Noise Impact Assessment

Methodist Central Hall Manchester

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NOISE IMPACT ASSESSMENT

Methodist Central Hall
Manchester

Prepared for:

MCH Manchester

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EXECUTIVE SUMMARY

BACKGROUND

Site Address	Methodist Central Hall, Oldham Street, Manchester M1 1JQ
National Grid Reference	E 384460 N 398418
Proposed Development	Proposed improvements and extension to the existing building and rooms. Including improving the overall building functionality and circulation, while increasing the capacity for multifunctional room usage. This includes the creation of individual rentable rooms, improvements to the central hall, and the addition of new rooftop extension to create a hireable events space. In addition to the architectural work, a large part of the mechanical and electrical services of the building will be upgraded.
Report Objectives	The objectives of this report are to: • Identify, measure and assess the potential impact of any proposed noise sources associated with the development upon existing receptors. • Identify, measure and assess the potential impact of any existing noise sources around the development upon proposed receptors. The report follows current and relevant British Standards in order to provide a robust assessment.

ASSESSMENT

Surveys Completed	Two unattended weekday and weekend background and ambient sound surveys have been completed in order to capture noise levels associated with, primarily, Dale Street and Oldham Street, as well as to establish background sound levels at existing and proposed receptors.
Assessments	As the internal noise levels are unknown, E3P have calculated an allowable limit for this based on the proposed façade insulation at the site, distance to receptors and an appropriate criterion. These limits are appropriate for the internal music speaker system and should be followed strictly. E3P has also assessed the potential impact of proposed roof mounted plant items and its impact upon existing receptors.
Mitigation Requirements	The assessment has recommended appropriate limits for internal music noise. Furthermore, glazing specification have been recommended for proposed rooms and mitigation measures for the roof mounted plant are discussed.

CONCLUSIONS

Where the proposed limits are observed and not exceeded and the proposed glazing is installed, as shown in the report, the closest noise sensitive receptors are protected from adverse impact from existing and proposed noise sources.

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1. INTRODUCTION

1.1. BACKGROUND

E3P were commissioned by MCH Manchester to undertake a Noise Impact Assessment for a proposed development at the existing Methodist Central Hall in Manchester, to be referred to hereafter as *'the Site'*.

This assessment looks to determine the key noise sources in the immediate vicinity of the Site and associated with the development and to assess their impact, if any, upon existing and proposed residential receptors and to specify mitigation measures, where required.

Specifically, this report has been produced to address the following from Manchester City Council:

> *An acoustic assessment under the requirements of paragraph 180 of the National Planning Policy Framework, (Core Strategy DM1 and Saved Unitary Development Plan Policy DC26) which provides details of the existing noise levels in the area including levels during daytime, night time and weekends along with an indication of noise levels that you propose to achieve within the accommodation and details of the acoustic glazing and acoustically treated ventilation you propose to use and what measures will need to be implemented on site to meet internal noise requirements. In terms of the proposed uses, the study should identify the acoustic treatment and measures that will limit the breakout of noise in accordance with a noise study of the premises. The scheme proposed shall include measures such as acoustic lobbies at access and egress points of the premises, acoustic treatment of the building structure, sound limiters linked to sound amplification equipment, and specified maximum internal noise levels (Core Strategy DM1 and Saved Unitary Development Plan Policy DC26).*

1.2. PROPOSED DEVELOPMENT

The client intends to undertake improvements and add an extension to the existing building and rooms. Including improving the overall building functionality and circulation, while increasing the capacity for multifunctional room usage. This includes the creation of individual rentable rooms, improvements to the central hall, and the addition of new rooftop extension to create a hireable events space. In addition to the architectural work, a large part of the mechanical and electrical services of the building will be upgraded.

The proposed operational times are:

- (L00 - L02) Rooms for hire, main hall and sanctuary: 7 Days a week, 08:00 - 22:00 operating hours.
- Offices: Monday to Friday, 08:00 - 18:00 operating hours.
- (L-01) Mosaic: 7 Days a week, (Monday to Thursday) 08:00 - 18:00 (Friday to Sunday) 07:00 - 18:00, opening hours vary on use.

The key sources associated with the development will be noise break-out for any events or hireable spaces as well as any fixed plant items. Existing sources of sound impacting upon the site is road traffic and patron noise along Dale Street and Oldham Street.

1.3. LIMITATIONS

Where a noise or vibration survey is required to inform an assessment, E3P will endeavour to ensure that all noise and vibration measurements taken are robust, representative, and reliable in order to inform an accurate assessment at the time.

E3P will endeavour to capture all existing and proposed sources of sound and vibration at the time of the surveys and/or assessments. However, should new sources of sound be introduced, existing sources modified/changed, or characteristics of the sound be altered following completion of such, E3P cannot be held accountable for this.

Where mitigation measures are specified in this report, it should be noted that these measures are relative to a specific sound or vibration source, both in terms of the measured sound pressure and vibration level and the character of the sound source. Where either the sound pressure level or the character of the sound varies following completion of the sound survey, E3P cannot be held responsible for any subsequent variations in the proposed mitigation performance, for either absolute levels or frequency content.

2. ASSESSMENT METHODOLOGY

2.1. NATIONAL PLANNING POLICY FRAMEWORK

Planning policies and decisions should 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:

- mitigate and reduce to a minimum potential adverse impact resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life.
- identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason; and
- limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation

2.2. NATIONAL PLANNING PRACTICE GUIDANCE

Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or taking decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.

Local planning authorities' plan-making and decision-making should take account of the acoustic environment and in doing so consider:

- Whether or not a significant adverse effect is occurring or is likely to occur.
- Whether or not an adverse effect is occurring or is likely to occur.
- Whether or not a good standard of amenity can be achieved.

In line with the explanatory note of the NPSE, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase, where applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation.

The "observed effect levels" are as follows:

- **Significant observed adverse effect level:** This is the level of noise exposure above which significant adverse effects on health and quality of life occur.
- **Lowest observed adverse effect level:** This is the level of noise exposure above which adverse effects on health and quality of life can be detected.
- **No observed effect level:** This is the level of noise exposure below which no effect at all on health or quality of life can be detected.

Table 2.1 summarises the noise exposure hierarchy, based on the likely average response.

TABLE 2.1 NOISE EXPOSURE HIERARCHY

PERCEPTION	EXAMPLES OF OUTCOMES	INCREASING EFFECT LEVEL	ACTION
Not Noticeable	No effect.	No observed effect	No specific measures required
Noticeable and Not Intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No observed adverse effect	No specific measures required
Lowest Observed Adverse Effect Level			
Noticeable and Intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television, speaking more loudly, or having to close windows for some of the time because of the noise where there is no alternative ventilation. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed adverse effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and Disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion, having to keep windows closed most of the time because of the noise where there is no alternative ventilation. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant observed effect	Avoid
Noticeable and Very Disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening, loss of appetite, significant/medically definable harm (auditory and non-auditory).	Unacceptable adverse effect	Prevent

The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any situation. These factors include the following:

- The source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause a greater adverse effect at night than if they occurred during the day. The adverse effect can also be greater simply because there is less background noise at night.
- For non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise can be important.

- The spectral content of the noise and the general character of the noise. The local topology and topography should also be considered along with the existing and, where appropriate, the planned character of the area.

More specific factors to consider when relevant:

- Where applicable, the cumulative impacts of more than one source should be considered along with the extent to which the source of noise is intermittent and of limited duration.
- Consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases, a suitable alternative means of ventilation is likely to be necessary.
- If external amenity spaces are an intrinsic part of the overall design, then the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.

2.3. BS 4142: 2014+A1:2019 'METHODS FOR RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND'

This standard describes methods for rating and assessing sound of an industrial or commercial nature which includes:

- 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 processes or premises, such as that from forklift trucks, or that from train or ship movements on or around an industrial or commercial Site.

The procedure detailed in the standard compares the measured or predicted specific noise level from any of the above with the background sound level at a residential dwelling. The measured background sound level at a receptor should be reliable and should not necessarily ascertain a lowest measured background sound level, but rather to quantify what is typical.

