RBA ACOUSTICS

CROME, 36 JAMES STREET, LONDON W1U

Plant Noise Assessment

Reference: 10883.RP01.PNA.0
Prepared: 9 April 2021
Revision Number: 1

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Revision	Comment	Date	Prepared By	Approved By
0	First issue of report	24 March 2021	Josh Evans	David Johnston
0	Updated M&E Layout	9 April 2021	Josh Evans	David Johnston

Terms of contract:

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The recommendations within this report relate to acoustics performance only and will need to be integrated within the overall design by the lead designer to incorporate all other design disciplines such as fire, structural integrity, setting-out, etc. Similarly, any sketches appended to this report illustrate acoustic principles only and again will need to be developed in to full working drawings by the lead designer to incorporate all other design disciplines.

In line with our Environmental Policy, up to two hard copies of the report will be provided upon request. Additional copies of the report, or further hard copies of revised reports, would be subject to an administrative cost of £20.00 (+VAT) per copy.

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1.0 INTRODUCTION

It is proposed to locate new items of plant to the rear of the proposed Crome development located at 36 James Street, London W1U 1ES. As part of the planning application, the City of Westminster requires consideration be given to atmospheric noise emissions from the proposed equipment at the nearest noise-sensitive property.

RBA Acoustics have been commissioned to undertake measurements of the prevailing noise conditions at the site and to determine the atmospheric noise emissions in accordance with the City of Westminster's requirements. This report presents the results of the noise measurements, associated criteria and provides the required assessment.

2.0 ENVIRONMENTAL NOISE SURVEY

2.1 General

In accordance with the requirements of the Local Authority, monitoring of the prevailing background noise was undertaken over the following periods:

Tuesday 16 March to Wednesday 17 March 2021

During the survey periods the weather conditions were generally appropriate for the noise measurement exercise, it being dry with light winds.

Measurements were made of the L_{A90}, L_{Amax} and L_{Aeq} noise levels over sample periods of 15 minutes duration.

2.2 Measurement Location

Measurements were undertaken with the microphone positioned on a tripod placed on the ground floor roof to the rear of the development. This measurement position was considered as being representative of the noise climate as experienced at the closest residential receptors to the proposed plant to the rear of the property. The prevailing noise climate was noted to consist primarily of operations of nearby building services plant installations, of which there was noted to be several in the area.

The majority of plant in the area was not operating, as due to the ongoing COVID-19 pandemic the vast majority of businesses in the area remain closed. It is expected that during typical operation there will be a perceivable increase in noise levels in the area.

The measurement positions are also illustrated on the site plan in Figure 2 in Appendix E.

2.3 Instrumentation

Details of the instrumentation used to undertake the survey are provided in Appendix B.

The sound level meter was calibrated both prior to and on completion of the survey with no significant calibration drift observed.

3.0 RESULTS

The noise levels at the measurement positions are shown as time-histories on the attached Graphs 1 to 2.

In order to ensure a worst-case assessment, the lowest background L_{A90} noise levels measured have been used in our analyses. The lowest L_{A90} and the period averaged L_{Aeq} dB noise levels measured are summarised below.

Table 1 – Measured Levels

Measurement Period	L_{90} (dBA)	L_{eq} (dBA)
Daytime (07:00 – 19:00)	51	55
Evening (19:00 – 23:00)	51	57
Night-time (23:00 – 07:00)	51	54
Operating Hours (08:00 - 23:00)	51	56

4.0 CRITERIA

The requirements of the City of Westminster's Environmental Health Department regarding new building services plant are confirmed as follows.

Any noise generated by new building services plant should be designed to a level either 5dB or 10dB below the lowest background L_{A90} 15-minute sample during operational hours, as measured 1m outside the nearest affected residential window.

Whether the criterion is a 5dB or 10dB reduction is dependent on the existing external noise levels at the nearest noise sensitive properties, at the quietest time during which the plant operates. If the measured L_{Aeq}, period is found to be above the World Health Organisation (WHO) criteria a reduction of 10dB is applied. A less stringent 5dB reduction is required where existing L_{Aeq}, period noise levels are currently below WHO criteria.

