Environmental Equipment Corporation Ltd
Richmond House, Churchfield Road
Walton on Thames
Surrey. KT12 2TP
[redacted]

Project:

Tara, Cavendish Road, KT13 0JT

Title:

Plant Noise Impact Assessment

quietly moving forward

Environmental Equipment Corporation Ltd
Richmond House, Churchfield Road
Walton on Thames
Surrey. KT12 2TP
[redacted]

Report Title	Tara, Cavendish Road, KT13 0JT Plant Noise Impact Assessment
Reference	TB/EC19557-5
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Issue Date	12 June 2023
Client	Adair Ltd
Author	Thomas Buchan BA(Hons) Acoustic Consultant
Checked	Jon Mudd BEng(Hons) MIOA Director

Revision	Date	Author	Checked

CONTENTS:

1 INTRODUCTION

1.01 Environmental Equipment Corporation Limited has been commissioned by Adair Ltd to undertake a noise assessment of three external condensing units to serve a residential property at Tara Cavendish Road, Weybridge.

1.02 This noise assessment has been conducted in accordance with the policies and requirements of Elmbridge Borough Council (EBC) 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 EBC 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 Adair Ltd. 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 Adair Ltd 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 Tara is a new build residential development located in a private residential estate on St Georges Hill, Weybridge.

2.02 The property is bound by the following:

- North – Three storey residential property on Cavendish Road;
- East – Rear gardens of residential properties on White Knights Road and Old Avenue;
- South – Rear garden and residential property on Cavendish Road; and
- West – Cavendish Road roadway with residential properties beyond.

2.03 This application is for 3 No. Daikin condensing units as detailed below which are to be located in a dedicated plant area in the southeast corner of the property curtilage, as presented in Appendix B.

CU1 – 1 No. Daikin REYQ12T

CU2 – 1 No. Daikin REYQ14T

CU3 – 1 No. Daikin RXYSQ4T8V

2.04 The noise sensitive receptor that is closest to and most affected by the proposed plant is the west facing top-floor window belonging to the residential property immediately south of Tara.

2.05 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 Local and National Planning Policy for Elmbridge Borough Council is presented in Appendix C of this document. The below statement is taken from a typical planning condition set by the Local Authority for an application for new fixed plant and machinery:

"The measured or calculated rating level of any plant & equipment, as part of this development shall be equal to (or lower than) the background by 5 dB at any time, or by 10 dB if there is a particular tonal, impulsive or discrete component to the noise."

4 MEASUREMENTS

4.01 Environmental noise measurements were carried out over a weekday period, between 1130 hours on Thursday 13th April 2023 and concluded 1000 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 at a height of approximately 1.5 metres above the ground in the southeast corner of the property curtilage. 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 west facing rear windows of the residential property immediately to the south of Tara.

5 EQUIPMENT

5.01 Equipment for the survey was as follows:-

- Brüel & Kjær type 2250 Integrating Sound Level Meter conforming to Class 1 BS EN 61672, Type 1 BS EN 60804 & BS EN 60651: 1994.
- Brüel & Kjær Condenser Microphone and Connecting Leads.
- Brüel & Kjær Outdoor Microphone Kit, type UA1404.
- Tripod.

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

Sound Level Meter B&K2250	Serial No.	3007298
	Calibration Date	4th August, 2022
	Cal Certificate No.	U41645
½" Condenser Mic. B&K4189	Serial No.	2978645
	Calibration Date	4th August, 2022
	Cal Certificate No.	U41644
Calibrator B&K4231	Serial No.	3018006
	Calibration Date	4th August 2022
	Cal. Certificate No.	U41643

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 distant road traffic and construction noise during working hours. 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)	59	41
	Evening (1900-2300 hrs)	53	42
	Night-time (2300-0700 hrs)	45	38

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

7 PLANT ASSESSMENT

7.01 This application is for the installation of three Daikin condenser units to be located in the southeast corner of the curtilage of the new dwelling.

7.02 Based on the standard requirements of EBC 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 Please note, that in accordance with the requirements of EBC, the proposed noise limits are based on being 5 dB below the measured background noise level.

