



Friends and Neighbours Centre
Maes-Y-Ffynnon Close, Neath, SA11 1HQ

Noise Impact Assessment

22nd May 2024
First Issue



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Revision History

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First Issue	First issued version of the report	Patrick Shuttleworth Senior Acoustic Consultant BSc (Hons) MIOA	Chris Parker-Jones Director and Acoustic Consultant BSc (Hons) MSc MIOA	22nd May 2024

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Executive Summary and Conclusions

This document, a Noise Impact Assessment (NIA) has been written to assess the risk of adverse impact from noise 'pollution' generated by proposals for the installation of 3 no. air source heat pumps at the Friends and Neighbours Centre, Maes-Y-Ffynnon Close, Neath, SA11 1HQ.

The assessment has been made based on the manufacturer's laboratory test noise data, inputting this into 3D noise mapping software to predict the noise emissions outside of neighbouring windows and in neighbouring gardens. This has then been assessed against background noise levels determined in accordance with BS 4142:2014+A1:2019, with context provided by further assessment against BS 8232:2014 and WHO noise guidelines.

PJA understands that the Local Planning Authority will require the noise emissions to be at most, equal to the representative background sound level, when assessed in accordance with BS 4142:2014+A1:2019. The required noise limits are provided in **Table 5.1 (Section 5.1)**.

Predicted plant noise emissions are up to 33 dB L_{Aeq} outside of the worst-affected neighbouring window; and 39 dB L_{Aeq} in the worst-affected neighbouring garden. Whilst predicted levels outside of windows are within daytime and evening limits (of 38 dB and 36 dB respectively), levels in the worst-affected garden would be above the limits by a margin of up to 3 dB.

The required level of reduction can be achieved via the installation of a close boarded fence/screen of 2m height to the plant area as indicated in **Figure 5.1 (Section 5.5)**, reducing the predicted noise emissions to up to 29 dB L_{Aeq} outside of the worst-affected neighbouring window; and 35 dB L_{Aeq} in the worst-affected neighbouring garden.

Vibration has also been considered in **Section 6.0** – and it is expected that the provision of suitable anti-vibration mounts will ensure that the risk of adverse impact from vibration is negligible.

Therefore, PJA recommends that noise should not pose a constraint to achieving planning permission and that the proposals should not result in anything greater than a low level of impact, providing the recommendations for a fence around the compound as outlined above / in **Section 5.5** are followed.

Contents

Executive Summary and Conclusions	3
1.0 Introduction.....	5
2.0 Site and Development Description.....	6
3.0 Relevant Guidelines	8
3.1 Local Authority Criteria	8
3.2 BS 4142:2014.....	8
3.3 BS 8233:2014	9
3.4 World Health Organisation (WHO) Environmental Noise Guidelines.....	9
4.0 Baseline Noise Survey	10
4.1 Methodology.....	10
4.2 Results	11
5.0 Noise Assessment.....	13
5.1 Background Sound Levels.....	13
5.2 Proposed Plant	14
5.3 Predicted Noise Emissions	15
5.4 Analysis	15
5.5 Mitigation	16
6.0 Vibration Assessment.....	17
Appendix A – Acoustic Terminology and Concepts.....	18
Appendix B – Noise Survey Methodology	19
B.2 – Photos	20
Appendix C – Calculations.....	21
Appendix D – Manufacturer Data.....	27

1.0 Introduction

ParkerJones Acoustics Limited (PJA) has been instructed to undertake a Noise Impact Assessment to accompany a planning application for the installation of 3 no. air source heat pumps at the Friends and Neighbours Centre, Maes-Y-Ffynnon Close, Neath, SA11 1HQ.

This document has been written to assess the risk of adverse impact from noise 'pollution' generated by the proposed ASHPs ('the plant') on neighbouring residential properties once it is fully operational.

The objective is to ensure that the risk of noise impact will be controlled sufficiently. This is based upon ensuring that the noise emissions from the plant will not cause internal ambient noise levels inside nearby residential properties to exceed typical levels which are deemed to be acceptable for good living and sleeping conditions and that external noise levels in gardens won't affect the recreational use of these areas.

Therefore, the purpose of this report is to demonstrate whether the plant is able to achieve sufficiently low noise levels that avoids an adverse impact, and if not, to provide recommendations on how to do so.

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**.

The assessment has been undertaken in reference to:

- BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound';
- BS 8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings'; and
- the WHO Environmental Noise Guidelines for the European Region.

2.0 Site and Development Description

The property in question is a detached community centre building at Maes-Y-Ffynnon Close, Neath, SA11 1HQ – located as shown in **Figure 2.1**.

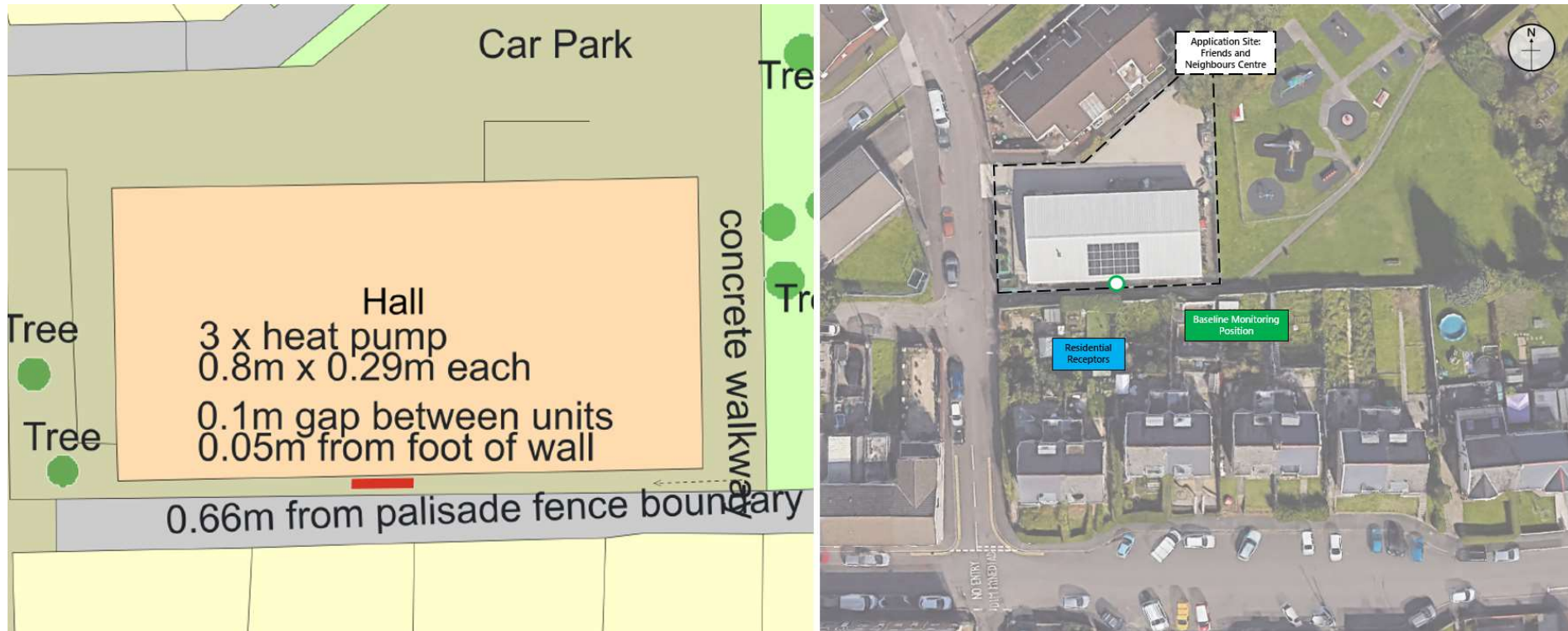
The proposals assessed herein, include the installation of 3 air source heat pumps. Each of the proposed units will be a *Fujitsu* AOYG18KMTA model, located at ground level on the southern elevation of the building.