The specific WHO guideline levels are detailed as follows:

Daytime (07:00 - 19:00)	$L_{Aeq,12\ hours}$	55 dB
Evening (19:00 - 23:00)	$L_{Aeq,\ 4\ hours}$	50 dB
Night-time (23.00 - 07.00)	$L_{Aeq,\ 8\ hours}$	45 dB

The measured L_{Aeq} level is beneath the WHO criterion for the daytime period. As such, a plant noise emission limit of 5dB below the lowest measured L_{A90} level is applied here. The measured L_{Aeq} levels are above the WHO criterion for evening and night-time. As such, a plant noise emission limit of 10dB below the lowest measured L_{A90} level is applied here.

The operation period of the proposed building services plant is 08:00 – 23:00.

In line with the above requirements and the proposed operating period, we would propose items of mechanical services be designed so that noise emissions from the plant do not exceed the following levels when assessed at the nearest noise sensitive location:

- Operating Hours (08:00 – 23:00) 41 dB

In line with BS 4142: 2014, should the proposed plant be identified as having intermittent or tonal characteristics, a further penalty should be subtracted from any of the above proposed noise emission limits.

5.0 ASSESSMENT

Our assessment has been based upon the following information:

5.1 Proposed Plant Items

Table 2 – Plant Information

Ref.	Manufacturer/Model/Duty	Plant Type
C-01	Daikin RZASG140MV1	Condensing Unit
SF-01	Systemair Prio Silent XP 315EC	Supply Fan
EF-01	Systemair Prio Silent XP 315EC	Extract Fan

5.2 Position of Units

The condensing unit is to be located on the first-floor flat roof to the rear of the property. The supply and extract fans are to be located internally within the ground floor ceiling of the café. The intake and exhaust terminations are to be located on the first-floor flat roof to the rear of the property. The equipment positions are indicated on the site plan in Figure 2 in Appendix E.

5.3 Noise Levels

Information regarding the noise levels of the proposed plant has been provided by the manufacturer of the unit. The associated plant noise levels are detailed as follows:

Table 3 – Plant Noise Levels

Unit	Parameter	Sound Level (dB) at Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
Daikin RZASG140MV1	SPL at 1m	53	55	53	54	48	46	38	32
Systemair Prio 315 EC – Inlet	SWL	48	54	61	62	67	58	52	47
Systemair Prio 315 EC - Outlet	SWL	50	56	63	63	68	59	53	48

Review of the octave band data provides no indication of any tonal characteristics associated with the proposed plant.

5.4 Location of Nearest Residential Windows

The closest residential windows to the plant were advised as being the rear first floor windows of 36 St James Street which overlook the proposed plant installation.

5.5 Mitigation

We recommend that the condenser to the rear of the property is fully enclosed with acoustic louvres, including the lid. The louvres should be capable of achieving the performance levels detailed in the specification below. An example capable of achieving this level is the Allaway Louvres AL1515 (150mm deep).

Table 4 – Acoustic Louvres

Transmission Loss (dB) at Octave Band Centre Frequency (Hz)							
63	125	250	500	1k	2k	4k	8k
4	4	5	8	12	16	15	13

We also recommend that the atmospheric terminations of both fans are fitted with attenuators. The attenuators should be capable of achieving the following minimum performance levels detailed in the specification below.

Table 5 – Attenuator Performance

Location	Example Attenuator	Insertion Loss (dB) at Octave Band Centre Frequency (Hz)							
		63	125	250	500	1k	2k	4k	8k
SF-01	Systemair LDC 100-600	4	3	11	24	36	49	34	17
EF-01	Systemair LDC 100-600	4	3	11	24	36	49	34	17

5.6 Calculation of Noise Levels at Nearest Residential Window

Our calculation method for predicting noise levels from the proposed plant at the nearest residential windows, based on the information stated above, is summarised below.