Location	Period	Measured Existing $L_{A90,T}$	Proposed Noise Limit L_{Ar}
West facing top-floor window of residential property to the south	Day	41 dB	36 dB
	Evening	42 dB	37 dB
	Night	38 dB	33 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 approaching the NOEL with respect to the NPPF.

7.06 The manufacturers published sound power levels for each unit are presented below. Copies of the manufacturer's plant data sheets are included in Appendix F.

CU1 – 1 No. Daikin REYQ12T – 81 dB(A)

CU2 – 1 No. Daikin REYQ14T – 81 dB(A)

CU3 – 1 No. Daikin RXYSQ4T8V – 68 dB(A)

7.07 It is proposed to house the three units in a bespoke high-performance acoustic louvred enclosure.

7.08 Predicted noise levels have been calculated at the closest noise sensitive windows, the west facing top-floor window of the residential property immediately south of Tara.

7.09 Other residential receptors located further from the site will be subject to lower noise levels than those predicted at the above locations.

7.10 Tables 7.2 – 7.5 present the results of worst-case plant noise predictions at the worst-case locations.

Item	Noise Level	Notes
CU1 & CU2	84 dB(A)	Cumulative sound power level
Noise Control	- 13 dB	Bespoke high-performance acoustic louvred enclosure
Conformal area Losses over 21 metres	- 38 dB	Distance to closest window
Resultant Noise Level	33 dB(A)	West facing top-floor window of residential property to the south

Table 7.2: CU1 & CU2 Plant Noise Calculation

Item	Noise Level	Notes
CU3	68 dB(A)	Sound power level
Noise Control	- 13 dB	Bespoke high-performance acoustic louvred enclosure
Conformal area Losses over 21 metres	- 38 dB	Distance to closest window
Resultant Noise Level	17 dB(A)	West facing top-floor window of residential property to the south

Table 7.3: CU3 Plant Noise Calculation

Item	Noise Level	Notes
CU1 & CU2	33 dB(A)	West facing top-floor window of residential property to the south
CU3	17 dB(A)	West facing top-floor window of residential property to the south
Cumulative Noise Level	33 dB(A)	West facing top-floor window of residential property to the south

Table 7.4: Cumulative Plant Noise Calculation

Property	Period	Proposed Noise Limit L_{Ar}	Predicted $L_{Aeq,T}$	Exceedance of noise limit
West facing top-floor window of residential property to the south	Daytime	36 dB	33 dB	- 3 dB
	Evening	37 dB	33 dB	- 4 dB
	Night-time	33 dB	33 dB	0 dB

Table 7.5: Assessment of Predicted Noise Levels Based on Proposed Noise Limit, Free-field dB(A)

7.11 It can be seen from the above tables that the noise limits are met during all periods at the west facing top-floor window of the residential property to the south of Tara.

7.12 Assuming that the proposed plant and noise control equipment specified in this report are 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.

7.13 With respect to the NPPF, achieving the noise limits would be classified as approaching the NOEL.

8 CONCLUSIONS

8.01 Adair Ltd has appointed Environmental Equipment Corporation Limited to undertake a noise assessment for three proposed condensing units to serve a residential property at Tara on Cavendish Road in St Georges Hill, Weybridge.

8.02 The assessment has been carried out in accordance with national planning guidance and the typical requirements of Elmbridge Borough Council (EBC) 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 condensers at the closest existing noise sensitive residential receptors.

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 EBC, to control the noise from the proposed condensing units. In accordance with the typical requirements of EBC, the noise limit has been set 5 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 plants proposed operation, assuming, all three units are installed within the bespoke acoustic louvred enclosure outlined in section 7.07 of this report.

8.06 Assessing the site in accordance with the principles of the National Planning Policy Framework has shown that predicted noise levels would be approaching 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 condensing units.

