



Environmental Equipment Corporation Ltd
Richmond House, Churchfield Road
Walton on Thames
Surrey, KT12 2TP
t: 01932 230940
f: 01932 230941
e: info@eecco.uk

Project:

Next, Oracle Reading

Title:

Plant Noise Impact Assessment

quietly moving forward



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Client		Andy Kerr Associates	
Author		Jon Mudd BEng(Hons) MIOA Director 	
Checked		Tim Meed BSc(Hons) MIOA Director 	
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1 INTRODUCTION

- 1.01 Environmental Equipment Corporation Limited has been commissioned by Andy Kerr Associates to undertake a noise assessment of new HVAC plant that will serve the Next Store that is being fitted out within Unit 16-18 in the Oracle Shopping Centre in Reading.
- 1.02 This noise assessment has been conducted in accordance with the policies and requirements of Reading Borough Council and is based on a noise survey carried out at the site over a typical weekday period.
- 1.03 This assessment includes:
- the prediction of noise impacts at the worst affected noise sensitive receptors based on the proposed items of plant and their location; and
 - their likely impact in line with current British Standards as referenced by Reading Borough Council.
- 1.04 This report is prepared solely for Andy Kerr Associates. Environmental Equipment Corporation Limited accepts no responsibility for its use by any third party.
- 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 A new Next retail store is to be fitted out within units 16-18 in the Oracle Shopping Centre in Reading. As part of the fitout new HVAC plant is to be installed on the roof of the store. The new plant will replace a packaged air handling unit that had been installed on the roof for a previous tenant.
- 2.02 This application is for 18 No. Mitsubishi condensing units and 1 No VES supply and Extract air handling unit to be installed on the roof of the store as presented in Appendix B. An acoustic screen standing to the same height as the tallest plant item will be installed along the north elevation of the plant area.
- 2.03 The aerial photograph below shows the footprint of the store and also the surrounding area. Whilst the majority of the area is commercial there is a hotel to the north of the store (the George Hotel). There are dwellings above one of the adjoining buildings but none have windows that look out onto the plant area. The closest and most affected noise sensitive receptors to the proposed plant items will be the top floor, south facing windows of the George Hotel

