



Dunsbury Park, Havant, Hampshire

Noise Impact Assessment - Plots 500 -502

For Portsmouth City Council

Date: 20 September 2021

Doc ref: 15067-HYD-ZZ-XX-RP-Y-1001-P02

DOCUMENT CONTROL SHEET

Issued by	Hydrock Consultants Limited 5-7 Tanner Street London SE1 3LE United Kingdom	T +44 (0)203 8468456 E london@hydrock.com www.hydrock.com
Client	Portsmouth City Council	
Project name	Dunsbury Park, Havant, Hampshire	
Title	Noise Impact Assessment - Plots 500 -502	
Doc ref	15067-HYD-ZZ-XX-RP-Y-1001-P02	
Project no.	19453	
Status	S1	
Date	20/09/2021	

Document Production Record		
Issue Number	P02	Name
Prepared by	Ian Arthurs, BSc (Hons), MSc, MIOA	
Checked by	Chris Borak, BSc, PGDip, MIOA	
Approved by	Ric Hampton, BSc (Hons), MIOA	

Document Revision Record			
Issue Number	Status	Date	Revision Details
P01	S1	20/09/2021	Issued to client for comment
P02	S1	28/09/2021	Updated to incorporate client comments

Hydrock Consultants Limited has prepared this report in accordance with the instructions of the above-named client for their sole and specific use. Any third parties who may use the information contained herein do so at their own risk.

CONTENTS

1.	INTRODUCTION.....	3
1.1	Scope	3
2.	EXISTING SITE AND PROPOSED DEVELOPMENT.....	4
2.1	The site and existing development	4
2.2	Proposed development.....	4
3.	ASSESSMENT METHODOLOGY	6
3.1	Policy and Guidance.....	6
4.	NOISE SURVEY.....	7
4.1	Survey overview	7
4.2	Monitoring methodology and locations.....	7
4.3	Equipment	10
4.1	Weather conditions	10
4.2	Noise surveys results	11
5.	NOISE ASSESSMENT	13
5.1	Noise sensitive receptors.....	13
5.2	Construction noise and vibration assessment	13
5.3	Operational noise assessment	16
5.4	Traffic noise assessment	19
5.5	External plant limits	20
5.6	BREEAM Pol 05 Requirements	21
6.	CONCLUSIONS & SUMMARY	22
	National Planning Policy Framework (NPPF).....	24
	Noise Policy Statement for England (NPSE)	25
	Planning Practice Guidance (PPG).....	25
	BS 5228 - Code of practice for noise and vibration control on construction and open sites (Part 1: Noise) (Part 2: Vibration)	26
	BS 8233:2014 - Guidance on sound insulation and noise reduction for buildings	27
	BS 4142:2014 - Methods for rating and assessing commercial and industrial sound	28
	Calculation of Road Traffic Noise	28

Tables

Table 1: Summary of noise monitoring locations.....	8
Table 2: Environmental noise survey equipment.....	10

Table 3: Summary of short-term attended noise measurements.....	11
Table 4: Summary of long-term unattended noise measurements	12
Table 5: Identified NSRs	13
Table 6: Thresholds of significant effect at residential receptors in accordance with the ABC method of BS 5228-1	14
Table 7: BS 5228 category values.....	14
Table 8: Vibration guide values for cosmetic damage	15
Table 9: BS 5228-2 Guidance effects of vibration levels perceptible to humans	15
Table 10: Predicted vehicle movements	17
Table 11: Measured noise levels from lorries manoeuvring	17
Table 12: Estimated specific day-time operation noise levels to properties off Calshot Road	18
Table 13: Estimated specific night-time operational noise levels to properties off Calshot Road	18
Table 14: BS4142:2014 Assessment –deliveries and collections, units 500 - 502.....	18
Table 17: Proposed Plant Limits	20

Figures

Figure 1: Site plan and noise sensitive receptors (NSRs).....	5
Figure 2: Site plan and noise monitoring locations	9

Appendices

Appendix A: Glossary of technical terms
Appendix B: Policy and Guidance
Appendix C: Noise Survey Results

1. INTRODUCTION

Hydrock Consultants Ltd (Hydrock) are appointed by Portsmouth City Council (the client) to provide acoustic engineering services to support the planning application (for the Reserved Matters application) for units 500-502 of the Dunsbury Park development.

The Dunsbury Park development comprises the construction of new industrial B1/B2/B3 industrial units. The site is located at Fitwygram Way, Havant, Hampshire, PO9 4EE, adjacent to junction 3, east of the A3(M).

The site has outline planning consent for B1/B3/B8 use. It is understood that a series of Reserved Matters (RM) applications will be submitted for the various plots contained within the masterplan.

1.1 Scope

This noise assessment considers units 500 - 502. Other units within the development (i.e. 100, 400, 600 - 601 and 700) are not considered and fall outside the scope of this assessment.

Acoustic engineering services to support RIBA stages 2 - 6 fall outside the scope, and are not presented in this report.

A detailed review has been undertaken of relevant planning policies and current guidance documents to inform an assessment of the potential noise impacts associated with units 500 -502 of the development with consideration given to construction noise and vibration, development generated road traffic noise, noise limits from ancillary plant, and BREEAM Pol 05 requirements.

A baseline noise survey was carried over the period Thursday 22nd July to Wednesday 28th July 2018 to establish the existing prevailing noise climate across the development site.

The Suitably Qualified Acoustician (SQA) is Ian Arthurs, who undertook this assessment. Ian is an Associate Acoustic Engineer at Hydrock, and holds a Master's degree (MSc) in Applied Acoustics and Noise Control Engineering, a BSc (hons) degree in Engineering, and is a full corporate Member of the Institute of Acoustics (MIOA). Ian has over 14 years of experience of work in the field of environmental noise assessments.

This report is technical in nature; therefore, a glossary of acoustic terminology is provided in **Appendix A** to assist in understanding this report.

2. EXISTING SITE AND PROPOSED DEVELOPMENT

2.1 The site and existing development

Dunsbury Park, Fitzwygram Way, Havant, Hampshire, is adjacent to junction 3 of the A3 at Waterloo, approximately 8 miles north of Portsmouth. The site lies within the administrative boundary of Havant Borough Council.

The development site has been levelled and are served by high voltage power, broadband and utilities. A recently built roundabout and main access road (Fitzwygram way) is located in the south west area of the site. Park Lane comprises a bridleway/bicycle path and traverses the central area of the site orientated approximately northwest to southeast.

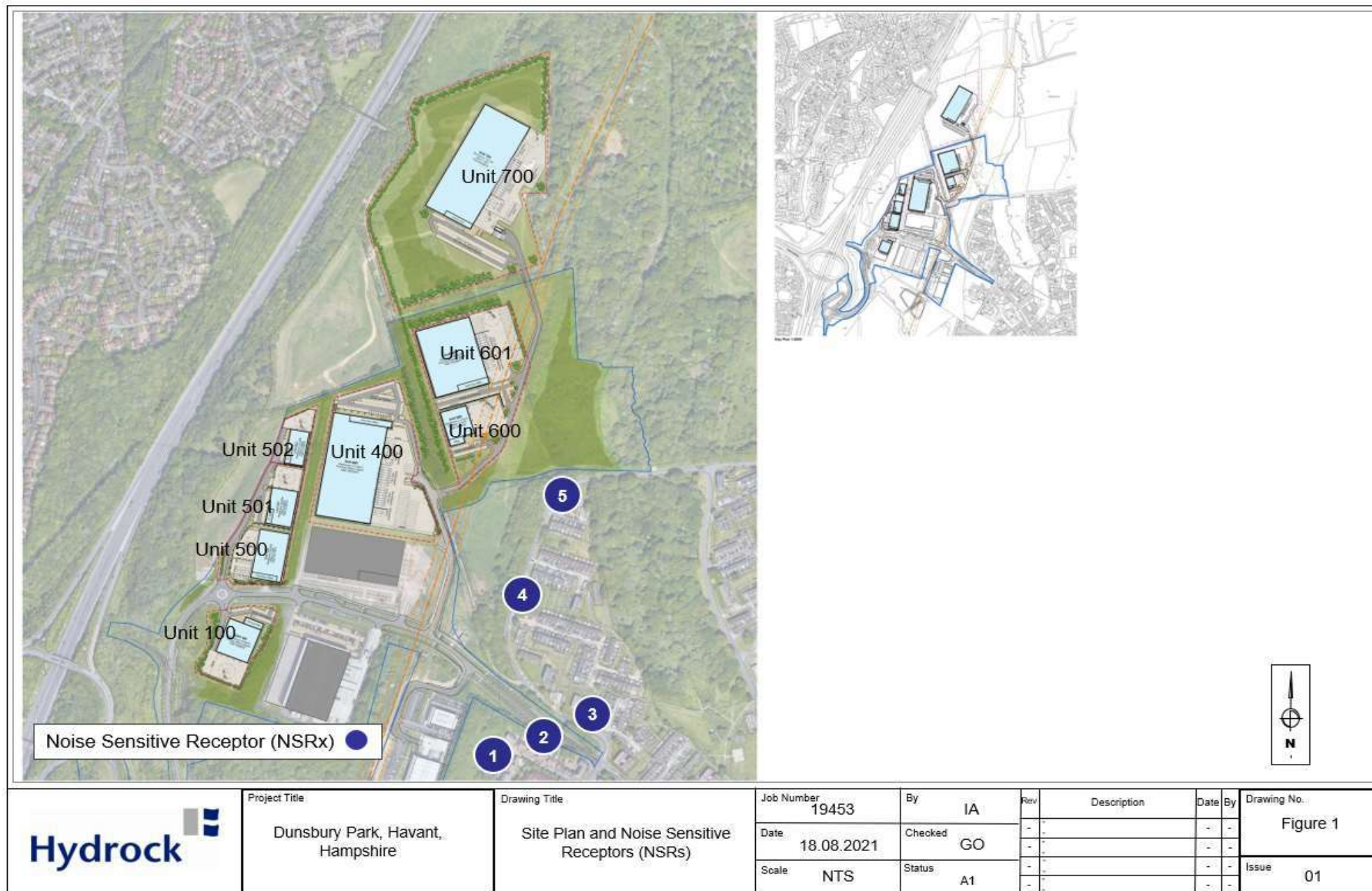
The site is currently open land covered by grass/scrub vegetation and mature trees predominately limited to the field boundaries with several footpaths crossing the area. To the north are undeveloped areas. Residential properties are present to the east beyond woodland. The site is bounded to the south and west by woodland. The A3(M) is situated to the west beyond woodland.

