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PROPOSED AIR SOURCE HEAT PUMP INSTALLATION

ARBETA, ONE CENTRAL PARK, MANCHESTER

NOISE IMPACT ASSESSMENT

R2149-REP01-JW

21 December 2022

REPORT DETAILS

Project	Proposed Air Source Heat Pump Installation Arbeta One Central Park 11 Northampton Road Manchester, M40 5BP
Client	AA Projects Jackson House Sibson Road Hale Manchester M33 7RR
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SUMMARY

Red Acoustics has been commissioned by AA Projects Ltd to provide an assessment of noise impact from the proposed installation of 4no. Air Source Heat Pump (ASHP) units at Arbeta, One Central Park, Manchester.

The existing noise climate has been assessed at a position representative of the nearest noise sensitive dwellings and target noise levels set in line with published guidance and Manchester City Council criteria.

This report presents the results of noise propagation modelling predictions at the proposed location based on manufacturer supplied plant noise data.

Compliance with the recommended target criteria is expected without the need for additional noise mitigation.

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1.0 INTRODUCTION

Red Acoustics has been commissioned by AA Projects Ltd to provide an assessment of noise impact from the proposed installation of 4no. Air Source Heat Pump (ASHP) units at Arbeta, One Central Park, Manchester.

Red Acoustics has been commissioned by AA Projects Ltd to conduct the following assessments:

- Assess the existing background noise climate at a position representative of nearby noise sensitive receptors.
- Based on the measured existing background sound levels, determine target noise limits for the proposed externally mounted mechanical plant items.
- Prepare a 3D computer noise propagation model to predict the impact of environmental noise from the proposed mechanical plant items.
- Advise as necessary on the level of mitigation required to achieve target limits to enable approval to be sought from the Local Planning Authority for installation of the proposed mechanical plant items.

This report presents the results of an environmental noise survey and details an assessment of environmental noise impact from the proposed installation.

2.0 DETAILS OF THE PROPOSED DEVELOPMENT

The proposed plant installation is to be located within an external plant area along the North-West elevation of Arbeta, which is a shared workspace and technology development. The building is located within a recently developed commercial park and is situated North of Northampton Road. The site location and proposed ASHP location is shown in Figure 2.1 below.

