
Greenheys, Manchester Science Park

Environmental Noise Assessment Report

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1 Introduction

BDP Acoustics has been commissioned by Bruntwood SciTech to provide an Environmental Noise Assessment report for the Greenheys development project, Manchester Science Park (MSP), “the Proposed Development”.

The Proposed Development proposals consist of construction of a 7-storey building comprising up to 186,000 sq. ft. commercial floor space across 6 occupiable floors (Use Class E), plus plant level above; in addition to associated cycle parking, hard and soft landscaping, access and servicing and other associated works.

The EIA screening opinion received from the City Council, as Local Planning Authority, is that an Environmental Impact Assessment is not required in this instance. The screening opinion adopted by Manchester City Council for the proposed development, dated 6th March 2023, with respect to noise, states:

“...Such impacts are therefore not considered to be of a scale which is more than local significance and therefore do no warrant consideration as part of an EIA.

...It is considered that whilst some there would be environmental impacts associated with this development, these can be suitably mitigated against:

Noise and vibration – The proposal would generate a degree of noise from comings and goings in the local area both during the construction and operations of the development. Mitigation can be put in place during the construction in the form of a construction management strategy. For the occupation of the development, the buildings would be acoustically insulated and the comings and goings would be commensurate with local area.”

This Environmental Noise Assessment report includes the following:

- Review of current planning guidance and acoustic standards related to the environmental noise assessment of the new development, including BREEAM 2018 and Local Planning Authority requirements.
- A summary of the environmental noise surveys undertaken.
- Proposed assessment criteria for operational phase external noise limits, based on the relevant guidance and standards.
- Recommended mitigation measures to suitably reduce construction noise and vibration.
- Recommended mitigation measures to suitably reduce operational phase external noise.

A glossary of acoustic terms is presented in Appendix I – Glossary of Acoustic Terms.

2 Relevant guidance and standards

2.1 Noise Policy Statement for England

The NPSE provides guidance on the management of noise from sustainable development. The statement sets out three key aims in paragraph 1.7:

“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- *Avoid significant adverse impact on health and quality of life;*
- *Mitigate and minimise adverse impacts on health and quality of life; and*
- *Where possible, contribute to the improvement of health and quality of life.”*

2.2 National Planning Policy Framework

The NPPF sets out the Government’s planning policies for England and how these are expected to be applied. It provides a framework within which locally-prepared plans for housing and other development can be produced.

It advises that planning decisions should prevent new and existing developments from being put at unacceptable risks from, amongst other things, noise pollution. It goes on to advise that new development should be appropriate to its location and should mitigate and reduce to a minimum potential adverse impacts resulting from noise new development and avoid noise giving rise to significant adverse effects on health and quality of life.

2.3 Manchester City Council (MCC) Core Strategy Policy DM1

Policy DM1 within this document states that all new developments should have regard to, amongst other specific issues, effects of noise, including proposals which would be sensitive to existing environmental conditions.

2.4 MCC Planning and Noise Technical Guidance

It is proposed to adopt external plant noise emission criteria in accordance with that stated for fixed plant items / commercial developments within Manchester City Council ‘Planning and Noise’ Technical Guidance document, dated October 2022.

2.5 BS5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: noise (BS5228-1)

Part 1 of BS 5228 gives recommendations for basic methods of noise control relating to construction and open sites where work activities/operations generate significant noise levels, including Industry specific guidance.

2.6 BS5228-2:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 2: Vibration (BS5228-2)

Part 2 of BS 5228 gives recommendations for basic methods of vibration control relating to construction and open sites where work activities/operations generate significant vibration levels, including Industry specific guidance.

2.7 BS4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound

BS 4142:2014+A1:2019 (BS 4142) provides a method for rating industrial and commercial sound and a method for assessing resulting impacts upon people. The impact assessment procedure described in BS 4142 is based on the comparison of rating sound level with the background sound level prevailing at the assessment locations.

2.8 BREEAM New Construction 2018

The Proposed Development is being targeted to meet certain performance standards from this version of BREEAM. The acoustic design strategy will address the following requirement elements from this document:

- HEA05 Acoustic performance;
- Pol 05 Reduction of noise pollution.

2.9 Health Technical Memorandum 08-01: Acoustics (HTM 08-01)

Health Technical Memorandum 08-01 gives comprehensive advice and guidance on the acoustic design, installation and operation of specialised building and engineering technology used in the delivery of healthcare.

Some of the acoustic design guidance contained within this document is also applicable to commercial office developments, including guidance on appropriate noise limits for emergency plant equipment.

3 Proposed assessment criteria

Based on the guidance documents referenced in Section 2, the following criteria are proposed for the purpose of this assessment.

3.1 Operational phase non-standby plant noise limits at nearest noise sensitive receptors

It is proposed to adopt external plant noise emission criteria in accordance with that stated for commercial developments within Manchester City Council 'Planning and Noise' Technical Guidance document, dated October 2022.

'Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (L_{Aeq}) below the typical background (L_{A90}) level at the nearest noise sensitive location'

3.2 Operational phase standby plant noise limits at nearest noise sensitive receptors

We propose that in accordance with Health Technical Memorandum 08-01 guidance, standby plant will be limited to 10 dBA above 'worst case' (lowest) representative background noise levels measured at the identified nearest noise sensitive receptors, on the basis that this plant will only operate in the event of a mains power failure, or for other emergency life safety purposes, or when tested, with scheduled testing only taking place on a weekday in daytime hours.

3.3 Operational phase delivery and collection noise

Delivery and collection noise during the operational phase is proposed to be mitigated by restricting delivery and collections to daytime hours (7am to 7pm).

4 Environmental noise surveys

4.1 Site description

The Proposed Development site is located within the Manchester Science Park (MSP). To the immediate south of the site lies the commercial Base building, with the Darul Aman Mosque beyond, to the west lies existing residential areas over Greenheys Lane, to the north the McDougal Centre Site and Burlington street with existing residential areas beyond, and to the east lies further commercial buildings, including the Bright building, within the MSP.

The nearest or most exposed existing noise sensitive receptors to the Proposed Development site are understood to be:

- Residential receptors on the opposite side of Greenheys Lane;
- Commercial office buildings to the east (Bright building) & south (Base building) of the Site;
- Mosque McDougall Prayer Hall to the north of the Site;
- Darul Aman Mosque to the south of the Site; and
- Residential receptors on the opposite side of Burlington Street to the north of the Site.

