SYNTEGRA CONSULTING

Plant Noise Assessment

Liddell Road, West Hampstead, London

August 2023

Ref: 20-7620 Rev A

TABLE OF CONTENTS

Quality Standards Control

The signatories below verify that this document has been prepared in accordance with our quality control requirements. These procedures do not affect the content and views expressed by the originator.

This document must only be treated as a draft unless it has been signed by the originators and approved by a director.

Revision	-	*Rev A*
Date	18.07.2023	03.08.2023
Prepared by	D. Yates MIOA	D. Yates MIOA
Checked by	A. Gonzales	-
Authorised by	D. Yates MIOA	D. Yates MIOA

Limitations

Syntegra Consulting Ltd ("SC") has prepared this report for the sole use of the client in accordance with the agreement under which our services were performed. No other warranty, expressed or implied, is made as to the professional advice included in this report or any other services provided by SC.

The conclusions and recommendations contained in this report are based upon information provided by others and upon the assumption that all relevant information has been provided by those parties from whom it has been requested and that such information is accurate. Information obtained by SC has not been independently verified by SC, unless otherwise stated in the report.

The methodology adopted and the sources of information used by SC in providing its services are outlined in this report. The work described in this report was undertaken in **July 2023** and is based on the conditions encountered and the information available during the said period of time. The scope of this report and the services are accordingly factually limited by these circumstances.

Where assessments of works or costs identified in this report are made, such assessments are based upon the information available at the time and where appropriate are subject to further investigations or information which may become available.

SC disclaim any undertaking or obligation to advise any person of any change in any matter affecting the report, which may come or be brought to SC's attention after the date of the report.

Certain statements made in the report that are not historical facts may constitute estimates, projections or other forward-looking statements and even though they are based on reasonable assumptions as of the date of the report, such forward-looking statements by their nature involve risks and uncertainties that could cause actual results to differ materially from the results predicted. SC specifically does not guarantee or warrant any estimate or projections contained in this report.

Costs may vary outside the ranges quoted. Whilst cost estimates are provided for individual issues in this report these are based upon information at the time which can be incomplete. Cost estimates for such issues may therefore vary from those provided. Where costs are supplied, these estimates should be considered in aggregate only. No reliance should be made in relation to any division of aggregate costs, including in relation to any issue, site or other subdivision.

No allowance has been made for changes in prices or exchange rates or changes in any other conditions which may result in price fluctuations in the future. Where assessments of works or costs necessary to achieve compliance have been made, these are based upon measures which, in SC's experience, could normally be negotiated with the relevant authorities under present legislation and enforcement practice, assuming a pro-active and reasonable approach by site management.

Forecast cost estimates do not include such costs associated with any negotiations, appeals or other non-technical actions associated with the agreement on measures to meet the requirements of the authorities, nor are potential business loss and interruption costs considered that may be incurred as part of any technical measures.

Copyright

1. Executive Summary

A plant noise assessment has been carried out for the proposed installation at **Liddell Road, West Hampstead, London.**

The proposed plant to be installed includes an Air Source Heat Pump on the rooftop of Block B which has the potential to operate 24 hours a day. No noisy plant is expected to be installed on Block C, and therefore that area has been scoped of the assessment.

The plant is proposed to be located on the rooftop of Block B, which is an 11-storey building. The nearest noise sensitive receptors will be residential flats on the 4th floor of Block C, located at a distance of approximately 50m.

The results of the assessment have identified:

- The plant as proposed would achieve an initial rating of below a *low impact*. Taking into account the context of the surrounding area, significant adverse impacts would not be expected.
- **The requirements of Planning Condition 28 would be achieved during the daytime and at night, assuming the use of the "silenced mode" at night.**

Achievement of the target noise criteria will ensure compliance with the aims of the NPPF and the PPG in that it will avoid noise from giving rise to significant adverse impacts on health or quality of life on nearby noise sensitive receptors.

2. Introduction

This report has been prepared to assess the impact of plant noise from the approved development at **Liddell Road, West Hampstead, London** due to the proposed plant installation.

The proposed plant to be installed includes an Air Source Heat Pump on the rooftop of Block B which has the potential to operate 24 hours a day. No noisy plant is expected to be installed on Block C, and therefore that area has been scoped of the assessment.

The report assesses, through on-site noise measurements, the impact of the proposed plant on the surrounding noise sensitive receptors.

A glossary of acoustic terminology is provided in **Appendix 1**.

The plant is proposed to be located on the rooftop of Block B, which is an 11-storey building. The nearest noise sensitive receptors will be residential flats on the 4th floor of Block C, located at a distance of approximately 50m. The location of the proposed development site is provided in **Figure 2.1**.

