RSK Acoustics

Camden Goods Yard

Plant Noise Assessment – Block B

Report 20/0484/R4

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Plant Noise Assessment – Block B

Report 20/0484/R4

St George PLC

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Revision	Description	Date	Prepared	Approved
0	First Issue	23rd September 2022	Thomas Goose	Octavio Lora Aranda
1	Second Issue	3rd January 2022	Thomas Goose	Octavio Lora Aranda
2	Third Issue	10th February 2022	Thomas Goose	Octavio Lora Aranda

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1 Introduction

1.1 Planning consent has been granted with reference 2020/0034/P for a mixed use scheme off Chalk Farm Road, Camden, subject to conditions including the following relating to external plant noise emissions:

> *"13 - Prior to installation of any plant/machinery/equipment on any new building on the Main Site land parcel, an acoustic report setting out details of how the external noise levels from such equipment would meet the Council's noise (as set out in condition 10 above) and vibration (as set out in Table A of Appendix 3 to the Local Plan 2017) standards shall be submitted and approved in writing by the local planning authority. Such details to include any acoustic mitigation and anti-vibration measures as required. All such noise and anti-vibration mitigation measures shall be put in place prior to first use of the relevant plant/machinery/equipment and shall thereafter be retained. The plant/machinery/equipment shall thereafter be maintained and operated in accordance with the manufacturers' recommendations.*
>
> *10 - Prior to installation of the relevant plant/ machinery/ equipment, details shall be submitted to and approved in writing by the Council, of the external noise level emitted from that plant/ machinery/ equipment and mitigation measures as appropriate. The mitigation measures shall ensure that the external noise level emitted from plant, machinery/ equipment will be lower than the lowest existing background noise level by at least 10dBA, by 15dBA where the source is tonal, as assessed according to BS4142:2014 at the nearest and/or most affected noise sensitive premises, with all machinery operating together at maximum capacity."*

1.2 RSK Acoustics have been instructed to undertake an assessment of the plant associated with the site. This report assesses the items on the rooftop of Block B.

1.3 This report details an assessment of the plant noise emission levels of the proposed installations, outlining the mitigation measures required to meet the plant noise limits.

2 Site Description

2.1 The site resides on Chalk Farm Road, Camden Town, London NW1 8AA on the site of an existing Morrisons Supermarket site. The site lies east of an existing residential settlement on Juniper Crescent with further existing residential to the east on Gilbeys Yard. The site and surroundings can be seen in the attached site plan 20/0484/R4/SP1.

2.2 To the north of the site runs an overground line emanating from St Pancras Station, to the south of the site runs a line emanating from Euston Station. Beyond the line to the north is Camden Market. Beyond the line to the south is further residential on Gloucester Avenue.

2.3 The prevailing noise sources around the site are from the two existing rail lines to the north and south of the site, with local road traffic noise also present.

3 Environmental Noise Survey

3.1 Methodology and Instrumentation

3.1.1 An unattended noise survey was undertaken at the site between Thursday 4th and Tuesday 9th March 2021.

3.1.2 The measurements were used to quantify the noise climate at the site during the day and night time periods at locations representative of the existing noise sensitive receivers. The loggers were left over multiple days to ensure the levels measured were representative.

3.1.3 The noise monitoring positions were chosen to quantify the existing noise climate at the site.

3.1.4 The measurement positions are described below.

- MP1 – North Eastern boundary, overlooking the rail lines separating the site from Camden Market
- MP2 – North Western Boundary, overlooking the rail lines separating the site from Camden Market
- MP3 – South Western boundary, overlooking rail lines between London Euston and South Hampstead

3.1.5 Noise measurements at all positions were made in the L_{Aeq}, L_{Amax}, L_{A10} and L_{A90} indices (see the Glossary of Acoustic Terms for an explanation of the noise units used). All measurements were made over 15-minute periods.

3.1.6 The noise measurements were performed using the equipment detailed in table T1 below.

Item	Manufacturer	Type
Sound Level Analyser	Norsonic	118
Acoustic Calibrator	Norsonic	1251
Weatherproof windshield	Norsonic	1212
Sound Level Analyser	Rion x2	NL-52
Acoustic Calibrator	Rion x2	NC-74
Weatherproof windshield	Rion x2	WS-15

T1 Equipment used during unattended noise survey.

3.1.7 The microphones of the sound level meters used for the unattended measurements were extended with cables and fitted within weatherproof windshields.

3.1.8 All sound level meters were calibrated before and after the measurement periods to ensure a consistent and acceptable level of accuracy was maintained throughout. No significant drift was observed during the surveys.

3.1.9 Weather conditions when setting up the survey was cool and dry, with low wind speeds.

3.1.10 Weather conditions when collecting the unattended noise monitors were warm, dry with mixed wind conditions. Publicly available weather data show that conditions were suitable throughout the noise survey with no precipitation recorded.

3.2 Noise survey results

3.2.1 Full details of our noise survey can be found in our Noise and Vibration Assessment Report (REF:20/0484/R1). For the purposes of this Plant Noise Assessment we have taken the noise limits derived from MP2 and MP3, considered to be representative of the residence nearest the Block B rooftop plant installations.

3.2.2 The measured background (L_{A90}) noise levels derived from the unattended noise survey results can be seen in the attached time history graph 20/0484/R4/TH1 and are outlined in Table T2 below.

Measurement Location	Lowest Measured Background Noise Level, dB L_{A90}	
	Daytime (0700-2300 only)	Night time (24-hour)
MP2 – North Western Boundary	39	34
MP3 – South Western Boundary	38	35

T2 Measured background L_{A90} noise levels

4 Noise Emission Criteria

4.1 Local Authority Criteria

4.1.1 The site falls within the jurisdiction of the London Borough of Camden. Appendix 3 of the Camden Local Plan 2017 provides the following guidance on noise limits for industrial and commercial noise sources:

"A relevant standard or guidance document should be referenced when determining values for LOAEL and SOAEL for non-anonymous noise. Where appropriate and within the scope of the document it is expected that British Standard 4142:2014 'Methods for rating and assessing industrial and commercial sound' (BS 4142) will be used. For such cases a 'Rating Level' of

10 dB below background (15 dB if tonal components are present) should be considered as the design criterion).”

4.1.2 Paragraph 6.100 of the Local Plan states the following with regards to noise limits for Emergency Plant:

“Emergency equipment such as generators which are only to be used for a short period of time will be required to meet the noise criteria of no more than 10dB above the background level (L90 15 minutes). During standby periods, emergency equipment will be required to meet the usual criteria for plant and machinery. Conditions to this effect may be imposed in instances where emergency equipment forms part of the application.”

