RSK Acoustics

Camden Goods Yard

Plant Noise Assessment – Block A

Report 20/0484/R2

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Plant Noise Assessment – Block A

Report 20/0484/R2

St George PLC

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0	First Issue	1st February 2022	Henry Stead	Ben Harper
1	Second Issue	21st June 2022	Thomas Goose	Andy Emery
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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 A.

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/R2/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 MP3, considered to be representative of the residence nearest the Block A 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/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)
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)**	
APA1: 100 Juniper Crescent, 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 two roofs; on each tower of the Block A 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/R2/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 APA1 on the attached site plan 20/0484/R2/SP1, and described below:

- APA1 – 1m from residential roof window on the 2nd floor of 100 Juniper Crescent.

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/R2/CS1 – 20/0484/R2/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.

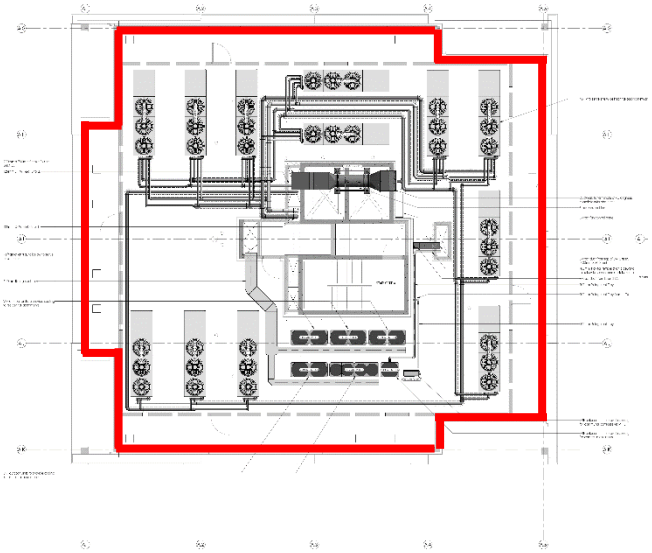
6.3.7 We would expect the insertion losses required for the AHU be achieved using a rectangular silencer with 40% free-area and 1200mm in length and the SEF silencers outlined above would typically be achieved with a 35% free-area and 1800mm in length silencer.

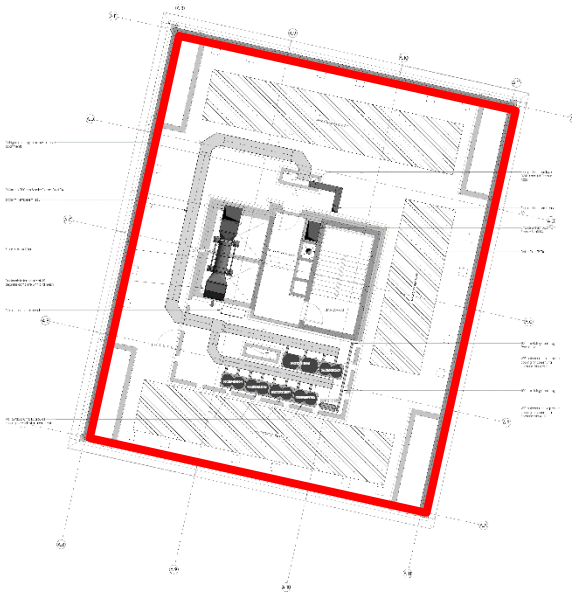
6.3.8 However, the insertion losses outlined above should be taken as the design criteria, and not the silencer length. Any proposed silencer should be confirmed to meet the insertion losses in each octave band as a minimum.

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 surround both rooftop plant areas within an acoustic barrier of a height at least 1.1m above the ASHPs and 1.2m above ODUs, approximately 3m above the plant deck, with layouts indicatively shown below in **red**:





6.3.11 Barriers shall be of imperforate construction over their full areas with a minimum of 10 kg/m^2 uniform mass per unit area of the full area of the barrier, and remain so for the design life of the barrier.

6.3.12 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.

