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Project:
41 Sheldon Avenue London N6 4JP

Title:
Plant Noise Impact Assessment

quietly moving forward



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1 INTRODUCTION

- 1.01 Environmental Equipment Corporation Limited has been commissioned by Edward Pearce LLP to undertake a noise assessment of a number of new mechanical services plant items to the residential dwelling of No 41 Sheldon Avenue.
- 1.02 This noise assessment has been conducted in accordance with the policies and requirements of Haringey London Borough Council (HLBC) and is based on a noise survey carried out at the site over a typical weekday period.
- 1.03 This assessment includes:
- the setting of plant noise limits in accordance with the requirements of HLBC and national planning policy, standards and guidance; and
 - the prediction of noise impacts at the worst affected noise sensitive receptors based on the proposed items of plant and their location.
- 1.04 This report is prepared solely for Edward Pearce LLP. Environmental Equipment Corporation Limited accepts no responsibility for its use by any third party. Note that the contents contained herein are produced for the purposes of review by relevant Planning Authority departments and do not constitute a detailed design or specification document to be used for the purposes of construction. Subsequent development of noise mitigation schemes shall engage EEC Ltd and Edward Pearce LLP so as to support the conclusions of this report.
- 1.05 Whilst every effort has been made to ensure that this report is easy to understand, it is necessarily technical in nature. To assist the reader, an explanation of the terminology used in this report is contained in Appendix A.

2 SITE

- 2.01 41 Sheldon Avenue is a large single-family dwelling located in a predominantly residential area of Highgate. The dwelling is proposed to undergo redevelopment in which the existing structure will be demolished and rebuilt, with new mechanical services plant included in the redevelopment.
- 2.02 The property is bound by the following:
- North – Neighbouring residential dwelling of No. 43 Sheldon Avenue;
 - East – Sheldon Avenue roadway with further residential dwellings beyond;
 - South – Neighbouring residential dwelling of No. 39 Sheldon Avenue; and
 - West – Grounds of Highgate Golf Club.
- 2.03 The below table presents the proposed items of plant to be installed as well as their respective closest noise sensitive receptors. The locations of the plant items can also be seen annotated on the site map in Appendix B.

Plant Item	Installation Location	Closest Noise Sensitive Receptor
Daikin REYQ22U external condenser	Pool-Side Plant Area	No 43 Sheldon Avenue Top Floor Rear-Windows
Daikin RDXYQ5T internal condenser	Bin-Store on South Elevation	No 39 Sheldon Avenue Top Floor Rear-Windows
InverX IXR80T external heat pump	Pool-Side Plant Area	No 43 Sheldon Avenue Top Floor Rear-Windows

Table 2.1: Proposed Mechanical Services Plant and Respective Locations

- 2.04 It is proposed that the two external plant items located in the Pool-Side plant area will be individually enclosed in high-performance acoustic enclosures, whilst the RDXYQ5T unit located in the Bin Store will be ducted via attenuators to louvre sections at high & low level external to the bin-store. It is also proposed that the Daikin REYQ22U unit will operate with a setback through the night-time hours to afford an operation noise reduction of 5 dB.
- 2.05 The closest noise sensitive receivers to the proposed new plant have been identified as the top floor rear windows of Nos 39 & 43 Sheldon Avenue. Table 2.1 above presents the closest Noise Sensitive Receivers (NSR) for each individual item of plant.
- 2.06 All other noise sensitive receptors are at a greater distance from the proposed location of the units, or are protected by more screening by the intervening structures, and as such will be subject to lower levels of noise.

3 GUIDANCE

- 3.01 National Planning Policy is presented in Appendix C of this document.
- 3.02 From a review of Haringey Council's planning policies, no clear or descriptive guidance could be found regarding fixed plant Noise. From past experience in the borough, EEC understands that Haringey Council require new noise generated by fixed plant to be – 10dB below background noise level.
- 3.03 Haringey Council Development Management DPD (Adopted July 2017):

Noise and vibration 4.60 – “Noise pollution can adversely impact on the amenity and health of building occupiers as well as the wider public. The Council will seek to ensure that new developments both minimise noise pollution and appropriately manage its impact. Noise sensitive development (such as housing, schools and health facilities) should be located away or appropriately separated from major sources of noise. The Council will expect that mitigation measures are considered and incorporated into the design process prior to the submission of an application”.

