasonable and enforceable.

As a further measure to protect outdoor amenity spaces we suggest that because the existing ambient $L_{Aeq,T}$ noise levels during the day and evening periods lie between the range of 50 to 55 dB $L_{Aeq,T}$, that the new plant will not add to the existing ambient $L_{Aeq,T}$ noise level in the nearest outdoor amenity space. 50 to 55 dB $L_{Aeq,T}$ is the upper range which the WHO Community Noise Guidelines recommends protects the majority of persons in outdoor amenity spaces against being moderately or highly annoyed respectively by noise.

4.2 Proposed Alternative Project Criteria

In keeping with the aim of protecting residential amenity, we propose the following alternative condition wording should apply to the proposals:

Prior to installation of the final selected plant, details of plant and its noise emissions along with any mitigation measures required to meet the noise limits described below shall be submitted to the local planning authority for approval;

a) The cumulative noise emissions from all plant and equipment associated with the development, operating during any given period, should achieve a BS 4142:2014+A1:2019 rating level no higher than 5 dBA below the representative background sound level ($L_{A90,T}$) for the period, when assessed at 1 m from the external façade of the worst-affected residential receptor. The assessment periods are daytime (07:00-19:00), evening (19:00-23:00) and night-time (23:00-07:00).

And:

b) Furthermore, the cumulative noise emissions from all plant and equipment associated with the development, operating during any given period, should achieve a rating level no higher than 10 dBA below the period-averaged ambient sound level ($L_{Aeq,T}$) for the period, when assessed at 5 m from the plant enclosure and within an area used for residential outdoor amenity. The assessment periods are daytime (07:00-19:00) and evening (19:00-23:00).

And:

c) Any approved mitigation measures must be implemented in full prior to the operation of the plant and maintained thereafter for the lifetime of the plant.

4.3 Justification

We consider that the proposed condition provides adequate protection to residential amenity without unreasonably restricting development, and is enforceable.

Achieving Part a of the proposed condition would result in a low probability of adverse effects due to noise from the proposed plant, and the use of the Rating Level ensures that the potential for tonality is suitably addressed in line with industry standards.

Achieving Part b of the proposed condition would result in ambient levels in the amenity areas not increasing and therefore remaining within the range of 50-55 dBA which is cited by both BS 8233:2014 and the WHO as an acceptable ambient noise condition for residential outdoor amenity. The use of the Rating Level once again ensures that the potential for tonality is suitably addressed. It should be noted that BS 4142 states that when considering the context of a proposal, in addition to comparing the predicted rating level with the representative sound level, assessment of the rating level within the context of the existing ambient residual or ambient sound level is also appropriate, as well as consideration of the absolute level at the receptor positions. The predicted rating levels are low, and significantly below the existing ambient sound levels.

Part c of the proposed condition ensures that any relevant mitigation measures are implemented prior to operation of the plant and maintained for the lifetime of the plant.

We therefore consider that application of the proposed condition wording provided here-in, in conjunction with the altered Design Requirements proposed by Havant Borough Council, would provide adequate protection of both indoor and outdoor residential amenity.

5. PLANT NOISE ASSESSMENT

This assessment has been based on the information provided to RBA by Heritage Potential and is described in the following sections.

5.1 Proposed Plant Items

The following plant is proposed for the scheme:

Table 2 – Proposed Plant Items

Ref.	Type/Duty	Plant Type
TF	Three Phase Single and Dual Ratio 200 kVA	Transformer

5.2 Plant Locations

The transformer is to be located within a brick-built enclosure at the rear of the pub. The following parameters and assumptions have been used in our assessment of the predicted noise levels:

- The substation is to be in the same location but rotated 90° compared with the previously submitted proposal, as per Havant's requested Design Requirement provided in Section 4.1. The 750 x 550 mm ventilation louvres will therefore face west instead of north and the vented door will face east instead of south.
- The plant room has dimensions of approximately 4.4 m (w) x 4 m (l) x 2.7 m (h)
- The plant room has an average reverberation time of 1.7 s
- The overall sound reduction of the west-facing façade is R_w 12 dB based on the brick and block external wall (R_w 45 dB) and 0.8m² weather louvres (R_w 0 dB)
- The overall sound reduction of the east-facing façade is R_w 13 dB based on the brick and block external wall (R_w 45 dB), door (R_w 25 dB) and 0.7m² weather louvres (R_w 0 dB)
- The overall radiating area dimensions are approximately 4.4 m (w) x 2.7 m (h) in each direction.

The equipment positions are indicated on the site plan in Figure 1 and Figure 3 in Appendix E.