Completed plots that lie within the overall foot print of the Dunsbury Park development site include Plot 2, which is occupied by a clothes retailer ("Fatface") providing office and distribution space. Plot 3a is occupied by Breeze Motor Group and provides VW servicing and office space. Plot 4a is nearly complete and soon to be occupied by Watson Marlow.

2.2 Proposed development

The proposed development comprises the continued construction of new industrial B1/B2/B3 units with the intention for plots 500 - 502 to be designed and built on a speculative / CAT A basis. It is understood that the development targets the BREEAM 'excellent' standard.

A site plan - including existing, the proposed 500 - 502 units, other units within the development (i.e. 100, 400, 600 - 601 and 700), surrounding and nearest noise sensitive receptors (NSRs) is provided in **Figure 1**.



1

Figure 1: Site plan and noise sensitive receptors (NSRs)

3. ASSESSMENT METHODOLOGY

3.1 Policy and Guidance

The methodology used for this noise assessment is based on the most relevant and up to date acoustic guidance, including:

- National Planning Policy Framework, 2021 (NPPF);
- Noise Policy Statement for England, 2010 (NPSE);
- Planning Practice Guidance, 2014 (PPG);
- World Health Organisation (WHO) 1999: Guidelines for Community Noise;
- British Standard 5228-1 & -2:2009+A1:2014 - Code of practice for noise and vibration control on construction and open sites (Part 1: Noise, Part 2: Vibration) (BS 5228-1/-2)
- British Standard 8233:2014 - Guidance on sound insulation and noise reduction for buildings (BS 8233);
- British Standard 4142:2014 + A1 2019 (BS 4142) - Methods for rating and assessing commercial and industrial sound;
- Department of Transport Technical Memorandum: Calculation of Road Traffic Noise, 1975 (CRTN); and
- British Standard 7445-1:2003 - Description and measurement of environmental noise. Guide to quantities and procedures (BS 7445).

A review of the relevant planning policy and acoustics guidance is found throughout this document and in **Appendix B**.

3.1.1 *Local noise criteria*

The development is located within the administrative boundary of Havant Borough Council.

The proposed noise impact assessment methodology was shared and agreed with Havant Borough Council Environmental Team.

For fixed plant and building services associated with the operation of the proposed plots, noise limits should be in accordance with BS 4142:2014. Havant Borough Council have advised the rating level ($L_{A,r,Tr}$) should be 5dB below the background ($L_{A90,T}$).

The Havant Borough Council Environmental Team have also requested operational noise sources (such as vehicle movements / unloading / reversing sirens) are considered in the noise impact assessment.

4. NOISE SURVEY

4.1 Survey overview

An environmental noise survey was undertaken between 14:00hrs 22nd July, and 15:15hrs 28th July 2021 to establish the existing prevailing noise environment across the entire development site (i.e all units). The noise survey comprised both short-term, attended noise measurements, and long-term, unattended noise measurements.

Short-term noise measurements were undertaken to assess the variation in noise levels across, and in the vicinity of the proposed development site, and to obtain observations of sources governing the existing ambient noise environment.

Long-term, unattended noise measurements were obtained to measure the diurnal variation in noise levels over weekday, and weekend periods.

Full details of the noise survey including methodology, monitoring locations, equipment, weather conditions, and results are presented in the following sub-sections.

4.2 Monitoring methodology and locations

Noise measurement locations were selected to obtain representative background noise levels across the proposed development site. Proposed noise monitoring locations were shared and agreed with the Havant Borough Council Environmental Team prior to undertaking any survey work.

All noise monitoring locations are shown on **Figure 2**, and summarised in **Table 1** below.

Table 1: Summary of noise monitoring locations

Monitoring Location ID	Description	Monitoring Period
LTM1 (unattended)	Unattended noise monitoring undertaken at the site boundary, adjacent to Calshot Road. This location is considered to be representative of background levels at the sensitive receptors to the east of the site.	14:00 23 rd July to 14:45 28th July 2021
LTM2 (unattended)	Unattended noise monitoring undertaken at the site boundary on Fitzwygram Way. This measurement location was selected to obtain background noise levels towards the south of the development site in proximity to sensitive receptors to the north at Calshot Road, and south at Shepherd Way.	14:00 22 nd July to 15:15 28th July 2021
LTM3 (unattended)	Unattended noise monitoring undertaken north west of the development site boundary.	13:15 22 nd July to 14:15 28th July 2021
STM1 (attended)	Attended noise measurements undertaken to identify dominate noise sources. This location is considered representative of background noise levels at nearby residential receptors on Calshot Road (north)	13:36 to 13:51 28 th July 2021
STM2 (attended)	Attended noise measurements undertaken to identify dominate noise sources. This location is considered representative of background noise levels at nearby residential receptors on Calshot Road (south)	13:14 to 13:29 28 th July 2021
STM3 (attended)	Attended noise measurements undertaken to identify dominate noise sources across the site and to assist with the calibration of noise models. This location is considered representative of background noise levels at nearby residential receptors on Shepherd Way and Prospect School.	12:49 to 13:04 28 th July 2021
STM4 (attended)	Attended noise measurements undertaken to identify dominate noise sources across the site and to assist with the calibration of noise models.	12:22 to 13:37 28 th July 2021

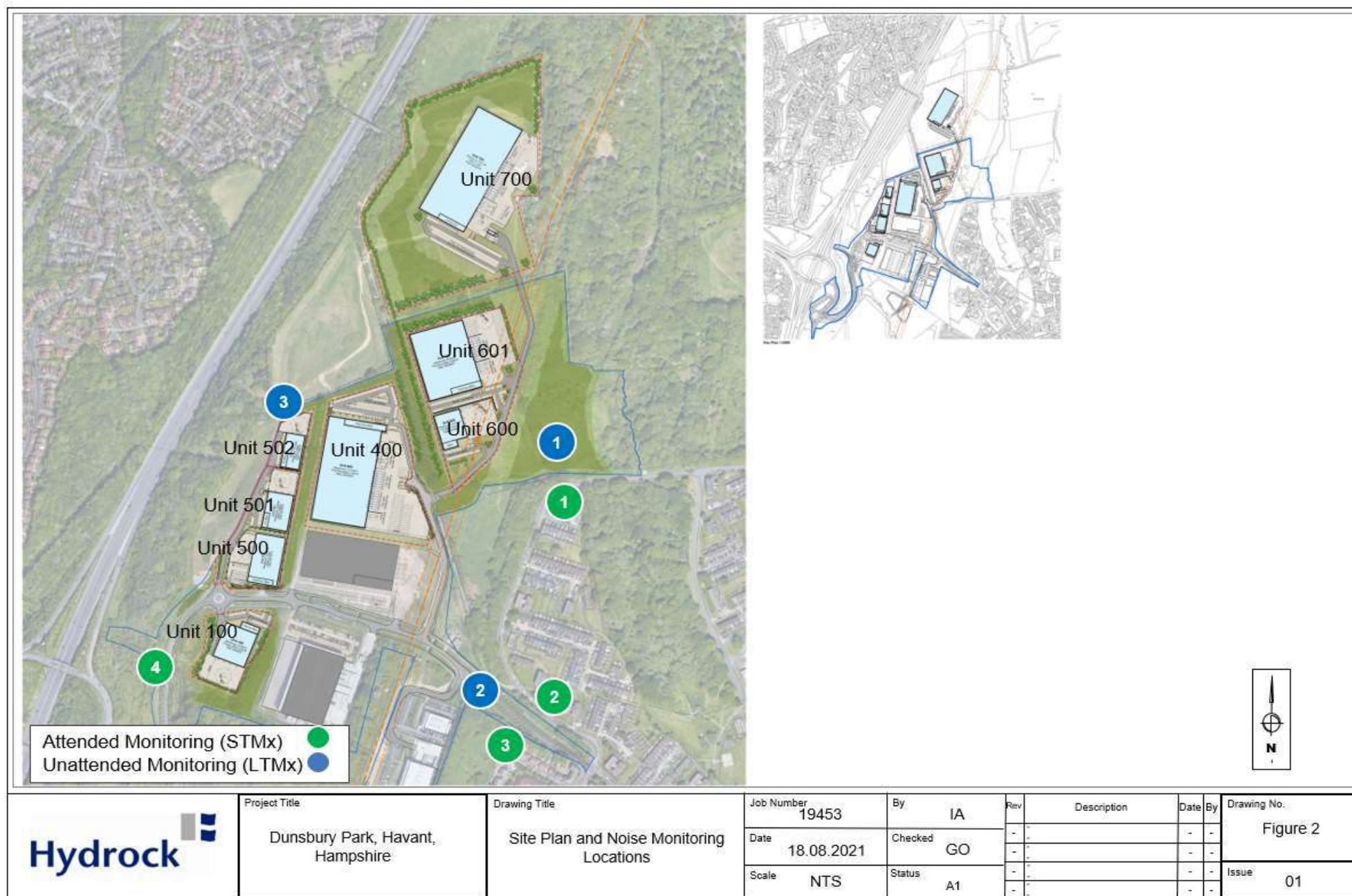


Figure 2: Site plan and noise monitoring locations

At all monitoring locations the measurement microphone was located at a height of 1.5m above local ground. Measurements were undertaken in accordance with the guidance outlined in the relevant British Standards, BS 4142:2014 and BS 7445-1:2003. The monitoring procedure followed the guidance outlined in BS 7445:2003 Part 1, Section 5.2.3 and section 5.2.2.

Measurements were ‘free field’, i.e. the microphone was more than 3.5m from reflective elements except the ground. A wind shield was fitted to the monitoring equipment at all times.

All noise monitoring was undertaken by Nick Rowswell, BSc (Hons), MIOA.

4.3 Equipment

Details of the equipment used for the environmental noise measurements are provided in **Table 2**.

Table 2: Environmental noise survey equipment

Monitoring ID	Equipment	Manufacturer	Instrument	Serial No.	Date of Last Laboratory Calibration
LTM1	Sound Level Meter	01dB	Fusion	14018	18 May 21
	Pre-amp		Pre22	2105046	
	Microphone	G.R.A.S	40CD	428504	19 Aug 20
	Calibrator	01dB	Cal31	89115	
LTM2	Sound Level Meter	01dB	Fusion	14016	18 May 21
	Pre-amp		Pre22	2105045	
	Microphone	G.R.A.S	40CD	415846	19 Aug 20
	Calibrator	01dB	Cal31	89115	
LTM3	Sound Level Meter	01dB	Cube	11165	18 Feb 21
	Pre-amp		Pre22	1610406	
	Microphone	G.R.A.S	40CD	287995	14 July 21
	Calibrator	01dB	Cal21	34323957	
STM1 – STM4	Sound Level Meter	B&K	2250	3009207	19 Feb 20
	Pre-amp		ZC	0032	
	Microphone	B&k	4189	3005149	5 Aug 20
	Calibrator		4231	3015450	

All sound level meters used for the noise survey have been verified as confirming to BS EN 61672-1. The acoustic calibrator used conforms to BS EN IEC 60942. Equipment calibration certificates can be provided on request.