The specific noise level also acknowledges the reference time intervals depending upon whether the noise source operates during daytime (1-hour) or night-time (15-minute) periods.

There are several 'penalties' which can be attributed to the specific sound level depending upon the 'acoustic features' of the sound level under investigation as follows:

Tonality

- +2 dB: where the tonality is just perceptible.
- +4 dB: where the tonality is clearly perceptible; and
- +6 dB: where the tonality is highly perceptible.

Impulsivity

- +3 dB: where the impulsivity is just perceptible.
- +6 dB: where the impulsivity is clearly perceptible; and
- +9 dB: where the impulsivity is highly perceptible.

Intermittency

- +3dB: where the intermittency is readily distinctive against the acoustic environment.

In addition to the above, there is a penalty for 'other sound characteristics' of +3 dB where a sound exhibits characteristics that are neither tonal nor impulsive, though are readily distinctive against the acoustic environment. BS 4142 goes on to state that the rating level is equal to the specific sound level if there are no such features present or expected to be present.

Assessment of the rating level relative to the background sound level can yield the following commentary:

- Typically, the greater this difference (between the rating level and the background sound level), 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; and
- 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. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.

2.4. BRITISH STANDARD BS 8233:2014 – GUIDANCE ON SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS

2.4.1. NOISE CRITERIA LIMITS

The scope of this standard is the provision of recommendations for the control of noise in and around buildings including residential dwellings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new buildings or refurbished buildings undergoing a change of use, rather than to assess the effect of changes in the external noise climate.

The standard suggests suitable internal noise levels within different types of buildings, including residential dwellings, as shown in Table 2.2.

TABLE 2.2 BS 8233:2014 RECOMMENDED INTERNAL NOISE LEVELS

CRITERION	TYPICAL SITUATION	DESIGN CRITERION, $L_{Aeq,T}$ (dB)
Suitable Resting and Sleeping Conditions	Living Room	35
	Bedroom	30

BS 8233 goes on to recommend noise levels for gardens:

> *It is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors might be warranted.*

BS 8233 goes on to say:

> *In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited.*

2.5. WORLD HEALTH ORGANISATION (WHO) – GUIDELINES FOR COMMUNITY NOISE

The WHO gives guidance on desirable levels of environmental noise. The levels presented in the WHO Community Guidelines are those at which adverse effects become measurable. The 1980 WHO document suggested that *"general daytime outdoor noise levels of less than 55 dB(A) $L_{eq,16hr}$ are desirable to prevent any significant community annoyance."* This level is an external free-field noise level. The 1980 document also stated in relation to internal levels, *"that night-time noise levels of 35 dB(A) $L_{eq,8hr}$ or less will not interfere with the restorative process of sleep"*.

A report was submitted to the WHO in 1995 for consideration as a revision to the 1980 document and revised community guidelines were issued in 2000. In the 2000 guidelines, it is considered that the sleep disturbance criteria should be taken as an internal noise level of 30 dB $L_{Aeq,8\,hr}$ or an external level of 45 dB $L_{Aeq,8\,hr}$. It also recommends that internal L_{Amax} levels of 45 dB and external L_{Amax} levels of 60 dB should be limited where possible.

3. SURVEY RESULTS

The measurement positions are detailed in Figure 1 of Appendix II.

The main sources of sound impacting upon the development is road traffic and patrons along Dale Street and Oldham Street. As such, two measurement positions were chosen to capture these main sources over a full weekday and weekend period.

3.1. BACKGROUND AND AMBIENT SOUND MEASUREMENTS – DALE STREET

E3P have undertaken a full weekday and weekend Background and Ambient sound survey in order to quantify the baseline levels of sound incident on the northern facades due to sound along Dale Street. The survey was carried out over the following time periods:

- 13:00 Friday 26th January to 12:00 Tuesday 30th January 2024.

The following Noise Measurement Position was used:

- Noise Measurement Position 1 (NMP1): Located on the flat roof of the existing building on the north east corner overlooking Dale Street. The microphone of the sound level meter was extended 1 m out from the edge of the façade and secured to the safety barrier on the roof edge. The sound climate was dominated by road traffic sound on the surrounding road network. This position is representative of the closest noise sensitive receptor. The measurement position is considered free-field but some level of reflection would be taking place and so is considered worst-case.

Table 3.1 details the measured background and ambient sound levels. Full hourly and 15-minute data sets are available in Appendix II.

TABLE 3.1 BACKGROUND AND AMBIENT SOUND MEASUREMENTS – DALE STREET

DATE	MEASUREMENT PERIOD	AVERAGE MEASURED AMBIENT NOISE LEVEL, $L_{Aeq,T}$ (dB)	RANGE OF MEASURED BACKGROUND SOUND LEVEL, $L_{A90,T}$ (dB)	MEDIAN MEASURED BACKGROUND SOUND LEVEL, $L_{A90,T}$ (dB)
Friday 26th January 2024	Daytime	62.9	56.1-57.9	57
	Night-time	60.2	45.0-58.0	55
Saturday 27th January 2024	Daytime	63.2	50.9-59.5	59
	Night-time	60.6	43.9-58.8	57
Sunday 28th January 2024	Daytime	61.5	48.9-56.2	**53**
	Night-time	57.4	41.5-54.6	**44**
Monday 29th January 2024	Daytime	**64.0**	51.2-57.3	57
	Night-time	**61.6**	43.5-52.4	47

The worst-case average ambient noise levels are highlighted and to be used in the noise impact assessment. The lowest median measured background sound levels are highlighted to inform the plant noise assessment.

3.2. BACKGROUND AND AMBIENT SOUND MEASUREMENTS – OLDHAM STREET

E3P have undertaken a full weekday and weekend Background and Ambient sound survey in order to quantify the baseline levels of sound incident on the northern facades due to sound along Oldham Street. The survey was carried out over the following time periods:

- 13:00 Friday 26th January to 12:00 Tuesday 30th January 2024.

The following Noise Measurement Position was used:

- Noise Measurement Position 2 (NMP2): Located out of an existing 3rd floor window overlooking Oldham Street. The microphone of the sound level meter was extended 1 m out from the edge of the façade in façade conditions. The sound climate was dominated by road traffic sound on the surrounding road network.

Table 3.2 details the measured background and ambient sound levels. Full hourly and 15-minute data sets are available in Appendix II. The below values are façade levels, and, in the assessment, a -3 dB correction will be applied to correct to free-field.

TABLE 3.2 BACKGROUND AND AMBIENT SOUND MEASUREMENTS – OLDHAM STREET

DATE	MEASUREMENT PERIOD	AVERAGE MEASURED AMBIENT NOISE LEVEL, $L_{Aeq,T}$ (dB)	RANGE OF MEASURED BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)	MEDIAN MEASURED BACKGROUND SOUND LEVEL, $L_{A90,T}$ (dB)
Friday 26th January 2024	Daytime	66.5	59.3-61.0	60
	Night-time	**63.7**	50.5-62.4	58
Saturday 27th January 2024	Daytime	67.8	52.0-62.6	60
	Night-time	63.5	49.7-61.3	58
Sunday 28th January 2024	Daytime	65.4	50.3-60.0	**57**
	Night-time	62.7	49.0-54.9	**50**
Monday 29th January 2024	Daytime	**69.8**	55.5-64.2	60
	Night-time	63.2	49.5-55.3	51

The worst-case average ambient noise levels are highlighted and to be used in the noise impact assessment. The lowest median measured background sound levels are highlighted to inform the plant noise assessment.

The equipment outlined in Table 3.3 was used for the noise survey.

TABLE 3.3 NOISE MEASUREMENT EQUIPMENT AND CALIBRATION DATES

MEASUREMENT POSITION	EQUIPMENT DESCRIPTION	MANUFACTURER & TYPE NUMBER	SERIAL NUMBER	CALIBRATION DUE DATE AT TIME OF SURVEY
NMP1	Sound Level Meter	01dB Fusion	14226	7th December 2025
	Pre-amplifier	01dB Pre22	2135072	
	Microphone	GRAS 40CE	470570	
	Calibrator	Cirrus CR:515	99204	2nd August 2024
NMP2	Sound Level Meter	Norsonic Nor 145	14529152	13th June 2025
	Pre-amplifier	Norsonic Nor1209	22293	
	Microphone	Norsonic Nor1227	332220	
	Calibrator	Norsonic Nor1255	125525208	6th June 2024

The sound level meters were field calibrated on site using the above-mentioned calibrator prior to and after noise measurements were taken. No significant drift was witnessed as noted above. Calibration certificates are available upon request.

