parkerjones acoustics

7 Frognal Gardens

London, NW3 6UY

Noise Impact Assessment

16th December 2024

First Issue

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Revision History

Version	Comments	Author	Checked By	Date
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Executive Summary and Conclusions

ParkerJones Acoustics Limited (PJA) has been instructed to undertake a Noise Impact Assessment to assess the risk of adverse impact on local noise-sensitive receptors from noise generated by proposals for the installation of an external air source heat pump unit ('ASHP unit' / 'the proposed plant') at 7 Frognal Gardens, London, NW3 6UY.

The assessment has been conducted by predicting the noise emissions from the proposed plant to nearby noise-sensitive receptors (i.e. neighbouring residential dwellings) and comparing against existing background noise levels.

This report takes into account the typical planning conditions applied by the Local Planning Authority ('the LPA', in this case, Camden Council), to other applications of a similar nature (summarised in Section 3.0).

The existing background sound levels have been determined by conducting a baseline noise survey (Section 4.1) at a position representative of noise levels outside of neighbouring properties over several days.

Maximum permissible plant noise levels at 1m outside of neighbouring windows and 1.5m above ground in neighbouring gardens have been set (in Section 4.2) based on the survey results and the LPA's criteria, at 29 dB L_{Aeq} during the day (07:00 – 23:00), and 28 dB L_{Aeq} overnight (23:00 – 07:00).

Plant noise emissions at the receptor have been predicted (in Section 4.4) using 3D noise modelling/mapping software, based on the plant running at maximum capacity. The worst case level at 1m from a receptor façade is 27 dB, at the third floor window of Nos 12 and 14 Frognal Gardens. The worst case level at 1.5m within a receptor garden is 29 dB, within the private garden of No 9 Frognal Gardens.

It is therefore seen that the predicted noise levels are fully compliant with the requirements of the local authority. As such, no additional mitigation measures will be required.

Vibration has also been considered in Section 5.0. The unit is a significant distance away from neighbouring properties with no structural connections, thus the risk is considered to be negligible.

Contents

1.0 Introduction

ParkerJones Acoustics Limited (PJA) has been instructed to undertake a Noise Impact Assessment to assess the risk of adverse impact on local noise-sensitive receptors from noise generated by proposals for the installation of an external air source heat pump unit ('ASHP unit' / 'the proposed plant') at 7 Frognal Gardens, London, NW3 6UY.

This document has been written to assess the risk of adverse impact from noise generated by the proposed plant on neighbouring residential properties once it is fully operational. The report:

- determines the representative background sound level outside of neighbouring residential properties;
- sets appropriate noise level criteria based upon this pre-existing noise level in line with Local Planning Policy; and
- predicts the noise emissions from the proposed plant and thus demonstrates 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 account the typical noise-related planning conditions applied by the Local Planning Authority (in this case Camden Council) to other applications of a similar nature.

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 at 7 Frognal Gardens, London, NW3 6UY – a semi-detached building, located as shown in Figure 2.1. The proposed ground floor plan, indicating the ASHP location is provided in Figure 2.2.

The proposals assessed herein, include the installation of an external ASHP unit. The unit is to be located at ground level, in proximity to the eastern boundary of the site. The nearest noise sensitive receptors are seen to be those at Nos 5, 9, 12 and 14 Frognal Gardens.

The noise modelling software used in the assessment calculates noise emissions to all receptor locations. The calculations do not automatically assume that the closest receptor is the worst affected given there are differences in terms of building heights and intervening buildings/structures that result in different 'screening losses' to each receptor point (which are all inherently accounted for within the noise modelling software).