All sound level meters were calibrated to a reference level of 94 dB at 1kHz both prior to, and on completion of, the noise survey period. No significant drift in calibration was noted during the survey (≤ 0.5 dB).

4.1 Weather conditions

Average recorded wind speeds during the environmental noise measurement process did not generally exceed 5 m/s. There was no significant rainfall recorded during the survey period. Temperatures ranged between 15° and 28° Celsius.

BS 4142:2014 provides the following guidance with regards to the acquisition of environmental noise measurements and weather conditions:

‘An effective windshield should be used to minimize turbulence at the microphone.’

‘NOTE Windshields are generally effective up to wind speeds of 5 m/s’ and. ‘exercise caution when making measurements in poor weather conditions such as wind speeds greater than 5 m/s.’

Weather conditions during the noise survey were suitable for the acquisition of noise data. Measurements are therefore considered to adhere to the guidance of the relevant British Standard and no corrections to the measured noise dataset has been applied.

4.2 Noise surveys results

The results of the short-term attended noise measurements obtained at locations STNM1 - STNM4 are summarised in **Table 3**.

Table 3: Summary of short-term attended noise measurements

Monitoring Location	Start Time Date	Duration	Measured dB L _{Amax,F}	Measured dB L _{Aeq,T}	Measured dB L _{A90,T}
STM1	13:36 28/7/21	15 min	67	54	50
STM2	13:14 28/7/21	15 min	77	58	52
STM3	12:49 28/7/21	15 min	67	54	52
STM4	12:22 28/7/21	15 min	80	63	59

Observations and subjective evaluation of noise sources was carried out during the initial site walkover and attended monitoring which identified the following significant noise sources contributing to the noise climate at the site:

Road Traffic: Road Traffic noise from A3(M) and M3 was the dominant source of noise on-site during the course of the environmental noise surveys.

Other Sources: Other noise sources contributing to the noise environment included road traffic on local roads, bird song, and wind in trees.

The results of the long-term unattended noise measurements obtained at locations LTM1 - LTM3 are presented graphically in a Time-history form in **Appendix C**. A summary of the 16-hours daytime (07:00hrs to 23:00hrs) and 8-hour night time (23:00hrs to 07:00hrs) equivalent continuous (L_{Aeq,T}) and background sound levels (L_{A90}) are presented in **Table 4**. The presented overall levels are the logarithmic average for L_{Aeq} and the mode average for L_{A90}.

Table 4: Summary of long-term unattended noise measurements

Period	Overall		
	LTNM1	LTNM2	LTNM3
Daytime LAeq (16hour) dB	53	53	57
Night-Time LAeq (8hour) dB	51	50	49
Typical Daytime LA90 (1hour) dB	37	38	52
Typical Night-Time LA90 (15mins) dB	32	29	33

5. NOISE ASSESSMENT

5.1 Noise sensitive receptors

Noise sensitive receptors (NSRs) considered for the noise assessment are detailed in **Table 5** and are presented in **Figure 1**. NSRs have been selected following a review of the proposed development plans and on-site observations.

Table 5: Identified NSRs

NSR ID	Receptor Address	Receptor Type
NSR1	Properties on Shepherd Way (south & west facing façades)	Residential
NSR2	Properties on Shepherd Way (north facing façade)	Residential
NSR3	Newmer Court	Residential
NSR4	Properties off Calshot Road	Residential
NSR5	Properties off Calshot Road	Residential

5.2 Construction noise and vibration assessment

5.2.1 Construction noise assessment

Activities associated with the construction phase of units 500 - 502 have the potential to generate noise that propagates beyond the site boundary. At this stage, detailed information regarding the nature and timescales of activities likely to take place during the construction phase of the proposed development are not known.

Activities which could give rise to significant impacts during construction include, but are not limited to, include:

- Site preparation i.e. ground excavation, levelling of ground, trenching, trench filling, unloading and levelling of hardcore and compacting filling; and,
- Construction of the proposed development, i.e. (piling, construction of buildings, building cladding, local roads, car parking, landscaping).

BS 5228-1 provides guidance on the assessment of noise impacts during the redevelopment of a site, including procedures for estimating noise levels from construction activities. The guidance does not define acceptable limits. However, it does provide potential methods for assessing the significance of noise impacts.

Daytime significance effect thresholds values at receptors recommended by BS 5228-1 are reproduced in **Table 6**.

Table 6: Thresholds of significant effect at residential receptors in accordance with the ABC method of BS 5228-1

Assessment Category and Threshold Value Period ($L_{Aeq,T}$)	Threshold Value, in decibels (dB)		
	Category A *1	Category B *2	Category C *3
Daytime (07:00 - 19:00) and Saturdays (07:00 - 13:00)	65	70	75
*1 Category A: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than this value. *2 Category B: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values. *3 Category C: Threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are more than this value.			

Based on the ABC method described above, and the results of the noise survey presented in **Section 4**, the construction noise limits considered applicable to NSRs previously identified in **Table 6** are presented in **Table 7**.

Table 7: BS 5228 category values

Receptor ID*	Receptor type	Representative monitoring location ID	Average measured daytime level, dB $L_{Aeq,T}$	Ambient noise level rounded to nearest 5 dB (A)	Appropriate category value accordingly to BS 5228-1	Significant noise impact threshold value dB(A)
NSR1	Properties on Shepherd Way (south & west facing façades)	LTM2	53	55	A	65
NSR2	Properties on Shepherd Way (north facing façade)	LTM2	53	55	A	65
NSR3	Newmer Court	LTM2	53	55	A	65
NSR4	Properties off Calshot Road	LTM2	53	55	A	65
NSR5	Properties off Calshot Road	LTM1	53	55	A	65

Notes: * As shown on Figure 1

5.2.2 Construction vibration risk assessment

5.2.2.1 Building Damage Thresholds

According to BS 7385-2¹ for residential or light commercial buildings, the threshold for the onset of potential cosmetic damage (i.e. formation of hairline cracks on drywall surfaces or the growth of existing cracks in plaster or drywall surfaces) to buildings varies with frequency. This ranges from a Peak Particle Velocity (PPV) (component) of 15 mms^{-1} at 4 Hz, rising to 20 mms^{-1} at 15 Hz, and to 50 mms^{-1} at and above 40 Hz. BS 7385-23 also states that the probability of building damage tends towards zero at 12.5 mms^{-1} peak component particle velocity.

The same thresholds are referenced in BS5228-2² and are presented in **Table 8**.

¹ BS 7385-2:1993 Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration

² BS 5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2; Vibration

Table 8: Vibration guide values for cosmetic damage

Type of Building	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
Unreinforced or light framed structures Residential or light commercial buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz
NOTE 1 Values referred to are at the base of the building.		
NOTE 2 For unreinforced or light framed structures, at frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.		

5.2.2.2 Human Response

Vibration is perceptible at levels well below those likely to cause building damage. Vibration may in some circumstances be perceptible at approximately 0.14 mms^{-1} , particularly at higher frequencies. Guidance on the human response from vibration is principally contained within BS 6472-1³. BS 5228-24 references BS 6472-15 and provides the following guidance on the effects of vibration on building occupants:

Table 9: BS 5228-2 Guidance effects of vibration levels perceptible to humans

Vibration Level A), B), C)	Effect
0.14 mms ⁻¹	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mms ⁻¹	Vibration might be just perceptible in residential environments.
1.0 mms ⁻¹	It is likely that vibration of this level in residential environmental will cause complaint, but can be tolerated if prior warning and explanation has been given to residents
10 mms ⁻¹	Vibration is likely to be intolerable for more than very brief exposure to this level in most building environments
A) The magnitudes of the values presented apply to a measurement position that is representative of the point of entry into the recipient.	
B) A transfer function (which relates an external level to an internal level) needs to be applied if only external measurements are available.	
C) Single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case. The values are provided to give an initial indication of potential effects, and where these values are routinely measured or expected then an assessment in accordance with BS 6472-1 or -2, and/or other available guidance, might be appropriate to determine whether the time varying exposure is likely to give rise to any degree of adverse comment.	

5.2.2.3 Summary of Vibration Criteria

To summarise the above, vibration levels below 12.5 mms^{-1} are unlikely to give rise to building damage. Levels of demolition vibration may be perceptible above about 0.3 mms^{-1} and levels above 1 mms^{-1} could give rise to complaints.

5.2.2.4 Assessment of Risk

Typical construction vibration sources include:

³ BS 6471-1:2008 Guide to evaluation of human exposure to vibration in buildings. Vibration sources other than blasting

- General demolition activities - i.e. such as breaking concrete, excavators digging foundations
- Construction activities - i.e. piling, dynamic compaction
- Impact forces - i.e. material being dropped from height to facilitate materials being removed
- General site equipment movements - i.e. heavy plant / heavy tracked plant operating over the site to demolish buildings and trucks removing debris from site.

Vibration levels at surrounding receptors will depend on the following factors:

- Site activity
- Frequency content of vibration created
- Ground conditions (soil stiffness, damping)
- Distance to receptor
- Receptor building foundation type and structure design.

Variations in the above result in large differences in vibration levels from site to site.

Construction activities, methodologies and plant lists are not yet available. However, due to the relatively large distances (>220m) between identified sensitive receptors, and the proposed units, vibration building damage and vibration human response thresholds are unlikely to be exceeded for this project.

It is recommended the vibration risk assessment is reviewed once construction activities, methodologies and plants lists are available.

5.3 Operational noise assessment

The latest indicative scheme layout drawings (as per **Figure 1**) have been used for the operational noise assessment. Traffic data for units 500 - 502 have been provided by Hydrock's Transport team and have been applied to the operational assessment.

From review of the scheme layout drawings, it is noted properties off Calshot Road are the closest to the proposed developed.

It is noted, units 501 and 502 will eventually be screened by unit 400 which will provide acoustic benefit to properties east of the development. Units 501 - 502 are noted to be orientated so that external operational activities (vehicle movements) are screened by the units themselves, again providing acoustic benefit to properties east of the development.

Potentially significant external noise sources associated with operation of all units may include:

- LGV movements (including reversing alarms);
- HGV movements (including reversing alarms);
- HGV manoeuvring slowly;
- Door slam; and
- Engines idling.

