parkerjones acoustics

57 Osborne Road

London, E7 0PJ

Noise Impact Assessment

27th October 2023

First Issue

57 Osborne Road

London, E7 0PJ

Noise Impact Assessment

27th October 2023

First Issue

Revision History

Version	Comments	Author	Checked By	Date
First Issue	First issued version of the report	**Patrick Shuttleworth** Acoustic Consultant BSc (Hons) MIOA	**Chris Parker-Jones** Director and Acoustic Consultant BSc (Hons) MSc MIOA	27th October 2023

ParkerJones Acoustics Limited

Bristol
11 Bankside Road
Brislington
Bristol
BS4 4LB

London
29 Lincoln's Inn Fields
Holborn
London
WC2A 3EE

Glasgow
126 West Regent Street
Glasgow
G2 2RQ

+44 (0)800 830 3338
+44 (0)117 914 6558
info@parkerjonesacoustics.com
www.parkerjonesacoustics.com

Registered in England and Wales
Company No. 12235614

Executive Summary and Conclusions

This document, a Noise Impact Assessment (NIA) has been written to assess the risk of adverse impact on local noise-sensitive receptors from noise generated by the proposed installation of an external air source heat pump (ASHP) at 57 Osborne Road, London, E7 0PJ.

The assessment has been conducted by predicting the plant noise emissions and assessing against existing background noise levels at nearby noise-sensitive receptors, in accordance with BS 4142:2014+A1:2019, and the typical planning conditions applied by the local planning authority.

The existing background sound levels have been measured by conducting a baseline noise survey (Section 4.0) at the site, determining a representative background sound level of 44 dB L_{A90} during the day, and 39 dB L_{A90} at night. The local planning authority require that the rating level of the mechanical plant installation does not exceed the existing background noise levels.

The results indicate that the local authority criteria are met, with the rating level during the daytime, when running in cooling mode (the noisiest mode) at full capacity, being 3 dB below the existing representative background noise level.

At night-time, the limit is met providing that the unit is restricted to 'night-time' / 'quiet' mode between 23:00 and 07:00 (and will be 5 dB below the representative night-time background sound level).

Contents

1.0 Introduction

ParkerJones Acoustics Limited (PJA) has been instructed to undertake a Noise Impact Assessment regarding the installation of an external air source heat pump (ASHP) at 57 Osborne Road, London, E7 0PJ.

This document has been written to assess the risk of adverse impact from noise 'pollution' generated by proposed unit ('the plant') on neighbouring residential properties.

The purpose of this report is to determine the representative background sound level outside of neighbouring residential properties; set appropriate noise level criteria based upon this pre-existing noise level in line with Local Planning Policy and demonstrate whether the plant has been designed and located to sufficiently mitigate noise levels to meet these noise level limits successfully – and if not, provide recommendations on how to mitigate the impact to an acceptable level.

This report takes into consideration the noise pollution related planning conditions that have been applied to other sites in the nearby area by the LPA (in this case the London Borough of Newham).

Whilst every attempt has been made to ensure that this report communicates effectively to a reader who might not have much knowledge of acoustics, some parts are necessarily technical. A glossary of acoustic terminology and concepts is provided in Appendix A.