5.3 Noise-Sensitive Receptor (NSR)

Based on observations made on site and discussions with the design team we understand the nearest noise-sensitive receptors to the proposed plant to be as follows:

- Receptor point offset to west – x (horizontal) 20 m, y (vertical) 0 m, d (perpendicular distance away) 0 m. Overall 20m
- Receptor point offset to east – x (horizontal) 16 m, y (vertical) 0 m, d (perpendicular distance away) 10 m. Overall 18m

The receptors are shown on the site plan in Figure 1 in Appendix E.

5.4 Plant Noise Levels

At this stage final plant selections have not been made, however based on sound data from Scottish & Southern Electricity Networks, a sound power level of 59 dBA has been assumed for the transformer. In the absence of product-specific noise levels, and due to the potential for the type of plant to be tonal, **we have chosen to apply the maximum tonality ratings penalty as described in BS 4142:2014 to the assessment, which is 6 dBA.**

In order to predict octave band sound levels at the receptors we have used the following indicative spectral data, taken from measured data of a comparable-sized unit. The 63 Hz octave band is 8 dB higher than the level at 125 Hz, suggesting the potential for tonality.

Table 3 – Plant Noise Levels

Unit	Parameter	Sound Level (dB) at Octave Band Centre Frequency (Hz)								dBA
		63	125	250	500	1k	2k	4k	8k	
Substation	L_w	69	61	58	57	54	50	44	25	59

5.5 Predicted Noise Levels at NSRs

Our calculation method for predicting plant noise egress from internal plantrooms to the nearest residential windows is summarised below and detailed in Appendix C:

- Source Term SWL
- Reverberant Conditions Correction & Transfer to Radiating Surface
- Composite Sound Reduction from External Wall/Louvres
- Reverberant to Free-Field Correction
- Radiating Area Correction/Distance Attenuation/Directivity
- BS 4142 Ratings Penalties

The results of the calculations indicate the following noise levels at the nearest affected residential windows:

Table 4 – Predicted Façade Plant Noise Levels

Measurement Period	Assessment Position 1m from Façade of Receptor to East		Assessment Position 1m from Façade of Receptor to West	
	Predicted Rating Level, L_{Ar,T_r} (dB) i.e. includes +6 dB for tonality	Representative Background Sound Level $L_{A90,15min}$ (dB)	Predicted Rating Level, L_{Ar,T_r} (dB) i.e. includes +6 dB for tonality	Representative Background Sound Level $L_{A90,15min}$ (dB)
Daytime (07:00 – 19:00)	27	50	25	50
Evening (19:00 – 23:00)	27	47	25	47
Night-time (23:00 – 07:00)	27	37	25	37

Predicted noise from the proposed plant installations is a minimum of 10dBA below the representative background sound level in each assessment period. The predicted levels include a 6 dBA tonality penalty.

The results of the calculations indicate the following noise levels at 5m from the plant room within the residential amenity area (garden).

Table 5 – Predicted Amenity Plant Noise Levels

Measurement Period	Assessment Position 5m from Plant Enclosure, within Amenity Area	
	Predicted Rating Level, (dB) $L_{A,r,T}$ i.e. includes +6 dB for tonality	Period-Averaged Ambient Sound Level $L_{Aeq,T}$ (dB)
Daytime (07:00 – 19:00)	38	54
Evening (19:00 – 23:00)	38	52
Night-time (23:00 – 07:00)	N/A	48

Predicted noise from the proposed plant installations is a minimum of 14dBA below the period-averaged ambient sound level in each relevant assessment period. The predicted levels include a 6 dBA tonality penalty.

6. CONCLUSION

RBA Acoustics have undertaken noise monitoring at The Ship Inn, Langstone P09. The measured noise levels are presented within this report.

Noise criteria for the proposed substation plant have been proposed and supported by suggest wording for planning Conditions.

An assessment of noise from the proposed plant has been undertaken against the proposed criteria. The results of the assessment are that predicted noise levels at the façade of the nearest noise-sensitive receptor are a minimum of 10 dBA below the representative background sound levels, and that the predicted noise levels at 5m from the plant room are a minimum of 10 dBA below the period-averaged ambient sound levels.

We consider that achieving the levels stated above constitutes a robust protection of external amenity, is in line with the guidance within BS 4142:2014+A1:2019 and can be considered acceptable in terms of noise.