Figure 2.1: Site Location in Relation to Surroundings

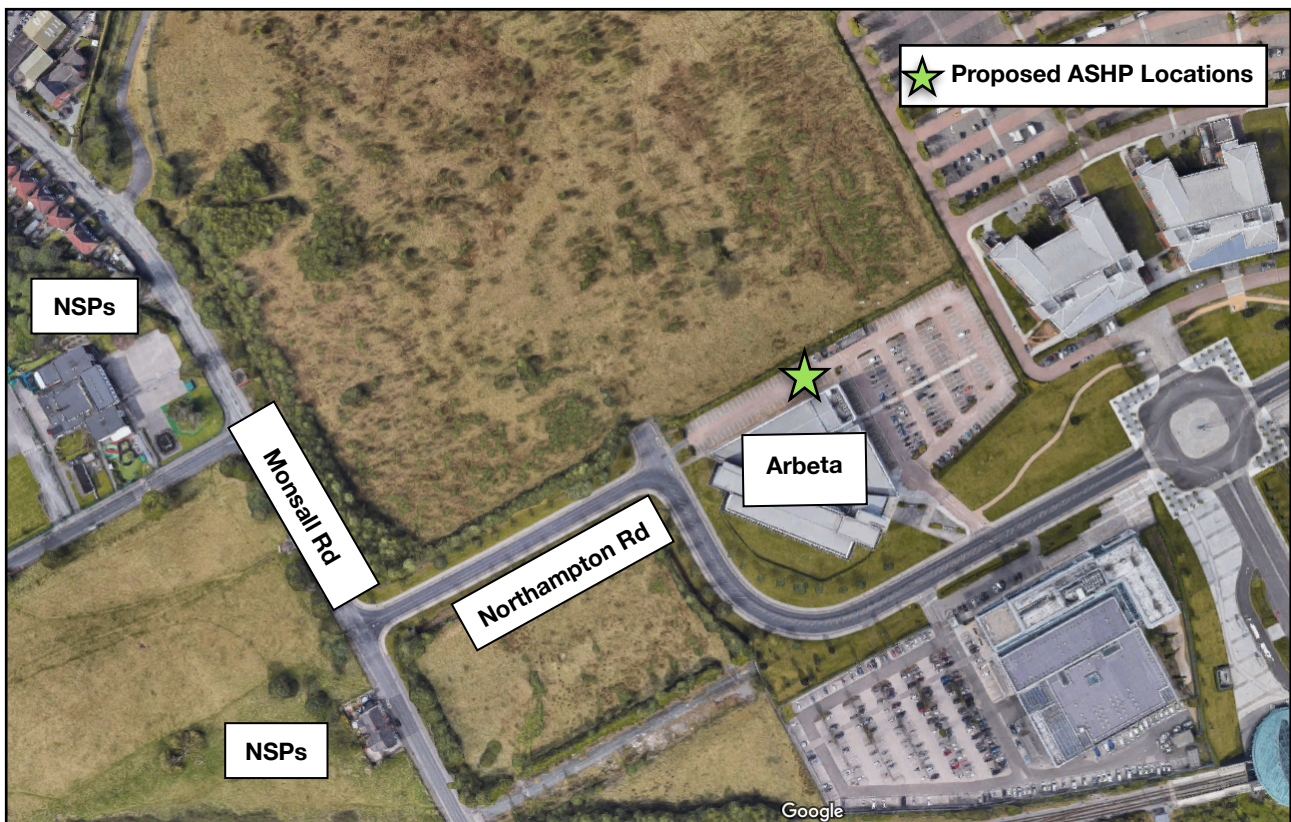
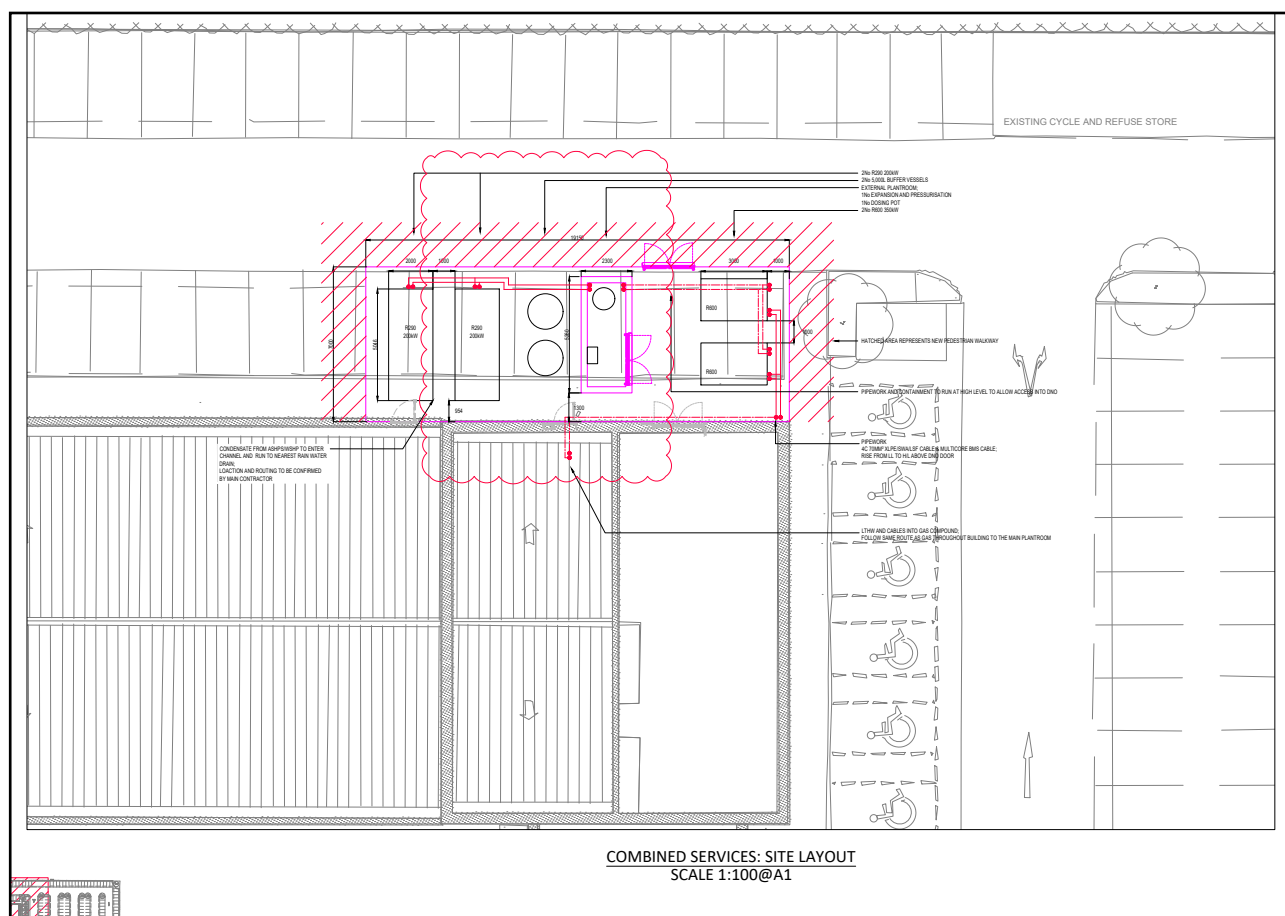