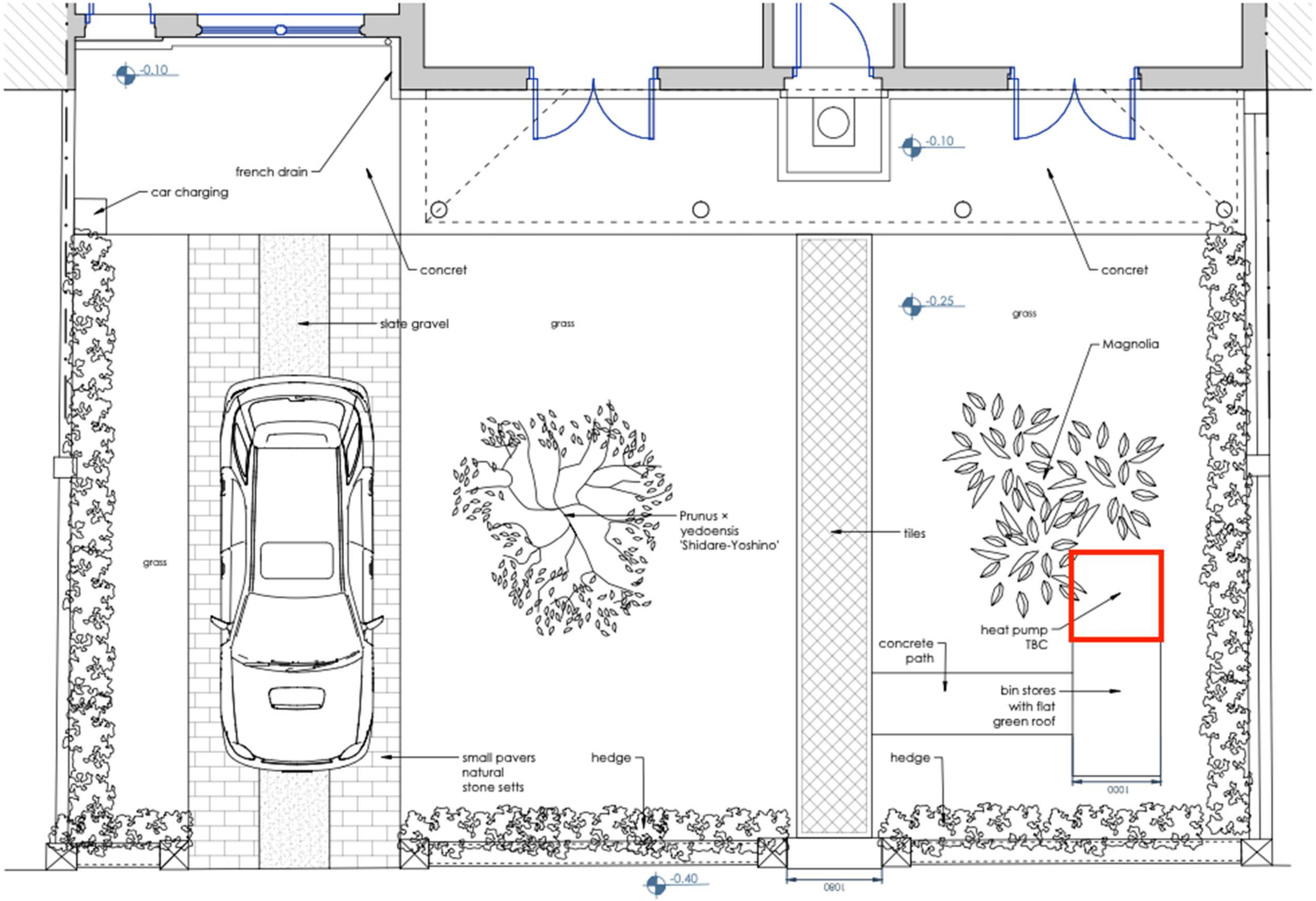
2.0 Site and Development Description

The property in question is a two storey house at no. 57 Osborne Road, London, E7 0PJ – located as shown in Figure 2.1. The proposals assessed herein are for the installation of a single external ASHP at the front of the premises as shown in Figure 2.2.

The property is surrounded by residential properties on all sides. The noise modelling software used in the assessment inherently accounts for *all* neighbouring windows in the area rather than assume that the closest is the worst-affected.

Figure 2.1 – Aerial view of the site

Figure 2.2 – Proposed plans, ASHP location (red)



3.0 Local Authority Requirements

Whilst there are no planning conditions placed upon the proposals at this stage, PJA believes that the standard condition applied to similar applications in the London Borough of Newham is as follows;

Prior to the commencement of works on the development hereby permitted, an acoustic report shall be submitted to and approved by the Local Planning Authority. All plant operation and activity on site shall not give rise to a BS4142 rating level greater than the background level at the nearest or worst affected property. Where it is considered impractical to meet this noise standard the report should detail mitigation measures taken to reduce noise to a minimum.

The approved scheme shall be implemented prior to occupation of the development and shall be permanently maintained thereafter. The developer shall certify to the local planning authority that the noise mitigation measures agreed have been installed prior to first use of the equipment.

Reasons: To protect the amenity of future occupants and/or neighbours.

4.0 Baseline Noise Survey

4.1 Methodology

PJA has attended the site to conduct a baseline noise survey between Tuesday the 17th and Sunday the 22nd of October 2023. The results have been used to determine a representative background sound level at nearby residential receptors.

A fixed monitoring position was employed on the front façade of No 57, approximately 1m outside of a 1st floor close to the nearest neighbouring property at no. 59. The location of the monitoring position is also shown in Figure 2.1 (Section 2.0).

The sound level meter was set to log noise levels over continuous 15-minute averaging periods with a 1-second time history rate. The monitoring equipment was left unattended for the majority of the survey with the exception for a short period around the installation and collection of the equipment.

The following noise indices were recorded (amongst others):

- $L_{Aeq,T}$: The A-weighted equivalent continuous noise level over the measurement period T. This parameter is typically considered as a good representation of the average ambient sound level;
- $L_{AFmax,T}$: The maximum A-weighted noise level during the measurement period T and the best representation of short high noise levels 'events' – i.e., emergency services sirens; and
- $L_{A90,T}$: The A-weighted noise level that is exceeded for 90% of the measurement period T. This parameter is often considered as the 'average minimum level' and is therefore used in determining the representative background noise level – or noise levels from continuous noise sources such as plant.

Appendix B contains further information on the methodology of the survey, including photographs taken from site and the equipment used.

4.2 Results

A graph of the measured noise levels across the monitoring period is given in Figure 4.1. Table 4.1 summarises the results across the daytime (07:00 – 23:00) and night-time (23:00 – 07:00) periods.

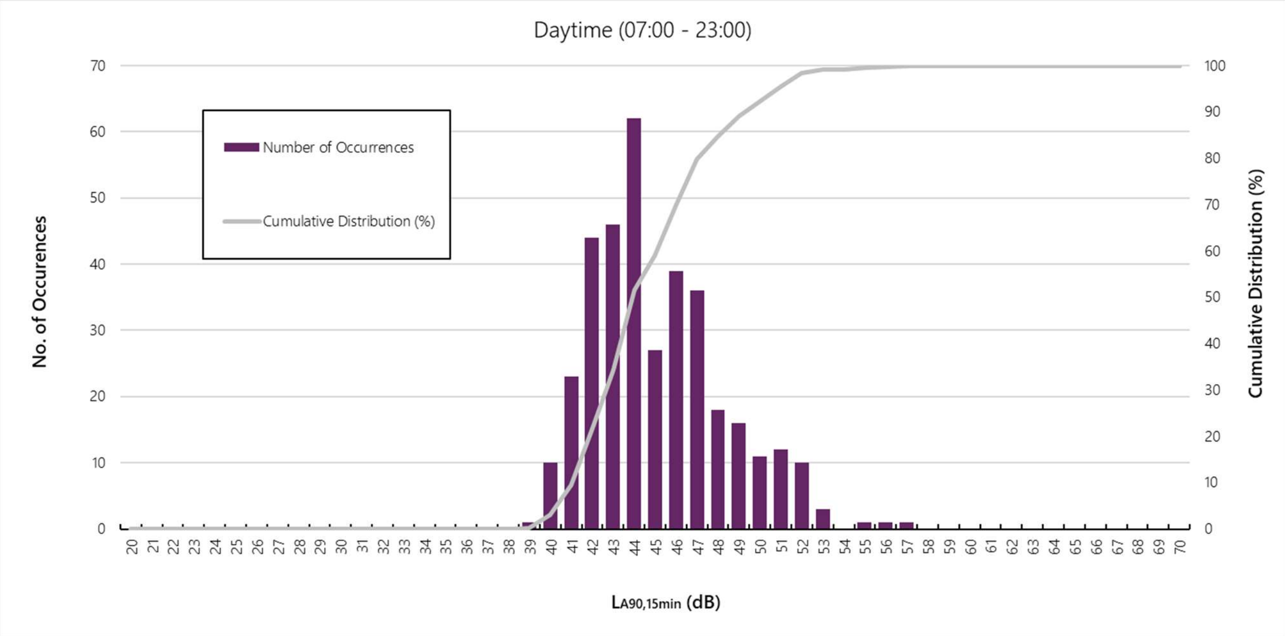
The most relevant parameter in terms of the 'representative background sound level' referenced in BS 4142:2014 is the $L_{A90,15min}$. Figure 4.2 presents histograms of the $L_{A90,15min}$ values – showing modal values of 39 dB overnight and 44 dB during the day.