4 MEASUREMENTS

4.01 Environmental noise measurements were carried out over a weekday period, between 1215 hours on Thursday 17th August 2023 and concluded 1045 hours the following day, to establish the existing noise levels at the site. The survey methodology and results are set out below.

4.02 Noise measurements have been carried out at the following position, as shown in Appendix B and described as:

- Position 1: located in the rear garden at a height of approximately 1.5 metres above ground level. The measurement was not located within 3.5 metres of any reflecting surfaces, other than the mounting surface.

4.03 This position is considered to be representative of the closest windows to both plant locations.

5 EQUIPMENT

5.01 The equipment used for the survey was as follows:-

- 01dB Fusion Integrating Sound Level Meter conforming to Class 1 BS EN 61672, Type 1 BS EN 60804 & BS EN 60651: 1994;
- GRAS 40CD Condenser Microphone, PRE22 S Pre-amp and Connecting Leads;
- Tripod.

5.02 The equipment holds current accreditation and serial numbers as follows:

Sound Level Meter 01dB Fusion	Serial No.	14666
	Calibration Date	1 st September 2022
	Verification Certificate No.	22-95709
½" Condenser Mic. GRAS 40CD	Serial No.	470803
	Calibration Date	1 st September 2022
	Verification Certificate No.	22-95709
Calibrator CR 515	Serial No.	99534
	Calibration Date	8 th September 2022
	Cal. Certificate No.	179790

N.B. Copies of calibration certificates are available upon request.

5.03 The equipment was calibrated both before and after the survey with no difference noted in the levels.

6 RESULTS

- 6.01 The weather during the survey was suitable for noise measurement, it being dry with little wind for the duration of the survey.
- 6.02 Noise sources at the site include local and distant road traffic. There were no other significant sources of noise during the survey.
- 6.03 A list of the levels measured is included in Appendix D and represented graphically in Appendix E.
- 6.04 A summary of the time averaged ambient levels and lowest measured background levels over the measurement periods are shown in Table 6.1. The minimum L_{A90} is the lowest fifteen-minute measurement in the specified period.

Position	Period	Average $L_{Aeq,T}$ – dB	Minimum L_{A90} – dB
1	Day time (0700-1900 hrs)	48	37
	Evening (1900-2300 hrs)	46	34
	Night-time (2300-0700 hrs)	41	27

Table 6.1: Free-Field Measured Ambient and Lowest Background Noise Levels

7 PLANT ASSESSMENT

- 7.01 This application is for the installation of plant, located in two separate areas.
- 7.02 Based on the standard requirements of Haringey London Borough Council and the lowest measured background noise level in each time period, Table 7.1 sets out the recommended noise limits that the proposed items of plant should meet.
- 7.03 In accordance with the requirements of HLBC, the proposed noise limits are based on being 10 dB below the measured background noise level.

Location	Period	Measured Existing $L_{A90,T}$	Proposed Noise Limit L_{Ar}
Nos 39 & 43 Sheldon Avenue Top Floor Rear Windows	Day	37 dB	27 dB
	Evening	34 dB	24 dB
	Night	27 dB	17 dB

Table 7.1: Suggested Plant Noise Emission Limits Based on Lowest Measured L_{A90} , Free-field dB

- 7.04 Note that the limits suggested above are rating levels and as such any design should take into account the acoustic characteristics of the plant. In this instance the proposed units display none of the characteristics whereby the acoustic correction should be applied.
- 7.05 Assuming the proposed items meet the noise limits set out in Table 7.1 noise will be below the NOEL with respect to the NPPF.
- 7.06 The below table presents the manufacturer-stated noise level for each of the proposed plant items. Copies of the manufacturer's plant data sheets are included in Appendix F.

Plant Item	Manufacturer-Stated Noise Level	
	Sound Power Level	Sound Pressure Level at 1m
Daikin REYQ22U	85 dB(A)	N/A
Daikin RDXYQ5T	76 dB(A)	N/A
InverX IXR80T	N/A	52 dB(A)

Table 7.2: Manufacturer Stated Noise Levels for Proposed Items of Plant

- 7.07 It is proposed that the two condensing units in the poolside plant area will be individually enclosed in high performance acoustic enclosures, with the Daikin REYQ22U unit operating with a 5dB set-back through the night-time hours. The Daikin RDXYQ5T unit will be ducted to intake/exhaust louvres at high and low level via attenuators in the proposed bin-store location.
- 7.08 To mitigate the transfer of structure borne noise, all the proposed plant items will be installed upon suitable anti-vibration mounts.
- 7.09 Predicted noise levels have been calculated at the closest noise sensitive windows to each plant location, the top floor rear windows of Nos 39 & 43 Sheldon Avenue.
- 7.10 Other residential receptors located further from the site will be subject to lower noise levels than those predicted at the above locations.
- 7.11 Tables 7.3 – 7.7 present the results of worst-case plant noise predictions at the worst-case locations.