4.2 Survey methodology

A series of manned short-term measurements were undertaken by BDP Acoustics at a number of locations on and in the vicinity of the proposed Project site during worst-case daytime, evening and night-time periods.

The approximate measurement positions are presented in Figure 1. Measurement positions were selected in order to:

- Measure worst-case, i.e. noisiest, daytime (1600 – 1850 hours) noise levels at the locations of the proposed building façades in order to establish the noise levels that will impact upon the façades of the proposed building (Positions 2, 7, 8, and 9).
- Provide data representative of the worst-case, i.e. quietest, daytime (1245 – 1516 hours), evening (2200 – 2230 hours) and night-time (0230 – 0310 hours) noise levels at the nearest or most exposed noise sensitive receptors for the purposes of informing environmental plant noise limits to maintain residential amenity (Positions 1 – 6).

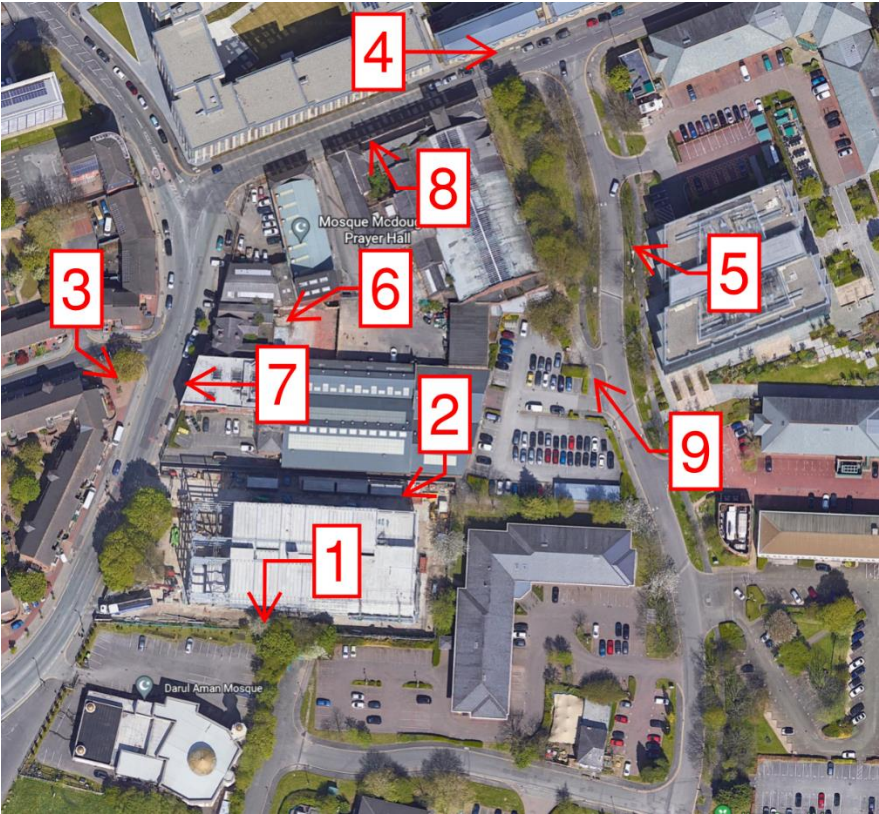
Weather conditions during the daytime survey were dry with low wind speeds (<2m/s), temperatures varying around -3°C and cloud cover of approximately 10%. Weather conditions during the evening survey were dry with no wind, temperatures of -3°C and 5% cloud cover. Weather conditions during the night-time survey were dry with no wind, temperatures of -3°C and 5% cloud cover.

The instrumentation used for measurements consisted of a Rion NA-28 sound level meter and a Bruel & Kjaer 2260 sound level meter, which were both calibrated before and after the surveys, with no significant drift in sensitivity observed.

At each position, octave band and A-weighted fast response levels were recorded for a comprehensive suite of noise level metrics.

