

Acoustic Report - Condition 9

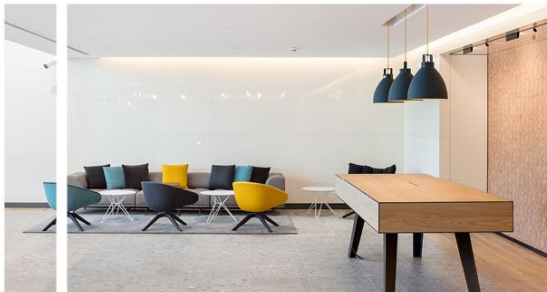
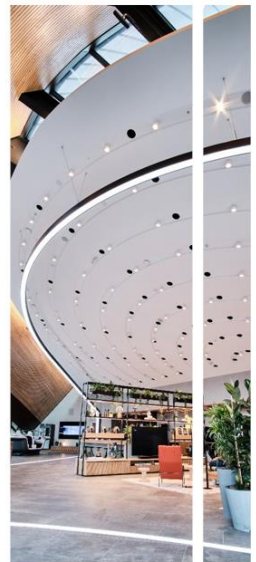
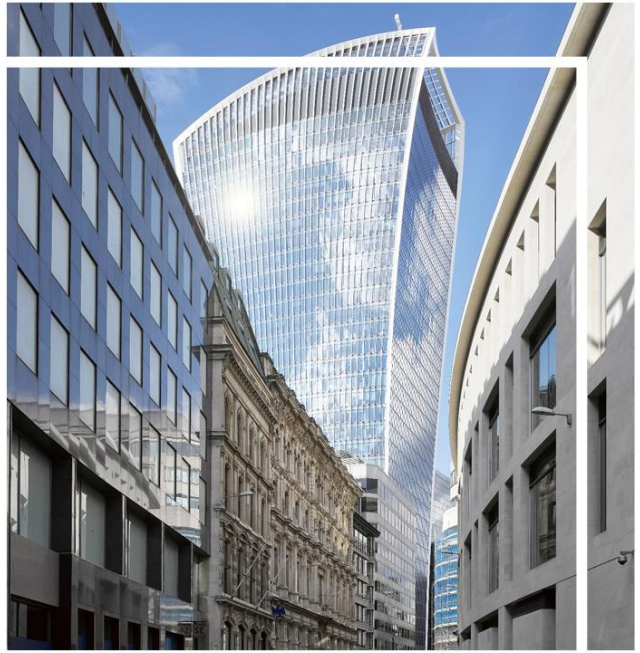
Mosley Street Grade 2* Listed Building
Refurbishment
Bruntwood

23 November 2023

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Issue 01





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Executive Summary

Hilson Moran have been commissioned by Bruntwood to provide evidence to Manchester City Council (MCC) to demonstrate that the installed building services plant at 38 Mosley Street achieves the relevant planning requirements to discharge Planning Condition 9.

To facilitate this assessment, a baseline noise survey was undertaken between 15th and 18th November 2021, to establish and quantify the existing background noise climate in the vicinity of the site.

Based on the results of the environmental noise survey and the plant noise policy of MCC, appropriate maximum plant noise emission limits were set in controlling new fixed building services plant to 5 dB below the lowest representative existing $L_{A90,T}$ background noise level for noise sensitive residential receptors, and equal to the lowest representative existing $L_{A90,T}$ background noise level for commercial receptors, during which plant may operate.

A desktop assessment of the noise from the plant items resulting at the nearest noise sensitive receptors surrounding the development has been undertaken. The assessment was based on the plant noise data provided to us by the contractor through Technical Submissions, and assumes all plant will be in operation simultaneously, representing a worst-case assessment. The calculations were undertaken using a three-dimensional model constructed in CadnaA which calculates in accordance with BS 9613-2:1996, correcting for factors such as the directivity of plant, acoustic shielding, distance attenuation and ground absorption.

The results of the desktop assessment show that the plant noise levels are predicted to be in compliance with the requirements of Manchester City Council at all the receptor locations.

To verify the findings of the modelling, onsite measurements were taken of the building services plant (where accessible) during operation. The measurements showed the model to be predicting a worst-case assessment, and that typically noise levels are lower than those predicted. The onsite measurements therefore also show that the plant noise levels are in compliance with the requirements of MCC.

1. Introduction

Planning permission has been conditionally granted for a refurbishment at 38 Mosley Street, Manchester, M2 3AZ (hereafter the Site) to include the provision of new tenanted office space with ground floor and basement tenanted restaurant/bar use, as well as basement ancillary spaces including a gym. Noise from the new items of plant associated with the development are subject to Condition 9.

This acoustic report has been prepared to present the noise emissions from the significant plant items associated with the development to satisfy the Manchester City Council (MCC) requirements such that Planning Condition 9 can be discharged.

The following sections present a description of the Site and surroundings, the wording of the Planning Condition, and the background noise levels measured during a baseline noise survey undertaken at the Site. Plant noise emissions have been modelled with the intention of assessing the level of noise from new building services plant associated with the development at the nearest noise sensitive receptors (NSRs). The plant noise level has then been compared with the plant noise limits as set in Hilson Moran's Noise Impact Assessment (ref: MOSE-HMM—ZZ-ZZ-RP-Y-0004_P02, dated 10th March 2022). Following this, site measurements were taken during plant operation to verify the findings of the model.

