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ENVIRONMENT

KAMES PROPERTY INCOME FUND

39 DEANSGATE
MANCHESTER

Noise Impact Assessment

MCA2017

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39 DEANSGATE
MANCHESTER

Noise Impact Assessment

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EXECUTIVE SUMMARY

BWB Consulting Ltd was appointed by Kames Property Income Fund to undertake an environmental noise assessment to support a planning application for the redevelopment of 39 Deansgate on the corner of St. Mary's Gate in Manchester ('the Site').

To inform the assessment, a baseline noise survey was undertaken in October 2019 to determine the prevailing noise climate on the site and at the nearest noise sensitive receptors to the proposed development.

The assessment has been undertaken in accordance with relevant planning policy, British Standards and Guidance documents.

Based on the assessment findings, it is considered that noise levels can be satisfactorily controlled to within recommended acoustic design standards so that a suitable acoustic environment is provided to all future occupants and that impacts associated with the operation of the development can be controlled to an appropriate degree.

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1. INTRODUCTION

Appointment & Background

- 1.1 BWB Consulting Ltd was appointed by Kames Property Income Fund to undertake an environmental noise assessment to support a planning application for the redevelopment of 39 Deansgate on the corner of St. Mary's Gate in Manchester ('the Site').
- 1.2 This report considers the Site's suitability for the nature of proposed uses through measurement of existing baseline noise affecting the Site, which have been used to carry out the following works:
 - Preliminary façade sound insulation assessment to provide early indication of the necessary façade airborne sound insulation required to achieve appropriate internal noise levels (*BS8233:2014*);
 - The setting of appropriate noise emission limits for new fixed building services plant associated with the Development (*in accordance with the plant noise policy of Manchester City Council (MCC) and BS4142:2014+A:2019*).
- 1.3 This report is necessarily technical in nature, so to assist the reader, a glossary of acoustic terminology can be found in **Appendix A**.

Site Description

- 1.4 The Site is irregular in shape and comprises an area of around 0.12 hectares (1,227 sq.m). It is bound by Deansgate to the West, St Mary's Gate to the North, the Grade II* listed Barton Arcade to the South and by 12-14 St Mary's Gate to the East. It is situated within the St Ann's Conservation Area.
- 1.5 39 Deansgate is currently occupied by a 9-storey mixed use building known as 'Speakers' House', built in 1963 and designed by the architectural practice of Douglas Stephen & Partners. It has been refurbished numerous times over the years most recently in 2013 when new cladding was added to the main shop front façades. The existing building has a Net area of 3,754 sq.m (40,408 sq.ft) with accommodation arranged over ground, mezzanine, and eight upper floors. Car Parking provision with 13 spaces is provided to the rear. The ground floor, circa 1116 sq.m (12,013 sq.ft) is occupied by retail tenants including the Flight Centre, Spar and Gregg's. The upper floors are currently used as offices, with an area in excess of 2,638 sq.m (28,395 sq.ft). The offices are partially occupied and generally characterised by short term leases.
- 1.6 The Site is currently serviced by an alley leading to a yard accessed via the pedestrianised Exchange Street/ St. Ann's Square to the East.
- 1.7 In the vicinity of the Site, the main noise source is road traffic from Deansgate and St. Mary's Gate with contributions from fixed plant from the various commercial and retail uses in the immediate area.

- 1.8 The nearest noise sensitive receptors (NSRs) are existing residential dwellings to the north at No.1 Deansgate, and to the south in Barton Arcade. In addition, the nearest offices are located at 8-10 Exchange St.

Description of Development

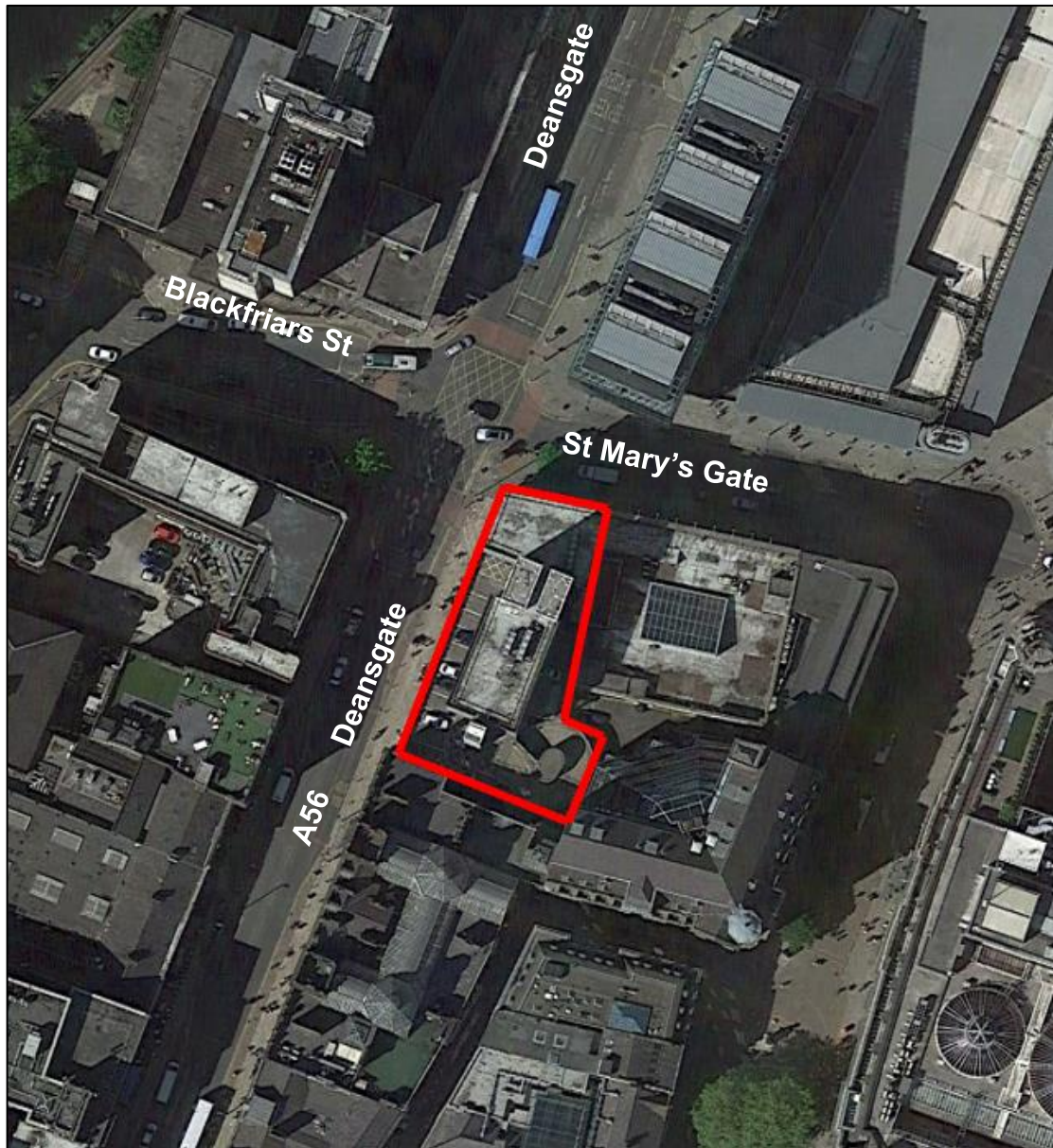
- 1.9 *"Erection of a 17 storey building comprising office use (Use Class E(g)(i)) and flexible ground floor commercial units (Use Classes E(a),(b),(c) and sui generis 'drinking establishment'), new electricity sub-station, basement cycle parking and rooftop plant enclosure, together with access, servicing and associated works following demolition of the existing building"*

- 1.10 Key features include:

- No basement car parking is now proposed. Cycle store/ Showers/ drying rooms etc in basement accessed via a dedicated ramp
- Façade Material – Tonal Aluminium not anodised aluminium
- Blue/ Green Roof

- 1.11 **Figure 1.1** details the location of the Site.

Figure 1.1 – Site Location



- 1.12 A typical floor plan layout for the Site is shown below in **Figure 1.2**.
- 1.13 Layout drawings showing the location and orientation of the proposed plant items to service the premises can be found in **Figure 1.3**.
- 1.14 It is understood that any fixed plant associated with the new development has the potential to operate continuously over a 24-hour period.