Figure 2.1 – Aerial view of the site and surrounding area

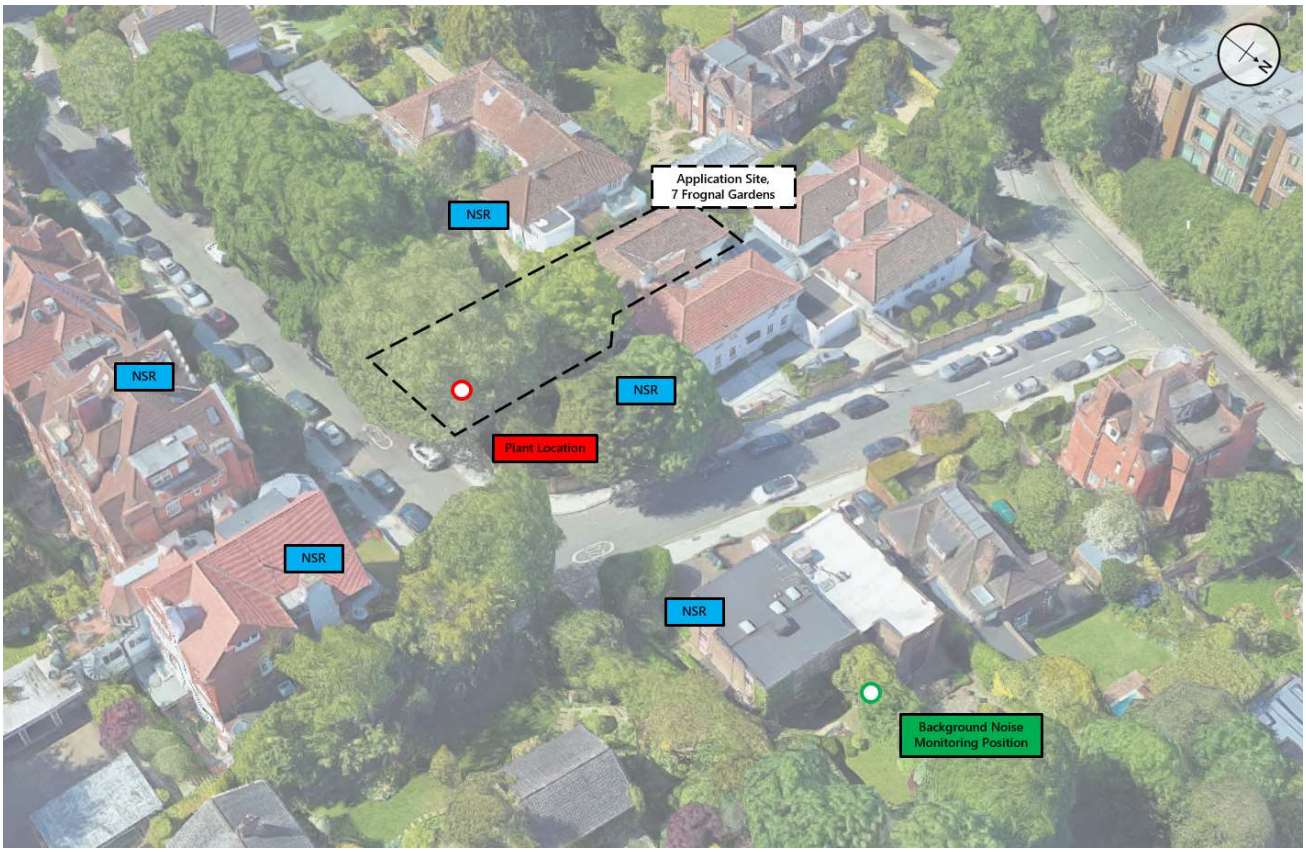
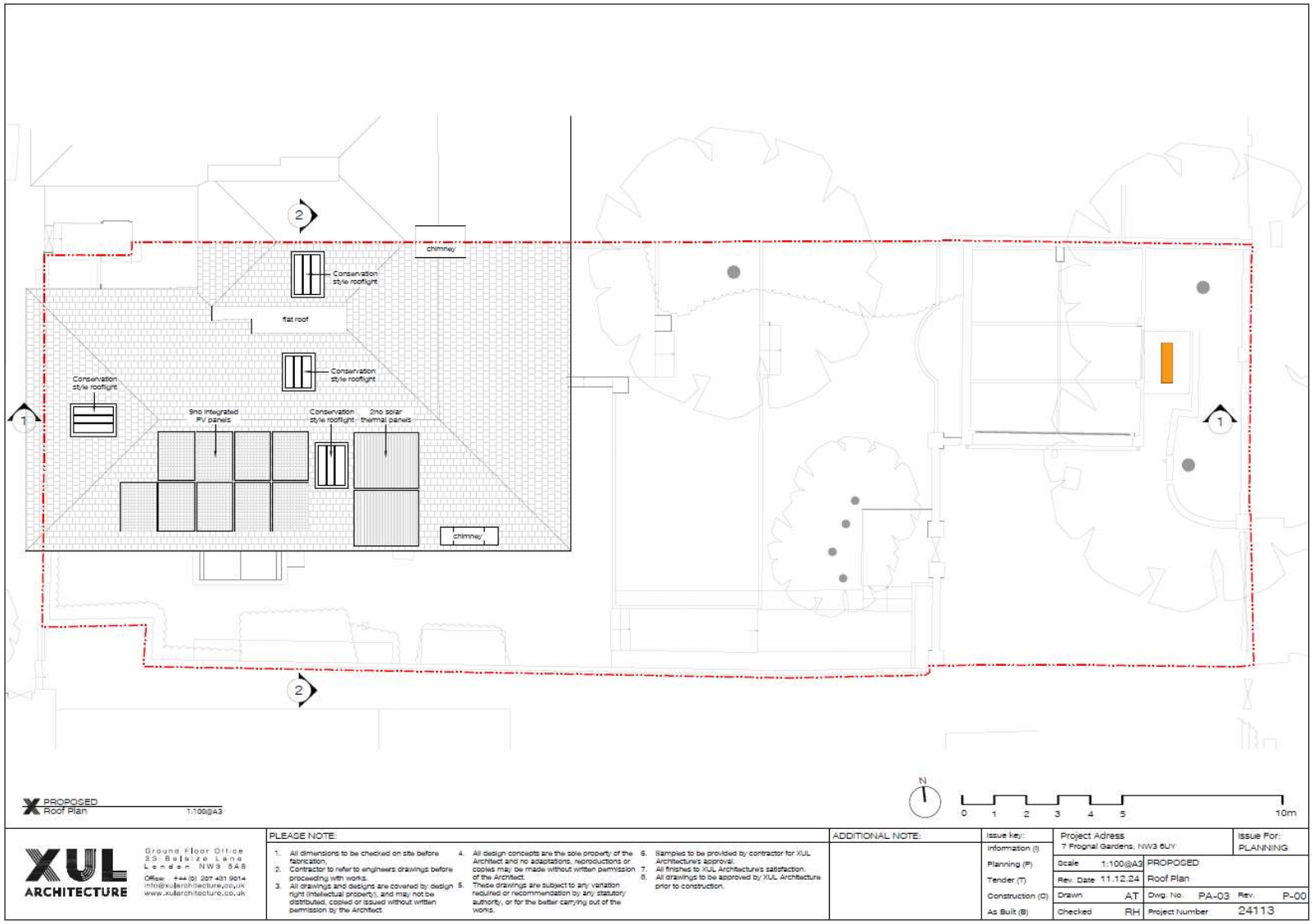