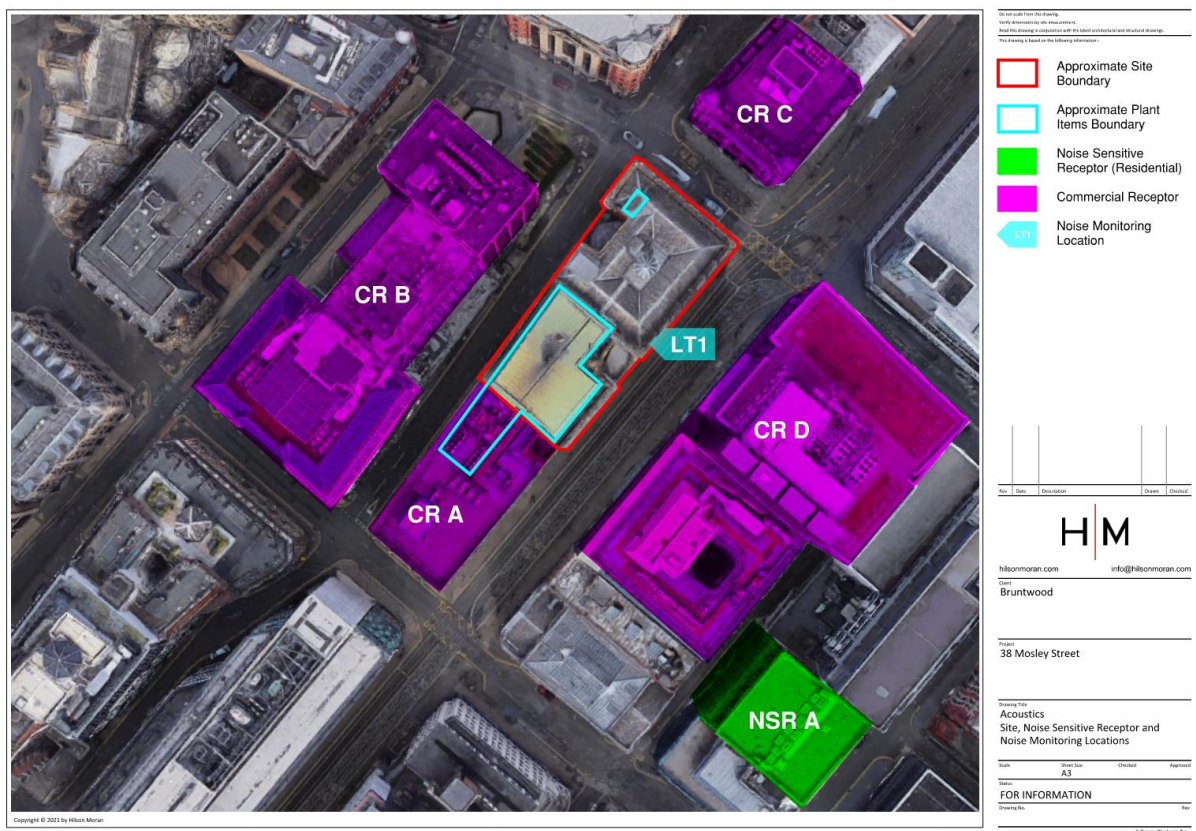
2. Site Description, Setting and Development

2.1. Site Description

The Site is located within the jurisdiction of Manchester City Council (MCC). A site location plan is provided as Figure 2.1, showing the location of the Site and orientation with respect to other existing developments and the road network for the area.

The Site has frontages onto Mosley Street to the south-east, West Mosley Street to the north-west, York Street to the north-east and the building shares a party wall with 57 Spring Gardens to the south-west. A regularly trafficked tramline runs along Mosley Street.

Figure 2.1: Site and Noise Sensitive Receptor Locations



2.2. Proposed Development

Replacement building services plant is provided as part of the refurbishment, with all plant emitting noise externally located at roof level either within the rooftop plant room, or on the roof of the neighbouring 57 Spring Gardens building. The area where plant is located is shown in Figure 2.1.

2.3. Noise Climate Summary

The noise climate in the area is dominated by noise from regularly passing trams (approximately one each way every 5 minutes during typical daytime hours) on the Metrolink tramlines on Mosley Street. Noise from plant units serving commercial properties surrounding the site, intermittent local road traffic on Mosley Street and more distant road traffic from the Manchester city centre road network also contribute to the noise climate at the site.

3. Planning Condition 9

Planning condition 9 refers to external noise emissions from building services and reads as follows:

“9) Within three months of the first occupation of any part of the scheme hereby approved, a verification report shall be submitted to and approved in writing by the City Council as local planning authority to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic report (Report reference MOSE-HMM-ZZ-ZZ-RP-Y-0004 dated 10/03/22 and prepared by Hilson Moran). The report shall also undertake post-completion testing to confirm that the noise criteria have been met. Any instances of non-conformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria.

Reason - To minimise the impact of the development and to prevent a general increase in pre-existing background noise levels around the site, pursuant to Manchester Core Strategy policy DM1 and saved Manchester Unitary Development Plan Policy DC26.1.”

3.1. Noise Sensitive Receptors

MCC’s requirements are applicable at the nearest noise sensitive premises. The surrounding area consists largely of commercial uses, although one residential building considered sensitive to noise has been identified within the vicinity of the Site.

MCC have advised that both residential and commercial receptors should be considered in terms of impact. The residential noise sensitive receptor (NSR) and commercial receptors (CRs) for assessment of impact from the development are detailed in Table 3.1 and the locations shown on Figure 2.1.