Figure 1.2 – Typical Floor Plan Layout

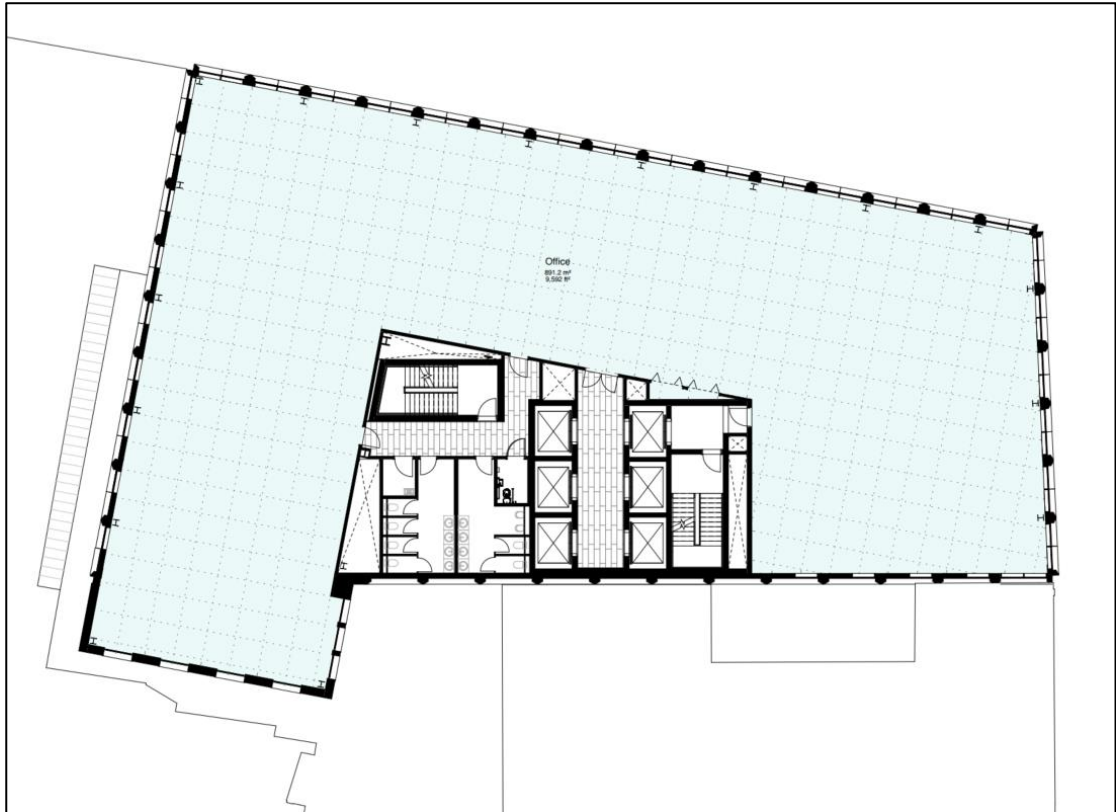
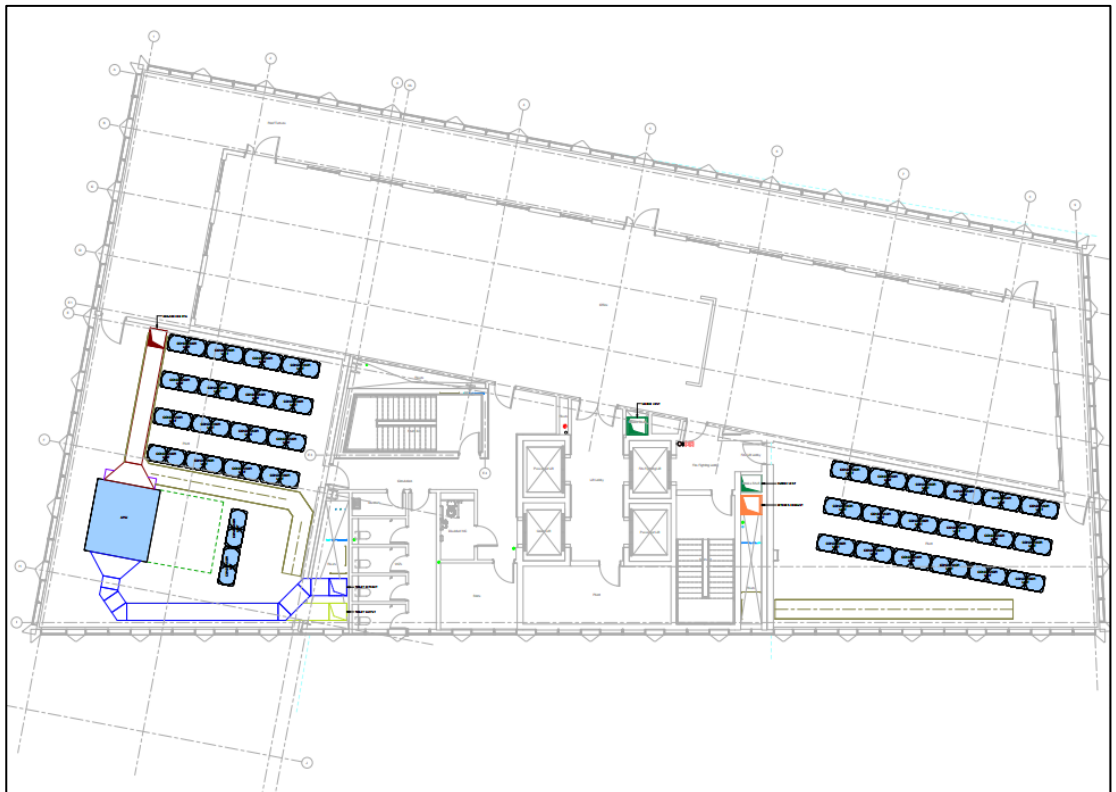


Figure 1.3 – Level 15 Plant Layout



2. STANDARDS AND GUIDANCE

National Planning Policy Framework (NPPF)

- 2.1 Published in July 2021, this document sets out the Government's planning policies for England and supersedes the previous NPPF published in 2012. 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."

- 2.2 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 impacts 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."

BS 8233:2014: Guidance on Sound Insulation and Noise Reduction for Buildings

- 2.3 To help in the design of the building and the control of noise outside and in the building, reference has been made to relevant and credited guidance documents, notably, British Council for Offices (BCO) and BS 8233:2014, which recommend suitable external noise intrusion and internal ambient noise level (IANL) criteria to be met within commercial buildings to ensure the acoustic environment within different room spaces are appropriate to their function. The noise level criteria relevant to the development are presented in **Table 2.1**.

Table 2.1 - Internal Noise Criteria in Unoccupied Spaces

Room Space	Level of External Noise Intrusion	BS8233 $L_{Aeq,T}$ Criteria	Criterion
Meeting Rooms, Executive Offices	-	35-45 35-40	Reasonable conditions for study and work requiring concentration
Cellular Offices	NR 35	40-50	
Speculative Offices	NR 38		
Open Plan Offices, Reception Rooms	NR 40 NR 45	45-50 45-50	Reasonable acoustic privacy in shared spaces
Corridors, Toilets	-	45-55	Reasonable speech or telephone conversations

BS 4142:2014+A:2019: Methods for Rating & Assessing Industrial and Commercial Sound

- 2.4 This standard describes methods for rating and assessing the following:
- Sound from industrial and manufacturing processes;
 - Sound from fixed installations which comprise mechanical and electrical plant and equipment;
 - Sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
 - Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train movements on or around an industrial and/or commercial site.
- 2.5 The methods use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident. The Standard advises the purpose of the methodology includes the assessment of sound from any plant and activities associated with existing industrial and/or commercial uses at proposed residential dwellings.
- 2.6 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 such as tonal qualities and/or distinct impulses, to give a 'rating' level ($L_{Ar,T}$). The Standard effectively compares

and rates the difference between the rating level of the specific sound and the typical background sound level ($L_{A90,T}$) in the absence of the specific sound.

- 2.7 The Standard advises that the time interval ('T') of the background sound measurement should be sufficient to obtain a representative or typical value of the background sound level at the time(s) the source in question operates or is proposed to operate in the future.
- 2.8 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."

Local Authority Criteria – Consultation with Manchester City Council

- 2.9 Consultation was undertaken with Graeme Souter of MCC by email on 9th October 2019. The following methodology was proposed:

- Assess the existing noise levels at the proposed development, in accordance with the above guidance;
- Assess the potential impact of noise from the proposed commercial/industrial noise sources at the nearest noise sensitive receptors, in accordance with the above guidance;
- Where appropriate, mitigation measures will be considered, to reduce the noise to within acceptable levels at the proposed development; and
- Provide a noise report summarising our findings.

- 2.10 A response was received on 22nd October 2019, with the following comments:

"I am fine with midweek monitoring for the purposes of undertaking the background noise assessment.