4.1.3 Further to the information found in the local plan, the following question had been posed to the Local Authority, below is the question and response:

““We would like confirmation from LBC’s EHO that the baseline for background noise is the existing surrounding buildings, i.e. not the new buildings being delivered as part of the scheme. This is our understanding from the regulations referenced.”

To which they answered:

"We have had a response from our EHO, they’ve said that is correct the baseline does not include the new buildings to be delivered.””

4.1.4 Therefore, noise limits are set at the existing residences only, with no requirement at our own buildings.

5 Plant Noise Limits

5.1.1 Camden Local authority provide guidance on the proposed noise limits for fixed items of plant, as outlined within their Local Plan, and discussed in the criteria section above. The noise limits outlined have been determined based on the noise levels measured on site in conjunction with the Camden Local Plan and Local Authority consultation. These are set out below.

Assessment Position *(Representative Measurement Position)*	Maximum Rating Level for Plant, dB $L_{Ar,Tr}$		Maximum Sound Pressure Level for Emergency Plant, dB L_{Aeq} Night time (24-hour)
	Daytime (0700-2300 only)	Night time (24-hour)	
APB1: 119 Juniper Crescent, 2nd floor window *(MP2)*	29	24	44
APB2: 41 Gilbeys Yard, 2nd floor window *(MP3)*	28	25	45

T3 Background noise levels and plant noise rating limits

5.1.2 The noise limits are to apply at 1m from the nearby residential windows. These limits apply to all mechanical services items being installed when running at duty with all items running concurrently during the relevant period. Plant items should not exhibit a significant tonal component to their noise emissions.

5.1.3 It is recommended any necessary testing of emergency plant items be limited to no more than one hour per month between the hours of 09:00 – 17:00 Monday to Friday excluding bank holidays.

6 Plant Noise Assessment

6.1 Proposed Installation

6.1.1 The proposed plant items to be installed are listed in the attached plant noise schedule.

6.1.2 Plant items are to be installed externally on the four corners of the roof of the Block B building.

6.1.3 The Condenser Units are designed to operate at 85% capacity during daytime hours, and in low-noise mode at night time (2300 – 0700).

6.1.4 Air Source Heat Pumps will also operate with a reduced setting during night-time hours.

6.1.5 Air Handling Units will operate at any time, and Smoke Extract Fans are for emergency use only.

6.1.6 Manufacturers' noise data has been provided for this assessment and can be found in the attached sheet 20/0484/R4/PNS1. For the Condenser Units, octave band data has been

calculated based on manufacturer's data for octave bands when units are operating at 100%, scaled to the broadband data for 85% operation.

6.2 Methodology

6.2.1 Noise levels have been calculated at the assessment position labelled as APB1 and APB2 on the attached site plan 20/0484/R4/SP1, and described below:

- APB1 – 1m from residential window on the 2nd floor of 119 Juniper Crescent.
- APB2 – 1m from residential window on the 2nd floor of 41 Gilbeys Yard

6.2.2 The assessment has taken into account radiation, distance losses, directivity, screening and façade reflections, where each is appropriate.

6.2.3 Summary calculation sheets are provided in the attached sheet 20/0484/R4/CS1 – 20/0484/R4/CS3.

6.3 Mitigation

6.3.1 Mitigation will be required to meet the plant noise limits. This is expected to take the form of acoustic enclosures, top-only noise reduction kits for the condensers, in-duct silencers, and a barrier of 3 metres in height.

Acoustic Enclosure

6.3.2 It will be necessary to install acoustic enclosures around each air source heat pump (ASHP), and apply top-only noise reduction kits to each condenser unit.

6.3.3 Specifications for this mitigation are set out in table T4 below.

Mitigation Specification *Location*	**Insertion Loss in dB at Octave Band Centre Frequency (Hz)**							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
MIT01 – Acoustic Enclosure *ASHPs*	2	4	6	8	10	9	8	7
MIT02 – Top Only Kit *Condensers*	2	2	3	3	5	5	4	4

T4 Noise mitigation insertion loss requirements.

6.3.4 This acoustic enclosure insertion loss can typically be achieved using an enclosure with 300mm deep acoustic louvres to all four sides and the top of the unit. The insertion losses outlined above should be taken as the design criteria and the supplier of the enclosure should confirm that the insertion loss can be met in each octave band.

Silencers

6.3.5 It will be necessary to install in-duct silencers on air handling units (AHUs) atmospheric intakes and outlets. Specifications for these silencers are set out in table T5 below.

Silencer Specification *Location*	**Insertion Loss in dB at Octave Band Centre Frequency (Hz)**							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
SIL01 *AHUs atmospheric intakes and outlets*	4	9	17	26	31	30	23	16

T5 In-duct silencer insertion loss requirements.

