

Ref: 51-119-R3-1
Date: 4th July 2024

KW TOWERS LTD

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BY Email

TECHNICAL NOTE – NIGHT-TIME OPERATION OF THE ASHP WORTHINGTON HOUSE, DIDSBURY

1. BACKGROUND

E3P have been commissioned to provide evidence that the currently operational Air Source Heat Pump (ASHP) would be able to operate during the night-time period without causing adverse impact to the surrounding noise sensitive receptors. This ASHP has been granted permission to operate during daytime hours currently (application reference 138822/FO/2023).

As such, E3P have undertaken a BS 4142:2014+A1:2019 assessment of fixed plant sound during night-time periods for the surrounding residential receptors. Consideration has also been given to existing office receptors which are assessed in accordance with BS 8233:2014+A1:2019 criterion as given that the ASHP will be operational it is assumed the office will be occupied. The assessment was undertaken by Scott Boughton, Senior Acoustic Consultant at E3P and a member of the Institute of Acoustics (MIOA).



2. NOISE SURVEY

2.1. BACKGROUND SOUND MEASUREMENTS

E3P has undertaken attended background sound measurements during worst case night-time hours. An unattended long-term measurement was not possible due to site constraints, with security of the monitor equipment being the primary reason. As such, worst-case periods have been captured. The survey was carried out over the following time periods:

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 03:35 to 06:05 Tuesday 2nd July 2024.

The following Noise Measurement Position was used:

 Noise Measurement Position 1 (NMP1): Located on the northern boundary of the Worthington House site in free field conditions. The sound climate was dominated by road traffic sound on the surrounding road network. This position is representative of the closest noise-sensitive receptor located to the north on Wilmslow Road.

Table 2.1 details the measured background sound levels.

TABLE 2.1 BACKGROUND SOUND MEASUREMENTS

MEASUREMENT PERIOD	MEASURED AMBIENT SOUND LEVEL, $L_{Aeq,15min}$ (dB)	MEASURED BACKGROUND SOUND LEVEL, $L_{A90,15min}$ (dB)
03:35 – 03:50	41.8	35.3
03:50 – 04:05	42.6	35.7
04:05 – 04:20	43.8	37.0
04:20 – 04:35	43.5	36.7
04:35 – 04:50	46.5	37.3
04:50 – 05:05	57.4	38.6
05:05 – 05:20	45.4	38.8
05:20 – 05:35	46.7	40.1
05:35 – 05:50	48.4	42.4
05:50 – 06:05	59.7	42.4

The typical background sound level during the night-time period has been determined by finding the median of the above data set. This equates to a median value of 38 dB and is considered typical and representative of the background sound level and can be considered a worst case.



Technical Note – Night-time Operation of the ASHP

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TABLE 2.2 NOISE MEASUREMENT EQUIPMENT AND CALIBRATION DATES

MEASUREMENT POSITION	EQUIPMENT DESCRIPTION	MANUFACTURER & TYPE NUMBER	SERIAL NUMBER	CALIBRATION DUE DATE
NMP1	Sound Level Meter	Cirrus CR:171A	G303884	15/09/2025
	Pre-amplifier	Cirrus MV:200F	12731F	
	Microphone	Cirrus MK:224	215899D	
	Calibrator	Cirrus CR:515	99403	15/09/2024

The sound level meter was 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.



3. BS 4142 ASSESSMENT

For the BS 4142:2014+A1:2019 assessments, penalties are applied to the specific sound level to provide the rating level. These penalties relate to the acoustic features of the sound source. Accordingly, the following objective and subjective features have been accounted for in the assessment, in accordance with the subjective method detailed in BS 4142:2014+A1:2019.

TABLE 3.1 ACOUSTIC FEATURES

ACOUSTIC FEATURE	APPLICABLE?	ATTRIBUTABLE PENALTY	COMMENT
Tonality	No	-	No tonality is detected
Impulsivity	No	-	Plant is steady state at the receptors when in operation
Intermittency	No	-	Plant is steady state at the receptors when in operation
Other Sound Characteristics	No	-	The ASHP when operational is at a low level. The lowest ambient sound level measured was 42 dB as such ambient sound levels mask the ASHP noise

Table 3.2 below details the BS 4142 assessment for the closest receptors during the night-time.

The nearby office windows are assessed separately in Section 4.

E3P has been to the site to measure the installed ASHP in order to discharge the pre-commencement condition Part B. This survey determined the ASHP operates at a derived sound power level of 79 dB. As such this will be used for the assessment. This will be input as a point source within the 3D noise model.

