

Sainsbury's Local
Crouch End Broadway
N8 8DU

**Plant Noise
Impact Assessment**

On behalf of

Sainsbury's

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For and on behalf of Noise Solutions Ltd				
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01	20 Jun 2023	Air conditioning units included	NAC	JS

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Executive Summary

Noise Solutions Limited has been appointed to provide a noise impact assessment of external plant to be installed at the Sainsbury's Local store at The Broadway, London, N8 8DU.

The assessment shows that, when attenuated as described in this report, noise from the plant will comply with the local authority's usual requirements and should therefore be acceptable to them.

1.0 Introduction

- 1.1. Noise Solutions Ltd (NSL) has been commissioned by Sainsbury's to provide a noise impact assessment of plant to be installed at the Sainsbury's Local store at The Broadway, London, N8 8DU.
- 1.2. A detailed, fully automated environmental noise survey has been undertaken to establish the prevailing background and ambient sound pressure levels at a location representative of the sound levels outside the nearest noise sensitive receptors to the site.
- 1.3. Plant noise levels have been predicted at the nearest residential properties and assessed against the typical local authority requirements and the guidance provided in BS 4142:2014 '*Methods for rating and assessing industrial and commercial sound*'.
- 1.4. To assist with the understanding of this report a glossary of acoustic terms can be found in [Appendix A](#). An in-depth glossary of acoustic terms can be viewed online at www.acoustic-glossary.co.uk.

2.0 Details of development proposals

- 2.1. A CO₂ gas cooler, refrigeration compressor pack and four air conditioning (AC) units are proposed to be sited at the rear (west side) of the store. The refrigeration plant will operate at all times; the air conditioning units will operate only when the store is trading.
- 2.2. A figure showing the site and surrounding area and the noise monitoring location used in this assessment is presented in [Appendix B](#).
- 2.3. The proposed plant layout is shown in [Appendix D](#). To control acoustic reflections it is proposed to fix acoustic wall lining to the store wall adjacent to the two AC units to the south of the bottom of the ramp to the main plant area, as indicated in the Appendix.
- 2.4. Plant noise data is given in [Appendix E](#).

3.0 Nearest noise-sensitive receptors

- 3.1. The area immediately around the site is mixed residential and commercial in nature.
- 3.2. The closest residential receptors are houses to the south and north west of the plant, receptors R1 and R2 respectively. Receptor R1 is approximately 22m from the closest plant item. Receptor R2 is approximately 25m from the nearest plant item.

- 3.3. The location is indicated in [Appendix B](#). All other dwellings are at greater distances or benefit from greater screening.

4.0 Existing noise climate

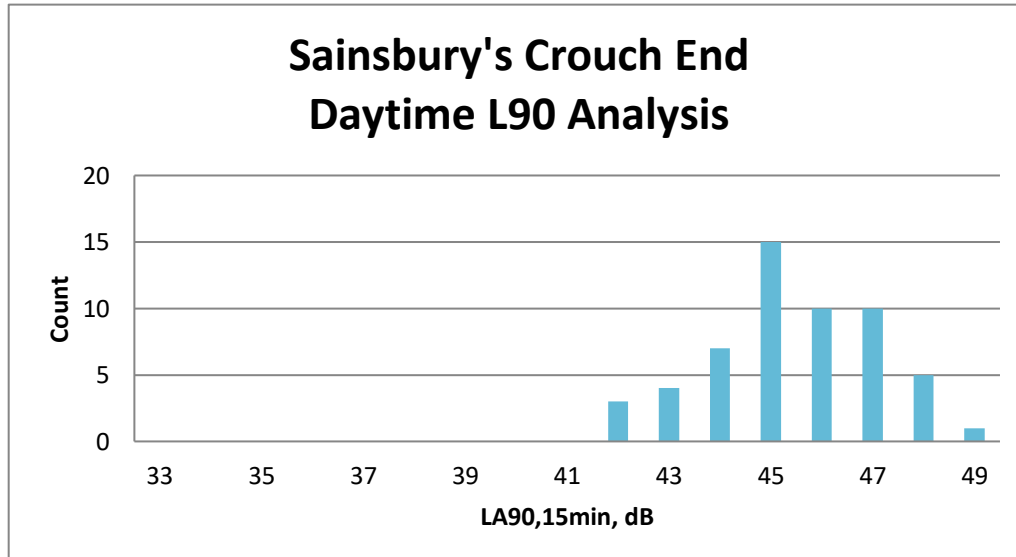
- 4.1. An environmental noise survey was undertaken close to the proposed site and the nearest noise sensitive receptors considered here.
- 4.2. The results of the noise survey have been summarised in Table 1 below. The full set of measurement results and details of the survey methodology can be found in [Appendix C](#).