Table 3.1: Description of Nearest Noise Sensitive Receptors

Receptor Location (Figure 2.1)	Name	Type of Receptor	Approximate Distance from Site Boundary
NSR A	Manhattan Apartments, 36 George Street	Residential	50 m to the south-east
CR A	57 Spring Gardens	Commercial	Adjacent to the south-west
CR B	55 Spring Gardens and York House, 20 York Street	Commercial	12 m to the north-west
CR C	Colwyn Chambers, 19 York Street	Commercial	15 m to the north-east
CR D	One New York Street and City Gate	Commercial	12 m to the south-east

4. Baseline Noise Survey

4.1. Noise Survey

Long-term unattended noise monitoring was carried out by Hilson Moran externally between Monday 15th November and Thursday 18th November 2021 at a key location described in Table 4.1 and illustrated in Figure 2.1. Monitoring was carried out over a 72-hour period. The purpose of the measurements was to establish and quantify the existing noise climate at and within the vicinity of the site.

Table 4.1: Noise Monitoring Locations

Monitoring Location (Figure 2.1)	Period	Description	Observations and Predominant Noise Sources
LT1	72 hours	Façade measurement at a position fronting Mosley Street. Microphone position on the 3rd floor roof overlooking the parapet.	Noise from regular trams (approximately one each way every 5 minutes), as well as regular, but not constant cars, buses, HGVs on Mosley Street. Plant noise from the surrounding buildings also contributes to the noise climate, as well as constant, distant road traffic from the Manchester road network.

All noise measurements were taken with calibrated precision grade (Class 1) frequency (one-third-octave band) sound level meters to provide a detailed description of the prevailing environmental noise characteristics. The sound level meters were set-up to record over consecutive 5-minute periods the L_{eq} , L_{90} , L_{10} , L_{max} and L_1 noise indices in the A-weighting network over a 125 ms fast response time constant interval for the duration of the survey. The indices are described in Appendix A, but roughly translated they describe in turn the average, background, road traffic, maximum noise level and typical maximum noise level discounting one-off events.

Full details of the instrumentation used for the noise measurements, including calibration certificates are available on request.

Weather conditions, whilst not actively measured during the survey period, were monitored remotely throughout. Weather conditions were generally ideal for the measurement of noise, it being fine and mostly dry, with just light westerly winds ($<5 \text{ ms}^{-1}$) prevailing. The data during instances of rainfall and one instance of wind speed above 5 ms^{-1} (5.8 ms^{-1}) was checked to verify its suitability for use, with no data requiring removal from the dataset.

Due to the distance of NSR A away from the site and monitoring location, the background noise levels measured at position LT1 may not be fully representative of those at NSR A. Because of this, historical noise surveys undertaken at the location of NSR A have been reviewed against data captured at LT1. These documents are available on the Manchester City Council Planning Portal.

4.2. Baseline Noise Results

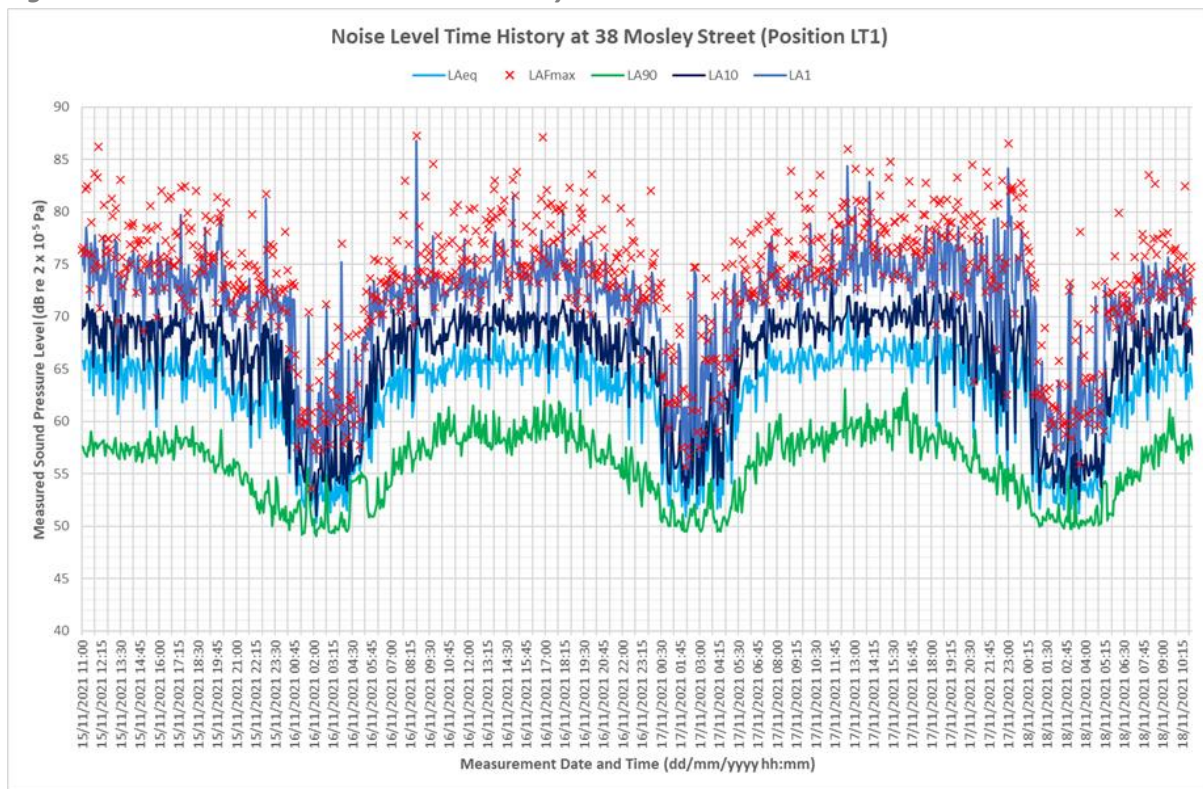
The full results of the long-term noise measurements are displayed graphically in time-history format in Figure 4.1, whilst a summary of the measured daytime (07:00 to 23:00 hours) and night-time (23:00 to 07:00 hours) noise levels for the survey period are provided in Table 4.2.