Appendix A - Acoustic Terminology

A-weighting (e.g. dB(A))	A correction applied across the frequency bands to take into account the response of the human ear, and therefore considered to be more representative of the sound levels people hear.
DeciBel (dB)	Unit used for many different acoustic parameters. It is the logarithmic ratio of the level being assessed to a standard reference level.
L_{eq}	The level of a notional steady sound which, over a stated period of time, T , would have the same acoustic energy as the fluctuating noise measured over that period. Typically used to represent the average or ambient noise level.
$L_{Aeq,T}$	The A-weighted level of a notional steady sound which, over a stated period of time, T , would have the same acoustic energy as the fluctuating noise measured over that period. Typically used to represent the average or ambient noise level.
L_{An} (e.g. L_{A10} , L_{A90})	The sound level exceeded for n% of the time. E.g. L_{A10} is the A-weighted level exceeded for 10% of the time and as such can be used to represent a typical maximum level. Similarly, L_{A90} is the level exceeded for 90% of the measurement period, and is often used to describe the underlying background noise.
NR	Noise Rating – A single figure term to describe a measured noise level which considers the frequency content of the noise, generally used for internal noise level measurements (particularly mechanical services plant).

Appendix B - Instrumentation

The following equipment was used for the acoustic measurements.

Table B1 - Equipment Calibration Details

Manufacturer	Model Type	Serial No.	Calibration	
			Certificate No.	Valid Until
Norsonic Type 1 Sound Level Meter	Nor140	1403226	UCRT25/1108	16 January 2027
Norsonic Pre Amplifier	1209A	12066		16 January 2027
Norsonic ½" Microphone	1225	168180	UCRT25/1104	16 January 2027
Norsonic Sound Calibrator	1251	31988		16 January 2027

Appendix C - Plant Calculations

Table C1 - Example Calculation – Substation to Receptor to East

Parameter	Octave-band Noise Levels (dB) at Octave-band Centre Frequency [Hz]								dBA
	63	125	250	500	1000	2000	4000	8000	
Source Term L_w	69	61	58	57	54	50	44	25	59
Total Direct Level at Plant Room Wall (L_p)	58	50	47	46	43	39	33	14	
Total Reverberant Level ($L_{p,rev}$)	66	58	57	56	53	49	43	24	
Total Level at Plant Room Wall	67	59	58	57	54	50	44	25	59
Sound Power on Radiating Element (façade) (11.8m ²)	72	64	63	62	59	55	49	30	63
Composite Sound Reduction, (Wall, Door & Louvres)	11	12	12	12	12	12	12	12	-
Distance Attenuation (18m)	-25	-25	-25	-25	-25	-25	-25	-25	-
Directivity (45° off axis)	-5	-5	-5	-5	-5	-5	-5	-5	
Noise level at Receiver	31	22	21	20	17	13	7	0	21
Ratings Penalty	+6	+6	+6	+6	+6	+6	+6	+6	
Rating Level at Receiver	37	28	27	26	23	19	13	0	27

**Integer values are subject to rounding errors of +/- 1dB*

***Octave band figures are illustrative only*

Appendix D - CDM Considerations

The Likelihood (**L**) the harm will occur can be assessed by applying an indicative score (from 1 to 5) as follows:

- 1 – Remote (almost never)
- 2 – Unlikely (occurs rarely)
- 3 – Possible (could occur, but uncommon)
- 4 – Likely (recurrent but not frequent)
- 5 – Very likely (occurs frequently)

The Severity of harm (**S**) can be assessed by applying an indicative score (from 1 to 5) as follows:

- 1 – Trivial (e.g. discomfort, slight bruising, self-help recovery)
- 2 – Minor (e.g. small cut, abrasion, basic first aid need)
- 3 – Moderate (e.g. strain, sprain, incapacitation for more than 3 days)
- 4 – Serious (e.g. fracture, hospitalisation for more than 24 hours, incapacitation for more than 4 weeks)
- 5 – Fatal (single or multiple)

The rating value is obtained by multiplying the two scores and is then used to determine the course of action.