4. NOISE IMPACT ASSESSMENT

E3P note the following requirements from MCC and have summarised them into specific sections of the assessment:

> *An acoustic assessment under the requirements of paragraph 180 of the National Planning Policy Framework, (Core Strategy DM1 and Saved Unitary Development Plan Policy DC26) which provides details of the existing noise levels in the area including levels during daytime, night time and weekends along with an indication of noise levels that you propose to achieve within the accommodation and details of the acoustic glazing and acoustically treated ventilation you propose to use and what measures will need to be implemented on site to meet internal noise requirements. In terms of the proposed uses, the study should identify the acoustic treatment and measures that will limit the breakout of noise in accordance with a noise study of the premises. The scheme proposed shall include measures such as acoustic lobbies at access and egress points of the premises, acoustic treatment of the building structure, sound limiters linked to sound amplification equipment, and specified maximum internal noise levels (Core Strategy DM1 and Saved Unitary Development Plan Policy DC26).*

As such, the following is required to be considered and assessed:

- Provide details of the existing noise levels in the area including levels during daytime, night time and weekends (as shown in Section 3.0) along with an indication of noise levels that you propose to achieve within the accommodation and details of the acoustic glazing and acoustically treated ventilation you propose to use and what measures will need to be implemented on site to meet internal noise requirements.
- In terms of the proposed uses, the study should identify the acoustic treatment and measures that will limit the breakout of noise in accordance with a noise study of the premises.

4.1. EXISTING NOISE SOURCE IMPACT ASSESSMENT

For the purposes of this assessment, E3P has used noise modelling software, CadnaA 2023 MR2, to determine the impact of noise from road traffic sound. The following information has been used to inform the noise model:

The following inputs have been included in the model:

- Site elevations have been taken as existing by way of a 2 m grid Digital Terrain Model (DTM) which contains public sector information licensed under the Open Government License v3.0.
- The worst case measured ambient noise levels from NMP1 and NMP2 are used to calibrate Dale Street and Oldham Street. It is assumed that the noise sources here are primarily road traffic with contribution from patrons along the roads. As such, the sources are inputted as road sources and assessed as line sources.
- A reflection order of 1 has been used in all calculations.
- Ground absorption has been taken as 0 due to the acoustically hard landscape.
- Noise levels generated using ISO 9613-1 and ISO 9613-2 "*Acoustics – Attenuation of sound during propagation outdoors*" as incorporated into CadnaA software.

Figure 2 determines the noise levels across the Site during the daytime periods only due to the proposed operational hours, shown below:

- (L00 - L02) Rooms for hire, main hall and sanctuary: 7 Days a week, 08:00 - 22:00 operating hours.
- Offices: Monday to Friday, 08:00 - 18:00 operating hours.
- (L-01) Mosaic: 7 Days a week, (Monday to Thursday) 08:00 - 18:00 (Friday to Sunday) 07:00 - 18:00, opening hours vary on use.

4.1.1. INTERNAL NOISE LEVEL ASSESSMENT

E3P have applied relevant criteria taken from BS 8233, as follows (lower ground rooms are not considered as there are no external windows and nor is ground as this area is enclosed by the retail units with no external windows:

1st Floor

- Room for Hire – 35-40 dB.

2nd Floor

- Room for Hire – 35-40 dB.
- Boardroom – 35-40 dB.

3rd Floor

- Offices – 35-40 dB.
- Social Area – 40-50 dB.

Extension

- Events Space – 35-40 dB
- External Terrace – 50-55 dB.

Given the above, Table 4.1 has been created taking the predicted daytime noise levels for the external façade of each room and compares this to the allowable external façade limits based on the existing glazing performance.

As the development site is within a conservation area there is a preference to retain the existing window frames but reglaze with slimline double glazing for the external windows 4/4/4 and add 4 mm safety glass as secondary glazing with a air space of 75 mm between the double glazed and single glazed units. This configuration is expected to provide a sound reduction of 38 dB R_w (-3;-9). When weighted for road traffic noise using the '+C_{tr}' correction, the unit has a sound insulation performance value of approximately 29 dB and so this value has been used to calculate internal noise levels.

TABLE 4.1 NOISE ASSESSMENT OF MIXED-USE NOISE SENSITIVE ROOMS

FLOOR	ROOM	PREDICTED FAÇADE NOISE LEVEL, $L_{Aeq,16hr}$ (dB)	ALLOWABLE EXTERNAL NOISE LEVEL, $L_{Aeq,16hr}$ (dB)	WITHIN DESIGN RANGE?
1st Floor – North East	Room for Hire	69	69	Yes
1st Floor – North West	Room for Hire	70	69	**No**
2nd Floor - North East	Room for Hire	69	69	Yes
	Boardroom	70	69	**No**
2nd Floor – North West	Boardroom	70	69	**No**
	Room for Hire	70	69	**No**
2nd Floor - South East	Room for Hire	56	69	Yes
3rd Floor - North East	Office	69	69	**No**
3rd Floor – South East	Office	62	69	Yes
	Social Area	53	79	Yes
3rd Floor – North West	Office	70	69	**No**
Extension	Events Space	52	69	Yes
	External Terrace	52	55	Yes

There is no requirement to mitigate against overheating in office space but appropriate ventilation will need to be provided so that windows do not have to be opened for fresh air flow. It is understood that natural ventilation is currently used for this purpose which is to be retained and upgraded with mixed mode ventilation as part of the development. As such, consideration to ventilation requirements are not considered further as a betterment on the existing situation is to be provided.

As can be seen in Table 4.1 and Figure 2, noise sensitive rooms on north western and north western facades within the existing building will experience an exceedance of the above criteria. As such, noise sensitive rooms on these facades will require higher specification glazing.

As shown in the Figure, the roof extension is subject to noise levels of no more than 52 dB and external noise levels of 52 dB in the terraced area. Both levels are suitably low not to cause adverse impact.

Exact glazing requirements will be discussed in section 5.

4.2. INTERNAL TO EXTERNAL BREAK-OUT ASSESSMENT

In order to assess the potential for noise break-out upon existing receptors, E3P have drawn upon the advice given in Noise from Pubs and Clubs from University of Salford (2005). The guidance states there are numerous paths of assessment ranging from absolute criterion to Noise Rating Curves. Indeed, it is considered that amplified music would be the main concern and internal noise from occupants is unlikely to be at a high enough level to break-out from the façade.

As the previous assessment has determined that alternative means to ventilation is needed, the assessment considers windows closed at the site.

Accordingly, in order to provide a robust assessment, E3P will aim to achieve the following criteria at the closest existing receptors due to music break-out and transmission through the partition floor:

- Noise Rating Curve NR 25 for private dwellings and offices as well as protecting the hall within the building.
- Absolute criteria of 35 dB during the day within habitable rooms and offices.

As such, in order to achieve the above criteria, it is necessary to set limits inside each room based on detailed calculations of break-out. This will require back calculations from the closest noise sensitive window, with the criteria set, through the façade of the venue and resulting in an absolute limit inside that cannot be exceeded should the limits at the receptors be achieved.

The following assumptions are made:

- It is assumed that the noise sensitive receptors will have windows partially open, with a sound reduction of -13 dB set.
- Any limits set will be based on daytime criteria given the sensitivity and that the venue will only operate during the daytime period (07:00 and 22:00).
- Noise limits set are as measured 1 m from a speaker/s.

The client has provided plans detailing the internal layout. The following is assumed:

- Glazing is 4 mm Float Glass and will be resealed as part of the development and renovation.
- Solid brick façade with no other openings except glazing units.

Table 4.2 below details the process of calculating the internal noise limits at the worst-case room, based on achieving the internal criteria of NR25 at the closest receptor, which is assumed to be 9 m from the closest edge of the south east façade.