- Source Term SPL / SWL
- In-duct losses
- 20LogR Distance Attenuation
- Directivity

Calculation sheets are attached for further information in Appendix C.

The results of the calculations indicate the following noise levels at the nearest affected residential windows:

Table 6 – Predicted Noise Levels

Operating Period	Prediction	Criterion
Operating Hours (08:00 - 23:00)	39	41

Noise from the proposed units to the rear of the property is within the target criteria. Therefore, the installation with the recommend mitigation should be considered acceptable.

6.0 VIBRATION CONTROL

In addition to the control of airborne noise transfer, it is also important to consider the transfer of noise as vibration to adjacent properties (as well as to any sensitive areas of the same building).

We would typically advise that condensing units and fans be isolated from the supporting structure by means of either steel spring isolators or rubber footings. For particularly sensitive locations, or when on lightweight structures the mounts should ideally be caged and be of the restrained type.

It is important the isolation is not "short-circuited" by associated pipework or conduits. To this end, any conduits should be looped and flexible connectors should be introduced between the condenser and any associated pipework. Pipework should be supported by brackets containing neoprene inserts.

7.0 CONCLUSION

Measurements of the existing background noise levels at 36 James Street have been undertaken. The results of the measurements have been used in order to determine the required criteria for atmospheric noise emissions from the future plant installations.

The results of the assessment indicate atmospheric noise emissions from the plant are within the criteria required by the City of Westminster providing suitable mitigation measures are employed. As such, the proposed plant installations should be considered acceptable.

Appendix A – Acoustic Terminology

dB	Decibel - Used as a measurement of sound pressure level. It is the logarithmic ratio of the noise being assessed to a standard reference level.
dB(A)	The human ear is more susceptible to mid-frequency noise than the high and low frequencies. To take account of this when measuring noise, the 'A' weighting scale is used so that the measured noise corresponds roughly to the overall level of noise that is discerned by the average human. It is also possible to calculate the 'A' weighted noise level by applying certain corrections to an un-weighted spectrum. The measured or calculated 'A' weighted noise level is known as the dB(A) level. Because of being a logarithmic scale noise levels in dB(A) do not have a linear relationship to each other. For similar noises, a change in noise level of 10dB(A) represents a doubling or halving of subjective loudness. A change of 3dB(A) is just perceptible.
L_{eq}	L_{eq} is defined as a notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the actual, fluctuating sound measured over that period (1 hour).
L_{Aeq}	The level of notional steady sound which, over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measured over that period.
L_{An} (e.g. L_{A10}, L_{A90})	If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time, hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the average minimum level and is often used to describe the background noise.
$L_{max,T}$	The instantaneous maximum sound pressure level which occurred during the measurement period, T. It is commonly used to measure the effect of very short duration bursts of noise, such as for example sudden bangs, shouts, car horns, emergency sirens etc. which audibly stand out from the general level of, say, traffic noise, but because of their very short duration, maybe only a very small fraction of a second, may not have any effect on the L_{eq} value.

Appendix B – Instrumentation

The following equipment was used for the measurements

Manufacturer	Model Type	Serial No.	Calibration	
			Certificate No.	Expiry Date
Norsonic Type 1 Sound Level Meter	Nor140	1403226	U36698	5 January 2023
Norsonic Pre Amplifier	1209A	12066		
Norsonic ½“ Microphone	1225	168180	36697	5 January 2023
Norsonic Sound Calibrator	1251	31988	U36696	4 January 2023

Appendix C – Plant calculations

A summary of the noise levels at each receiver from each proposed plant item is provided below, together with the overall predicted level.