I have had a read through the methodology and it looks like you have identified the nearest noise sensitive residential properties. Those residents in No 1 Deansgate are particularly sensitive so the assessment of any roof mounted equipment such as AHU's or Kitchen extracts will need to take this into consideration. I understand these properties rely on opening windows for ventilation and do not benefit from mech vent

so this will also need to be considered and will need to be assessed against lowest representative background noise level.

Please also be aware that office space is considered a noise sensitive receptor so should also be included in the scope when designing noise limits in accordance with our criteria."

Further Consultation with Manchester City Council

- 2.11 Following submission of the Noise Impact Assessment report as part of the outline planning application (reference 126328/FO/2020) to MCC, feedback was subsequently received regarding acoustic insulation and external equipment insulation including electricity substation, which required consideration. A technical note was produced (dated 30th March 2021) to provide a response to these comments.
- 2.12 Subsequently, additional comments were received back from the EHO and a further technical note produced (dated 1st May 2020) to address these comments. BWB has sought to address all of the EHO concerns in this updated version of the report.

MCC: Planning and Noise Technical Guidance document

- 2.13 MCC's Planning and Noise Technical Guidance document (Dec 2015) states the following regarding noise and vibration from fixed plant:

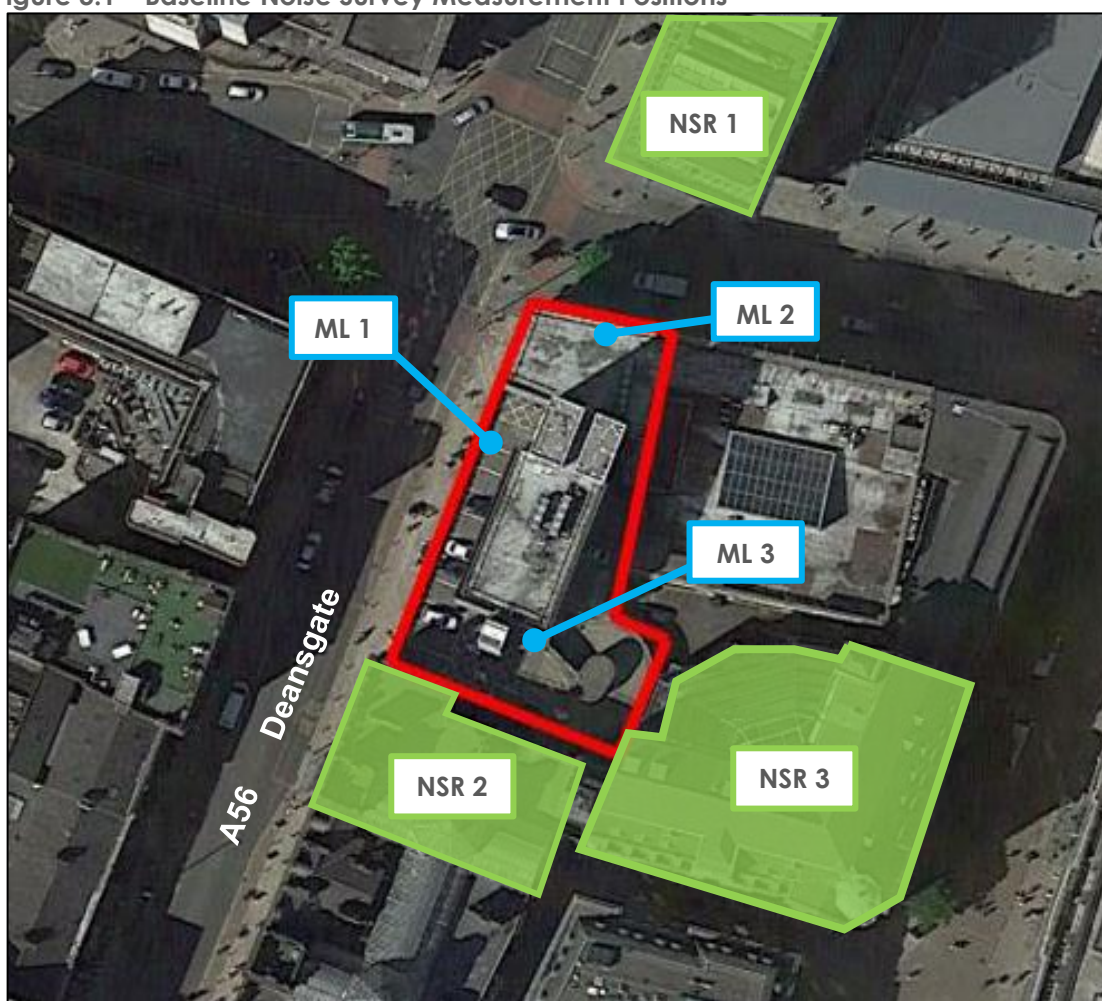
'Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location'.

3. ENVIRONMENTAL NOISE SURVEY

Summary

- 3.1 A baseline noise survey has been undertaken to determine the prevailing noise climate across the proposed development site, and at the nearest noise sensitive receptors to the site. Measurement positions adopted during the survey are identified in **Figure 3.1** below. Details of monitoring undertaken at each position are provided below.

Figure 3.1 – Baseline Noise Survey Measurement Positions



Measurement Positions

ML1

- 3.2 Monitoring Location 1 (ML1) was selected to determine noise levels from road traffic along Deansgate onto the proposed site.
- 3.3 Monitoring at ML 1 was undertaken over a 24hr period, from 11:00hrs on Wednesday 23 October 2019 to 11:00hrs on Thursday 24 October 2019. Measurement equipment was established in free-field conditions at a height of circa. 2m above the local roof level, along the boundary parapet with line of sight to road traffic along Deansgate.

- 3.4 The noise climate at ML 1 was dominated by road traffic along Deansgate throughout the survey periods.

ML 2

- 3.5 ML 2 was selected to determine background noise levels at the nearest dwellings of No.1 Deansgate, against which to assess plant noise.
- 3.6 Monitoring at ML 2 was undertaken over a 48-hr period, from 13:00hrs on Wednesday 23 October 2019 to 13:00hrs on Friday 25 October 2019. Measurement equipment was established in free-field conditions at a height of circa. 1.5m above the 6th floor roof level, along the northern site boundary with line of sight to St. Mary's Gate and NSR 1.
- 3.7 The noise climate at ML 2 was dominated by road traffic along St Mary's Gate and Deansgate and by plant noise from the various commercial and retail uses in the area.

ML 3

- 3.8 ML 3 was selected to determine background noise levels at the nearest dwellings of Barton Arcade, and offices within the 8-10 Exchange Street building, against which to assess plant noise.
- 3.9 Monitoring at ML 3 was undertaken over a 24hr period, from 12:00hrs on Thursday 24 October 2019 to 12:00hrs on Friday 25 October 2019. Measurement equipment was established in facade conditions out of an 8th floor window along the southern elevation, at 1m from the facade, at a height of circa. 1m from the floor line with line of sight to Barton Arcade, NSR 2 and NSR3.
- 3.10 The noise climate at ML 3 was dominated by plant noise from the various commercial and retail uses in the area.
- 3.11 Analysis of the data found that levels were unusually high during the period from 20:15hrs on Thursday 24 October until 00:45hrs on Friday 25 October. It was not possible to identify the source of the increase in noise levels, and the levels are not considered typical for this time of day, being consistently high and continuous, therefore data during this period has been excluded from the assessment.

Measurement Equipment

- 3.12 The baseline noise survey was undertaken using the Class 1 specification noise measurement equipment detailed in **Table 3.1**. Equipment was calibrated using a portable calibrator immediately before and after the measurements with no significant drift in calibration observed. The sound level meters, pre-amplifiers and microphones were calibrated to traceable standards within the 24 months prior to the measurements. The portable calibrators were calibrated within the 12 months preceding the date of the survey.

Table 3.1 - Noise measurement equipment

Position	Item	Make & Model	Serial Number	Calibration due Date
ML 1 ML 3	Sound Level Meter	Svantek 971	72615	June 2020
	Pre-Amplifier	Svantek SV18	72283	
	Microphone	ACO Pacific 7052E	69463	
	Calibrator	Svantek SV33A	76650	August 2020
ML 2	Sound Level Meter	Svantek 971	72616	June 2020
	Pre-Amplifier	Svantek SV18	72297	
	Microphone	ACO Pacific 7052E	69479	
	Calibrator	Svantek SV33A	73421	August 2020

Meteorological Conditions

3.13 Weather conditions during the survey were conducive for environmental noise monitoring; it being mostly dry with negligible winds (<5ms⁻¹).

Measurement Results

3.14 A summary of measured noise levels at ML 1 - 3 are presented in **Tables 3.2 to 3.5**. Full results are provided in **Appendix B**.