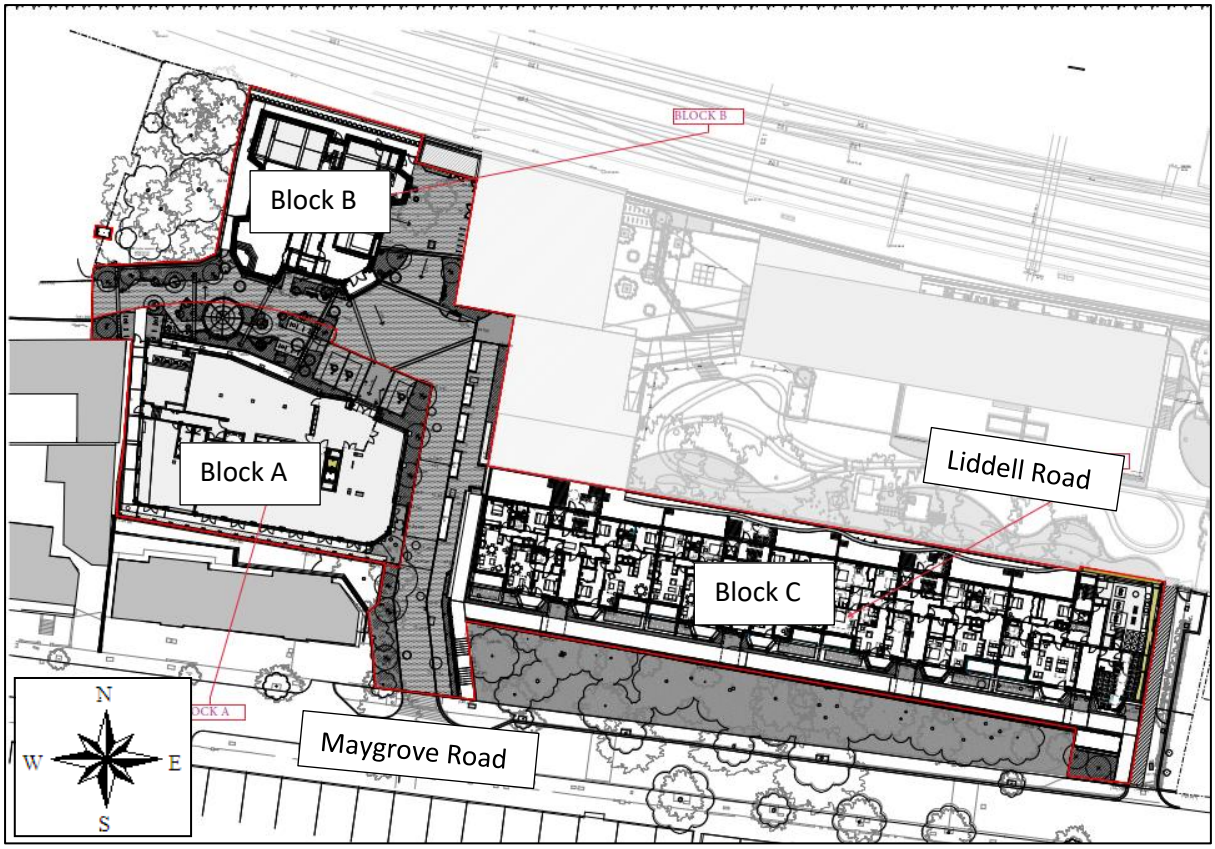


Figure 2.1: Site Location

3. Planning Condition and Guidance Documents

3.1. Planning Condition

The development was granted planning permission by The London Borough of Camden (application ref: 2014/7651/P, non-material amendments through application ref: 2022/3454/P) and Planning Condition 28 has been set in respect of plant noise, which states:

"28 Plant

Prior to the occupation of each block hereby permitted, details of the external noise level emitted from plant/machinery/equipment, and mitigation measures as appropriate, shall be submitted to and approved in writing by the Local Planning Authority.

The measures shall ensure that the external noise level emitted from plant/machinery/equipment will be lower than the lowest existing background noise level by at least 5dBA, by 10dBA where the source is tonal, as assessed according to BS4142:2014 at the nearest and/or most affected noise sensitive premises, with all machinery operating together at maximum capacity.

A post installation noise assessment shall be carried out where required to confirm compliance with the noise criteria and additional steps to mitigate noise shall be taken, as necessary. Approved details shall be implemented prior to occupation of the development and thereafter be permanently retained.

Reason: To safeguard the amenities of future occupiers in accordance with the requirements of policy CS5 of the London Borough of Camden Local Development Framework Core Strategy and policies DP26 and DP28 of the London Borough of Camden Local Development Framework Development Policies."

3.2. British Standard 4142:2014

British Standard 4142:2014 "*Methods for rating and assessing industrial and commercial sound*" provides a method for the measurement and rating of industrial type noise sources and background noise levels outside dwellings. The rating level (defined in the BS) is used to rate the noise source outside residential dwellings (this is defined as the "specific sound level").

The rating level is determined by assessing the character of the noise and applying an acoustic feature correction if appropriate. Corrections are applied for the tonality and intermittency of the noise source which can both make noise more noticeable.