Figure 2.2 – Proposed plan, ASHP location



3.0 Local Authority Requirements

PJA notes that planning applications for new air conditioning units / air source heat pumps in the Camden Council area (when not classified as permitted development) typically require the specific noise levels from plant to be no greater than 10 dB below the minimum background sound level and when determined at 1m outside of neighbouring noise-sensitive windows. If the source is tonal, as assessed according to BS 4142:2014+A1:2019, then it should be at least 15 dB below. The following are typical conditions:

1) *The external noise level emitted from plant, machinery or equipment at the development hereby approved shall be lower than the lowest existing background noise level by at least 10dBA, by 15dBA where the source is tonal, as assessed according to BS4142:2014 at the nearest and/or most affected noise sensitive premises, with all machinery operating together at maximum capacity.*

   Reason: To safeguard the amenities of the adjoining premises and the area generally in accordance with the requirements of policies G1, CC1, D1,and A1 of the London Borough of Camden Local Plan 2017.

2) *Prior to use, plant or equipment and ducting at the development shall be mounted with proprietary anti-vibration isolators and fan motors shall be vibration isolated from the casing and adequately silenced and maintained as such.*

   Reason: To safeguard the amenities of the adjoining premises and the area generally in accordance with the requirements of policies G1, CC1, D1,and A1 of the London Borough of Camden Local Plan 2017.

4.0 Noise Assessment

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

- a representative background sound level $L_{A90,T}$ during the proposed operating hours of the plant is determined based on the results of an environmental noise survey;
- the maximum permissible plant noise level $L_{Aeq,T}$ outside of neighbouring windows and in neighbouring gardens is then determined based upon the $L_{A90,T}$ and the criteria set by/typically applied by the Local Planning Authority;
- the predicted plant noise level $L_{Aeq,T}$ 1m outside of nearby residential windows/in neighbouring gardens is predicted using 3D noise modelling/noise mapping;
- the predicted plant noise level $L_{Aeq,T}$ is compared to the maximum permissible level; and
- if necessary, mitigation measures are recommended to reduce noise emissions to an acceptable level.

4.1 Background Sound Levels

4.1.1 Baseline Noise Survey

PJA has attended the site to conduct a baseline noise survey across a several-day period between Monday the 16th and Thursday the 19th of July 2024. The results have been used to determine a representative background sound level at a position representative of nearby residential receptors.

Note that the survey was undertaken in relation to a recent unrelated planning application. The survey location is however seen to be representative of a worst case, as it is located within the rear garden of 18A Frognal Gardens, and is therefore more screened from road traffic noise than the front of the affected receptors at Nos 5, 9, 12 and 14 Frognal Gardens.

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 except 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 the site and the equipment used.

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 nighttime (23:00 – 07:00) periods.