Table 3.2 - Summary of measured sound pressure levels at ML1

Start Date and Time	Duration (T)	dB L _{Aeq,T}	dB L _{A90,T} ¹
23/10/2019 11:00	Daytime (07:00-23:00)	67	59
23/10/2019 23:00	Night-time (23:00-07:00)	63	53
1 Representative L _{A90,T} value during the measurement period			

Table 3.3 - Summary of daytime octave band sound pressure levels at ML1

Descriptor	Octave Band Sound Pressure Levels (L _{eq} dB)								dB(A)
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
L _{Aeq}	69	66	65	63	63	59	56	51	67

Table 3.4 - Summary of measured sound pressure levels at ML2

Start Date and Time	Duration (T)	dB L _{Aeq,T}	dB L _{A90,T} ¹
23/10/2019 13:00	Daytime (07:00-23:00)	63	56
23/10/2019 23:00	Night-time (23:00-07:00)	58	50
1 Representative L _{A90,T} value during the measurement period			

Table 3.5 - Summary of measured sound pressure levels at ML3

Start Date and Time	Duration (T)	dB L _{Aeq,T}	dB L _{A90,T} ¹
24/10/2019 12:00	Daytime (07:00-23:00)	58	57
24/10/2019 23:00	Night-time (23:00-07:00)	57	57
1 Representative L _{A90,T} value during the measurement period			

4. METHODOLOGY

- 4.1 This assessment considers noise from road traffic on the sensitive areas of the proposed development and from fixed plant on existing noise sensitive receptors.

Noise Modelling

- 4.2 A detailed 3D acoustic model of the site has been generated using the CadnaA noise modelling package in order to calculate the daytime and night-time noise propagation across the site from road traffic incident upon the proposed development, and from proposed plant noise upon the nearest noise sensitive receptors. This noise model was generated applying the following methodology:

- The noise model was set up to apply the noise prediction methodology set out in the 1988 Department of Transport and the Welsh Office document Calculation of Road Traffic Noise for road traffic noise sources, and ISO 9613-2: Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation for external fixed plant noise sources;
- The road traffic noise data collected from the Site was used to calibrate the road traffic noise sources. The manufacturer noise data provided by the building services consultant was used to model the external fixed plant noise sources, which were modelled as point sources;
- Mapping of the Site and the surrounding area was calibrated into the noise model based on known Ordinance Survey grid reference points. Indicative ground topography was approximated using the LIDAR Composite 1m DTM data freely available from the DEFRA data.gov Website;
- Off-site buildings which would provide screening to the Site have been incorporated as reflective façades; and
- To reflect the local ground cover, ground absorption was set to $G = 0$ (100% acoustically reflective ground) and the model was set to include second order reflected noise from solid structures.

Noise Break-in Calculation

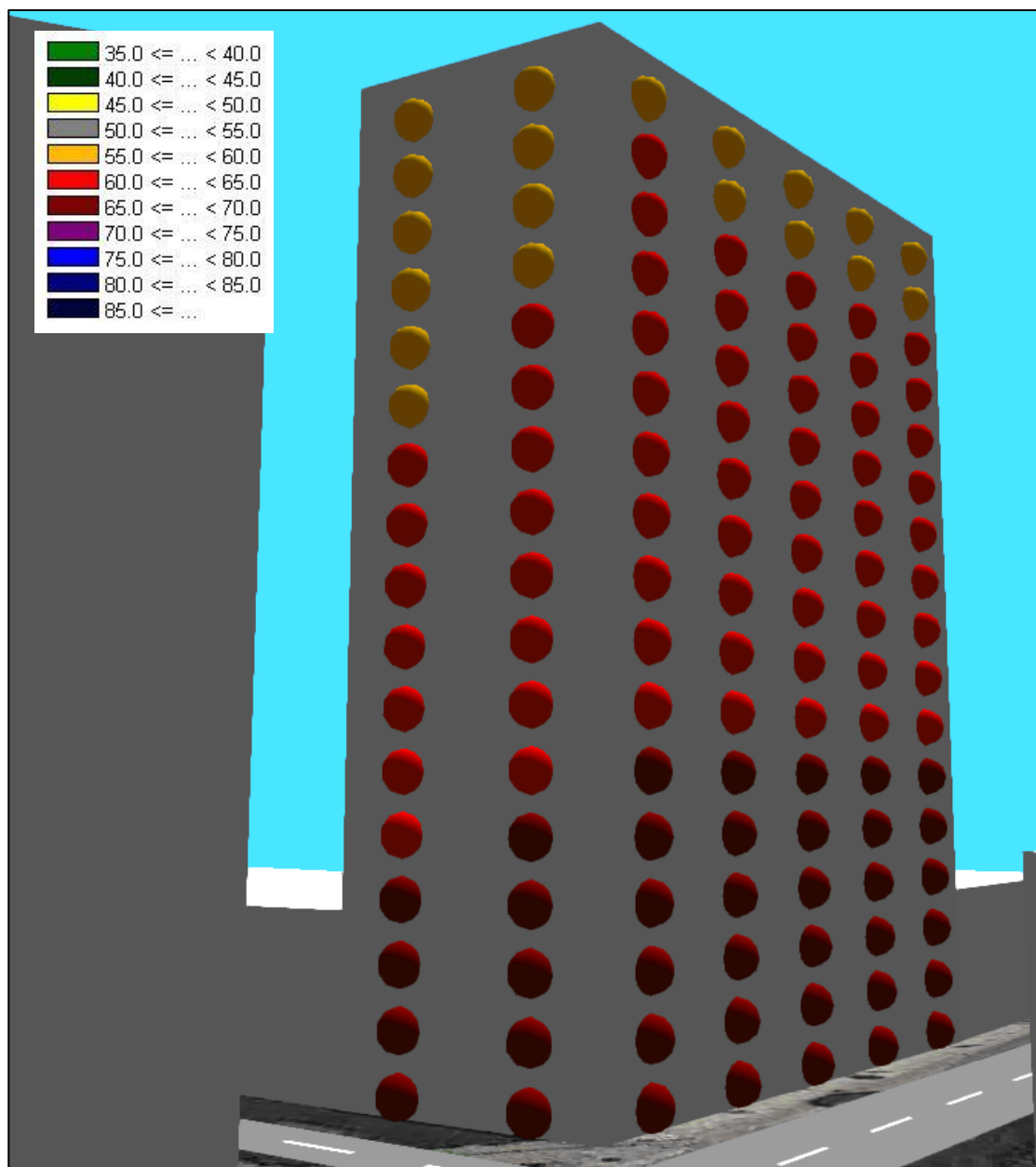
- 4.3 Noise levels measured at ML1 have been used as the basis for the assessment of road traffic noise from Deansgate and St Mary's Gate. It is considered that both the office and retail uses have the potential to be used during the night-time as well as the daytime period, therefore the following assessment considers both.
- 4.4 As discussed in **Section 2**, it is anticipated that the most noise sensitive uses on the proposed development will comprise meeting rooms/cellular offices, the design range for which is stated to be $L_{Aeq,T} 35 - 40$ dB within BS 8233:2014.
- 4.5 Detailed noise break-in calculations have been undertaken in accordance with the rigorous method from section G.2 from BS 8233 based on the frequency spectra measured on-site and the following dimensions:
- Room dimensions of 3m (width) x 4m (depth) x 3m (height);
 - Fully glazed facade (100% glazing); and
 - A reverberation time of 0.5 seconds.

5. NOISE ASSESSMENT

Façade Assessment

- 5.1 The worst-case incident daytime noise level was $L_{Aeq,1-hour}$ 69 dB. It is understood that the facades will be fully glazed, and ventilation to internal spaces will be provided via mechanical means, and that openable windows are not proposed for this development.
- 5.2 Based on this, to achieve the internal criterion of 35-40 dB $L_{Aeq,T}$ adopted for this assessment, a reduction of between 29-34 dB(A) would be required for the office spaces on the worst affected floors. This is likely to require a laboratory sound reduction performance of circa R_w 36dB.
- 5.3 It is anticipated that the above should be achievable with suitably specified thermal double glazing, such as 6/12/6.4 laminate glazing.
- 5.4 Detailed analysis should be undertaken during technical design stage with full consideration to all design parameters. Specifications will be prepared in a suitable format for tender to ensure all planning obligations and employers requirements are achieved.
- 5.5 The 3D acoustic model was used to show the variation of incident noise levels on the facades as you go up the building, further away from the noise source. **Figure 5.1** below shows the predicted noise levels at the facades by floor level along the north and west elevations.