4.3 Measurement locations

Figure 1: Approximate noise survey positions



4.4 Results

Table 1: Summary of measured survey results

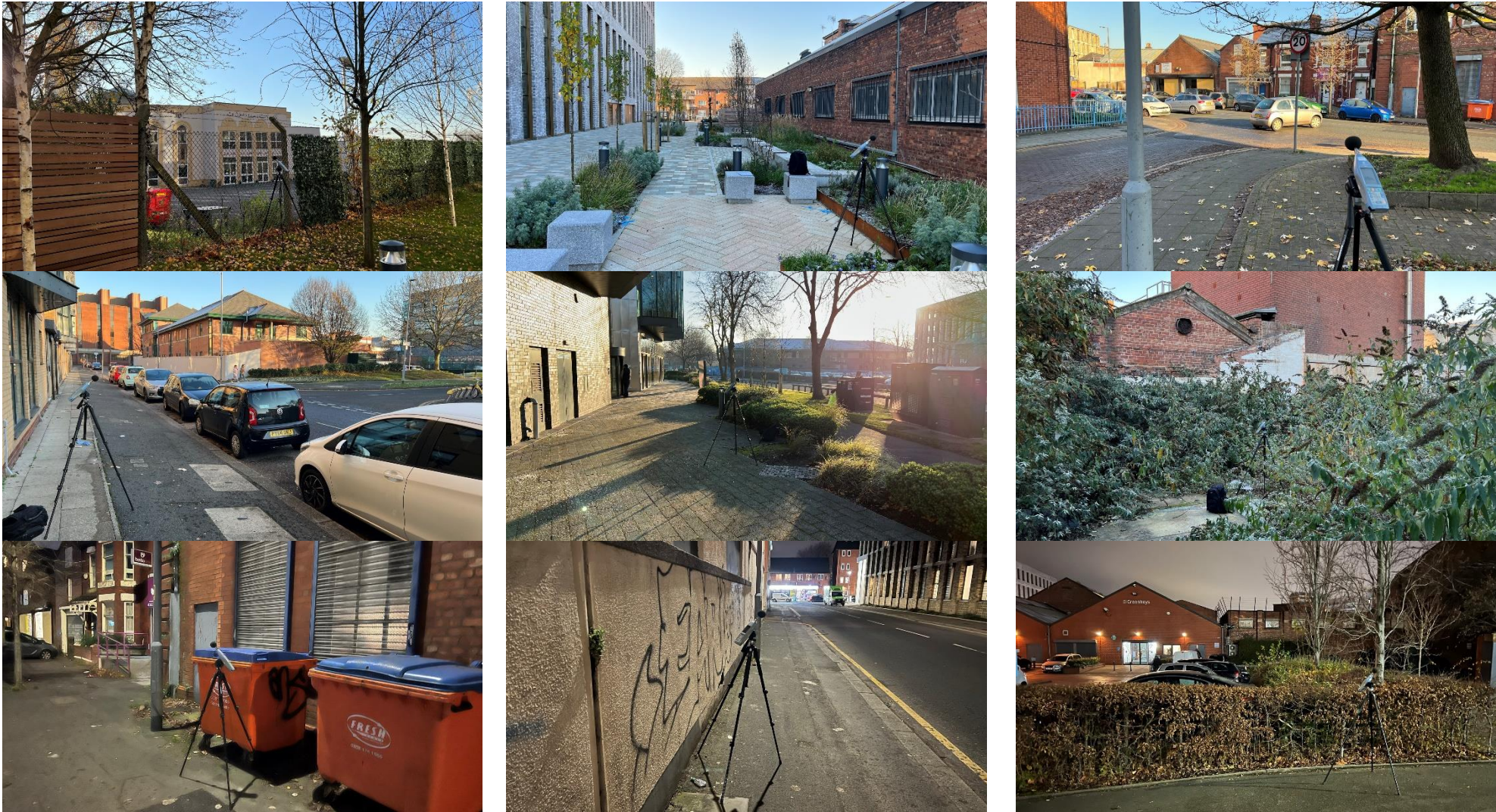
Position	Start (hh:mm)	End (hh:mm)	<i>L</i> _{Aeq,5mins} Range (dB)	<i>L</i> _{A90,5mins} Range (dB)	<i>L</i> _{AFmax,5mins} Range (dB)
1	12:46	13:02	52.4 - 54.1	45.1 - 48.4	59.7 - 60.1
2	13:04	13:20	48.3 - 51.2	44.2 – 46.0	56.3 – 63.0
2	16:14	16:31	49.9 - 51.4	46.4 - 48.1	59.5 - 62.6
2	17:36	17:52	50.7 - 51.2	45.1 - 45.4	59.8 - 66.8
3	13:23	13:42	60.8 - 62.9	50.5 - 53.5	68.6 - 73.6
3	22:10	22:25	58.7 - 61.0	44.8 - 46.2	68.8 - 72.9
3	02:28	02:43	47.5 - 52.4	37.8 - 38.6	65.1 - 69.0
4	13:45	14:01	60.9 - 63.9	49.5 - 53.1	75.0 - 79.9
4	22:31	22:46	63.0 - 65.6	44.4 - 45.8	78.7 - 83.0
4	02:48	03:03	46.5 - 62.1	39.6 - 40.4	62.7 - 82.0
5	14:09	14:25	51.8 - 54.0	45.2 - 46.9	65.3 - 71.3
6	15:00	15:16	52.0 - 58.4	51.1 - 55.8	59.8 - 61.9
6	03:08	03:23	48.6 - 48.7	48.2 - 48.2	50.2 - 55.2
7	16:37	16:55	67.2 - 67.5	53.4 - 58.0	76.9 - 77.7
7	17:54	18:10	66.0 - 66.2	53.2 - 54.2	75.8 - 81.4
8	16:58	17:14	71.6 - 73.3	56.0 - 58.2	83.5 - 84.8
8	18:12	18:28	70.3 - 71.8	51.5 - 54.6	83.3 - 85.7
9	17:17	17:34	56.4 - 59.8	46.3 - 46.8	71.3 - 75.2
9	18:31	18:47	51.3 - 60.8	44.8 - 46.6	51.3 - 76.2

4.5 Survey noise climate

During the daytime, the background noise climate surrounding the site and local area is dominated by road traffic noise. The busiest roads are Greenheys Ln., on the western boundary of the site, and Burlington St. to the north of the site. The ambient noise climate at measurement positions close to these roads (positions 3, 4, 7, 8) is dominated by vehicles travelling on these roads. These roads are also used by several bus routes, with the buses travelling on them also contributing to the ambient noise climate at these locations. The ambient noise climate at measurement positions further away from these roads, including positions 5 and 9 on Pencroft Way, is dominated by less frequent car pass-bys. The ambient noise climate at the courtyard measurement position, position 6, is dominated by fixed plant operated by the takeaway restaurant adjacent to the existing Greenheys building.

During the night-time, the ambient noise climate at each of the measurement positions is generally dominated by local plant sources with contributions from occasional vehicle pass-bys. The background noise level was dominated by local plant sources and more distant commercial sources.

Figure 2: Noise monitoring positions (1 to 9 from top left to bottom right)



5 Site suitability assessment

5.1 Construction phase

5.1.1 Construction noise and vibration

Construction and construction traffic noise and vibration during the construction phase of the Proposed Development: Construction programme, process and plant information are not finalised at this stage of the project, however noise and vibration resulting from the construction of the proposed development can be mitigated at nearest noise sensitive receptors by including a construction management plan as part of the final construction proposals which adopts the relevant noise and vibration reduction measures recommended in BS5228-1 and BS5228-2.

5.2 Operational phase

5.2.1 External plant noise emissions

5.2.1.1 Plant noise limits at nearest noise sensitive receptors

Based on the surveyed noise levels measured at the nearest/most exposed existing noise sensitive receptors, Table 2 presents the recommended external noise limits that fixed plant and equipment installations associated with the new development should be designed to, in order to comply with the proposed assessment criteria in Section 3 of this report.

Noise limits only apply to a noise sensitive premises during periods when the noise sensitive premises is typically occupied. These noise limits are the cumulative rating level and as such account for any required character corrections.