The initial assessment described in BS 4142 to determine whether an adverse impact is likely is based on establishing the difference between the rating level and the background noise level outside the residential property of interest. The British Standard states that the following points should be considered:

- *'Typically, the greater this difference, the greater the magnitude of the impact.*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
- *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.'*

4. Baseline Noise Levels

In order to determine the baseline noise levels in the vicinity of the proposed plant, measurements have been carried out in order to characterise the existing noise climate during the most sensitive times of operation over a 5-day period. The noise climate at the site was dominated by road traffic noise and railway noise. Occasional construction and commercial noise were audible during set up and collection, but this would not have been present for the entire duration of the survey period.

The noise measurements utilised a Svantek 958 Type 1 Precision Sound Level Meter with a current certificate of calibration, the full list of equipment is detailed in **Appendix 3**. Before and after the measurement period the equipment was calibrated in order to ensure that the equipment had remained within reasonable calibration limits (+/- 0.5 dB). Noise Measurements were carried out in consecutive 5 minutes periods with a 1 second resolution.

Measurements were carried out between 1300 hrs on Thursday 13th July 2023 and 0900 hrs on Monday 17th July 2023.

During the noise measurement survey, the temperature was up to 21°C, dropping to a low of 13°C overnight. Wind speeds were generally low to moderate (1-3 m/s) and from a predominantly south-westerly direction. From late on Saturday 15th July to the afternoon of Sunday 16th July higher wind speeds were noted, which has corresponded with relatively high noise levels being recorded during that time period compared to other overnight periods. Cloud cover was noted to be 80% at set up and 25% at collection.

Noise measurements were carried out at Measurement Position 1 (MP1) in a free-field location at a height of approximately 2.5m, just over the existing boundary fence. The position was chosen to representative of noise levels at the nearest noise sensitive receptor location.

The noise monitoring position is shown in **Figure 4.1**.

Figure 4.1: Noise Monitoring Location

Table 4.1 below displays a summary of the measured noise levels and detailed measurement results are presented in **Appendix 4**.

Measurement Position	Period (hours)	$L_{Aeq,T}$ (dB)	Typical L_{A90} (dB)
MP1	Daytime (0700-2300)	59	40
	Night-time (2300-0700)	49	30

Table 4.1: Summary of Free Field Semi-Permanent Noise Levels

Note: The average noise levels stated are logarithmic for L_{Aeq}. The typical L_{A90} is the most commonly measured $L_{A90,5min}$ during the assessment time period (a detailed assessment is provided in Appendix 4).

5. Plant Noise Levels

5.1. Plant Noise Levels – Manufacturers Data

The plant noise levels have been obtained from manufacturers data. A summary of the manufacturers noise levels is presented in **Table 5.1.** Detailed noise levels are presented in **Appendix 5**.

Plant Reference	Operational Mode	Quoted Sound Power Level L_{wA} (dB)
Elco Aerotop L65 ASHP	Normal Mode	81
	"Silenced Mode"	76

Table 5.1: Plant Noise Levels

5.2. Receptor Noise Levels

The future plant noise levels at the nearest noise sensitive receptors have been predicted using standard acoustic formulae based on the measured noise levels and are detailed in **Table 5.2**. We have assumed a -10 dB screening due to no line of sight to the plant due to the height differential between plant (above 10th floor) and receptor (4th floor). For the purposes of calculation, it has been assumed that the unit will run in "normal mode" during the daytime (0700 hrs – 2300 hrs) and in "silenced mode" during the night-time (2300 hrs – 0700 hrs).

	Receptor - Block C 4th Floor	
	Daytime	Night-time
Sound Power Level of Source (L_{wA} dB)	81	76
Distance to Nearest Habitable Room Window (approx.)	50m	50m
Distance Correction (dB)	-34	-34
Screening Correction (dB)	-10	-10
Sound Power Level to Sound Pressure Level Correction (dB)	-8	-8
Predicted Noise Level at Receptor (L_{Aeq} dB)	**29**	**24**

Table 5.2: Predicted Plant Noise Levels

6. Plant Noise Assessment

The background noise level and plant noise data presented in **Sections 4** and **5** has been utilised to determine the noise impact at the nearest noise sensitive receptor when assessed using the methodology in BS 4142:2014. The aim is to meet the requirements of Planning Condition 28 which, due to the potential tonal element of the noise from the plant (refer to **Appendix 5**) is to be at least 10 dB below the background noise level.

Table 6.1 below summarises the plant noise assessment procedure carried out for the site.