Item	Noise Level		Notes
	DAY	NIGHT	
Daikin REYQ22U	85 dB(A)	80 dB(A)	Sound Power Level
Barrier Effect	- 5 dB		No line of sight to proposed plant location
Noise Control	- 25 dB		High performance bespoke acoustic enclosure
Conformal area Losses over 15 metres	- 34 dB		Distance to closest window
Reflections	0 dB		No additional reflections
Total Noise Level	21 dB(A)	16 dB(A)	No 43 Sheldon Avenue Top Floor Rear Windows

Table 7.3: No 43 Sheldon Avenue Plant Noise Calculation

Item	Noise Level	Notes
InverX IXR80T	52 dB(A)	Sound Pressure Level at 1m
Barrier Effect	- 7 dB	No line of sight to proposed plant location
Noise Control	- 15 dB	High performance acoustic enclosure
Conformal area Losses over 15 metres	- 20 dB	Distance to closest window
Reflections	0 dB	No additional reflections
Total Noise Level	10 dB(A)	No 43 Sheldon Avenue Top Floor Rear Windows

Table 7.4: No 43 Sheldon Avenue Plant Noise Calculation

Plant Item	Resultant Noise Level $L_{Aeq,T}$	
	DAY	NIGHT
Daikin REYQ22U	21 dB(A)	16 dB(A)
InverX IXR80T	10 dB(A)	10 dB(A)
Cumulative SPL	21 dB(A)	17 dB(A)

Table 7.5: No 43 Sheldon Avenue Cumulative Resultant Noise Level (Top Floor Rear Windows)

Item	Noise Level	Notes
Daikin RDXQ5T	76 dB(A)	Sound Power Level
Barrier Effect	- 15 dB	No line of sight to proposed plant location
Noise Control	- 19 dB	High performance acoustic enclosure
Conformal area Losses over 9 metres	- 30 dB	Distance to closest window
Reflections	+ 3 dB	Reflection from side wall
Total Noise Level	15 dB(A)	No 39 Sheldon Avenue Top Floor Rear Windows

Table 7.6: No 39 Sheldon Avenue Plant Noise Calculation

Property	Period	Proposed Noise Limit L_{Ar}	Predicted $L_{Aeq,T}$	Exceedance of noise limit
No 43 Sheldon Avenue Top Floor Rear Windows	Daytime	27 dB	21 dB	- 6 dB
	Evening	24 dB	21 dB	- 3 dB
	Night-time	17 dB	17 dB	0 dB
No 39 Sheldon Avenue Top Floor Rear Windows	Daytime	27 dB	15 dB	- 12 dB
	Evening	24 dB	15 dB	- 9 dB
	Night-time	17 dB	15 dB	- 2 dB

Table 7.7: Assessment of Predicted Noise Levels Based on Proposed Noise Limit, Free-field dB(A)

- 7.12 It can be seen from the above tables that the noise limits are not exceeded during any period at the closest noise sensitive receivers, the top floor rear windows of Nos 39 & 43 Sheldon Avenue.
- 7.13 The above noise emissions for each plant item have been assessed to their closest and most affected receiver individually. Cumulative contributions from all plant items have been accounted for at all receiver positions however, where contributions have been calculated a minimum of 10dB below the controlling noise source at the respective receiver, they have been removed from the above assessment.
- 7.14 Assuming that the proposed plant and bespoke noise control scheme is included in the installation, predicted noise levels will meet the requirements of the Local Authority during all periods of operation and at the closest noise sensitive receptors.
- 7.15 The proposed scheme of vibration isolation will also mitigate the transfer of vibration to the supporting and connecting structures and ensure that the airborne sound mitigation design is not compromised.
- 7.16 With respect to the NPPF, achieving the noise limits would be classified as being below the NOEL.