Table 1 Summary of noise survey results

Measurement period	Range of noise levels over measurement period (dB)			
	L _{Aeq} (15mins)	L _{Amax} (15mins)	L _{A10} (15mins)	L _{A90} (15mins)
Daytime (07.00 - 23.00 hours)	46-72	63-103	47-70	42-49
Night-time (23.00 - 07.00 hours)	36-64	49-81	38-62	33-44

- 4.3. The following figure presents the distribution of daytime background sound pressure levels.

Figure 1 Histogram of daytime L_{A90} background sound pressure levels



- 4.4. Additional statistical analysis has been undertaken. As shown in Table 2, the mean, median, and modal values have been calculated:

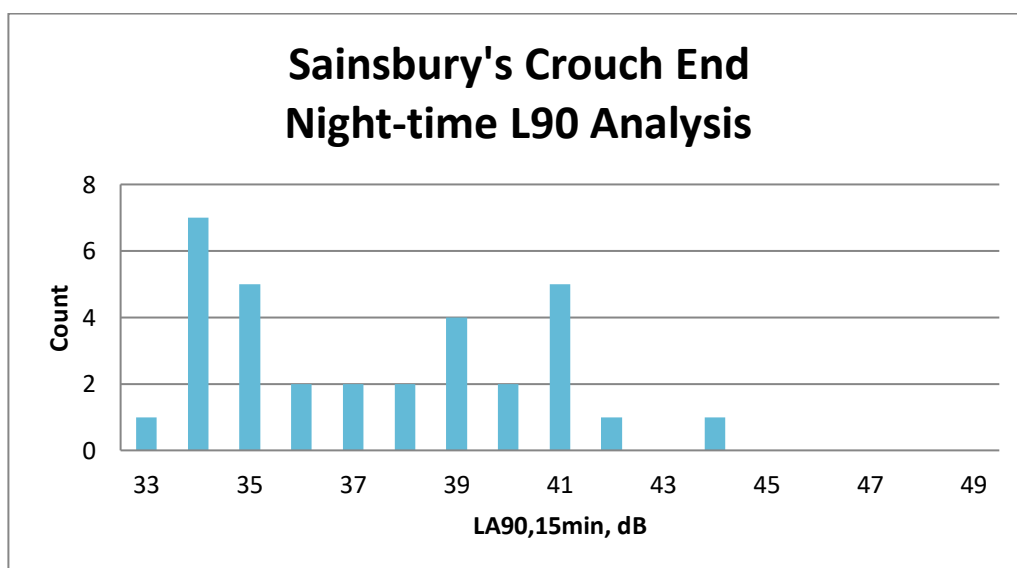
Table 2 Statistical analysis of $L_{A90,15min}$ levels during the daytime period

dB, L_{A90} daytime period	
Mean	45
Mode	45
Median	45

4.5. From reviewing the above histogram and statistics, 43 dBA has been selected to be robustly representative of the daytime background sound level in this area.

4.6. The following figure presents the distribution of night-time background sound pressure levels.

Figure 2 Histogram of night-time L_{A90} background sound pressure levels



4.7. Additional statistical analysis has been undertaken. As shown in Table 3, the mean, median, and modal values have been calculated:

Table 3 Statistical analysis of $L_{A90,15min}$ levels during the night-time period

dB, L_{A90} night-time period	
Mean	37
Mode	34
Median	37

4.8. From reviewing the above histogram, 34 dBA has been selected to be robustly representative of the night-time background sound level in this area.

4.9. Therefore, the following values are considered to be robustly representative of the existing background sound pressure levels at nearby noise sensitive receptors:

- 43 dBA L_{90} during the daytime period; and
- 34 dBA L_{90} during the night-time period.

5.0 Plant noise design criteria

London Borough of Haringey

- 5.1. London Borough of Haringey has imposed the following condition relating to plant noise on a similar project.

"The design and installation of new items of fixed plant hereby approved by this permission shall be such that, when in operation, the cumulative noise level $L_{Aeq} 15$ min arising from the proposed plant, measured or predicted at 1m from the facade of nearest residential premises shall be a rating level of at least 5dB(A) below the background noise level L_{AF90} . The measurement and/or prediction of the noise should be carried out in accordance with the methodology contained within BS 4142: 1997. Upon request by the local planning authority a noise report shall be produced by a competent person and shall be submitted to and approved by the local planning authority to demonstrate compliance with the above criteria."