The closest neighbouring properties to the proposed plant location are those to the south on Wellfield Avenue. The noise modelling software used in the assessment inherently predicts noise emissions to *all* neighbouring windows and gardens in the area.

PJA understands that the plant would only need to be operational during the daytime period (between 07:00 and 23:00).

The property sits within a residential area where ambient/background noise levels are seen to be moderately low, given the lack of major roads and railways or industrial use in the area.

Figure 2.1 – Site block plan, Plant location in red (left) – Aerial view indicating receptor location, Baseline monitoring position (right)



3.0 Relevant Guidelines

3.1 Local Authority Criteria

Based on a review of local planning policy and historic planning applications within Neath Port Talbot County Borough Council, it is seen that the following typical planning condition will be applicable to the proposed development;

"The applicant is to submit a noise impact assessment for the proposed development. The noise rating level emitted from external plant serving the approved use shall not be greater than the existing background noise level. The noise levels shall be determined at the nearest noise-sensitive premises or at another location that is deemed suitable by the Local Planning Authority. Measurements and assessments shall be made in accordance with 'BS 4142:2014 Method for rating and assessing industrial and commercial sound.'"

The typical planning condition requires that the rating level of the mechanical plant installation does not exceed the existing background noise levels. PJA assumes that similar requirements would be set for the proposals assessed herein.

3.2 BS 4142:2014

BS 4142:2014 'Methods for rating and assessing industrial and commercial sound' is intended to be used to assess the potential adverse impact of sound of an industrial and/or commercial nature, at nearby noise-sensitive receptor (NSR) locations (i.e., residential windows) within the context of the existing sound environment.

The method is based upon assessing the predicted noise emissions from plant/equipment against the existing background sound levels at NSRs, the latter of which is determined by a noise survey conducted at the site.

The predicted noise emissions are termed as a 'rating level', which is the 'specific sound level' from plant (the actual measurable noise level), plus 'penalties' which account for whether the noise has distinguishing characteristics such as tonality, intermittency, impulsivity, or is generally distinguishable from the ambient noise environment. Such features may attract attention and be considered annoying, hence sounds with these qualities should be penalised over sounds at the same specific noise level which is less intrusive.

The general aim is for the 'rating level' (plant noise emissions) to not exceed the existing background sound levels outside of residential windows. BS 4142:2014 states that *"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 or a significant 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, depending on the context."*

3.3 BS 8233:2014

BS 8233:2014 'Guidance on Sound Insulation and Noise Reduction for Buildings' suggests appropriate criteria and limits for different situations. This includes internal noise criteria for residential developments. The limits with BS 8233:2014 are similar to those in the WHO's 'Guidelines for Community Noise and Night Noise Guidelines for Europe' document.

Table 4 of BS 8233:2014 provides internal ambient noise level (IANL) limits for dwellings from "steady external noise sources". These are summarised in **Table 3.1** below.

Table 3.1 – BS 8233:2014 internal ambient noise level (IANL) upper limits

Activity	Location	Daytime (07:00 – 23:00)	Night-time (23:00 – 07:00)
Resting	Living Room	35 dB $L_{Aeq,16hr}$	-
Dining	Dining Room/Area	40 dB $L_{Aeq,16hr}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$

Annex G.1 of BS 8233:2014 suggests that "if partially open windows were relied upon for background ventilation, the insulation would be reduced to approximately 15 dB". Therefore, a noise limit directly outside of the nearest residential windows could be set based on the values above plus 15 dB. Therefore, to meet internal noise targets in nearby residential dwellings, noise from the proposed plant should not exceed 50 dB L_{Aeq} during the daytime and 45 dB L_{Aeq} during the night-time when measured/calculated directly outside of a bedroom or living room window.

3.4 World Health Organisation (WHO) Environmental Noise Guidelines

The WHO document *Guidelines for Community Noise 1999* has recently been superseded by the *Environmental Noise Guidelines for the European Region*. However, the updated guidance states that 'all WHO guidelines for community noise (CNG) indoor guideline values and any values not covered by the current guidelines (such as industrial noise and shopping areas) should remain valid'.

The document sets out guidance as to noise levels at which there will be an unacceptable impact on the local community. WHO guidelines state:

- To protect the majority of people from being seriously annoyed during the daytime, the sound pressure level on balconies, terraces and outdoor living areas should not exceed 55 dB L_{Aeq} for a steady, continuous noise.
- To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound pressure level should not exceed 50 dB L_{Aeq} .

Therefore, noise from the proposed plant should not exceed 50 dB L_{Aeq} during the daytime when measured or calculated within a residential garden, patio, or balcony.

4.0 Baseline Noise Survey

4.1 Methodology

PJA has attended the site to conduct a baseline noise survey across several days between Monday the 13th and Friday the 17th of May 2024. The results have been used to determine a representative background sound level at a position representative of nearby residential receptors.