APPENDIX A

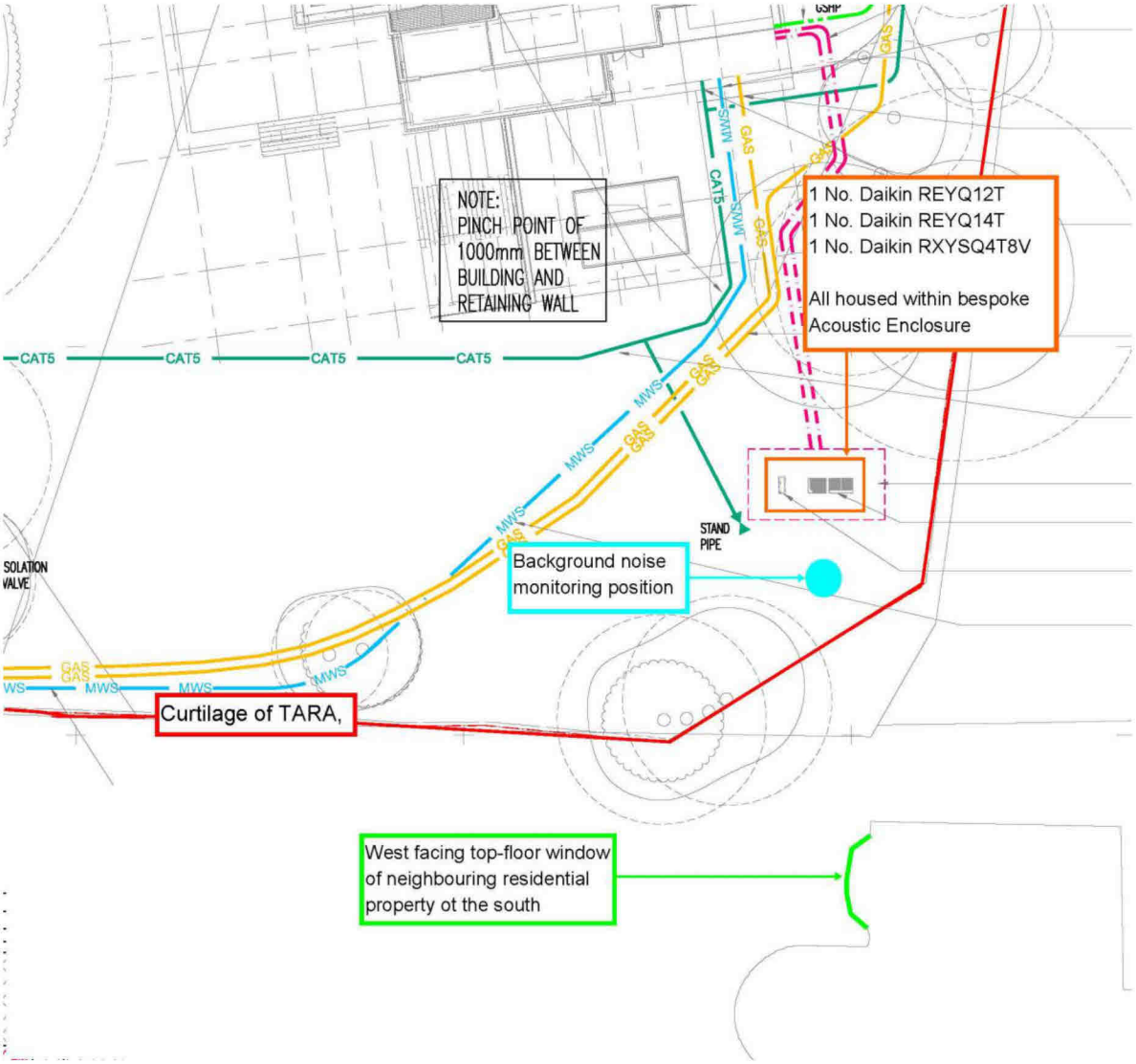
GLOSSARY OF TECHNICAL TERMS

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

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 19557 - TARA, Cavendish Road, KT13 0JT