- 5.2. It should be noted that BS 4142:1997 has been superseded by BS 4142:2014+A1:2019.

BS 4142:2014 + A1:2019 Methods for Rating and Measuring Industrial and Commercial Sound

- 5.3. British Standard (BS) 4142:2014+A1:2019 describes a method for rating and assessing sound of an industrial or commercial nature, which includes:
- Sound from industrial and manufacturing processes;
 - Sound from fixed installations which comprise mechanical and electrical plant and equipment;
 - Sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and
 - Sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.
- 5.4. The industrial or commercial sound is assessed outside a dwelling or premises used for residential purposes, upon which sound is incident.

- 5.5. The procedure contained in BS 4142:2014+A1:2019 is to quantify the "specific sound level", which is the measured or predicted level of sound from the source in question over a one hour period for the daytime and a 15-minute period for the night-time. Daytime is defined in the standard as 07:00 to 23:00 hours, and night-time as 23:00 to 07:00 hours.
- 5.6. The specific sound level is converted to a rating level by adding penalties on a sliding scale to account for either potentially tonal or impulsive elements. The standard sets out objective methods for determining the presence of tones or impulsive elements, but notes that it is acceptable to subjectively determine these effects.
- 5.7. The penalty for tonal elements is between 0dB and 6dB, and the standard notes: "Subjectively, this can be converted to a penalty of 2 dB for a tone which is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible."
- 5.8. The penalty for impulsive elements is between 0dB and 9dB, and the standard notes: "Subjectively, this can be converted to a penalty of 3 dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible."
- 5.9. The background sound level should be established in terms of the L_{A90} noise index. The standard states that the background sound level should be measured over a period of sufficient length to obtain a representative value. This should not normally be less than 15-minute intervals. The standard states that: *"A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value."*
- 5.10. The assessment outcome results from a comparison of the rating level with the background sound level. The standard states:
- a) Typically, the greater this difference, the greater the magnitude of the impact.*
- b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
- d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a 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 impact, depending on the context.*

Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse

impacts will lead to complaints and not every complaint is proof of an adverse impact."

- 5.11. The standard goes on to note that: "Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."
- 5.12. In addition to the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, the 2014 edition places emphasis upon an appreciation of the context, as follows:

"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."

- 5.13. BS 4142:2014+A1:2019 requires uncertainties in the assessment to be considered, and where the uncertainty is likely to affect the outcome of the assessment, steps should be taken to reduce the uncertainty.

Low background levels

- 5.14. Due to the exceptionally low prevailing environmental noise levels measured during the survey for the night-time period, it is suggested that the plant noise design criteria at the nearest residences should be limited to 30dBA. This proposed criterion is based on guidance found in Section 11 of BS 4142:2014+A1:2019 which states:

Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

- 5.15. A plant noise level of 30dBA at the façade would result in an internal noise level of 15dBA, which is likely to be lower than self-generated noise internally (for example, from domestic refrigerators). This assumption is based on guidance found in BS 8233:2014, which states that approximately 15dB of insulation is provided by a partially open window.

Summary of criteria

- 5.16. It is proposed that the BS 4142:2014+A1:2019 rating level due to the new plant, at the nearest residential windows, is at least 5 dBA below the representative background sound level during the day and night, subject to a lower limit of 30 dBA. The proposed plant limits are therefore as shown in Table 4.

Table 4 Proposed plant noise emissions level limits at nearest residential receptors

Period	Plant rating level (dB L _{Ar,Tr})
Daytime (07.00 – 23.00 hours)	38
Night-time (23.00 – 07.00 hours)	30

6.0 Plant noise impact assessment

- 6.1. Plant noise levels have been predicted at the nearest residential façades. Noise calculations have considered the directivity of sound propagation, reflections and geometric distance losses between the sources and the noise sensitive receptors.
- 6.2. Acoustic wall lining is proposed to control acoustic reflections from the southernmost AC units, as shown in [Appendix D](#).
- 6.3. It should be noted that the proposed plant is not anticipated to exhibit any tonal or impulsive characteristics provided it is well maintained. All proposed plant will be inverter driven and, therefore, will gently ramp up and down depending on the demands on the various systems. As the proposed plant replaces similar equipment, and similar plant is installed at other premises in the area, no other feature corrections are considered appropriate.
- 6.4. A summary of plant noise levels and a comparison with the criteria is shown in Table 5. Full calculations are given in [Appendix F](#).