A fixed monitoring position was employed adjacent to the southern façade of the community building, in a position whereby background sound levels would be representative of the closest neighbouring properties on Wellfield Avenue. 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 of 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**. It is understood that the operating times of the proposed plant will be variable but will be restricted to daytime hours only, and that the plant will not operate during the night time period (23:00 – 07:00).

Table 4.1 summarises the results across the daytime (07:00 – 18:00) and evening (18:00 – 23:00) 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.

Table 4.1 – Summary of measured noise levels

Period	Parameter	Maximum	Minimum	Logarithmic Average	Mean Average	Modal Average	Median Average
Daytime (07:00 – 18:00)	$L_{Aeq,15min}$ (dB)	66	40	52	47	44	46
	$L_{AFMax,15min}$ (dB)	91	53	N/A	68	65	66
	$L_{A90,15min}$ (dB)	58	35	N/A	40	38	39
Evening (18:00 – 23:00)	$L_{Aeq,15min}$ (dB)	60	31	47	43	46	43
	$L_{AFMax,15min}$ (dB)	85	44	N/A	63	63	62
	$L_{A90,15min}$ (dB)	47	28	N/A	36	36	36

Figure 4.1 – Graph of measured noise levels

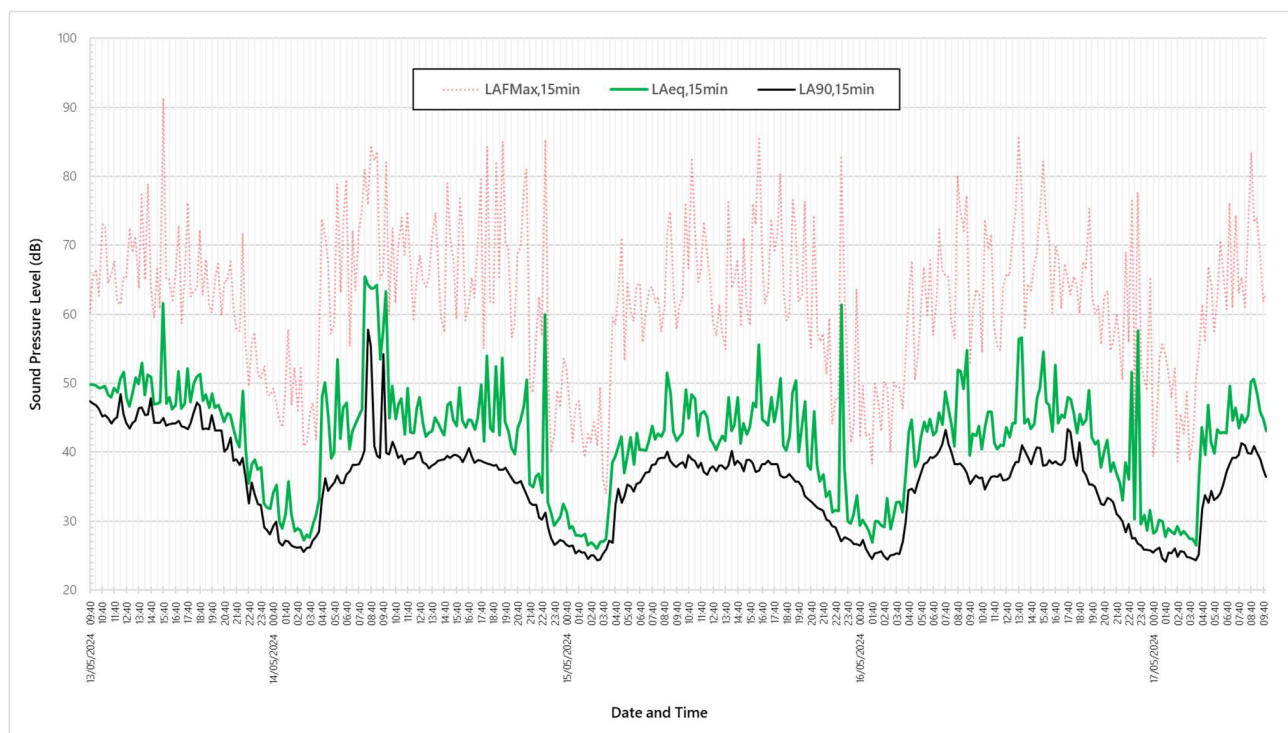
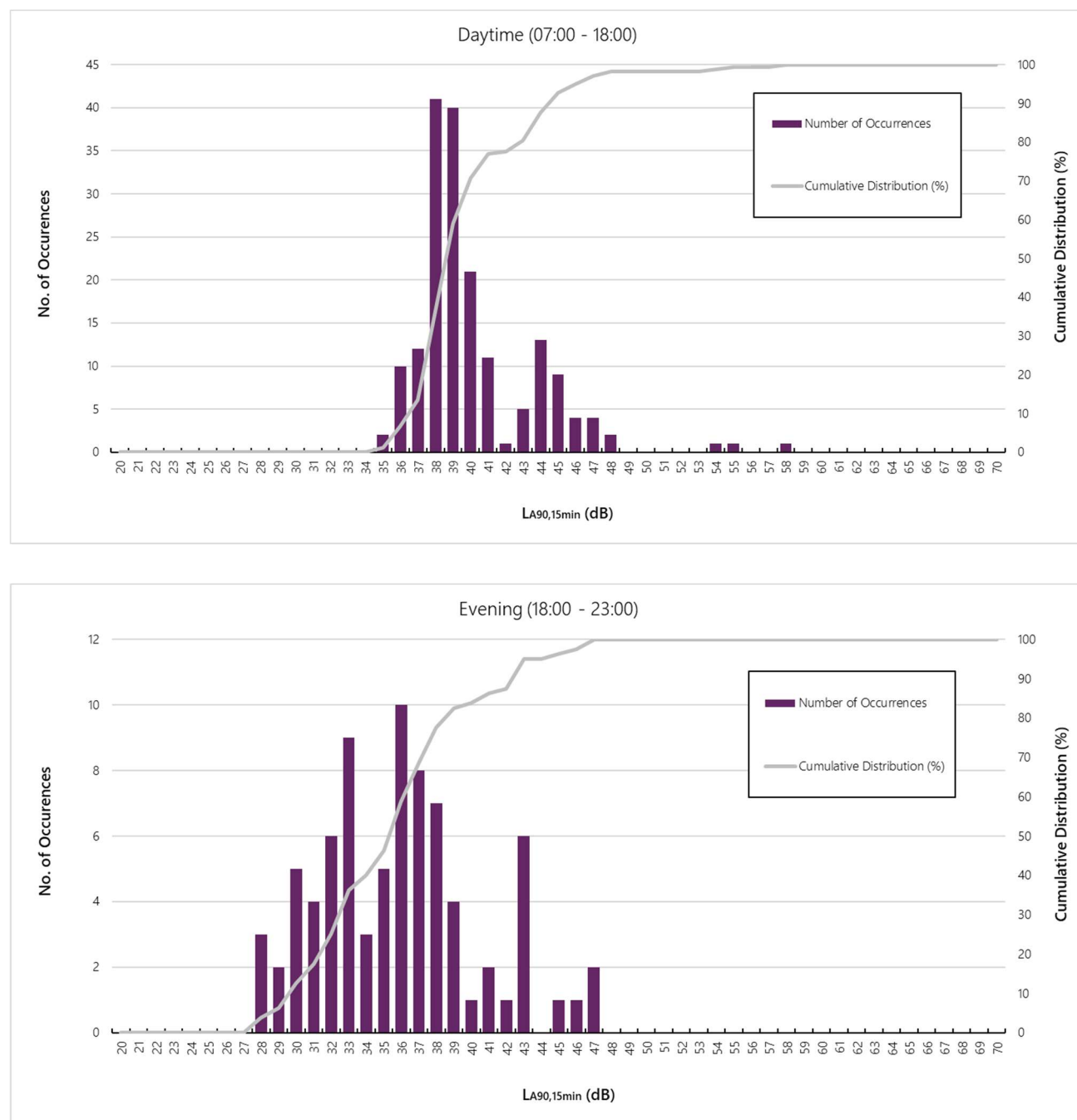