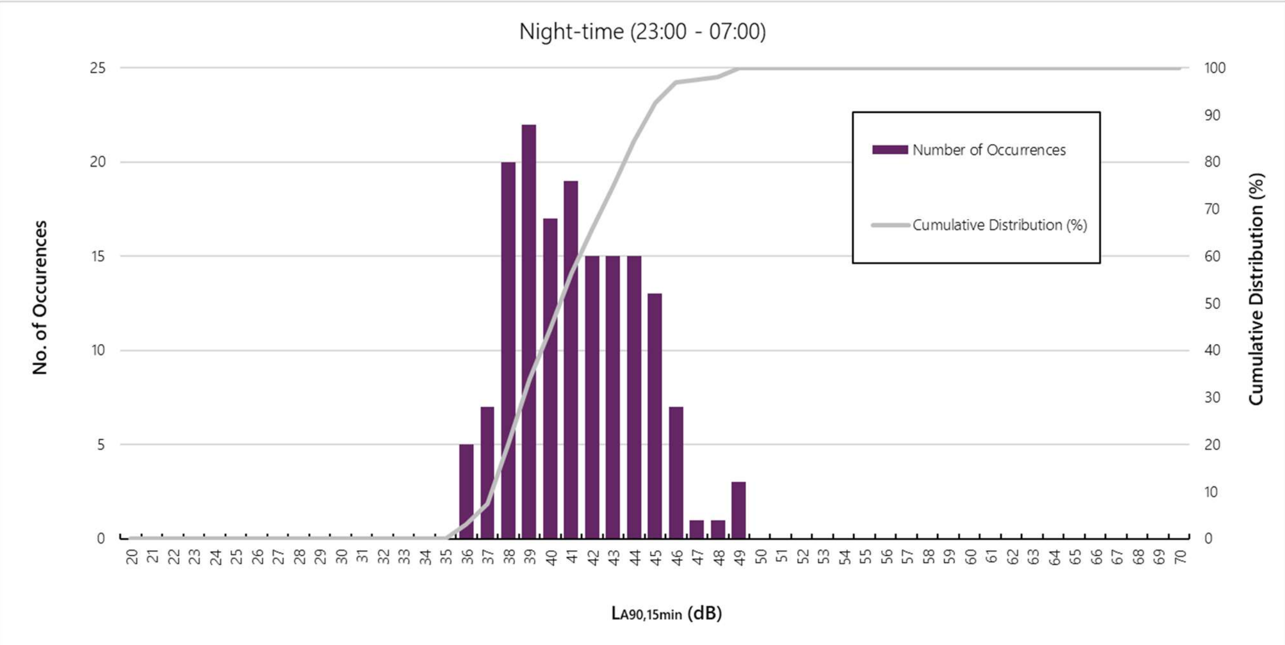
Table 4.1 – Summary of measured noise levels

Period	Parameter	Maximum	Minimum	Logarithmic Average	Mean Average	Modal Average	Median Average
Daytime (07:00 – 23:00)	$L_{Aeq,15min}$ (dB)	70	47	55	53	54	53
	$L_{AFMax,15min}$ (dB)	97	59	76	69	66	68
	$L_{A90,15min}$ (dB)	57	39	46	45	44	44
Night-time (23:00 – 07:00)	$L_{Aeq,15min}$ (dB)	65	39	50	47	48	47
	$L_{AFMax,15min}$ (dB)	80	46	67	63	65	63
	$L_{A90,15min}$ (dB)	49	36	42	41	39	41

Figure 4.1 – Graph of measured noise levels

Figure 4.2 – Histogram of measured $L_{A90,15min}$ values





5.0 Assessment

5.1 Methodology

The following summarises the main steps of action in the assessment method:

- An estimated representative background sound level $L_{A90,Tr}$ is determined;
- the maximum permissible plant noise level $L_{Aeq,T}$ outside of neighbouring windows is then determined based upon the $L_{A90,T}$ and the criteria set by the Local Planning Authority;
- the specific sound level L_s at nearby residential windows is predicted using a 3D noise model/noise mapping;
- the predicted specific sound level L_s is compared to the $L_{A90,Tr}$ and the criteria set by the Local Planning Authority;
- if necessary, mitigation measures are recommended to reduce the predicted rating level.

5.2 Background Sound Levels

The predicted plant noise emissions at noise-sensitive receptors should be assessed against a 'representative' background sound level. This is commonly determined through the results of a baseline sound survey, as has been done here.

BS 4142:2014 states that *"in using the background sound level in the method for rating and assessing industrial and commercial sound it is important 0PJto ensure that values are reliable and suitably represent both the particular circumstances and periods of interest. For this purpose, the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods."* BS 4142:2014 further states that *"a representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either minimum or modal value"*. Hence BS 4142:2014 does not provide a 'black and white' method of obtaining the assessment level for background sound $L_{A90,T}$.

The representative background sound level listed in Table 5.1 are based on the modal levels recorded during the survey, as these are seen to be representative of typical conditions.

Table 5.1 – Representative background sound level $L_{A90,T}$ at nearby NSRs

Noise-Sensitive Receptor (NSR)	Period	Representative Background Sound Level L_{A90} (dB)
1m outside of the windows of neighbouring noise-sensitive buildings	Daytime (07:00 to 23:00)	44
	Night-time (23:00 – 07:00)	39

5.3 Plant Noise Limits

The typical planning condition requires that the rating level of the ASHP does not exceed the background noise level at any time. BS 4142 defines the receptor location as 1m from the nearest affected receptor window. The required rating level limits are therefore equal to the representative background noise levels in Table 5.1.