Table 5 Plant noise assessment

Receptor	Period	Plant rating level, dB L _{Ar,Tr}	Proposed criterion, dB L _{Ar,Tr}	Excess, dBA
R1	Day (07.00 – 23.00 hrs)	38	38	0
	Night (23.00 – 07.00 hrs)	25	30	-5
R2	Day (07.00 – 23.00 hrs)	35	38	-3
	Night (23.00 – 07.00 hrs)	25	30	-5

- 6.5. The assessment shows that, when attenuated as described above, the proposed criteria are met at all times and plant noise levels should therefore be acceptable to the local authority.

Context and uncertainties

- 6.6. As BS 4142:2014+A1:2019 advises, the impact must be considered within the context of the site and the surrounding acoustic environment. The following must, therefore, also be taken into consideration when determining the potential impact that may be experienced:
- The assessment is undertaken at representative, nearest residential windows. The impact on all other nearby residential windows will be lower due to screening and distance attenuation.
- 6.7. Where possible uncertainty in the above assessments has been minimised by taking the following steps:
- The meter and calibrator used have a traceable laboratory calibration and the meter was field calibrated before and after the measurements.
 - Uncertainty in the calculated impacts has been reduced by the use of a well-established calculation method.
 - Care was taken to ensure that the measurement positions were representative of the noise climate outside the nearby residential dwellings and not in positions where higher noise levels were present.

7.0 Summary

- 7.1. Noise Solutions Ltd (NSL) has been commissioned by Sainsbury's to a noise impact assessment of proposed plant to serve the Sainsbury's Local store at The Broadway, Crouch End, N8 8DU.
- 7.2. An environmental sound survey was undertaken at the site in order to establish typical background sound levels at the closest noise sensitive receptor.
- 7.3. Plant noise levels have been predicted and using the typical council requirements and the guidance provided in BS 4142:2014+A1:2019 '*Methods for rating and assessing industrial and commercial sound*'.
- 7.4. Acoustic wall lining is proposed to control acoustic reflections from the southernmost AC units.
- 7.5. The assessment shows that, when attenuated as described in this report, plant noise levels meet the proposed criteria and should therefore be acceptable to the local authority.

Appendix A Acoustic terminology

Parameter	Description
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10} (s_1/s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is $20\mu\text{Pa}$. The threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only perceptible under controlled conditions.
dB(A), L_{Ax}	Decibels measured on a sound level meter incorporating a frequency weighting (A weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB(A) broadly agree with people's assessment of loudness. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; heavy road traffic about 80 dB(A) at 10 metres; the level near a pneumatic drill about 100 dB(A).
Fast Time Weighting	Setting on sound level meter, denoted by a subscript F, that determines the speed at which the instrument responds to changes in the amplitude of any measured signal. The fast time weighting can lead to higher values than the slow time weighting when rapidly changing signals are measured. The average time constant for the fast response setting is 0.125 (1/8) seconds.
Free-field	Sound pressure level measured outside, far away from reflecting surfaces (except the ground), usually taken to mean at least 3.5 metres
Façade	Sound pressure level measured at a distance of 1 metre in front of a large sound reflecting object such as a building façade.
$L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level recorded during a noise event with a period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise. $L_{A10,18h}$ is the A-weighted arithmetic average of the 18 hourly $L_{A10,1h}$ values from 06:00-24:00.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. Generally used to describe background noise level.

Appendix B

Layout of existing site showing areas of interest



Appendix C Environmental sound survey

Details of environmental sound survey

- C.1 Measurements of the existing background sound levels were undertaken between 13.00 hours on Tuesday 11th April and 10.45 hours on Wednesday 12th April 2023.
- C.2 The sound level meter was programmed to record the A-weighted L_{eq} , L_{90} , L_{10} and L_{max} noise indices for consecutive fifteen-minute sample periods for the duration of the survey.

Measurement position

- C.3 The sound level meter was positioned on a lamppost along Bryanstone Road, close to the site and representative of the closest receptors. The approximate location of the microphone is indicated on the plan in [Appendix B](#).
- C.4 In accordance with BS 7445-2:1991 'Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use', the measurements were undertaken under free-field conditions.