8 CONCLUSIONS

- 8.01 Edward Pearce LLP has appointed Environmental Equipment Corporation Limited to undertake a noise assessment for a number of new proposed mechanical services plant items to serve the residential dwelling of No 41 Sheldon Avenue.
- 8.02 The assessment has been carried out in accordance with national planning guidance and the requirements of the Haringey London Borough Council, and is based on an environmental noise survey conducted at the site over a mid-week period.
- 8.03 A noise assessment has been undertaken to evaluate the potential noise impact of the proposed plant at the closest existing residential receptor to each item.
- 8.04 Plant noise limits have been set based on the methodology contained in BS4142, the results of a background noise survey and the requirements of HLBC, to control the noise from the proposed plant items. In accordance with the Haringey London Borough Council, the noise limit has been set 10 dB below the lowest measured background noise level.
- 8.05 Predictions have shown that the noise criterion is met at all assessment locations during all periods of the proposed operation of the plant, assuming, the proposed noise control scheme is included in the final installation.
- 8.06 Assessing the site in accordance with the principles of the National Planning Policy Framework has shown that predicted noise levels would be below the level at which no effects are observed to occur, the NOEL.
- 8.07 On the basis of this assessment it is considered that noise does not pose a material constraint to the operation of the new plant.

APPENDIX A
GLOSSARY OF TECHNICAL TERMS

ACOUSTIC TERMINOLOGY

Absorption Classes	The sound absorption of a material is rated from Class A to Class E, where Class A materials provide the highest level of sound absorption.
Ambient Noise Levels	Noise levels measured in the absence of noise requiring control, frequently measured to determine the situation prior to the additional of a new noise source.
dB	Decibel. The logarithmic unit of sound level.
dBA	A-weighted decibel. The A-weighting approximates the response of the human ear.
$D_{nT,w}$	Weighted standardized level difference. A single number quantity of the sound level difference between two rooms. $D_{nT,w}$ is typically used to measure the on-site sound insulation performance of a building element such as a wall, floor or ceiling. Measured in accordance with BS EN ISO 16283-1 and weighted in accordance with BS EN ISO 717-1.
$D_{n,e,w}$	The weighted element-normalized level difference. A single number rating of the sound reduction provided by a sound passing through an individual element. $D_{n,e,w}$ is typically used to define the sound insulation provided by ventilators. Measured in accordance with BS EN ISO 10140-2:2010 and rated in accordance with BS EN ISO 717-1.
Flanking	Transmission of sound energy through paths adjacent to the building element being considered. For example, sound may be transmitted around a wall by travelling up into the ceiling space and then down into the adjacent room.
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 4kHz, roughly equal to the range of frequencies on a piano.
Impact Sound	Sound produced by an object impacting directly on a building structure, such as footfall noise or chairs scrapping on a floor.
$L_{Aeq,t}$	The equivalent continuous sound level measured in dBA. This is commonly referred to as the average noise level. 't' is the interval time for the measurement. Typically 't' of 16hrs and 8hrs is used for day and night time ambient noise respectively or 't' is defined by the period of interest in BS4142 assessments.
$L_{A90,t}$	The noise level exceeded for 90% of the measurement period, measured in dBA. This is commonly referred to as the background noise level.
$L'_{nT,w}$	Weighted, standardized impact sound pressure level. A single number rating of the impact sound insulation of a floor/ceiling when impacted on by a standard "tapper" machine. The lower the $L'_{nT,w}$, the better the acoustic performance. Measured in accordance with BBS EN ISO 140-7 and rated in accordance with BS EN ISO 717-2.
NR	Noise Rating. A single number rating which is based on the sound level in the octave bands 31.5Hz – 8kHz inclusive, generally used to assess noise from mechanical services in buildings.
Octave Band	Frequencies are often grouped together into octaves for analysis. Octave bands are labelled by their centre frequency which are: 63Hz, 125Hz, 250Hz, 500Hz, 1kHz, 2kHz and 4kHz.
Reverberation Time (T_{mf})	Reverberation time is used for assessing the acoustic qualities of a space. It is defined as the time it takes for an impulse to decay by 60dB. T_{mf} is the arithmetic average of the reverberation time in the mid frequency bands (500Hz, 1kHz and 2kHz).
R_w	Weighted sound reduction index. A single number rating of the sound insulation performance of a specific building element. R_w is measured in a laboratory. R_w is commonly used by manufacturers to describe the sound insulation performance of building elements such as plasterboard and concrete. Measured in accordance with BS EN ISO 10140-2:2010 and rated in accordance with BS EN ISO 717-1.
Sound Absorption	When sound hits a surface, some of the sound energy is absorbed by the surface material. Sound absorption refers to the ability of a material to absorb sound, rated from 0, complete reflection, to 1, complete absorption.
Sound Insulation	When sound hits a surface, some of the sound energy travels through the material. 'Sound insulation' refers to the ability of a material to prevent the travel of sound.
Structure-borne transmission	Transmission of sound energy as vibrations via the structure of a building.