Table 5.2 – Maximum plant noise rating level at nearby NSRs

Noise-Sensitive Receptor (NSR)	Period	Maximum Plant Noise Rating Level $L_{Ar,T}$ (dB)
1m outside of the windows of neighbouring noise-sensitive buildings	Daytime (07:00 to 23:00) Tr = 60-minutes	44
	Night-time (23:00 – 07:00) Tr = 15-minutes	39

5.4 Proposed Plant / Source Noise Levels

The proposed unit will be a Daikin EPRA18DAV3[1]. Extracts from the manufacturers' datasheet are given in Appendix D.

Table 5.3 presents the noise data used in the assessment. A sound pressure level at 1m in front of the unit in semi-anechoic conditions of 52 dB(A) is claimed in cooling mode, and 48 dB(A) in heating mode. According to the manufacturer, the unit has a quiet mode (which is typically used ad night) which runs at a level 8 dB(A) below full speed operation.

Table 5.3 – Source noise emission data for the external ASHP

Model	Mode	Sound Pressure Levels @ 1m [2]							
		Octave Band Centre Frequencies, Hz							dB(A)
		63	125	250	500	1 k	2 k	4 k	
Daikin EPRA18DAV3	Cooling	54	54	51	52	46	42	36	52
	Cooling (Quiet Mode)	48	46	47	45	37	33	25	44

1 - https://www.daikin.co.uk/en_gb/products/product.html/EPRA014-018DV.html

2 - Measured at 1m in front of the unit at a height of 1.5m. Measured in a semi anechoic chamber with a hard/reflective ground.

5.5 Predicted Noise Levels at Receptors

The noise predictions within this report have been undertaken using the proprietary software CadnaA® by DataKustik, a 3-D noise mapping package that implements a wide range of national and international standards, guidelines, and calculation algorithms, including those set out in ISO 9613-2:1996. A full explanation of the noise modelling is provided in Appendix C, along with images and noise maps/results from the model.

The noise maps in Figure C.2 and Figure C.3 show the predicted specific noise levels ($L_{As,Ts}$) from the proposed unit (running in cooling mode during the day, and in quiet mode during the night).

The plots show levels at 1m from the receptor facades – showing the worst affected floor level (typically upper floor windows at a height of 4m). The noise contour is plotted at ground floor height (1.5m).

The ASHP has been modelled as facing to the west.

In summary, the predicted *specific noise level* from the proposed unit is 38 dB $L_{As,Ts}$ outside of the closest/worst-case residential window, when in cooling mode during the daytime, and 31 dB $L_{As,Ts}$ when in low noise mode overnight.

A rating level penalty should be applied to the specific noise level when assessing in accordance with BS 4142:2014. It is expected that the plant would likely not have a significant tonal quality, nor be impulsive/intermittent, but *may* be readily distinguishable (given it is a different noise in nature compared to the road), hence a 3 dB penalty has been applied.

Table 5.4 summarises the assessment result, showing the predicted levels outside of the worst-affected neighbouring window. The most affected receptor is the façade of 59 Osborne Road, as illustrated in Figure C.2.

The results indicate that the local authority criteria are met, with the rating level during the daytime, when running in cooling mode (the noisiest mode) at full capacity, being 3 dB below the existing representative background noise level.

At night-time, the limit is met providing that the unit is restricted to 'night-time' / 'quiet' mode between 23:00 and 07:00 (and will be 5 dB below the representative night-time background sound level).

Table 5.4 – Predicted noise levels outside of the worst-affected neighbouring window

Location	Period	Mode	Specific Noise Level $L_{Aeq,T}$ (dB)	Rating Level Penalties (dB)	Predicted Rating Level $L_{Ar,T}$ (dB)	Maximum Rating Level $L_{Ar,T}$ (dB)	Difference
1m outside of the worst affected neighbouring window	Daytime (07:00 to 23:00)	Cooling	38	+3	41	44	**-3**
	Night-time (23:00 – 07:00)	Cooling (Quiet Mode)	31		34	39	**-5**

Appendix A – Acoustic Terminology and Concepts

A.1 – Glossary

Table A.1 – Glossary of acoustic terminology

Term	Description
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio of the root-mean-square pressure of the sound and a reference pressure (2x10-5 Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e., 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
Frequency	Sound can occur over a range of frequencies extending from the very low, such as the rumble of thunder, up to the very high such as the crash of cymbals. Sound is generally described over the frequency range from 63Hz to 4000Hz (4kHz). This is roughly equal to the range of frequencies on a piano.
$L_{Aeq,T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period. This parameter is typically considered a good representation of the 'average' overall noise level. It is referred to technically as the A-weighted equivalent continuous sound level and is a dB(A) as defined above.
$L_{A90,T}$	The A-weighted noise level that is exceeded for 90% of the measurement period T. This parameter is often considered as the 'average minimum level'.
$L_{A10,T}$	The A-weighted noise level that is exceeded for 10% of the measurement period T. This parameter is often considered as the 'average maximum level';
$L_{AFmax,T}$	The maximum A-weighted noise level during the measurement period T.

A.2 – Subjective Changes in Noise Level

Table A.2 – Subjective loudness from an increase or decrease in sound pressure level

Change in sound pressure level	Relative change in sound power energy (multiplier)		Change in apparent subjective loudness (for mid-frequency range)
	Decrease	Increase	
3 dB	1/2	2	'Just perceptible'
5 dB	1/3	3	'Clearly noticeable'
10 dB	1/10	10	'Half or twice as loud'
20 dB	1/100	100	'Much quieter, or louder'

Appendix B – Noise Survey Methodology

B.1 – Survey Equipment

The monitoring equipment used for the baseline noise survey is detailed in the table below. The sound level meter was calibrated before and after the survey, with no significant drifts of greater than 0.5 dB observed. The sound level meter has been calibrated to a traceable standard within the 24 months preceding the survey, and the calibrators have been calibrated to a traceable standard within the 12 months preceding the survey. The equipment complies with the standards of a BS EN 60942:2003 Class 1 device.