Figure 4.2 – Histogram of measured $L_{A90,15min}$ values



5.0 Noise Assessment

5.1 Background Sound Levels

In accordance with BS 4142:2014, the predicted rating level 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 in this case.

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 to 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"*.

In this case, PJA has used the lowest of the mean/modal/median averages of $L_{A90,15min}$ as the representative background sound level.

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

Noise-Sensitive Receptor (NSR)	Period	Representative Background Sound Level $L_{A90,T}$ (dB)
1m outside of neighbouring residential windows	Daytime (07:00 to 18:00)	38
	Evening (18:00 – 23:00)	36

5.2 Proposed Plant

The proposed external ASHP units will each be a *Fujitsu* model AOYG18KMTA ¹ (632mm high x 799mm wide x 290mm deep).

Extracts from the manufacturers' Technical Manual ² are given in **Appendix D** – from which the source noise data in **Table 5.2** has been taken from. Octave band sound pressure levels are not provided by the manufacturer. Heating and cooling modes are seen to exhibit the same noise emissions.

Table 5.2 – Source noise emission data for the proposed external AC unit

Make/Model	Mode	Sound Pressure Levels @ 1m ³								
		dB at Octave Band Centre Frequencies, Hz								dB(A)
		63	125	250	500	1 k	2 k	4 k	8 k	
Fujitsu model AOYG18KMTA	Cooling	-	-	-	-	-	-	-	-	50
	Heating	-	-	-	-	-	-	-	-	50

The spectral noise levels do not suggest a tonal quality – the lack of tonality being a typical trait of a small ASHP because the fan rotates at a relatively low speed and consequently the blade passing frequency (the main cause of tonality) is at a very low frequency, meaning the sound overall is perceived as broadband in nature. The assessment has been based on the assumption that the unit could run at full capacity at any point of the day/night.

1 - [5.2kW Outdoor Unit – R32 Single Phase | FUJITSU GENERAL United Kingdom \(fujitsu-general.com\)](#)

2 - [AOYG18KMTA design+&+technical+manual.pdf](#)

3 - Assumed to be measured at 1m in front of the unit at a height of 1.5m above ground, in an anechoic chamber.

5.3 Predicted 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. A full explanation of the noise modelling is provided in **Appendix C** along with images and noise maps/results from the model.

Figures C.2 and C.3 in Appendix C show the predicted plant noise levels ($L_{Aeq,15min}$) at ground floor (1.5m, with additional receptor points in gardens) and 1st floor (4.5m) heights respectively.

In summary, the predicted plant noise emissions are up to:

- 33 dB L_{Aeq} outside of the worst-affected neighbouring window; and
- 39 dB L_{Aeq} in the worst-affected neighbouring garden.

The highest specific noise levels are therefore those within the affected residential garden, with façade noise levels being lower due to distance. The highest façade noise levels are those at first floor level, due to screening.

5.4 Analysis

If assessing based on BS 8233:2014 and WHO guidelines, to exceed internal noise level targets (of 35 dB $L_{Aeq,16hrs}$) within a bedroom or living room during the daytime, based on an estimated sound reduction across an open window of 10 - 15 dB, specific noise levels would have to exceed 45 - 50 dB $L_{Aeq,16hrs}$ when measured outside of the window.

The worst-case specific noise level, in this case, is 33 dB L_{Aeq} – and hence these internal noise targets would easily be achieved (18 – 23 dB L_{Aeq}).

A level of 39 dB L_{Aeq} within gardens is also within WHO/BS 8233 targets (<50 dB). Note that this level is derived at the end of the amenity area at 74 Wellfield Avenue which is closest to the proposed plant location. Noise levels further away in the receptor gardens will be significantly lower.

Nonetheless, the Local Authority Criteria (as outlined in **Section 3.1**) require that the rating level of the plant is at most, equal to the background sound level.

The predicted worst-case façade noise level of 33 dB L_{Aeq} is below both the day (38 dB L_{A90}) and evening (36 dB L_{A90}) limits. The predicted specific noise level of 39 dB L_{Aeq} however is in excess of the limits above.

As such, mitigation will be required in order to comply with the local authority rating level requirements. At least a 3 dB reduction will be required.