Condensing Unit

Unit	Parameter	Sound Level (dB) at Octave Band Centre Frequency (Hz)								dBA
		63	125	250	500	1k	2k	4k	8k	
Daikin RZASG140MV1	SPL at 1m	53	55	53	54	48	46	38	32	55
Distance Loss at 2.2m	-	-7	-7	-7	-7	-7	-7	-7	-7	-
Acoustic Louvre	-	-4	-4	-5	-8	-12	-16	-15	-13	-
Resultant at Receiver	SPL at 1m	42	44	41	39	29	23	16	12	39

Supply Fan

Unit	Parameter	Sound Level (dB) at Octave Band Centre Frequency (Hz)								dBA
		63	125	250	500	1k	2k	4k	8k	
Systemair Prio Silent XP 315EC	SWL	48	54	61	62	67	58	52	47	68
Induct Losses	-	-11	-7	-3	-1	0	0	0	0	-
Attenuator	-	-4	-3	-11	-24	-36	-49	-34	-17	-
Directivity	-	0	+1	+2	+3	+4	+5	+6	+6	-
Hemispherical Spreading at 4.3m	-	-21								-
Resultant at Receiver	SPL at 1m	13	24	28	20	14	-7	3	15	23

Extract Fan

Unit	Parameter	Sound Level (dB) at Octave Band Centre Frequency (Hz)								dBA
		63	125	250	500	1k	2k	4k	8k	
Systemair Prio Silent XP 315EC	SWL	50	56	63	63	68	59	53	48	70
Induct Losses	-	-11	-7	-3	-1	0	0	0	0	-
Attenuator	-	-6	-5	-19	-45	-50	-50	-50	-29	-
Directivity	-	0	-1	0	-1	-1	-6	-9	-9	-
Hemispherical Spreading at 2.5m	-	-16	-16	-16	-16	-16	-16	-16	-16	-
Resultant at Receiver	SPL at 1m	19	30	32	21	15	-12	-6	6	26

Total

Unit	Parameter	Sound Level (dB) at Octave Band Centre Frequency (Hz)								dBA
		63	125	250	500	1k	2k	4k	8k	
C-01 at Receiver	SPL at 1m	42	44	41	39	29	23	16	12	39
SF-01 at Receiver	SPL at 1m	13	24	28	20	14	-7	3	15	23
EF-01 at Receiver	SPL at 1m	19	30	32	21	15	-12	-6	6	26
Total at Receiver	SPL at 1m	42	44	42	39	29	23	16	17	39

Appendix D – CDM Considerations

The likelihood the harm will occur can be assessed by applying an indicative score (from 1 to 5) as follows:

1 – Remote (almost never)
2 – Unlikely (occurs rarely)
3 – Possible (could occur, but uncommon)
4 – Likely (recurrent but not frequent)
5 – Very likely (occurs frequently)

The severity of harm can be assessed by applying an indicative score (from 1 to 5) as follows:

1 – Trivial (e.g. discomfort, slight bruising, self-help recovery)
2 – Minor (e.g. small cut, abrasion, basic first aid need)
3 – Moderate (e.g. strain, sprain, incapacitation > 3 days)
4 – Serious (e.g. fracture, hospitalisation > 24 hrs, incapacitation > 4 weeks)
5 – Fatal (single or multiple)

The rating value is obtained by multiply the two scores and is then used to determine the course of action.

Rating Bands (Severity x Likelihood)		
Low Risk (1 – 8)	Medium Risk (9 -12)	High Risk (15 – 25)
May be ignored but ensure controls remain effective	Continue, but implement additional reasonable practicable controls where possible	Avoidance action is required; therefore alternative design solutions must be examined. Activity must not proceed until risks are reduced to a low or medium level

The following hazards pertinent to our design input have been identified and control measures suggested:

Hazard	Risk Of	At Risk	Rating			Control Measures	Controlled		
			L	S	R		L	S	R
Attenuators/ Acoustic Lagging	Strain of neck, limbs or back.	Contractors	3	4	12	Provide sufficient manpower/ lifting gear	1	4	4
Attenuators/ Acoustic Lagging	Skin & respiratory irritation	Contractors	4	3	12	Wear gloves and mask	1	3	3