Figure 2.2 below shows drawn information provided by the client, detailing the location of the proposed ASHP units.

Figure 2.2: Location of the Proposed ASHP Units



Proposed ASHP Unit

The proposal is to install 4no. free standing Air Source Heat Pump units consisting of 2no. Clade R290 and 2no. Clade R600 units. It is proposed these be installed in an external plant area enclosed by a solid 3.9m high fence constructed from metal cladding type material.

In order to assess the potential for noise impact to the surrounding environment, manufacturer supplied broadband sound power pressure level data measured at 10m has been used. Information provided by the equipment manufacturer (Clade) advises that the plant items have a broadband sound pressure level of 49dBA (R600) and 54dBA (R290) at 10m. Following discussion with the plant manufacturer, only broadband sound pressure level data is available.

Typical ASHP Unit Hours of Operation

Specific plant operational hours have not yet been confirmed by the project M&E engineer however initial client discussion indicates that the plant will be expected to operate 24 hours. Daytime and night-time period target noise levels have therefore been determined through environmental sound measurements for the purpose of the assessment.

3.0 PLANNING POLICY & DESIGN TARGETS

Planning Policy

National Planning Policy Framework

The National Planning Policy Framework (NPPF¹) was updated in 2021 and sets out the Government's planning policies for England and how these should be applied. Where issues of noise impact are relevant the NPPF provides guidance. In paragraph 174 it states that planning policies and decisions should contribute to and enhance the natural and local environment by:

'preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of noise pollution'.

Paragraph 185 also advises:

'Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should: mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development - and avoid noise giving rise to significant adverse impacts on health and quality of life'.

The NPPF also refers to the 2010 DEFRA publication, the Noise Policy Statement for England (NSPE) which reinforces and supplements the NPPF guidance.

Noise Policy Statement for England

The Noise Policy Statement for England² (NPSE) sets out the long term vision of promoting good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development. This vision is supported by the following aims:

- Avoid Significant adverse impacts on health and quality of life.
- Mitigate and minimise adverse impacts on health and quality of life.
- Where possible, contribute to the improvement of health and quality of life.

The NPSE describes the following levels at which noise impacts may be identified:

¹ National Planning Policy Framework. Ministry of Housing, Communities & Local Government (2021)

² Noise Policy Statement for England - Department for Environment, Food & Rural Affairs (2010)

- NOEL - No Observed Effect Level. This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
- LOAEL - Lowest Observed Adverse Effect Level : This is the level above which adverse effects on health and quality of life can be detected.
- SOAEL - Significant Observed Adverse Effect Level : This is the level above which significant adverse effects on health and quality of life occur.

According to the explanatory notes in the statement, where a noise level falls between LOAEL and a level which represents SOAEL then:

'all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life whilst also taking into consideration the guiding principles of sustainable development. This does not mean that such effects cannot occur'.

Planning Practice Guidance on Noise

Planning Practice Guidance (PPG) - Noise³ is an online [www.gov.uk](https://www.gov.uk/guidance/noise--2) resource (last updated 2019) to provide additional guidance on the NPPF. It discusses:

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

In line with the Explanatory Note of the NPSE, the PPG references the LOAEL and SOAEL in relation to noise impact. It also provides examples of outcomes that could be expected for a given perception level of noise, plus actions that may be required to bring about a desired outcome. However, inline with the NPSE, no objective noise levels are provided although the PPG states that:

'the subjective nature of noise means that there is not a simple relationship between noise levels and impact on those effected. This will depend on how various factors combine in any particular situation'

Table 3.1 below summarises the PPG noise expose hierarchy.