6.3.6 Silencers should be fitted close to the fans to ensure that noise breakout from the ductwork is reduced.

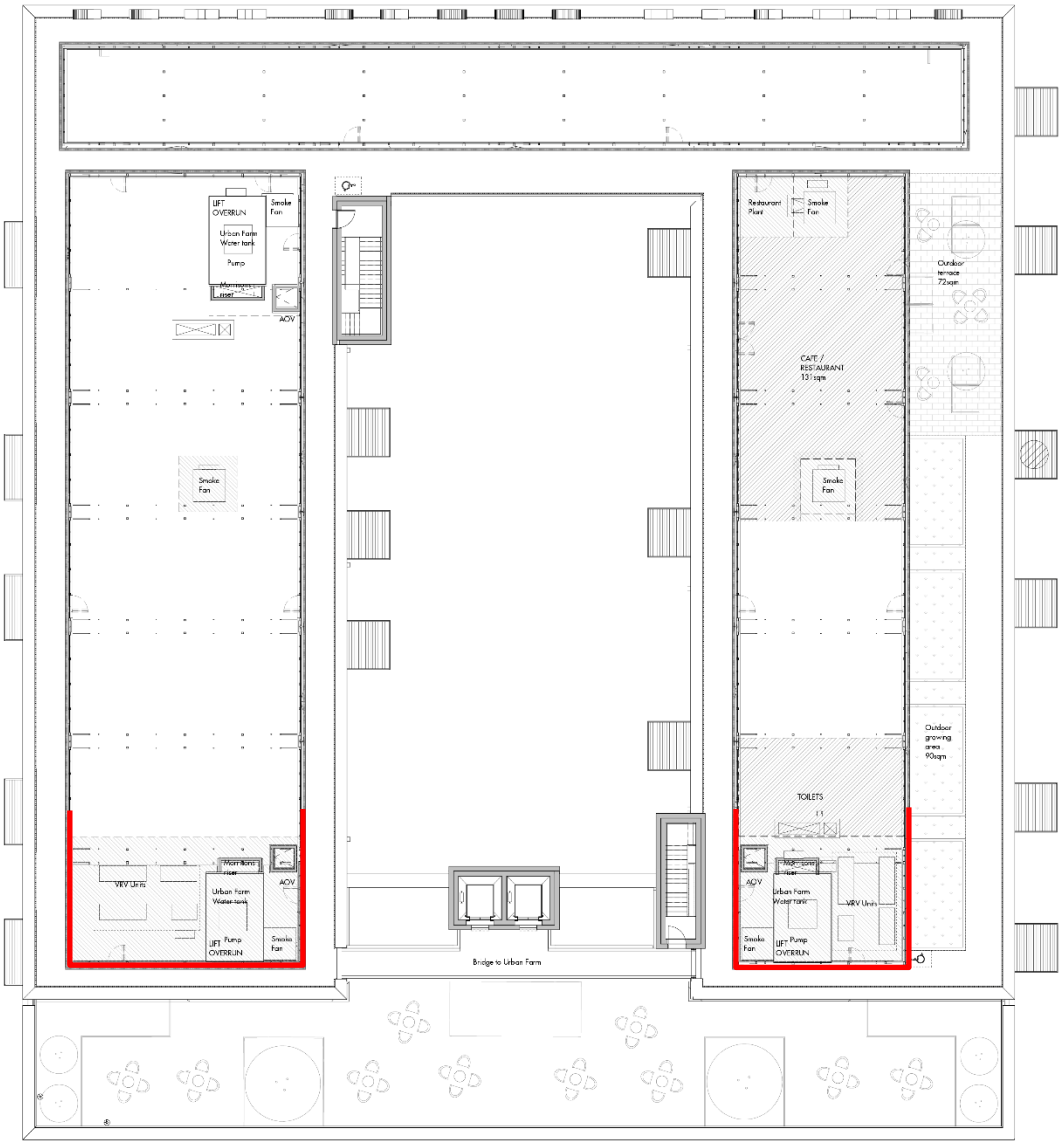
6.3.7 We would expect the insertion losses required for the AHU be achieved using a rectangular silencer with 40% free-area and 1200mm in length.

6.3.8 However, the insertion losses outlined above should be taken as the design criteria, and not the silencer length. Any proposed silencer should be confirmed to meet the insertion losses in each octave band as a minimum.

6.3.9 Fans should be mounted on anti-vibration mounts to control structure-borne vibration.

Acoustic Barrier

6.3.10 It will be necessary to include an acoustic barrier near to the north-western edge of the roof, and near to both south-eastern edges (with returns). This must be a height of at least 1.1m above the ASHPs and 1.2m above ODUs, approximately 3m above the plant deck. Positions are indicated below in **red** but can also be set further back from the roof provided they screen the plant items from nearby sensitive receptors:



6.3.11 Barriers shall be of imperforate construction in all sections above 1500mm in height with a minimum of 10 kg/m^2 uniform mass per unit area, and remain so for the design life of the barrier. Below 1500mm in height the barrier is not required to be solid, but must meet at least the sound insulation performance specified in Table T6.

Indicative dimensions	Insertion Loss in dB at Octave Band Centre Frequency (Hz)							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
100mm acoustic louvre	4	4	5	6	9	12	12	11

T6 Insertion loss requirement for lower portion of barrier

6.3.12 The same acoustic requirements above and below 1500mm in height apply to any doors in the barrier such as those used for maintenance access or emergency use, which should be provided with seals.

6.3.13 It is essential, especially for barriers with butting or overlapping components, that the joints are well sealed to prevent leakage. This should be achieved without compromising the overall density requirement. Gravel boards of equivalent density are to be used to prevent gaps between screen structure and roof/ground if necessary.

6.3.14 The barrier structure is to be suitably designed and engineered with appropriate consideration for wind loading and aerodynamic forces.

6.3.15 No major maintenance should be required for the barriers for 20 years and each barrier should remain serviceable for at least 40 years.

6.4 Results

6.4.1 With the proposed mitigation measures in place, the noise levels shown in table T7 below have been calculated at the nearest residential receiver:

Assessment Position	**Calculated Rating Level for Plant, dB $L_{Ar,Tr}$ *(Limit)***		**Calculated Sound Pressure Level for Emergency Plant, dB L_{Aeq} *(Limit)***
	Daytime (0700-2300 only)	**Night-time (24-Hours)**	**24 Hours**
APB1: 119 Juniper Crescent, 2nd floor window	22 *(29)*	18 *(24)*	41 *(44)*
APB2: 41 Gilbeys Yard, 2nd floor window	28 *(28)*	23 *(25)*	43 *(45)*

T7 Predicted plant noise emission levels at the nearest residential receivers.

6.4.2 The above table shows that noise emissions from the proposed plant items are predicted to meet the noise criterion at all times with the stated mitigation in place. Summary calculation sheets are provided in the attached sheet 20/0484/R4/CS1 – 20/0484/R4/CS3. Full calculation sheets are available upon request.

6.4.3 This assessment positions are the closest and most exposed windows of the most exposed properties to the rooftop plant installation and thus represent the worst-case receptor. Any other receptors can therefore expect to be subject to lower noise levels.

7 Conclusions

7.1 Planning consent has been granted with reference 2020/0034/P for a mixed use scheme off Chalk Farm Road, Camden, subject to conditions including two relating to external plant noise emissions.

7.2 A noise survey has been undertaken at the site to quantify the existing noise levels and set noise limits in line with the local authority criteria.

7.3 An assessment of atmospheric plant noise has been undertaken for the proposed plant items and mitigation has been specified for the items to meet these limits.

7.4 Mitigation is to take the form of acoustic enclosures, silencers and barriers. Specifications have been set out in full within this report.

7.5 Employing the proposed acoustic mitigation measures outlined in this report, the noise levels at the nearest residential receptor have been shown to meet the criteria of the Local Authority at all times.

End of Section

Glossary of Acoustic Terms

L_{Aeq}:

The notional steady sound level (in dB) which over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measurement over that period. Values are sometimes written using the alternative expression dB(A) L_{eq}.

L_{Amax}:

The maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise when occasional loud noises occur, which may have little effect on the L_{Aeq} noise level. Unless described otherwise, L_{Amax} is measured using the "fast" sound level meter response.

L_{A10} & L_{A90}:

If non-steady noise is to be described, it is necessary to know both its level and degree of fluctuation. The L_{An} indices are used for this purpose. The term refers to the A-weighted level (in dB) exceeded for n% of the time specified. L_{A10} is the level exceeded for 10% of the time and as such gives an indication of the upper limit of fluctuating noise. Similarly L_{A90} gives an indication of the lower levels of fluctuating noise. It is often used to define the background noise.