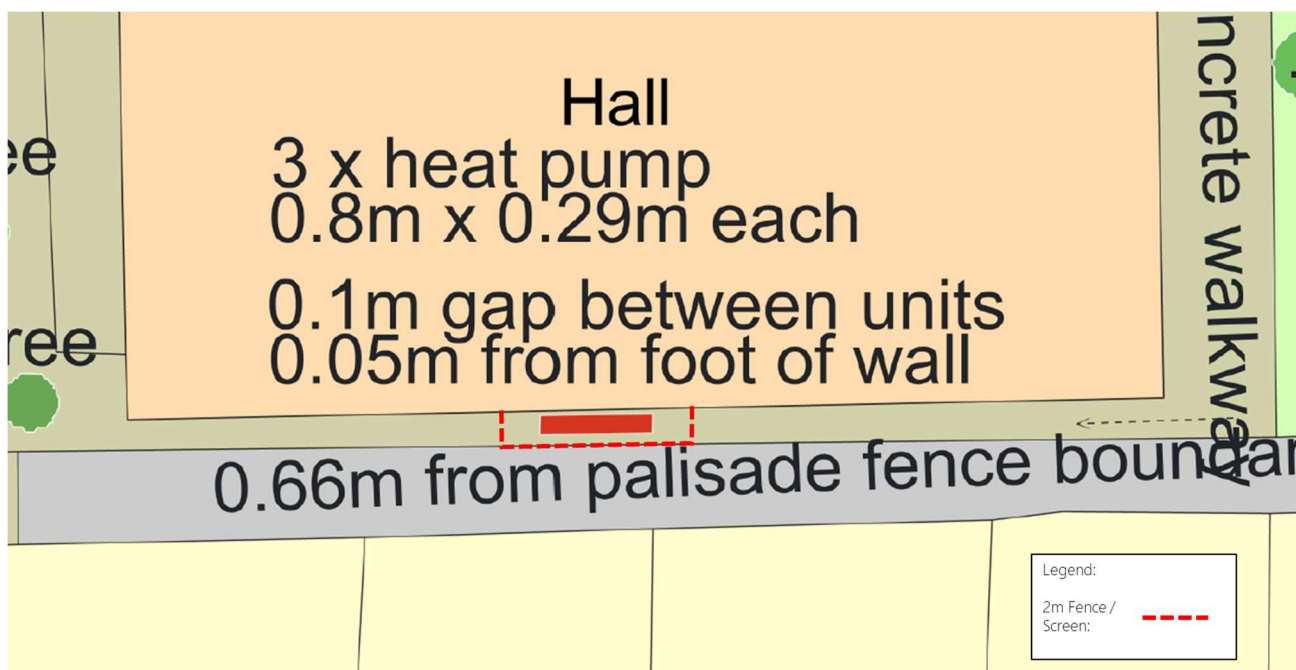
5.5 Mitigation

Some form of mitigation will be required for plant noise emissions to be reduced to a level that is compliant with the criteria stipulated by the Local Planning Authority, i.e., no greater than the existing background noise levels.

At least a 3 dB reduction will be required to meet the specified evening noise limit.

The required level of reduction can be achieved via the installation of a solid fence / screen of 2m height to the plant area as indicated in **Figure 5.1** below.

Figure 5.1 – Noise mitigation – Proposed 2m solid fence / screen



To be effective in acting as a noise barrier, the fences should have a minimum mass of 10 kg/m² and be close-boarded/imperforated with no air gaps either within the fence panel, underneath the fence, or between panel and post. For example, a 20mm thick timber fence would achieve this mass.

Figures C.4 and C.5 in Appendix C show the predicted specific noise levels with the inclusion of this mitigation, showing predicted plant noise emissions of up to:

- 29 dB L_{Aeq} outside of the worst-affected neighbouring window; and
- 35 dB L_{Aeq} in the worst-affected neighbouring garden.

This would be below the representative background sound level during both the daytime and evening periods.

6.0 Vibration Assessment

The external unit should be installed using anti-vibration fixings and rubber washings on screws/bolts, to dampen vibration transmitting through the fixings and radiating through the structure. This is particularly important when a unit is fixed to the external wall.

Such mounts would usually be made of a resilient material such as rubber and are usually supplied by the manufacturer (as standard) and then applied to any connection with the structure, including floors and walls.

Given that the unit will share no structural connection with any adjoining buildings, the risk of perceptible vibration at any of the receptor locations is seen to be negligible.

However, in the unlikely event that the applicant receives a formal complaint from any of the neighbouring properties, the applicant is committed to investigating the source of the problem and re-installing the offending unit on an upgraded anti-vibration mount if necessary.

This further action is unlikely to be required as the risk of vibration is considered to be very low. ASHPs are regularly installed into similar properties with minimal risk of vibration impact.

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 (2×10^{-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 as 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'.
$L_{AFmax,T}$	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 as BS EN 60942:2003 Class 1 device.

Table B.1 – Equipment used for the noise survey

Name	Serial Number	Last Calibrated	Calibration Due
SVAN 949 Class 1 Sound Level Meter	9720	Dec-23	Dec-25
SV22 Class 1 Microphone	4012386	Dec-23	Dec-25
Cirrus CRL511E Class 1 Acoustic Calibrator	035235	May-24	May-25

B.2 – Photos

Figure B.1 – Photographs of the monitoring position and receptor locations



Appendix C – Calculations

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.