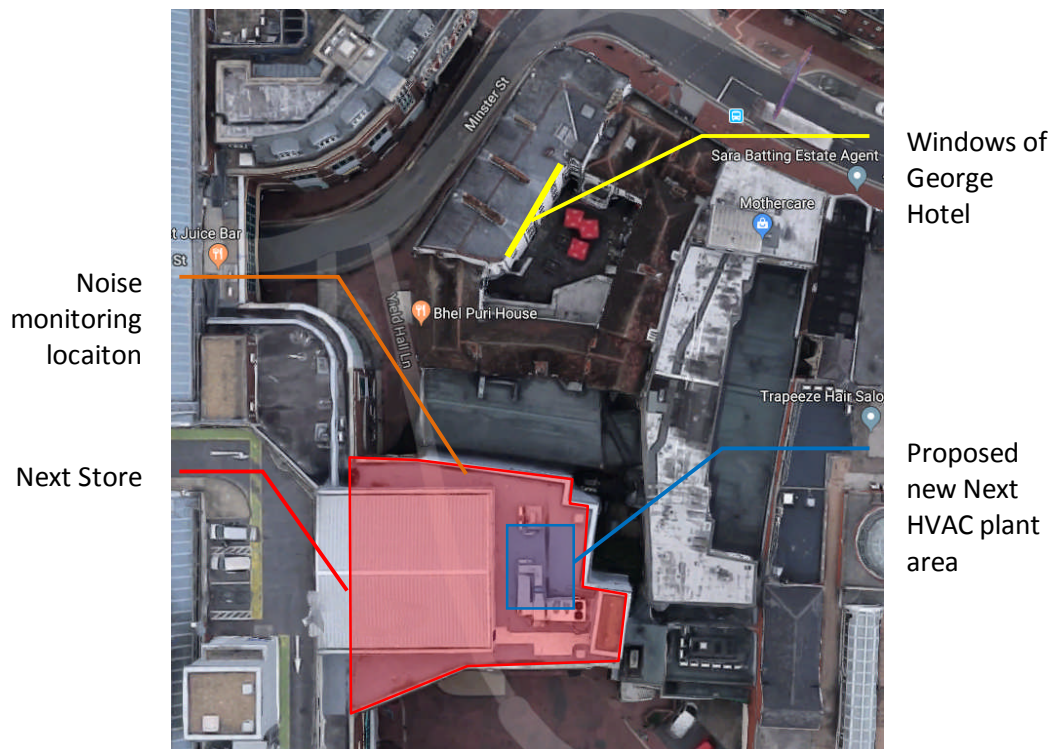


Figure 1: Aerial photograph of the site and surrounding area

- 2.04 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 the Reading Borough Council is presented in Appendix C of this document.
- 3.02 A summary of the pertinent points relating to this application are presented below and based upon a review of current design policy adopted by RBC;
- All plant should have a noise impact assessment carried out in line with the methodology specified within BS 4124:2014.
 - Typically, RBC adopt one of two possible design criteria in the context of plant noise:
 - a) The predicted **specific sound level** ($L_{Aeq,Tr}$) as measured at a point 1 metre external to sensitive facades shall be at least 10dB below the existing background sound level, $L_{A90,T}$ when all plant/equipment (or any part of it) is in operation.
 - b) The predicted **rating level**, $L_{Ar,Tr}$ (specific sound level plus any adjustment for the characteristic features of the sound) as measured at a point 1 metre external to sensitive facades shall not exceed the existing background sound level, $L_{A90,T}$ when all plant/equipment (or any part of it) is in operation

4 MEASUREMENTS

- 4.01 Environmental noise measurements were carried out over a weekday period, between 1340 hours on Tuesday 25th September 2018 and concluded 1430 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 Figure 1 and described as:
- Position 1: located at a height of approximately 1.5 metres above the top of the window. 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 George Hotel to the north of the measurement locations as it is equidistant from the dominant noise sources in the area and similarly screened from the surrounding roads.

5 EQUIPMENT

- 5.01 The equipment used for the survey was as follows:-
- 01dB Metravib Black Solo Integrating Sound Level Meter conforming to Class 1 BS EN 61672, Type 1 BS EN 60804 & BS EN 60651: 1994;
 - 01dB Metravib MCE 212 Condenser Microphone, PRE 21 S Pre-amp and Connecting Leads;
 - 01dB Outdoor Microphone Kit and a
 - Tripod.

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

Sound Level Meter 01dB Black Solo	Serial No.	65736
	Calibration Date	11 th August 2017
	Cal Certificate No.	U26342
½" MCE 212 Condenser Mic.	Serial No.	175307
	Calibration Date	11 th August 2017
	Cal Certificate No.	26341
Calibrator CAL 21	Serial No.	34634297
	Calibration Date	24 th October 2016
	Cal. Certificate No.	U22947

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 included noise from ventilation plant serving nearby restaurants and local and distant road traffic. There were no other significant sources of noise during the survey and the existing plant on the roof of Units 16-18 had already been decommissioned and removed.

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 five minute measurement in the specified period.

Position	Period	Average $L_{Aeq,T}$ – dB	Minimum L_{A90} – dB
1	Day time (0700-1900 hrs)	55.6	47.3
	Evening (1900-2300 hrs)	52.1	44.7
	Night-time (2300-0700 hrs)	49.9	38.7
	Trading Hours (0900-2000 hrs)	55.8	47.3

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

7 PLANT ASSESSMENT

- 7.01 This application is for the installation for 18 No. Mitsubishi condensing units and 1 No VES supply and Extract air handling unit to be installed on the roof of the store as presented in Appendix B.
- 7.02 Based on the standard requirements of Reading Borough Council and subsequent clarifications issued by the Environmental Health Department 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 with the most stringent and restrictive requirements of Reading Borough Council the proposed noise limits are based on achieving 10dB below the lowest background noise level at all times. .

Location	Period	Measured Existing $L_{A90,T}$	Proposed Noise Limit $L_{Ar,Tr}$
George Hotel	Day	47.3 dB	37 dB
	Evening	44.7 dB	35 dB
	Night	38.7 dB	29 dB
	Trading hours (0900-2000 hrs)	47.3 dB	37 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 Table 7.2 below details the condensing unit manufacturer's published broadband sound pressure levels at one metre along with the area served and the proposed operating hours.