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

6.3.14 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 T6 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
APA1 – 100 Juniper Crescent, 2nd floor window	27 *(28)*	25 *(25)*	33 *(45)*

T6 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/R2/CS1 – 20/0484/R2/CS3. Full calculation sheets are available upon request.

6.4.3 This assessment position is the closest and most exposed window of the most exposed property to the rooftop plant installation and thus represents 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 from the plant items 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 acoustic 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

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Figure 20/0484/R2/SP1

Title:

Site Plan showing assessment position and approximate Block A outline.

Key:

- AP Assessment Position
- MP Measurement Position
- Approximate Block A Outline

North

Project:

Camden Goods Yard, Block A

Date: June 2022

Revision: -

Scale: Not to scale

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Noise Level Time History at Position MP3, 4 to 9 March 2021

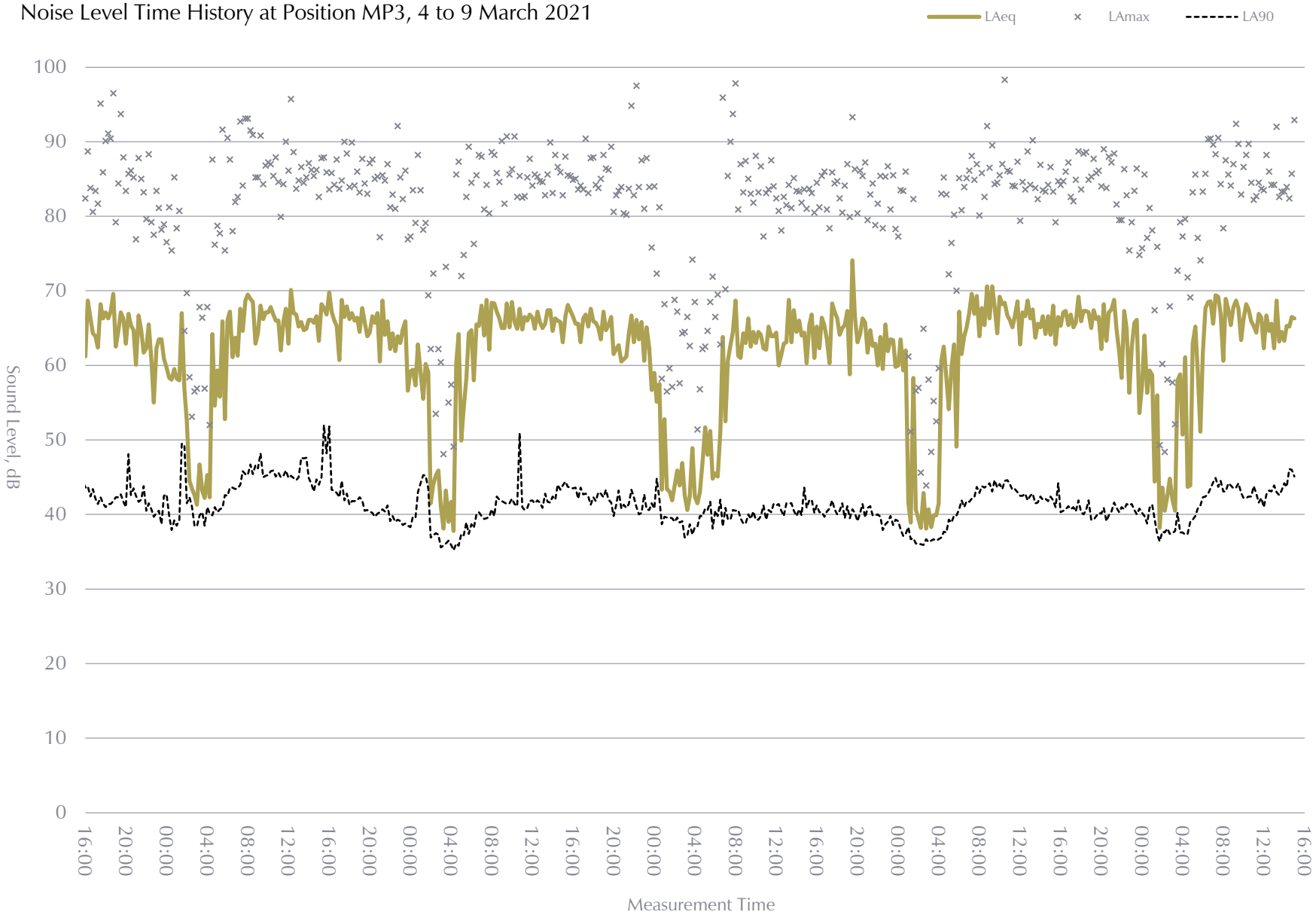


Figure 20/0484/TH03

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
BA1 - SEF Outlet	Smoke Extract COLT	Man	Sound Power, Lw	96	92	86	98	91	92	90	86
BA1 - SEF Inlet	Smoke Extract COLT	Man	Sound Power, Lw	94	89	86	97	93	91	90	87
BA1 - SEF Breakout	Smoke Extract COLT	Man	Sound Pressure, Lp	48	51	54	67	59	54	48	43
BA1 - AHU Inlet	Flaktwood	Man	Sound Power, Lw	83	78	72	67	66	62	57	51
BA1 - AHU Outlet	Flaktwood	Man	Sound Power, Lw	85	80	79	76	73	69	66	60
BA1 - AHU Breakout	Flaktwood	Man	Sound Power, Lw	72	63	59	39	32	28	30	20
BA1 - ODU1 day	VRF Outdoor Mitsu PUHY-P200YNW-A(-BS)	Man	Sound Pressure, Lp	73	65	66	65	59	55	49	46