Figure 5.1 – 3D Model of the Predicted Noise Levels at the Facades by Floor Level - North and West Elevations



External Fixed Plant Assessment

- 5.6 The external fixed plant and equipment associated with the proposed development with the potential to generate noise has been provided by the building services consultant and is detailed in **Table 5.1** below.

Table 5.1 – Fixed Plant Details

Plant Item	Quantity	Make & Model	Location
Condensing Unit	36	Mitsubishi - PURY-EP500 YNW-A(-BS)	Level 15 Roof Area
Toilet Air Handling Unit (AHU)	1	Exhausto	Level 15 Roof Area

Plant Item	Quantity	Make & Model	Location
Smoke Extract Fan (SEF)	2	Colt	Roof Level
Future Kitchen Extract Fan (KEF)	1	Flakt Woods - 100JM.BIF(200) /25/4/9/8 (example specification)	Roof Level

- 5.7 It is understood that the smoke extract fans may run during high ambient temperatures however their main use would be to run in an emergency situation and for maintenance purposes. The smoke extract fans are not considered part of everyday operational use however will be run outside of emergency purposes during maintenance periods, therefore they have been included in the assessment.
- 5.8 In addition, spatial allowance has been made on the roof level for a kitchen extract fan, to be sized and installed by the future tenant of the retail space, therefore the exact details of this are currently unknown. However, details of an example appropriately sized unit have been provided by the building services consultant for use in the assessment.
- 5.9 The associated manufacturer plant data used in the assessment can be seen in **Table 5.2** below.

Table 5.2 - Summary of manufacturer octave band sound power levels used in the assessment

Plant Item	Noise Source Data used	Octave Band Sound Power Levels (L_{eq} dB) in Hz								dBA
		63	125	250	500	1000	2000	4000	8000	
Condenser	Standard Cooling	85	76	74	69	64	62	59	52	72
Toilet AHU	To outdoor duct	55	83	70	63	59	49	35	20	69
	To exhaust duct	62	73	78	82	81	76	71	65	84
	To surroundings	69	76	64	58	57	50	43	38	63
SEF	Outlet	94	93	89	90	91	92	88	86	109
KEF	Outlet	90	90	105	102	104	102	96	90	100

- 5.10 The data is presented as sound power levels, which have been inputted as point sources in the acoustic model.
- 5.11 The assessment for proposed fixed plant has been based on the following assumptions:
- The nearest noise sensitive receptors relative to the externally mounted roof plant are dwellings to the north at No.1 Deansgate (NSR1), dwellings to the south at Barton Arcade (NSR2) and office spaces to the south-east at 8-10 Exchange Street (NSR3);
 - The 3D acoustic model includes the dimensions of the existing residential properties and of the proposed building, and accounts for the closer distance of proposed plant and screening associated with the development;
 - The roof plant is located on the roof level, where line of sight is screened by a façade of height 4.4m (which is open to above) around the full extent of the building, and above this façade there also sits a parapet of height 0.6m;

- All noise sources used in the calculations, as described in **Table 5.2**, have been treated as point sources. The condensing unit sources and toilet AHU breakout source (to surroundings) have assumed a height of 1.5 m from the Level 15 external plant area. The Toilet AHU outdoor and extract ducts have assumed a height of 0.5 m from local roof level (5.5 m from external plant area level) and the kitchen extract and smoke extract fan sources have assumed a height of 1 m above the roof level; and
 - The site is expected to operate during both the daytime and night-time periods; therefore, both have been assessed.
- 5.12 Based on the noise levels outlined in **Table 5.2**, the specific cumulative noise level, with all plant sources switched on, has been predicted at the nearest NSRs, using point source attenuation.
- 5.13 The resultant levels of each item of plant are derived in the model and each incorporate the different reductions for distance, screening etc. The modelling software is able to give a breakdown of the contribution of each plant item at each identified receptor. The most sensitive receptor in terms of the roof plant is No.1 Deansgate (NSR 1) and the Table below details the predicted contribution of each plant item at this receptor, at the closest façade to the proposed building, in this instance being the top floor level of No.1 Deansgate.
- 5.14 The 3D acoustic modelling software Cadna-A is able to give a breakdown of the contribution of each plant item at each identified receptor. Noise sources and their corresponding octave band sound power levels are entered into the model and the calculation method used to determine the predicted level at the receptor is that of ISO 9613-2:1996 '*Attenuation of sound during propagation outdoors*' which breaks down the attenuation into the following five types:
- Attenuation due to geometrical divergence (distance)
 - Attenuation due to atmospheric absorption
 - Attenuation due to ground effect
 - Attenuation due to a barrier (screening)
 - Attenuation due to miscellaneous other effects
- 5.15 The modelling software does not however give the breakdown for each of the separate attenuations, however in this scenario the main sound attenuation is likely to be from distance and screening. To address this point, we have included for the distance by carrying out a simple point source correction from each plant item to the receptor.
- 5.16 To account for the screening attenuation, the model was re-run without the proposed building and the corresponding barriers, so that essentially the plant items are in free-field space, and this was compared to the level from the model with the proposed building and barriers included to inform of the reduction given by screening. These reductions are shown in **Table 5.3** below, which also breaks down the plant by type and shows the subtotal for each set of plant items, and the resultant cumulative level of all plant at No.1 Deansgate.
- 5.17 There is a small discrepancy of typically 2dB between these calculated levels and the modelling results, accounted for by a mixture of ground effect, atmospheric absorption,

and miscellaneous other effects, however the below table demonstrates the indicative attenuation from the primary effects.

Table 5.3 - Breakdown of the contribution by plant item at NSR1

No. of	Plant Item	Contribution (dB)	Total Att.	Distance Att.(Q=2)	Screening Att.
1	Condenser	16.7	47.3	26.8	21.8
2	Condenser	16.3	47.7	27.6	21.6
3	Condenser	16.1	47.9	28.2	21.2
4	Condenser	15.6	48.4	28.8	21.2
5	Condenser	16.4	47.6	29.3	19.9
6	Condenser	15.8	48.2	29.9	20.0
7	Condenser	15	49.0	29.9	20.8
8	Condenser	15.7	48.3	29.3	20.6
9	Condenser	14.6	49.4	28.8	22.3
10	Condenser	15.1	48.9	28.2	22.3
11	Condenser	16.4	47.6	27.6	21.6
12	Condenser	16.9	47.1	26.8	21.7
13	Condenser	17	47.0	26.8	21.6
14	Condenser	16.5	47.5	27.6	21.5
15	Condenser	15.1	48.9	28.2	22.3
16	Condenser	15.5	48.5	28.8	21.4
17	Condenser	15.1	48.9	29.3	21.3
18	Condenser	15	49.0	29.9	20.8
	Subtotal	28.1			
19	Condenser	4.3	59.7	35.3	26.3
20	Condenser	4.3	59.7	35.6	26.0
21	Condenser	4.3	59.7	35.8	25.7
22	Condenser	4.6	59.4	36.0	25.2
23	Condenser	4.6	59.4	36.0	25.2
24	Condenser	4.3	59.7	35.8	25.7
25	Condenser	4.3	59.7	35.6	26.0
26	Condenser	4.3	59.7	35.3	26.3
27	Condenser	4.6	59.4	35.3	26.0
28	Condenser	4.3	59.7	35.6	26.0
29	Condenser	4.3	59.7	35.8	25.8
30	Condenser	4.6	59.4	36.0	25.2
31	Condenser	4.5	59.5	36.0	25.3
32	Condenser	4.3	59.7	35.8	25.7