TABLE 4.2 INTERNAL NOISE LIMITS – DAYTIME TO PROTECT AGAINST NOISE BREAKOUT

Hz	63	125	250	500	1000	2000	4000
Noise Rating NR25 Inside Closest Habitable Room (dB)	55.2	43.7	35.2	29.2	25.0	21.9	19.5
Noise Rating NR 25 outside Venue Façade (dB)	77.7	66.2	57.7	51.7	47.5	44.4	42.0
Façade SRI Calculated (dB)	25.9	33.5	37.5	38.7	44.7	49.5	49.5
Unweighted Limit Inside Venue (dB)	**103.7**	**99.8**	**95.3**	**90.4**	**92.2**	**94.0**	**91.5**
A-weighted Limit inside Venue (dBA)	**77.5**	**83.7**	**86.7**	**87.2**	**92.2**	**95.2**	**92.5**

The above A-weighted limit results in an absolute internal level of 99 dB as measured at the façade inside. This is well above what would be expected in a room of this type and levels internally are likely to be no higher than 75 dB.

Should windows be allowed to be opened or required to, the following limits apply:

TABLE 4.3 INTERNAL NOISE LIMITS – DAYTIME TO PROTECT AGAINST NOISE BREAKOUT – WINDOWS OPEN

Hz	63	125	250	500	1000	2000	4000
Noise Rating NR25 Inside Closest Habitable Room (dB)	55.2	43.7	35.2	29.2	25.0	21.9	19.5
Noise Rating NR 25 outside Venue Façade (dB)	77.7	66.2	57.7	51.7	47.5	44.4	42.0
Façade SRI Calculated (dB)	13	13	13	13	13	13	13
Unweighted Limit Inside Venue (dB)	**90.7**	**79.2**	**70.7**	**64.7**	**60.5**	**57.4**	**55.0**
A-weighted Limit inside Venue (dBA)	**64.5**	**63.1**	**62.1**	**61.5**	**60.5**	**58.6**	**56.0**

The above A-weighted limit results in an absolute internal level of 70 dB as measured at the façade inside with windows open.

This limit is considered more akin to the proposed usage and can also be applied to the events space on the roof which is noted to have openable doors onto an external terrace.

Accordingly, an absolute internal noise limit of 70 dB is recommended for all Rooms for Hire.

Limits on the music system should be set to those above at 1 m from the speaker. This would ensure that sound transmission through the partition floor would not generate adverse impact as well as internal to external break-out, even with windows open.

It should be noted that the above absolute internal level of 70 dB may not be an appropriate sound level for the proposed usage of the development, with music likely to be used only for background sound. Typical levels of background music within restaurant/bars are usually of low level to allow patrons to easily hear conversation. Levels of background music are typically less than 55 dBA.

4.3. EXTERNAL TERRACE NOISE IMPACT ASSESSMENT

There is potential for patron noise, associated with patrons using the external terrace on the roof, to have a noise impact upon existing receptors. As such, an assessment of this noise is undertaken and shown in Figure 3.

Here, we have assumed an area source, in the absence of actual numbers of people, with the assumption of a noise level of no more than 65 dB in the centre of the space. As the area is used during daytime periods only, it is assumed that noise levels would be akin to a beer garden during the day rather than a bar/restaurant terrace at night.

As shown in Figure 3, noise levels at existing noise sensitive windows are expected to be no more than 53 dB for the development and 49 dB for the closest non associated receptors. With windows open at the development, internal noise levels are expected to be no more than 40 dB and for non-associated receptors, 36 dB.

Noise levels on the development windows are considered acceptable. However, noise levels at receptors to the south east are 1 dB in exceedance of an acceptable noise level. It is important though to consider context at this stage. Indeed, these same facades are subject to noise levels of approximately 53-55 dB during the day as a result of road traffic sound. The introduction of this sound source would increase ambient noise levels outside the window by up to 1.5 dB. This level of increase is not considered significant. As such, no mitigation measures are required.

4.4. PROPOSED FIXED PLANT SOUND

The development will include roof mounted plant items, including Air Handling Units (AHUs), heating/cooling items and other ancillary plant. The exact details of which are provided below.

- VRF Condenser - Lower Ground Floor PURY-EP200 YNWA-A2.
- VRF Condenser - Ground Floor PURY-EP200 YNWA-A2.
- VRF Condenser - First Floor PURY-EP350 YNWA-A2.
- VRF Condenser - Second Floor PURY-EP400 YNWA-A2.

- VRF Condenser - Third Floor PURY-EP400 YNWA-A2.
- VRF Condenser - Fourth Floor PURY-EP200 YNWA-A2.
- 8 x Air Source Heat Pumps (ASHP).
- Air Handling Unit Basement.
- Air Handling Unit Main Hall.

Additional ancillary plant is proposed but noise levels from these additional items are well below those above and will not affect the outcome of the assessment. Noise level data for all the above has been provided and is available upon request.

As such, the noise model has been used to predict noise levels at noise sensitive facades at surrounding residential receptors. The following limits apply when measured at the closest existing habitable room window in accordance with BS 4142 and from experience of limits applied to similar schemes:

- During daytime operational periods, 07:00-22:00, the rating level from proposed fixed plant items should be at least 5 dB below the existing background sound level of 53 dB at the closest existing residential receptor (**Rating level limit of 48 dB**).

Accordingly, a façade limit of 48 dB is applicable. As existing plant is audible from other buildings and the level of noise from the city centre, no feature corrections are applied.

Figure 4 details the façade noise levels from proposed plant items only.

As can be seen, daytime façade noise levels are predicted to be below 48 dB at receptors to the south east, south west and north west. However, noise levels of up to 52 dB are predicted for facades to the immediate north east on Dale Street. As such, mitigation measures are required and discussed in Section 6.0.

5. OUTLINE GUIDANCE ON SOUND INSULATION

In addition to controlling exterior noise and internal services noise, sound from adjacent spaces can affect the intended use, depending on the noise activity, noise sensitivity and privacy requirement. A matrix may be used to determine the sound insulation requirement of separating partitions once the noise activity, noise sensitivity and privacy requirements for each room and space are established. Each room may be both a source and a receiving room. Where adjacent rooms have different uses, the worst-case sound insulation will be specified.

Table 5.1 details the example sound insulation matrix from BS 8233.

TABLE 5.1 EXAMPLE ON-SITE SOUND INSULATION MATRIX

PRIVACY REQUIREMENT	ACTIVITY NOISE OF SOURCE ROOM	NOISE SENSITIVITY OF RECEIVING ROOMS		
		LOW	MEDIUM	SENSITIVE
Confidential	Very high	47	52	57*
	High	47	47	52
	Typical	47	47	47
	Low	42	42	47
Moderate	Very high	47	52	57*
	High	37	42	47
	Typical	37	37	42
	Low	No rating	No rating	37
Not Private	Very high	47	52	57*
	High	37	42	47
	Typical	No rating	37	42
	Low	No rating	No rating	37

Values are dB $D_{nT,w}$
* Values of more than 55 dB are difficult to obtain on site and room adjacencies requiring these levels should be avoided wherever practical.

With reference to the above and the proposed internal layouts, the following relationships are found:

- Extension Events Space – Central Hall = Confidential privacy, high activity noise of source room and sensitive receiving room = 52 dB $D_{nT,w}$ sound insulation required.

As such, it is found that a sound insulation performance of **at least 52 dB $D_{nT,w}$** is required between the new Events Space and the floor below.

6. MITIGATION

6.1. FAÇADE INSULATION

The previous section determined that most proposed rooms would experience unacceptable noise levels with standard double glazing. As such, certain elevations will require higher specification glazing.

As the development site is within a conservation area there is a preference to retain the existing window frames but reglaze with slimline double glazing for the external windows 4/4/4 and add a secondary pane of 4 mm glass. However, this was found to only just achieve the criteria or not at all for selected rooms with a 1 dB exceedance.

Considering the above, the most appropriate option is to increase the thickness of the secondary glass pane to increase the performance. The following glazing is proposed:

- 4/4/4 slimline double-glazed unit, 75 mm air space and 8 mm safety glass – 41 dB R_w (-2;-8). This provides a weighted sound reduction of 33 dB against road traffic.