APPENDIX B
SITE PLAN
&
MEASUREMENT LOCATION



APPENDIX C
PLANNING POLICY
AND GUIDANCE

National Planning Policy Framework and the Noise Policy Statement for England

The Department for Communities and Local Government published the National Planning Policy Framework (NPPF) on 27th March 2012 (as amended on 20th July 2021) and upon its publication, the majority of planning policy statements and guidance notes were withdrawn, including Planning Policy Guidance 24 Planning and Noise, which previously presented the government's overarching planning policy on noise.

Paragraph 174 in Section 15 of the NPPF (2021), entitled Conserving and enhancing the natural environment, states that:

“Planning policies and decisions should contribute to and enhance the natural and local environment by:

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability...”

Paragraph 185 in Section 15 also states that:

“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:

a) 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 the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason...”

The Department for Environment Food and Rural Affairs published the Noise Policy Statement for England (NPSE) in March 2010. The explanatory note of NPSE defines the following terms used in the NPPF:

“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.

2.21 Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.”

The NPSE does not define any of the above effect levels numerically.

The NPSE presents the Noise Policy Aims as:

“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy and sustainable development:

- avoid significant adverse impacts on health and quality of life;
- mitigate and minimise adverse impacts on health and quality of life; and
- where possible, contribute to the improvement of health and quality of life.”

It can be seen that the first two bullet points are similar to Section 11 of the NPPF, with a third aim that seeks to improve health and quality of life. The NPSE later expands on the Noise Policy Aims, stating:

2.23 The first aim of the NPSE states that significant adverse effects on health and quality of life should be avoided while also taking into account the guiding principles of sustainable development (paragraph 1.8).

2.24 The second aim of the NPSE refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur.

2.25 This aim (the third aim), seeks where possible, positively to improve health and quality of life through the pro-active management of noise while also taking into account the guiding principles of sustainable development (paragraph 1.8), recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.”

It is clear that noise described in the NPSE as SOAEL that would lead to significant adverse effects should be avoided, although there is no definition as to what constitutes a significant adverse effect. Similarly, noise should be mitigated where it is high enough to lead to adverse effects, termed the LOAEL, but not so high that it leads to significant adverse effects.

British Standard 4142

To assess the acceptability of the resultant noise levels we have consulted the relevant standards. BS 4142:2014 'Methods for rating and assessing industrial and commercial sound' has been used to assess the likelihood any adverse impacts based on the resultant noise level from the new plant item, including any corrections for the character of the noise against the existing background noise level.

BS4142 gives guidance on assessing the likelihood of adverse impacts by calculating a 'rating level' of the new noise source and comparing its magnitude at noise sensitive locations to the existing or underlying background noise level. The background noise level is subtracted from the 'rating level' to assess the likelihood of complaints:

- The greater the difference the greater the likelihood of complaints.
- A difference of around +10dB or more is an indication of a significant adverse impact, depending on the context.
- A difference of +5dB 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 noise level, the less likely it is that the specific sound source will have an adverse impact or 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 sound impact, depending on the context.

This assessment is carried out over a one hour period for the daytime and a fifteen minute period for the night-time. For the purposes of the standard it states that daytime and night-time are typically 07:00 to 23:00 hours and 23:00 to 07:00 hours respectively.

The 'rating level' of the noise source is obtained taking the following factors into consideration:

- The new plant noise (the specific noise) is measured or predicted in terms of L_{Aeq} .
- An additional correction shall be included if the noise contains a distinguishable, discrete continuous note, if the noise contains distinct impulses or if the noise is irregular enough to attract attention. The value for any tonal noise can be an addition of up to 6dB and for impulsive noise of up to 9dB.

BS 4142 goes onto state that:

'The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context.'