BA1 - ODU2 day	VRF Outdoor Mitsu PUHY-P900YSNW-A(-BS)	Man	Sound Pressure, Lp	72	61	64	62	57	52	47	42
BA1 - ODU3 day	VRF Outdoor Mitsu PUHY-P600YSNW-A(-BS)	Man	Sound Pressure, Lp	74	60	61	58	52	47	43	38
BA1 - ODU4 day	VRF Outdoor Mitsu PUHY-P600YSNW-A(-BS)	Man	Sound Pressure, Lp	74	60	61	58	52	47	43	38
BA1 - ODU5 day	VRF Outdoor Mitsu PUHY-P600YSNW-A(-BS)	Man	Sound Pressure, Lp	74	60	61	58	52	47	43	38
BA1 - ODU6 day	VRF Outdoor Mitsu PUHY-P900YSNW-A(-BS)	Man	Sound Pressure, Lp	72	61	64	62	57	52	47	42

Reference	Description	Data Source	Noise Level Type	Noise Levels (dB)							
				63	125	250	500	1k	2k	4k	8k
BA1 - ODU7 day	Condenser for AHU Mitsu PUHZ-ZRP50VKA2	Man	Sound Pressure, Lp	51	54	47	41	42	35	28	27
BA1 - ODU8 day	VRF Outdoor Mitsu PUHY-P200YNW-A(-BS)	Man	Sound Pressure, Lp	52	55	54	51	45	40	39	36
BA2 - AHU Inlet	Flaktwood	Man	Sound Power, Lw	83	78	72	67	66	62	57	51
BA2 - AHU Outlet	Flaktwood	Man	Sound Power, Lw	85	80	79	76	73	69	66	60
BA2 - AHU Breakout	Flaktwood	Man	Sound Power, Lw	72	63	59	39	32	28	30	20
BA2 - SEF Outlet	Smoke Extract COLT	Man	Sound Power, Lw	96	92	86	98	91	92	90	86
BA2 - SEF Inlet	Smoke Extract COLT	Man	Sound Power, Lw	94	89	86	97	93	91	90	87
BA2 - SEF Breakout	Smoke Extract COLT	Man	Sound Pressure, Lp	48	51	54	67	59	54	48	43
BA2 - ODU1 day	VRF Outdoor Mitsu PUHY-P400YNW-A(-BS)	Man	Sound Pressure, Lp	66	58	59	58	52	48	42	39
BA2 - ODU2 day	VRF Outdoor Mitsu PUHY-P400YNW-A(-BS)	Man	Sound Pressure, Lp	66	58	59	58	52	48	42	39
BA2 - ODU3 day	VRF Outdoor Mitsu PUHY-P400YNW-A(-BS)	Man	Sound Pressure, Lp	66	58	59	58	52	48	42	39
BA2 - ODU4 day	VRF Outdoor Mitsu PUHY-P400YNW-A(-BS)	Man	Sound Pressure, Lp	66	58	59	58	52	48	42	39
BA2 - ODU5 day	VRF Outdoor Mitsu PUHY-P550YSNW-A(-BS)	Man	Sound Pressure, Lp	70	59	59	56	50	45	44	38