Adair Ltd

Tabulated Noise data

Time	L_{Aeq}	L_{AMax}	L_{A90}
11:30	58	73	48
11:45	57	74	47
12:00	58	72	48
12:15	72	84	49
12:30	65	76	51
12:45	58	71	51
13:00	56	68	52
13:15	58	77	47
13:30	58	77	47
13:45	56	72	48
14:00	53	64	48
14:15	56	71	47
14:30	57	75	46
14:45	57	74	46
15:00	58	79	45
15:15	55	64	46
15:30	55	65	45
15:45	58	71	46
16:00	50	64	44
16:15	51	67	43
16:30	52	64	43
16:45	49	69	41
17:00	52	66	42
17:15	49	63	41
17:30	53	67	42
17:45	53	66	42
18:00	50	64	41
18:15	55	69	41
18:30	54	69	42
18:45	52	67	41
19:00	54	66	42
19:15	54	66	45
19:30	52	73	45
19:45	57	71	46
20:00	53	72	45
20:15	51	63	43
20:30	46	63	44
20:45	52	66	45
21:00	55	69	44
21:15	51	61	46
21:30	50	61	45
21:45	55	71	44
22:00	51	62	45
22:15	54	67	44
22:30	53	65	43
22:45	50	64	42
23:00	47	61	42
23:15	51	65	40

Time	L_{Aeq}	L_{AMax}	L_{A90}
23:30	45	58	39
23:45	40	47	39
00:00	39	47	38
00:15	40	47	38
00:30	40	42	38
00:45	39	44	38
01:00	39	46	38
01:15	40	52	39
01:30	39	42	38
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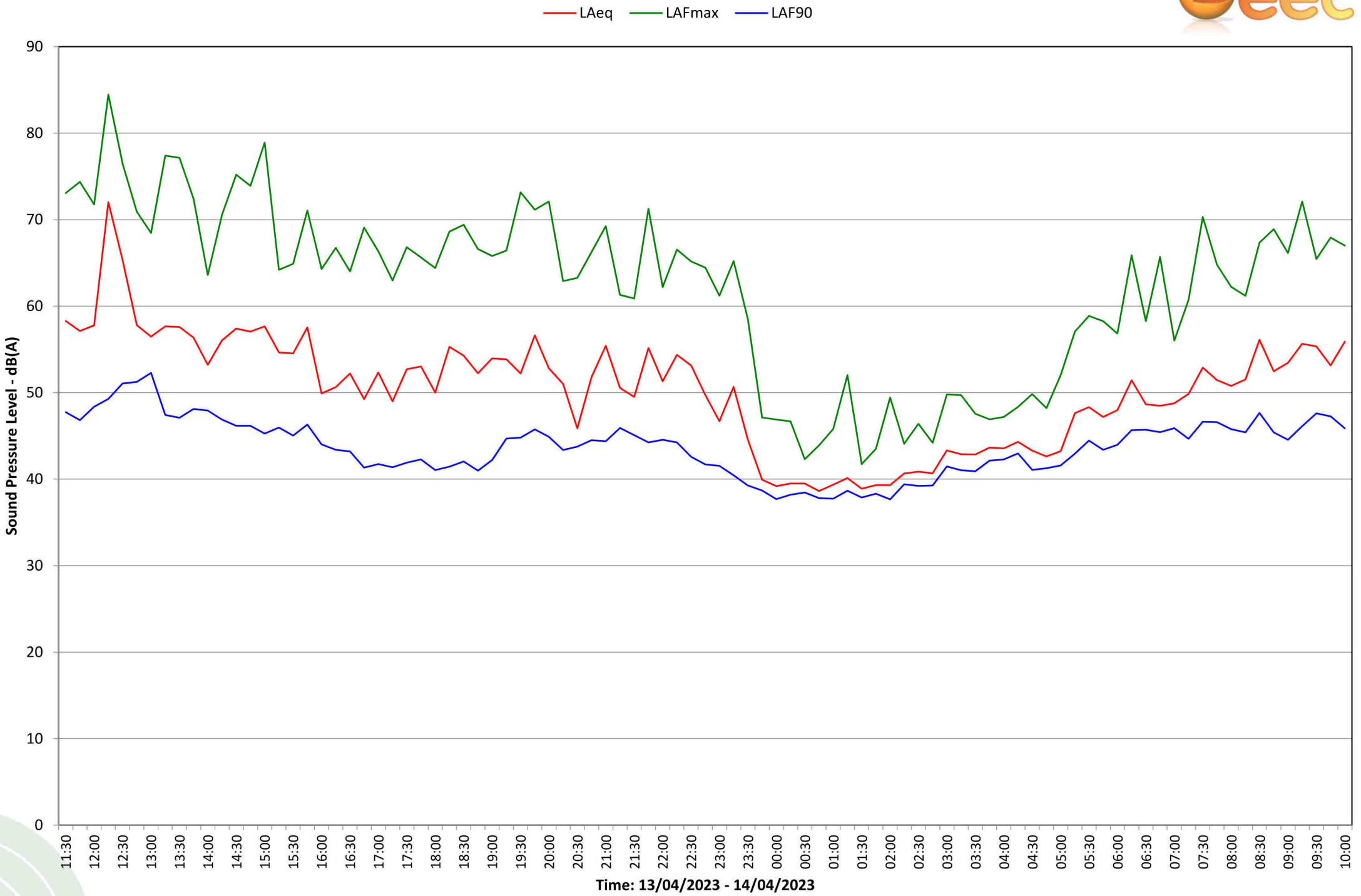
07:00	49	56	46
07:15	50	61	45
07:30	53	70	47
07:45	51	65	47
08:00	51	62	46
08:15	52	61	45
08:30	56	67	48
08:45	52	69	45
09:00	53	66	45
09:15	56	72	46
09:30	55	65	48
09:45	53	68	47
10:00	56	67	46