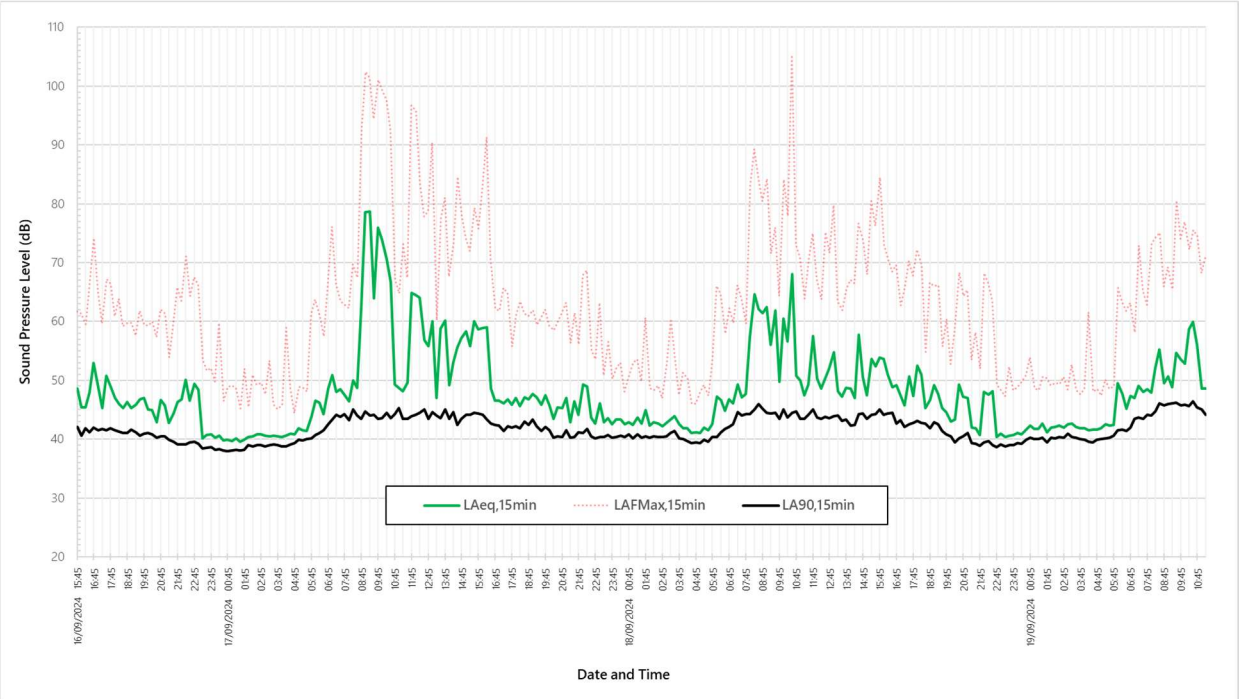
The most relevant parameter in terms of the 'representative background sound level' is the $L_{A90,15min}$. Figure 4.2 presents histograms of the $L_{A90,15min}$ values – showing minimum values of 38 dB overnight and 39 dB during the day.

Subjectively, baseline noise levels are mostly from road traffic. Construction noise at the development was a factor, however, it has not significantly affected the results in terms of the background noise level $L_{A90,15min}$ [1].

Table 4.1 – Summary of measured noise levels

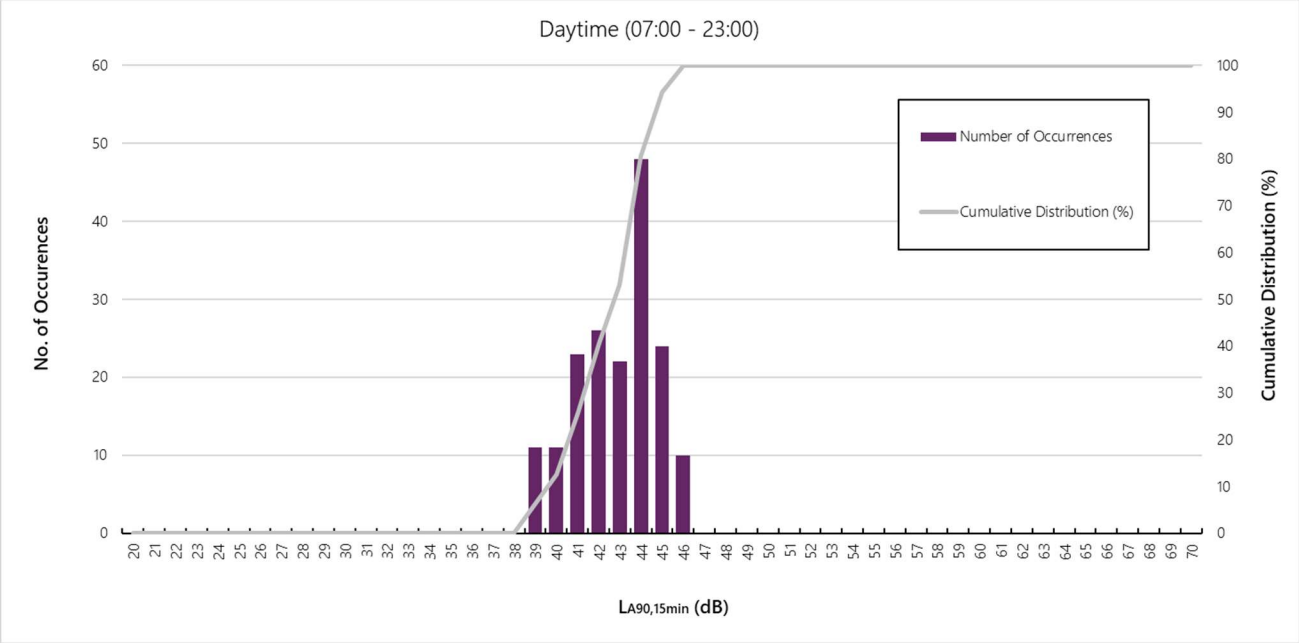
Period	Parameter	Maximum	Minimum	Logarithmic Average	Mean Average	Modal Average	Median Average
Daytime (07:00 – 23:00)	$L_{Aeq,15min}$ (dB)	79	40	62	51	47	49
	$L_{AFMax,15min}$ (dB)	105	49	N/A	69	60	67
	$L_{A90,15min}$ (dB)	46	39	N/A	43	44	43
Nighttime (23:00 – 07:00)	$L_{Aeq,15min}$ (dB)	49	40	43	42	42	42
	$L_{AFMax,15min}$ (dB)	67	44	N/A	52	49	50
	$L_{A90,15min}$ (dB)	43	38	N/A	40	40	40