TABLE 6.1 NOISE ASSESSMENT OF MIXED-USE NOISE SENSITIVE ROOMS

FLOOR	ROOM	PREDICTED FAÇADE NOISE LEVEL, $L_{Aeq,16hr}$ (dB)	MINIMUM REQUIRED GLAZING PERFORMANCE, $R_W + c_{T,r}$ (dB)	EXAMPLE GLAZING SPECIFICATION (mm)
1st Floor – North East	Room for Hire	69	32	Slimline 4/4/4 with 75 mm air space and 8 mm safety glass
1st Floor – North West	Room for Hire	70	33	
2nd Floor - North East	Room for Hire	69	32	
	Boardroom	70	33	
2nd Floor – North West	Boardroom	70	33	
	Room for Hire	70	33	
3rd Floor - North East	Office	69	32	
3rd Floor – North West	Office	70	33	

6.2. FIXED PLANT NOISE

The previous assessment for the proposed fixed plant determined an exceedance of the -5 dB criterion of 5 dB, with rating levels falling below the background sound by 1 dB during daytime periods. As such, mitigation measures in the form of acoustic louvred barriers are proposed and have been modelled in Figure 5. The model has assumed a solid barrier around the north eastern and eastern elevations of the plant area but an acoustically treated louvred panel should provide sufficient attenuation to achieve the 4 dB reduction. The barrier/panels are modelled at a height of 1.5 m above roof level.

As can be seen, noise levels at the facades to the north east are now 48 dB, thus achieving the -5 dB criterion.

An alternative to mitigation would be the relocation of the plant. However, this may have limited benefit and could move the exceedances to north west or south east receptors thus resulting in mitigation, albeit in different locations.

Additionally, quieter VRF plant could be used as these are the main contributing plant items. A reduction of 5 dB would be recommended across all VRF models used in lieu of the above recommendations.



7. CONCLUSION AND RECOMMENDATIONS

E3P were commissioned by MCH Manchester to undertake a Noise Impact Assessment for a proposed redevelopment and extension to the Methodist Central Hall in Manchester.

Two unattended weekday and weekend background and ambient sound survey have been conducted in order to capture ambient noise levels associated with Dale Street and Oldham Street and to establish background sound levels at existing receptors.

As the internal noise levels from music are unknown, E3P have calculated an allowable limit for this based on the proposed façade insulation at the site, distance to receptors and an appropriate criterion. These limits are appropriate for the internal music speaker system and should be followed strictly.

E3P have also specified glazing specifications for all rooms. Furthermore, E3P have assessed potential plant noise impact upon existing receptors and recommended appropriate mitigation measures in order to control the noise.

Where the proposed music limits are observed and not exceeded and mitigation measures are installed, as shown in the report, the closest noise sensitive receptors and proposed rooms are protected from adverse impact from existing and proposed sound sources.

END OF REPORT

APPENDIX I
GLOSSARY OF ACOUSTIC TERMINOLOGY

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. An indication of the range of sound levels commonly found in the environment is given in the following table.

TABLE A1 TYPICAL SOUND PRESSURE LEVELS

SOUND PRESSURE LEVEL	LOCATION/EXAMPLE
0	Threshold of hearing
20–30	Quiet bedroom at night
30–40	Living room during the day
40–50	Typical office
50–60	Inside a car
60–70	Typical high street
70–90	Inside a factory
100–110	Burglar alarm at 1 m away
110–130	Jet aircraft on take off
140	Threshold of pain

ACOUSTIC TERMINOLOGY

TABLE A2 TERMINOLOGY

DESCRIPTOR	EXPLANATION
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2E-05 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 as such can be regarded as the "average maximum level". Similarly, L_{90} is the "average minimum level" and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise.
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.
Fast	A time weighting used in the root-mean-square section of a sound level meter with a 125-millisecond time constant.
Slow	A time weighting used in the root-mean-square section of a sound level meter with a 1000-millisecond time constant.

APPENDIX II
MEASURED SOUND PRESSURE LEVELS

TABLE A1 MEASURED AMBIENT AND BACKGROUND HOURLY NOISE LEVELS AT NMP1

MEASUREMENT START TIME	MEASURED AMBIENT NOISE LEVEL, $L_{Aeq,1hr}$ (dB)	MEASURED BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)
26/01/2024 13:00	63.4	56.8
26/01/2024 14:00	62.3	56.1
26/01/2024 15:00	62.2	56.1
26/01/2024 16:00	62.9	56.6
26/01/2024 17:00	62.4	56.5
26/01/2024 18:00	64.1	57.4
26/01/2024 19:00	62.4	57.4
26/01/2024 20:00	62.3	57.7
26/01/2024 21:00	62.2	57.5
26/01/2024 22:00	63.9	57.9
26/01/2024 23:00	61.7	57.0
27/01/2024 00:00	63.2	56.9
27/01/2024 01:00	61.1	57.1
27/01/2024 02:00	60.0	55.8
27/01/2024 03:00	59.2	53.1
27/01/2024 04:00	57.7	46.8
27/01/2024 05:00	55.1	46.1
27/01/2024 06:00	58.5	49.1
27/01/2024 07:00	61.3	50.9
27/01/2024 08:00	61.3	53.2
27/01/2024 09:00	62.2	54.6
27/01/2024 10:00	62.2	54.8
27/01/2024 11:00	62.5	55.4
27/01/2024 12:00	62.9	57.1
27/01/2024 13:00	62.8	57.7
27/01/2024 14:00	63.0	58.4
27/01/2024 15:00	63.2	58.7
27/01/2024 16:00	63.2	58.7
27/01/2024 17:00	65.9	58.7
27/01/2024 18:00	63.8	59.5
27/01/2024 19:00	63.3	59.4
27/01/2024 20:00	64.9	58.5
27/01/2024 21:00	62.7	58.8



MEASUREMENT START TIME	MEASURED AMBIENT NOISE LEVEL, $L_{Aeq,1hr}$ (dB)	MEASURED BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)
27/01/2024 22:00	62.9	59.1
27/01/2024 23:00	62.2	58.8
28/01/2024 00:00	61.2	57.8
28/01/2024 01:00	61.8	58.4
28/01/2024 02:00	61.5	57.5
28/01/2024 03:00	62.4	54.7
28/01/2024 04:00	58.4	50.6
28/01/2024 05:00	54.4	44.6
28/01/2024 06:00	58.2	45.9
28/01/2024 07:00	64.3	48.9
28/01/2024 08:00	58.5	49.2
28/01/2024 09:00	63.7	51.6
28/01/2024 10:00	61.2	52.3
28/01/2024 11:00	62.1	55.6
28/01/2024 12:00	62.3	56.0
28/01/2024 13:00	61.3	55.7
28/01/2024 14:00	61.9	56.2
28/01/2024 15:00	63.0	55.6
28/01/2024 16:00	61.1	55.1
28/01/2024 17:00	63.2	54.1
28/01/2024 18:00	60.2	53.3
28/01/2024 19:00	59.0	52.1
28/01/2024 20:00	59.1	52.1
28/01/2024 21:00	58.1	50.6
28/01/2024 22:00	59.2	50.7
28/01/2024 23:00	57.0	48.5
29/01/2024 00:00	54.9	45.1
29/01/2024 01:00	54.2	44.6
29/01/2024 02:00	52.6	42.6
29/01/2024 03:00	52.8	42.0
29/01/2024 04:00	51.7	42.0
29/01/2024 05:00	59.2	43.6
29/01/2024 06:00	63.0	52.0
29/01/2024 07:00	65.2	56.6