Table D1- Risk Ratings

Rating Bands (Likelihood x Severity)		
Low Risk (1 – 8)	Medium Risk (9 -12)	High Risk (15 – 25)
May be ignored but ensure controls remain effective	Continue, but implement additional reasonable practicable controls where possible	Avoidance action is required; therefore alternative design solutions must be examined. Activity must not proceed until risks are reduced to a low or medium level

The following hazards pertinent to our design input have been identified and control measures suggested:

Table D2 – Risk Assessment

Hazard	Risk Of	At Risk	Rating			Control Measures	Controlled		
			L	S	R		L	S	R
Mineral wool within drywalls and linings	Skin and respiratory irritation	Contractors	4	3	12	Wear gloves and mask	1	3	3
Acoustic doors - weight	Strain of neck, limbs or back	Contractors	3	4	12	Provide sufficient manpower/ lifting gear	1	4	4
Plant room noise levels may be above lower exposure action level	Hearing damage.	Contractors/ Operators	3	4	12	Employer should undertake noise at work assessment.	1	4	4
Vibration Isolators	Injury to hands	Contractors	3	3	9	Care needs to be taken during adjustment. Follow manufacturers guidance	1	3	3

L: Likelihood S: Severity R: Rating

Appendix E - Graphs and Site Plans

The Ship Inn, Langstone PO9

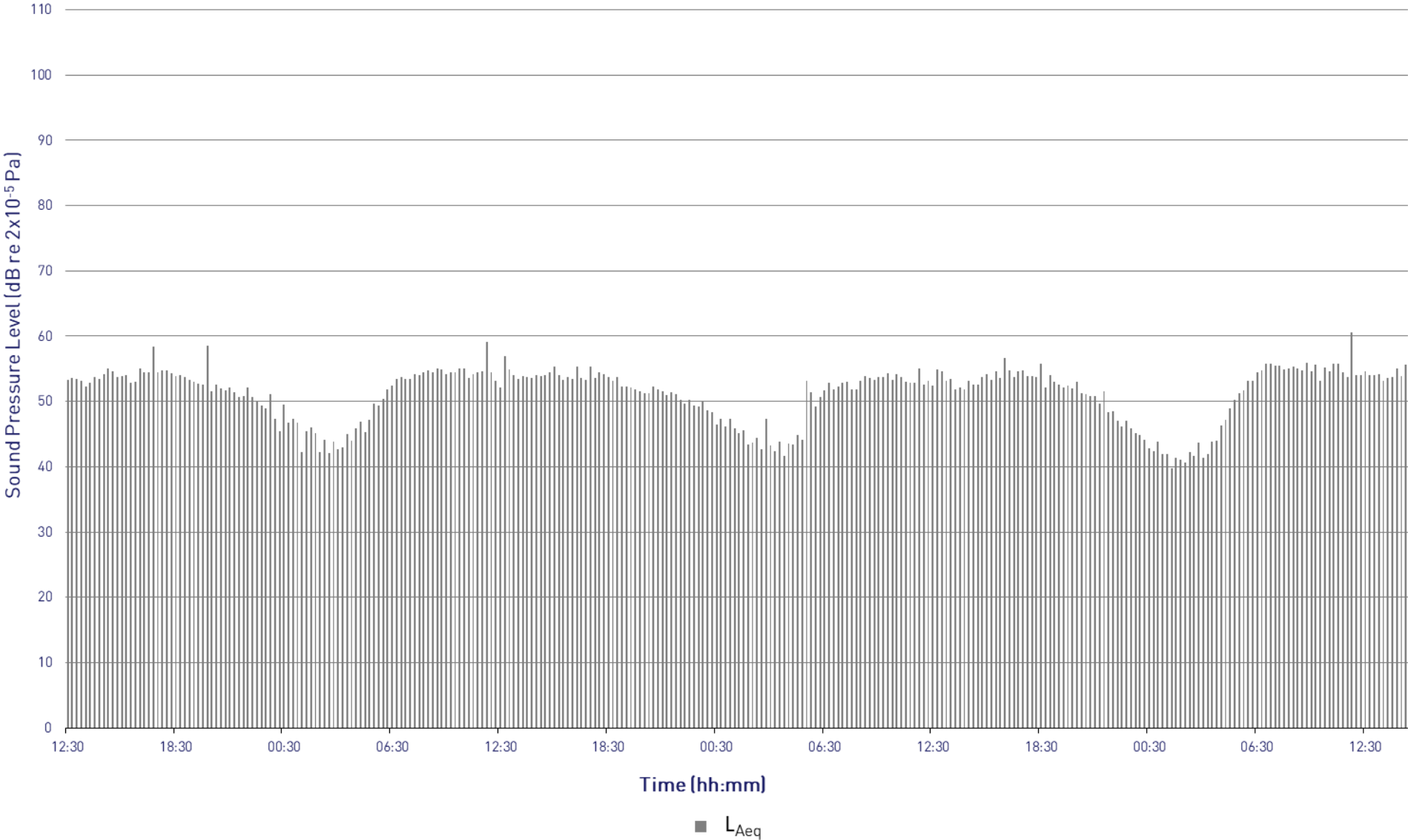
L_{Aeq} Time History

Measurement Position 1 - Rear of Pub - 14 March to 17 March 2025



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Graph 1



The Ship Inn, Langstone PO9