E3P have utilised 3D noise modelling software, CadnaA, to model noise from the fixed plant at nearby receptors. Regarding assumptions for the assessment, the following has been considered:

- ✳ Ground 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.
- ✳ Ground absorption is set at 0.
- ✳ A reflection order of 1 is used.
- ✳ Noise levels generated using ISO 9613-1 and ISO 9613-2 “Acoustics – Attenuation of sound during propagation outdoors” as incorporated into CadnaA software.



3.1. NIGHT-TIME ASSESSMENT

TABLE 3.2 WORST-CASE NIGHT-TIME BS 4142 ASSESSMENT

RESULTS		RELEVANT CLAUSE	COMMENTARY
Sound Power Level of the ASHP	79 dB	7.1 7.3 7.3.6	Derived sound power levels from measurements taken of the ASHP in operation at the site. Taken from the Technical note reference '51-119-R2-1'
Residual sound level	N/A	7.3.3 7.3.5	N/A
Background sound level	38 dB L _{A90,15min}	8.1.3 8.3 8.4 8.5	E3P have taken the typical background sound level during a worst-case night-time period to inform a worst-case assessment.
Assessment made during the night-time, so the reference time interval is 15 minutes		7.2	
Specific sound level	33 dB L _{Aeq,1hr}	7.3.4 7.3.5 7.3.6 7.3.7	3D noise modelling used to calculate the specific sound level outside the façade of the closest residential receptor due to fixed plant sound.
Acoustic feature correction	0 dB	9.2	No penalties applied. Tonality, intermittency and impulsivity were not found to be present. The 'other' penalty is not applicable as the lowest measured ambient sound level of 42 dB indicates that the specific noise levels of 33 dB at the worst affected receptor will be masked by existing noise sources.
Rating level	33 dB L _{A,r}	9.2	Specific sound level + acoustic feature correction.
5 dB Below Background sound level	L _{A90,15min} = (38 – 5) = 33 dB	8	Manchester City Council require 5 dB below the background
Excess of rating over background sound level	(33 – 33) dB = 0 dB achieving the criterion	11	The closest façade to the plant would experience rating levels that are equal to the background sound level criterion.
Assessment indicates likely indication of a significant adverse impact, depending on the context		11	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.



RESULTS		RELEVANT CLAUSE	COMMENTARY
Uncertainty of the assessment	Not significant	10	The consideration of uncertainty, likely to be approximately 1 dB may cause an exceedance of 1 dB however given that the criterion is 5 dB below the typical background sound level the receptors would still be protected with noise levels not exceeding the actual background sound level.

4. BS 8233 OFFICE NOISE IMPACT ASSESSMENT

In order to assess the potential impact of fixed plant sound on the nearby office windows, E3P have considered the internal criteria stipulated in BS 8233:2014+A1:2019. Specifically, the following criterion will be applied:

 Open Plan Office – Design range of 45-50 dB.

Therefore, E3P have outputted the façade noise level from the noise model at the closest window, which is also noted in Figure 1.

The model has predicted a sound pressure level of 59 dB at the closest window. With windows open (13 dB attenuation), internal noise levels are expected to be approximately 46 dB which achieves the criterion of the design range above.

However, it should be noted that the closest and surrounding office buildings have no openable windows and, as such, internal noise levels would be dictated by the attenuation afforded by closed windows, 29 dB (R_w), if standard glazing is assumed. Given this, internal noise levels are expected to be 30 dB. This is 15 dB below the lower design range for open plan office spaces.

Furthermore, this is 5 dB below the lower design range criterion for executive office spaces where the design range is 35 dB to 40 dB.

As such, no adverse impact is predicted at existing surrounding office buildings as a result of the operation of the plant.



5. CONCLUSION

E3P have been commissioned to carry out an assessment to investigate the feasibility of the currently operational ASHP operating within the night-time period at the existing Worthington House office building in Didsbury.

As such, E3P have undertaken a BS 4142:2014+A1:2019 assessment of fixed plant sound during night-time period when the ASHP is proposed to be operational, for the nearby residential receptors. Assessment of internal noise levels at nearby office spaces has also been considered in accordance with BS 8233:2014+A1:2019 criterion.

It was found that the night-time rating level either achieves or falls well below the background sound level criterion set by Manchester City Council. Given this, no adverse impact is predicted if the operation of the ASHP was to be extended throughout the night-time period.