Results	Daytime (0700-2300)	Night-time (2300-0700)	Relevant Clauses of BS 4142:2014	Commentary
Measured Ambient Sound Level	59	49	7.3.2	Refer to **Table 4.1**
Residual Sound Level	59	49	7.3.3	*The ambient noise level without the plant operating.* Refer to **Table 4.1**
Typical Background Sound Level L_{A90} (dB)	40	30	8.1, 8.2	Refer to **Table 4.1**
Specific Sound Level	29	24	9.1, 9.2	Refer to **Table 5.2**
Acoustic Feature Correction	n/a	n/a	9.2	N/A due to the wording of the Planning Condition
Rating Level L_{Ar} (dB)	29	24	9.1	Specific Sound Level + Acoustic Feature Correction
Excess of Rating over Background Sound Level	-11	-6	11	
	Assessment indicates below a *low impact*	Assessment indicates below a *low impact*	11	
Achievement of identified Criteria	Yes	Yes	n/a	10 dB below L_{A90} daytime 5 dB below L_{A90} at night

Table 6.1: Plant Noise Assessment

Table 6.1 identifies that an assessment in line with BS 4142 indicates that the plant noise would be below the level where a low impact may be expected upon the residents at the nearest noise sensitive receptor. **Table 6.1** also identifies that the criteria of Planning Condition 28 would be achieved during the daytime and at night, assuming the use of the “silenced mode” at night.

6.1. Context of the Noise Source

BS 4142 advises that the "context" of the noise needs to be considered to determine the results of the assessment.

The predicted plant noise levels would be significantly below the existing ambient noise level, and below the background noise level during both the daytime and at night.

In consideration of the context of the noise source, the plant would not be expected to cause any significant adverse impacts on the health or quality of life of the nearest noise sensitive receptors.

6.2. Consideration of Uncertainty

The assessment has considered uncertainty by taking a cautious approach in terms of the likely noise levels from the activities and by taking conservative losses for the distance attenuation. The cautious approach means that the noise impact is more likely to be overstated, as opposed to understated, although it is not likely that the predicted noise levels would be significantly different from those stated within the report. Overall, it is unlikely that the conclusions of the assessment would be changed as a result of any uncertainty in the assessment process.

7. Conclusion

A plant noise assessment has been carried out for the proposed installation at **Liddell Road, West Hampstead, London.**

The proposed plant to be installed includes an Air Source Heat Pump on the rooftop of Block B which has the potential to operate 24 hours a day.

The results of the assessment have identified:

- The plant as proposed would achieve an initial rating of below a *low impact*. Taking into account the context of the surrounding area, significant adverse impacts would not be expected.
- **The requirements of Planning Condition 28 would be achieved during the daytime and at night, assuming the use of the "silenced mode" at night.**

Achievement of the target noise criteria will ensure compliance with the aims of the NPPF and the PPG in that it will avoid noise from giving rise to significant adverse impacts on health or quality of life on nearby noise sensitive receptors.

8. Appendix 1: Glossary of Acoustic Terminology

Term	Description
'A'-Weighting	*This is the main way of adjusting measured sound pressure levels to take into account human hearing, and our uneven frequency response.*
Decibel (dB)	*This is a tenth (deci) of a bel. The decibel can be a measure of the magnitude of sound, changes in sound level and a measure of sound insulation. Decibels are not an absolute unit of measurement but are an expression of ratio between two quantities expressed in logarithmic form.*
$L_{Aeq,T}$	*The equivalent steady sound level in dB containing the same acoustic energy as the actual fluctuating sound level over the given period, T. T may be as short as 1 second when used to describe a single event, or as long as 24 hours when used to describe the noise climate at a specified location. $L_{Aeq,T}$ can be measured directly with an integrating sound level meter.*
L_{A10}	*The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 10 per cent of a given time and is the L_{A10T}. The L_{A10} is used to describe the levels of road traffic noise at a particular location.*
L_{A50}	*The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 50 per cent of a given time and is the L_{A50T}.*
L_{A90}	*The 'A'-weighted sound pressure level of the residual noise in decibels exceeded for 90 per cent of a given time and is the L_{A90T}. The L_{A90} is used to describe the background noise levels at a particular location.*
L_{Amax}	*The 'A'-weighted maximum sound pressure level measured over a measurement period.*

9. Appendix 2: Professional Statement

David Yates

David Yates is a full member of the Institute of Acoustics (MIOA) and has over ten years' experience in acoustic consultancy. David has particular expertise in environmental noise providing acoustic consultancy for residential and mixed-use planning applications, plant noise and vibration, construction noise and the design of acoustic, noise and vibration control. David is also experienced in providing sound insulation testing and design advice. David is familiar with the application of all relevant standards associated with his work, including but not limited to, BS 4142, BS 8233, BS 7445, BS 6472, BS 5228, BS 140 series, BS 16283 series and BS 717 series. David manages the acoustic department and is responsible for maintaining Syntegra's ANC membership.