L: Likelihood S: Severity R: Rating

Appendix E – Graphs and Site Plans

Crome, St James Street, London W1U

L_{Aeq} Time History

Measurement Position 1, Tuesday 16 March to Wednesday 17 March 2021

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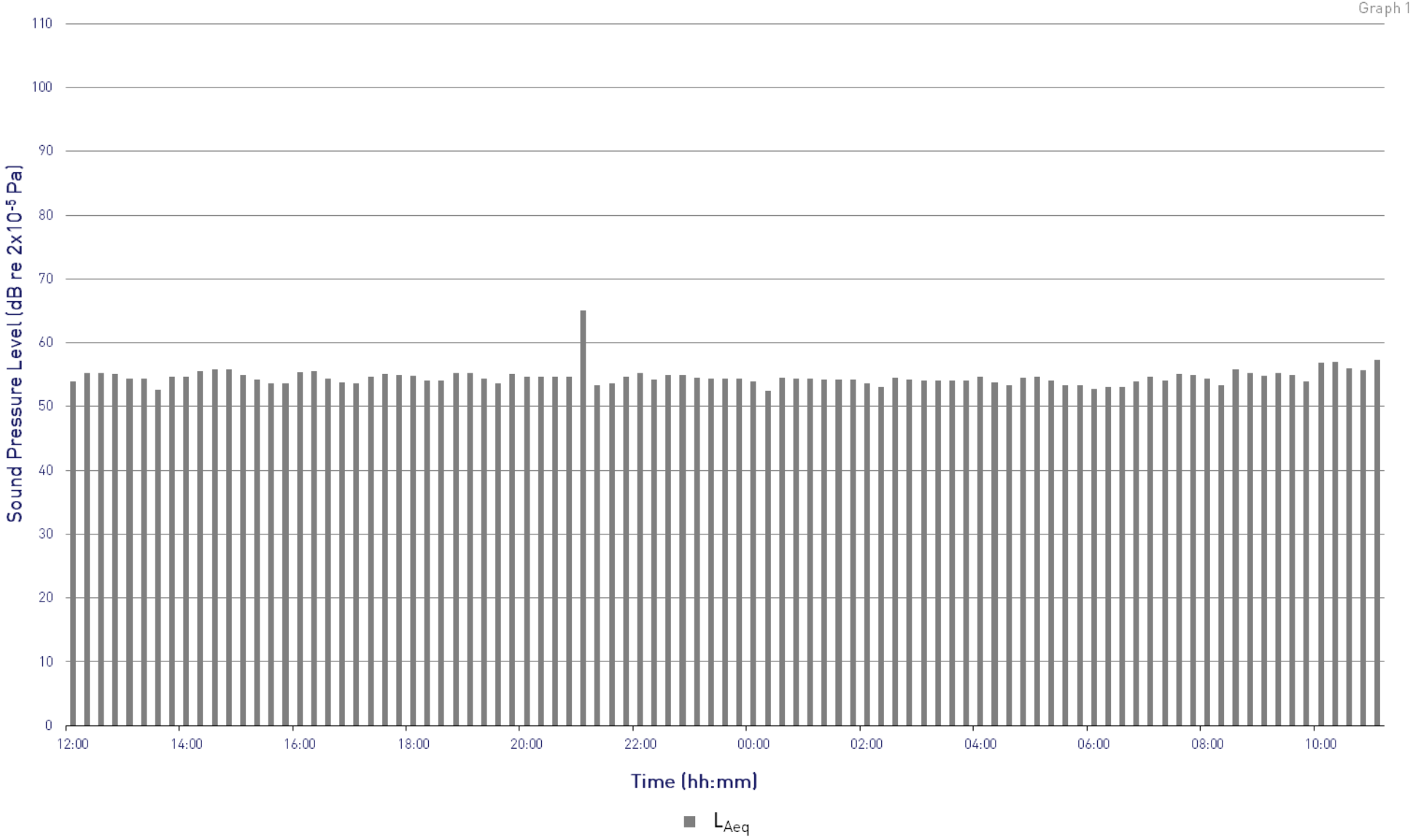
Graph 1



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$L_{Amax,f}$ and L_{A90} Time History