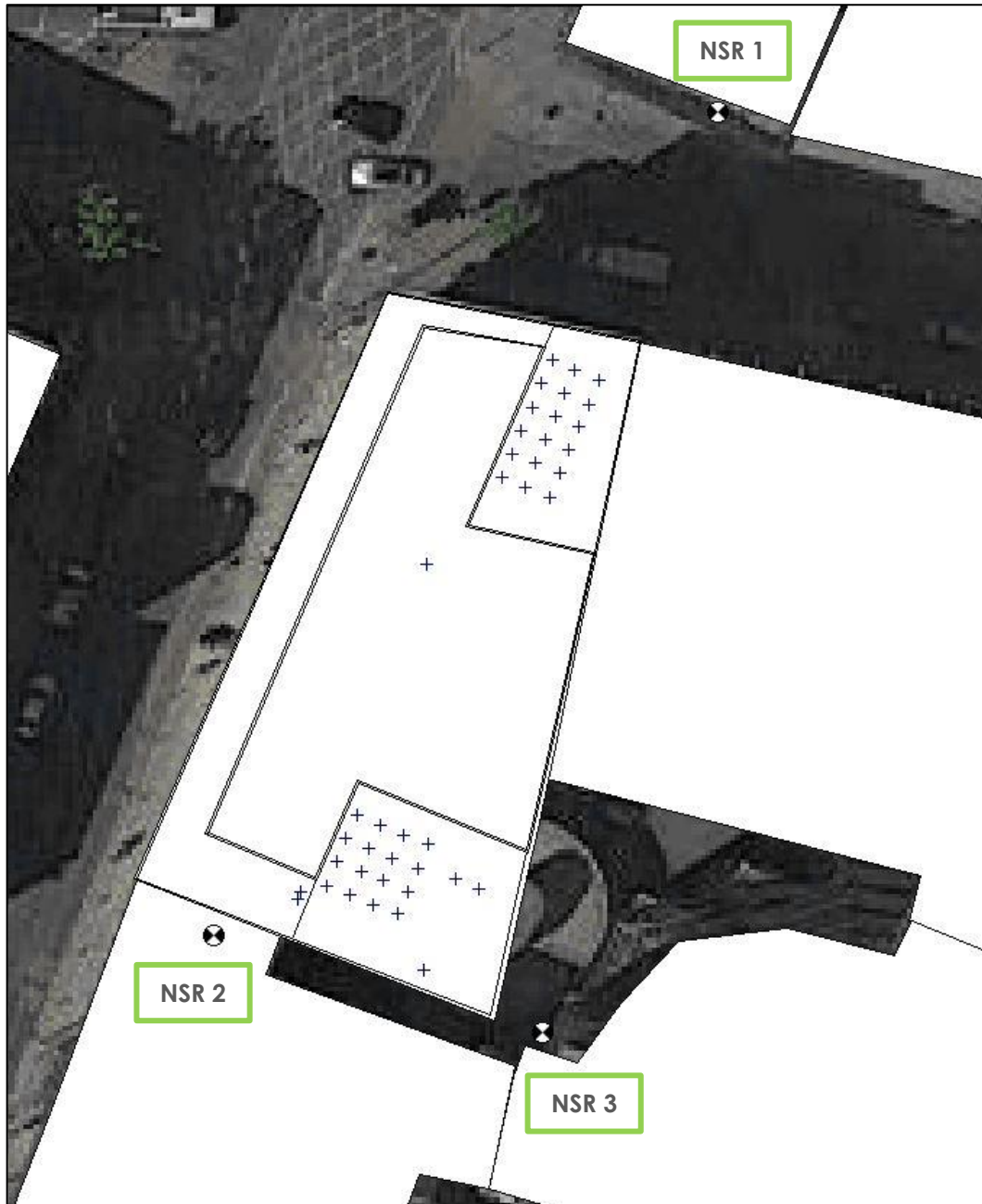
No. of	Plant Item	Contribution (dB)	Total Att.	Distance Att.(Q=2)	Screening Att.
33	Condenser	4.3	59.7	35.6	26.0
34	Condenser	4.6	59.4	35.3	26.0
35	Condenser	4.3	59.7	35.6	26.0
36	Condenser	4.7	59.3	35.6	22.6
	Subtotal	17.0			
1	Toilet AHU - to outdoor duct	9.4	51.6	36.2	17.8
1	Toilet AHU - to exhaust duct	18.8	57.2	36.2	23.4
1	Toilet AHU - surroundings	-1.7	56.7	36.5	23.2
	Subtotal	19.3			
1	Smoke Extract Fan 1 (standby)	34.4	57.6	32.3	23.8
2	Smoke Extract Fan 2 (standby)	35.3	56.7	31.6	23.6
	Subtotal	37.9			
1	Kitchen Extract Fan (standby)	46.7	54.3	31.8	23.2
	Subtotal	46.7			
	Total for all plant at No.1 Deansgate	47.3			

5.18 It is worth noting that the most onerous item of plant in terms of noise levels experienced at No.1 Deansgate is the Kitchen Extract Fan which provides the biggest contribution to the overall specific noise level.

5.19 The background noise levels captured during the baseline noise survey have been used in the assessment of noise from fixed plant, as seen in **Tables 3.4 and 3.5**. The $L_{A90,1hr}$ background noise levels used in the assessment are based on a typical representative daytime and night-time background levels.

5.20 **Figure 5.2** below shows the layout of the acoustic plant model and the nearest NSRs.

Figure 5.2 – Acoustic Plant Model Layout and NSRs.



- 5.21 The assessment of noise from the external fixed plant is shown in **Table 5.3**.
- 5.22 An acoustic feature penalty correction of +3dB has been applied due to the number of condenser units and potential for intermittency.

Table 5.3 – BS4142 Assessment of noise from the external plant at Level 15/Roof Level

Description	NSR 1 (Day/Night)	NSR 2 (Day/Night)	NSR 3 (Day/Night)
Specific sound level (dB L _s)	47 / 47	41 / 41	44 / 44
Acoustic feature Correction ¹ (dB)	+3	+3	+3
Rating level (dB L _{A,r,Tr})	50 / 50	44 / 44	47 / 47
Background sound Level ² (dB L _{A90,T})	56 / 50	57 / 57	57 / 57
Excess over Background (dB)	-6 / 0	-13 / -13	-10 / -10
BS 4142 impact	Low	Low	Low
Notes: Calculation based upon modelling, which takes into consideration any distance attenuation and site-specific screening attenuation. All figures rounded to the nearest whole number in accordance with BS4142. ¹ A penalty of 3dB has been applied due to the number of condenser units and potential for intermittency ² Typical background level based on the representative measured L_{A90,1hour} levels.			

- 5.23 MCC planning requirements state that the scheme must be designed to achieve a rating level of 5dB (L_{Aeq}) below the typical background level at the nearest noise sensitive location.
- 5.24 The above assessment indicates that noise generated by the external fixed plant would exceed MCC requirements by 5 dB at NSR 1 during the night-time period only.
- 5.25 Analysis of the noise source levels at NSR 1 indicates that the significant dominant noise source is the Kitchen Extract Fan which has a specific sound level of 47 dB at NSR 1. The data provided by the Building Services Consultant was stated as being for example purposes only and no attenuation has been applied. It will be possible to achieve the rating level of 45 dB to achieve MCC requirements by a suitably specified fan and attenuator, and it is understood that this will be addressed by condition.

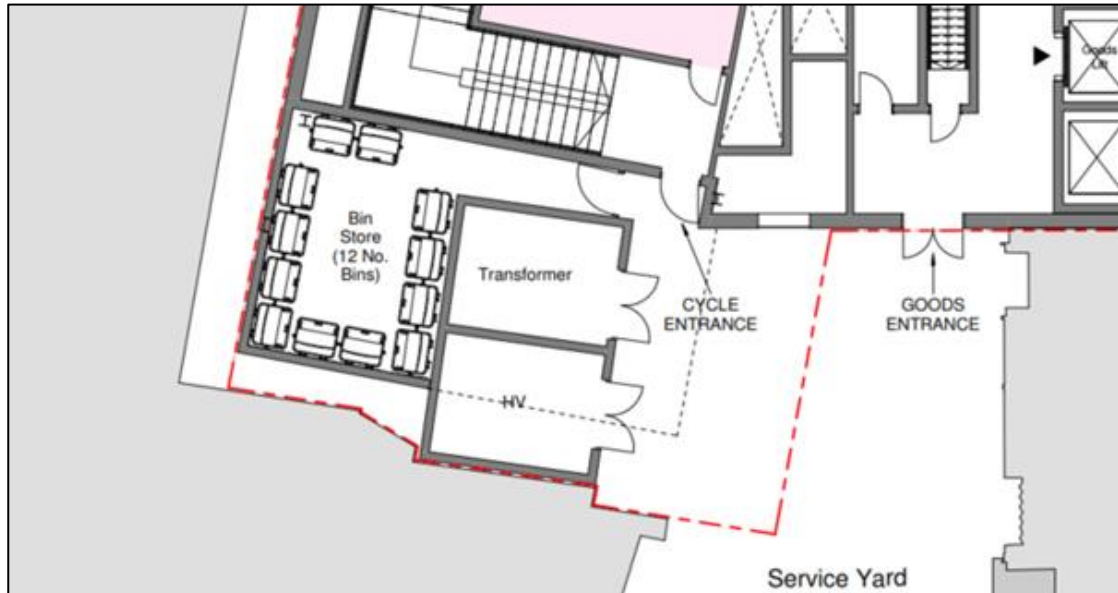
Consideration of the Electricity Substation

- 5.26 The selection of equipment for the electricity substation is at this stage currently unknown, and this will be reviewed at detailed design stage. There are a range of noise reduction measures available, and therefore it is considered that the electricity substation is not likely to give rise to complaints.
- 5.27 Notwithstanding this, Electricity North West's guidance document 'Electricity Specification 352, Issue 7' dated August 2017, states the following:

"Section 14.5 – Distances between Transformer and Nearest Dwelling

Table 14.2 – Note (i) Situations with background levels = 50dB(A) or more should not produce transformer noise complaints. For this reason there is no tabulation for urban locations."