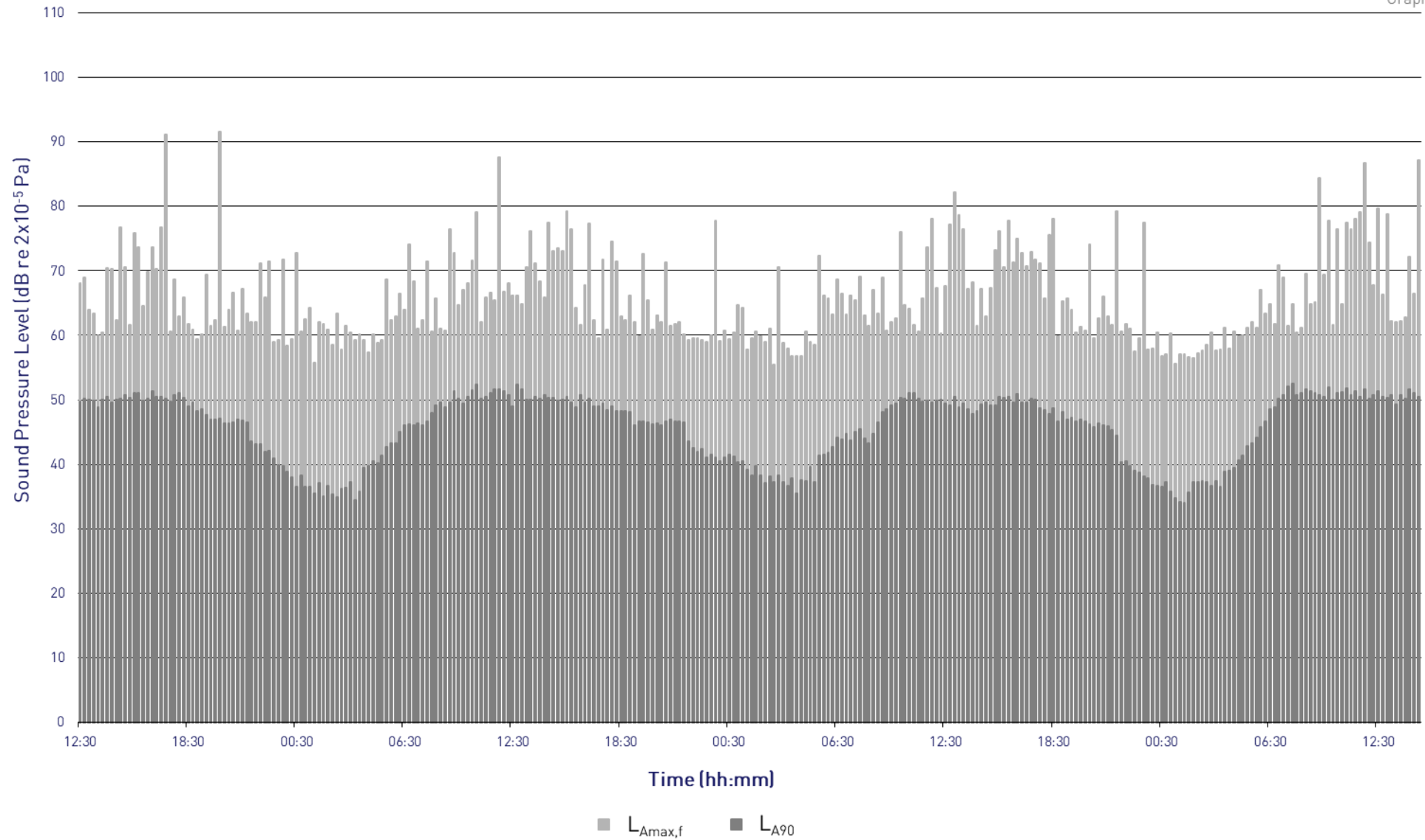
$L_{Amax,f}$ and L_{A90} Time History

Measurement Position 1 - Rear of Pub - 14 March to 17 March 2025



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Graph 2



The Ship Inn, Langstone PO9

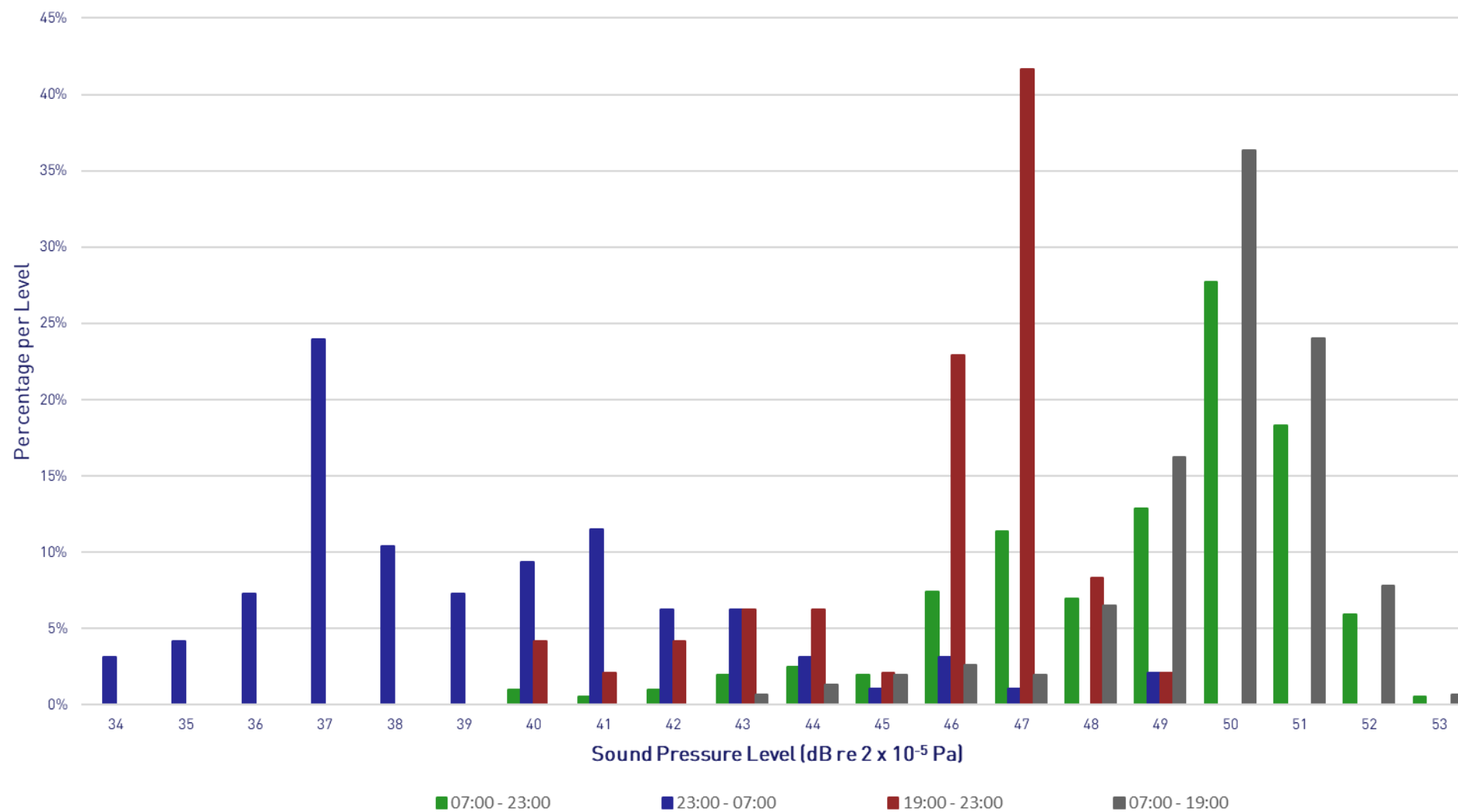
L_{A90,15 minutes} Histogram

Measurement Position 1 - Rear of Pub - 14 March to 17 March 2025



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Graph 3



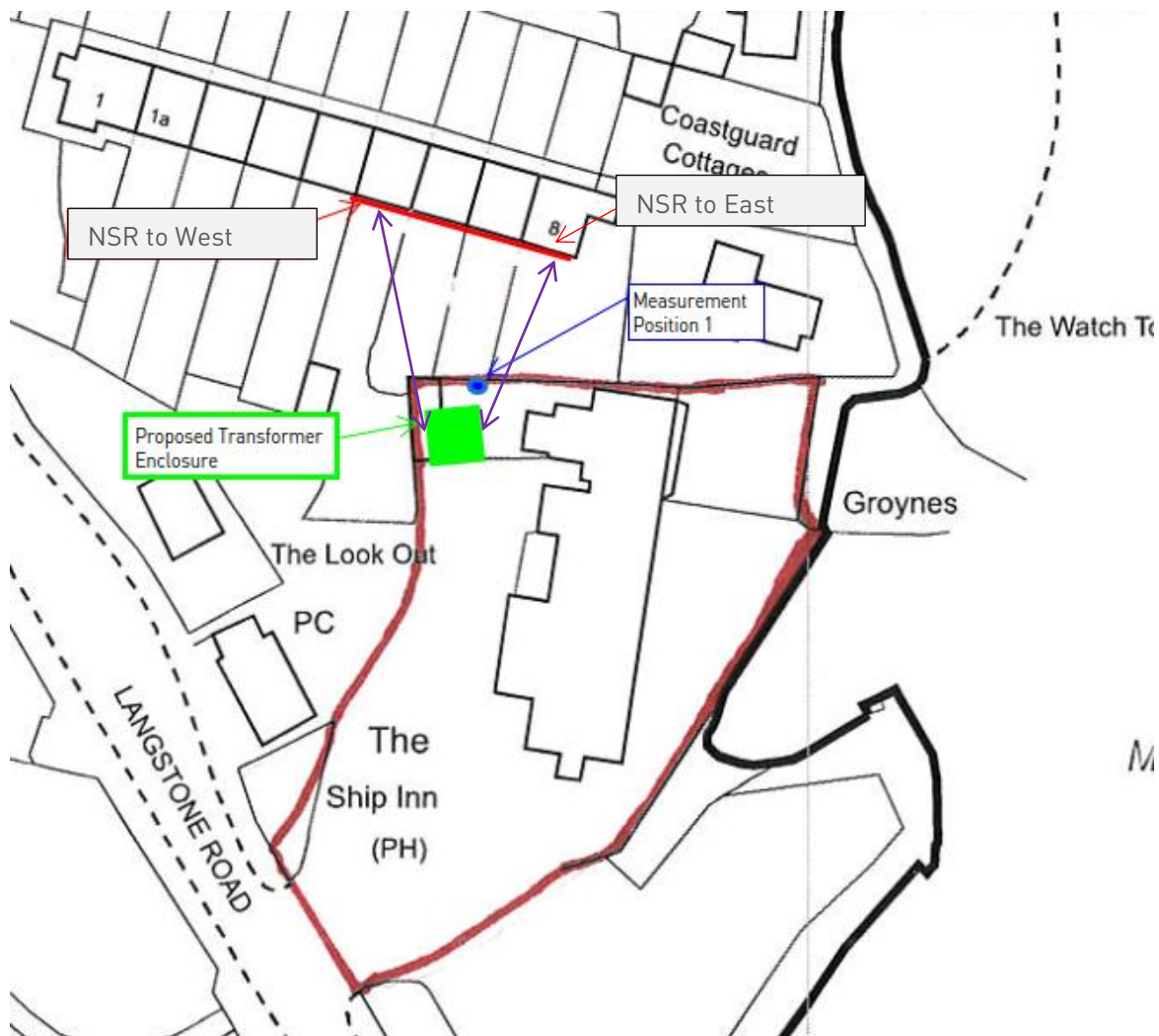


Figure 1 – Site Plan

The Ship Inn, Langstone P09

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Not to Scale



Figure 2 – Picture of Measurement Position 1

The Ship Inn, Langstone P09

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Not to Scale