Measurement Position 1, Tuesday 16 March to Wednesday 17 March 2021

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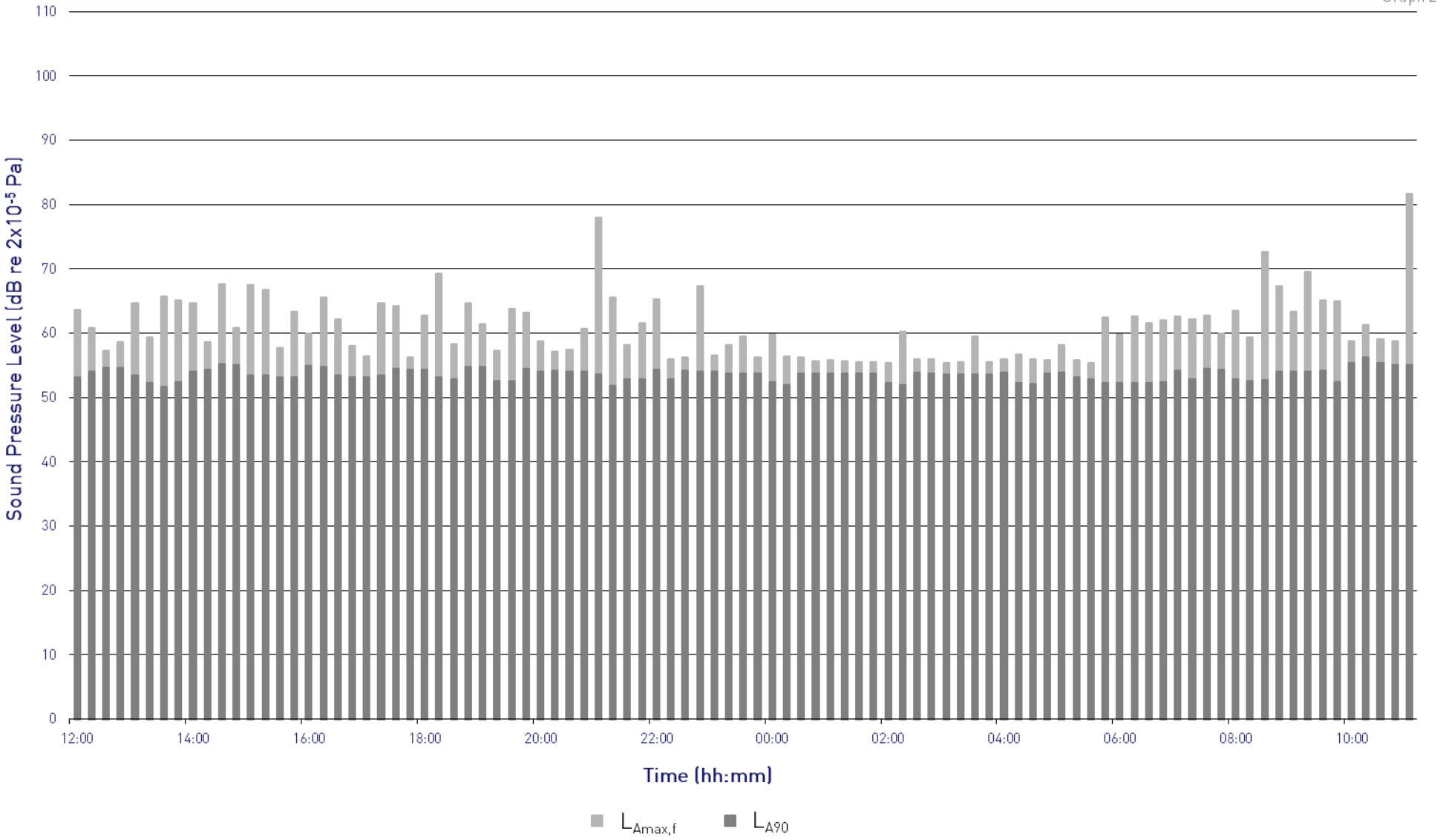
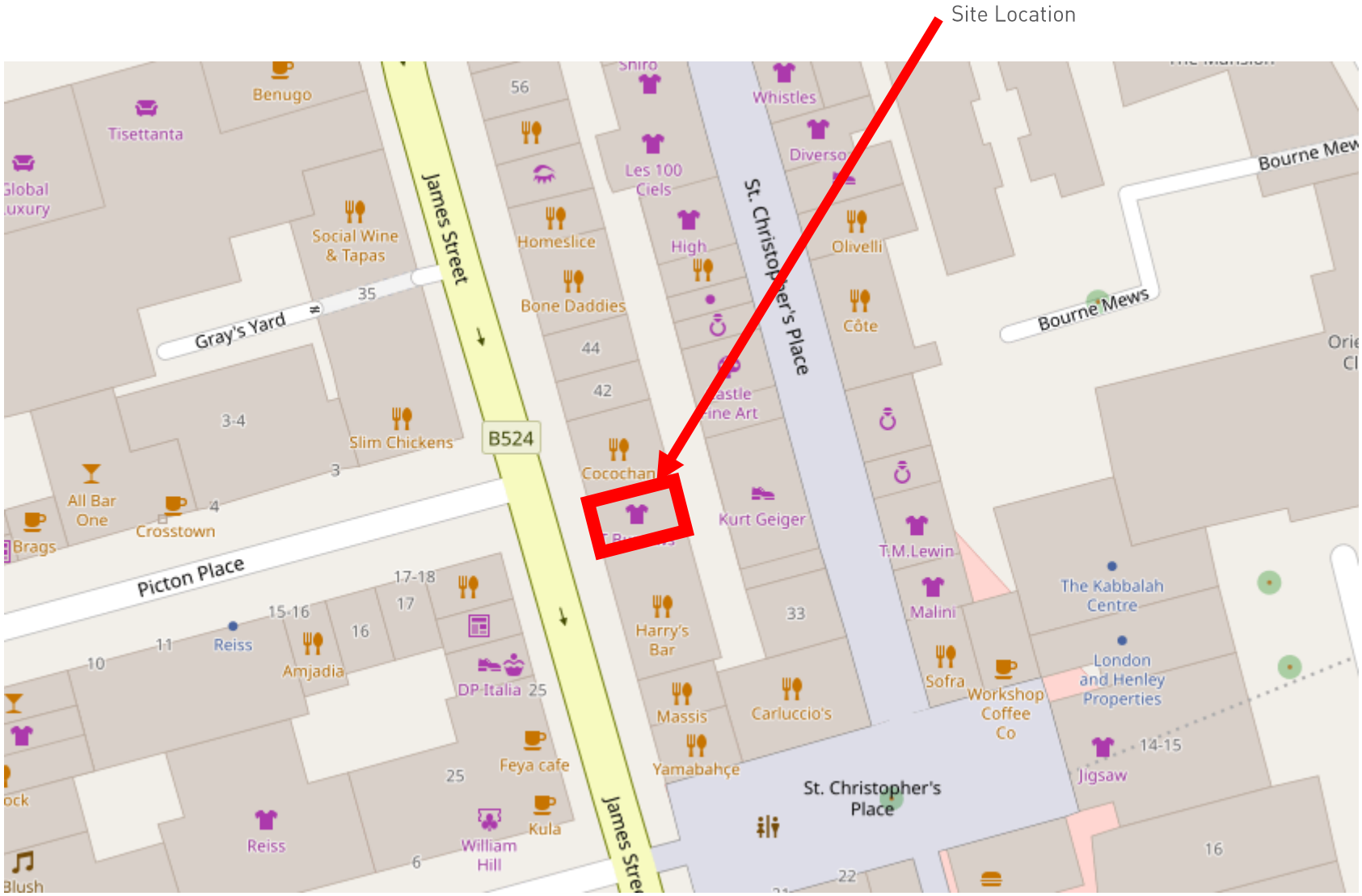
Graph 2