- 5.28 The background levels at the nearest receptors range between 50-57 dB(A) across both the daytime and night-time periods. The electricity substation is located in the south-east corner on ground floor level (see the figure below).



- 5.29 The nearest receptors to the substation are dwellings within Barton Arcade and the offices within the 8-10 Exchange St building. The background levels at these receptors are 57 dB(A) during both the daytime and night-time periods. Therefore, with respect to Electricity North West's guidance it is reasonable to assume that complaints due to transformer noise are not likely.
- 5.30 It is understood that MCC will require the substation to be assessed and to provide confirmation once equipment is selected that it does not exceed the relevant criteria, with particular attention made to meeting criteria at the low frequency octave bands.

Uncertainty

- 5.31 Reasonably practicable steps have been taken to reduce the level of uncertainty with respect to our measurements and assessment calculation methodology.
- 5.32 The level of uncertainty of our measurement is considered low given the length of our measurement period and intervals, and the non-differing weather condition. It should be noted that the specific noise source is significantly low in the context of the existing noise climate, therefore the risk of uncertainty causing adverse impact is considered very unlikely.
- 5.33 The level of uncertainty from our calculation is considered low. The resultant levels have been derived using an acoustic modelling software that uses the industry recognized standard IOS 9613-2 calculation method. Sound power levels stated on manufacturers/suppliers' datasheets were used as input data in the model which is thought to be representative of the source and the conditions under which the source is expected to operate. Notwithstanding this however, uncertainty in the operation or sound emission characteristics of the specific source remains, albeit a low risk for this particular assessment given the greater margin for non-compliance.

6. CONCLUSIONS AND RECOMMENDATIONS

- 6.1 BWB Consulting Ltd was appointed by Kames Property Income Fund to undertake an environmental noise assessment to support a planning application for the redevelopment of 39 Deansgate on the corner of St. Mary's Gate in Manchester.
- 6.2 To inform the assessment, a baseline noise survey was undertaken in October 2019 to determine the prevailing noise climate on the site and at the nearest noise sensitive receptors to the proposed development.
- 6.3 The assessment has been undertaken in accordance with relevant planning policy, British Standards and Guidance documents.
- 6.4 Based on assessment findings, it is considered that noise levels can be satisfactorily controlled to within recommended acoustic design standards so that a suitable acoustic environment is provided to all future occupants and that impacts associated with the operation of the Development can be controlled to an appropriate level.

APPENDICES

APPENDIX A: Glossary of Terms

Noise

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source.

The most widely used weighting mechanism that best corresponds to the response of the human ear is the 'A'-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq} , L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective, but as a general guide a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions.

Acoustic Terminology

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 (2×10^{-5} 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 away from buildings.
Façade Level	A sound field determined at a distance of 1m in front of a large sound reflecting object such as a building façade.

APPENDIX B: Measured Noise Levels

Table B1: Results from ML1 Daytime

Start Date & Time	Period (T)	dB LA _{Fmax}	dB LA _{eq,T}	dB LA _{10,T}	dB LA _{90,T}	Sound Pressure Levels (dB LA _{eq,T}) per Octave Band (Hz)							
						63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz
23/10/2019 11:00	1 hour	91	67	69	60	69	65	65	62	62	60	55	51
23/10/2019 12:00	1 hour	89	67	70	61	70	67	67	64	62	59	56	51
23/10/2019 13:00	1 hour	101	71	69	61	69	66	66	64	69	65	57	51
23/10/2019 14:00	1 hour	88	66	69	60	68	65	64	62	62	58	54	52
23/10/2019 15:00	1 hour	84	66	69	59	69	66	64	62	62	58	54	50
23/10/2019 16:00	1 hour	94	68	69	61	69	68	67	62	62	60	59	53
23/10/2019 17:00	1 hour	83	66	69	61	69	65	65	62	62	58	54	50
23/10/2019 18:00	1 hour	82	65	68	61	68	65	65	61	61	57	53	48
23/10/2019 19:00	1 hour	104	71	69	60	69	67	68	68	66	63	60	57
23/10/2019 20:00	1 hour	91	65	68	59	67	64	64	61	61	57	52	47
23/10/2019 21:00	1 hour	86	64	68	59	67	63	64	60	61	56	52	48
23/10/2019 22:00	1 hour	82	64	67	58	67	62	61	60	60	56	50	47
24/10/2019 07:00	1 hour	86	66	69	60	69	65	64	62	62	58	54	50
24/10/2019 08:00	1 hour	86	66	69	60	70	67	64	62	62	59	55	51
24/10/2019 09:00	1 hour	89	66	69	60	69	65	63	62	62	59	57	52
24/10/2019 10:00	1 hour	84	65	69	59	68	64	63	61	61	58	55	50

Table B2: Results from ML1 Night-time

Start Date & Time	Period (T)	dB LA _{Fmax}	dB LA _{eq,T}	dB LA _{10,T}	dB LA _{90,T}
23/10/2019 23:00	15 mins	89	64	67	57
23/10/2019 23:15	15 mins	80	63	66	57
23/10/2019 23:30	15 mins	80	63	66	57
23/10/2019 23:45	15 mins	72	62	65	55
24/10/2019 00:00	15 mins	74	62	65	55
24/10/2019 00:15	15 mins	77	62	65	56
24/10/2019 00:30	15 mins	74	62	65	55
24/10/2019 00:45	15 mins	72	60	64	54
24/10/2019 01:00	15 mins	80	62	66	54
24/10/2019 01:15	15 mins	71	61	65	54
24/10/2019 01:30	15 mins	73	61	65	54
24/10/2019 01:45	15 mins	72	60	63	53
24/10/2019 02:00	15 mins	70	60	64	53
24/10/2019 02:15	15 mins	78	61	66	53
24/10/2019 02:30	15 mins	76	61	65	53
24/10/2019 02:45	15 mins	75	60	64	53
24/10/2019 03:00	15 mins	77	60	65	53
24/10/2019 03:15	15 mins	75	61	65	54
24/10/2019 03:30	15 mins	79	67	72	55
24/10/2019 03:45	15 mins	75	60	63	53

Start Date & Time	Period (T)	dB L _A F _{max}	dB L _A eq,T	dB L _A 10,T	dB L _A 90,T
24/10/2019 04:00	15 mins	70	59	62	53
24/10/2019 04:15	15 mins	80	66	71	53
24/10/2019 04:30	15 mins	72	58	62	52
24/10/2019 04:45	15 mins	75	60	64	53
24/10/2019 05:00	15 mins	81	60	64	53
24/10/2019 05:15	15 mins	83	66	70	54
24/10/2019 05:30	15 mins	85	63	67	54
24/10/2019 05:45	15 mins	79	64	68	55
24/10/2019 06:00	15 mins	88	66	69	56
24/10/2019 06:15	15 mins	77	65	69	56
24/10/2019 06:30	15 mins	76	65	69	57
24/10/2019 06:45	15 mins	75	66	69	58

Table B3: Results from ML2

Start Date & Time	Period (T)	dB L _A F _{max}	dB L _A eq,T	dB L _A 10,T	dB L _A 90,T
23/10/2019 13:00	1 hour	96	67	65	60
23/10/2019 14:00	1 hour	76	62	64	60
23/10/2019 15:00	1 hour	79	62	64	59
23/10/2019 16:00	1 hour	81	63	64	60
23/10/2019 17:00	1 hour	81	62	64	59

Start Date & Time	Period (T)	dB L _A F _{max}	dB L _A eq,T	dB L _A 10,T	dB L _A 90,T
23/10/2019 18:00	1 hour	79	61	63	58
23/10/2019 19:00	1 hour	97	65	63	57
23/10/2019 20:00	1 hour	77	59	62	56
23/10/2019 21:00	1 hour	76	59	61	55
23/10/2019 22:00	1 hour	76	58	61	55
23/10/2019 23:00	15 mins	81	60	62	55
23/10/2019 23:15	15 mins	70	58	60	54
23/10/2019 23:30	15 mins	73	58	61	55
23/10/2019 23:45	15 mins	67	57	59	53
24/10/2019 00:00	15 mins	66	56	59	53
24/10/2019 00:15	15 mins	66	56	58	52
24/10/2019 00:30	15 mins	68	56	58	52
24/10/2019 00:45	15 mins	67	55	57	52
24/10/2019 01:00	15 mins	66	55	58	51
24/10/2019 01:15	15 mins	70	55	58	51
24/10/2019 01:30	15 mins	65	55	57	50
24/10/2019 01:45	15 mins	63	54	57	50
24/10/2019 02:00	15 mins	67	54	56	50
24/10/2019 02:15	15 mins	75	55	57	51
24/10/2019 02:30	15 mins	65	54	57	50
24/10/2019 02:45	15 mins	67	55	57	50