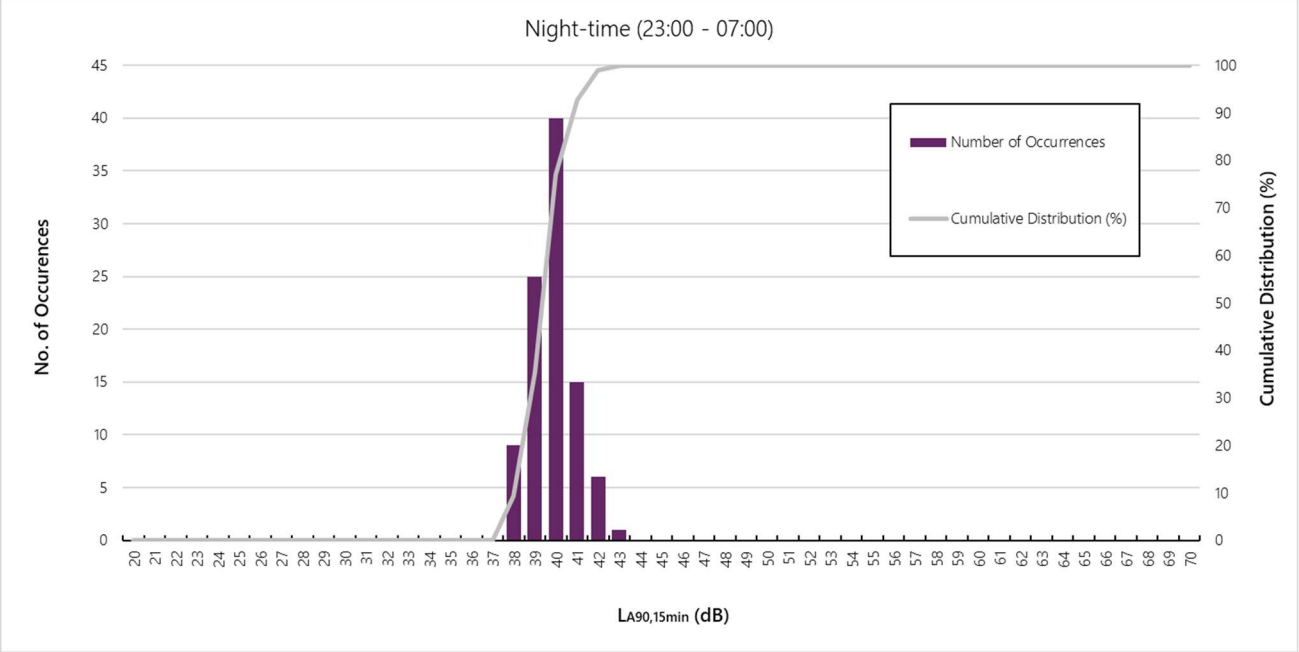
Figure 4.1 – Graph of measured noise levels



1 - The LA90 measurement represents the background noise level exceeded for 90% of each 15-minute measuring period and is not significantly affected by intermittent construction noise. While construction noise may raise LAeq (average noise level) and LAFmax (maximum noise level), it does not influence the lowest LA90. This is especially true given that lowest values of LA90 (which the assessment is based on) typically occurs during the evening and overnight when construction noise is absent.

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





4.1.2 Representative Background Sound Level

As referenced with the Local Planning Authority's guidance (Section 3.0), the minimum values of $L_{A90,15min}$ are taken as the representative background sound level – listed in Table 4.2.

Table 4.2 – Representative background sound level $L_{A90,T}$ at neighbouring noise-sensitive properties

Noise-Sensitive Receptor (NSR)	Period	Representative Background Sound Level $L_{A90,T}$ (dB)
1m outside of noise-sensitive neighbouring windows / 1.5m above ground in neighbouring external amenity areas	Daytime (07:00 to 23:00) T = 60-minutes	39
	Nighttime (23:00 – 07:00) T = 15-minutes	38

4.2 Plant Noise Limits at Receptors

Based on the Local Planning Authority's typical planning conditions (see Section 3.0), the maximum noise level from the plant should not exceed the representative background sound level minus 10 dB when measured at 1m outside of a neighbouring window, or 1.5m above ground level when measured in an external amenity space. This is assuming that the plant noise does not contain a tonal element.