Area served	Model Type	Operating Period	Published Sound Pressure Level at 1m
P1 Womenswear	Mitsubishi PUHZ-ZRP250	Trading hours	62 dB(A)
P2 Womenswear	Mitsubishi PUHZ-ZRP250	Trading hours	62 dB(A)
P3 Womenswear	Mitsubishi PUHZ-ZRP250	Trading hours	62 dB(A)
P4 Womenswear	Mitsubishi PUHZ-ZRP250	Trading hours	62 dB(A)
P5 Women's Fitting Room	PUHZ-ZM100YKA	Trading hours	51 dB(A)
P6 Childrenswear	Mitsubishi PUHZ-ZRP250	Trading hours	62 dB(A)
P7 Childrenswear	Mitsubishi PUHZ-ZRP250	Trading hours	62 dB(A)
P8 Childrenswear	PUHZ-ZM125YKA	Trading hours	52 dB(A)
P9 Home	PUHZ-ZM125YKA	Trading hours	52 dB(A)
P10 Home	Mitsubishi PUHZ-ZRP250	Trading hours	62 dB(A)
P11 Menswear	Mitsubishi PUHZ-ZRP250	Trading hours	62 dB(A)
P12 Menswear	Mitsubishi PUHZ-ZRP250	Trading hours	62 dB(A)
P13 Menswear	Mitsubishi PUHZ-ZRP250	Trading hours	62 dB(A)
P14 Men's Fitting Room	PUHZ-ZM50VKA	Trading hours	46 dB(A)
P16 Customer Stockroom	PUHZ-ZM125YKA	Trading hours	52 dB(A)
P17 Pre-retail Stockroom	PUHZ-ZM125YKA	Trading hours	52 dB(A)
P18 Cash/Admin Office	PUHZ-ZM60VKA	24 Hours	49 dB(A)
P19 Staffroom	PUHZ-ZM100YKA	Trading hours	51 dB(A)

Table 7.2 Manufacturer's Published Sound Pressure Levels at 1m.

7.06 Table 7.3 summarises the manufacturer's published sound power levels for the supply and extract AHU.

Area served	Model Type	Operating Period	Published Sound Pressure Level at 1m
Store Supply AHU	VES MAX32/A/SW/S	Trading hours	58 dB(A)
Store Extract AHU	VES MAX32/A/SW/S	Trading hours	68 dB(A)

Table 7.3 Manufacturer's Published Sound Pressure Levels at 1m.

7.07 It is proposed that a solid acoustic screen standing to the same height as tallest item of plant will be installed along the northern elevation of the plant area on the roof of the store. The screen will eliminate the line of sight between the plant area and the top floor windows of the George Hotel.

7.08 Predicted noise levels have been calculated at the closest noise sensitive windows, the George Hotel. These are the nearest and most affected windows to the proposed plant installation.

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 7.4-7.7 present the results of worst-case plant noise predictions at the worst-case locations.

Item	Noise Level		Notes
	Trading Hours	24 hours	
18 No Condenser Units-trading hours - Cash Office only 24 hours	72 dB(A)	49 dB(A)	Cumulative sound pressure level at 1m
Barrier Effect	10 dB	10 dB	Losses provided by solid acoustic screen
Conformal area Losses over 36 metres	- 27 dB	- 27 dB	Distance to closest window
Reflections	0 dB	0 dB	No additional reflections/flat roof
Total Noise Level	35 dB(A)	12 dB(A)	Top Floor Windows of George Hotel

Table 7.4: Condenser Plant Noise Calculation

Item	Noise Level	Notes
AHU Inlet Noise	58 dB(A)	Cumulative sound pressure level at 1m
Barrier Effect	10 dB	Losses provided by solid acoustic screen
Point Source Losses over 36 metres	- 31 dB	Distance to closest window
Reflections	+3 dB	1 No additional off flat roof
Total Noise Level	20 dB(A)	Top Floor Windows of George Hotel

Table 7.5: AHU Inlet Plant Noise Calculation

Item	Noise Level	Notes
AHU Exhaust Noise	68 dB(A)	Cumulative sound pressure level at 1m
Barrier Effect	10 dB	Losses provided by solid acoustic screen
Point Source Losses over 36 metres	- 31 dB	Distance to closest window
Reflections	+3 dB	1 No additional off flat roof
Total Noise Level	30 dB(A)	Top Floor Windows of George Hotel

Table 7.6: Condenser Plant Noise Calculation

Property	Period	Proposed Noise Limit $L_{Ar,Tr}$	Predicted $L_{Aeq,T}$	Exceedance of noise limit
Top Floor Windows of George Hotel	Trading Hours	37 dB	36 dB	- 1 dB
	Night-time	29 dB	12 dB	- 17 dB

Table 7.7: 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 with the inclusion of the proposed acoustic screen the resultant noise level outside the windows of the nearest noise sensitive, the George Hotel, will be 10 dB below the lowest recorded background noise level at all times of the plant operation in accordance with requirements of Reading Borough Council.