³ Planning Practice Guidance on Noise (<https://www.gov.uk/guidance/noise--2>). Ministry of Housing, Communities & Local Government

Table 3.1: Explanation of Noise Exposure Hierarchy - PPG

Perception	Examples of Outcomes	Increasing Effect Levels	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; closing windows for some of the time because of the noise. Potential for non-awakening sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse Effect Level	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. having to keep windows closed most of the time, avoiding certain activities during periods of intrusion. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

British Standard 4142

BS 4142:2014+A1:2019⁴ presents methods for rating and assessing the potential impact of commercial and industrial sound upon noise sensitive receptors. In order to assess impact using BS 4142, the Rating Level of the new sound source is compared with the existing contextual Background Sound Level.

- Typically, the greater this difference, the greater the magnitude of the impact.
- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
- 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.

The Rating Level is determined by assessing the Ambient Sound Level, distinguishing the Specific Sound Level from the Residual Sound Level and applying any sound specific penalties for acoustic features that would subjectively cause the sound to be perceived differently.

The Specific Sound Level of the commercial / industrial sound source is determined by either; measurement or calculation with regard to the appropriate reference time interval (for daytime or night-time periods). The standard requires separate analysis for daytime and night-time periods, evaluating the Rating Level over an appropriate reference time interval (T_r) of: 1hr for daytime (07:00 - 23:00 hrs) and 15min for night time (23:00 - 07:00 hrs). The Specific Sound Level is defined as equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T (determined either by calculation or deducting the measured Residual Sound Level from the measured Ambient Sound Level).

‘Ambient sound’ is defined as the totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far (The ambient sound comprises the residual sound and the specific sound when present).

‘Residual sound’ is defined as the ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.

⁴ BS4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound

Where appropriate, a rating penalty can be applied to the specific sound level to account for the character of the sound, namely: tonality, impulsivity and intermittency. Such acoustic feature corrections can be added together linearly.

Tonality can be determined objectively (using adjacent third octave band analysis or the Joint Nordic method) or subjectively as described below:

- +2dB penalty: Just perceptible
- +4dB penalty: Clearly perceptible
- +6dB penalty: Highly perceptible

Impulsivity can be determined objectively (using Fast Fourier Transform analysis) or subjectively as described below:

- +3dB penalty: Just perceptible
- +6dB penalty: Clearly perceptible
- +9dB penalty: Highly perceptible

Where intermittency is present, a +3dB penalty can be applied. Where the acoustic feature characteristics are neither tonal nor impulsive, but are clearly distinguishable against the residual sound, a +3dB penalty can be applied.

Manchester City Council Guidance

Manchester City Council has published comprehensive guidance in relation to noise impact due to new development. The MCC Planning and Noise Technical Guidance document was updated in October 2022 and discusses the assessment of environmental noise from new development of plant items in the vicinity of nearby noise sensitive uses. The published guidance forms the basis for the decision making process when assessing planning applications within the Council's boundaries and provides design targets. With regard to fixed plant items the guidance states:

'Externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location'.

The guidance further states that the assessment of impact from fixed plant items should be undertaken in accordance with the guidance in BS4142:2014+A12019 and the assessment advice within the MCC guidance document.

