Sainsbury's Superstore

Haycock's Road
Haverhill
CB9 7YL

Plant Noise Impact Assessment

On behalf of

RAC ENGINEERING SERVICES LTD

Project Reference: 87572 | Revision: - | Date: 14th June 2024

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Document Information

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For and on behalf of Noise Solutions Ltd				

Revision	Date	Description	Prepared	Reviewed/ Approved

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Contents

Appendices

Executive Summary

Noise Solutions Limited has been appointed to provide a noise impact assessment of replacement plant to be installed at the existing Sainsbury's Superstore along Haycocks Road in Haverhill.

New plant will be installed on the roof of the building. Main plant items will comprise three air handling units, four air source heat pumps and two gas coolers.

The assessment shows that noise levels resulting from the proposed plant will comply with recognised Standards and should therefore be acceptable.

1.0 Introduction

1.1. Noise Solutions Ltd (NSL) has been commissioned by RAC Engineering Services Ltd to provide a noise impact assessment of replacement plant serving an existing Sainsbury's Superstore located along Haycocks Road in Haverhill.

1.2. An environmental sound survey has been undertaken to establish the prevailing background 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 houses and assessed against recognised Standards and guidance.

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. The Sainsbury's Superstore occupies a dedicated building located along Haycocks Road in Haverhill. Replacement refrigeration, air conditioning and heating plant will be installed on the roof of the building.

2.2. Major items of plant will comprise two refrigeration gas coolers, four air handling units (AHUs) and four air source heat pumps (ASHPs). Small extract fans and air conditioning condensers will also be installed. The proposed plant layout and noise data are included in **Appendix D** and **Appendix E** respectively.

2.3. It is understood that these major plant items may operate at any time, with the ASHPs operating at a lower duty at night than during the daytime.

2.4. A site plan showing the site and surrounding area and the noise monitoring location used in this assessment is presented in **Appendix B**.

3.0 Nearest noise-sensitive receptors

3.1. The area to the north of the site is agricultural land. The nearest houses are to the south, across Haycocks Road (Reference R1) the nearest of which are approximately 76m from the closest of the proposed new plant items.

4.0 Existing noise climate

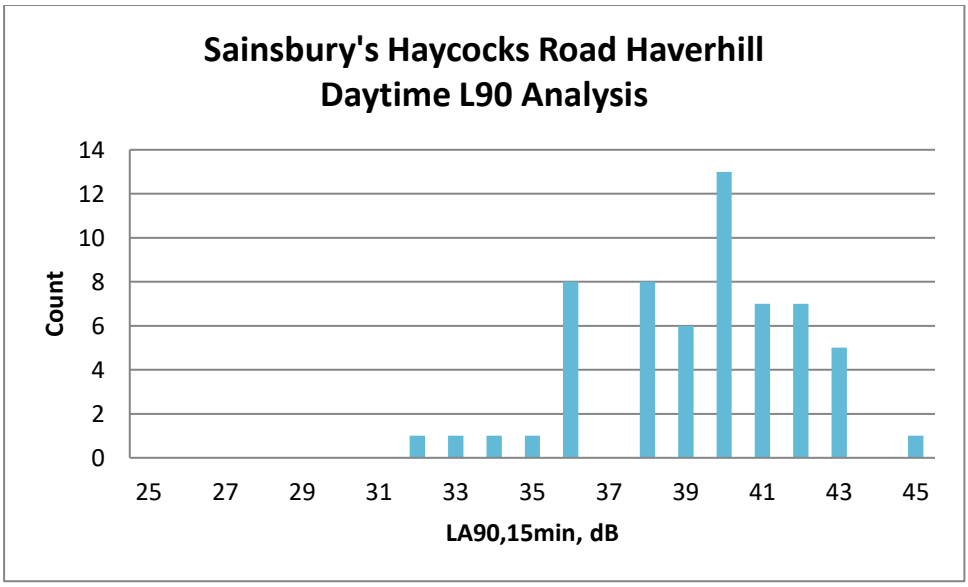
4.1. An environmental noise survey was undertaken to establish the typical background sound levels at a location representative of the noise climate outside the façades of the nearest noise sensitive receptors to the proposed plant area during the quietest times at which the plant will operate.