Reference	Description	Data Source	Noise Level Type	Noise Levels (dB)							
				63	125	250	500	1k	2k	4k	8k
BA2 - ODU6 day	Condenser for AHU Mitsu PUHZ-ZRP50VKA2	Man	Sound Pressure, Lp	51	54	47	41	42	35	28	27
BA2 - ODU7 day	VRF Outdoor Mitsu PUHY-P400YNW-A(-BS)	Man	Sound Pressure, Lp	66	58	59	58	52	48	42	39
BA2 - ASHP1 day	Aermek NRP700	Man	Sound Power, Lw	73	73	73	78	78	80	77	65
BA2 - ASHP2 day	Aermek NRP700	Man	Sound Power, Lw	73	73	73	78	78	80	77	65
BA2 - ASHP3 day	Aermek NRP700	Man	Sound Power, Lw	73	73	73	78	78	80	77	65
BA2 - ASHP4 day	Aermek NRP700	Man	Sound Power, Lw	73	73	73	78	78	80	77	65
BA2 - ASHP5 day	Aermek NRK700	Man	Sound Power, Lw	73	73	73	78	78	80	77	65
BA2 - ASHP6 day	Aermek NRK700	Man	Sound Power, Lw	73	73	73	78	78	80	77	65
BA2 - ASHP7 day	Aermek NRK700	Man	Sound Power, Lw	73	73	73	78	78	80	77	65
BA2 - ASHP8 day	Aermek NRK700	Man	Sound Power, Lw	73	73	73	78	78	80	77	65
BA2 - ASHP9 day	Aermek NRK700	Man	Sound Power, Lw	73	73	73	78	78	80	77	65
BA2 - ASHP10 day	Aermek NRK700	Man	Sound Power, Lw	73	73	73	78	78	80	77	65
BA2 - ASHP11 day	Aermek NRK700	Man	Sound Power, Lw	73	73	73	78	78	80	77	65
BA2 - ASHP12 day	Aermek NRK700	Man	Sound Power, Lw	73	65	66	65	59	55	49	46

Reference	Description	Data Source	Noise Level Type	Noise Levels (dB)							
				63	125	250	500	1k	2k	4k	8k
BA1 - ODU1 night	VRF Outdoor Mitsu PUHY-P200YNW-A(-BS)	Man	Sound Pressure, Lp	51	50	44	42	37	30	33	37
BA1 - ODU2 night	VRF Outdoor Mitsu PUHY-P900YSNW-A(-BS)	Man	Sound Pressure, Lp	68	61	57	54	52	48	44	47
BA1 - ODU3 night	VRF Outdoor Mitsu PUHY-P600YSNW-A(-BS)	Man	Sound Pressure, Lp	55	56	51	49	43	38	36	36
BA1 - ODU4 night	VRF Outdoor Mitsu PUHY-P600YSNW-A(-BS)	Man	Sound Pressure, Lp	55	56	51	49	43	38	36	36
BA1 - ODU5 night	VRF Outdoor Mitsu PUHY-P600YSNW-A(-BS)	Man	Sound Pressure, Lp	55	56	51	49	43	38	36	36
BA1 - ODU6 night	VRF Outdoor Mitsu PUHY-P900YSNW-A(-BS)	Man	Sound Pressure, Lp	68	61	57	54	52	48	44	47
BA1 - ODU7 night	Condenser for AHU Mitsu PUHZ-ZRP50VKA2	Man	Sound Pressure, Lp	51	54	47	41	42	35	28	27
BA1 - ODU8 night	VRF Outdoor Mitsu PUHY-P200YNW-A(-BS)	Man	Sound Pressure, Lp	51	50	44	42	37	30	33	37
BA2 - ODU1 night	VRF Outdoor Mitsu PUHY-P400YNW-A(-BS)	Man	Sound Pressure, Lp	65	57	52	48	47	43	39	44
BA2 - ODU2 night	VRF Outdoor Mitsu PUHY-P400YNW-A(-BS)	Man	Sound Pressure, Lp	65	57	52	48	47	43	39	44
BA2 - ODU3 night	VRF Outdoor Mitsu PUHY-P400YNW-A(-BS)	Man	Sound Pressure, Lp	65	57	52	48	47	43	39	44