4.0 ENVIRONMENTAL NOISE SURVEY

Environmental Noise Survey

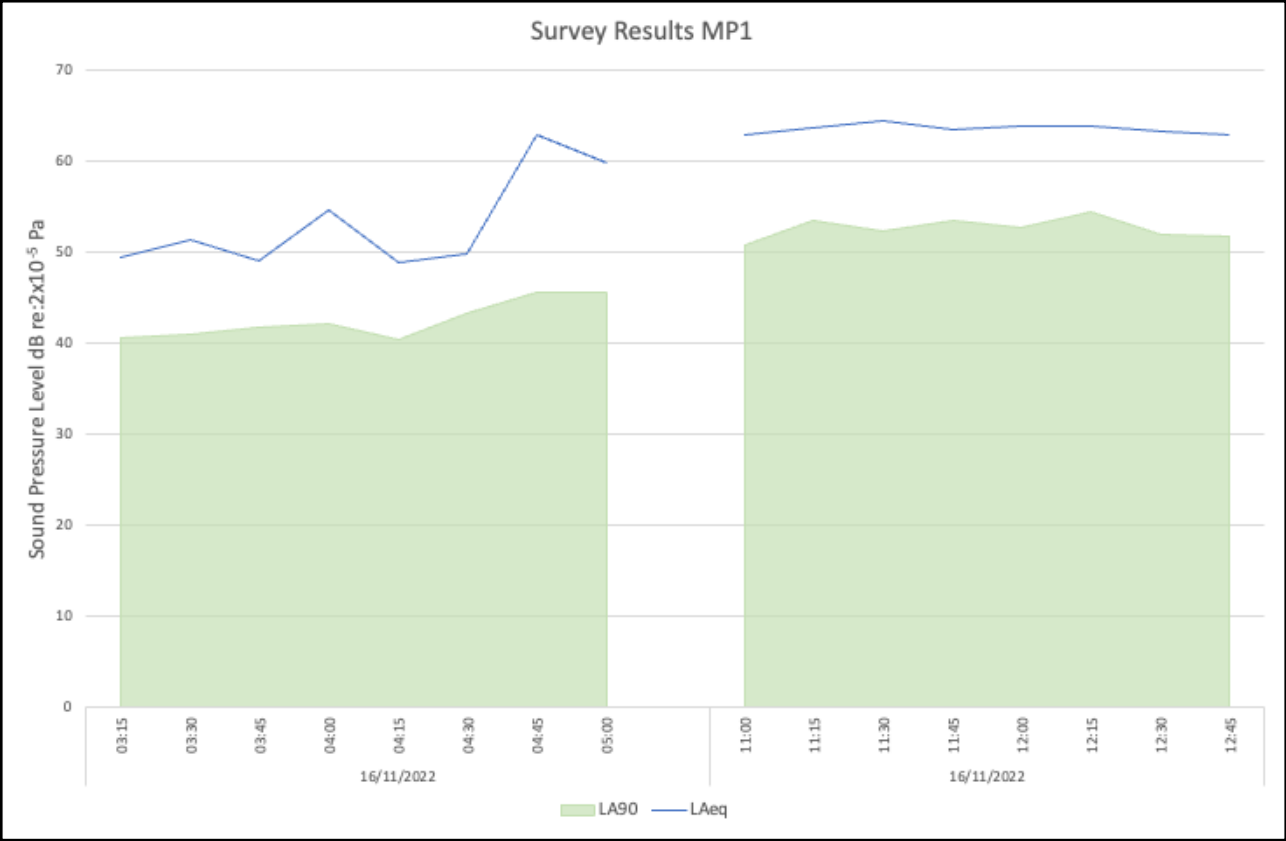
In order to determine the prevailing environmental noise levels at the site, representative manned measurements were taken on 16th November 2022. The measurement location used during the survey is shown in Figure 4.1 below. This position was selected to provide a measurement at a position which is representative of background noise levels for the nearest noise sensitive receptors.

Figure 4.1: Noise Survey Measurement Location



During the measurement periods, the noise climate for the site was driven by road traffic with some rail line noise also present. Figure 4.2 below shows the broadband noise survey data at the monitoring position. The measured data shown has been used to determine the typical background sound level during relevant periods.

Figure 4.2: Broadband Noise Survey Data



An assessment of predicted noise impact on the nearby residential receptors is presented in section 5.0 below.

Based on the measured survey data, Table 4.1 below identifies the recommended L_{Aeq} plant noise limits for the proposed installation at the nearest noise sensitive receptors. The assessments are based on the lowest measured $L_{A90,15min}$ during the relevant periods and Manchester City Council guidance.

Table 4.1: Plant Noise Limits at Nearest Noise Sensitive Facade

	Measured Noise Levels & Target Noise Limits			
	Day Time (07:00 - 23:00)		Night-time (23:00 - 07:00)	
Location	Typical Measured L _{A90} , dB	Target Noise Limit, dB L _{Aeq}	Typical Measured L _{A90} , dB	Target Noise Limit, dB L _{Aeq}
Nearest Noise Sensitive Facade	51	≤ 46	41	≤ 36

5.0 CADNAA NOISE PROPAGATION MODELLING

To predict noise levels from the proposed Air Source Heat Pump installation to the surrounding environment and the nearest noise sensitive receptors, the latest version of CadnaA 3D noise propagation modelling software has been used, which implements the calculation procedure specified within ISO9613-2.