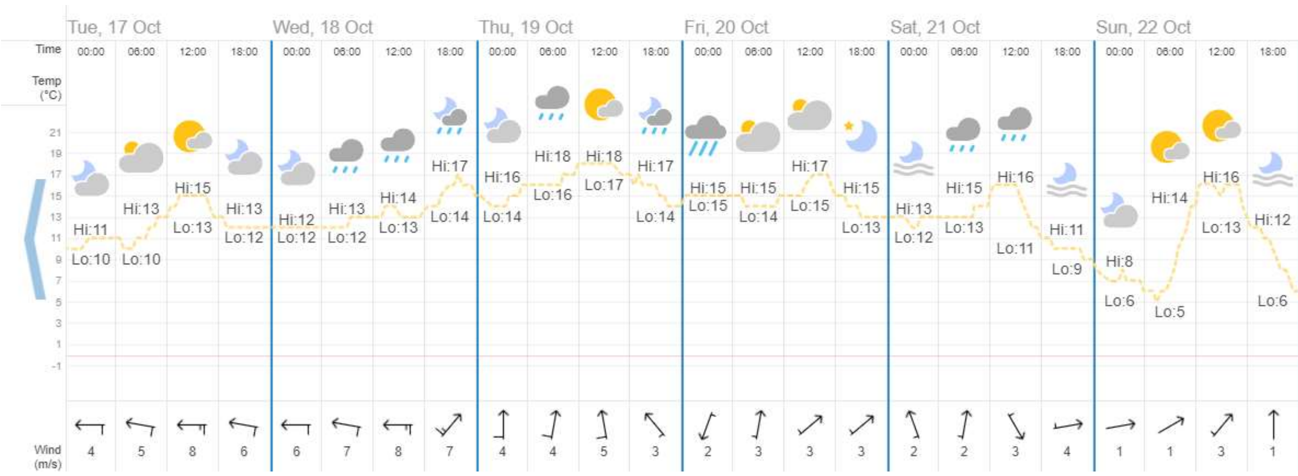
Table B.1 – Equipment used for the noise survey

Name	Serial Number	Last Calibrated	Calibration Due
Casella CEL 633C Class 1 Sound Level Meter	2145374	Feb-22	Feb-24
B&K 4189 Class 1 Microphone	2529821	Feb-22	Feb-24
Cirrus CRL511E Class 1 Acoustic Calibrator	035235	May-23	May-24

B.2 – Meteorological Conditions

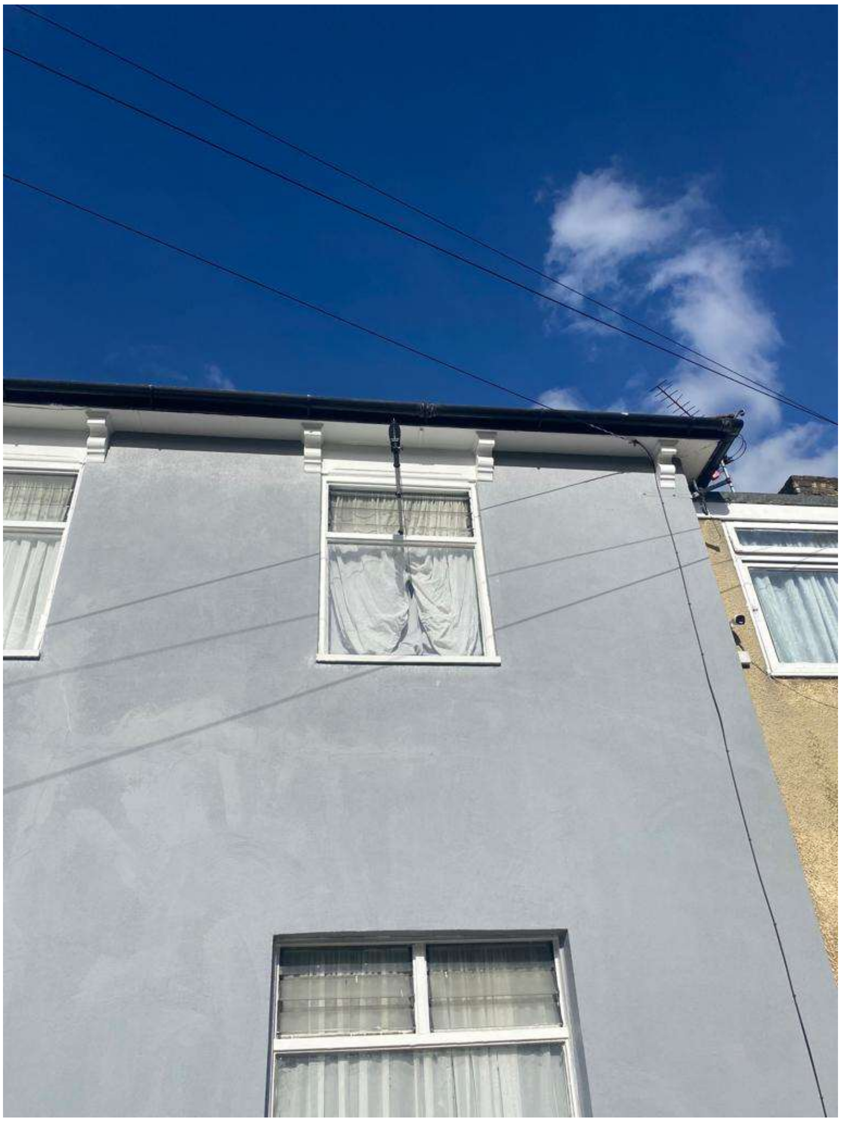
During the survey, weather conditions were variable with wind speeds of generally less than 5 ms^{-1} (the microphone was fitted with a weather protection kit/windshield). These weather conditions are suitable for the measurement of environmental noise in accordance with BS 7445 '*Description and Measurement of Environmental Noise*'. The weather data below has been sourced from https://www.timeanddate.com/weather/uk/london/historic.