With regards to office space, internal noise levels are expected to achieve all relevant criterion. As such, no adverse impact is predicted at existing office spaces as a result of the operation of the plant.

Given the above, I trust this provides sufficient information in order to allow for the granting of permission to allow the ASHP to operate during the night-time but please do not hesitate to contact me should you require further information.

Yours sincerely,
For and on behalf of E3P Ltd

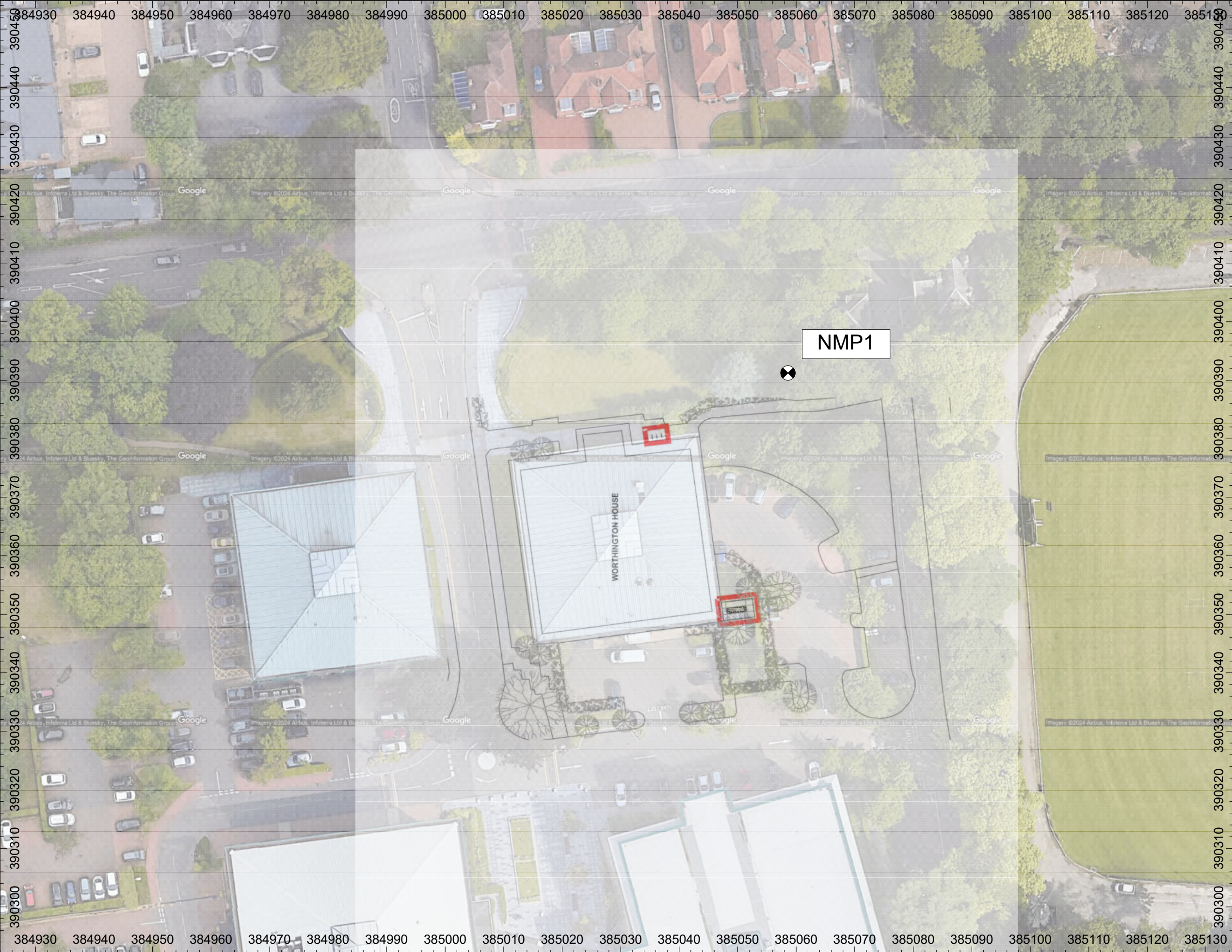
Scott Boughton
Senior Acoustic Consultant