MEASUREMENT START TIME	MEASURED AMBIENT NOISE LEVEL, $L_{Aeq,1hr}$ (dB)	MEASURED BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)
29/01/2024 08:00	64.0	56.8
29/01/2024 09:00	65.0	57.2
29/01/2024 10:00	63.7	56.0
29/01/2024 11:00	63.9	56.9
29/01/2024 12:00	63.5	56.6
29/01/2024 13:00	64.2	57.3
29/01/2024 14:00	63.2	56.3
29/01/2024 15:00	63.2	55.8
29/01/2024 16:00	64.9	57.0
29/01/2024 17:00	64.3	56.6
29/01/2024 18:00	64.2	56.2
29/01/2024 19:00	63.7	55.5
29/01/2024 20:00	62.3	52.8
29/01/2024 21:00	61.5	51.2
29/01/2024 22:00	65.3	51.2
29/01/2024 23:00	61.3	51.4
30/01/2024 00:00	60.3	48.4
30/01/2024 01:00	57.8	45.7
30/01/2024 02:00	54.9	43.9
30/01/2024 03:00	54.0	43.7
30/01/2024 04:00	55.1	44.8
30/01/2024 05:00	67.9	49.1
30/01/2024 06:00	61.4	49.4
30/01/2024 07:00	63.7	53.7
30/01/2024 08:00	63.9	55.8
30/01/2024 09:00	65.2	58.7
30/01/2024 10:00	64.2	56.9
30/01/2024 11:00	63.0	55.7
30/01/2024 12:00	64.0	56.3

TABLE A2 MEASURED AMBIENT AND BACKGROUND HOURLY NOISE LEVELS AT NMP2

MEASUREMENT START TIME	MEASURED AMBIENT NOISE LEVEL, $L_{Aeq,1hr}$ (dB)	MEASURED BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)
26/01/2024 13:00	65.9	59.7
26/01/2024 14:00	66.0	59.9
26/01/2024 15:00	64.8	59.9
26/01/2024 16:00	66.8	59.3
26/01/2024 17:00	66.4	61.0
26/01/2024 18:00	67.2	61.0
26/01/2024 19:00	65.9	60.5
26/01/2024 20:00	66.0	59.4
26/01/2024 21:00	67.2	60.3
26/01/2024 22:00	67.7	60.9
26/01/2024 23:00	65.8	62.4
27/01/2024 00:00	65.4	60.9
27/01/2024 01:00	63.7	59.6
27/01/2024 02:00	63.0	57.9
27/01/2024 03:00	65.5	57.7
27/01/2024 04:00	58.7	53.7
27/01/2024 05:00	60.0	50.5
27/01/2024 06:00	62.9	50.5
27/01/2024 07:00	63.8	52.0
27/01/2024 08:00	65.3	54.8
27/01/2024 09:00	67.2	57.1
27/01/2024 10:00	65.9	59.5
27/01/2024 11:00	65.5	58.7
27/01/2024 12:00	67.1	59.3
27/01/2024 13:00	66.2	61.6
27/01/2024 14:00	66.7	61.2
27/01/2024 15:00	67.7	61.8
27/01/2024 16:00	67.0	62.6
27/01/2024 17:00	75.1	62.3
27/01/2024 18:00	66.9	62.6
27/01/2024 19:00	66.5	61.3
27/01/2024 20:00	65.6	60.3
27/01/2024 21:00	65.4	59.9



MEASUREMENT START TIME	MEASURED AMBIENT NOISE LEVEL, $L_{Aeq,1hr}$ (dB)	MEASURED BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)
27/01/2024 22:00	66.1	60.2
27/01/2024 23:00	65.7	61.0
28/01/2024 00:00	64.5	61.3
28/01/2024 01:00	66.9	59.5
28/01/2024 02:00	63.7	58.9
28/01/2024 03:00	61.9	57.8
28/01/2024 04:00	59.8	55.0
28/01/2024 05:00	56.5	51.3
28/01/2024 06:00	60.0	49.7
28/01/2024 07:00	62.7	50.3
28/01/2024 08:00	62.1	52.3
28/01/2024 09:00	64.9	52.8
28/01/2024 10:00	64.1	54.4
28/01/2024 11:00	64.1	55.1
28/01/2024 12:00	65.4	57.8
28/01/2024 13:00	64.8	59.3
28/01/2024 14:00	65.7	59.3
28/01/2024 15:00	65.9	60.0
28/01/2024 16:00	65.0	59.3
28/01/2024 17:00	72.1	59.3
28/01/2024 18:00	64.0	58.2
28/01/2024 19:00	62.7	57.9
28/01/2024 20:00	61.8	55.4
28/01/2024 21:00	62.7	55.1
28/01/2024 22:00	63.7	55.1
28/01/2024 23:00	61.0	54.9
29/01/2024 00:00	56.5	53.1
29/01/2024 01:00	57.9	50.4
29/01/2024 02:00	54.5	50.4
29/01/2024 03:00	54.9	49.4
29/01/2024 04:00	58.1	49.1
29/01/2024 05:00	63.5	49.0
29/01/2024 06:00	69.6	50.4
29/01/2024 07:00	74.0	59.5



MEASUREMENT START TIME	MEASURED AMBIENT NOISE LEVEL, $L_{Aeq,1hr}$ (dB)	MEASURED BACKGROUND SOUND LEVEL, $L_{A90,1hr}$ (dB)
29/01/2024 08:00	71.0	62.3
29/01/2024 09:00	69.7	62.9
29/01/2024 10:00	67.9	60.4
29/01/2024 11:00	67.0	59.6
29/01/2024 12:00	71.0	59.0
29/01/2024 13:00	70.1	60.1
29/01/2024 14:00	68.0	64.2
29/01/2024 15:00	67.3	61.5
29/01/2024 16:00	68.6	59.1
29/01/2024 17:00	67.7	60.7
29/01/2024 18:00	67.5	60.6
29/01/2024 19:00	67.0	60.4
29/01/2024 20:00	65.1	58.7
29/01/2024 21:00	64.4	55.8
29/01/2024 22:00	74.9	55.5
29/01/2024 23:00	64.6	55.3
30/01/2024 00:00	62.6	54.6
30/01/2024 01:00	58.4	51.9
30/01/2024 02:00	55.9	50.6
30/01/2024 03:00	56.6	49.8
30/01/2024 04:00	66.0	49.5
30/01/2024 05:00	65.0	50.0
30/01/2024 06:00	65.4	55.3
30/01/2024 07:00	67.2	55.4
30/01/2024 08:00	70.4	58.2
30/01/2024 09:00	75.2	59.2
30/01/2024 10:00	67.6	64.4
30/01/2024 11:00	66.9	60.7
30/01/2024 12:00	66.3	59.2