BS4142 has been referenced in setting noise limits for any fixed plant proposed as part of the proposed development.

APPENDIX D
SURVEY RESULTS
(TABULAR)

EC 20229 - 41 Sheldon Avenue

Edward Pearce & Partners Ltd

Tabulated Noise data

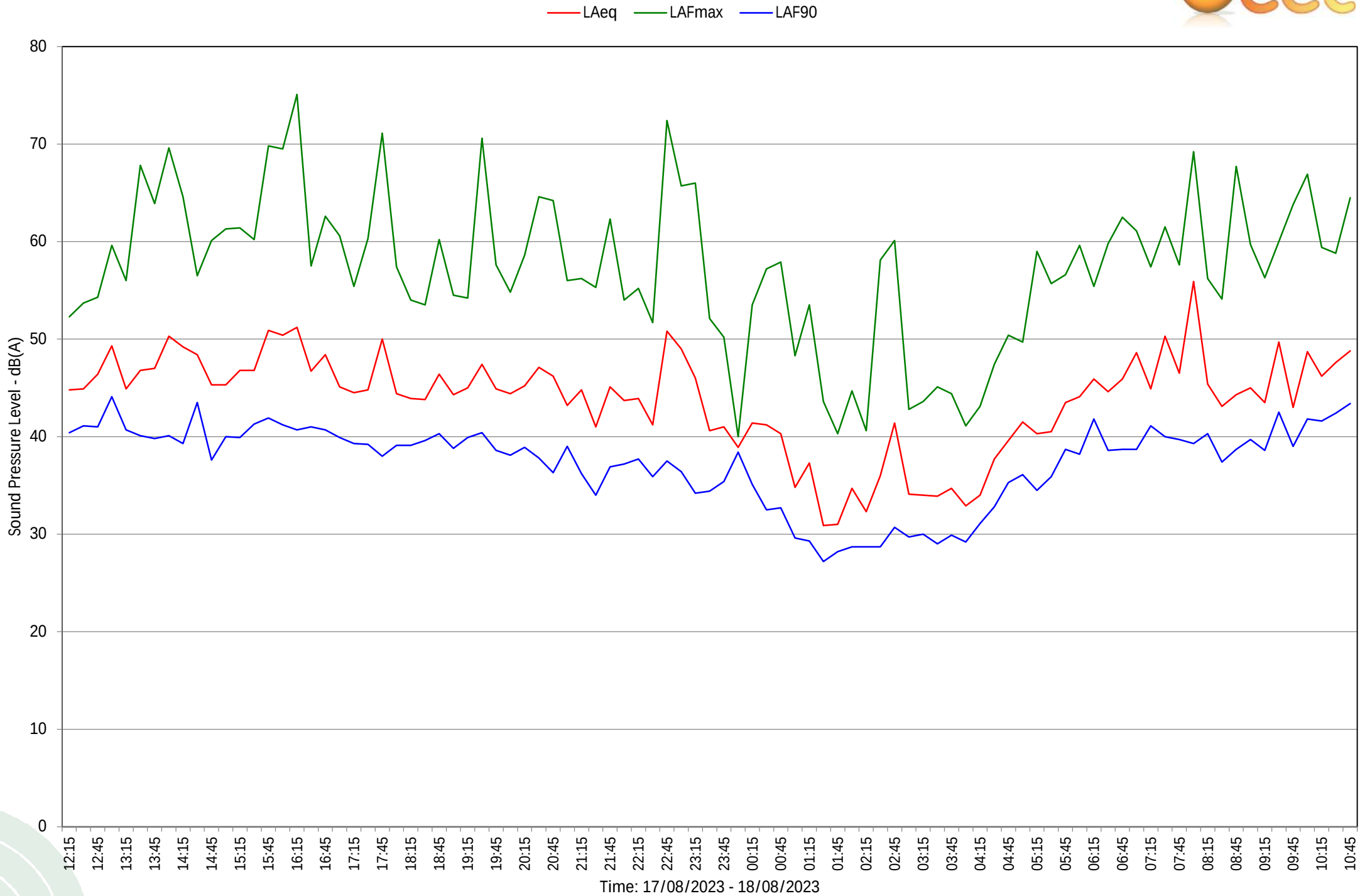
Sheet 1 of 1

Time	L _{Aeq}	L _{AMax}	L _{A90}
12:15	45	52	40
12:30	45	54	41
12:45	46	54	41
13:00	49	60	44
13:15	45	56	41
13:30	47	68	40
13:45	47	64	40
14:00	50	70	40
14:15	49	65	39
14:30	48	57	44
14:45	45	60	38
15:00	45	61	40
15:15	47	61	40
15:30	47	60	41
15:45	51	70	42
16:00	50	70	41
16:15	51	75	41
16:30	47	58	41
16:45	48	63	41
17:00	45	61	40
17:15	45	55	39
17:30	45	60	39
17:45	50	71	38
18:00	44	57	39
18:15	44	54	39
18:30	44	54	40
18:45	46	60	40
19:00	44	55	39
19:15	45	54	40
19:30	47	71	40
19:45	45	58	39
20:00	44	55	38
20:15	45	59	39
20:30	47	65	38
20:45	46	64	36
21:00	43	56	39
21:15	45	56	36
21:30	41	55	34
21:45	45	62	37
22:00	44	54	37
22:15	44	55	38
22:30	41	52	36
22:45	51	72	38
23:00	49	66	36
23:15	46	66	34
23:30	41	52	34
23:45	41	50	35
00:00	39	40	38

Time	L _{Aeq}	L _{AMax}	L _{A90}
00:15	41	54	35
00:30	41	57	33
00:45	40	58	33
01:00	35	48	30
01:15	37	54	29
01:30	31	44	27
01:45	31	40	28
02:00	35	45	29
02:15	32	41	29
02:30	36	58	29
02:45	41	60	31
03:00	34	43	30
03:15	34	44	30
03:30	34	45	29
03:45	35	44	30
04:00	33	41	29
04:15	34	43	31
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06:15	46	55	42
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07:30	50	62	40
07:45	47	58	40
08:00	56	69	39
08:15	45	56	40
08:30	43	54	37
08:45	44	68	39
09:00	45	60	40
09:15	44	56	39
09:30	50	60	43
09:45	43	64	39
10:00	49	67	42
10:15	46	59	42
10:30	48	59	42
10:45	49	65	43

APPENDIX E
SURVEY RESULTS
(GRAPHICAL)

Noise Level Time History at 41 Sheldon Avenue



APPENDIX F

PUBLISHED PLANT NOISE DATA