Traffic noise, and fixed plant noise are dealt with in sections 5.5 and 5.6 respectively.

5.3.1 Vehicle movements

Predicted peak hour movements for HGVs and all other vehicle types, for units 500 - 502 has been provide by Hydrock's transport team and is provided in **Table 10**.

Table 10: Predicted vehicle movements

Time Period	Predicted Peak Hour Movements (Unit 500 - 502)	
	LGVs	HV
Night-time (2300 – 0700 hours) peak hour	12	3
Daytime (0700 – 2300 hours) peak hour	63	19

5.3.2 Source-term noise levels

Hydrock library noise data of identified potential noise sources are presented in **Table 11**.

Table 11: Measured noise levels from lorries manoeuvring

Description	L _{Aeq,T} dB @ 10m
LGV movements	66
HGV reversing into bay	67
Lorry idling	62
Door slam	77

5.3.3 Operational assessment (deliveries and collections)

BS4142:2014 requires noise from the commercial activity (the specific noise level) to be assessed over 15 minutes during the night, and 1 hour during the day.

Properties off Calshot are approximately 450m from units 500 - 502. Day-time and night-time specific operational noise levels have been calculated to properties off Calshot Road and are presented in **Tables 12 and 13**.

The following assumptions are made:

- Lorries travel at 2.2 m/s on site;
- A lorry will take a maximum of approximately 45 seconds to drive from the site entrance to a loading bay (based on 100m driving distance to furthest bay and 2.2m/s on site speed);
- A lorry will take a maximum of approximately 90 seconds to manoeuvre into a loading bay;
- A single lorry will be manoeuvring in any 15-minute period;
- Lorries will typically allow the engine to idle for no more than 60 seconds after pulling into a bay;
- Horns will not be used during the night;
- Noise levels estimated to properties off Calshot Road; and
- 5dB screening provided by Units 500, 501, 502.

Table 12: Estimated specific day-time operation noise levels to properties off Calshot Road

Noise Source	Source Noise Level (L _{Aeq,T} dB)	Ref. Distance (m)	On-time (sec)	Quantity / No. Events	Screening	Distance to Receptor (m)	Receptor Noise Level (L _{Aeq,T} dB)
LGV movements	66	10	45	19	-5	450	22
HGV reversing into bay	67	10	60	19	-5	450	24
Lorry idling	62	10	60	19	-5	450	19
Door slam	77	10	1	19	-5	450	16
Specific day-time operational noise level at receptor (L _{Aeq} 1 hr, dB)							27

Table 13: Estimated specific night-time operational noise levels to properties off Calshot Road

Noise Source	Source Noise Level (L _{Aeq,T} dB)	Ref. Distance (m)	On-time (sec)	Quantity / No. Events	Screening	Distance to Receptor (m)	Receptor Noise Level (L _{Aeq,T} dB)
LGV movements	66	10	45	3	-5	450	20
HGV reversing into bay	67	10	60	3	-5	450	22
Lorry idling	62	10	60	3	-5	450	17
Door slam	77	10	1	3	-5	450	14
Specific night-time operational noise level at receptor (L _{Aeq} 15 minute, dB)							25

5.3.3.1 BS4142 Assessment

A BS 4142:2014 assessment of operational noise (deliveries and collections) for units 500-502 is presented in Table 14.

Table 14: BS4142:2014 Assessment –deliveries and collections, units 500 - 502

Results	Day-time	Night-time	Commentary
Measured Background Sound Level (L _{A90} , dB)	37 dB	32 dB	Typical night-time level measured at LTNM1 used.
Specific Sound Level - (L _{Aeq} , dB)	27 dB	25 dB	(Calculations from Tables 12 and 13)
BS4142 Rating Level (L _{Ar})	27 dB	25 dB	No character correction is deemed to apply to noise at receptors. Noise from site will primarily be from vehicles manoeuvring on site. There may be some tonal noise from reversing alarms and some impulsive noise from manual handling and closing of lorry doors but this is not expected to be tonal or impulsive (based on any measurable criteria) at receptors given the distance.
Excess of Rating Level over Background Sound level (dB)	(27 - 10) = -10 dB	(25 - 32) = -7 dB	The assessment indicates that noise from the operations (deliveries and collections) of Units 500 - 502 would be a low impact.

For **Units 500 -502**, the specific noise does not exceed the existing background sound level; *“this is an indication of the specific sound source having a low impact, depending on the context”*. The context that should be considered in this case is as follows:

- predicted noise levels from both Units 500 -502 are low in absolute terms and would not exceed design noise levels for habitable rooms, associated with sleep disturbance etc., from WHO Guidelines or BS8233:2014 even in the closest dwellings when windows are open;
- the predicted noise levels are only likely during the peak hour and most of the time noise levels from the proposed development will be much lower.

Therefore, in consideration of the context as set out above, the rating level slightly above the existing background sound level is considered to represent a *“low impact”* in terms of BS 4142:2014.

BS4142:2014 requires an assessment of uncertainty. Uncertainty with respect to the measured background sound levels has been minimised by measuring over a full week.

As the specific use of the site has yet to be determined, there is a degree of uncertainty relating to the source noise levels in terms of the estimated intensity of activity at the site vs those used for the assessment. More vehicles arriving simultaneously would result in higher noise levels.

5.4 Traffic noise assessment

BS4142:2014 is not appropriate for the assessment of road traffic noise on public highways.

Highways Agency guidance for the assessment of road noise is provided in the Design Manual for Roads and Bridges (DMRB), Volume 11, Section 3. DMRB provides the following commentary on the significance of changes in road noise levels:

“A change in road traffic noise of 1 dB $L_{A10,18h}$ in the short term (e.g. when a project is opened) is the smallest that is considered perceptible. In the long term (typically 15 years after project opening), a 3 dB $L_{A10,18h}$ change is considered perceptible.”

Therefore, a change of less than 1dB is of negligible significance. DMRB also provides the following simplified method for relating traffic flow to the change in road noise:

“A change in noise level of 1 dB $L_{A10,18h}$ is equivalent to a 25% increase or a 20% decrease in traffic flow”

Traffic flow rates have been provided by the Hydrock Transport team based on the latest indicative scheme layout drawings for the following scenarios: baseline (2019 pre covid), baseline + committed (future year); and, baseline + committed + development (future year) for units 500, 501 and 502.

18-hour Annual Average Weekday (AAWT) flow rate estimates for each scenario are presented in **Table 15**.

Table 15: Traffic Estimates

Link & ID	Scenario								
	Baseline			Baseline + Committed			Baseline + Committed + Development		
	Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total	Light Vehicles	Heavy Vehicles	Total
Hulbert Way West	36,775	1,307	38,082	36,892	1,375	38,267	36,964	1,392	38,356
Hulbert Road	17,616	241	17,857	18,926	648	19,574	19,364	748	20,112
Hulbert Way South	9,935	227	10,163	10,186	305	10,492	10,270	325	10,595
Purbrook Way West	27,278	651	27,929	27,540	732	28,273	27,628	753	28,380
Purbrook Way East	21,421	612	22,033	21,806	731	22,537	21,934	761	22,695

Scenarios based on cumulative flows from units 500, 501 and 502.

The total number of vehicles is predicted to slightly increase due to the proposed development. However, the change in the road noise level is less than 1dB, and therefore it is considered negligible.

5.5 External plant limits

At this stage, detailed information relating to any proposed fixed plant and/or building services is unavailable.

The proposed plots are likely to incorporate building services plant which could potentially vent to external locations or have externally located intake and exhaust grilles. These are capable of producing audible noise and may require noise control measures.

A statistical assessment of background sound levels has been undertaken in accordance with BS 4142:2014 and is presented graphically in **Appendix C**.

The typical background daytime and night-time sound levels measured at the long-term monitoring location LTNM2 situated adjacent to the nearest sensitive receptors are shown below:

- dB $L_{A90,16hr}$ 38 dB daytime (07:00hrs to 2300hrs)
- dB $L_{A90,8hr}$ 29 dB night-time (2300hrs to 0700hrs)

The proposed external plant limits for units 500 -502 are presented in **Table 15** and would ensure plant Rating Levels achieve -5dB below the Background level which constitutes "Low Impact" when assessed in accordance with the procedures of BS 4142:2014.

Table 15: Proposed Plant Limits

Parameter	Period	Noise Levels, dB
$L_{Ar,1hour}$	Daytime (0700hrs to 2300hrs)	33
$L_{Ar,15mins}$	Night-time (2300hrs to 0700hrs)	24

The external noise limits presented in **Table 15** are 'free-field' levels at any height above ground and 1.0m from the nearest noise sensitive property façade. It applies to the overall combined operation of building services plant without any specific tone or character.

The magnitude of impact depends upon the context and not only upon the comparison of rating and background noise levels, therefore these levels are intended to provide a guideline. Proposals should be reviewed further during technical design.

As detailed information relating to fixed plant is unknown, Hydrock highlight the provision for the selection of low noise equipment, silencers, enclosures, screens, and other acoustic attenuation measures should be made where necessary.

5.6 BREEAM Pol 05 Requirements

The aim of Pol 05 is to reduce noise from the new development affecting nearby noise-sensitive buildings.

One credit is awarded by default if there are not any (or will not be any) noise-sensitive areas or buildings within 800m of the assessed development.

Where this requirement cannot be met, a noise impact assessment should be carried out. This assessment should measure existing background noise at the nearest or most exposed noise-sensitive development and measure the noise level resulting from the new noise source at the same location.

The noise level resulting from the new noise sources should be rated appropriately for tonality, impulsivity and other effects in accordance with BS4142:2014.

The Rating Level for the new source(s) should be compared to the measured pre construction background level.

The Pol 05 criteria states that the Rating Level should exceed the Background Level by no more than -5 dB during the day and night. If this criterion cannot be met without mitigation, appropriate noise mitigation will need to be applied, if the Credit is to be awarded.

The advice offered within this report assumes that all the available BREEAM Credits for will be targeted.

An operational assessment of deliveries and collections has been made based on assumptions derived from the latest indicative scheme layout drawings (**see Section 5.3**)

This assessment indicates the Rating Level does not exceed the existing background sound level.

Assumptions should be reviewed further during technical design, and if required, appropriate mitigation measures applied to satisfy the BREEAM Pol 5 credit requirements.

External fixed plant limits have been established in **Section 5.5** to ensure plant Rating Levels achieve -5 dB below the Background level.

6. CONCLUSIONS & SUMMARY

A noise assessment has been made to support the planning application (for the Reserved Matters application) for units 500-502 at the site known as Dunsbury Park, Fitwygram Way, Havant, Hampshire PO9 4EE.