APPENDIX III
FIGURES

Figure 1 - Noise Survey Measurement Positions



Project:
Methodist Central Hall Manchester

Project-No:
51-100

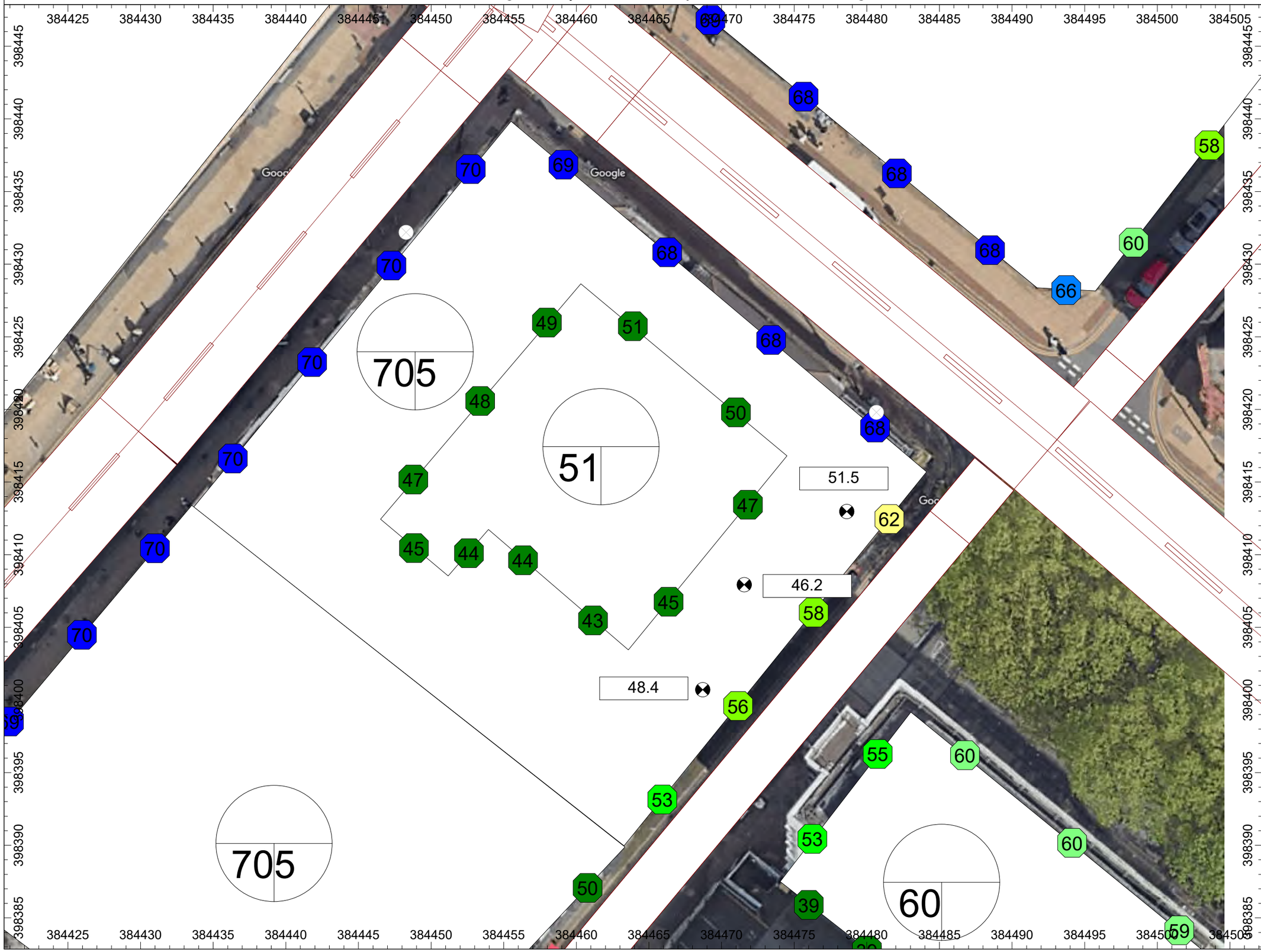
Client:
MCH Manchester

N

e3p

Project Engineer: L Faulkner
Date: 31/01/2024

Figure 2 - Daytime Grid Noise Map - Calculation at 1.5m above ground level



Project:
Methodist Central Hall, Manchester

Project-No:
51-100

Client:
MCH Manchester

Daytime Noise Level, LAeq,16hr (dB)

- ... <= 52
- 52 < ... <= 55
- 55 < ... <= 58
- 58 < ... <= 60
- 60 < ... <= 62
- 62 < ... <= 65
- 65 < ... <= 68
- 68 < ... <= 70
- 70 < ...

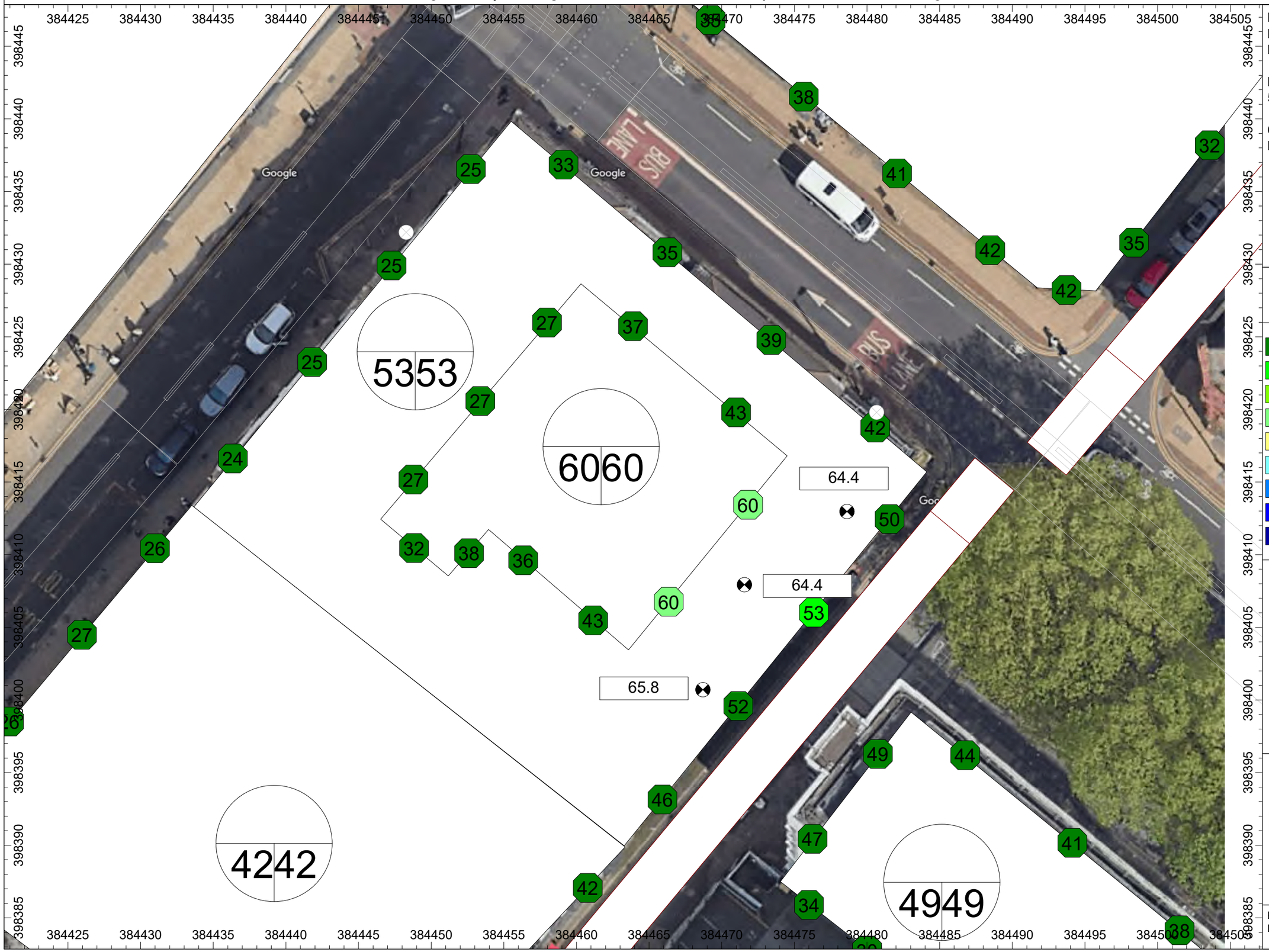
Noise Map Objects

- Area Source
- Road
- Building
- Height Point
- Receiver
- Building Evaluation

e3p

Project Engineer: L Faulkner
Date: 31/01/2024

Figure 3 - Daytime Usage of External Terrace Grid Noise Map - Calculation at 1.5m above ground level



Project:
Methodist Central Hall, Manchester

Project-No:
51-100

Client:
MCH Manchester

Daytime Noise Level, LAeq,16hr (dB)

- ... <= 52
- 52 < ... <= 55
- 55 < ... <= 58
- 58 < ... <= 60
- 60 < ... <= 62
- 62 < ... <= 65
- 65 < ... <= 68
- 68 < ... <= 70
- 70 < ...