10. Appendix 3: List of Equipment

Equipment Type	Manufacturer	Serial Number	Calibration Certification Number	Date of Last Calibration Check
SV36 Sound Calibrator	Svantek	73463	TCRT21/1765	November 2021
SVAN 958	Svantek	92843	TCRT23/1132	February 2023
MK 255 Microphone	Microtech Gefell	20197	TCRT23/1132	February 2023
SV12L Preamplifier	Svantek	106885	TCRT23/1132	February 2023

11. Appendix 4: Detailed Noise Measurement Results

Measured Noise levels – 13.07.2023

Time	$L_{Aeq,T}$ (dB)	$L_{AF(max)}$ (dB)	L_{A10} (dB)	L_{A90} (dB)
1300-1400	59	92	62	54
1400-1500	62	88	66	56
1500-1600	66	86	71	53
1600-1700	58	80	56	48
1700-1800	60	79	57	49
1800-1900	49	83	50	47
1900-2000	49	80	51	48
2000-2100	47	78	50	44
2100-2200	44	62	46	42
2200-2300	44	77	46	42
2300-0000	42	66	44	39
1300-2300	**59**	**81**	**55**	**48**
2300-0000	**42**	**66**	**44**	**39**

Measured Noise levels – 14.07.2023

Time	$L_{Aeq,T}$ (dB)	$L_{AF(max)}$ (dB)	L_{A10} (dB)	L_{A90} (dB)
0000-0100	41	67	42	39
0100-0200	40	65	43	32
0200-0300	37	63	40	31
0300-0400	36	60	39	30
0400-0500	37	57	39	32
0500-0600	42	68	43	37
0600-0700	45	75	46	41
0700-0800	49	80	50	47
0800-0900	54	86	58	49
0900-1000	58	88	58	55
1000-1100	69	83	74	54