Table 2: Proposed nearest or most exposed noise sensitive receptor (NSR) noise limits for fixed plant and equipment installations associated with the new development

Nearest or most exposed noise sensitive receptor (NSR) location	Time Period	Lowest measured existing background noise level at NSR (dB $L_{A90,5min}$)	Non-standby plant external noise limits at the NSR façade location (dB $L_{Ar,Tr}$)	Standby plant* external noise limits at the NSR façade location (dB $L_{Ar,Tr}$)
Residential properties across Greenheys Lane	Daytime (07:00 – 23:00 hours)	51	46	61
	Evening (19:00 to 23:00 hours)	45	40	55
	Night-time (23:00 – 07:00 hours)	38	33	48
Residential properties across Burlington Street	Daytime (07:00 – 23:00 hours)	50	45	60
	Evening (19:00 to 23:00 hours)	45	40	50
	Night-time (23:00 – 07:00 hours)	40	35	45
Bright Building	Daytime (07:00 – 23:00 hours)	45	40	55
Mosque McDougall Prayer Hall	Daytime (07:00 – 23:00 hours)	51	46	61

Nearest or most exposed noise sensitive receptor (NSR) location	Time Period	Lowest measured existing background noise level at NSR (dB $L_{A90,5min}$)	Non-standby plant external noise limits at the NSR façade location (dB $L_{A,Tf}$)	Standby plant* external noise limits at the NSR façade location (dB $L_{A,Tf}$)
Base Building	Daytime (07:00 – 23:00 hours)	44	39	54
Darul Aman Mosque	Daytime (07:00 – 23:00 hours)	45	40	55

**Standby plant will only operate in the event of a mains power failure, or for other emergency life safety purposes, or when tested, with scheduled testing only taking place on a weekday in daytime hours.*

5.2.1.2 Appraisal of external plant noise levels

Building service plant selections and attenuation requirements are not finalised at this stage of the project. Attenuation requirements will be finalised subject to the engineers' final equipment selections and layouts in subsequent design work-stages.

Based on the proposed new building proximity to the nearest noise sensitive receptors, these limits can be achieved with suitable equipment selections and conventional plant and equipment attenuation measures.

5.2.1.3 Plant noise at potential future student residential development on the northern adjacent side

Through complying with the proposed building service plant noise limits presented in Table 2, building service plant noise levels incident on a potential student residential development located on the northern adjacent site (as referenced in the 'Manchester Science Park Strategic Regeneration Framework Update' August 2018), would be limited

to enable conventional building envelope sound insulation mitigation strategies to be utilised on the student residential development, in order to prevent adverse internal noise levels.

5.2.2 Delivery and collection noise

As noted in the EIA screening opinion, comings and goings associated with the operation of the development will be commensurate with local area. Delivery and collection noise during the operational phase is proposed to be mitigated by restricting delivery and collections to daytime hours (7am to 7pm).

6 Summary

- BDP Acoustics has been commissioned by Bruntwood SciTech to provide an Environmental Noise Assessment report for the Greenheys development project, Manchester Science Park (MSP), “the Proposed Development”.
- Assessment acoustic criteria have been proposed relating to external plant and equipment noise emissions resulting from the operation of the proposed development, based on relevant guidance documents such as BREEAM 2018, BS4142 and Manchester City Council planning guidance.
- An environmental noise survey has been carried out to determine the existing noise climate at the site and at the nearest or most exposed noise sensitive receptor locations.
- Based on the assessment criteria, relevant guidance documents referenced, and measured environmental noise survey data, a site suitability assessment has been undertaken and indicates that:
 - Construction noise and vibration resulting from the Proposed Development construction phase can be suitably mitigated at nearest noise sensitive receptors by including a construction management plan as part of the final construction proposals which adopts the relevant noise and vibration reduction measures recommended in BS5228-1 and BS5228-2.
 - Operational phase fixed plant and equipment external noise emissions can be suitably mitigated through imposing noise limits in accordance with the assessment criteria at the nearest or most exposed noise sensitive receptors. Based on the proposed new building proximity to the nearest noise sensitive receptors, these limits can be achieved with suitable equipment selections and conventional plant and equipment attenuation measures.

Appendix I – Glossary of Acoustic Terms

A-Weighting

Normal hearing covers the frequency range from approximately 20Hz to 20kHz but sensitivity is greatest between about 500Hz and 8kHz. The "A-Weighting" is an electronic filters network incorporated in sound level meters which approximately corresponds to the frequency response of the ear. The unit of measurement of A-weighted sound level is dBA or dB(A).

Break-in

Noise transmission into a structure from the outside.

CadnaA Noise Modelling Software

CadnaA is an internationally recognised software package for calculation and assessment of environmental noise resulting from industrial and traffic sources. From input of calibrated noise sources, topographical data and building locations, a 3D model of an area can be produced. The propagation of noise from user defined sources can then be evaluated, taking into account height data and building locations. Noise levels at specific locations (such as a particular building façade) can then be calculated.

The standard outdoor noise propagation model used in the CadnaA program is in accordance with ISO 9613 Parts 1 & 2: 1996 '*Attenuation of sound during propagation outdoors*'.

Decibel, dB

This is a relative unit of measurement which in acoustics is the unit to measure sound. The human ear has an approximately logarithmic response to acoustic pressure over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). The dB is a logarithmic unit used to describe a ratio between the measured level and a reference or threshold level of 0dB (re. 20 micro-Pascals). We therefore use a logarithmic scale to describe sound pressure level, intensities and sound power levels. Subjectively, an increase of 10dB corresponds to a doubling in the perceived loudness of sound.

Equivalent Continuous Sound Level, L_{eq} or L_{Aeq}

The equivalent continuous sound level, L_{eq} is a notional sound level. It is the sound level, which, if maintained for a given length of time, would produce the same acoustic energy as a fluctuating noise over the same time period. (The formula for the above is implemented electronically in all good sound level meters and it is customary to measure rather than calculate the equivalent continuous sound level.) L_{Aeq} (A-weighted L_{eq}) is widely used to measure any environmental noise which varies considerably with time.

Free Field

A sound field region with no adjacent reflecting surfaces.

Octave and Third Octave Bands

The human ear is sensitive to sound over a range of approximately 20Hz to 20kHz, and is generally more sensitive to medium and high frequencies than to low frequencies. In order to define the frequency content of a noise, the spectrum is divided into frequency bands (continuous range of frequencies between two limiting frequencies), and the sound pressure level is measured in each band. The most commonly used frequency bands are octave bands, in which the mid-frequency of each band is twice that of the band below it. (For instance the octave bands above and below the 500Hz octave band are 1kHz and 250Hz respectively). For finer analysis, each octave band may be split into three one-third octave bands or in some cases, fine frequency bands.

Rating Level, $L_{Ar,Tf}$

The specific sound level plus any adjustment for the characteristic features of the sound, as described in BS 4142:2014.

Sound Insulation

Airborne sound insulation refers to the process of separating, by a physical barrier, a space to be protected from a noise source or space containing a noise source.

Statistical Level: L_{90} or L_{A90}

Sound pressure level that is exceeded for 90% of the measurement time. Consequently it is indicative of the general background noise level in the absence of any higher level short duration events that occur during the period.

Statistical Level: $L_{max,T}$

A noise level index defined as the maximum RMS sound pressure level measured during the measurement period, T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.