Table 4.2: Summary of Baseline Noise Monitoring Results – Façade Values

Monitoring Location (Figure 2.1)	Period	Duration	L _{Aeq,T} dB	LA90,15min dB		L _{AFmax,5min} dB	L _{A1,1hr}
			Ave ¹	Min	Mode ²	95%ile ³	Max ⁴
LT1	Day	16 hours	65	51	58	83	76
	Night	8 hours	60	49	50	78	72

Notes: ¹ Logarithmic average over the day/night survey periods; ² Lowest modal value over the day/night survey periods, considered to represent the typical background noise level; ³ The 95th percentile L_{AFmax} value presented is considered representative of typical L_{AFmax} levels experienced; ⁴ The arithmetic average of the maximum L_{A1,1hr} values measured during each of the day/night survey periods. All figures rounded to nearest whole decibel.

Figure 4.1: Measured Noise Level Time History at Position LT1



4.2.1. Historical Noise Survey

As noted above, historical noise surveys undertaken at and near to the location of NSR A have been reviewed to check whether the background noise levels measured at position LT1 are in line with the expected background noise levels at NSR A. Two historical surveys were reviewed, including:

- Historical Survey 1 - An Environmental Noise Study (Report Ref: PR0547-REP01-MPF) undertaken by Fisher Acoustics in February 2016 at the site of NSR A, for the application to convert the building into residential apartments (Planning Ref: 115207/FO/2017); and
- Historical Survey 2 - An Environmental Noise Impact Assessment Report (Report Ref: 26520/NIA1) undertaken by Hann Tucker Associates in April 2019 at 53-55 Mosley Street, for the application for an office refurbishment and extension (Planning Ref: 123289/FO/2019).

For Historical Survey 1 the measured background noise levels at the location nearest 38 Mosley Street (position 2 in the Fisher Acoustics report) were found to be between 51 and 60 dB L_{A90} during the daytime, and between 50 and 58 dB L_{A90} during the night-time. While the data information provided in the report is not detailed, it can be seen that the background noise levels measured do show some correlation with the levels measured by Hilson Moran at position LT1. As there was concern from MCC that the data used was dated (from 2016), and that detailed information was not provided, the data from Historical Survey 2 (undertaken in 2019) was also reviewed.

The survey for Historical Survey 2 included a position just across the street from NSR A (position 2) in a similar location to that reviewed for Historical Survey 1. The lowest measured background noise levels given at this position were 56 dB $L_{A90,15min}$ and 49 dB $L_{A90,15min}$ for the daytime and night-time periods respectively. As the night-time value is the same as the minimum value measured by Hilson Moran at position LT1, it is therefore considered that the background noise levels at position LT1 can be used to set appropriate noise limits to be achieved at NSR A.

5. Building Services Plant Noise Limiting Criteria

Based on the results of the noise survey and the requirements of Planning Condition 9, suitable noise limits have been established to which the installed plant should adhere. To present a worst-case scenario, the limits have been based on the typical lowest background noise levels measured during each period, such that the requirements of MCC are achieved during typically quieter periods.

Therefore, based on the results of the baseline noise survey, and the plant noise requirements of MCC, suitable noise limits to which fixed building services plant should adhere have been set and are presented in Table 5.1.

Table 5.1: Building Services Noise Limits

NSR Location	Period	Representative Minimum Background, dB L _{A90,T} ¹	Plant Noise Emission Limit, dB L _{Ar,Tr}
NSR A	Daytime (07:00 – 23:00)	58	53
	Night-time (23:00 – 07:00)	50	45
Commercial Receptors (CR A, B, C, D)	Daytime (07:00 to 23:00)	58	58 ²

Notes: ¹ Lowest modal value over the day/night survey periods, considered to represent the typical background noise level; ² The commercial limit is given as a Rating Noise Level in line with BS 4142 so should account for acoustic characteristics (tonal/impulsive/intermittent), and is equal to the measured background noise level.

The above limits apply to the total contribution from all plant items operating during a given period, together with acoustic character corrections applied for any tonal, intermittent, impulsive or other discernible characteristics in accordance with BS 4142:2014.

6. Plant Noise Assessment

6.1. Significant Plant Items

The Proposed Development will be served with new mechanical and electrical building services installations. Plant items associated with the Site are located in the rooftop plant room of the Site, but also on the roof of 57 Spring Gardens. The areas where plant items associated with the Site are located is illustrated in Figure 2.1.