1100-1200	65	90	68	55
1200-1300	55	76	56	54
1300-1400	61	85	61	54
1400-1500	66	85	71	57
1500-1600	58	85	60	56
1600-1700	59	91	63	55
1700-1800	56	73	58	54
1800-1900	58	72	61	55
1900-2000	53	72	54	52
2000-2100	51	69	52	50
2100-2200	50	74	52	49
2200-2300	52	72	54	49
2300-0000	51	75	54	47

Time	$L_{Aeq,T}$ (dB)	$L_{AF(max)}$ (dB)	L_{A10} (dB)	L_{A90} (dB)
0700-2300	**61**	**80**	**59**	**53**
2300-0700	**44**	**66**	**43**	**36**

Measured Noise levels – 15.07.2023

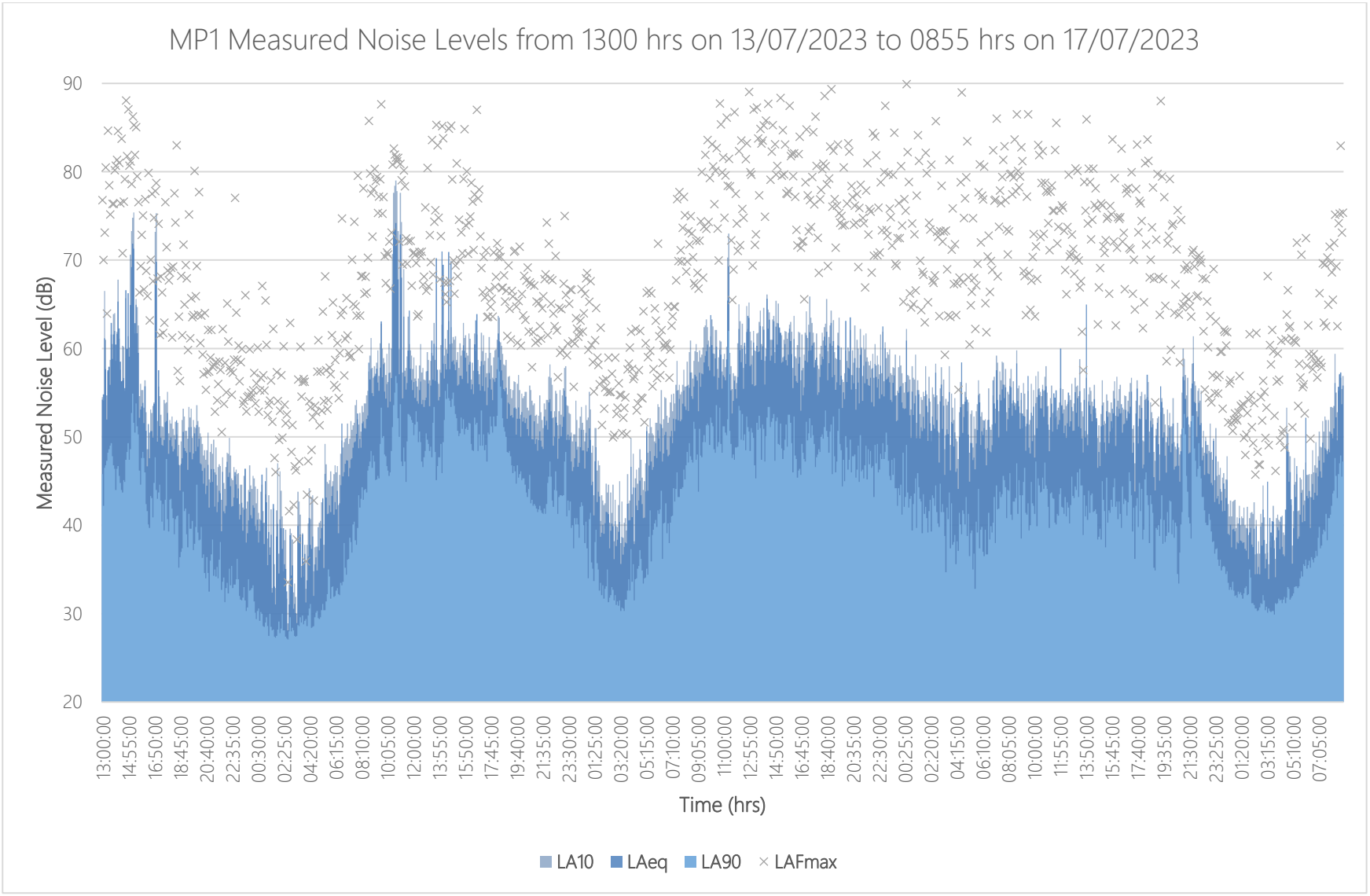
Time	$L_{Aeq,T}$ (dB)	$L_{AF(max)}$ (dB)	L_{A10} (dB)	L_{A90} (dB)
0000-0100	49	69	50	47
0100-0200	47	68	50	41
0200-0300	40	59	41	38
0300-0400	39	59	40	37
0400-0500	43	62	45	41
0500-0600	46	67	48	41
0600-0700	49	72	51	48
0700-0800	52	78	54	49
0800-0900	55	77	57	53
0900-1000	58	84	60	56
1000-1100	59	95	60	56
1100-1200	61	87	65	54
1200-1300	60	91	63	56
1300-1400	59	87	61	56
1400-1500	62	93	63	58
1500-1600	61	91	62	58
1600-1700	58	84	61	55
1700-1800	60	86	61	58
1800-1900	59	89	61	55
1900-2000	58	89	61	55
2000-2100	59	95	63	54
2100-2200	57	90	59	54
2200-2300	57	93	58	54
2300-0000	56	87	57	52
0700-2300	**59**	**88**	**61**	**55**
2300-0700	**49**	**68**	**48**	**43**