Time Weighting

One of the standard averaging times (Fast (F), Slow (S)) used for the measurement of RMS sound pressure level in sound level meters, specified in BS 5969.

Appendix II – Daytime Noise Survey Measurement Data

Table 3: Noise survey data

Measurement Position	Start Time (dd/mm/yyyy hh:mm)	Duration (mm:ss)	Metric	$L_{Aeq,5min}$ (dB) / $L_{AFmax,5min}$ (dB) / $L_{A90,5min}$ (dB)	$L_{Zeq,5min}$ and $L_{Zmax,5min}$ and $L_{Z90,5min}$ (dB) at octave band centre frequency							
					63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
1	08/12/2022 12:46	05:00	Leq	54.1	61.7	56	50.1	49.5	51.4	45.6	32.8	21.9
1	08/12/2022 12:51	05:00	Leq	52.4	58.8	53.2	48.2	46.7	50	44.3	31.8	20.3
1	08/12/2022 12:56	05:00	Leq	53.3	60.5	53.5	48.2	47.5	51.1	45.1	32.6	24.4
2	08/12/2022 13:04	05:00	Leq	48.3	60.3	53.4	47.4	44.4	44.4	39.5	30.6	22.5
2	08/12/2022 13:09	05:00	Leq	49.3	61.4	54.3	49.2	45.3	45.4	40.3	31.2	23.7
2	08/12/2022 13:15	05:00	Leq	51.2	61.4	56.2	54.5	48.6	45.4	40.3	32.6	27
3	08/12/2022 13:23	05:00	Leq	61.3	67.8	59.8	56.5	55.8	58.4	54	44.6	36.7
3	08/12/2022 13:31	05:00	Leq	60.8	66	60.1	56.1	55.4	58	53.3	44.4	35.5
3	08/12/2022 13:37	05:00	Leq	62.9	69	66	58.6	57.4	59.9	55.7	46.4	37.4
4	08/12/2022 13:45	05:00	Leq	63.9	72.6	63.9	61.6	59.4	60.7	56	48.3	42.8
4	08/12/2022 13:50	05:00	Leq	60.9	68.1	59.8	58.3	55.7	58	53.2	43.6	35.2
4	08/12/2022 13:56	05:00	Leq	63.5	71.6	63.4	60.9	58.2	60.4	56.2	46.9	39.2
5	08/12/2022 14:09	05:00	Leq	54	61.7	55.3	52.9	48.6	50.8	46.3	35.7	27.3
5	08/12/2022 14:14	05:00	Leq	53.5	62.7	56.5	52.1	49.8	50.1	44.7	35.8	28.4
5	08/12/2022 14:20	05:00	Leq	51.8	62.3	54.6	50.2	46.7	48.4	44.2	35.2	27.1
6	08/12/2022 15:00	05:00	Leq	52	62.7	60.3	58.1	47.6	45.4	39.7	33.3	25.6
6	08/12/2022 15:06	05:00	Leq	58.4	62.5	62.7	58.5	52.3	55	50.1	43.7	33.5
6	08/12/2022 15:11	05:00	Leq	57.4	62.4	60.9	57.9	53.4	54	48.6	41	30.5
2	08/12/2022 16:14	05:00	Leq	51.4	60.8	57.4	49.6	47.1	48	42.6	33.8	21.2
2	08/12/2022 16:19	05:00	Leq	50.2	60.9	55.7	48.4	45.5	46.7	41.7	33.6	24.9
2	08/12/2022 16:25	05:00	Leq	49.9	59.6	54.7	49	45.1	46.5	41.1	31.3	22.9
7	08/12/2022 16:37	05:00	Leq	67.5	71.5	66.8	61.8	61.6	64.9	60.3	50.8	42.4
7	08/12/2022 16:45	05:00	Leq	67.2	71	70.7	62	61.4	64.5	59.3	50.7	43.3
7	08/12/2022 16:50	05:00	Leq	67.5	68.3	65.2	60.6	61.4	65.2	60.1	49.9	40.8
8	08/12/2022 16:58	05:00	Leq	71.6	73	64	65.8	65.5	69.1	64.4	53.2	42.1
8	08/12/2022 17:04	05:00	Leq	73.3	73.4	65.2	67	67.2	70.9	66.4	54.3	43.1
8	08/12/2022 17:09	05:00	Leq	72.5	75.5	67.2	67.3	66.5	69.8	65.4	54.2	44.2
9	08/12/2022 17:17	05:00	Leq	56.4	62.5	57.8	54.8	50.9	53.8	47.7	37.3	29.3
9	08/12/2022 17:23	05:00	Leq	57.9	62.8	56.8	54.2	51.7	55.5	49.7	40.2	33.3
9	08/12/2022 17:29	05:00	Leq	59.8	65.3	59.6	57.1	54.2	57.3	51.3	41.1	33.7
2	08/12/2022 17:36	05:00	Leq	51.2	60.1	54.4	50.1	46.6	48.1	42.5	32.9	27.8
2	08/12/2022 17:42	05:00	Leq	51	61.2	54.6	47.5	45.4	48.4	42.5	30.9	21.8
2	08/12/2022 17:47	05:00	Leq	50.7	61	53.6	48.5	46.3	47.4	42.4	34.6	25.6
7	08/12/2022 17:54	05:00	Leq	66.1	69.8	64.7	62.6	60.4	63.3	58.7	48.7	40.9
7	08/12/2022 18:00	05:00	Leq	66	70.1	68	62.6	59.8	63	58.8	49.4	39.9
7	08/12/2022 18:05	05:00	Leq	66.2	66.5	62.7	60.2	60.1	63.7	59.2	48	37.3
8	08/12/2022 18:12	05:00	Leq	71.1	72	64.7	64.4	64.8	68.7	64	53.7	41.6