Figure B.1 – Meteorological conditions during the survey



B.3 – Photos

Figure B.2 – Photograph of the monitoring position



Appendix C – Plant Noise Emissions

The noise predictions within this report have been undertaken using the proprietary software CadnaA® by DataKustik, a 3-D noise mapping package that implements a wide range of national and international standards, guidelines, and calculation algorithms, including those set out in ISO 9613-2:1996.

All of the objects within the model (buildings, roads, barriers, foliage, etc) have been imported from OpenStreetMap. The heights of the buildings and roads have been based upon Google Earth Pro, using the 3D view to be able to measure the elevation heights at the tops of objects, and then inserting this manually into the model. Where OpenStreetMap contains little or inaccurate information, the objects have been drawn manually. The scaled site plan, floor plan, and elevation for the proposed development have been accounted for in the model.

The noise model has been used to predict the resulting L_{Aeq} noise emissions from the proposed plant.

The noise model has assumed:

- downwind propagation, i.e., a wind direction that assists the propagation of sound from source to receptor, as a worst-case;
- a maximum reflection factor of two where buildings and barriers are assumed to have a 'smooth' reflective façade, as a worst-case;
- a ground absorption factor of 0 to represent hard ground, 0.5 in mixed areas and 1 for areas of grass.
- receptor heights on the façade at ground floor (1.5m), 1st floor (4m), and 2nd floor (6.5m), and 3rd floor (9m) window heights, placed at 1m outside of elevations which contain windows.
- the noise contours are plotted at a height of 1.5m.
- atmospheric sound absorption based upon a temperate of 10^{o}C and a humidity level of 70%, as per Table 2 of ISO 9613-2:1996

The images on the following pages contain the results of the mapping.

Figure C.1 – 3D view of the model setup

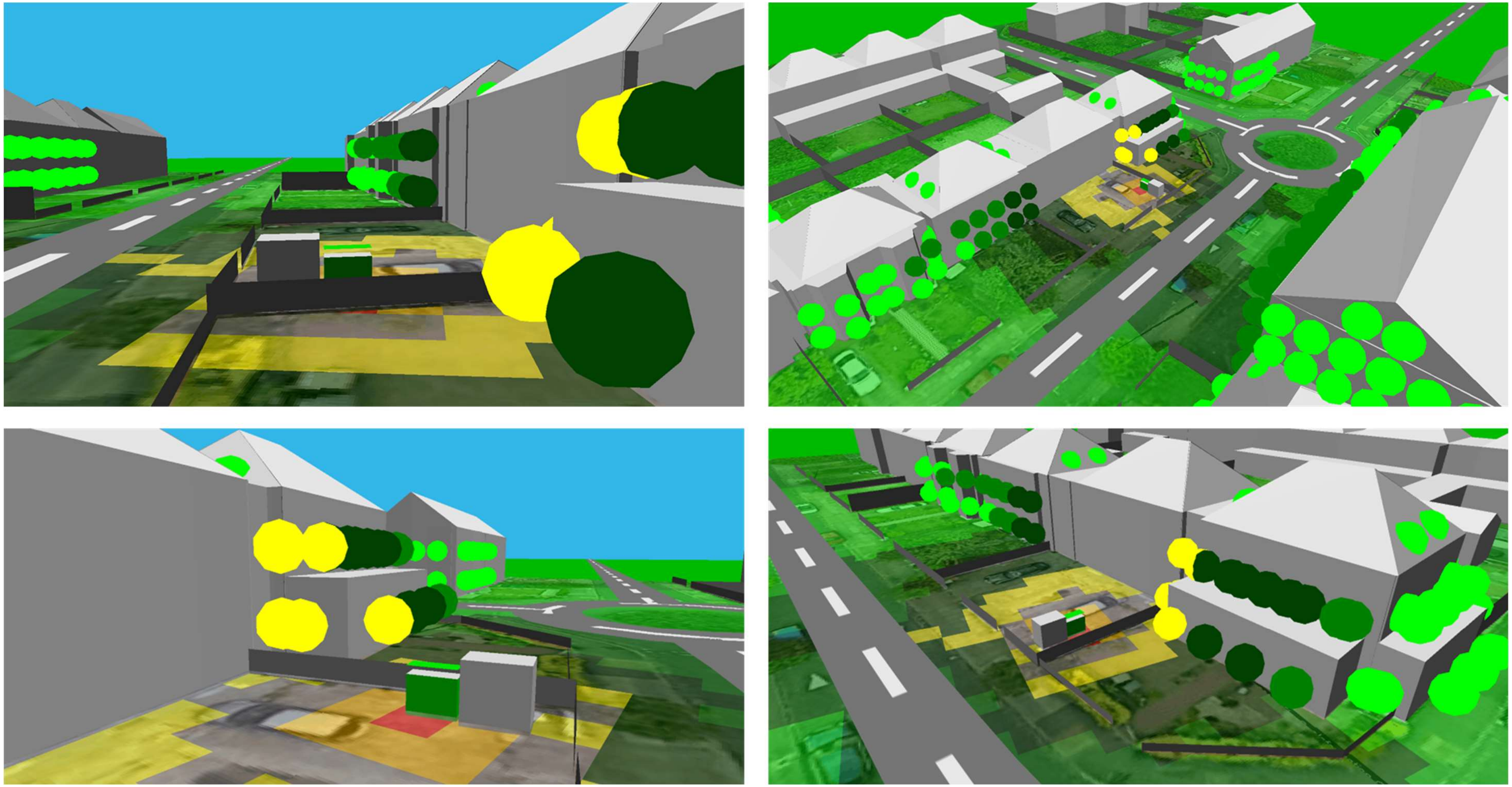


Figure C.2 – Predicted specific noise levels (dB L_{Aeq}), Cooling Mode, Daytime (0700-2300)