L_{A10} is commonly used to describe traffic noise. Values of dB L_{An} are sometimes written using the alternative expression dB(A) L_{n}.

L_{AX}, L_{AE} or SEL

The single event noise exposure level which, when maintained for 1 second, contains the same quantity of sound energy as the actual time varying level of one noise event. L_{AX} values for contributing noise sources can be considered as individual building blocks in the construction of a calculated value of L_{Aeq} for the total noise. The L_{AX} term can sometimes be referred to as Exposure Level (L_{AE}) or Single Event Level (SEL).

End of Section

RSK Acoustics

Figure 20/0484/R4/SP1

Title:

Site Plan showing assessment position and approximate Block B outline.

Key:

AP Assessment Position

MP Measurement Position

Approximate Block B Outline

North

Project:

Camden Goods Yard, Block B

Date: January 2023

Revision: -

Scale:

Not to scale

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Noise Level Time History at Position MP2, 4 to 9 March 2021

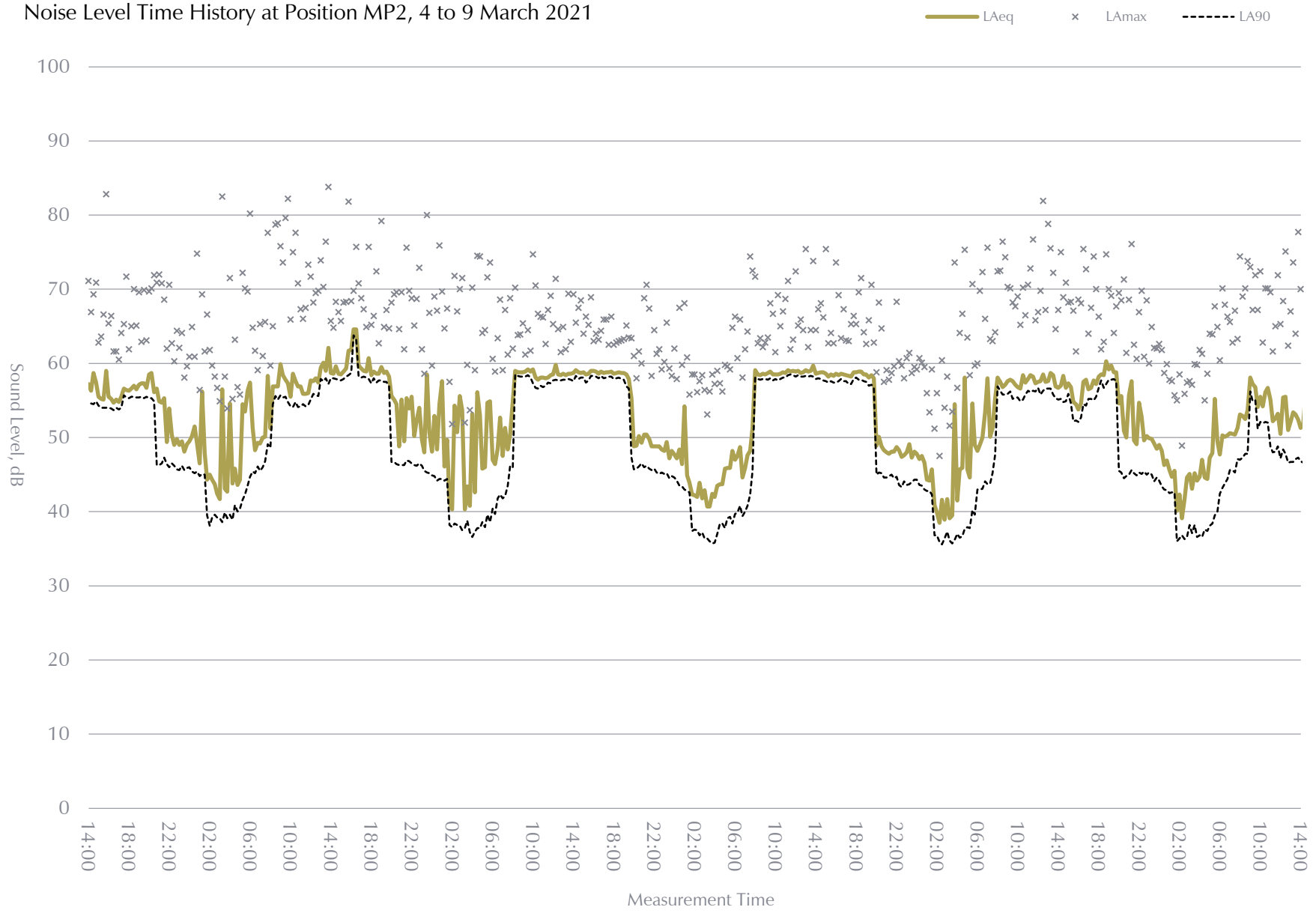


Figure 20/0484/TH02

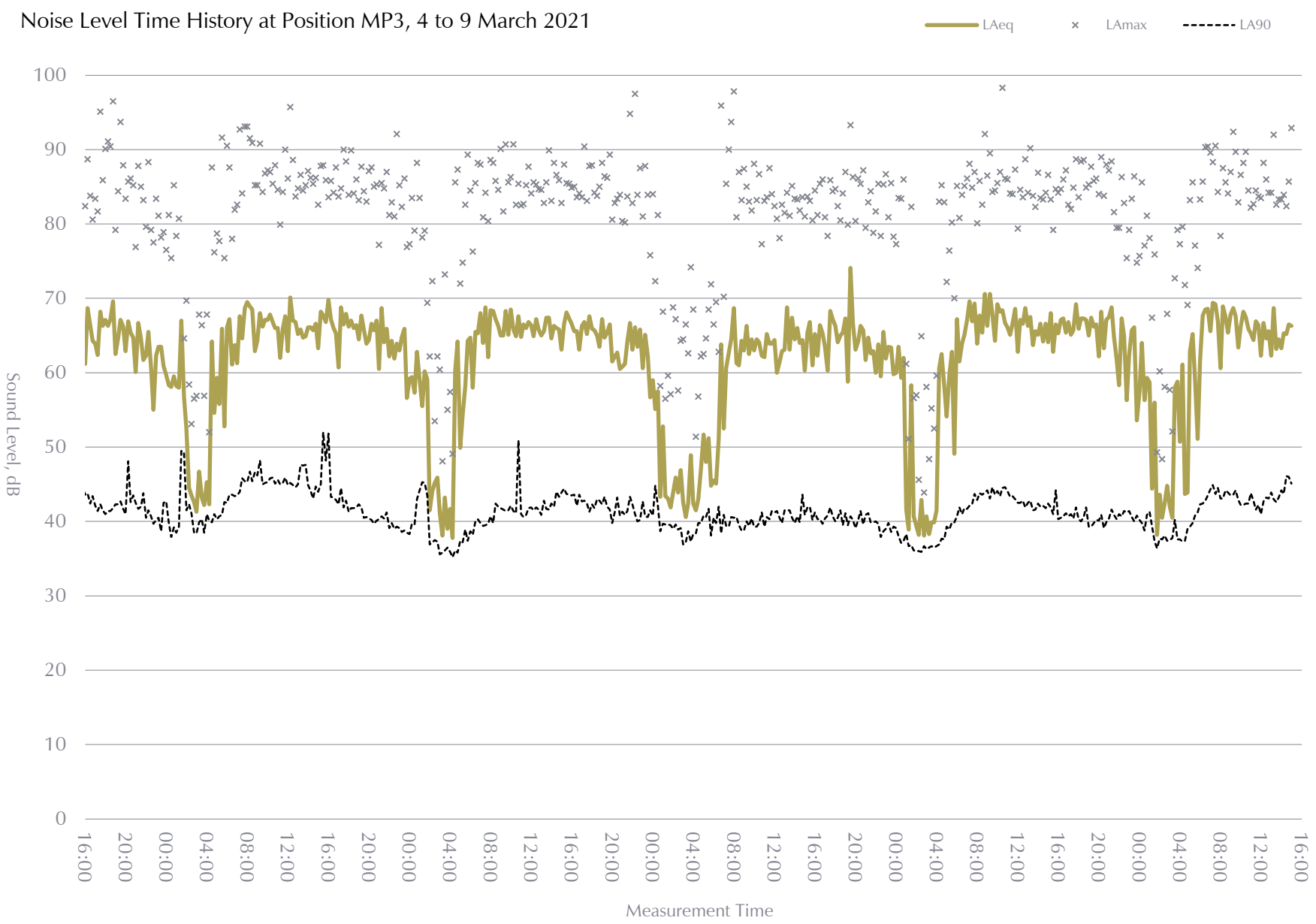


Figure 20/0484/TH03

Schedule of Plant and Air Handling Equipment Sound Levels, dB

Reference	Description	Data Source [1]	Noise Level Type	Noise Levels (dB)							
				63	125	250	500	1k	2k	4k	8k
BB1-RF-AHU-001 Inlet	Flaktwood	Man	Sound Power, Lw	83.0	78.0	72.0	67.0	66.0	62.0	57.0	51.0
BB1-RF-AHU-001 Breakout	Flaktwood	Man	Sound Power, Lw	72.0	63.0	59.0	39.0	32.0	28.0	30.0	20.0
BB1-SEF-RF-001 Outlet	Colt	Man	Sound Power, Lw	96.0	92.0	86.0	98.0	91.0	92.0	90.0	86.0
BB1-SEF-RF-001 Breakout	Colt	Man	Sound Power, Lw	48.0	51.0	54.0	67.0	59.0	54.0	48.0	43.0
BB1-RF-ODU-001 day	Mitsubishi PUHZ-ZRP100VKA3	Man	Sound Pressure, Lp								
BB1-RF-ODU-002 day	Mitsubishi PUHZ-ZRP100VKA3	Man	Sound Pressure, Lp								
BB1-RF-AHU-002 Inlet	Flaktwood	Man	Sound Power, Lw	83.0	78.0	72.0	67.0	66.0	62.0	57.0	51.0
BB1-RF-AHU-002 Breakout	Flaktwood	Man	Sound Power, Lw	72.0	63.0	59.0	39.0	32.0	28.0	30.0	20.0