APPENDIX I

FIGURES

Figure 1 - Noise Measurement Positions



Project:
Worthington House,
Didsbury

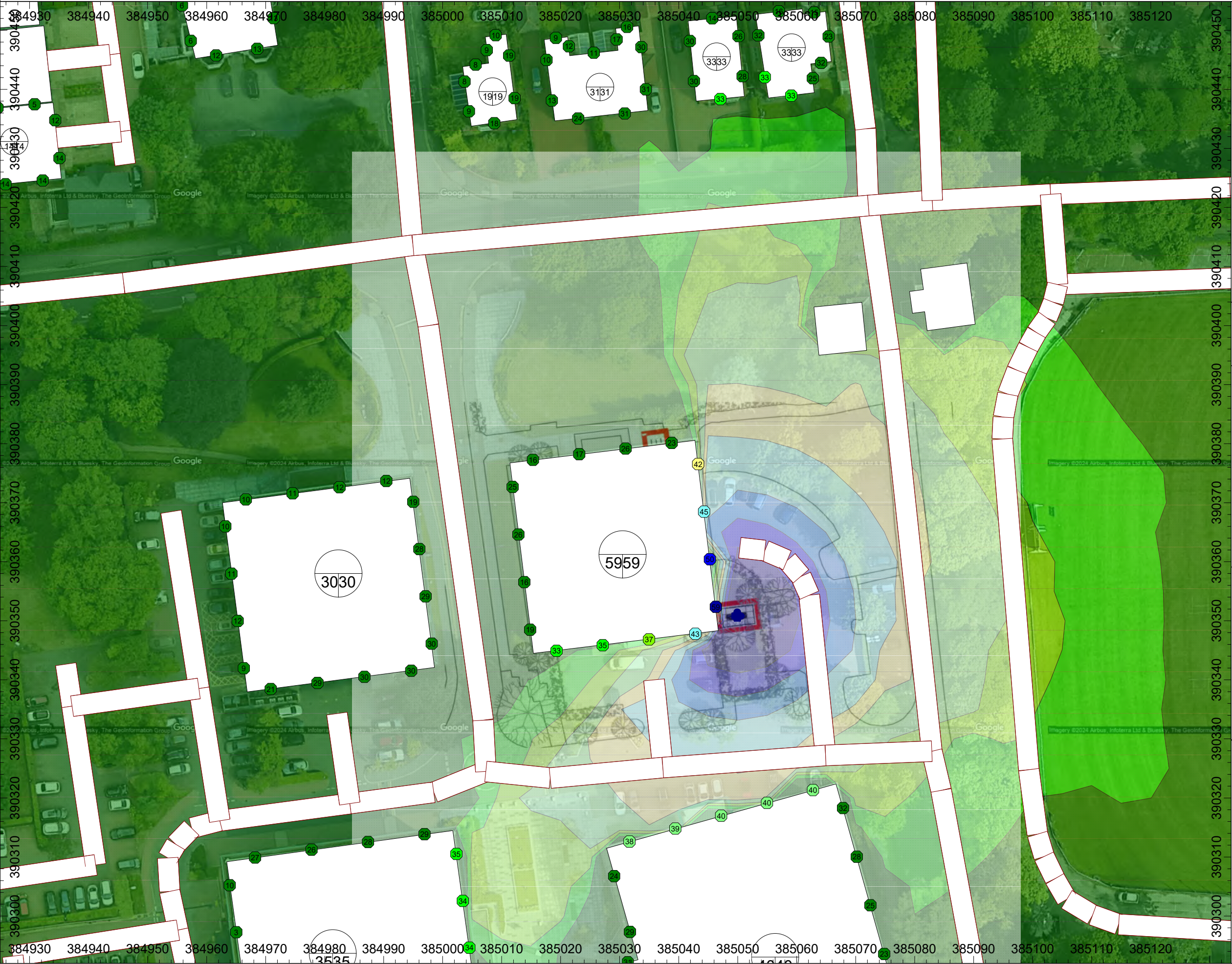
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Project Engineer: Scott Boughton
Date: 03/07/2024

Figure 2 - Night-time Grid Noise Map (BS 4142) - Calculation at 4.5 m above ground level



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**Night-time Specific Noise Level,
LAeq, T (dB)**

Dark Green	... ≤ 32
Light Green	32 < ... ≤ 35
Yellow-Green	35 < ... ≤ 38
Yellow	38 < ... ≤ 40
Light Blue	40 < ... ≤ 42
Medium Blue	42 < ... ≤ 45
Dark Blue	45 < ... ≤ 48
Purple	48 < ... ≤ 50
Dark Purple	50 < ...

Noise Map Objects

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

Project Engineer: Scott Boughton
Date: 03/07/2024