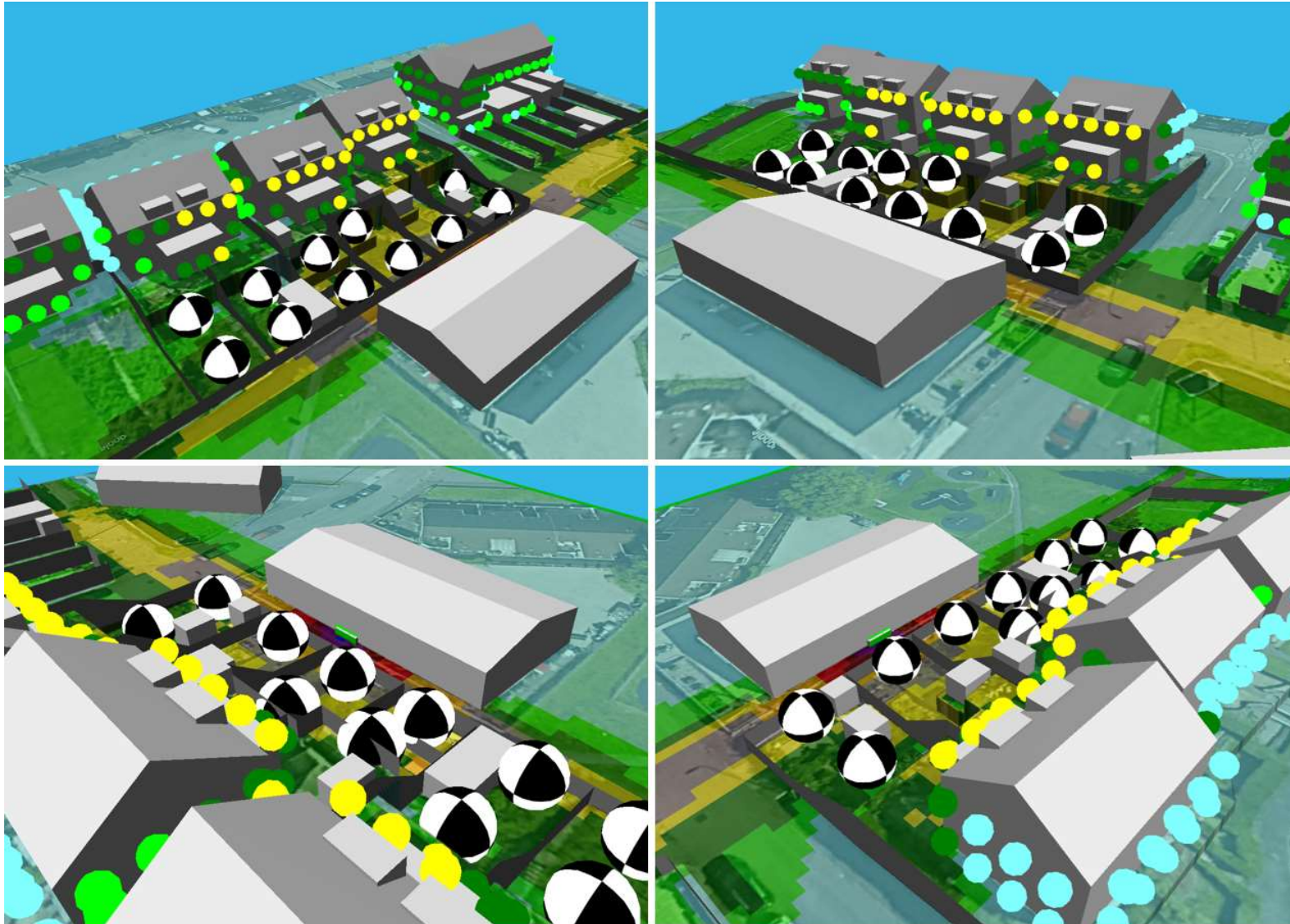
The noise model has been used to predict the resulting L_{Aeq} noise emissions from the proposed plant.

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 as a worst-case, with a factor of 1 for grass and 0.5 for mixed areas;
- receptor points on the façade at ground floor (1.5m) and 1st floor (4.5m) window heights, placed at 1m outside of elevations which contain windows;
- receptor points at a height of 1.5m within the affected 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

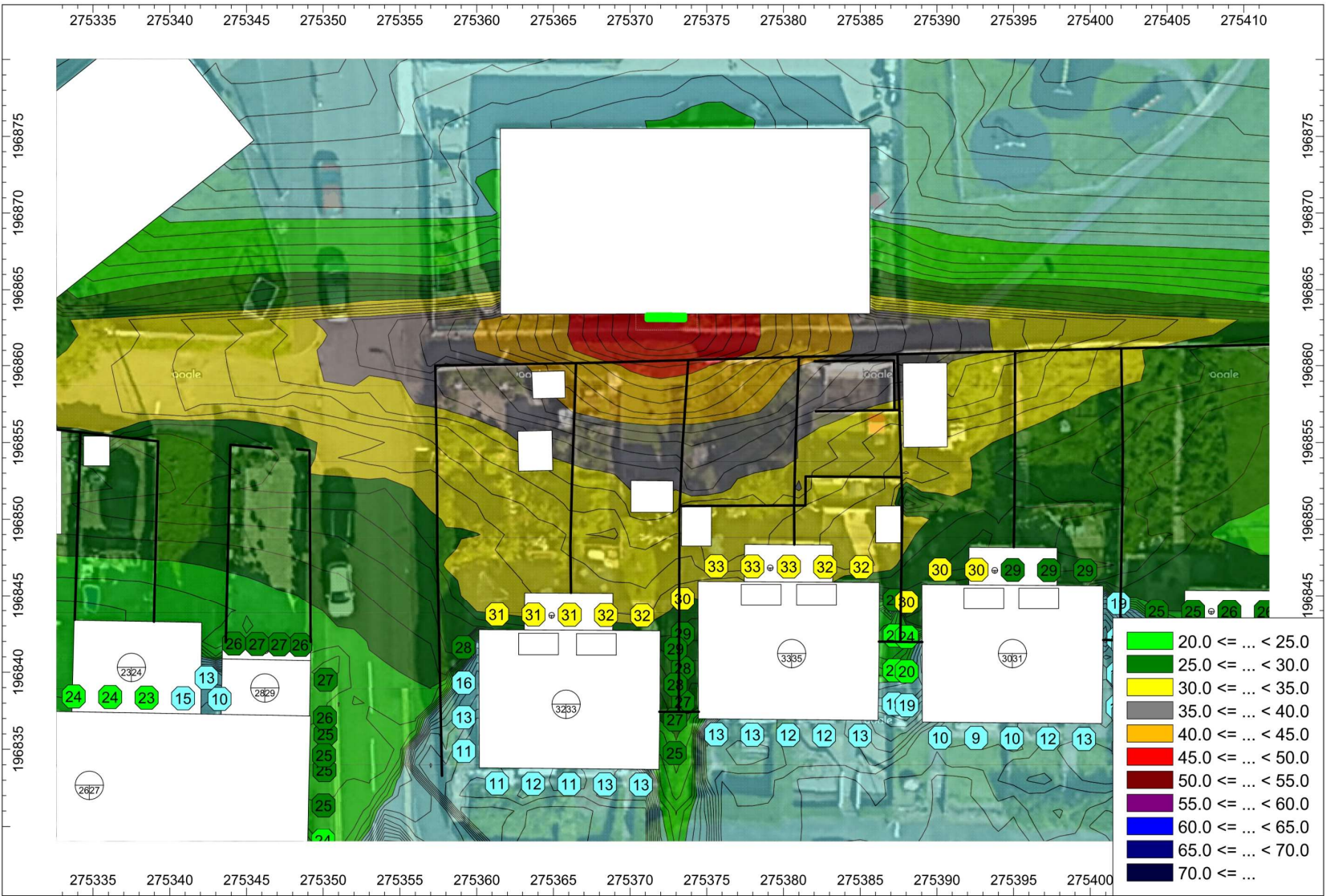


The figure is a topographic map of a study area, showing contour lines and elevation data. The map is overlaid with a grid of coordinates. The x-axis (horizontal) ranges from 275335 to 275410, and the y-axis (vertical) ranges from 196835 to 196875. The map displays various features, including buildings, roads, and vegetation. A legend on the right side of the map provides a color-coded scale for elevation data, ranging from 20.0 to 70.0. The legend includes the following categories:

- 20.0 ≤ ... < 25.0 (Light Green)
- 25.0 ≤ ... < 30.0 (Dark Green)
- 30.0 ≤ ... < 35.0 (Yellow)
- 35.0 ≤ ... < 40.0 (Grey)
- 40.0 ≤ ... < 45.0 (Orange)
- 45.0 ≤ ... < 50.0 (Red)
- 50.0 ≤ ... < 55.0 (Dark Red)
- 55.0 ≤ ... < 60.0 (Purple)
- 60.0 ≤ ... < 65.0 (Blue)
- 65.0 ≤ ... < 70.0 (Dark Blue)
- 70.0 ≤ ... (Black)

The map also includes several numerical labels, such as 2324, 2629, 3233, 3335, 3031, and 3037, which likely represent specific elevation points or data values. The contour lines indicate the topography of the area, with higher elevations generally located in the central and right portions of the map.

Figure C.3 – Specific noise levels (dB L_{Aeq}) – heating / cooling – First floor (4.5m)

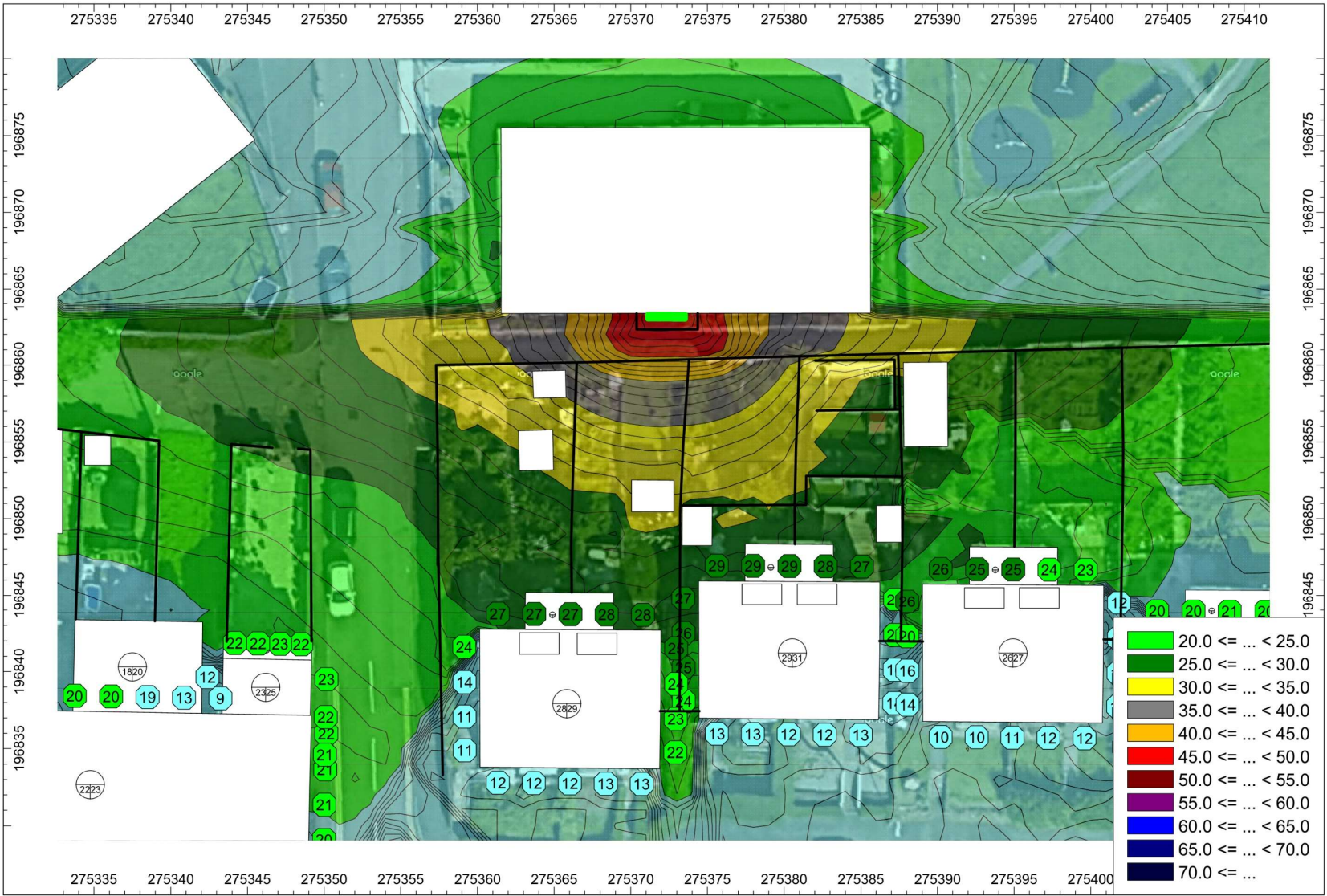


The map displays a topographic site plan with contour lines indicating elevation. A large white rectangular area is located at the top of the map. Below this, a central area contains several buildings and a large white rectangle. The bottom area features more buildings and a large white rectangle. The map is overlaid with a grid of coordinates. A legend on the right side shows color-coded elevation ranges from 20.0 to 70.0. The map includes various symbols for buildings, trees, and other features.

Legend (Elevation Ranges):

- 20.0 ≤ ... < 25.0
- 25.0 ≤ ... < 30.0
- 30.0 ≤ ... < 35.0
- 35.0 ≤ ... < 40.0
- 40.0 ≤ ... < 45.0
- 45.0 ≤ ... < 50.0
- 50.0 ≤ ... < 55.0
- 55.0 ≤ ... < 60.0
- 60.0 ≤ ... < 65.0
- 65.0 ≤ ... < 70.0
- 70.0 ≤ ...