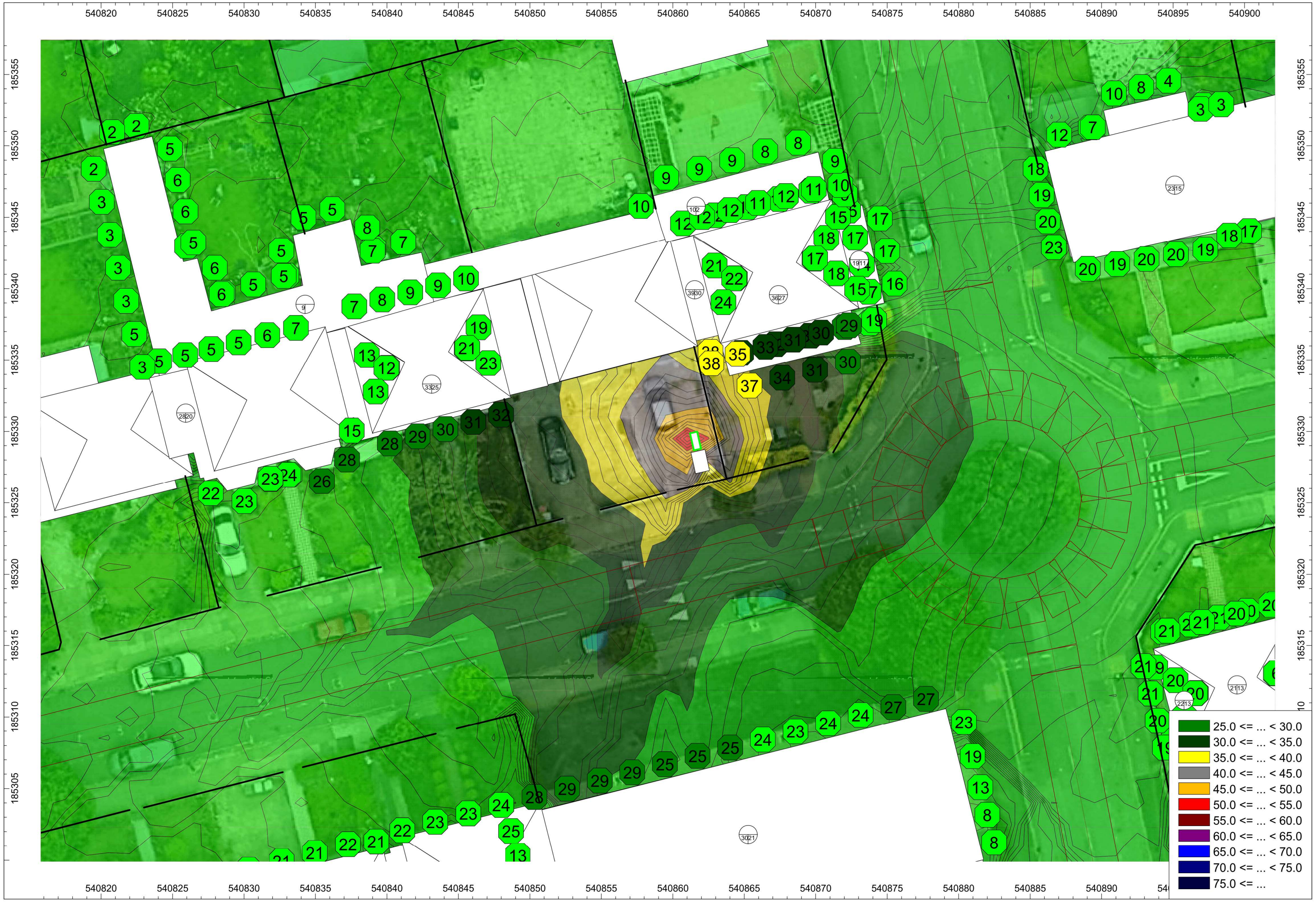
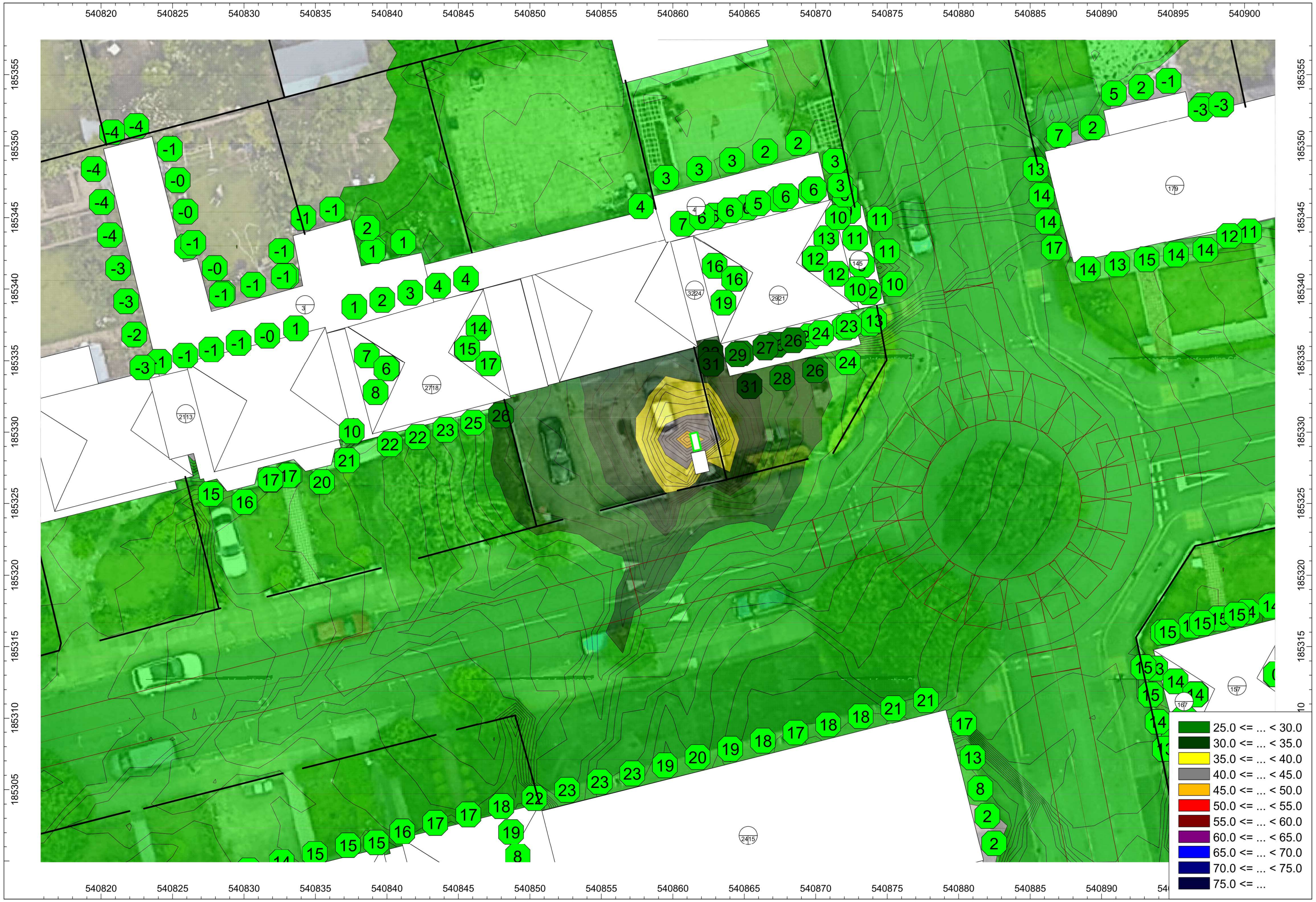
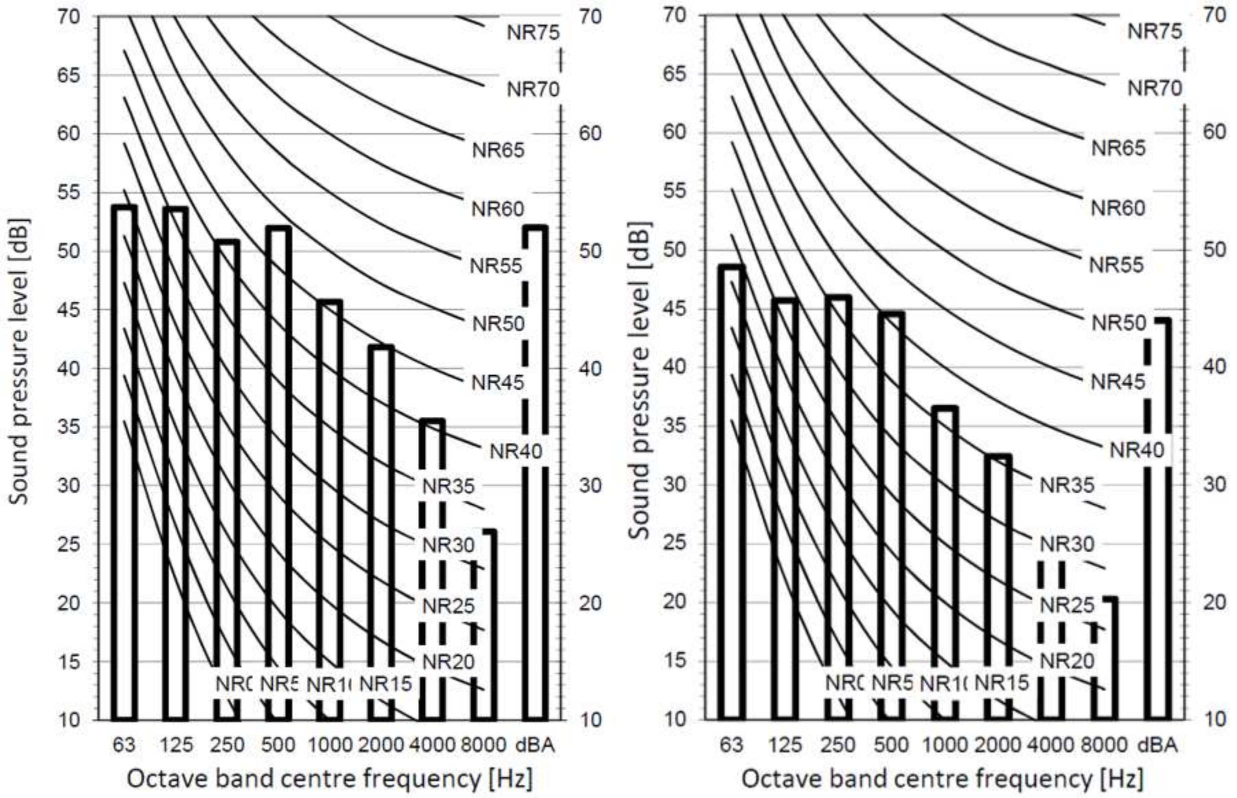