Other units within the Dunsbury Park development (i.e. 100, 400, 600 - 601 and 700) are not considered and fall outside the scope of this assessment.

An environmental noise survey was undertaken between 22nd and 28th July 2021 to establish the existing prevailing noise environment across the development site. The survey comprised both short-term, and long-term noise measurements. The main sources of noise contributing to the noise environment were observed to include road traffic from the A3(M), M3 and road traffic on local roads.

The noise assessment has been undertaken with consideration given to the potential noise impacts:

- Construction-phase noise and vibration
- Operational noise assessment (external activities)
- Development generated road traffic noise; and
- Noise limits from external, ancillary plant.

The latest indicative scheme layout drawings have been used to derive worst-case scenario assumptions for an operational noise assessment. For Units 500 -502, the assessment shows specific noise levels are up to 10 dB below the existing background sound levels which represents a "*low impact*" in terms of BS 4142:2014.

Considering the context, this is considered to represent a "*low impact*" in terms of BS 4142:2014.

The noise impact of traffic increases from Units 500 - 502 on local roads is negligible.

Fixed plant noise emissions limits have been established, based on the results of the noise survey. These are likely to be achieved with appropriate consideration for selection of low-noise plant and proprietary attenuation measures as appropriate during technical design.

The advice offered within this report assumes that all the available BREEAM Pol 05 Credits will be targeted.

Appendix A Glossary of technical terms

Term	Description
dB (decibel)	The scale on which sound pressure level is expressed. Sound pressure level is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure ($2 \times 10^{-5} \text{Pa}$).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' - weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq,T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A - weighted fluctuating sound measured over that period.
L_{Amax}	L_{Amax} is the maximum A - weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, 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_{10} and L_{90}	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time, and the L_{90} is the level exceeded for 90% of the time.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally, as measured outside and at least 3m from buildings.

Appendix B Policy and Guidance

National Planning Policy Framework (NPPF)

Published in July 2021, this document sets out the Government's planning policies for England and supersedes the previous version of the NPPF published in 2012 and 2019. It makes the following reference to noise in the section entitled Conserving and enhancing the natural environment:

*"174. Planning policies and decisions should contribute to and enhance the natural and local environment by:
[...]*

e) 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. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans."

It also makes the following references to noise in the Section entitled Ground conditions and pollution:

"185. 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 the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life⁶⁰;

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

60 See Explanatory Note to the Noise Policy Statement for England (Department for Environment, Food & Rural Affairs, 2010)."

And

"187. Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed."

Noise Policy Statement for England (NPSE)

Published in March 2010, the Noise Policy Statement for England (NPSE) sets out the long-term vision of Government noise policy as follows:

“Promote good health and good quality of life through the effective management of noise within the context of Government policy on sustainable development.”

The NPSE identifies three observed effect levels, names “No Observed Effect Level” (NOEL), “Lowest Observed Adverse Effect Level” (LOAEL) and “Significant Observed Adverse Effect Level” (SOAEL).

The NPSE contains little detail on assessment methodologies and specific parameters at which the varying observed effect levels would occur in the context of a residential development.

Planning Practice Guidance (PPG)

The table below provides a summary of the noise exposure hierarchy, as described within Planning Practice Guidance (PPG).

Response	Examples of outcomes	Increasing effect level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; 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 small actual or perceived change in the quality of life	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, 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	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

BS 5228 - Code of practice for noise and vibration control on construction and open sites (Part 1: Noise) (Part 2: Vibration)

BS5228 Part 1: 2009+A1:2014 provides practical guidance on the control of noise from construction sites. The legislative background to noise control is described and recommendations are given regarding procedures for creating effective liaison between developers, site operators and local authorities. Methods for predicting and measuring noise are presented and guidance is given concerning the measurement of noise. Annex E of BS5228 introduces the 'ABC' assessment method, which defines the threshold of likely significant effects at receivers.

BS5228 Part 2: 2009+A1: 2014 provides practical guidance on the control of vibration from construction sites. The legislative background to vibration control is described and thresholds for avoiding significant impacts such as building damage are provided.

Both parts of BS5228 (Noise and Vibration) provide methods for prediction and case history measurements for use in predicting the noise and vibration impacts from construction sites.

Ground-borne vibration from construction sites can cause discomfort to occupiers of neighbouring buildings and, at much higher level, cosmetic and even structural damage.

Vibration may in some circumstances be perceptible at approximately 0.14 mms⁻¹, particularly at higher frequencies. Guidance on the human response from vibration is principally contained within BS 6472-1:2008. However, for construction induced vibration, BS 5228-2:2009 references this standard and provides the following guidance on the effects of vibration on building occupants:

BS 5228-2:2009 Guidance on effects of vibration levels perceptible to humans

Vibration Level A), B), C)	Effect
0.14 mms ⁻¹	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.
0.3 mms ⁻¹	Vibration might be just perceptible in residential environments.
1.0 mms ⁻¹	It is likely that vibration of this level in residential environmental will cause complaint, but can be tolerated if prior warning and explanation has been given to residents
10 mms ⁻¹	Vibration is likely to be intolerable for more than very brief exposure to this level in most building environments
A) The magnitudes of the values presented apply to a measurement position that is representative of the point of entry into the recipient. B) A transfer function (which relates an external level to an internal level) needs to be applied if only external measurements are available. C) Single or infrequent occurrences of these levels do not necessarily correspond to the stated effect in every case. The values are provided to give an initial indication of potential effects, and where these values are routinely measured or expected then an assessment in accordance with BS 6472-1 or -2, and/or other available guidance, might be appropriate to determine whether the time varying exposure is likely to give rise to any degree of adverse comment.	

At levels above the threshold for human perception, vibration can cause damage to existing structures. According to BS 7385-2, for residential or light commercial buildings, the threshold for the

onset of potential cosmetic damage (i.e. formation of hairline cracks on drywall surfaces or the growth of existing cracks in plaster or drywall surfaces) to buildings varies with frequency. This ranges from a Peak Particle Velocity (PPV) (component) of 15 mms-1 at 4 Hz, rising to 20 mms-1 at 15 Hz, and to 50 mms-1 at and above 40 Hz. BS 7385-2 also states that the probability of building damage tends towards zero at 12.5 mms-1 peak component particle velocity.

The same thresholds are referenced in BS5228-2:2009 and are presented below.

Type of Building	Peak component particle velocity in frequency range of predominant pulse	
	4 Hz to 15 Hz	15 Hz and above
Reinforced or framed structures	50 mms-1 at 4 Hz and above	
Industrial and heavy commercial buildings	15 mms-1 at 4 Hz increasing to 20 mms-1 at 15 Hz	20 mms-1 at 15 Hz increasing to 50 mms-1 at 40 Hz
<i>NOTE 1 Values referred to are at the base of the building.</i>		
<i>NOTE 2 For unreinforced or light framed structures, at frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.</i>		

BS 8233:2014 - Guidance on sound insulation and noise reduction for buildings

The approach that is generally adopted when assessing environmental noise sources on residential developments is to undertake an assessment in accordance with BS 8233:2014 - Guidance on sound insulation and noise reduction for buildings.

BS 8233 provides guidance for the control of noise in and around buildings. The guidance provided within the document is applicable to the design of new buildings, or refurbished buildings undergoing a change of use, but does not provide guidance on assessing the effects of changes in the external noise levels due to occupants of an existing building.

Internal Noise Levels

Desirable internal noise level criteria which are applicable to dwellings for steady external noise sources are set out in the table below:

Activity	Location	Period	
		Daytime (07:00 to 23:00 hrs)	Night-time (23:00 to 07:00 hrs)
Resting	Living room	L _{Aeq,16hrs} 35 dB	-
Dining	Dining room/area	L _{Aeq,16hrs} 40 dB	-
Sleeping (daytime resting)	Bedroom	L _{Aeq,16hrs} 35 dB	L _{Aeq,8hrs} 30 dB

BS 4142:2014 - Methods for rating and assessing commercial and industrial sound

BS 4142 describes methods for rating and assessing sound from industrial and manufacturing processes, fixed installations which comprise mechanical and electrical plant and equipment, the loading and unloading of goods and materials at industrial and/or commercial premises and mobile plant and vehicles that are an intrinsic part of the overall sound emanating from premises or processes.

A BS 4142 assessment is made by determining the difference between the specific noise under consideration and the background sound level as represented by the L_{A90} parameter, determined in the absence of the commercial sound. The L_{A90} parameter is defined as the level exceeded for 90% of the measurement time. This parameter therefore excludes short duration noise events and represents the underlying continuous noise.

If appropriate, the specific sound level of the source ($L_{Aeq,T}$) is corrected, by the application of one or more corrections for acoustic features to give a 'rating' level (L_{Ar,T_r}). The Standard effectively compares and rates the difference between the rating level of the sound and the prevailing background sound level ($L_{A90,T}$). Comparing the rating level with the background sound level, BS 4142 states:

"Typically, the greater this difference, the greater the magnitude of 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."

The standard highlights the importance of considering the context in which a sound occurs. Factors including the absolute sound level, the character of the sound, the sensitivity of the receptor and the existing acoustic character of the area should be considered when assessing the noise impact. The use of the proposed premises for short term holiday rentals is also pertinent to the consideration of context.

Calculation of Road Traffic Noise

The 'Department of Transport: Calculation of Road Traffic Noise: 1988 Section, shortened measurement procedure has been used to calculate the predicted noise emissions of road traffic noise emanating from surrounding roads.

The shortened measurement procedure outlined in section 43 provides the following guidance:

'Measurements of L_{10} are made over any three consecutive hours between 10:00-17:00 hours. Using $L_{A10,3hr}$ as the arithmetic mean of the three consecutive values of hourly L_{A10} , the current value of $L_{10,18hr}$ can be calculated from the relation:

$$L_{A10,18hr} = L_{A10,3hr} - 1 \text{ dB}$$

The Transport Research Laboratory (TRL) document 'Converting the UK traffic noise index $L_{A10,18hr}$ to EU noise indices for noise mapping' PR/SE/451/02, outlines calculation methodology to calculate the L_{day} , $L_{evening}$, L_{night} and L_{den} using the $L_{A10,18hr}$ noise index.