Figure C.5 – Specific noise levels (dB L_{Aeq}) – heating / cooling – First floor (4.5m) – With a 2m high fence around the proposed plant

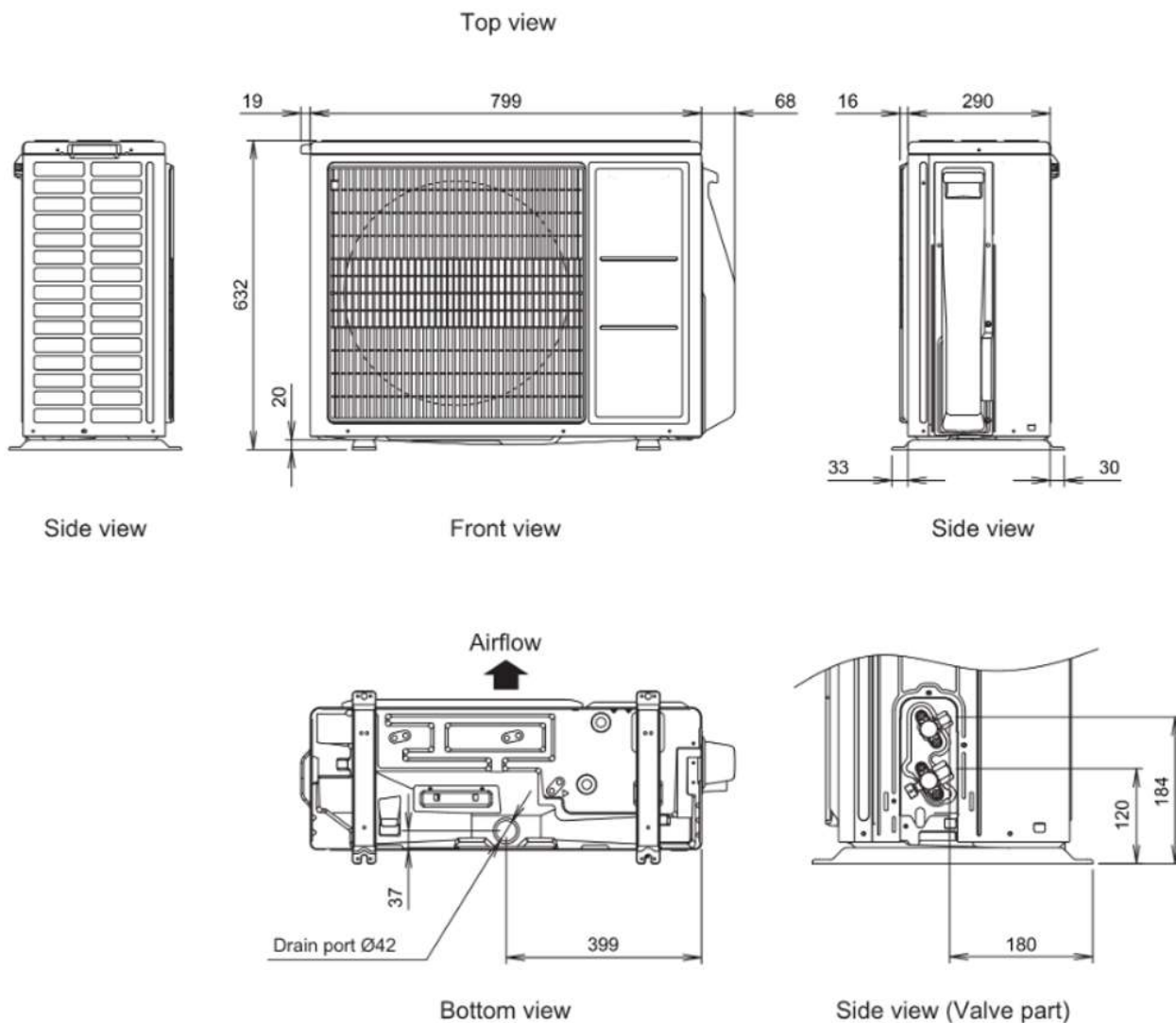


Appendix D – Manufacturer Data

Figure D.1 – Manufacturer general information – Fujitsu AOYG18KMTA

Type				Inverter heat pump			
Model name				AOYG18KMTA	AOYG24KMTA		
Power supply				230 V ~ 50 Hz			
Power supply intake				Outdoor unit			
Available voltage range				198—264 V			
Starting current			A	7.0	8.6		
Fan	Airflow rate	Cooling	m ³ /h	2,350	3,240		
		Heating		2,100	2,820		
	Type × Q'ty		Propeller fan × 1				
	Motor output		W	49			
Sound pressure level *1		Cooling	dB (A)	50	54		
		Heating		50	52		
Sound power level		Cooling	dB (A)	65	67		
		Heating		65	66		
Heat exchanger type		Dimensions (H × W × D)	mm	588 × 881 × 18.19	672 × 881 × 18.19		
				588 × 851 × 18.19	672 × 851 × 18.19		
		Fin pitch		1.3			
		Rows × Stages			1 × 28	1 × 32	
		Pipe type			Copper tube		
		Fin type	Type (Material)		Aluminum		
Surface treatment			PC fin				
Compressor	Type			DC twin rotary			
	Motor output		W	900	1,060		
Refrigerant		Type (Global warming potential)		R32 (675)			
		Charge	g	1,020	1,320		
Refrigerant oil		Type		FW68S	RmM68AF		
		Amount	cm ³	350	400		
Enclosure		Material		Steel sheet			
		Color		Beige			
				Approximate color of Munsell 10YR 7.5/1.0			
Dimensions (H × W × D)	Net	mm	632 × 799 × 290	716 × 820 × 315			
	Gross		692 × 940 × 375	776 × 961 × 450			
Weight	Net	kg	36	42			
	Gross		40	46			
Connection pipe	Size	Liquid	mm (in)	Ø 6.35 (Ø 1/4)			
		Gas		Ø 12.70 (Ø 1/2)			
	Method		Flare				
	Pre-charge length		m	15			
	Max. length			25	30		
	Max. height difference			20	25		
Operation range		Cooling	°C	-10 to 46			
		Heating		-15 to 24			
Drain hose		Material		PP			
		Size	mm	Ø 13.0 (I. D.), Ø 16.0 to Ø 16.7 (O. D.)			

Figure D.2 – Manufacturer schematics – Fujitsu AOYG18KMTA





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