8 CONCLUSIONS

- 8.01 Andy Kerr Associates has appointed Environmental Equipment Corporation Limited to undertake a noise assessment for 18 No. condenser units and a supply and extract AHU to serve a new Next Retail store in the Oracle Shopping Centre, Reading
- 8.02 The assessment has been carried out in accordance with national planning guidance and the requirements of the BS4142 and Reading 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 condensers at the closest existing 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 strictest requirements of Reading Borough Council to control the noise from the proposed new plant.
- 8.05 Predictions have shown that the required noise criteria for the new plant to be 10 dB below the lowest background noise level is achieved at the most affected windows of the nearest noise sensitive property, the George Hotel based on the installation of an acoustic screen along the north elevation of the plant area.
- 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 during all periods.
- 8.07 On the basis of this assessment it is considered that noise does not pose a material constraint to the operation of the proposed plant.

APPENDIX A

GLOSSARY OF TECHNICAL TERMS

TECHNICAL TERMS AND UNITS

Decibel (dB) - This is the unit used to measure sound. The human ear has an approximately logarithmic response to sound over a very large dynamic range (typically 20 micro-Pascals to 100 Pascals). We therefore use a logarithmic scale to describe sound pressure levels, intensities and power levels. The logarithms used are to base 10; hence, an increase of 10 dB in sound pressure level corresponds to a doubling in perceived loudness of the sound.

Sound Power Level (SWL) - This is a function of the noise source alone and is independent of its surroundings. It is a measure of the amount of sound power output measured in decibels.

Sound Pressure Level (SPL) - This is a function of the source and its surroundings and is a measure of the sound pressure at a point in space. For example, a sound pressure level measured at 1 metre from a sound source of certain sound power in reverberant room will not be the same as the sound pressure level at 1 metre from the sound source measured in open space.

Octave and One-Third Octave Bands - The human ear is sensitive to sound over a range of approximately 20 Hz to 20 KHz and is generally more sensitive to medium and high frequencies than to low frequencies. In order to define the frequency content of a noise, the spectrum is divided into frequency bands and the sound pressure level is measured in each band. The most commonly used frequency bands are octave bands, in which the mid frequency of each band is twice that of the band below it. For finer analysis, each octave band may be split into one-third octave bands.

"A" Weighting - A number of frequency weightings have been developed to imitate the ear's varying sensitivity to sound of different frequencies. The most commonly used weighting is the "A" weighting. The "A" weighted SPL can be measured directly or derived from octave or one-third octave band SPLs. The result is a single figure index which gives some idea of the subjective loudness of the sound, but which contains no information as to its frequency content.

Noise Rating (NR) Curves - The "A" weighted sound pressure level cannot be used to define a spectrum or to compare sounds of different frequencies. NR curves convey frequency information in a single-figure index. This is done by defining the maximum permissible sound pressure level at each frequency for each curve. To measure the noise rating of a given environment, the SPL is measured in octave or one-third octave bands and the noise rating is then the highest NR curve touched by the measured levels.

Intermittency and Time-Weighting - The degree of annoyance caused by a noise also depends on its duration and intermittency of a noise. Intermittent, impulsive or repetitive noises tend to be more annoying than continuous noises. Various time-weightings have been derived to measure sounds of differing intermittences and these can be measured directly on modern equipment. The most common time-weightings in use are as follows:-