Calculation Method 3 is shown below:

$$L_{day} = 0.95 \times L_{A10,18hr} + 1.44 \text{ dB}$$

$$L_{evening} = 0.97 \times L_{A10,18hr} - 2.87 \text{ dB}$$

$$L_{night} = 0.90 \times L_{A10,18hr} - 3.77 \text{ dB}$$

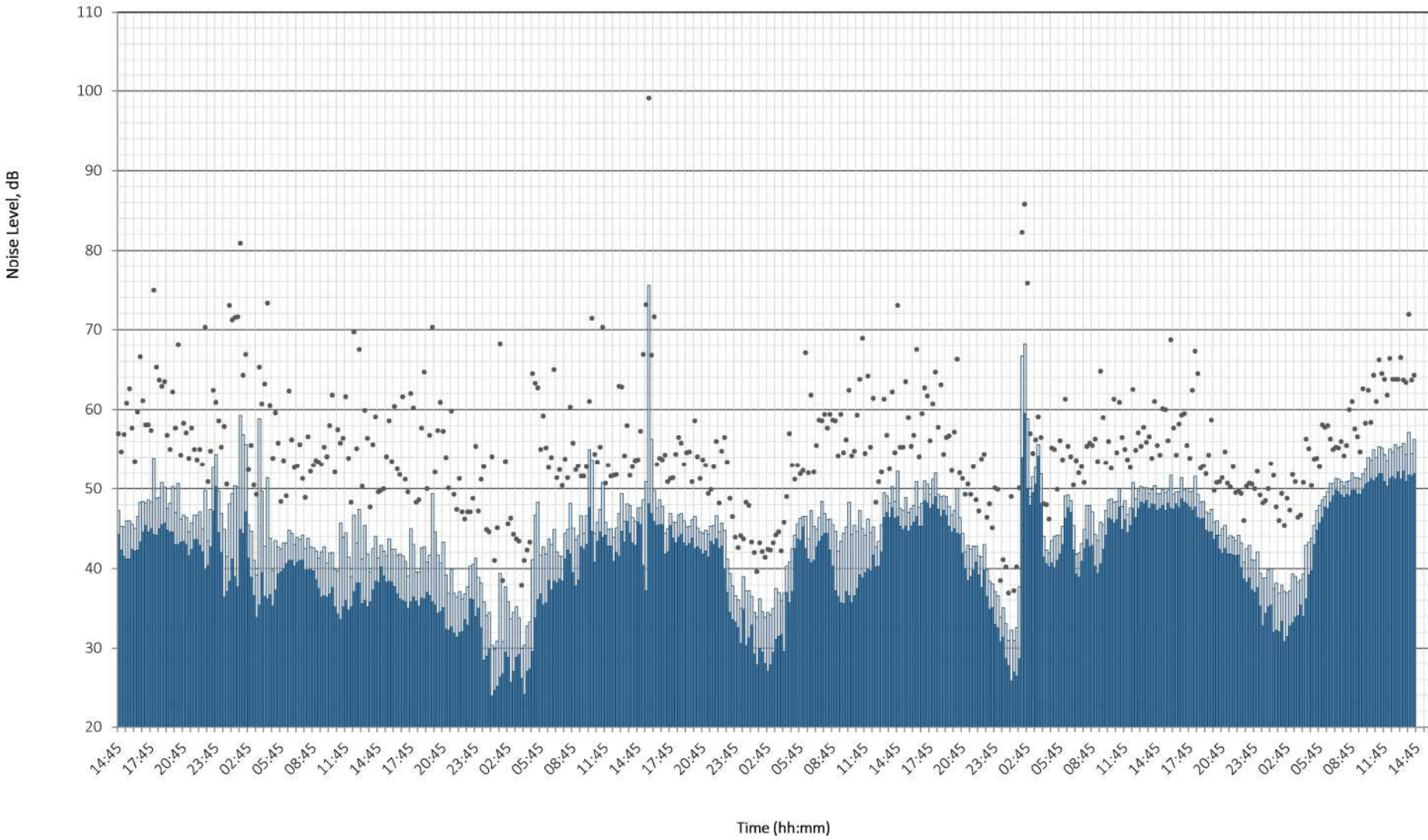
According to BS8233: 2014, conversion of $L_{A10,18hr}$ to $L_{Aeq,16hr}$ can be achieved using the formula below:

$$L_{Aeq,16hr} = L_{A10,18hr} - 2 \text{ dB}$$

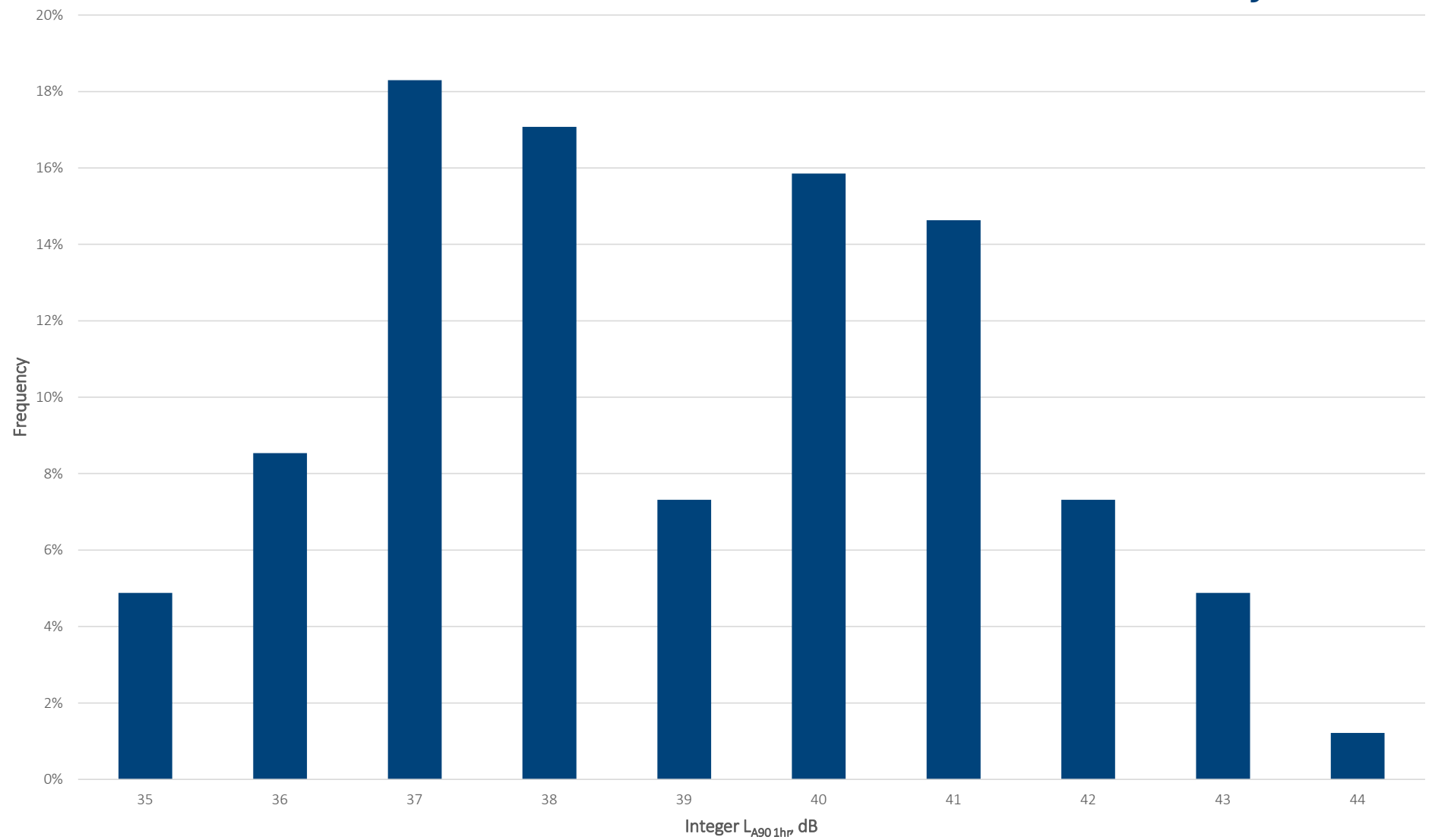
Appendix C Noise Survey Results



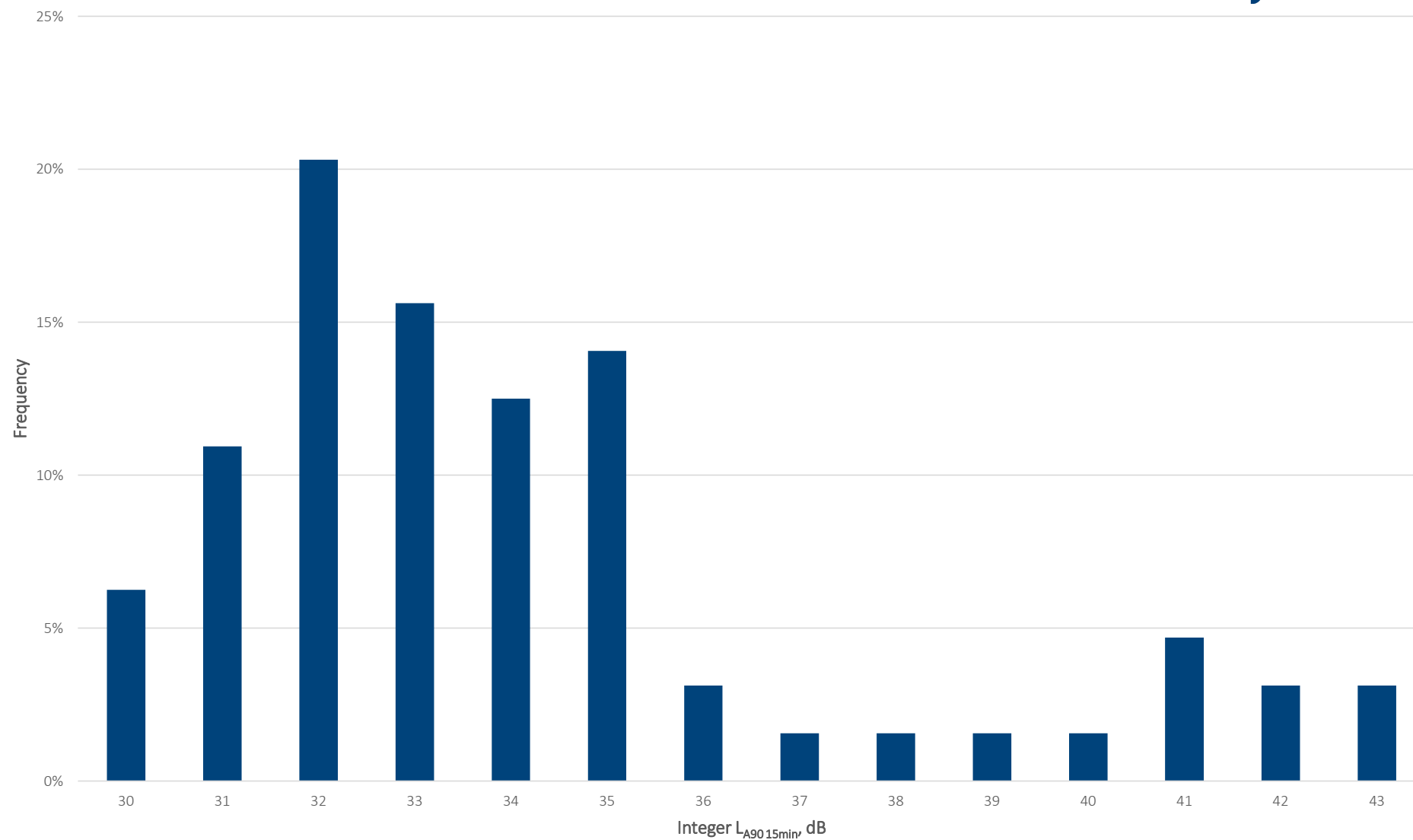
Monitoring Location LTN1
Friday 23rd to Wednesday 28th July 2021
Noise Time History Plot