Measured Noise levels – 16.07.2023

Time	$L_{Aeq,T}$ (dB)	$L_{AF(max)}$ (dB)	L_{A10} (dB)	L_{A90} (dB)
0000-0100	55	90	56	53
0100-0200	53	84	55	50
0200-0300	53	86	55	51
0300-0400	52	81	55	46
0400-0500	52	89	54	46
0500-0600	51	83	54	46
0600-0700	50	81	52	48
0700-0800	55	86	56	52
0800-0900	54	87	56	52
0900-1000	52	86	55	48
1000-1100	54	83	55	51
1100-1200	53	86	55	51
1200-1300	54	90	55	50
1300-1400	56	86	55	50
1400-1500	52	80	54	47
1500-1600	52	84	53	49
1600-1700	52	83	54	51
1700-1800	52	83	55	48
1800-1900	52	84	54	46
1900-2000	51	88	54	45
2000-2100	49	79	51	46
2100-2200	54	71	57	49
2200-2300	51	71	54	46
2300-0000	46	69	48	43
0700-2300	**53**	**83**	**55**	**49**
2300-0700	**52**	**83**	**54**	**48**

Measured Noise levels – 17.07.2023

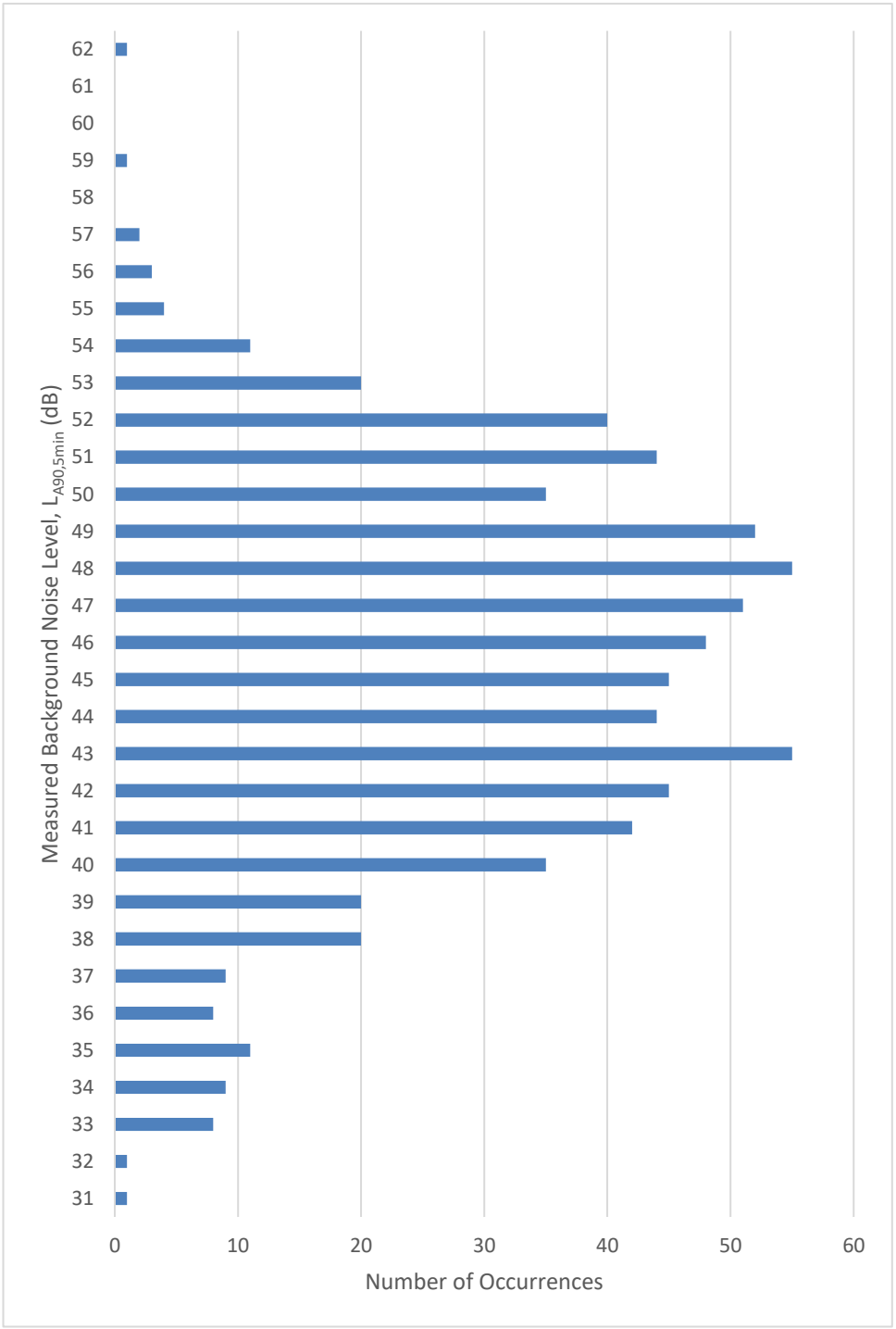
Time	$L_{Aeq,T}$ (dB)	$L_{AF(max)}$ (dB)	L_{A10} (dB)	L_{A90} (dB)
0000-0100	42	62	45	39
0100-0200	38	57	40	37
0200-0300	38	62	40	34
0300-0400	40	68	42	34
0400-0500	43	67	48	37
0500-0600	43	72	46	39
0600-0700	45	72	46	41
0700-0800	48	72	49	45
0800-0900	54	83	57	50
0700-0900	**52**	**77**	**53**	**48**
0000-0700	**42**	**66**	**44**	**37**


MP1 Measured Noise Levels from 1300 hrs on 13/07/2023 to 0855 hrs on 17/07/2023
Measured Noise Level (dB)
90
80
70
60
50
40
30
20
13:00:00
14:55:00
16:50:00
18:45:00
20:40:00
22:35:00
00:30:00
02:25:00
04:20:00
06:15:00
08:10:00
10:05:00
12:00:00
13:55:00
15:50:00
17:45:00
19:40:00
21:35:00
23:30:00
01:25:00
03:20:00
05:15:00
07:10:00
09:05:00
11:00:00
12:55:00
14:50:00
16:45:00
18:40:00
20:35:00
22:30:00
00:25:00
02:20:00
04:15:00
06:10:00
08:05:00
10:00:00
11:55:00
13:50:00
15:45:00
17:40:00
19:35:00
21:30:00
23:25:00
01:20:00
03:15:00
05:10:00
07:05:00
Time (hrs)
LA10
LAeq
LA90
LAFmax

11.1. Typical Background Noise Level Analysis for BS 4142:2014 Assessment

MP1 - Daytime (0700 hrs – 2300 hrs)