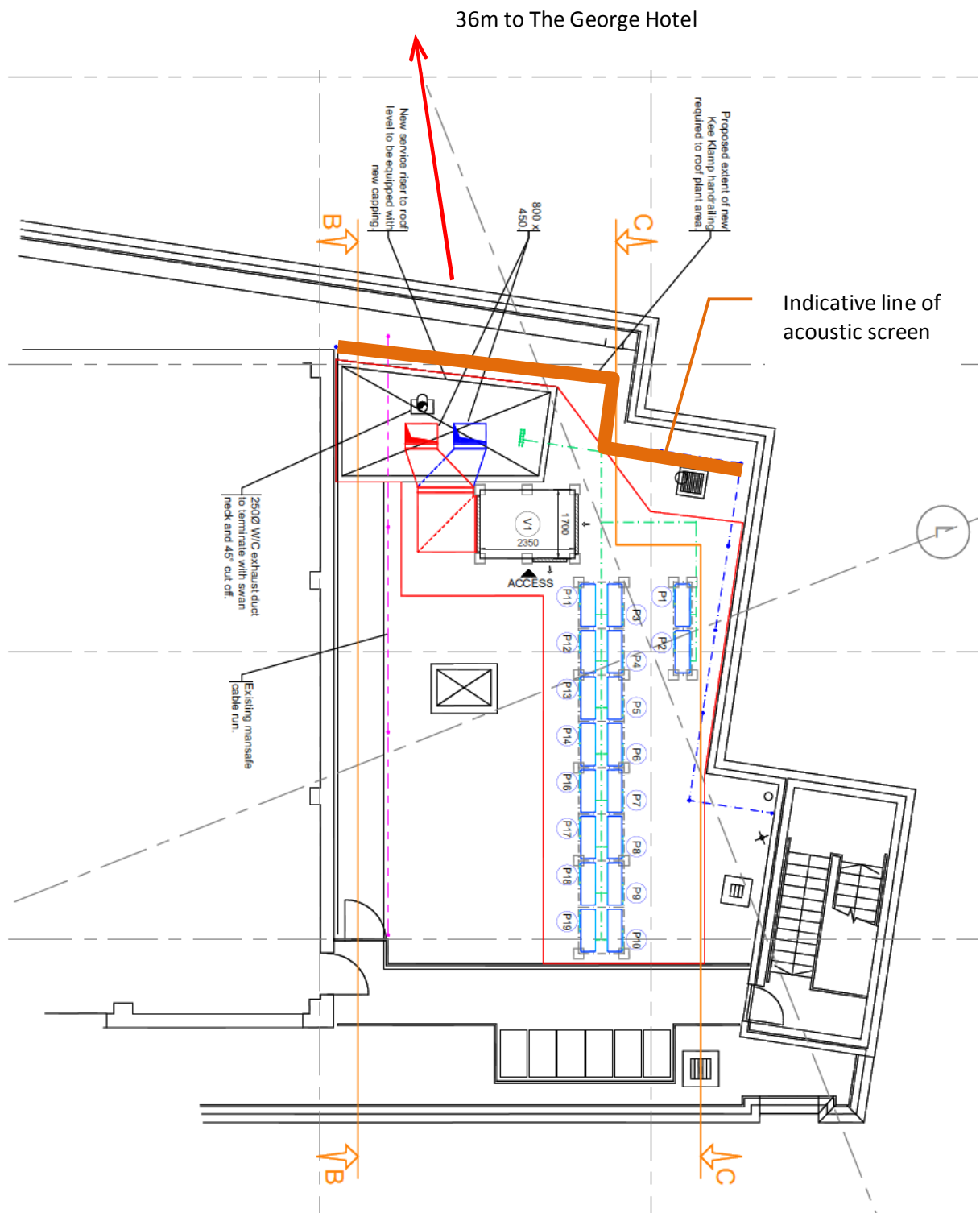
L_{90} This is the sound pressure level exceeded for 90% of the measurement period. It is widely used to measure background noise levels.

L_{10} This is the sound pressure level exceeded for 10% of the measurement period. It is widely used to measure traffic noise. For a given measurement period, the L_{10} level is by definition greater than or equal to the L_{90} level.

L_{eq} The equivalent continuous noise level is often used to measure intermittent noise. It is defined as the notional steady noise level that would contain the same acoustic energy as the varying noise. Because the averaging process used is logarithmic, the L_{eq} level tends to be dominated by the higher noise levels measured.

APPENDIX B
PLANT LAYOUT PLAN

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APPENDIX C

PLANNING POLICY AND GUIDANCE

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PLANNING POLICY AND GUIDANCE

Reading Borough Council Advice regarding this Application

Noise generating development – Advice provided by Rebecca Moon – Reading Borough Council

‘Applications which include noise generating plant when there are nearby noise sensitive receptors should be accompanied by an acoustic assessment carried out in accordance with BS4142:2014 methodology. This is a town centre location within a shopping centre, however there are residents in the vicinity that may be affected by the noise from the plant – for example the George Hotel and residents on Minster Street. The application is for a large number of condenser units therefore the cumulative noise level may be significant depending on relative location of nearby receptors.

A noise assessment has not been submitted with the application and therefore I cannot determine the likely noise impact of the proposal and whether the proposals are acceptable. I therefore recommend refusal unless a noise assessment can be submitted and considered by us before the application is determined.

Alternatively the following condition could be attached to consent, however it is possible that the criteria would be met with the plant specifications proposed in this application and a new application may need to be made at a later date for alternative plant / location.’

Recommended Condition

BS4142 Noise assessment – to be submitted

No mechanical plant shall be installed until a noise assessment of the proposed mechanical plant has been submitted and approved by this Council. The assessment shall be carried out for in accordance with BS4141:2014 methodology. The predicted specific sound level ($L_{Aeq,TR}$) as measured at a point 1 metre external to sensitive facades shall be at least 10dB below the existing background sound level, $L_{A90,T}$ when all plant/equipment (or any part of it) is in operation. The predicted rating level, $L_{Ar,Tr}$ (specific sound level plus any adjustment for the characteristic features of the sound) as measured at a point 1 metre external to sensitive facades shall not exceed the existing background sound level, $L_{A90,T}$ when all plant/equipment (or any part of it) is in operation. The plant shall thereafter only be installed in accordance with the assessment.