Equipment

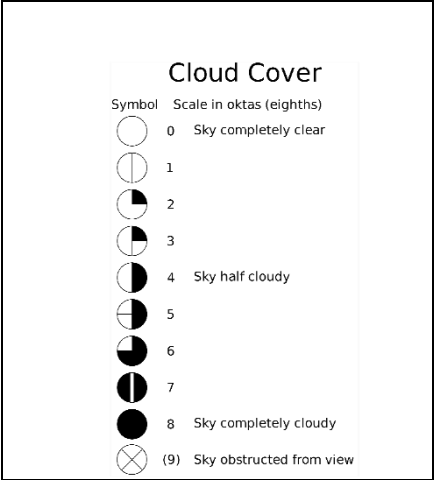
- C.5 Details of the equipment used during the survey are provided in the table below. The sound level meter was calibrated before and after the survey; no significant change (+/-0.2 dB) in the calibration level was noted.

Environmental noise survey instrumentation

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Svantek 977/ 69747	01/08/2022	1503080-1
Condenser microphone	ACO Pacific 7052E / 70829		
Preamplifier	Svantek SV12L / 73687		
Calibrator	Svantek SV30A / 10843	02/11/2022	1503080-2

Weather conditions

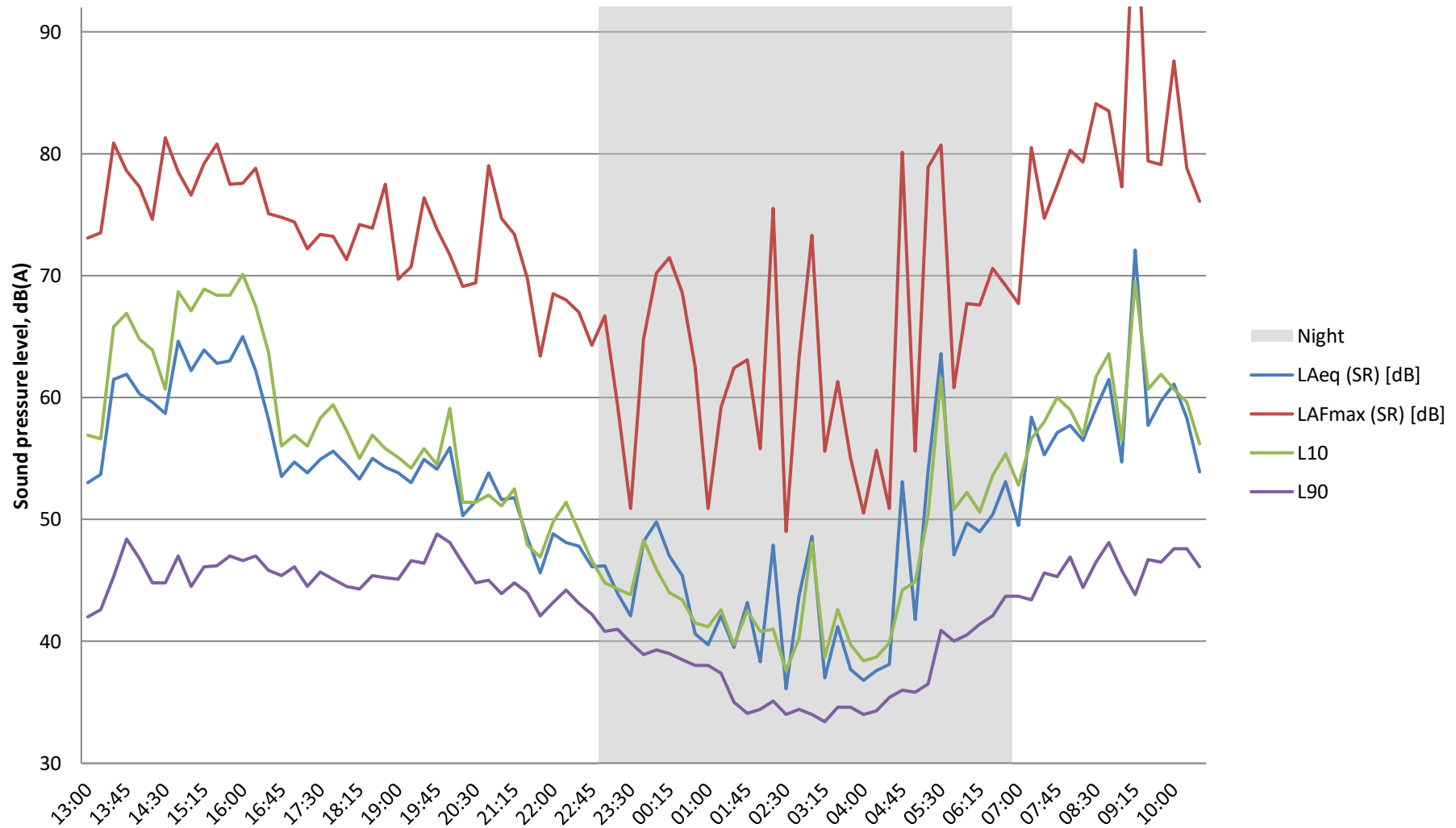
- C.6 Weather conditions were determined both at the start and on completion of the survey. It is considered that the meteorological conditions were appropriate for environmental noise measurements. The table below presents the weather conditions recorded on site at the beginning and end of the survey.