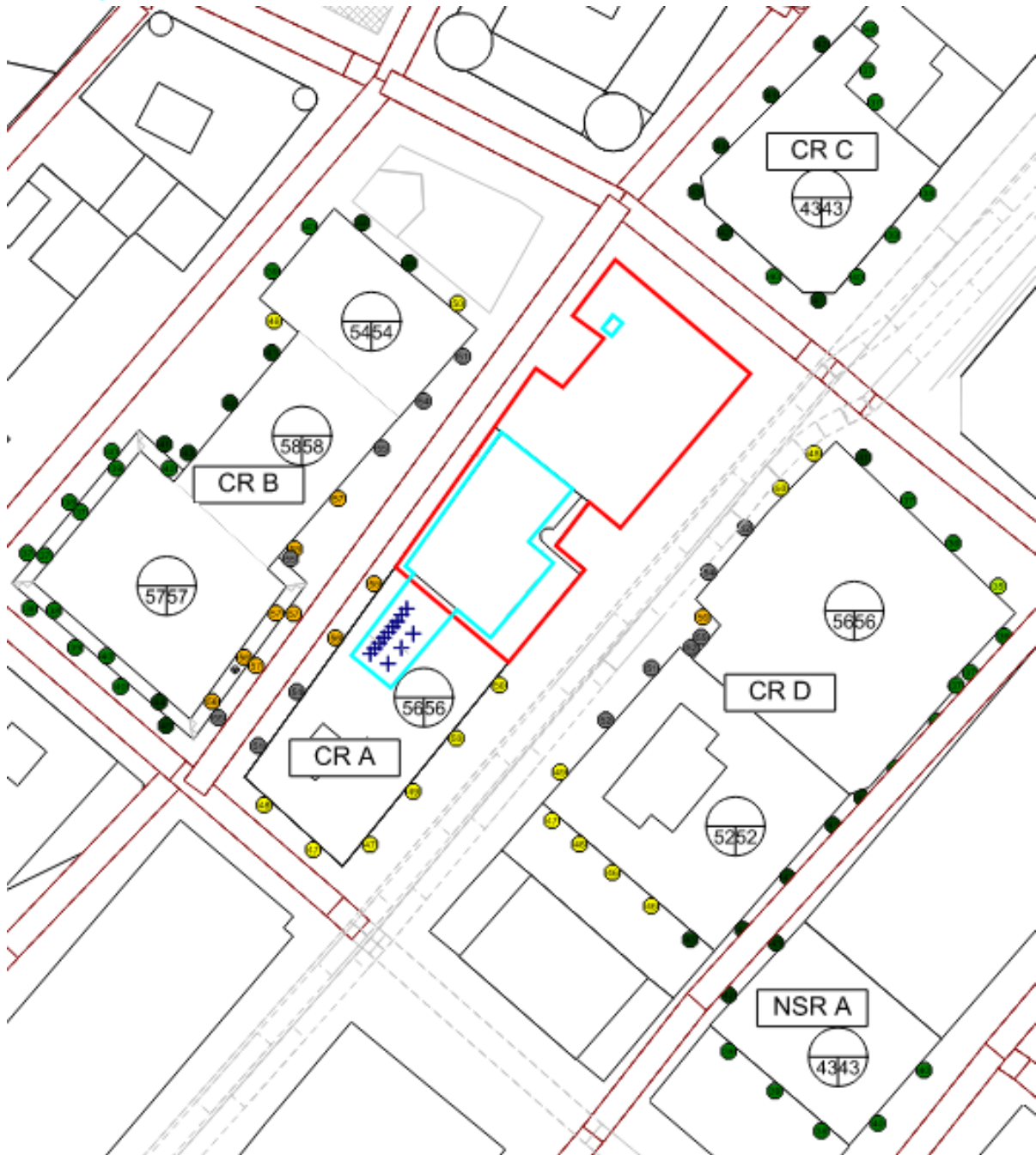
The noise levels associated with the plant items included within the assessment are listed in Appendix B, together with a full description of the manufacturer octave band noise data.

6.2. Predicted Plant Noise Emissions

Based on the quantity and noise emissions of the plant items described in Appendix B, a worst-case assessment has been undertaken in that it is assumed all plant items will be operating simultaneously during the quietest daytime and/or night-time period. In reality, the plant operation will be controlled by the Building Management System, limiting their operation outside of typical working hours. The predicted noise levels are therefore expected to be notably higher than those typically generated during evening and night-time hours.

A modelled noise contour plot showing the predicted cumulative plant specific levels at the identified NSRs and surrounding areas is shown in Figure 6.1.

Figure 6.1: Noise Contour Plot of Plant Noise Levels at the Closest NSRs, site boundary in red, plant area in light blue



Based on our experience, and review of the manufacturer's data, the character of the noise from the items of plant listed above are not anticipated to include any discernible or attention-catching characteristics warranting corrections to be applied in accordance with BS 4142:2014 and so these have not been applied to the predicted noise levels to obtain the rating level. The rating levels are therefore the same as the levels shown in Figure 6.1.

A summary of predicted plant noise levels at the nearest NSRs is presented in Table 6.1 below.

Table 6.1: Summary of Predicted Plant Noise Levels at the Closest Receptors

Assessment Parameter		NSR A (Manhattan Apartments)	CR A (57 Spring Gardens)	CR B (55 Spring Gardens and York House)	CR C (Colwyn Chambers)	CR D (One New York Street and City Gate)
Cumulative Receiver Plant Noise Level		43	56	58	43	56
Plant Noise Limit (dB)	Day	≤53	≤58	≤58	≤58	≤58
	Night	≤45	N/A	N/A	N/A	N/A
Difference (dB)	Day	-10	-2	0	-15	-2
	Night	-2	N/A	N/A	N/A	N/A
Compliant with the noise requirements of MCC?		Yes	Yes	Yes	Yes	Yes

It can be seen that from a review of Figure 6.1 and Table 6.1, for a worst-case scenario, that noise from the proposed plant scheme is expected to comply with MCC's criteria.