Reason: To safeguard the amenities of the adjoining premises and the area generally, in accordance with Policy CS34 of the Reading Borough LDF Core Strategy 2008 (Altered 2015) and Policy DM4 of the Reading Borough LDF Sites and Detailed Policies Document 2012 (Altered 2015).

National Planning Policy Framework and the Noise Policy Statement for England

The Ministry of Housing Communities and Local Government published the National Planning Policy Framework (NPPF) on July 2018 and upon its publication, presented the government's overarching planning policy on noise.

The NPPF contains three aims, which are set out at paragraph 180 in Section 15 of the document, titled *Conserving and enhancing the natural environment*:

"Planning policies and decisions 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* [See explanatory note to the Noise Policy Statement for England];
- 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; and*

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 16389 - Next Store - The Oracle, Reading

Andy Kerr Associates

Tabulated Noise data

Sheet 1 of 4

Time	L _{Aeq}	L _{AMax}	L _{A90}
13:40	55.4	71.1	50.6
13:45	55.4	66.1	50.5
13:50	55.9	66.7	51.0
13:55	53.9	67.8	51.0
14:00	56.8	70.3	51.4
14:05	53.6	64.1	50.1
14:10	53.2	66.0	50.4
14:15	56.2	70.3	51.4
14:20	54.8	70.4	51.0
14:25	54.4	67.3	51.0
14:30	54.8	64.8	50.9
14:35	53.6	67.4	50.8
14:40	54.1	67.9	50.6
14:45	53.2	63.4	50.4
14:50	58.9	76.3	50.9
14:55	54.3	65.1	51.1
15:00	56.8	78.5	50.5
15:05	53.4	64.1	50.3
15:10	56.9	67.8	51.9
15:15	53.8	63.4	50.7
15:20	53.2	64.0	50.6
15:25	54.3	64.2	51.3
15:30	56.2	69.9	50.8
15:35	52.2	60.1	50.1
15:40	52.9	64.7	50.2
15:45	55.8	70.7	50.9
15:50	52.8	66.7	50.4
15:55	53.4	63.7	50.6
16:00	54.0	67.3	50.9
16:05	55.8	70.2	51.1
16:10	55.2	74.3	50.6
16:15	57.0	73.5	50.4
16:20	56.1	75.8	50.8
16:25	53.7	61.3	50.6
16:30	55.8	66.7	50.6
16:35	53.3	64.1	50.8
16:40	52.5	62.8	50.4
16:45	55.2	69.4	51.1
16:50	56.0	67.5	51.1
16:55	52.6	58.5	50.4
17:00	53.2	65.5	50.9
17:05	53.8	65.5	50.5
17:10	53.2	64.0	50.4
17:15	55.7	70.5	51.2
17:20	52.1	61.9	50.5
17:25	51.9	60.3	50.2
17:30	52.4	64.6	50.5
17:35	53.4	62.8	50.6

Time	L _{Aeq}	L _{AMax}	L _{A90}
17:40	54.2	64.7	51.0
17:45	55.1	63.7	51.6
17:50	54.9	63.5	52.3
17:55	55.9	64.8	52.3
18:00	57.5	71.2	52.7
18:05	55.5	66.5	52.0
18:10	59.4	75.7	52.2
18:15	52.4	61.8	50.5
18:20	53.3	67.2	50.6
18:25	53.2	65.4	50.4
18:30	53.9	72.8	50.6
18:35	53.9	61.1	51.1
18:40	55.5	66.9	50.8
18:45	52.6	61.2	50.4
18:50	54.3	69.6	50.5
18:55	56.8	70.1	51.6
19:00	52.8	61.6	50.4
19:05	53.4	64.4	50.6
19:10	53.2	63.1	50.5
19:15	52.1	61.4	50.1
19:20	53.5	66.9	50.3
19:25	53.4	64.6	50.6
19:30	52.2	64.0	50.1
19:35	52.2	61.2	50.2
19:40	53.0	64.0	50.3
19:45	52.7	61.6	50.4
19:50	53.6	66.0	50.2
19:55	51.8	63.9	50.2
20:00	53.5	65.2	50.7
20:05	52.6	68.8	50.3
20:10	52.7	62.2	50.4
20:15	52.1	61.1	50.4
20:20	52.7	61.7	50.3
20:25	52.6	62.2	49.9
20:30	51.5	62.5	50.0
20:35	55.3	67.0	50.6
20:40	51.5	60.3	50.0
20:45	51.9	58.8	50.1
20:50	52.4	63.0	50.0
20:55	51.5	60.8	49.9
21:00	51.2	59.6	49.8
21:05	51.6	65.0	49.3
21:10	52.4	64.2	49.7
21:15	50.8	61.8	49.6
21:20	52.4	60.9	49.6
21:25	52.3	64.6	50.1
21:30	50.7	64.3	49.2
21:35	51.8	71.0	49.2