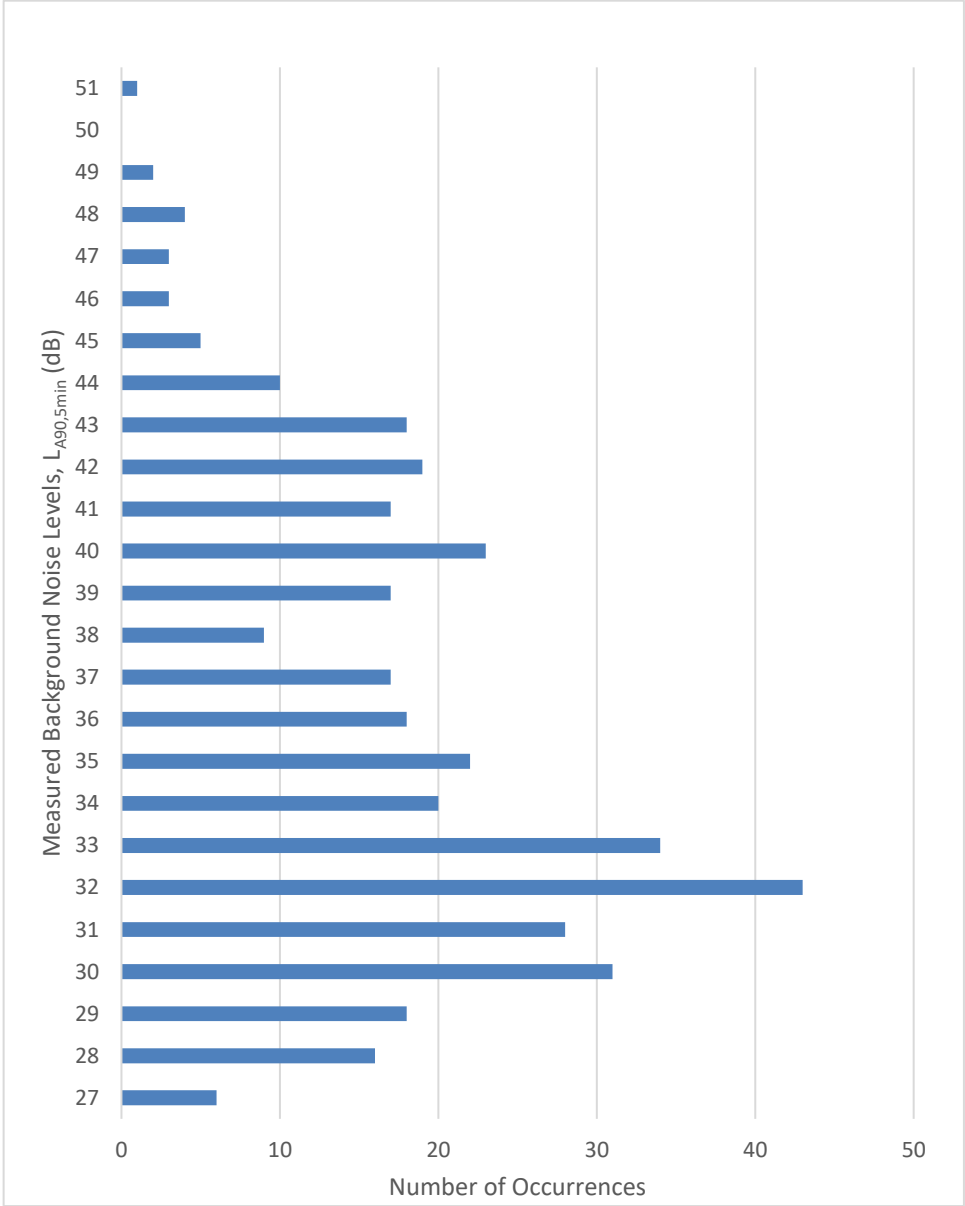
Measured $L_{A90,5min}$ (dB)	Number of Occurrences
31	1
32	1
33	8
34	9
35	11
36	8
37	9
38	20
39	20
40	**35**
41	42
42	45
43	55
44	44
45	45
46	48
47	51
48	55
49	52
50	35
51	44
52	40
53	20
54	11
55	4
56	3
57	2
58	0
59	1
60	0
61	0
62	1



Note: The row marked in bold is the chosen Typical L_{A90} for the BS 4142 plant noise assessment.

Night-time (2300 hrs – 0700 hrs)

Measured $L_{A90,5min}$ (dB)	Number of Occurrences
27	6
28	16
29	18
30	**31**
31	28
32	43
33	34
34	20
35	22
36	18
37	17
38	9
39	17
40	23
41	17
42	19
43	18
44	10
45	5
46	3
47	3
48	4
49	2
50	0
51	1



Note: The row marked in bold is the chosen Typical L_{A90} for the BS 4142 plant noise assessment.

12. Appendix 5: Detailed Plant Noise Levels and Tonality Assessment

Plant Unit	Operational Mode	Type of Data	Noise Levels (dB) in Octave Bands (Hz)								dB(A)
			63	125	250	500	1000	2000	4000	8000	
Elco Aerotop L65 ASHP	Normal Mode	Sound Power Level L_w	65	66	69	73	80	73	65	51	81
	"Silenced Mode"	Sound Power Level L_w	66	57	60	68	67	65	56	43	76

In order to assess tonality, the plant noise levels should be assessed using the 'Objective Method' detailed in BS4142:2014. The 'Objective Method' states: "*for a discrete tone to be identified as present, the time-averaged sound pressure level in the one-third-octave band of interest is required to exceed the time-averaged sound pressure levels of both adjacent one-third-octave bands by:*

- *15 dB in the low-frequency one-third-octave bands (25 Hz to 125 Hz);*
- *8 dB in the middle-frequency one-third-octave bands (160 Hz to 400 Hz); and*
- *5 dB in the high-frequency one-third-octave bands (500 Hz to 10 000 Hz)."*

The 'Objective Method' for assessing tonality, as set out in BS 4142:2014, strictly requires one-third octave bands to determine tonality. The octave band data provided, however, suggests a potential tone at 1000 Hz in normal mode, but no tone in "silenced mode".