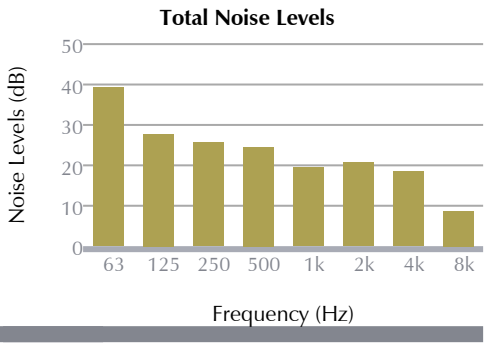
Reference	Description	Data Source	Noise Level Type	Noise Levels (dB)							
				63	125	250	500	1k	2k	4k	8k
BA2 - ODU4 night	VRF Outdoor Mitsu PUHY-P400YNW-A(-BS)	Man	Sound Pressure, Lp	65	57	52	48	47	43	39	44
BA2 - ODU5 night	VRF Outdoor Mitsu PUHY-P550YSNW-A(-BS)	Man	Sound Pressure, Lp	58	57	51	49	42	38	42	41
BA2 - ODU6 night	Condenser for AHU Mitsu PUHZ-ZRP50VKA2	Man	Sound Pressure, Lp	51	54	47	41	42	35	28	27
BA2 - ODU7 night	VRF Outdoor Mitsu PUHY-P400YNW-A(-BS)	Man	Sound Pressure, Lp	65	57	52	48	47	43	39	44
BA2 - ASHP1 night	Aermek NRP700	Man	Sound Power, Lw	73	72	72	77	76	78	75	63
BA2 - ASHP2 night	Aermek NRP700	Man	Sound Power, Lw	73	72	72	77	76	78	75	63
BA2 - ASHP3 night	Aermek NRP700	Man	Sound Power, Lw	73	72	72	77	76	78	75	63
BA2 - ASHP4 night	Aermek NRP700	Man	Sound Power, Lw	73	72	72	77	76	78	75	63
BA2 - ASHP5 night	Aermek NRK700	Man	Sound Power, Lw	73	72	72	77	76	78	75	63
BA2 - ASHP6 night	Aermek NRK700	Man	Sound Power, Lw	73	72	72	77	76	78	75	63
BA2 - ASHP7 night	Aermek NRK700	Man	Sound Power, Lw	73	72	72	77	76	78	75	63
BA2 - ASHP8 night	Aermek NRK700	Man	Sound Power, Lw	73	72	72	77	76	78	75	63
BA2 - ASHP9 night	Aermek NRK700	Man	Sound Power, Lw	73	72	72	77	76	78	75	63
BA2 - ASHP10 night	Aermek NRK700	Man	Sound Power, Lw	73	72	72	77	76	78	75	63

Reference	Description	Data Source	Noise Level Type	Noise Levels (dB)							
				63	125	250	500	1k	2k	4k	8k
BA2 - ASHP11 night	Aermek NRK700	Man	Sound Power, Lw	83	73	72	72	77	76	78	75
BA2 - ASHP12 night	Aermek NRK700	Man	Sound Power, Lw	83	73	72	72	77	76	78	75

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.