Table 4.3 – Maximum permissible plant noise level $L_{Aeq,T}$ at neighbouring noise-sensitive properties

Noise-Sensitive Receptor (NSR)	Period	Maximum Plant Noise Level $L_{Aeq,T}$ (dB)
1m outside of noise-sensitive neighbouring windows / 1.5m above ground in neighbouring external amenity areas	Daytime (07:00 to 23:00) T = 60-minutes	29
1m outside of noise-sensitive neighbouring windows	Nighttime (23:00 – 07:00) T = 15-minutes	28

4.3 Plant Noise Levels at Source

The proposed unit will be an LG HM161MR U34 model, with a nominal sound power level of 61 dB(A) in normal mode, and 57 dB(A) in 'low noise mode' [2] [3].

No octave band data is provided by the manufacturer. In PJA's experience of assessing condenser units, such units generally do not contain tonal qualities and are characterised by a broadband style noise, as the fan runs at a

2 - LG 16kW Air to Water Heat Pump Therma V R32 Monobloc S HM161MR.U34 - https://www.tradesparky.com/solarsparky/heating/air-source-heat-pumps/lg-hm161mru44-therma-v-s-16kw-heat-pump

3 - Noise data from Page 6 of https://www.lg.com/uk/business/download/airsolution/LGUKTHVMS_11-21v1_Heating%20Monobloc%20S%20leaflet_UK[20211203_2002395601].pdf

relatively low RPM and thus a low blade passing frequency, which is perceived as a low hum/broadband style noise rather than a defined mid-to-high frequency tone.

The assessment has been based on the assumption that the proposed plant could run at full capacity at any point of day or night, for 100% of the reference time period (1-hour in the daytime, and 15-minutes at night).

4.4 Predicted Plant 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 map in Figure C.2 shows the predicted specific noise levels (L_{Aeq}) from the proposed plant. Façade receptor points are modelled at heights representative of the receptor windows, with the plot showing the worst affected floor level on each elevation. Additional receptor points are also placed at a height of 1.5m within the affected receptor gardens. Table 4.4 summarises the assessment result, showing the predicted level at the most affected receptor locations.

The worst case level at 1m from a receptor façade is 27 dB, at the third floor window of Nos 12 and 14 Frognal Gardens. The worst case level at 1.5m within a receptor garden is 29 dB, within the private garden of No 9 Frognal Gardens (at a minimum distance of 1m from the boundary).

The predicted levels are assessed against the maximum permissible levels from Table 4.3 (Section 4.2), which are based upon being 10 dB below the representative background sound level. It is seen that the predicted level is fully compliant with the local authority requirements.

Therefore, no additional mitigation will be required.

Table 4.4 – Predicted noise levels at 1m outside of the worst-affected neighbouring window

Location	Period	Predicted Plant Noise Level $L_{Aeq,T}$ (dB)	Maximum Plant Noise Level $L_{Aeq,T}$ (dB)	Compliant?
Third Floor Window, Nos 12 and 14 Frognal Gardens	Daytime (07:00 to 23:00) T = 60-minutes	27	≤29	**Yes (-2 dB)**
	Nighttime (23:00 – 07:00) T = 15-minutes		≤28	**Yes (-1 dB)**
1.5m Within Private Garden, No 9 Frognal Gardens	Daytime (07:00 to 23:00) T = 60-minutes	29	≤29	**Yes (+/-0 dB)**

5.0 Vibration Assessment

As a matter of good practice, the external unit should be installed using anti-vibration fixings and rubber washings on screws/bolts, to dampen vibration transmitting through the fixings. Such mounts would usually be made of a resilient material such as rubber and should be supplied by the manufacturer as standard.

The unit is however totally detached from the adjoining premises and therefore shares no structural connection to any adjoining buildings. The risk of perceptible vibration at any receptor locations is therefore seen to be negligible.

In the unlikely event that the applicant receives a formal complaint from the neighbouring property, the applicant should be committed to investigating the source of the problem and re-installing the offending unit on an upgraded anti-vibration mount if necessary.

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 Details

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 had been calibrated to a traceable standard within the 24 months preceding the survey, and the calibrator had 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.

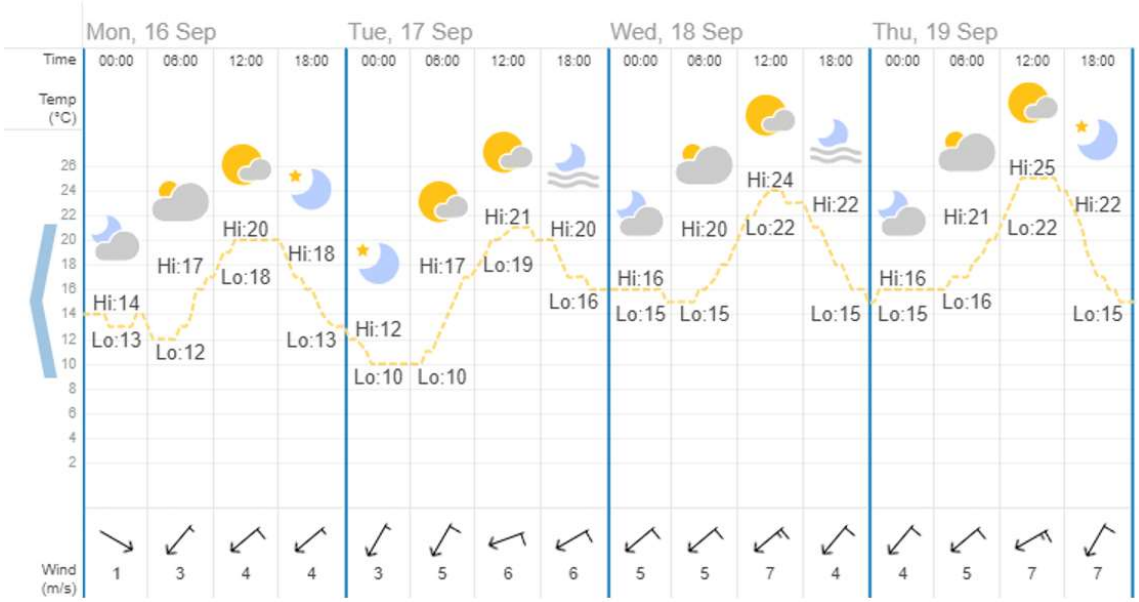
Table B.1 – Equipment used for the noise survey