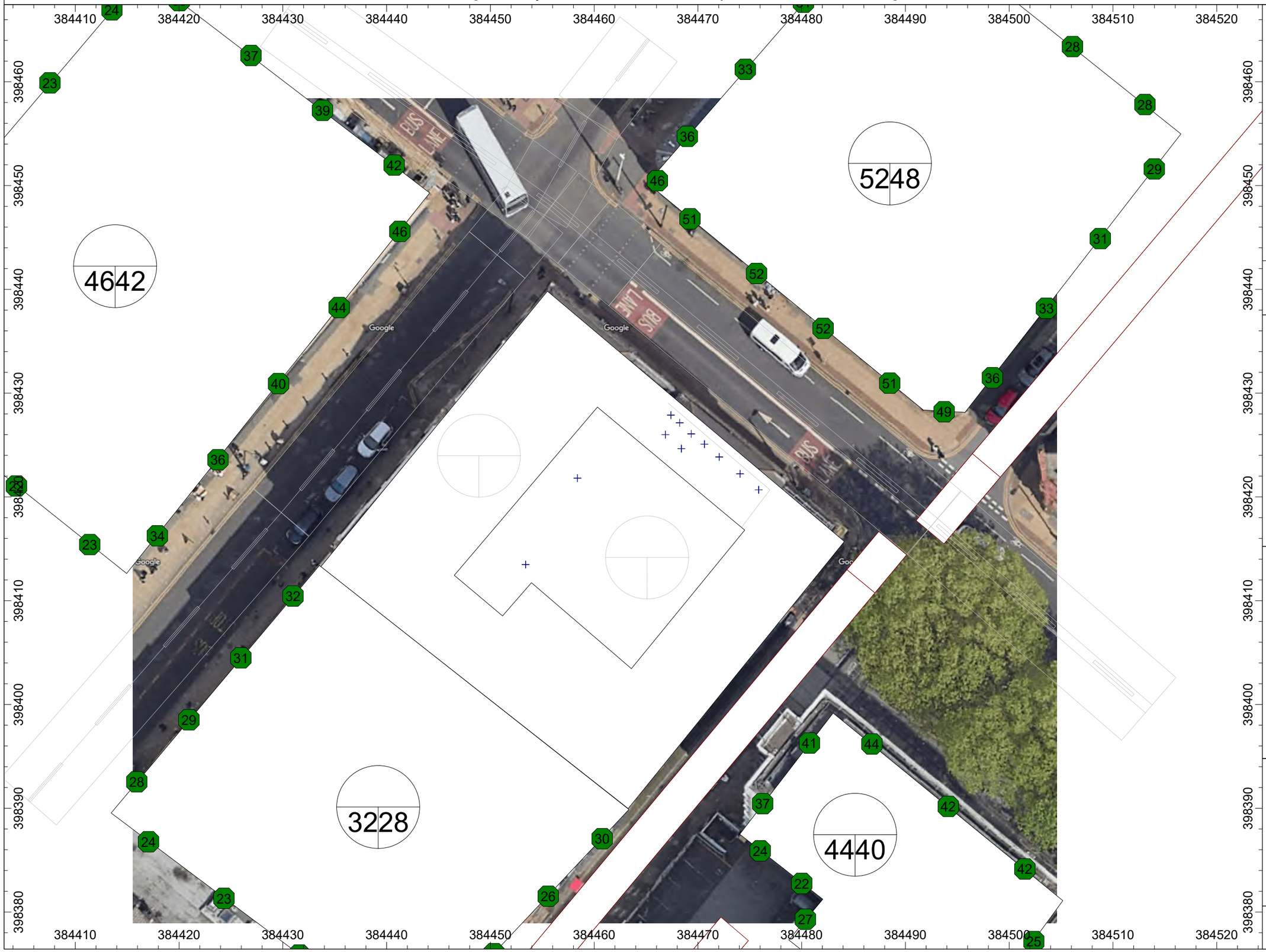
Noise Map Objects

- Area Source
- Road
- Building
- Height Point
- Receiver
- Building Evaluation

e3p

Project Engineer: L Faulkner
Date: 31/01/2024

Figure 4 - Daytime Fixed Plant Grid Noise Map - Calculation at 1.5m above ground level



Project:
Methodist Central Hall, Manchester

Project-No:
51-100

Client:
MCH Manchester

Rating Level, LA,r (dB)

- ... <= 52
- 52 < ... <= 55
- 55 < ... <= 58
- 58 < ... <= 60
- 60 < ... <= 62
- 62 < ... <= 65
- 65 < ... <= 68
- 68 < ... <= 70
- 70 < ...

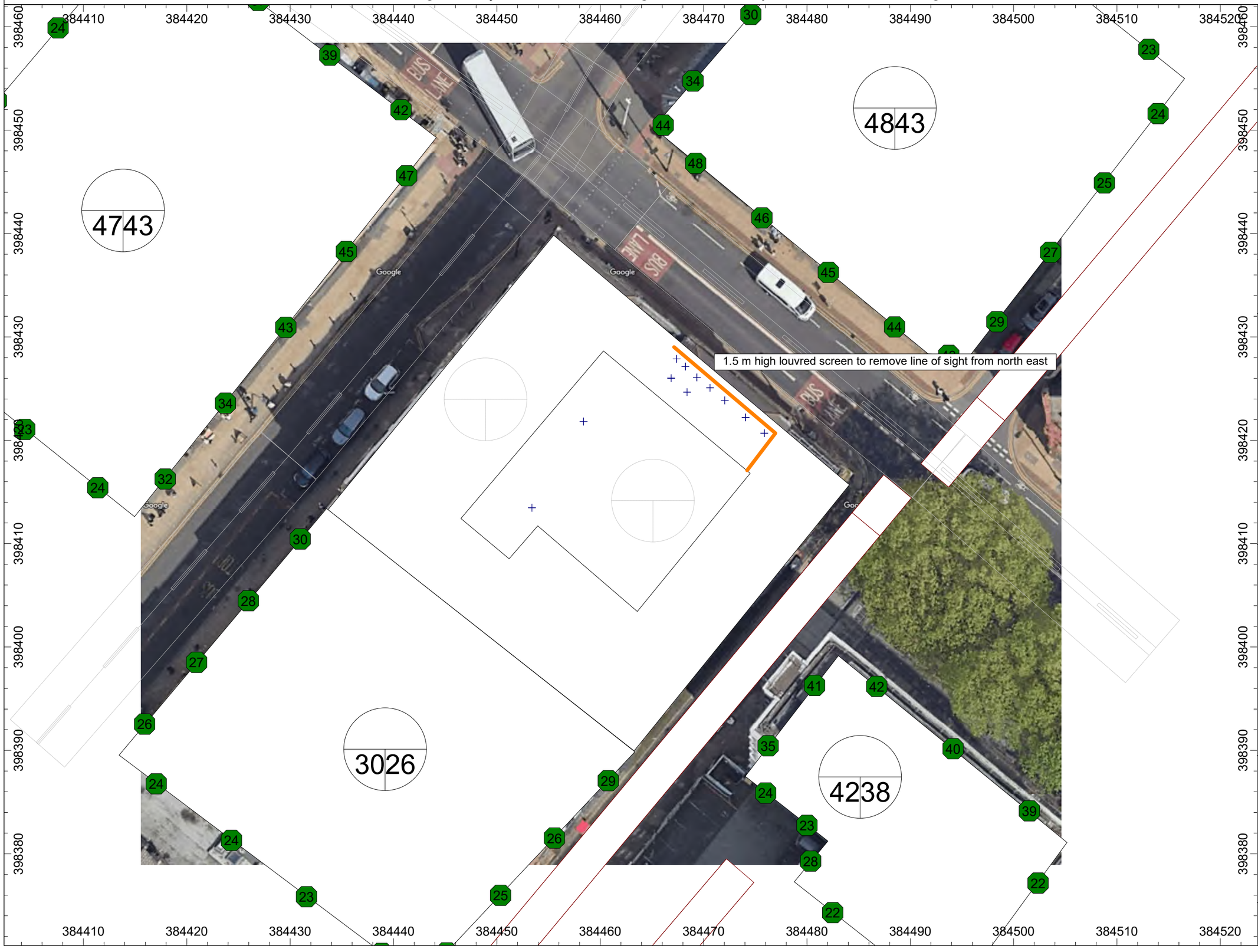
Noise Map Objects

- Point Source
- Area Source
- Road
- Building
- Barrier
- Height Point
- Building Evaluation

e3p

Project Engineer: L Faulkner
Date: 26/03/2024

Figure 5 - Daytime Fixed Plant with Mitigation Grid Noise Map - Calculation at 1.5m above ground level



Project:
Methodist Central Hall, Manchester

Project-No:
51-100

Client:
MCH Manchester

Rating Level, LA,r (dB)

- ... <= 52
- 52 < ... <= 55
- 55 < ... <= 58
- 58 < ... <= 60
- 60 < ... <= 62
- 62 < ... <= 65
- 65 < ... <= 68
- 68 < ... <= 70
- 70 < ...

Noise Map Objects

- Point Source
- Area Source
- Road
- Building
- Barrier
- Height Point
- Building Evaluation

e3p

Project Engineer: L Faulkner
Date: 26/03/2024