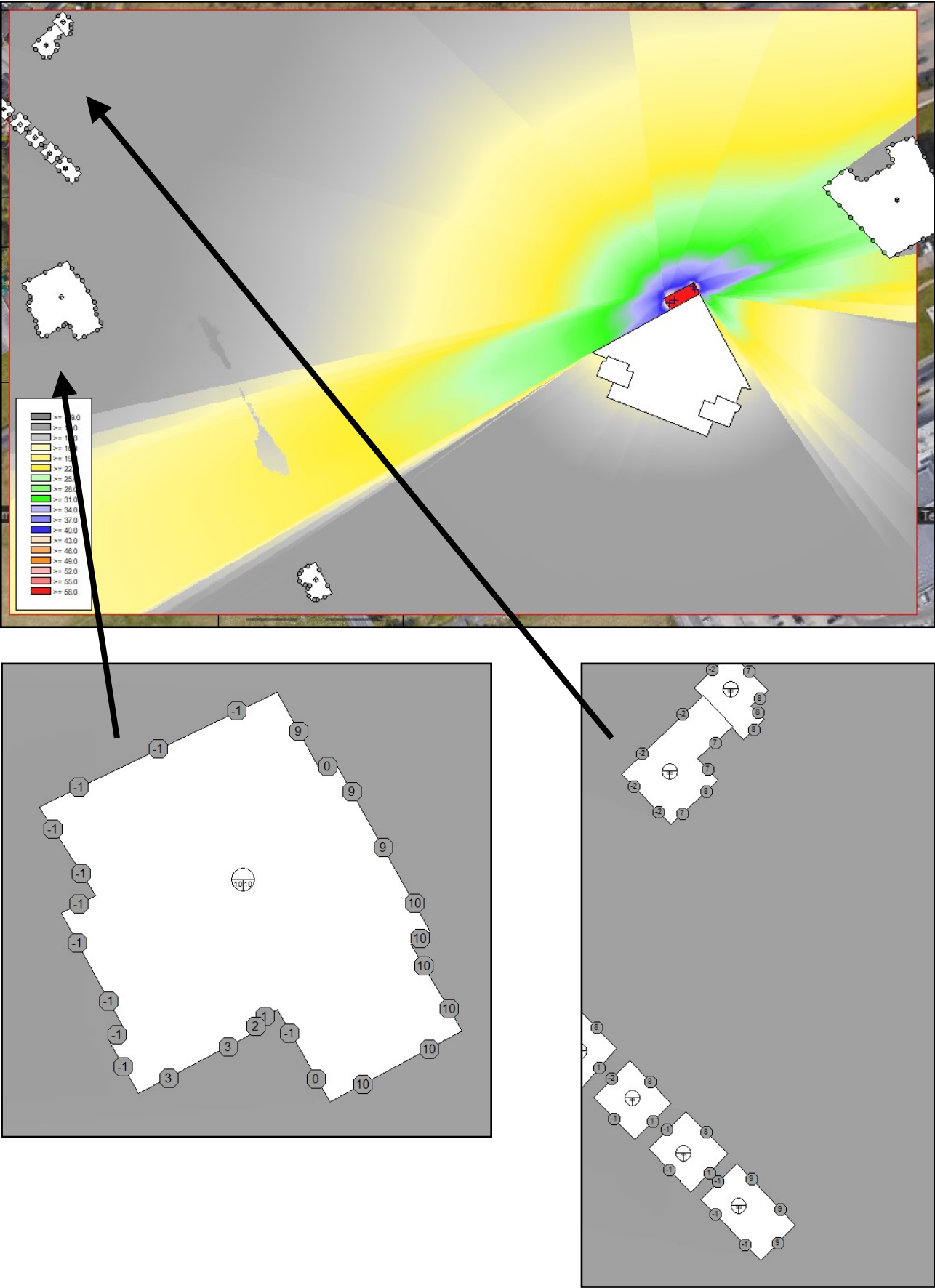
The model has been generated using the manufacturer supplied noise source sound pressure data presented in Section 2.0. The modelling of the surrounding environment was undertaken by modelling the existing buildings and the surroundings using Google Earth imagery and site inspection notes with ground heights set using 1m digital terrain height data obtained from the DEFRA data services platform.

Noise propagation is predicted from the proposed location of the ASHP installation with ground set to 50% reflective to represent mixed hard/soft ground and 4 orders of reflection set within the model. Noise impact is predicted to all facades of the nearest noise sensitive uses with the highest predicted facade level used for the purpose of the assessment.