BB1-SEF-RF-002 Outlet	Colt	Man	Sound Power, Lw	96.0	92.0	86.0	98.0	91.0	92.0	90.0	86.0
BB1-SEF-RF-002 Breakout	Colt	Man	Sound Power, Lw	48.0	51.0	54.0	67.0	59.0	54.0	48.0	43.0
BB2-SEF-RF-001 Outlet	Colt	Man	Sound Power, Lw	96.0	92.0	86.0	98.0	91.0	92.0	90.0	86.0
BB2-SEF-RF-001 Breakout	Colt	Man	Sound Power, Lw	48.0	51.0	54.0	67.0	59.0	54.0	48.0	43.0

Reference	Description	Data Source	Noise Level Type	Noise Levels (dB)							
				63	125	250	500	1k	2k	4k	8k
BB2-RF-AHU-001 Inlet	Flaktwood	Man	Sound Power, Lw	83.0	78.0	72.0	67.0	66.0	62.0	57.0	51.0
BB2-RF-AHU-001 Brekaout	Flaktwood	Man	Sound Power, Lw	72.0	63.0	59.0	39.0	32.0	28.0	30.0	20.0
BB2-RF-ODU-001 day	Mitsubishi PUHY-P550YSNW-A	Man	Sound Pressure, Lp	70.0	59.0	59.0	56.0	50.0	45.0	44.0	38.0
BB2-RF-ODU-002 day	Mitsubishi PUHY-P900YSNW-A	Man	Sound Pressure, Lp	72.0	61.0	64.0	62.0	57.0	52.0	47.0	42.0
BB2-RF-ODU-003 day	Mitsubishi PUHY-P900YSNW-A	Man	Sound Pressure, Lp	72.0	61.0	64.0	62.0	57.0	52.0	47.0	42.0
BB2-RF-ODU-004 day	Mitsubishi PUHY-P350YNW-A	Man	Sound Pressure, Lp	64.0	58.0	59.0	57.0	51.0	46.0	41.0	35.0
BB2-RF-ODU-005 day	Mitsubishi PUHZ-ZRP125VKA3R1	Man	Sound Pressure, Lp								
BB2-SEF-RF-002 Outlet	Colt	Man	Sound Power, Lw	96.0	92.0	86.0	98.0	91.0	92.0	90.0	86.0
BB2-SEF-RF-002 Breakout	Colt	Man	Sound Power, Lw	48.0	51.0	54.0	67.0	59.0	54.0	48.0	43.0
BB3-SEF-RF-002 Outlet	Colt	Man	Sound Power, Lw	96.0	92.0	86.0	98.0	91.0	92.0	90.0	86.0
BB3-SEF-RF-002 Beakout	Colt	Man	Sound Power, Lw	48.0	51.0	54.0	67.0	59.0	54.0	48.0	43.0
BB3-RF-ODU-001 day	Mitsubishi PUHY-P600YSNW-A	Man	Sound Pressure, Lp	74.0	60.0	61.0	58.0	52.0	47.0	43.0	38.0
BB3-RF-ODU-002 day	Mitsubishi PUHY-P900YSNW-A	Man	Sound Pressure, Lp	72.0	61.0	64.0	62.0	57.0	52.0	47.0	42.0
BB3-RF-ODU-003 day	Mitsubishi PUHY-P900YSNW-A	Man	Sound Pressure, Lp	72.0	61.0	64.0	62.0	57.0	52.0	47.0	42.0
BB3-RF-ODU-004 day	Mitsubishi PUHY-P350YNW-A	Man	Sound Pressure, Lp	64.0	58.0	59.0	57.0	51.0	46.0	41.0	35.0