Start Date & Time	Period (T)	dB L _A F _{max}	dB L _A eq,T	dB L _A 10,T	dB L _A 90,T
24/10/2019 03:00	15 mins	66	54	57	50
24/10/2019 03:15	15 mins	67	55	58	51
24/10/2019 03:30	15 mins	71	60	64	52
24/10/2019 03:45	15 mins	68	55	57	50
24/10/2019 04:00	15 mins	65	56	58	52
24/10/2019 04:15	15 mins	70	60	64	54
24/10/2019 04:30	15 mins	63	53	55	49
24/10/2019 04:45	15 mins	71	54	57	49
24/10/2019 05:00	15 mins	69	54	57	50
24/10/2019 05:15	15 mins	69	57	61	51
24/10/2019 05:30	15 mins	70	56	59	51
24/10/2019 05:45	15 mins	71	58	61	52
24/10/2019 06:00	15 mins	82	60	63	53
24/10/2019 06:15	15 mins	73	61	64	57
24/10/2019 06:30	15 mins	70	60	63	57
24/10/2019 06:45	15 mins	72	61	64	58
24/10/2019 07:00	1 hour	75	62	65	58
24/10/2019 08:00	1 hour	87	64	65	60
24/10/2019 09:00	1 hour	76	63	65	60
24/10/2019 10:00	1 hour	84	62	65	59
24/10/2019 11:00	1 hour	93	68	65	59

Start Date & Time	Period (T)	dB L _A F _{max}	dB L _A eq,T	dB L _A 10,T	dB L _A 90,T
24/10/2019 12:00	1 hour	91	64	65	59
24/10/2019 13:00	1 hour	96	62	64	58
24/10/2019 14:00	1 hour	78	62	64	59
24/10/2019 15:00	1 hour	95	65	64	58
24/10/2019 16:00	1 hour	91	64	64	58
24/10/2019 17:00	1 hour	82	62	64	59
24/10/2019 18:00	1 hour	83	62	64	58
24/10/2019 19:00	1 hour	85	64	67	59
24/10/2019 20:00	1 hour	79	61	64	56
24/10/2019 21:00	1 hour	83	61	64	56
24/10/2019 22:00	1 hour	86	61	63	56
24/10/2019 23:00	15 mins	85	65	64	58
24/10/2019 23:15	15 mins	72	61	64	58
24/10/2019 23:30	15 mins	75	60	63	56
24/10/2019 23:45	15 mins	69	59	62	55
25/10/2019 00:00	15 mins	67	58	61	54
25/10/2019 00:15	15 mins	69	61	65	54
25/10/2019 00:30	15 mins	86	61	62	54
25/10/2019 00:45	15 mins	65	57	60	53
25/10/2019 01:00	15 mins	76	57	60	52
25/10/2019 01:15	15 mins	66	56	60	52

Start Date & Time	Period (T)	dB L _A F _{max}	dB L _A eq,T	dB L _A 10,T	dB L _A 90,T
25/10/2019 01:30	15 mins	69	56	59	52
25/10/2019 01:45	15 mins	68	57	59	52
25/10/2019 02:00	15 mins	69	56	59	51
25/10/2019 02:15	15 mins	69	56	58	51
25/10/2019 02:30	15 mins	72	56	59	50
25/10/2019 02:45	15 mins	66	56	59	51
25/10/2019 03:00	15 mins	70	55	59	51
25/10/2019 03:15	15 mins	71	57	60	52
25/10/2019 03:30	15 mins	71	55	58	51
25/10/2019 03:45	15 mins	71	56	60	50
25/10/2019 04:00	15 mins	78	56	58	50
25/10/2019 04:15	15 mins	69	55	58	50
25/10/2019 04:30	15 mins	71	55	58	50
25/10/2019 04:45	15 mins	69	54	57	49
25/10/2019 05:00	15 mins	67	55	59	49
25/10/2019 05:15	15 mins	72	57	60	50
25/10/2019 05:30	15 mins	76	58	61	52
25/10/2019 05:45	15 mins	72	59	62	53
25/10/2019 06:00	15 mins	74	60	63	54
25/10/2019 06:15	15 mins	76	61	64	55
25/10/2019 06:30	15 mins	73	61	63	58

Start Date & Time	Period (T)	dB L _A F _{max}	dB L _A eq,T	dB L _A 10,T	dB L _A 90,T
25/10/2019 06:45	15 mins	74	62	65	59
25/10/2019 07:00	1 hour	80	63	65	60
25/10/2019 08:00	1 hour	82	63	65	60
25/10/2019 09:00	1 hour	78	63	65	59
25/10/2019 10:00	1 hour	80	62	65	58
25/10/2019 11:00	1 hour	76	63	65	60
25/10/2019 12:00	1 hour	78	64	66	61

Table B4: Results from ML3

Start Date & Time	Period (T)	dB L _A F _{max}	dB L _A eq,T	dB L _A 10,T	dB L _A 90,T
24/10/2019 12:00	1 hour	79	61	61	60
24/10/2019 13:00	1 hour	99	62	61	60
24/10/2019 14:00	1 hour	92	63	62	60
24/10/2019 15:00	1 hour	83	61	61	60
24/10/2019 16:00	1 hour	81	61	61	60
24/10/2019 17:00	1 hour	77	61	61	60
24/10/2019 18:00	1 hour	73	61	61	60
24/10/2019 19:00	1 hour	76	61	62	60
24/10/2019 20:00	1 hour	80	64	65	61
24/10/2019 21:00	1 hour	70	65	66	64

Start Date & Time	Period (T)	dB LA _{Fmax}	dB LA _{eq,T}	dB LA _{10,T}	dB LA _{90,T}
24/10/2019 22:00	1 hour	74	65	66	64
24/10/2019 23:00	15 mins	73	65	66	64
24/10/2019 23:15	15 mins	70	65	66	64
24/10/2019 23:30	15 mins	71	65	66	64
24/10/2019 23:45	15 mins	70	65	66	64
25/10/2019 00:00	15 mins	69	65	66	64
25/10/2019 00:15	15 mins	69	65	66	64
25/10/2019 00:30	15 mins	71	64	66	60
25/10/2019 00:45	15 mins	66	60	61	60
25/10/2019 01:00	15 mins	65	60	61	60
25/10/2019 01:15	15 mins	65	60	61	60
25/10/2019 01:30	15 mins	66	60	61	60
25/10/2019 01:45	15 mins	64	60	61	60
25/10/2019 02:00	15 mins	68	60	61	60
25/10/2019 02:15	15 mins	71	60	61	60
25/10/2019 02:30	15 mins	63	60	61	60
25/10/2019 02:45	15 mins	64	60	61	60
25/10/2019 03:00	15 mins	63	60	61	60
25/10/2019 03:15	15 mins	69	60	61	60
25/10/2019 03:30	15 mins	65	61	62	60
25/10/2019 03:45	15 mins	67	61	62	60

Start Date & Time	Period (T)	dB L _A F _{max}	dB L _A eq,T	dB L _A 10,T	dB L _A 90,T
25/10/2019 04:00	15 mins	71	60	61	60
25/10/2019 04:15	15 mins	63	60	61	60
25/10/2019 04:30	15 mins	68	60	60	59
25/10/2019 04:45	15 mins	62	60	60	59
25/10/2019 05:00	15 mins	62	60	61	60
25/10/2019 05:15	15 mins	69	61	61	60
25/10/2019 05:30	15 mins	69	60	61	60
25/10/2019 05:45	15 mins	73	61	61	60
25/10/2019 06:00	15 mins	67	61	61	60
25/10/2019 06:15	15 mins	67	61	62	60
25/10/2019 06:30	15 mins	64	61	62	60
25/10/2019 06:45	15 mins	80	61	62	61
25/10/2019 07:00	1 hour	73	61	62	61
25/10/2019 08:00	1 hour	77	61	62	61
25/10/2019 09:00	1 hour	76	61	62	61
25/10/2019 10:00	1 hour	78	61	62	60
25/10/2019 11:00	1 hour	74	61	62	61
25/10/2019 12:00	1 hour	72	61	62	61



BETTER SOLUTIONS, INTELLIGENTLY ENGINEERED