Crome, 36 James Street, London W1U
Site Location Plan
Project 10883

Figure 1
9 April 2021
Not to Scale

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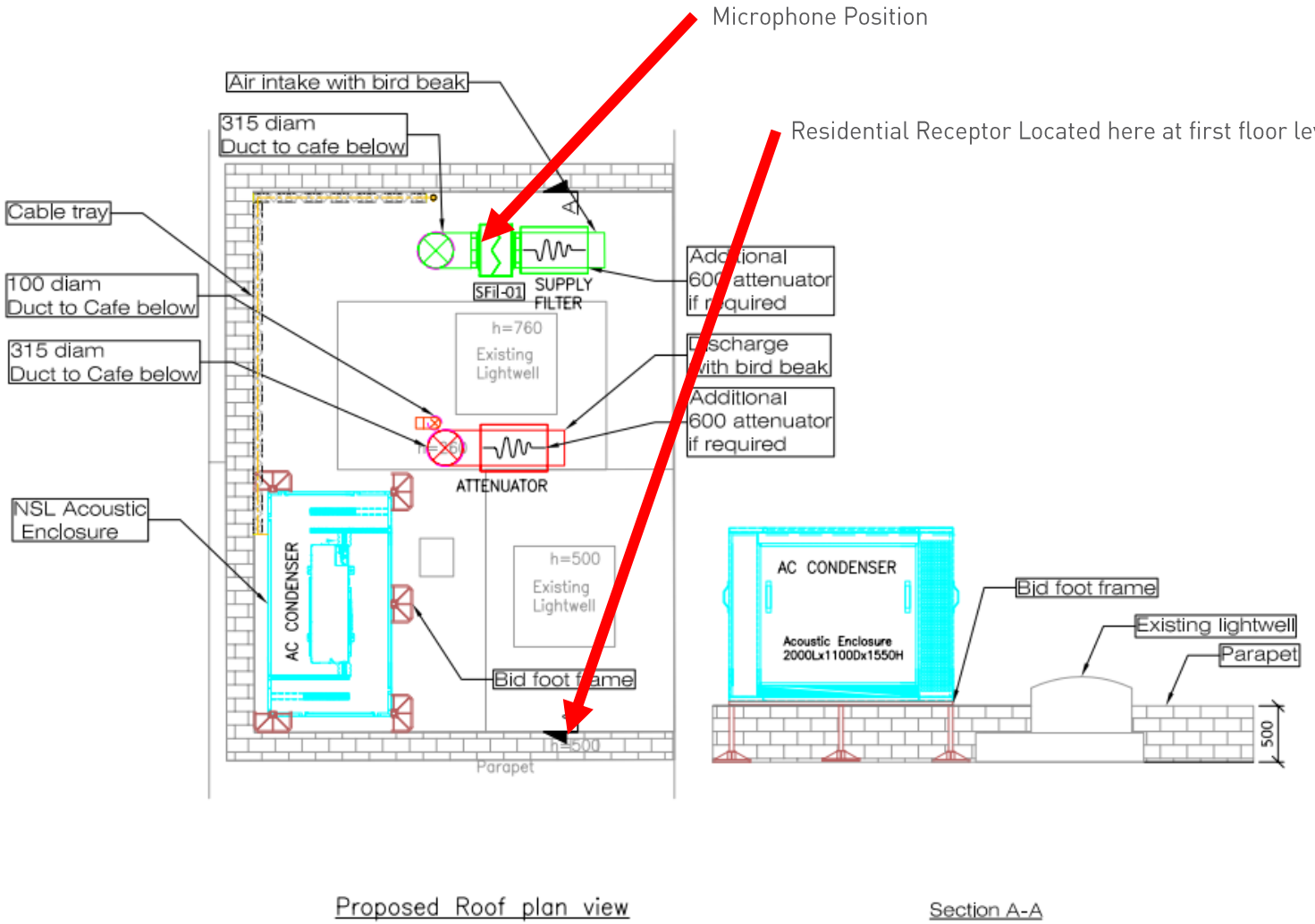

Proposed Roof plan view

Section A-A

Crome, 36 James Street, London W1U
Plan of Building Services including Microphone Position
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Figure 2
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Not to Scale

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