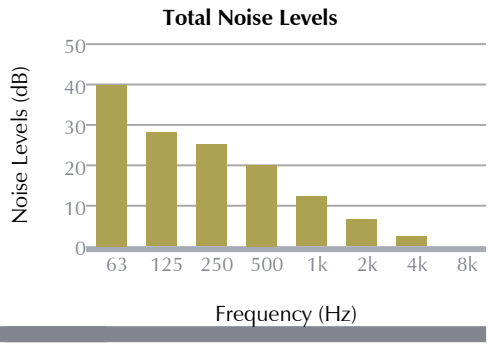
Reference	Description	Data Source	Noise Level Type	Noise Levels (dB)							
				63	125	250	500	1k	2k	4k	8k
BB3-RF-ODU-005 day	Mitsubishi PUHZ-ZRP125VKA3R1	Man	Sound Pressure, Lp								
BB3-SEF-RF-001 Outlet	Colt	Man	Sound Power, Lw	96.0	92.0	86.0	98.0	91.0	92.0	90.0	86.0
BB3-SEF-RF-001 Breakout	Colt	Man	Sound Power, Lw	48.0	51.0	54.0	67.0	59.0	54.0	48.0	43.0
BB3-RF-AHU-001 Inlet	Flaktwood	Man	Sound Power, Lw	83.0	78.0	72.0	67.0	66.0	62.0	57.0	51.0
BB3-RF-AHU-001 Breakout	Flaktwood	Man	Sound Power, Lw	72.0	63.0	59.0	39.0	32.0	28.0	30.0	20.0
BB2-RF-ODU-001 night	Mitsubishi PUHY-P550YSNW-A	Man	Sound Pressure, Lp	57.5	57.0	50.5	49.0	42.0	38.0	42.0	41.0
BB2-RF-ODU-002 night	Mitsubishi PUHY-P900YSNW-A	Man	Sound Pressure, Lp	68.0	61.0	56.5	54.0	51.5	48.0	44.0	47.0
BB2-RF-ODU-003 night	Mitsubishi PUHY-P900YSNW-A	Man	Sound Pressure, Lp	68.0	61.0	56.5	54.0	51.5	48.0	44.0	47.0
BB2-RF-ODU-004 night	Mitsubishi PUHY-P350YNW-A	Man	Sound Pressure, Lp	52.0	55.0	50.0	47.0	42.5	37.0	36.0	34.5
BB3-RF-ODU-001 night	Mitsubishi PUHY-P600YSNW-A	Man	Sound Pressure, Lp	55.0	56.0	51.0	49.0	43.0	37.5	35.5	36.0
BB3-RF-ODU-002 night	Mitsubishi PUHY-P900YSNW-A	Man	Sound Pressure, Lp	68.0	61.0	56.5	54.0	51.5	48.0	44.0	47.0
BB3-RF-ODU-003 night	Mitsubishi PUHY-P900YSNW-A	Man	Sound Pressure, Lp	68.0	61.0	56.5	54.0	51.5	48.0	44.0	47.0
BB3-RF-ODU-004 night	Mitsubishi PUHY-P350YNW-A	Man	Sound Pressure, Lp	52.0	55.0	50.0	47.0	42.5	37.0	36.0	34.5
BB1-RF-ODU-001 night	Mitsubishi PUHZ-ZRP100VKA3	Man	Sound Pressure, Lp								
BB1-RF-ODU-002 night	Mitsubishi PUHZ-ZRP100VKA3	Man	Sound Pressure, Lp								

Reference	Description	Data Source	Noise Level Type	Noise Levels (dB)							
				63	125	250	500	1k	2k	4k	8k
BB2-RF-ODU-005 night	Mitsubishi PUHZ-ZRP125VKA3R1	Man	Sound Pressure, Lp								
BB3-RF-ODU-005 night	Mitsubishi PUHZ-ZRP125VKA3R1	Man	Sound Pressure, Lp								

Notes

1 - Man refers to data supplied by the equipment manufacturer or supplier, Emp refers to data calculated using empirical formulae, and Meas refers to data measured by RSK Acoustics.

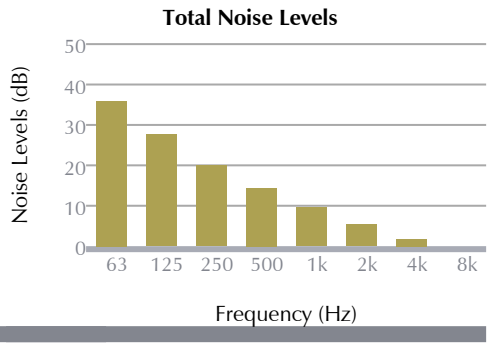
Project Name	Camden Goods Yard
Project Reference	20/0484
Receiver Reference	APB1 (day)
Description	119 Juniper Crescent
Noise Limit	29
dBA	22



Reference	Noise Levels (dB)							
	63	125	250	500	1k	2k	4k	8k
BB2-RF-ODU-004 day	19	10	7	3	-8	-16	-23	-32
BB2-RF-ODU-003 day	31	18	17	12	2	-6	-13	-21
BB2-RF-ODU-002 day	31	18	17	12	2	-6	-13	-21
BB2-RF-ODU-001 day	29	15	11	6	-5	-13	-16	-25
BB3-RF-ODU-004 day	19	10	8	3	-8	-16	-23	-32
BB3-RF-ODU-003 day	31	17	17	12	2	-6	-13	-21
BB3-RF-ODU-002 day	33	20	20	15	7	-1	-9	-17
BB3-RF-ODU-001 day	29	13	10	4	-7	-15	-21	-29
BB2-RF-ODU-005 day	6	4	0	-3	-8	-11	-13	-16
BB2-RF-AHU-001 Inlet	21	13	4	-5	-11	-20	-28	-37
BB2-RF-AHU-001 Brekaout	11	-1	-8	-31	-41	-48	-49	-62
BB3-RF-ODU-005 day	6	4	0	-3	-8	-11	-13	-16
BB3-RF-AHU-001 Inlet	21	13	5	-5	-11	-20	-28	-37
BB3-RF-AHU-001 Breakout	11	-1	-8	-31	-41	-48	-49	-62
BB1-RF-ODU-002 day	15	13	10	7	4	1	-2	-5
BB1-RF-AHU-002 Inlet	28	21	12	4	-1	-9	-17	-26