2-3 Technical Specifications					REYQ10U	REYQ13U	REYQ16U	REYQ18U	REYQ20U	REYQ22U	REYQ24U	REYQ26U
Heating capacity	Prated,h		kW	16.0	21.7	23.2	27.9	31.0	34.4	36.9	37.1	
	Max.	6°CWB	kW	32.0 (2)	41.0 (2)	50.0 (2)	56.5 (2)	62.5 (2)	69.0 (2)	75.0 (2)	82.5 (2)	
SEER				7.0	7.6	7.3	6.9	6.7	6.6	6.5		
SEER recommended combination 2				7.1	7.5	7.3	6.8	6.4	6.5	6.4		
SEER recommended combination 3				6.9	7.4	7.1	6.9	6.8	6.6	6.5	6.6	
SCOP				4.0	4.1	4.3		4.5		4.3	4.5	
SCOP recommended combination 2				4.1	4.0	4.2		4.4	4.5	4.2	4.4	
SCOP recommended combination 3				4.1	4.2	4.1	4.2	4.4		4.1	4.3	
ηs,c			%	275.1	301.3	288.6	272.9	266.0	260.4	257.7	257.5	
ηs,c recommended combination 2				280.4	296.3	290.6	269.4	252.4	256.8	253.7	254.1	
ηs,c recommended combination 3				272.0	291.7	282.1	274.2	269.0	262.7	256.6	260.5	
ηs,h			%	158.8	160.6	168.2	167.9	175.7	178.5	167.6	175.5	
ηs,h recommended combination 2				160.2	157.6	164.5	166.0	173.3	176.4	164.3	172.5	
ηs,h recommended combination 3				161.0	166.5	160.4	165.0	171.9	174.1	162.1	168.6	
Capacity range			HP	10	13	16	18	20	22	24	26	
Maximum number of connectable indoor units				64 (3)								
Indoor index connection	Min.			125.0	163.0	200.0	225.0	250.0	275.0	300.0	325.0	
	Max.			325.0	423.0	520.0	585.0	650.0	715.0	780.0	845.0	
Capacity control	Method			Inverter controlled								
Heat exchanger	Indoor side			Air								
	Outdoor side			Air								
	Air flow rate	Cooling	Rated	m³/h	19,440			20,220	20,820	21,600	25,320	24,480
		Heating	Rated	m³/h	19,440			20,220	20,820	21,600	25,320	24,480
Sound power level	Cooling	Nom.		dBA	81.0 (4)			81.6 (4)	84.5 (4)	84.8 (4)	86.3 (4)	85.3 (4)
	Heating	Nom.		dBA	65.7 (4)			66.9 (4)		67.8 (4)	69.6 (4)	69.9 (4)
Sound pressure level	Cooling	Nom.		dBA	60.0 (5)				62.5 (5)		64.0 (5)	63.5 (5)