Measurement Position	Start Time (dd/mm/yyyy hh:mm)	Duration (mm:ss)	Metric	$L_{Aeq,5min}$ (dB) / $L_{AFmax,5min}$ (dB) / $L_{A90,5min}$ (dB)	$L_{Zeq,5min}$ and $L_{Zmax,5min}$ and $L_{Z90,5min}$ (dB) at octave band centre frequency							
					63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
8	08/12/2022 18:17	05:00	Leq	71.8	74.7	66.2	68.5	67	69.1	64.2	54.1	43.7
8	08/12/2022 18:23	05:00	Leq	70.3	68.7	62.2	64	63.6	67.9	63.4	52.1	40.9
9	08/12/2022 18:31	05:00	Leq	56.3	61.5	55.3	52.5	50	54	48.1	37.4	29.6
9	08/12/2022 18:36	05:00	Leq	60.8	63	58.5	56.9	55	58.6	52.8	42	32.9
9	08/12/2022 18:41	05:00	Leq	51.3	59.3	55.4	50.7	46.1	48.3	42	33.1	24.5
3	08/12/2022 02:28	05:00	Leq	47.5	53.3	46.4	42.7	42.0	44.4	40.7	31.1	22.5
3	08/12/2022 02:33	05:00	Leq	48.3	52.7	45.7	42.8	42.2	45.8	40.9	29.8	21.0
3	08/12/2022 02:38	05:00	Leq	52.4	52.9	46.5	45.2	46.1	50.3	45.1	33.3	22.4
4	08/12/2022 02:48	05:00	Leq	57.1	52.0	50.4	50.5	49.9	54.3	51.1	39.6	28.0
4	08/12/2022 02:53	05:00	Leq	62.1	59.7	57.8	56.1	55.9	59.8	54.3	45.7	34.3
4	08/12/2022 02:58	05:00	Leq	46.5	50.9	48.4	43.9	42.2	44.0	36.9	26.6	19.7
6	08/12/2022 03:08	05:00	Leq	48.7	56.3	60.7	53.5	43.8	39.6	33.5	27.5	22.0
6	08/12/2022 03:13	05:00	Leq	48.7	56.6	61.0	53.0	44.3	40.2	33.6	26.9	21.3
6	08/12/2022 03:18	05:00	Leq	48.6	56.6	60.9	53.0	44.2	40.0	33.1	25.8	18.4
3	13/12/2022 22:10	05:00	Leq	61.0	62.1	56.4	53.5	53.8	58.4	54.7	44.3	31.9
3	13/12/2022 22:15	05:00	Leq	58.8	60.1	54.3	52.4	52.9	56.0	52.1	42.4	32.4
3	13/12/2022 22:19	05:00	Leq	58.7	63.5	56.7	56.2	55.4	55.1	51.0	42.5	33.0
4	13/12/2022 22:31	05:00	Leq	65.6	62.8	58.0	58.2	58.4	62.9	59.3	49.1	37.4
4	13/12/2022 22:36	05:00	Leq	65.3	60.6	57.1	57.8	58.0	62.6	59.3	48.4	35.1
4	13/12/2022 22:41	05:00	Leq	63.0	56.9	55.3	56.5	55.7	60.6	56.4	44.4	32.3
1	08/12/2022 12:46	05:00	Lmax	60.1	74.5	65.1	60.1	59.8	58.2	52.8	45.6	43.1
1	08/12/2022 12:51	05:00	Lmax	59.7	69.7	63.1	55.9	57.7	58.4	52.1	45.9	39.2
1	08/12/2022 12:56	05:00	Lmax	59.8	77.5	63.1	56.6	54.5	58.4	51.9	47.4	52
2	08/12/2022 13:04	05:00	Lmax	56.3	71.8	65.3	57.3	53.9	52.4	49.7	49.3	42.7
2	08/12/2022 13:09	05:00	Lmax	56.5	79.6	65.6	64.1	53.7	52.9	48.2	41.7	37.2
2	08/12/2022 13:15	05:00	Lmax	63	75.1	67.6	67.1	63	58.7	58.1	54	53.2
3	08/12/2022 13:23	05:00	Lmax	69.3	83.8	74.9	69.8	67.1	66.8	63.7	57	50.1
3	08/12/2022 13:31	05:00	Lmax	68.6	80.4	75.8	68.9	65.5	66.2	62.8	60.6	51.6
3	08/12/2022 13:37	05:00	Lmax	73.6	91.2	87.9	74.1	70.3	71.3	67.9	61.6	50
4	08/12/2022 13:45	05:00	Lmax	79.9	93.7	83.5	81.2	78.7	73.4	71.7	69.7	67.4
4	08/12/2022 13:50	05:00	Lmax	75	86.1	74.1	71.3	71.4	73.3	67.7	59.7	55.8
4	08/12/2022 13:56	05:00	Lmax	76.8	92.2	76.8	73.5	72.6	74.9	71.1	63.7	57.2
5	08/12/2022 14:09	05:00	Lmax	69	75.5	64.8	64.8	63.4	67.2	61.8	51.1	44.7
5	08/12/2022 14:14	05:00	Lmax	71.3	75.4	73.3	68.5	70.4	68	59.6	51.5	46.6
5	08/12/2022 14:20	05:00	Lmax	65.3	78.2	67.2	62.5	62.1	63	56.9	48.1	42.3
6	08/12/2022 15:00	05:00	Lmax	61.9	74.4	65.2	60.5	56.2	55.4	57	56.8	46.8
6	08/12/2022 15:06	05:00	Lmax	61.9	76.7	66.5	61.7	56.2	59.8	55.5	48.4	38.2
6	08/12/2022 15:11	05:00	Lmax	59.8	73.4	64.7	60.9	58.2	58.1	52.1	51.1	41.6
2	08/12/2022 16:14	05:00	Lmax	62.6	70.2	69.1	61.4	61.2	58.4	57.5	55.6	44
2	08/12/2022 16:19	05:00	Lmax	59.5	76.9	63.4	57.9	61.7	55.7	55.5	49.2	46.1
2	08/12/2022 16:25	05:00	Lmax	60.8	73.8	68.2	64.7	58.4	54.3	55.8	55.9	44.9
7	08/12/2022 16:37	05:00	Lmax	76.9	85.4	81.3	74.4	73.4	74.3	69.4	63.4	60.5