EC 16389 - Next Store - The Oracle, Reading

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Tabulated Noise data

Sheet 2 of 4

Time	L _{Aeq}	L _{AMax}	L _{A90}
21:40	51.0	58.0	49.4
21:45	51.1	57.9	50.0
21:50	51.9	63.0	50.0
21:55	51.6	61.4	49.4
22:00	50.8	65.9	48.9
22:05	51.0	59.5	49.2
22:10	51.9	64.3	49.1
22:15	49.9	59.4	48.8
22:20	51.8	61.7	49.4
22:25	51.5	59.5	49.9
22:30	51.4	62.8	49.8
22:35	52.5	66.5	49.9
22:40	50.2	61.6	48.5
22:45	52.2	63.6	47.8
22:50	51.1	66.7	45.8
22:55	46.6	55.9	44.7
23:00	49.3	60.7	43.1
23:05	48.0	62.9	42.6
23:10	47.8	63.1	43.9
23:15	48.7	57.7	44.3
23:20	47.8	59.4	44.0
23:25	49.6	59.2	45.9
23:30	49.5	60.2	44.1
23:35	49.5	62.7	42.6
23:40	48.0	59.5	42.8
23:45	51.4	62.0	46.6
23:50	47.3	58.9	45.6
23:55	49.2	60.3	45.7
00:00	49.1	59.3	45.2
00:05	51.6	65.9	44.8
00:10	48.3	58.3	43.9
00:15	48.7	62.2	44.3
00:20	47.3	60.7	44.2
00:25	49.4	63.3	43.2
00:30	48.4	56.1	43.7
00:35	49.2	58.6	46.0
00:40	48.8	58.9	43.3
00:45	49.1	61.5	43.6
00:50	49.3	59.4	45.5
00:55	49.0	59.4	44.3
01:00	48.5	58.1	45.6
01:05	48.8	61.5	44.6
01:10	52.5	71.6	44.4
01:15	49.6	56.9	46.2
01:20	51.4	77.2	44.0
01:25	49.7	72.0	43.4
01:30	50.5	72.0	44.2
01:35	47.6	58.0	44.2

Time	L _{Aeq}	L _{AMax}	L _{A90}
01:40	50.1	64.1	44.3
01:45	49.5	62.9	44.1
01:50	49.7	61.5	45.4
01:55	52.2	62.4	46.9
02:00	49.6	61.0	45.6
02:05	48.2	59.9	44.8
02:10	50.8	61.7	46.2
02:15	50.9	70.8	45.1
02:20	49.1	60.9	44.4
02:25	48.7	61.3	44.3
02:30	50.5	64.2	45.6
02:35	50.3	60.3	44.1
02:40	49.4	63.3	46.2
02:45	49.9	63.2	44.0
02:50	55.8	76.0	45.9
02:55	51.3	67.6	46.3
03:00	51.2	68.7	45.1
03:05	49.2	62.6	44.8
03:10	48.7	61.2	40.6
03:15	48.7	66.6	40.0
03:20	44.0	55.1	39.3
03:25	45.6	58.5	39.2
03:30	43.9	57.2	38.7
03:35	45.6	56.7	42.6
03:40	44.2	57.6	40.4
03:45	56.0	70.6	40.9
03:50	49.0	54.5	41.2
03:55	54.4	60.0	48.8
04:00	60.8	66.5	54.7
04:05	52.3	61.3	44.9
04:10	48.3	59.7	40.2
04:15	43.2	52.2	41.6
04:20	43.8	51.3	40.2
04:25	45.7	59.6	41.7
04:30	42.6	45.2	41.4
04:35	43.0	50.6	41.5
04:40	44.9	53.3	42.4
04:45	47.6	61.5	40.8
04:50	42.7	55.1	40.6
04:55	44.2	56.7	42.5
05:00	43.7	57.3	41.2
05:05	42.6	50.8	40.9
05:10	43.1	52.2	41.3
05:15	47.9	62.7	41.6
05:20	45.2	55.7	42.9
05:25	44.0	47.4	42.9
05:30	46.5	59.1	43.8
05:35	45.3	51.4	44.1