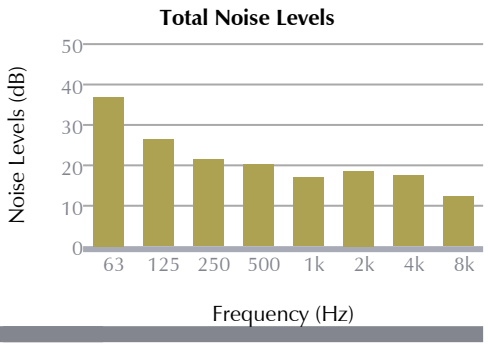
Project Name	Camden Goods Yard
Project Reference	20/0484
Receiver Reference	APA1 Day
Description	100 Juniper Crescent, 2nd floor window
Noise Limit	28
dBA	27



Reference	Noise Levels (dB)							
	63	125	250	500	1k	2k	4k	8k
BA1 - AHU Outlet	23	11	0	-15	-26	-32	-31	-33
BA1 - AHU Inlet	19	8	-9	-28	-39	-45	-46	-48
BA2 - AHU Outlet	25	13	2	-13	-24	-30	-29	-31
BA2 - AHU Inlet	21	10	-8	-26	-37	-43	-44	-46
BA2 - ASHP6 day	18	14	9	9	7	10	8	-2
BA2 - ASHP5 day	16	11	6	9	7	10	8	-3
BA2 - ASHP4 day	13	8	5	8	6	9	7	-4
BA2 - AHU Breakout	14	2	-3	-23	-30	-34	-32	-42
BA2 - ASHP1 day	13	8	5	8	6	9	7	-4
BA2 - ASHP2 day	13	8	5	8	6	9	7	-4
BA2 - ASHP3 day	13	8	5	8	6	9	7	-4
BA2 - ASHP7 day	18	14	9	9	7	10	8	-2
BA2 - ASHP8 day	18	13	8	9	7	10	8	-3
BA2 - ASHP9 day	18	14	9	9	7	10	8	-2
BA2 - ASHP10 day	18	14	9	9	7	10	8	-2
BA2 - ASHP11 day	18	14	9	9	7	10	8	-2

Reference	Noise Levels (dB)							
	63	125	250	500	1k	2k	4k	8k
BA2 - ODU1 day	25	14	13	12	4	0	-5	-8
BA2 - ODU2 day	25	14	13	12	4	0	-5	-8
BA2 - ODU3 day	25	14	13	12	4	0	-5	-8
BA2 - ODU4 day	24	14	12	11	3	-1	-6	-9
BA2 - ASHP12 day	18	6	2	-4	-12	-15	-20	-22
BA2 - ODU5 day	28	14	12	9	1	-4	-4	-10
BA2 - ODU7 day	26	15	14	13	5	1	-4	-7
BA2 - ODU6 day	11	11	3	-3	-2	-9	-16	-17
BA1 - ODU2 day	28	14	15	13	6	1	-3	-8
BA1 - ODU3 day	29	13	12	9	1	-4	-7	-12
BA1 - ODU4 day	29	13	12	9	1	-4	-7	-12
BA1 - ODU5 day	29	13	12	9	1	-4	-7	-12
BA1 - ODU6 day	28	15	16	14	7	2	-2	-7
BA1 - ODU7 day	12	12	5	-1	0	-7	-14	-15
BA1 - AHU Breakout	16	4	-3	-24	-31	-35	-33	-43
BA1 - ODU1 day	29	18	17	16	8	4	-1	-4
BA1 - ODU8 night	7	3	-5	-7	-14	-21	-17	-13