Measurement Position	Start Time (dd/mm/yyyy hh:mm)	Duration (mm:ss)	Metric	L _{Aeq,5min} (dB) / L _{AFmax,5min} (dB) / L _{A90,5min} (dB)	L _{Ze,5min} and L _{Zmax,5min} and L _{Z90,5min} (dB) at octave band centre frequency							
					63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
7	08/12/2022 16:45	05:00	Lmax	77.7	87	92.8	77.3	73	76.3	69.7	65.4	61.3
7	08/12/2022 16:50	05:00	Lmax	77.6	81.5	79.1	72.1	71.8	75.9	70.2	63.4	57.7
8	08/12/2022 16:58	05:00	Lmax	84	89.3	76	78.9	79.7	82.4	77.8	67.6	57.9
8	08/12/2022 17:04	05:00	Lmax	84.8	89.4	77.9	80.1	82.2	82.2	77.1	66.6	61.7
8	08/12/2022 17:09	05:00	Lmax	83.5	93.3	82.2	80.3	79	81	76.3	65.4	60.7
9	08/12/2022 17:17	05:00	Lmax	71.3	76.7	72	68.8	65.3	70.4	61.5	52.5	51.7
9	08/12/2022 17:23	05:00	Lmax	72.3	81.9	72.4	69.7	68.3	70.8	63.8	56.4	53.6
9	08/12/2022 17:29	05:00	Lmax	75.2	85.3	75.4	76.4	72.1	73.6	67.3	56.8	51.8
2	08/12/2022 17:36	05:00	Lmax	66.8	71.8	67.3	63.1	61.2	58.1	63.7	58.5	59.2
2	08/12/2022 17:42	05:00	Lmax	59.8	75.8	68.7	58.7	56.3	58.5	51.2	43.4	36.2
2	08/12/2022 17:47	05:00	Lmax	61.8	76.8	66.1	61.6	59.9	57.2	58.3	57.8	47.3
7	08/12/2022 17:54	05:00	Lmax	81.4	89.2	86.2	84.2	79.1	76.1	72.5	65.4	59.7
7	08/12/2022 18:00	05:00	Lmax	76.8	86.5	90.3	80.7	71.2	74.1	70.2	62.3	55.6
7	08/12/2022 18:05	05:00	Lmax	75.8	81.9	77.1	69.4	71.1	73.4	70	61.4	55.8
8	08/12/2022 18:12	05:00	Lmax	85.7	89.9	80.1	77.2	80	84.5	78.1	70.6	64.7
8	08/12/2022 18:17	05:00	Lmax	84.6	92	81.9	90	80.8	82.4	77.7	72.4	62
8	08/12/2022 18:23	05:00	Lmax	83.3	84.7	72.6	81.5	77.2	81.5	77	66.7	57.2
9	08/12/2022 18:31	05:00	Lmax	70.9	77.9	69.4	66.2	65	69.5	63.1	55	54.9
9	08/12/2022 18:36	05:00	Lmax	76.2	75.1	71.8	70.2	70.7	74.7	68.5	59	48.9
9	08/12/2022 18:41	05:00	Lmax	66.5	72.3	73.1	64.2	62.2	64.1	57.5	52.3	43.8
3	08/12/2022 02:28	05:00	Lmax	65.1	61.9	60.2	58.7	59.6	63.0	58.3	51.0	42.3
3	08/12/2022 02:33	05:00	Lmax	67.3	59.9	56.9	60.3	61.1	65.0	60.9	49.4	39.9
3	08/12/2022 02:38	05:00	Lmax	69.0	60.8	61.0	61.9	63.2	66.9	62.6	50.3	42.0
4	08/12/2022 02:48	05:00	Lmax	76.6	67.4	68.9	69.3	70.8	74.3	70.2	59.9	50.1
4	08/12/2022 02:53	05:00	Lmax	82.0	77.1	80.9	77.0	76.7	80.5	72.5	63.1	54.7
4	08/12/2022 02:58	05:00	Lmax	62.7	59.8	56.1	57.3	59.1	61.4	53.8	48.5	43.7
6	08/12/2022 03:08	05:00	Lmax	55.2	61.8	63.8	57.1	45.9	45.5	51.0	46.7	42.6
6	08/12/2022 03:13	05:00	Lmax	51.2	63.2	63.4	55.4	48.8	44.1	40.8	44.7	41.9
6	08/12/2022 03:18	05:00	Lmax	50.2	62.9	63.0	54.9	45.9	44.2	38.8	40.5	37.3
3	13/12/2022 22:10	05:00	Lmax	72.7	74.0	72.1	71.6	66.4	70.5	67.4	59.6	50.0
3	13/12/2022 22:15	05:00	Lmax	68.8	79.1	68.7	65.9	67.1	67.1	62.7	56.3	49.5
3	13/12/2022 22:19	05:00	Lmax	72.9	82.5	72.8	75.4	72.5	67.3	63.2	58.5	49.7
4	13/12/2022 22:31	05:00	Lmax	83.0	80.3	75.1	75.7	76.1	81.0	76.9	67.8	57.2
4	13/12/2022 22:36	05:00	Lmax	80.6	82.7	71.8	75.5	75.0	78.5	73.9	64.5	52.1
4	13/12/2022 22:41	05:00	Lmax	79.7	71.8	69.7	76.2	73.2	77.9	71.9	60.2	55.7
1	08/12/2022 12:46	05:00	L90	48.4	56.4	51.5	45.4	42.9	44.7	39.9	28.5	16.5
1	08/12/2022 12:51	05:00	L90	45.1	54.8	48.9	42.8	40	41.6	36.7	23.9	16.2
1	08/12/2022 12:56	05:00	L90	47.2	55.4	49.4	43.6	42	44.2	38.7	26.6	17.1
2	08/12/2022 13:04	05:00	L90	44.2	55.4	50.3	45	41.4	38.6	34	26.6	16.5
2	08/12/2022 13:09	05:00	L90	45.7	55.4	51.5	45.6	42.1	40.2	35.5	27.5	17.4
2	08/12/2022 13:15	05:00	L90	46	56.4	51.8	45.8	42.6	40.5	35.6	27	17.4
3	08/12/2022 13:23	05:00	L90	52.2	57.5	53.3	49.6	48.1	48.1	44.4	35.8	27.2