6.3. Post-Completion Testing

To verify the findings of the desktop assessment, onsite measurements of the plant in operation have been undertaken. Measurements were undertaken on 22nd November 2023 at locations on the roof of the building that were considered to be representative of the plant noise emissions. The measurement positions were then added as receivers in the noise model for comparison. The measurement locations are shown below in Figure 6.2.

Figure 6.2: Plant Noise Measurement Locations

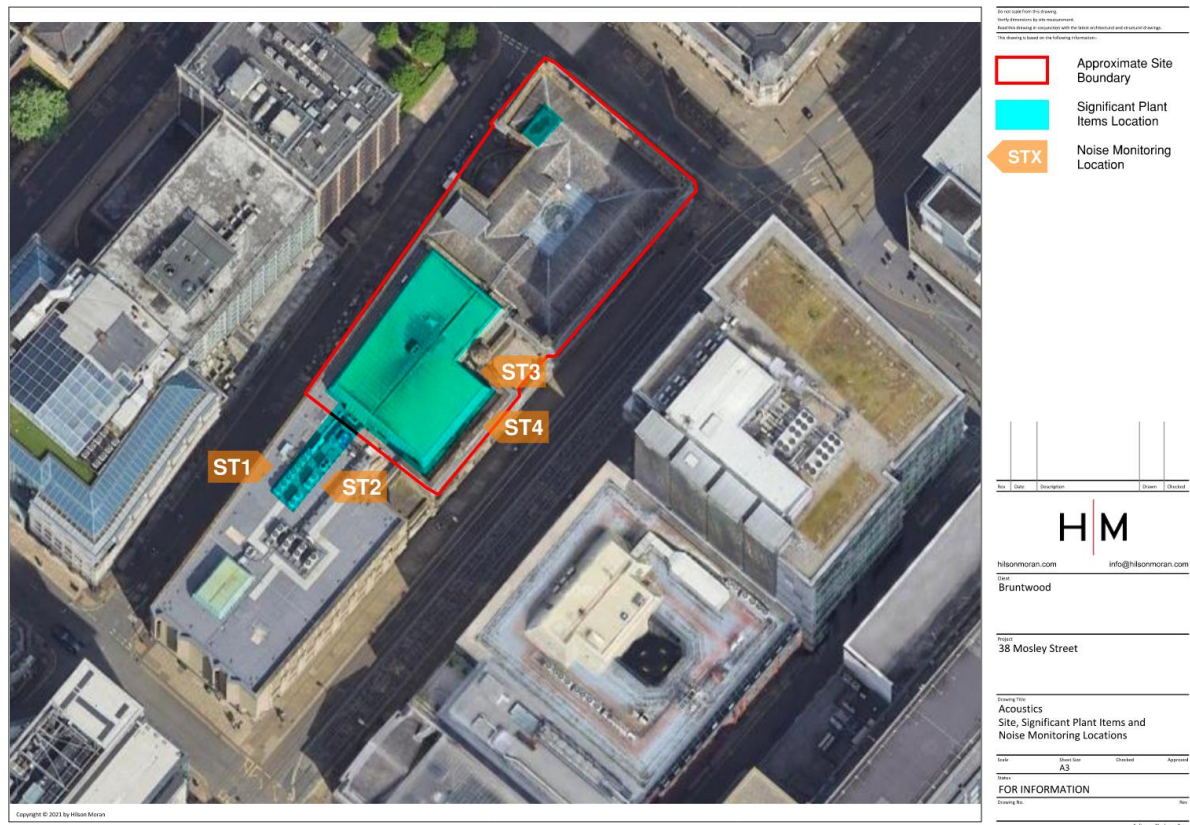


Table 6.2 presents the measured noise levels on the roof, and the modelled noise levels in that location for comparison.

Table 6.2: Summary of Measured Plant Noise Levels and Comparison with Model

Noise Monitoring Location	Modelled Noise Level	Measured Noise Level	Difference
ST1	75	65	-10
ST2	71	59	-12
ST3	80	67	-13
ST4	75	61	-14

As shown in Table 6.2 the modelled noise levels are greater than the actual noise levels from plant measured onsite. It is therefore concluded that the modelled scenario assesses a worst-case, and as this still achieves the requirements of MCC there is an objective basis for concluding that Planning Condition 9 can be discharged.

Appendix A – Acoustic Terminology

The following table contains a list of frequently used acoustic terms we use in our reports. The terms are defined with an explanation for each.