Figure C.3 – Predicted specific noise levels (dB L_{Aeq}), Quiet Mode, Night time (2300-0700)



Appendix D - Manufacturer Data

Figure D.1 – Manufacturer Noise Data, Cooling Mode (left) / Quiet Mode (right)



Appendix E - Author Qualifications

The report has been compiled by Patrick Shuttleworth, acoustic consultant at ParkerJones Acoustics. Patrick holds the following qualifications:

- MIOA (Member of the Institute of Acoustics)
- BSc in Audio and Music Technology from the University of the West of England – 1st Class

Patrick has worked as an acoustic consultant for various companies since 2011.

The report has been checked and approved by Chris Parker-Jones, the director and primary acoustic consultant at ParkerJones Acoustics. Chris holds the following qualifications:

- MIOA (Member of the Institute of Acoustics)
- BSc in Music Systems Engineering from the University of the West of England – 1st Class
- MSc in Sound and Vibration Studies from the University of Southampton - Distinction

Chris has worked as an acoustic consultant for various companies since 2011.

ParkerJones Acoustics Limited

Bristol
11 Bankside Road
Brislington
Bristol
BS4 4LB

London
29 Lincoln's Inn Fields
Holborn
London
WC2A 3EE

Glasgow
126 West Regent Street
Glasgow
G2 2RQ

+44 (0)800 830 3338
+44 (0)117 914 6558
info@parkerjonesacoustics.com
www.parkerjonesacoustics.com

Registered in England and Wales
Company No. 12235614