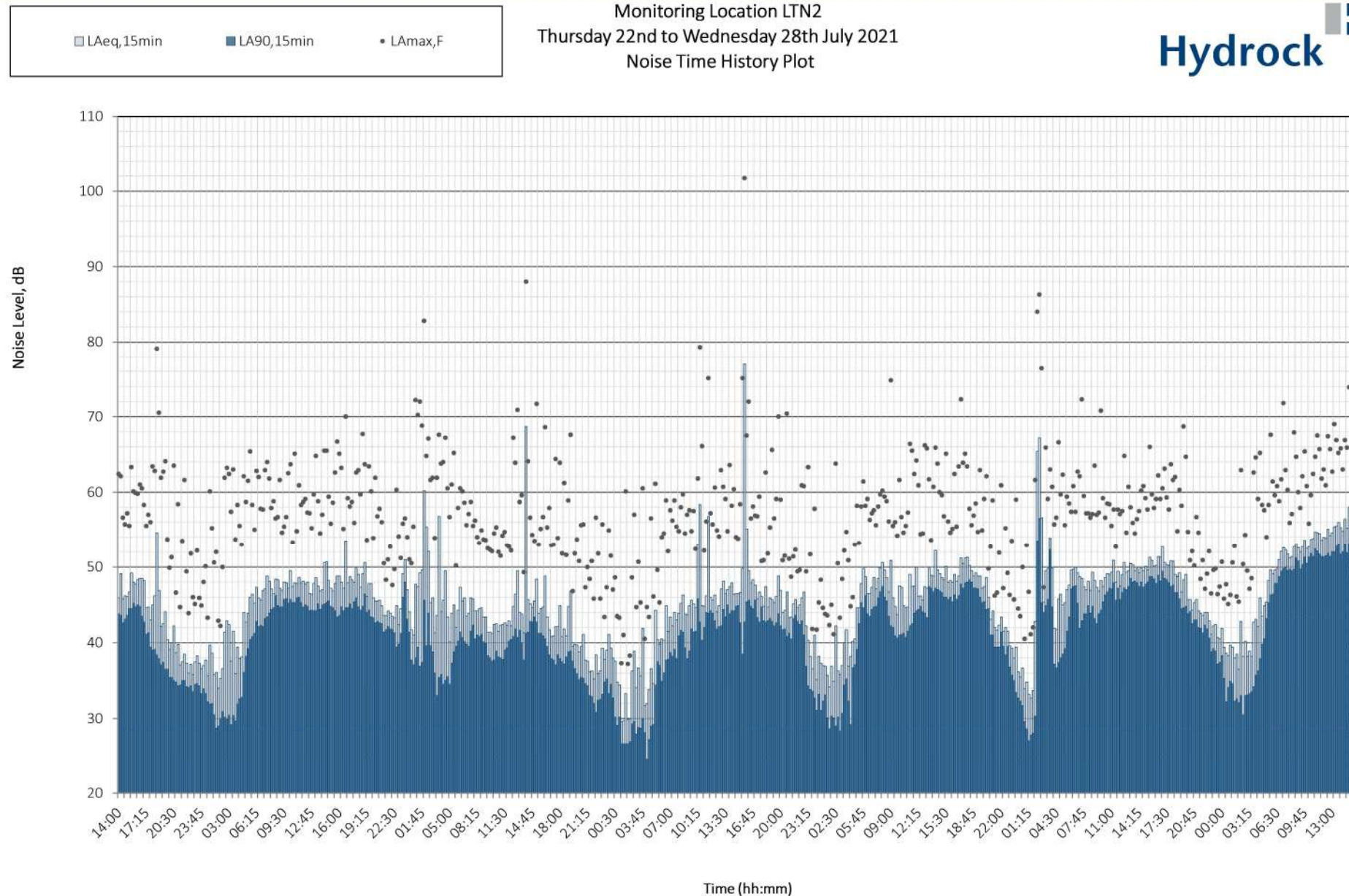
Dunsbury Park - LTNM1
Background Sound Level Distribution
Day (0700 to 1900)



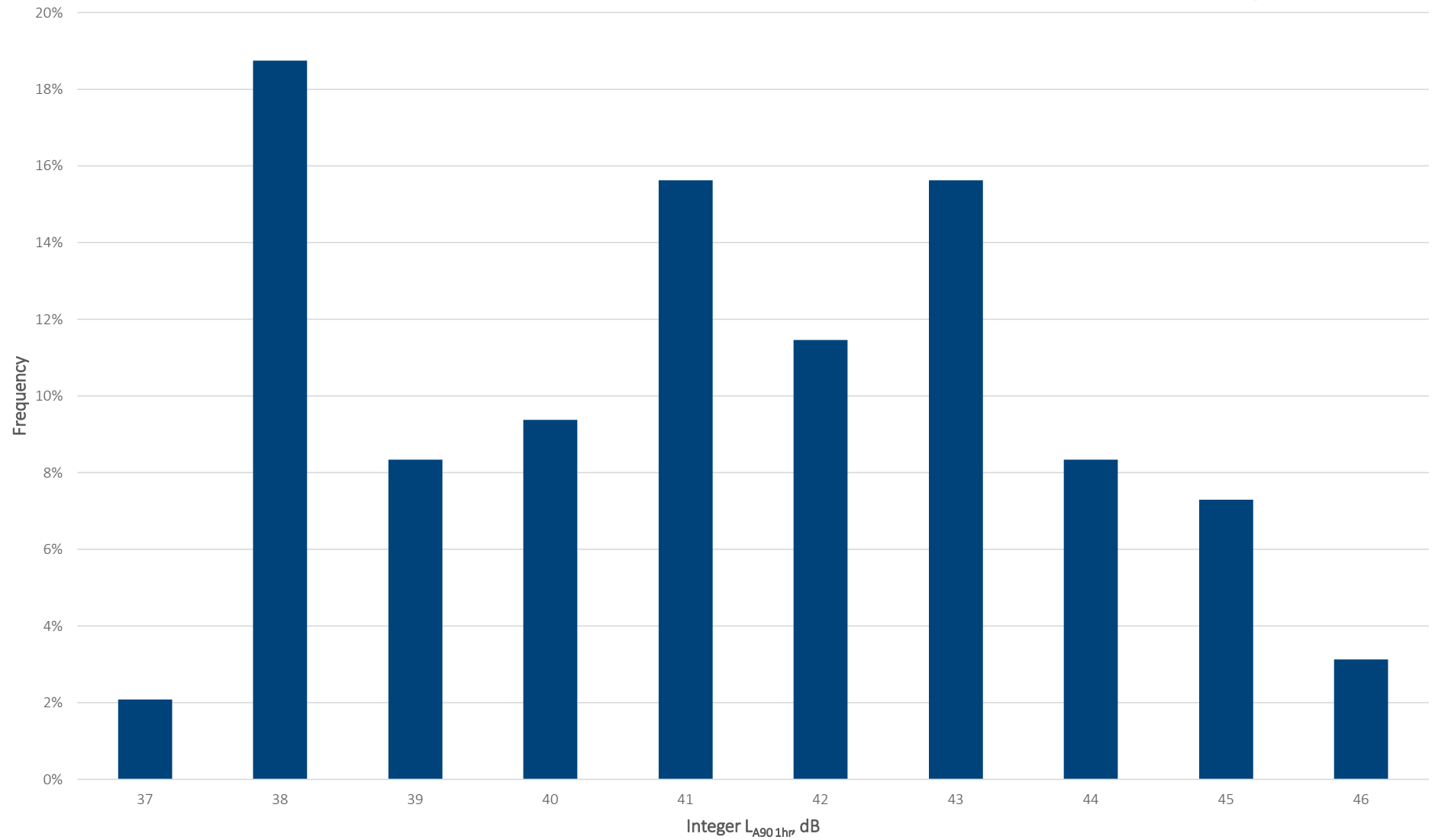
Dunsbury Park - LTNM1
Background Sound Level Distribution
Night (2300 to 0700)