EC 16389 - Next Store - The Oracle, Reading

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Tabulated Noise data

Sheet 3 of 4

Time	L _{Aeq}	L _{AMax}	L _{A90}
05:40	47.7	61.0	44.4
05:45	50.9	61.6	44.8
05:50	45.8	54.6	44.0
05:55	46.4	52.4	44.6
06:00	51.1	69.9	44.6
06:05	47.6	61.0	44.6
06:10	50.6	63.1	44.6
06:15	50.7	67.3	45.4
06:20	50.3	61.7	45.8
06:25	47.0	60.7	44.9
06:30	49.2	63.6	45.9
06:35	48.1	61.8	46.5
06:40	51.0	64.0	47.3
06:45	51.9	60.9	47.7
06:50	50.6	62.2	47.8
06:55	53.2	60.7	48.9
07:00	53.2	69.1	48.7
07:05	53.0	64.2	48.9
07:10	53.3	66.1	48.6
07:15	52.3	61.7	48.5
07:20	50.8	60.7	48.3
07:25	52.4	70.4	48.2
07:30	53.9	67.9	48.1
07:35	52.9	71.7	48.6
07:40	52.5	69.8	48.9
07:45	53.2	69.3	48.6
07:50	51.8	67.5	48.2
07:55	52.2	62.4	48.5
08:00	52.4	67.6	48.7
08:05	53.1	64.5	49.9
08:10	52.8	62.8	49.2
08:15	52.6	64.1	49.8
08:20	52.2	68.0	48.9
08:25	50.7	61.2	48.5
08:30	51.3	61.1	48.4
08:35	53.0	66.2	48.8
08:40	53.7	77.3	47.9
08:45	51.7	64.5	48.7
08:50	54.9	66.4	50.0
08:55	52.9	61.1	49.3
09:00	52.7	68.9	48.8
09:05	50.9	62.2	47.9
09:10	53.6	65.6	47.9
09:15	52.4	64.4	48.1
09:20	53.6	65.2	49.4
09:25	55.1	67.1	50.1
09:30	50.7	61.2	48.7
09:35	53.3	74.2	48.2

Time	L _{Aeq}	L _{AMax}	L _{A90}
09:40	54.7	65.9	49.0
09:45	53.8	68.5	48.2
09:50	54.9	68.1	49.1
09:55	53.0	65.2	48.0
10:00	56.9	69.5	49.2
10:05	57.4	70.3	47.8
10:10	54.2	64.3	47.3
10:15	56.0	70.1	50.1
10:20	55.5	70.5	50.1
10:25	56.2	68.9	50.0
10:30	56.0	68.4	50.1
10:35	55.4	66.3	49.2
10:40	54.6	69.2	49.7
10:45	56.3	72.4	49.3
10:50	58.3	72.0	50.7
10:55	57.7	68.7	51.4
11:00	54.5	62.4	50.3
11:05	62.6	73.2	55.8
11:10	60.6	70.6	55.2
11:15	59.7	66.2	51.9
11:20	61.0	83.9	53.6
11:25	57.0	71.2	50.6
11:30	58.9	73.9	49.6
11:35	56.2	68.8	50.1
11:40	57.4	67.0	50.8
11:45	57.0	67.6	50.3
11:50	56.1	68.7	50.0
11:55	60.4	77.0	51.0
12:00	57.4	74.0	50.0
12:05	57.9	69.8	50.4
12:10	59.1	70.2	50.7
12:15	59.6	68.4	52.0
12:20	57.8	68.5	52.7
12:25	57.6	68.2	51.9
12:30	57.6	66.9	52.9
12:35	59.4	70.9	52.8
12:40	59.4	73.6	51.7
12:45	57.8	73.5	51.0
12:50	57.7	75.3	50.8
12:55	56.3	70.8	49.9
13:00	55.5	70.2	50.6
13:05	55.6	66.7	50.2
13:10	56.6	66.7	51.4
13:15	54.9	64.6	50.7
13:20	53.5	65.7	50.4
13:25	53.4	63.3	50.9
13:30	54.3	64.5	50.8
13:35	56.8	71.1	51.3

EC 16389 - Next Store - The Oracle, Reading

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Tabulated Noise data

Sheet 4 of 4

Time	L _{Aeq}	L _{AMax}	L _{A90}
13:40	53.8	65.4	50.1
13:45	57.2	69.6	50.8
13:50	53.0	64.1	51.2
13:55	54.7	64.6	51.3
14:00	55.0	66.0	51.7
14:05	53.9	75.8	50.7
14:10	54.5	65.4	51.0
14:15	60.5	75.8	51.1
14:20	57.0	69.0	51.2

Time	L _{Aeq}	L _{AMax}	L _{A90}
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APPENDIX E
SURVEY RESULTS
(GRAPHICAL)

Noise Level Time History at Next Store - The Oracle, Reading