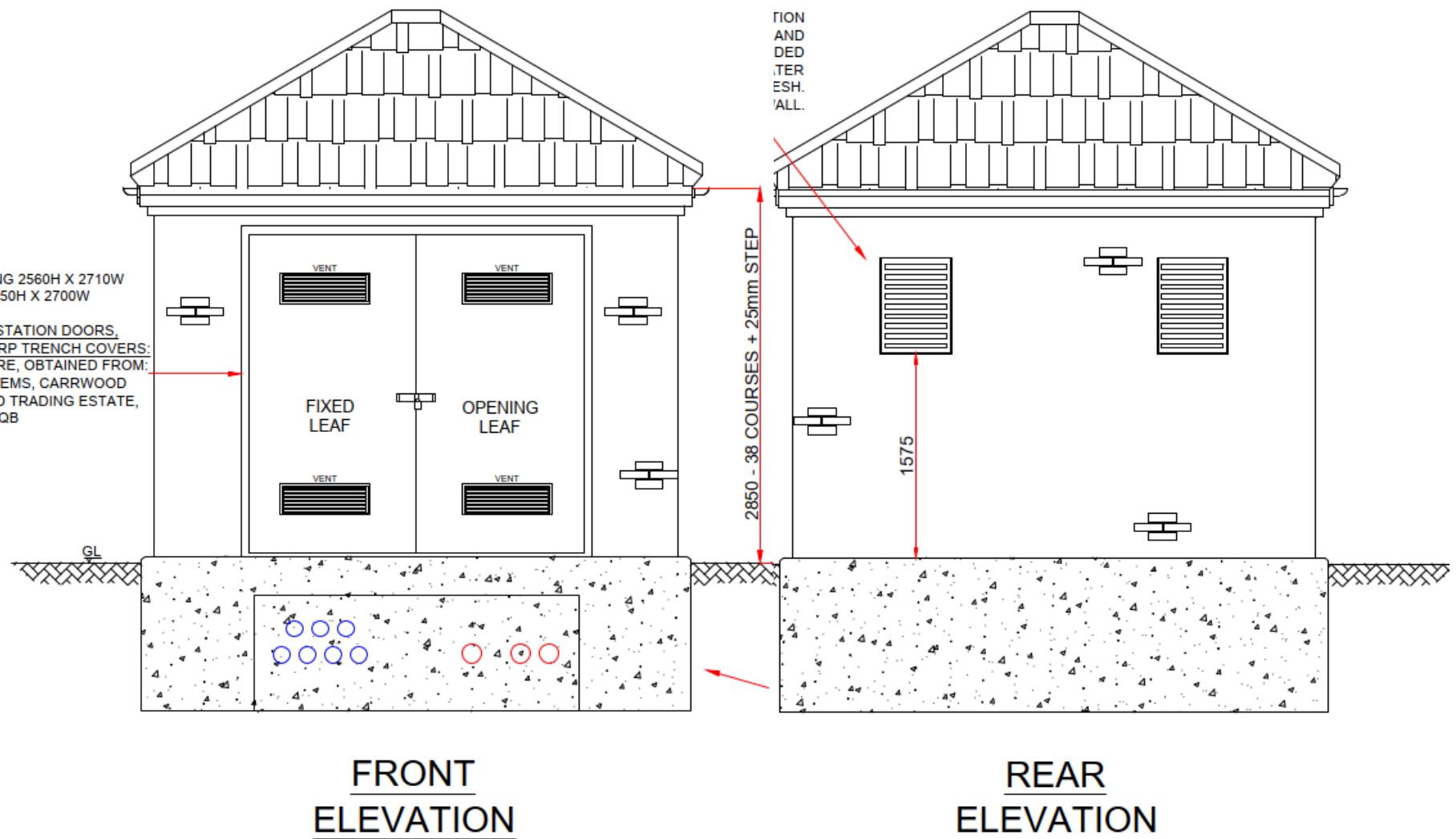


Figure 3 – East and West Elevations of Proposed Substation

The Ship Inn, Langstone PO9

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Not to Scale

6 33kV/LV Pole Mounted Transformers

6.1 Primary Voltage: 33kV

6.2 Secondary Voltage:

- Single Phase: 250-0V
- Split Phase: 250-0-250V (500V Phase-Phase)
- Three Phase: 250-0V (433V Phase-Phase)

Table 6.1 – Transformer Characteristics (2)

Transformer		Equivalent Impedance Referred to LV System (Ω)			Impedance (%)			Sound Power Level
Type	Rating (kVA)	Z_2	R_2	X_2	Z_T	R_T	X_T	dBA
Single Phase	16	0.1758	0.0791	0.1570	4.5	2.0250	4.0186	45
	25	0.1125	0.0506	0.1005	4.5	2.0250	4.0186	48
Split Phase Single and Dual Ratio	50	0.1125	0.0506	0.1005	4.5	2.0250	4.0186	51
	100	0.0563	0.0253	0.0502	4.5	2.0250	4.0186	56
Three Phase Single and Dual Ratio	50	0.1688	0.0759	0.1507	4.5	2.0250	4.0186	52
	100	0.0844	0.0380	0.0753	4.5	2.2563	4.1799	56
	200	0.0445	0.0212	0.0392	4.75	2.2563	4.1799	59

Table 6.2 – Equivalent Ratings (2)

Transformer		Secondary Current per Phase (A)	Equivalent Rating at 230V (kVAe)
Type	Rating (kVA)		
Single Phase	16	64.0	14.7
	25	100.0	23.0
Split Phase Single and Dual Ratio	50	100.0	46.0
	100	200.0	92.0
Three Phase Single and Dual Ratio	50	66.7	46.0
	100	133.3	92.0
	200	266.7	184.0

Figure 4 – Example Sound Data for Transformers

The Ship Inn, Langstone PO9

Project 14322

9 September 2025

Not to Scale



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