MODEL	IXR46	IXR56	IXR66	IXR80	IXR80T	IXR110T
Advised pool volume (m3)	30~60	40~75	55~100	65~120	65~120	90~160
Operating air temperature (°C)	-15~43					
Performance Condition: Air 26°C / Water 26°C / Humidity 80%						
Heating capacity (kW) in Smart mode	14.0	18.0	22.0	27.5	27.5	33.0
Heating capacity (kW) in Booster mode	17.0	21.5	26.0	32.0	32.0	40.0
COP	16.0~6.6	15.5~6.5	16.5~7.0	16.3~6.5	16.3~6.5	16.3~6.6
COP at 50% capacity	11.5	11.5	11.6	11.5	11.5	11.4
Performance Condition: Air 15°C / Water 26°C / Humidity 70%						
Heating capacity (kW) in Smart mode	9.5	12.0	15.0	18.5	18.5	24.5
Heating capacity (kW) in Booster mode	11.5	14.5	18.0	22.0	22.0	28.5
COP	7.5~4.5	8.0~4.7	8.0~5.1	8.0~5.0	8.0~5.0	8.1~4.8
COP at 50% capacity	6.8	7.0	7.0	7.0	7.0	6.9
Sound pressure at 1m dB(A)	42.0~47.7	42.9~50.8	40.8~51.2	43.3~51.9	43.3~51.9	42.5~51.7
Sound pressure of 50% capacity at 1m dB(A)	43.7	44.5	44.4	46.4	46.4	43.8
Sound pressure at 10m dB(A)	22.0~27.7	22.9~30.8	20.8~31.2	23.3~31.9	23.3~31.9	22.5~31.7

2-3 Technical Specifications					RDXVQ8T	RKCVQ8T	RDXVQ5T	RKCVQ5T	
Dimensions	Unit	Height			mm	397	701	397	701
		Width			mm	1,456	760	1,456	600
		Depth			mm	1,044	554	1,044	554
	Packed unit	Height			mm	1,245	825	1,245	838
		Width			mm	1,604	875	1,604	720
		Depth			mm	470	660	470	660
	Ducting	Height			mm	298	-	298	-
		Width			mm	1,196	-	1,196	-
Weight	Unit				kg	103	105	97	77
	Packed unit				kg	123	116	117	86
Packing	Material					Carton			
	Weight				kg	4.9	2.2	4.9	2.1
Packing 2	Material					Wood			
	Weight				kg	14.0	8.5	14.0	6.9
Packing 3	Material					-	Plastic	-	Plastic
	Weight				kg	-	0.3	-	0.3
Casing	Colour					Unpainted	Daikin White	Unpainted	Daikin White
	Material					Galvanised steel	Painted galvanized steel plate	Galvanised steel	Painted galvanized steel plate
Compressor	Quantity					-	1	-	1
	Type					-	G-type scroll compressor	-	Hermetically sealed swing inverter compressor
	Crankcase heater				W	-	33	-	
Fan	Quantity					3	-	2	-
	Air flow rate		Cooling	Nom.	m³/min	100	-	55	-
Fan motor	Quantity					3	-	2	-
	Output				W	500	-	500	-
Sound power level	Cooling		Nom.		dBA	81	64	76	60
Sound pressure level	Cooling		Nom.		dBA	54	48	47	
Refrigerant	Type					R-410A			
	GWP					-	2,087.5	-	2,087.5
	Charge				TCO _{2eq}	-	8.35	-	4.20
					kg	-	4.00	-	2.00
Refrigerant oil	Type					Daphne FVC68D		Synthetic (ether) oil	
Piping connections	Drain	OD	mm		32	-	32	-	