Measurement Position	Start Time (dd/mm/yyyy hh:mm)	Duration (mm:ss)	Metric	$L_{Aeq,5min}$ (dB) / $L_{AFmax,5min}$ (dB) / $L_{A90,5min}$ (dB)	$L_{Zeq,5min}$ and $L_{Zmax,5min}$ and $L_{Z90,5min}$ (dB) at octave band centre frequency							
					63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
3	08/12/2022 13:31	05:00	L90	50.5	57.8	53.3	48.8	46.3	46.3	42.2	31.7	21.9
3	08/12/2022 13:37	05:00	L90	53.5	59.6	55.4	50.1	48	49.8	46.4	36.6	25.8
4	08/12/2022 13:45	05:00	L90	50.8	59.8	52.8	49.4	46.7	46.9	41.2	30.5	20.4
4	08/12/2022 13:50	05:00	L90	49.5	58.5	52.3	47.8	45.2	45.6	40.3	29.6	20.4
4	08/12/2022 13:56	05:00	L90	53.1	60.1	55.4	52.4	49.1	48.9	43.1	33.3	23.9
5	08/12/2022 14:09	05:00	L90	46.6	56	50.8	46.1	41.9	41.7	36.5	27.4	20
5	08/12/2022 14:14	05:00	L90	46.9	57.8	50.9	45.6	42.2	42.3	37.8	28	19.8
5	08/12/2022 14:20	05:00	L90	45.2	56.7	49.6	44	40.6	41.2	35.8	26.7	18.9
6	08/12/2022 15:00	05:00	L90	51.1	60.7	59.1	57.3	46.4	43.6	36.1	26.6	17.8
6	08/12/2022 15:06	05:00	L90	51.8	60	60.4	57.4	47.3	44.5	37.2	27.4	18.7
6	08/12/2022 15:11	05:00	L90	55.8	59.7	58.7	56.8	50.1	51.7	47.5	39.5	29.3
2	08/12/2022 16:14	05:00	L90	48.1	56.9	53.1	46.3	43.7	44.3	38.6	28.6	15.8
2	08/12/2022 16:19	05:00	L90	47.4	56.3	53.4	45.5	42.6	43.4	38.1	28.1	16.2
2	08/12/2022 16:25	05:00	L90	46.4	55.5	51.5	45.4	41.8	42.3	37.2	27.3	15.5
7	08/12/2022 16:37	05:00	L90	58	62.1	57.9	53.5	52.6	54.8	50	38.8	28
7	08/12/2022 16:45	05:00	L90	55.2	60.1	56.1	50.6	50	51.8	46	33.8	23.7
7	08/12/2022 16:50	05:00	L90	53.4	57.9	54.5	49.4	48.7	50.5	44.3	31.9	21.2
8	08/12/2022 16:58	05:00	L90	56	60.9	55.7	54	50.9	52.6	48	35.9	24.7
8	08/12/2022 17:04	05:00	L90	57.7	62	56.4	54.7	52.5	54.5	50.2	37.4	24.3
8	08/12/2022 17:09	05:00	L90	58.2	64.9	57.5	56.1	54.2	54.2	50.6	40.4	27.2
9	08/12/2022 17:17	05:00	L90	46.6	56.7	50.6	46.6	41.2	43.1	36.7	26.6	18.3
9	08/12/2022 17:23	05:00	L90	46.3	56.3	49.5	45	40.3	43.2	36.5	25	17.1
9	08/12/2022 17:29	05:00	L90	46.8	56.6	50.8	46.2	40.9	43.3	37.3	26.5	17.8
2	08/12/2022 17:36	05:00	L90	45.4	54.3	48.9	44.2	40.8	41.7	35.9	24.9	15.1
2	08/12/2022 17:42	05:00	L90	45.3	56.2	49.4	44.3	40.7	41.2	35.5	25.2	15.1
2	08/12/2022 17:47	05:00	L90	45.1	54.9	49.5	43.9	40.7	41.1	35.6	25	15.5
7	08/12/2022 17:54	05:00	L90	53.2	56.2	53.3	50.5	47.7	50.3	44.7	32	21.4
7	08/12/2022 18:00	05:00	L90	53.2	55.2	53	50.8	47.3	50.3	45.6	31.2	18.3
7	08/12/2022 18:05	05:00	L90	54.2	55	51.5	48.6	47.5	52.1	45	31.1	19
8	08/12/2022 18:12	05:00	L90	54.6	60.8	55.5	51.4	49.3	51.3	46.3	34.4	20.5
8	08/12/2022 18:17	05:00	L90	53.5	59.6	54.6	51.2	48.5	50.2	45.7	33.1	22
8	08/12/2022 18:23	05:00	L90	51.5	58.8	53	49	45.9	48.3	42.9	31.2	19.7
9	08/12/2022 18:31	05:00	L90	46.6	55.7	50	45.2	40.6	43.5	37.2	24.3	15.5
9	08/12/2022 18:36	05:00	L90	45.4	56	50	45.5	40	41.8	34.9	23.5	15.8
9	08/12/2022 18:41	05:00	L90	44.8	54.9	49.2	45	39.6	41.2	33.8	21.7	14.6
3	08/12/2022 02:28	05:00	L90	38.6	50.5	43.4	38.7	36.3	33.1	26.4	16.0	13.1
3	08/12/2022 02:33	05:00	L90	37.8	50.1	43.3	38.2	36.0	32.1	25.3	15.9	13.1
3	08/12/2022 02:38	05:00	L90	38.0	50.1	43.4	38.8	36.1	32.4	25.2	15.3	13.0
4	08/12/2022 02:48	05:00	L90	39.9	49.0	45.9	41.1	38.0	34.4	26.6	18.2	13.1
4	08/12/2022 02:53	05:00	L90	40.4	49.1	46.6	41.4	38.3	35.7	27.4	17.7	12.9
4	08/12/2022 02:58	05:00	L90	39.8	48.7	46.2	40.8	37.6	34.3	26.4	17.3	12.8
6	08/12/2022 03:08	05:00	L90	48.2	54.7	55.7	52.3	43.0	38.5	32.1	23.3	15.2

Measurement Position	Start Time (dd/mm/yyyy hh:mm)	Duration (mm:ss)	Metric	$L_{Aeq,5min}$ (dB) / $L_{AFmax,5min}$ (dB) / $L_{A90,5min}$ (dB)	$L_{Zeq,5min}$ and $L_{Zmax,5min}$ and $L_{Z90,5min}$ (dB) at octave band centre frequency							
					63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz
6	08/12/2022 03:13	05:00	L90	48.3	54.8	60.1	52.1	43.3	39.2	32.3	23.7	15.5
6	08/12/2022 03:18	05:00	L90	48.3	55.0	60.0	52.1	43.3	39.2	32.2	24.1	15.3
3	13/12/2022 22:10	05:00	L90	46.3	55.0	47.7	43.8	42.1	42.5	38.7	29.2	---
3	13/12/2022 22:15	05:00	L90	44.8	52.4	46.5	42.7	40.4	41.4	36.1	25.6	---
3	13/12/2022 22:19	05:00	L90	45.0	53.4	46.7	43.5	40.8	41.0	36.1	26.6	---
4	13/12/2022 22:31	05:00	L90	44.5	52.2	47.7	44.7	40.7	41.0	33.7	21.5	14.0
4	13/12/2022 22:36	05:00	L90	46.0	51.9	48.3	45.3	41.5	42.9	36.2	20.7	13.2
4	13/12/2022 22:41	05:00	L90	44.4	52.2	48.5	44.5	41.0	40.8	32.9	22.0	13.5