Term	Description
Decibel, dB	The decibel is a logarithmic unit of measurement used for quantifying sound. It is derived from the logarithm to base 10 of the ratio of two quantities. Use of a logarithmic scale has the advantage that it compresses the very wide range of sound pressures to which the ear may typically be exposed to a more manageable range of numbers.
Frequency, Hz	In sound, the number of cycles per second of a pressure fluctuation and frequency in sound is proportional to its pitch. Different frequencies are divided into octave and one third octave bands.
Sound Pressure Level, L_p	This is the unweighted or linear level which is measured prior to any weightings being applied. The sound pressure level is 20 times the logarithm to base 10 of the ratio of the reference sound pressure (2×10^{-5}) and the measured sound pressure.
Sound Power Level, L_w	This is the total sound energy radiated from a given source. The sound power level is 10 times the logarithm to base 10 of the ratio of the reference sound power level (1×10^{-12}) and the measured power.
Frequency Weightings	Weightings can be applied to a spectrum of sound and act as a filter to account for different sensitivities and conditions.
Time Weightings	A time weighting to denote the response of the sound level meter. For most measurements the Fast time weighting is selected (F) however, a slow time weighting (S) is often used to for the measurement train noise and vibration.
A-weighted sound pressure level, L_{pA}	The sound pressure level with the A-weighting applied. The A-weighting is used for most environmental noise measurements and is used to weight a spectrum of sound to match the sensitivity of the human ear.
Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$	The L_{Aeq} is an energy average and defined as the level of sound which, over a given period of time, would equate to the same A-weighted sound energy as the actual fluctuating sound.
Octave Bands	A band of frequencies in which the upper limit of the band is twice the frequency of the lower limit.
Maximum noise Level, L_{AFmax}	The maximum instantaneous noise level measured during a given period of time. The time weighting to which the meter is set for this measurement parameter is always indicated by either an F or S.
Percentile level, $L_{AN,T}$	A-weighted sound pressure level obtained using time-weighting F, which is exceeded for N% of a specified time interval. An example of this is background noise which is quantified with the L_{A90} descriptor, which is the A-weighted level which is exceeded for 90% of the measurement period.
Sound exposure level, L_{AE}	A level of a sound, of 1 s duration, that has the same sound energy as the actual noise event considered.

Rating Level, L_{A,T_r}	The equivalent continuous A-weighted sound pressure level of the noise, plus any adjustment for the characteristic features of the noise.
Ambient Noise Level	The noise level in a given environment whilst it is subject to all of its normal sources of noise.
Background Sound / Noise Level, L_{A90}	These are amongst the lowest noise levels measured over a given period of time and exclude short term, intermittent noise sources. The background noise level is quantified by the L_{A90} descriptor and is therefore the level which is exceeded for 90% of a given period of time.
Reverberation Time, T	The time that would be required for the sound pressure level to decrease by 60 dB after the sound source has stopped. The descriptor T , often includes other nomenclature to describe the type of reverberation time measurement or if the reverberation time is an average taken for specific frequencies. For example a T_{mf} is the mid-frequency reverberation time.
Absorption Coefficient, α	The fraction of reverberant sound energy absorbed by a material. It is expressed as a value between 1.0 which equates to perfect absorption and 0 which equates to zero absorption.
Absorption, A	The acoustic absorption derived from the multiplication of the absorption coefficient by the surface area of a given material.
Acoustic Class, A - E	Classification of sound absorbers into Sound Absorption Classes A-E, according to BS EN ISO 11654, including frequencies 200-5000 Hz
NRC	A single-number rating system used to compare the sound-absorbing characteristics of building materials. A measurement of the acoustical absorption performance of a material, calculated by averaging its Sound Absorption Coefficients at 250, 500, 1000 and 2000 Hz
Sound Reduction Index, R	The laboratory measured sound insulation properties of a material or building element in octave or third octave bands.
Weighted Sound Reduction Index, R_w	A single number which represents the sound reduction of a material. It is derived by plotting the sound reduction index against a set of reference curves. The curves are shifted until a best-fit is established and the curve which best fits the sound reduction spectrum is used to represent the single figure value.
Weighted Level Difference, D_w	The weighted level difference between a pair of rooms, stated as a single figure.
Standardized Weighted Level Difference, D_{nT_w}	The standardized, weighted difference in sound level between a pair of rooms, stated as a single figure. The level difference in octave bands is first normalized to a reference reverberation time and then plotted against a set of reference curves to establish a single figure value.
Weighted, Normalised Flanking Level Difference, D_{nFw}	The normalised, weighted difference in sound level between a pair of rooms via a flanking element, such as mullion or ceiling detail. The level difference in octave bands is first normalized to a reference amount of absorption and then plotted against a set of reference curves to establish a single figure value.
Normalised Element Level Difference, D_{ne}	The normalised difference in sound level between a pair of rooms via a small element such as a trickle ventilator. The level difference in octave bands is normalized to a reference amount of absorption.

Weighted, Normalised Element Level Difference, D_{new}	The normalised, weighted difference in sound level between a pair of rooms via a small element such as a trickle ventilator, stated as a single figure. The level difference in octave bands is normalized to a reference amount of absorption and then plotted against a set of reference curves to establish a single figure value.
C_{tr}	A correction term applied to the sound insulation single-number values (R_w , D_w , and $D_{nT,w}$). Applying the C_{tr} penalises a construction's performance if its low frequency performance is poor in relation its performance at higher frequencies.
Impact Sound	The noise generated by an impact on a structure. This is normally used to describe the noise created by people walking on a floor structure.
Weighted standardized impact sound pressure level, $L_{nT,w}$	A single-number quantity used to characterize the impact sound insulation of floors over a range of frequencies.
Cross-talk	Noise transmission between one room and another room or space via a duct or other path.
Insertion Loss, IL	The reduction of noise level due to the presence of a noise control device such as an attenuator, excluding any regeneration noise created by its presence.
Dynamic Insertion Loss, DIL	The reduction of noise level due to the presence of a noise control device such as an attenuator, including any regeneration noise created by its presence.
NR	The Noise Rating level. This is a single figure value derived by plotting a noise spectrum against a set of curves. The curve under which the spectrum fits is the resulting NR level.
Vibration	The vibratory motion of a surface can be characterised by: (a) displacement (m), (b) velocity (m/s), or (c) acceleration (m/s²). The magnitude of the vibration can be quantified in several ways: Peak to Peak - The total excursion of the oscillation about the zero datum. Peak - This value gives the maximum excursion of the oscillation above or below the zero datum. r.m.s. - This value gives the root mean square of the time history over a specific time interval (time constant). dB - Vibration levels can be expressed in dB. A reference level of 10-6 m/s² r.m.s. is usually used for acceleration.
Ground borne noise	Audible noise caused by the vibration of elements of a structure, for which the vibration propagation path from the source is partially or wholly through the ground.
Structure borne noise	Audible noise caused by the vibration of elements of a structure, the source of which is within a building or structure with common elements.