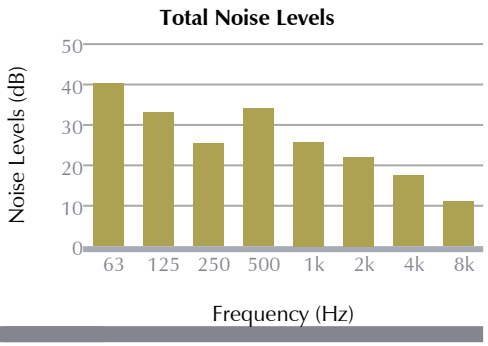
Project Name	Camden Goods Yard
Project Reference	20/0484
Receiver Reference	APA1 Night
Description	100 Juniper Crescent, 2nd floor window
Noise Limit	25
dBA	25



Reference	Noise Levels (dB)							
	63	125	250	500	1k	2k	4k	8k
BA2 - ASHP1 night	13	7	4	7	4	7	5	-6
BA2 - ASHP2 night	13	7	4	7	4	7	5	-6
BA2 - ASHP3 night	13	7	4	7	4	7	5	-6
BA2 - ASHP4 night	13	7	4	7	4	7	5	-6
BA2 - ASHP5 night	16	10	5	8	5	8	6	-5
BA2 - ASHP6 night	18	13	8	8	5	8	6	-4
BA2 - ASHP7 night	18	13	8	8	5	8	6	-4
BA2 - ASHP8 night	18	12	7	8	5	8	6	-5
BA2 - ASHP9 night	18	13	8	8	5	8	6	-4
BA2 - ASHP10 night	18	13	8	8	5	8	6	-4
BA2 - ASHP11 night	28	14	8	3	6	6	9	7
BA2 - ASHP12 night	28	14	8	3	6	6	9	7
BA2 - ODU1 night	24	13	6	2	-1	-5	-8	-3
BA2 - ODU2 night	24	13	6	2	-1	-5	-8	-3
BA2 - ODU3 night	24	13	6	2	-1	-5	-8	-3
BA2 - ODU4 night	23	13	5	1	-2	-6	-9	-4

Reference	Noise Levels (dB)							
	63	125	250	500	1k	2k	4k	8k
BA2 - ODU5 night	16	12	4	2	-7	-11	-6	-7
BA2 - AHU Breakout	14	2	-3	-23	-30	-34	-32	-42
BA2 - AHU Inlet	21	10	-8	-26	-37	-43	-44	-46
BA2 - AHU Outlet	25	13	2	-13	-24	-30	-29	-31
BA1 - AHU Inlet	19	8	-9	-28	-39	-45	-46	-48
BA1 - AHU Outlet	23	11	0	-15	-26	-32	-31	-33
BA2 - ODU7 night	25	14	7	3	0	-4	-7	-2
BA2 - ODU6 night	9	9	0	-6	-7	-14	-20	-21
BA1 - ODU2 night	24	14	8	5	1	-3	-6	-3
BA1 - ODU3 night	10	9	2	0	-8	-13	-14	-14
BA1 - ODU4 night	10	9	2	0	-8	-13	-14	-14
BA1 - ODU5 night	10	9	2	0	-8	-13	-14	-14
BA1 - ODU6 day	28	15	16	14	7	2	-2	-7
BA1 - ODU7 night	10	10	2	-4	-5	-12	-18	-19
BA1 - AHU Breakout	16	4	-3	-24	-31	-35	-33	-43
BA1 - ODU1 night	4	0	-7	-9	-16	-23	-19	-15
BA1 - ODU8 night	4	0	-7	-9	-16	-23	-19	-15

Project Name	Camden Goods Yard
Project Reference	20/0484
Receiver Reference	APA1 Emergency
Description	100 Juniper Crescent, 2nd floor window
Noise Limit	45
dBA	33



Reference	Noise Levels (dB)							
	63	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
BA2 - SEF Breakout	9	10	10	21	13	8	2	-3
BA2 - SEF Inlet	36	28	22	30	23	18	14	8
BA2 - SEF Outlet	38	31	22	31	21	19	14	7
BA1 - SEF Inlet	17	-7	-26	-18	-25	-30	-34	-40
BA1 - SEF Outlet	19	-4	-26	-17	-27	-29	-34	-41
BA1 - SEF Breakout	-1	-1	-4	0	-20	-26	-29	-28

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