Reference	Noise Levels (dB)							
	63	125	250	500	1k	2k	4k	8k
BB1-RF-AHU-002 Breakout	18	6	0	-23	-33	-40	-41	-54
BB1-RF-ODU-001 day	14	12	9	6	3	0	-3	-6
BB1-RF-AHU-001 Inlet	27	20	11	1	-4	-13	-21	-30
BB1-RF-AHU-001 Breakout	17	5	-1	-24	-34	-41	-42	-55
BB3-RF-AHU-001 Breakout	11	-1	-8	-31	-41	-48	-49	-62
BB3-RF-AHU-001 Inlet	21	13	5	-5	-11	-20	-28	-37
BB3-RF-ODU-005 night	6	4	0	-3	-8	-11	-13	-16

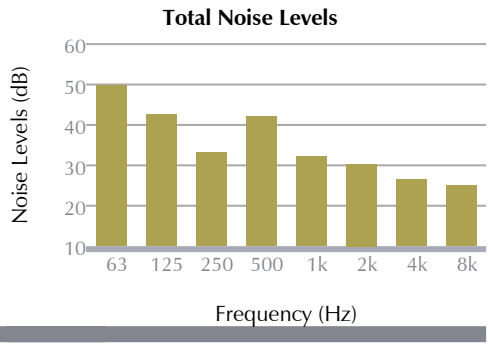
Project Name	Camden Goods Yard
Project Reference	20/0484
Receiver Reference	APB1 (night)
Description	119 Juniper Crescent
Noise Limit	24
dBA	18



Reference	Noise Levels (dB)							
	63	125	250	500	1k	2k	4k	8k
BB1-RF-AHU-001 Inlet	27	20	11	1	-4	-13	-21	-30
BB1-RF-AHU-001 Breakout	17	5	-1	-24	-34	-41	-42	-55
BB1-RF-ODU-001 night	14	12	9	6	3	0	-3	-6
BB1-RF-AHU-002 Inlet	28	21	12	4	-1	-9	-17	-26
BB1-RF-AHU-002 Breakout	18	6	0	-23	-33	-40	-41	-54
BB1-RF-ODU-002 night	15	13	10	7	4	1	-2	-5
BB2-RF-ODU-005 day	6	4	0	-3	-8	-11	-13	-16
BB2-RF-AHU-001 Inlet	21	13	4	-5	-11	-20	-28	-37
BB2-RF-AHU-001 Brekaout	11	-1	-8	-31	-41	-48	-49	-62
BB2-RF-ODU-004 night	7	7	-2	-7	-17	-25	-28	-33
BB2-RF-ODU-003 night	27	18	9	4	-4	-10	-16	-16
BB2-RF-ODU-002 night	27	18	9	4	-4	-10	-16	-16
BB2-RF-ODU-001 night	16	13	3	-1	-13	-20	-18	-22
BB3-RF-ODU-004 night	7	7	-1	-7	-17	-25	-28	-33
BB3-RF-ODU-003 night	27	17	9	4	-4	-10	-16	-16
BB3-RF-ODU-002 night	29	20	12	7	1	-5	-12	-12

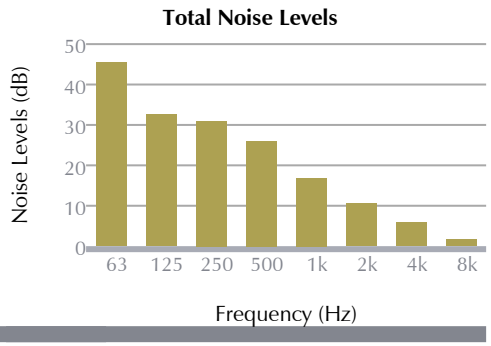
Reference	Noise Levels (dB)							
	63	125	250	500	1k	2k	4k	8k
BB3-RF-ODU-001 night	10	9	0	-5	-16	-24	-28	-31

Project Name	Camden Goods Yard
Project Reference	20/0484
Receiver Reference	APB1 (emergency)
Description	119 Juniper Crescent
Noise Limit	44
dBA	41



Reference	Noise Levels (dB)							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
BB2-SEF-RF-001 Outlet	42	36	28	37	27	25	20	13
BB1-SEF-RF-002 Breakout	-6	-6	-5	5	-6	-14	-23	-31
BB2-SEF-RF-002 Breakout	-10	-9	-9	1	-10	-18	-27	-35
BB2-SEF-RF-002 Outlet	38	32	23	32	22	20	15	8
BB3-SEF-RF-001 Breakout	-13	-13	-13	-3	-14	-22	-31	-39
BB3-SEF-RF-001 Outlet	35	28	19	28	18	16	11	4
BB2-RF-AHU-001 Brekaout	10	-2	-9	-32	-42	-49	-50	-63
BB2-SEF-RF-001 Outlet	34	27	18	27	17	15	10	3
BB3-SEF-RF-002 Outlet	46	37	23	26	14	16	21	24
BB3-SEF-RF-002 Beakout	-10	-9	-9	1	-10	-18	-27	-35
BB1-SEF-RF-001 Outlet	42	35	27	36	26	24	19	12
BB1-SEF-RF-001 Breakout	-6	-6	-5	5	-6	-14	-23	-31
BB1-SEF-RF-002 Outlet	42	36	27	36	27	25	20	13

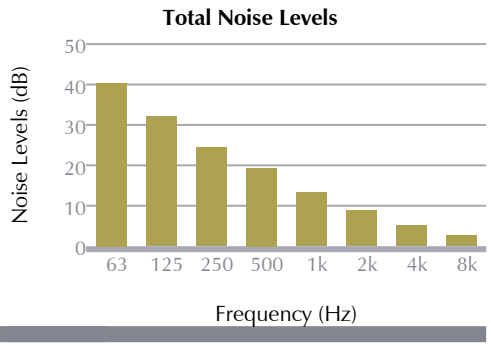
Project Name	Camden Goods Yard
Project Reference	20/0484
Receiver Reference	APB2 (day)
Description	41 Gilbeys Yard
Noise Limit	28
dBA	28