Name	Serial Number	Last Calibrated	Calibration Due
Svantek 958A Class 1 Sound Level Meter	69866	08/06/2023	08/06/2025
PCB 426M07 ICP Preamplifier	21590	08/06/2023	08/06/2025
PCB 377B02 Microphone	04684	08/06/2023	08/06/2025
Casella CEL 120-1 Class 1 Calibrator	3864607	08/02/2024	08/02/2025

B.2 – Meteorological Conditions

During the survey, weather conditions were dry and mild with wind speeds generally less than 7 ms^{-1} (the microphone was fitted with a weather protection kit/windshield). The weather conditions were 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 – Calculations / Noise Mapping

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, reflective ground in concreted/paved/tarmacked areas, 0.5 to represent mixed ground and 1 for areas of grass;
- receptor points at 1m from the affected facades, at height intervals representative of the receptor windows;
- additional receptor points at 1.5m height within receptor gardens;
- atmospheric sound absorption based upon a temperature of 10°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

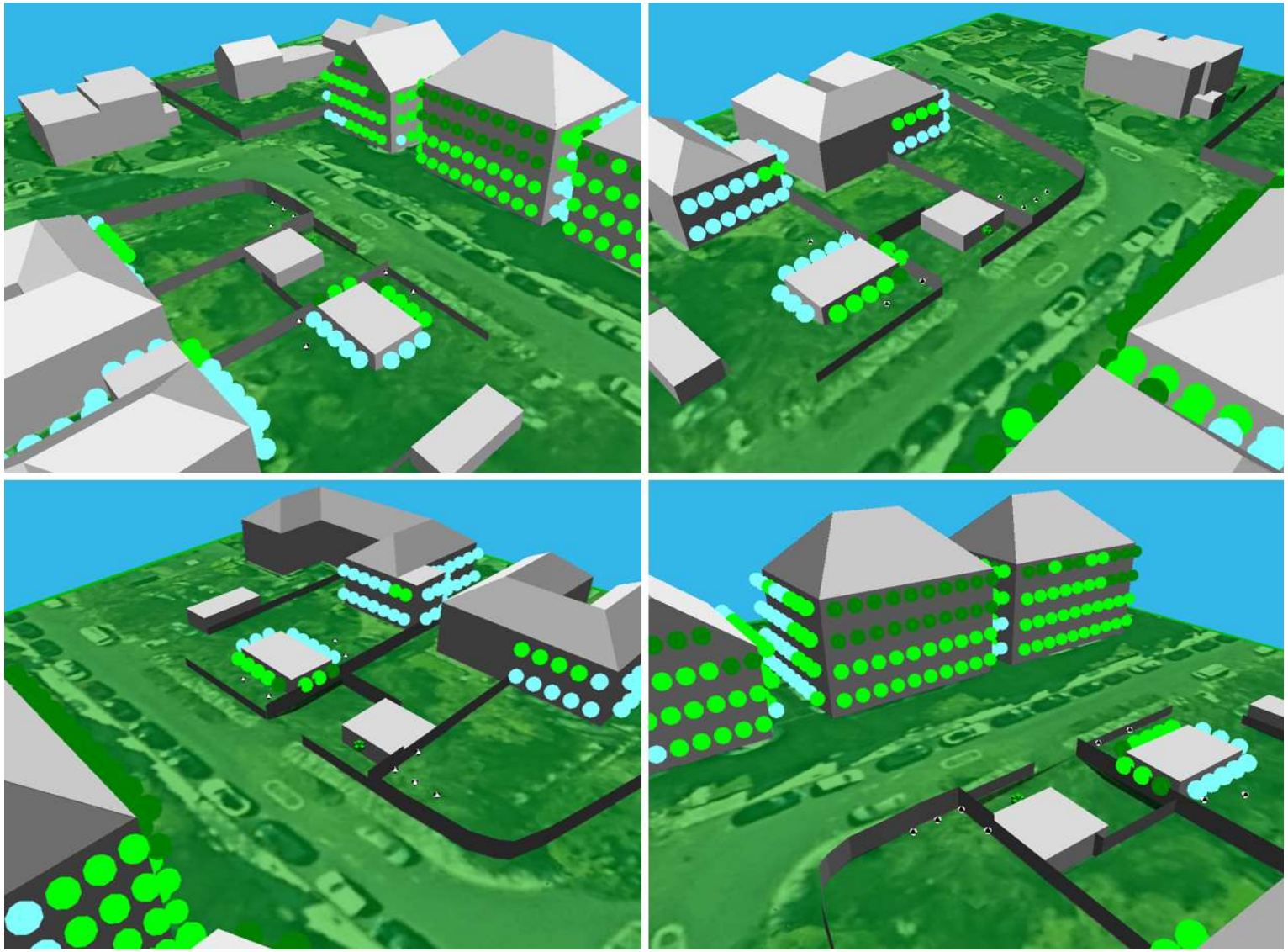
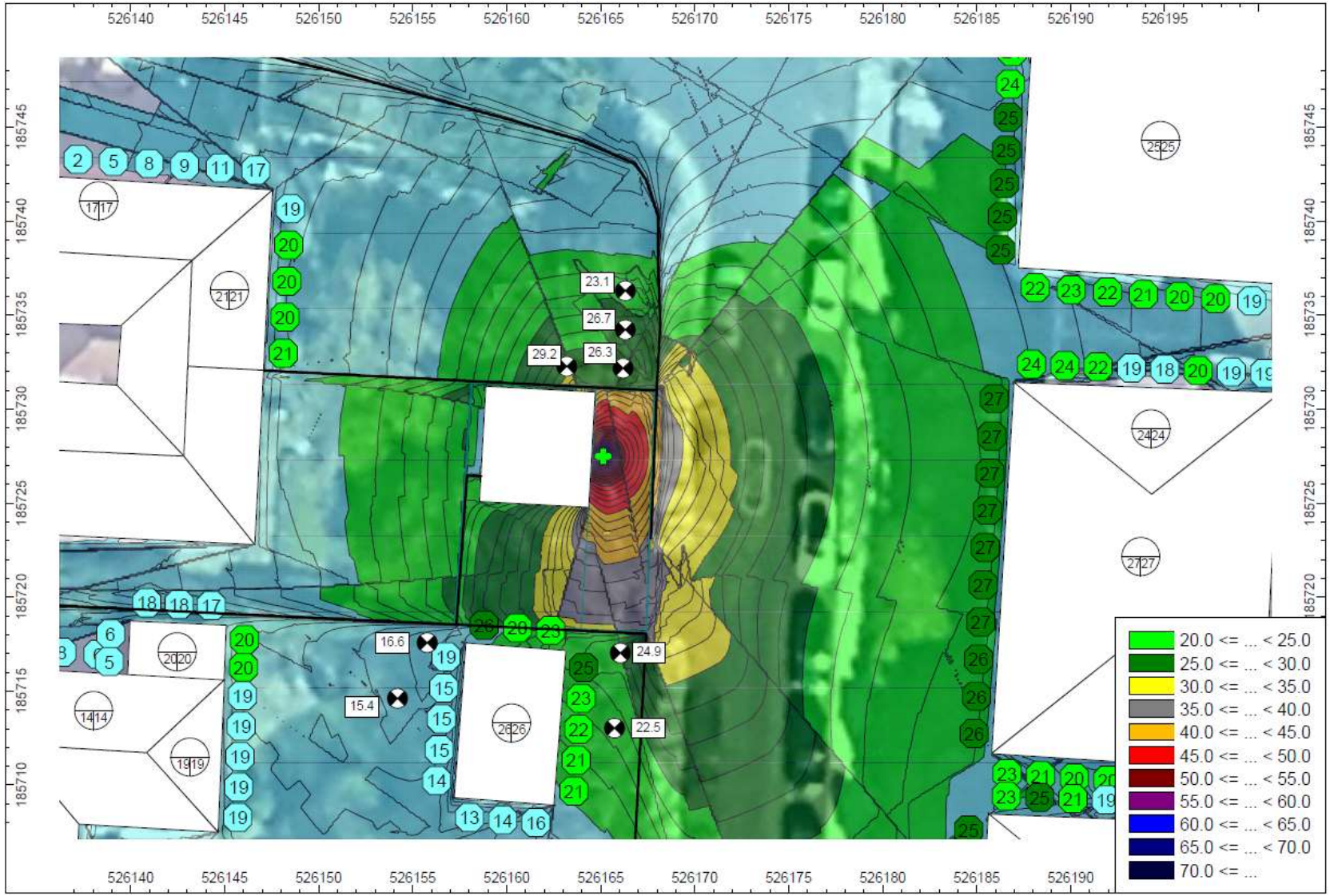


Figure C.2 – Predicted specific noise levels (dB L_{Aeq})



Appendix D - Author Qualifications

This 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.

This report has been 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.

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