V.D.V,	The VDV is the Vibration Dose a person is expected to be exposed to over the course of the day or night. The VDV is given by the fourth root of the time integral of the fourth power of the acceleration after it has been frequency-weighted.
eVDV	The estimated vibration dose value based on short duration measurements of transients with known durations and occurrences.

Appendix B – Manufacturer’s Acoustic Data

The following table present the manufacturer’s noise data for each significant plant item considered in this assessment. Full manufacturer technical submittals can be provided upon request.

Plant Item	Manufacturer, Model	Location	Part ^{1,2,3}	Noise Level (dB) at Octave Band Centre Frequency (Hz)								Noise Emission dB(A)
				63	125	250	500	1k	2k	4k	8k	
Condensing Unit serving Basement Floor	Mitsubishi PURY-M200YNW-A1	Roof	All L _{p@3m}	77	61	60.5	57.5	51	45.5	44	41.5	59
Condensing Unit serving 1 st Floor	Mitsubishi PURY-M250YNW-A1	Roof	All L _{p@3m}	78	62.5	61.5	59	52	48.5	48.5	43	61
Condensing Unit serving Ground Floor	Mitsubishi PURY-M300YNW-A1	Roof	All L _{p@3m}	75.5	62.5	62.5	60	54	49.5	44.5	40	67
Condensing Unit serving 2 nd Floor	Mitsubishi PURY-M250YNW-A1	Roof	All L _{p@3m}	78	62.5	61.5	59	52	48.5	48.5	43	61
Condensing Unit serving 2 nd Floor	Mitsubishi PURY-M300YNW-A1	Roof	All L _{p@3m}	75.5	62.5	62.5	60	54	49.5	44.5	40	67
Condensing Unit serving 3 rd Floor	Mitsubishi PURY-M250YNW-A1	Roof	All L _{p@3m}	78	62.5	61.5	59	52	48.5	48.5	43	61
Condensing Unit serving 3 rd Floor	Mitsubishi PURY-M200YNW-A1	Roof	All L _{p@3m}	77	61	60.5	57.5	51	45.5	44	41.5	59
Condensing Unit serving basement comms room cooling units	Mitsubishi PUZ-ZM100VKA2	Roof	All L _{p@3m}	64	64	63	49	46	42	36	29	49
Condensing Unit serving basement comms room cooling units	Mitsubishi PUZ-ZM100VKA2	Roof	All L _{p@3m}	64	64	63	49	46	42	36	29	49
Condensers serving the landlords radiator circuit	Mitsubishi R32 Ecoton CAHV-P500YB-HPB	Roof	All L _{p@1m}	70	65	61	57	52	47	49	45	59

Condensers serving the landlords radiator circuit	Mitsubishi R32 Ecoton CAHV-P500YB-HPB	Roof	All $L_{p@1m}$	70	65	61	57	52	47	49	45	59
Air to Water Heat Pump serves HWS heating requirements	Mitsubishi Qton ESA30EH-25	Roof	All $L_{p@1m}$	43	41	45	52	52	51	49	46	58
General Toilet Supply & Extract AHU 1	AirSource CF3-1-HR-S-RA	Roof (plant room)	Supply Fan Intake L_w	67	66	69	62	57	52	47	40	64
			Extract Fan Outlet L_w	70	70	70	66	62	58	54	47	68
General Toilet Supply & Extract AHU 2	AirSource CF4-1-HR-P-RF	Roof (plant room)	Supply Fan Intake L_w	63	65	71	68	65	64	66	60	72
			Extract Fan Outlet L_w	67	69	79	76	75	74	69	67	80
New General AHU to Serve 38 Mosley Street AHU 3	AirSource TEMPAIR 67T	Roof (plant room)	Supply Fan Intake L_w	71	88	77	72	71	68	63	62	77
			Extract Fan Outlet L_w	77	85	81	80	79	78	75	70	85
New General AHU to Serve 57 Spring Gardens AHU 5	AirSource TEMPAIR 67T	Roof (plant room)	Supply Fan Intake L_w	78	79	80	77	72	70	68	68	79
			Extract Fan Outlet L_w	82	85	83	82	81	80	77	74	87
AHU to Serve Basement Showers AHU 6	AirSource CF4-EH-S-RC-DX	Roof (plant room)	Supply Fan Intake L_w	61	65	70	68	63	61	62	53	70
			Extract Fan Outlet L_w	61	64	68	66	62	61	63	54	69

Notes: ¹ $L_{p@3m}$ – sound pressure level at 3m (dB) ² $L_{p@1m}$ – sound pressure level at 1m (dB) ³ L_w – sound power level (dB)



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