Reference	Noise Levels (dB)							
	63	125	250	500	1k	2k	4k	8k
BB1-RF-AHU-001 Inlet	21	13	5	-5	-11	-19	-27	-36
BB1-RF-AHU-001 Breakout	11	-1	-7	-30	-40	-47	-48	-61
BB1-RF-AHU-002 Inlet	23	16	8	-1	-6	-14	-21	-30
BB1-RF-AHU-002 Breakout	13	2	-5	-27	-37	-44	-45	-58
BB1-RF-ODU-002 day	10	8	5	3	0	-3	-6	-9
BB3-RF-AHU-001 Inlet	28	21	13	3	-3	-11	-19	-28
BB3-RF-AHU-001 Breakout	18	7	0	-22	-32	-39	-40	-53
BB3-RF-ODU-005 day	16	14	12	9	7	4	1	-2
BB2-RF-AHU-001 Inlet	27	20	12	3	-3	-12	-20	-29
BB2-RF-AHU-001 Brekaout	17	6	0	-23	-33	-40	-41	-54
BB2-RF-ODU-005 day	16	14	11	9	6	3	0	-3
BB2-RF-ODU-004 day	25	17	15	10	-1	-9	-16	-25
BB3-RF-ODU-001 day	39	23	21	15	4	-4	-10	-18
BB3-RF-ODU-002 day	37	24	24	19	9	1	-6	-14
BB3-RF-ODU-003 day	38	25	24	20	10	2	-5	-13
BB3-RF-ODU-004 day	26	18	15	11	0	-8	-15	-24

Reference	Noise Levels (dB)							
	63	125	250	500	1k	2k	4k	8k
BB1-RF-ODU-001 day	8	5	3	0	-3	-6	-9	-12
BB2-RF-ODU-002 day	37	24	24	19	9	1	-6	-14
BB2-RF-ODU-003 day	37	24	24	19	9	1	-6	-14
BB2-RF-ODU-001 day	32	18	15	9	-2	-10	-13	-22

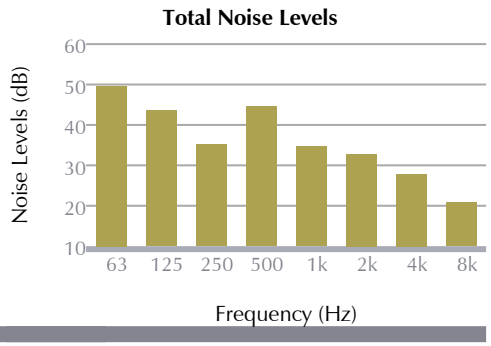
Project Name	Camden Goods Yard
Project Reference	20/0484
Receiver Reference	APB2 (night)
Description	41 Gilbeys Yard
Noise Limit	25
dBA	23



Reference	Noise Levels (dB)							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
BB1-RF-AHU-001 Inlet	21	13	5	-5	-11	-19	-27	-36
BB1-RF-AHU-001 Breakout	11	-1	-7	-30	-40	-47	-48	-61
BB1-RF-ODU-001 night	8	5	3	0	-3	-6	-9	-12
BB1-RF-AHU-002 Breakout	13	2	-5	-27	-37	-44	-45	-58
BB1-RF-AHU-002 Inlet	23	16	8	-1	-6	-14	-21	-30
BB1-RF-ODU-002 night	10	8	5	3	0	-3	-6	-9
BB2-RF-ODU-005 night	16	14	11	9	6	3	0	-3
BB2-RF-AHU-001 Brekaout	17	6	0	-23	-33	-40	-41	-54
BB2-RF-AHU-001 Inlet	27	20	12	3	-3	-12	-20	-29
BB3-RF-ODU-005 night	16	14	12	9	7	4	1	-2
BB3-SEF-RF-001 Breakout	-6	-5	-4	6	-5	-12	-21	-29
BB3-RF-AHU-001 Inlet	28	21	13	3	-3	-11	-19	-28
BB3-RF-AHU-001 Breakout	18	7	0	-22	-32	-39	-40	-53
BB3-RF-ODU-001 night	20	19	11	6	-5	-14	-18	-20
BB3-RF-ODU-002 night	33	24	16	11	3	-3	-9	-9
BB3-RF-ODU-003 night	34	25	17	12	4	-2	-8	-8

Reference	Noise Levels (dB)							
	63	125	250	500	1k	2k	4k	8k
BB3-RF-ODU-004 night	14	15	6	1	-9	-17	-20	-25
BB2-RF-ODU-001 night	19	16	6	2	-10	-17	-15	-19
BB2-RF-ODU-002 night	33	24	16	11	4	-3	-9	-9
BB2-RF-ODU-003 night	33	24	16	11	3	-3	-9	-9
BB2-RF-ODU-004 night	13	14	6	0	-9	-18	-21	-25

Project Name	Camden Goods Yard
Project Reference	20/0484
Receiver Reference	APB2 (emergency)
Description	41 Gilbeys Yard
Noise Limit	45
dBA	43



Reference	Noise Levels (dB)							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
BB1-SEF-RF-001 Breakout	-13	-13	-13	-3	-14	-22	-31	-39
BB1-SEF-RF-001 Outlet	35	28	19	28	18	16	11	4
BB1-SEF-RF-002 Outlet	37	31	22	32	22	20	15	8
BB1-SEF-RF-002 Breakout	-11	-10	-10	1	-10	-18	-27	-35
BB2-SEF-RF-002 Outlet	40	34	26	35	25	23	18	11
BB2-SEF-RF-002 Breakout	-8	-7	-6	4	-7	-15	-24	-32
BB3-SEF-RF-001 Outlet	42	36	28	37	27	26	21	14
BB3-SEF-RF-001 Breakout	-6	-5	-4	6	-5	-12	-21	-29
BB2-RF-AHU-001 Brekaout	18	7	1	-22	-32	-39	-40	-53
BB3-SEF-RF-002 Outlet	37	30	21	31	21	19	14	7
BB3-SEF-RF-002 Beakout	-11	-11	-11	0	-11	-19	-28	-36
BB1-SEF-RF-001 Breakout	-13	-13	-13	-3	-14	-22	-31	-39
BB1-SEF-RF-001 Outlet	35	28	19	28	18	16	11	4
BB1-SEF-RF-002 Breakout	-11	-10	-10	1	-10	-18	-27	-35
BB1-SEF-RF-002 Outlet	37	31	22	32	22	20	15	8
BB3-SEF-RF-002 Beakout	-11	-11	-11	0	-11	-19	-28	-36

Reference	Noise Levels (dB)							
	63	125	250	500	1k	2k	4k	8k
BB3-SEF-RF-002 Outlet	37	30	21	31	21	19	14	7
BB2-SEF-RF-002 Breakout	-8	-7	-6	4	-7	-15	-24	-32
BB2-SEF-RF-002 Outlet	40	34	26	35	25	23	18	11
BB3-SEF-RF-001 Outlet	42	36	28	37	27	26	21	14
BB2-RF-AHU-001 Brekaout	18	7	1	-22	-32	-39	-40	-53
BB2-SEF-RF-001 Outlet	42	36	28	37	27	25	20	13

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