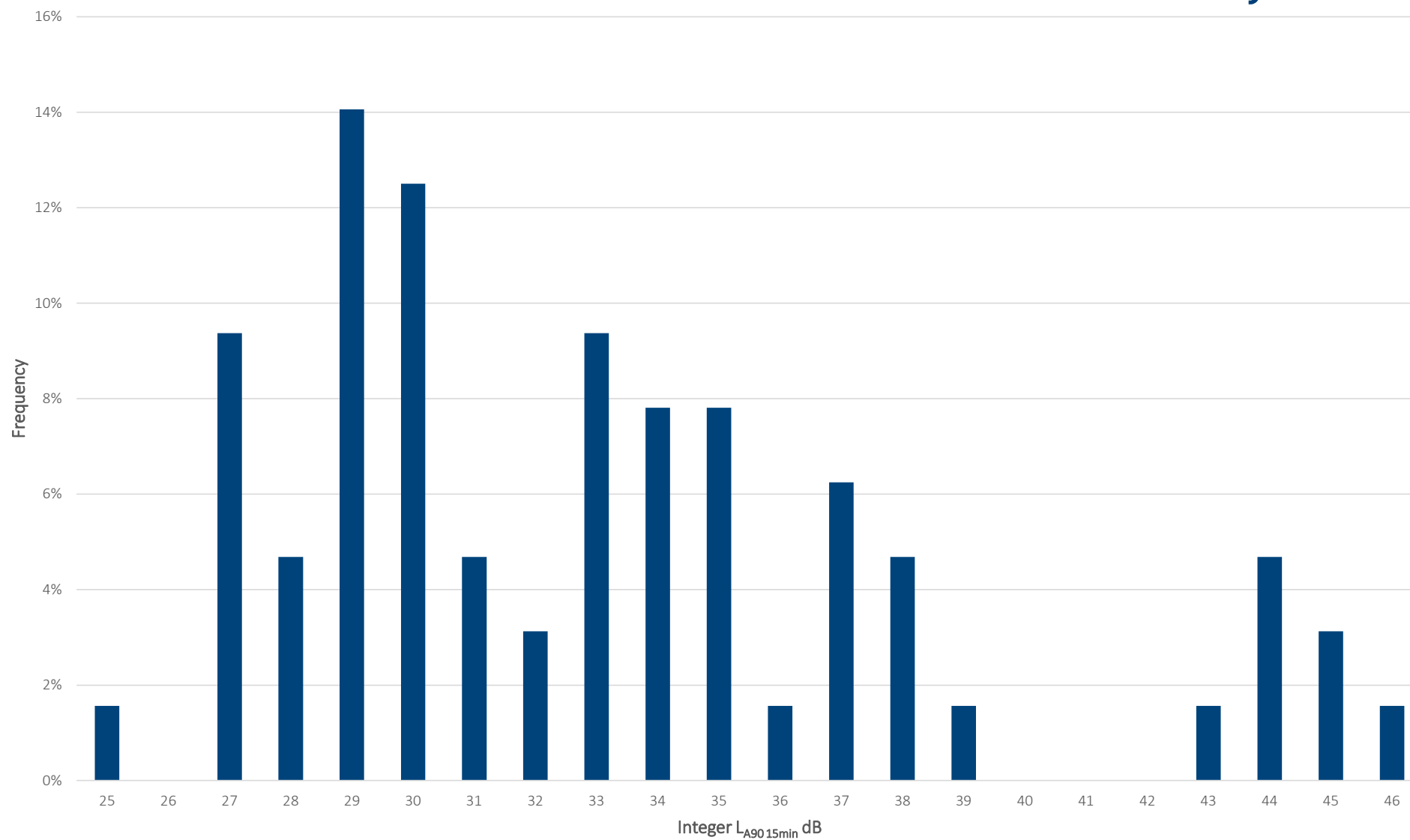
Monitoring Location LTN2
Thursday 22nd to Wednesday 28th July 2021
Noise Time History Plot



Dunsbury Park - LTNM2
Background Sound Level Distribution
Day (0700 to 2300)

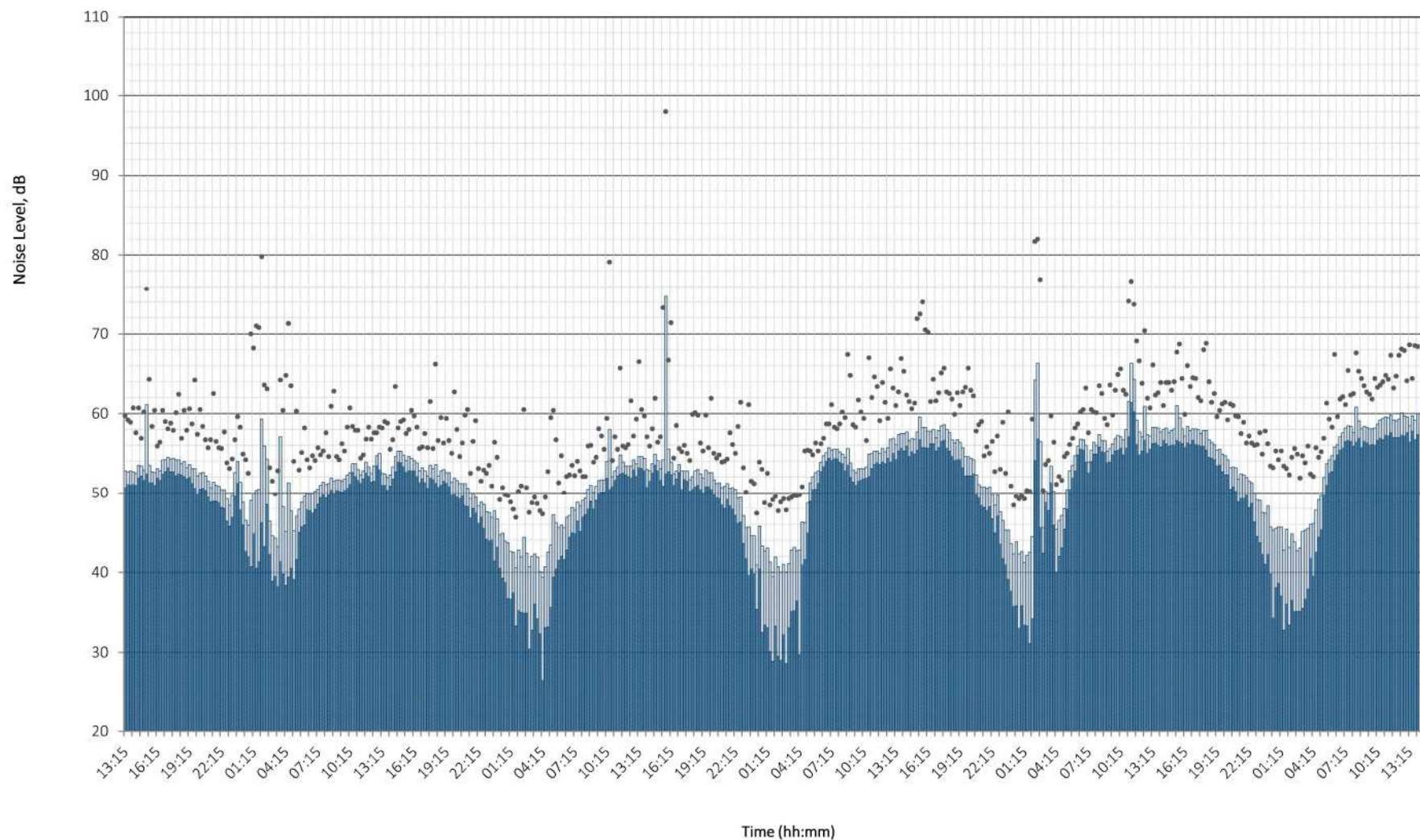


Dunsbury Park - LTNM2
Background Sound Level Distribution
Weekend Night (2300 to 0700)

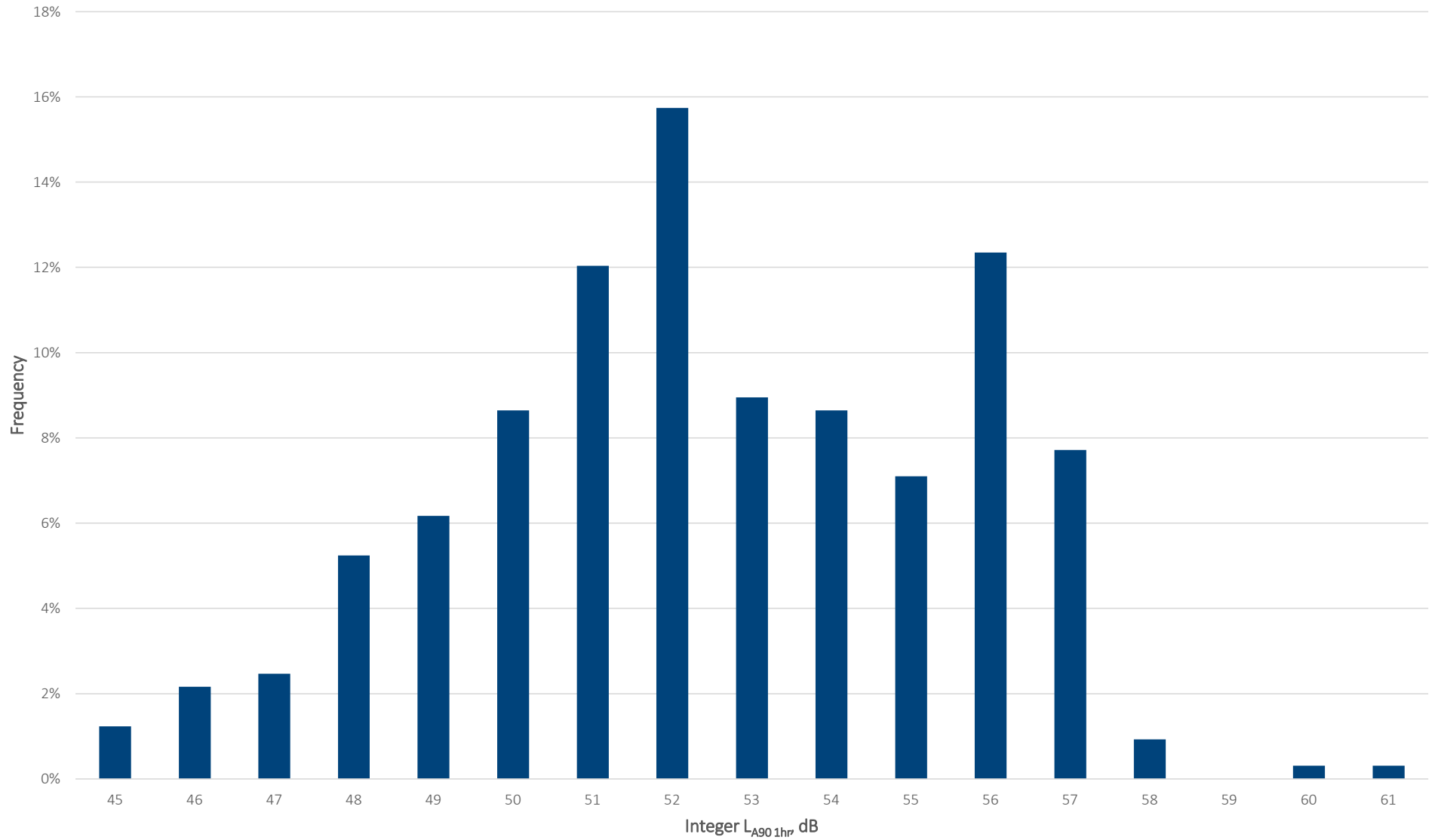




Monitoring Location LTN3
Thursday 22nd to Wednesday 28th July 2021
Noise Time History Plot



Dunsbury Park - LTNM3
Background Sound Level Distribution
Week Day (0700 to 1900)



Dunsbury Park - LTNM3
Background Sound Level Distribution
Night (2300 to 0700)