APPENDIX E

SURVEY RESULTS
(GRAPHICAL)

Noise Level Time History at Tara, Cavendish Road, KT13 0JT



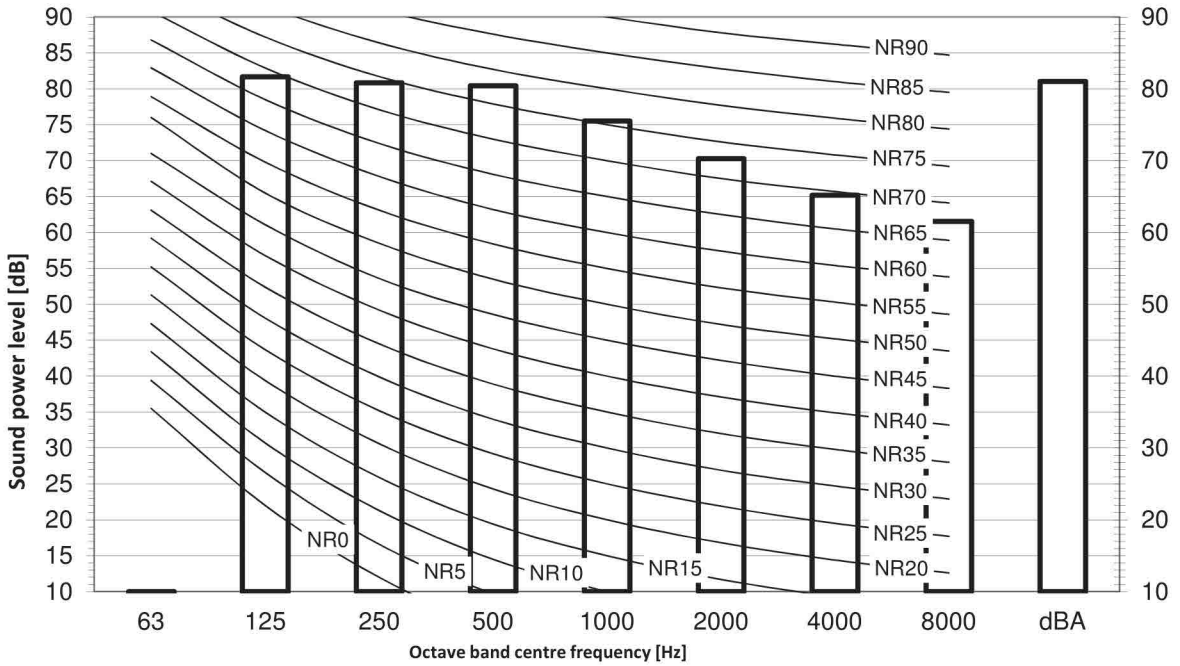
APPENDIX F

PUBLISHED PLANT NOISE DATA

11 Sound data

11 - 1 Sound Power Spectrum

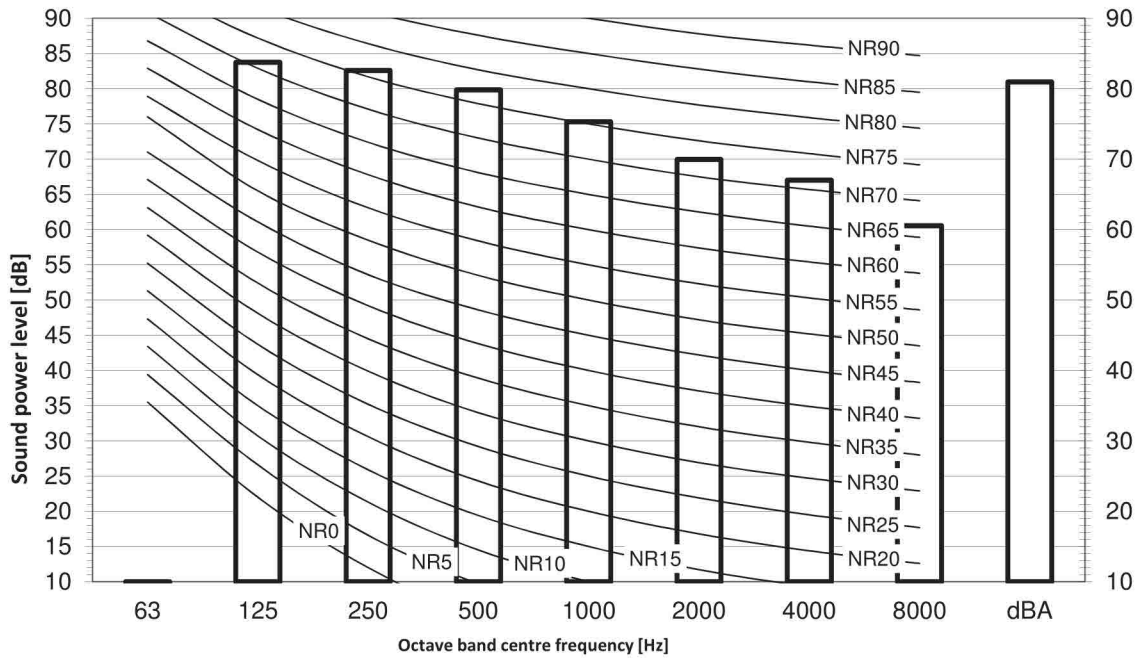
REYQ12T



Notes :
1. dBA = A-weighted sound power level (A scale according to IEC).
2. Reference acoustic intensity 0dB = ·10E-6µW/m²·
3. Measured according to ISO 3744