Weather Conditions				
Measurement Location	Date/Time	Description	Beginning of Survey	End of Survey
As indicated in Appendix B	13.00 11/04/23 – 10.45 12/04/23	Temperature (°C)	13	10
		Precipitation:	No	No
		Cloud cover (oktas - see guide)	8	4
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	No	No
		Wind Speed (m/s)	1	2
		Wind Direction	N	SW
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No

Results

- C.7 The results of the environmental survey are considered to be representative of the background sound pressure levels at the façades of the nearest noise sensitive receptors during the quietest times at which the plant will operate.
- C.8 The results of the survey are presented in a time history graph overleaf.

Sainsbury's Crouch End Tuesday 11 - Wednesday 12 Apr 2023



Architectural floor plan of a building. A blue arrow points from a text box to a wall lining adjacent to AC units. The plan includes various rooms and labels such as "PLANT DECK FL=100.00", "BOTTOM OF RAMP FL=99.72", "BOH FL=100.00", "SALES FLOOR FL=100.00", "ENTRANCE FL=99.99", and "BOTTOM OF RAMP FL=99.85". The plan also shows a grid of rooms and a large open area with a blue arrow pointing to a wall lining adjacent to AC units.

Notes:
Do not scale from this drawing. Contractors shall be responsible for the checking of all stated dimensions, with any anomalies being identified to the originator prior to any construction or fabrication works commencing.

[illegible]

A	12-06-23	Plant Arrangements
Rev.	18-06-23	Final issue
Date	Description	
	Project manager's contract particulars 2nd Floor Lafayette Trust Incorporation, London UK Tel: 0203 672 8893	jla
Status	CONSTRUCTION	
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Project Number	Drawing Number	Revision A
C-9462I	120	
Drawn	Checked	Scale
JN	VJA	1:1000&A1
Date	Date	
		16.06.23

Appendix E Plant noise data

Plant Item	Make/Model	Quantity	Sound pressure level (dBA)	
			Day	Night
311.0 Gas Cooler	Kelvion / GF-ND102G3H-091M430	1	30 at 10m	30 at 10m
301 Pack	SCM Frigo 1xMWS 096+065 MTDX + UMCE 007 BT/S	1	32 at 10m	32 at 10m
ACU1, ACU2 Sales floor AC units	Mitsubishi PUZ-M250YKA2	2	62 at 1m, each	-
ACU3, Sales floor AC unit	Mitsubishi PUZ-M125VKA	1	52 at 1m, each	-
ACU4, Cash office AC unit	Mitsubishi MUZ-AP20VG	1	52 at 1m, each	-

Appendix F Plant noise calculations

Receptor R1 (day and night)

Plant	Source sound pressure level		Distance (m)	Correction (dB)	Directivity (dB)	Screening (dB)	BS4142 Feature (dB)	Rating level at receptor
	dBA	at (m)						
Gas Cooler	30	10	27	-9	0	0	0	24
Pack	32	10	27	-9	0	0	0	23
ACU1	62	1	29	-29	0	0	0	33
ACU2	62	1	30	-30	3	0	0	35
ACU3	56	1	22	-27	0	0	0	29
ACU4	52	1	22	-27	0	0	0	25
Rating level (daytime)								38
Rating level (night-time)								25

Receptor R2 (day and night)

Plant	Source sound pressure level		Distance (m)	Correction (dB)	Directivity (dB)	Screening (dB)	BS4142 Feature (dB)	Rating level at receptor
	dBA	at (m)						
Gas Cooler	30	10	25	-8	0	0	0	22
Pack	32	10	30	-10	0	0	0	22
ACU1	62	1	34	-31	0	0	0	31
ACU2	62	1	36	-31	0	0	0	31
ACU3	56	1	42	-32	0	0	0	24
ACU4	52	1	43	-33	0	0	0	19
Rating level (daytime)								35
Rating level (night-time)								25