The results of the noise propagation modelling are presented below. Figure 5.1 below shows the prediction grid at ground floor level and the highest predicted facade levels for the nearest noise sensitive dwellings.

The predicted level represents the Specific Sound Level in terms of BS4142:2014+A1:2019. It can be seen in Figure 5.1 below that the highest predicted Specific Sound Level at the nearest residential facade is 10dBA with all ASHP units operating simultaneously.

Figure 5.1: Predicted Specific Sound Level (dBA) (Grid at Ground Floor Level)



6.0 BS4142 PLANT NOISE IMPACT ASSESSMENT

To undertake an impact assessment on the proposed development in accordance with BS4142:2014+A1:2019, measured data at the proposed development site has been employed to determine the existing Background Sound Level. The manufacturer supplied broadband sound pressure level as discussed in Section 2.0 above has been used within the CadnaA noise propagation model to predict the impact of the Specific Sound Level to the nearest NSPs. Table 6.1 below presents the BS4142 assessment for the facades of the nearest NSPs during the daytime period and night-time. The Rating Level has been rated against the typical measured $L_{A90,15min}$ Background Sound Level during both periods for a worst case assessment.

Table 6.1: BS4142 Assessment Table - NSP Typical Daytime Period

	Period (07:00 - 23:00)	Commentary
Ambient Sound Level	NA	Prediction method to be used.
Residual Sound Level	NA	
Specific Sound Level (predicted from plant sound power data)	10 dBA	Typical predicted facade level.
Corrections	0 dBA	No penalty corrections as impact is not expected to be readily distinguishable in context.
Rating Level dB	10 dBA	
Typical Existing Background $L_{A90,t}$	51 dBA	
Difference	-41 dBA	
Target	-5 dBA	
Comments	No further mitigation proposed	Rating level is below target.
Conclusion	Low Impact	

Table 6.2: BS4142 Assessment Table - NSP Typical Night-time Period

	Period (23:00 - 07:00)	Commentary
Ambient Sound Level	NA	Prediction method to be used.
Residual Sound Level	NA	
Specific Sound Level (predicted from plant sound power data)	10 dBA	Typical predicted facade level.
Corrections	0 dBA	No penalty corrections as impact is not expected to be readily distinguishable in context.
Rating Level dB	10 dBA	
Typical Existing Background $L_{A90,t}$	41 dBA	
Difference	-31 dBA	
Target	-5 dBA	
Comments	No further mitigation proposed	Rating level is below target.
Conclusion	Low Impact	

7.0 CONCLUSIONS

An assessment of noise impact due to the proposed installation of 4 no. air source heat pump units at Arbeta Manchester has been undertaken to determine the likely impact to the nearest noise sensitive receptors.

Based on sound pressure data provided by the equipment manufacturer and an environmental noise survey to determine the typical background sound climate during the relevant operational periods, a CandaA noise propagation model has been used to assess potential noise impact.

Based on the current proposal, impact is predicted to be low and no further mitigation measures are proposed.

APPENDIX A: NOISE MEASUREMENT DETAILS

Location

Monsall Road, Monsall, Manchester (Arbeta NSPs)

Survey Date

16 November 2022 — Background Noise Survey

Weather during the relevant survey period was noted to be dry with wind speeds below 5m/s

Survey Conducted By

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Instrumentation

Table A1: List of Instrumentation Used

Equipment Description	Type Number	Manufacturer	Serial Number	Date of Last Calibration	Calibration Certificate Number	Calibration Due
Sound Level Meter	Type 140 Type 1	Norsonic	1402994	28-Mar-22	1502069-4	27-Mar-24
Preamplifier	Nor 1209	Norsonic	12548	28-Mar-22	1502069-4	27-Mar-24
Microphone Capsule	Nor 1225	Norsonic	91872	28-Mar-22	1502069-4	27-Mar-24
Sound Calibrator	Type 1251 IEC 60942-20 03 Class 1	Norsonic	33007	28-Mar-22	1502069-2	28-Mar-23

Methodology

Before and after the measurements the sound level meter was check calibrated to an accuracy of $\pm 0.3\text{dB}$ using the sound calibrator. The calibrator produces a sound pressure level of 114 dB re 2×10^{-5} Pa @ 1kHz.