3D079909B

REYQ14T



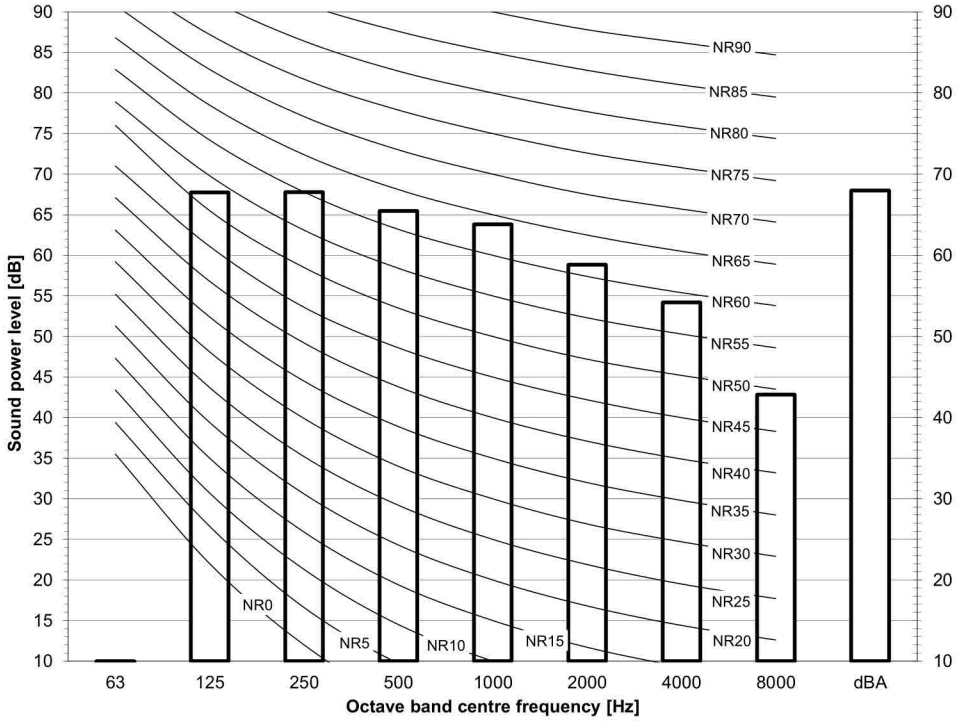
Notes :
1. dBA = A-weighted sound power level (A scale according to IEC).
2. Reference acoustic intensity 0dB = ·10E-6µW/m²·
3. Measured according to ISO 3744

3D079910B

11 Sound data

11 - 1 Sound Level Data

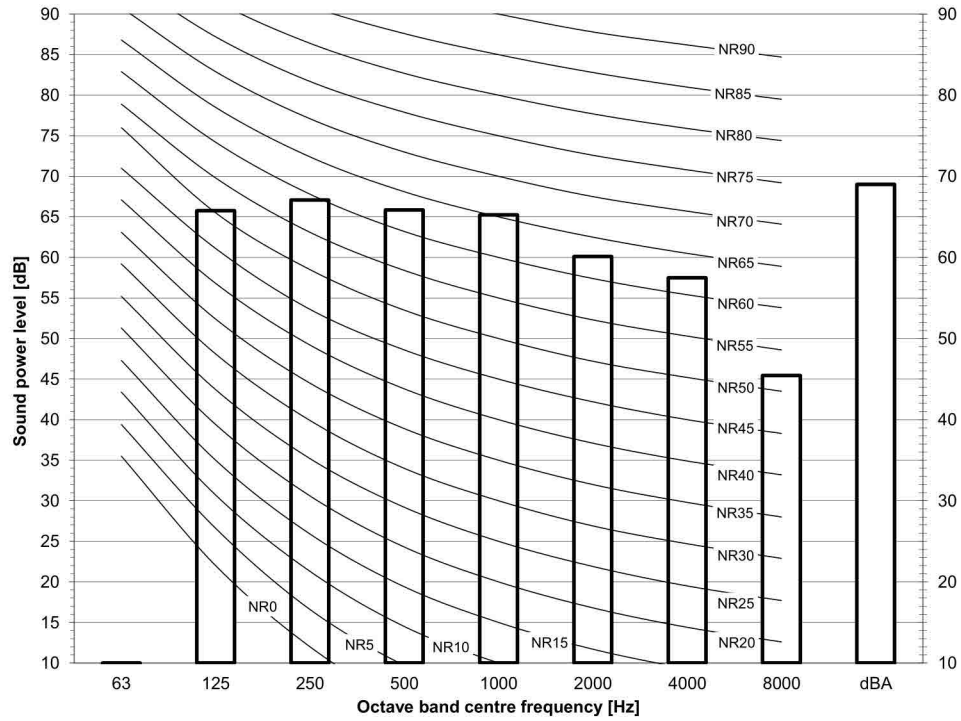
RXYSQ4T8V



Notes
- dBA = A-weighted sound power level (A scale according to IEC).
- Reference acoustic intensity 0dB = $10E-6 \mu W/m^2$.
- Measured according to ISO 3744

3D098212

RXYSQ5T8V



Notes
- dBA = A-weighted sound power level (A scale according to IEC).
- Reference acoustic intensity 0dB = $10E-6 \mu W/m^2$.
- Measured according to ISO 3744

3D098213