4.2. The results of the environmental sound survey are summarised in Table 1 below. The full set of measurement results and details of the survey methodology are presented in **Appendix C**.

Table 1 Summary of survey results

Measurement period	Range of recorded sound pressure levels (dB)			
	$L_{Aeq(15mins)}$	$L_{Amax(15mins)}$	$L_{A10(15mins)}$	$L_{A90(15mins)}$
Daytime (07.00 – 23.00 hours)	37-57	48-74	40-60	32-45
Night-time (23.00 – 07.00 hours)	31-46	40-71	33-50	25-40

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



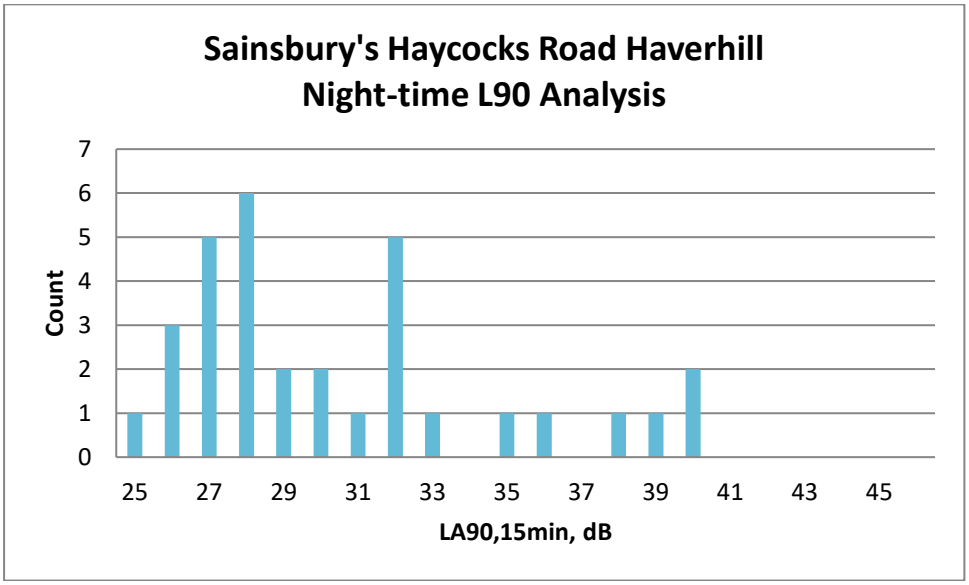
4.3. Further statistical analysis has been carried out on the data; the mean, modal and median values are shown in Table 2 below.

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

dB, L_{A90} daytime period	
mean	39
modal	40
median	40

4.4. From the histogram analysis, 36dB has been selected to be a robust representation of the background noise level during the daytime period.

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



4.5. Further statistical analysis has been carried out on the data; the mean, modal and median values are shown in Table 3 below.

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

dB, L_{A90} night-time period	
mean	31
modal	28
median	29

4.6. Again, from the histogram analysis, 28dB has been selected to be a robust representation of the background sound level during the night-time period.

4.7. Therefore, the following values are considered to be the representative background sound pressure levels at nearby noise sensitive premises:

- 36dB L_{A90} during the daytime period; and
- 28dB L_{A90} during the night-time period.

5.0 Plant noise design criteria

National Planning Policy Framework

5.1. A new edition of NPPF was published in December 2023 and came into effect immediately. The original National Planning Policy Framework (NPPF[1]) was published in March 2012, with subsequent revisions made periodically - this document replaced the existing Planning Policy

[1] National Planning Policy Framework, DCLG, March 2012

Guidance Note 24 (PPG 24) "Planning and Noise." The December 2023 revised edition contains no new directions or guidance with respect to noise. The paragraph references quoted below relate to the December 2023 edition.

5.2. Paragraph 180 of the NPPF states that the planning system should contribute to and enhance the natural and local environment by, (amongst others) *"preventing new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, water or noise pollution or land instability."*

5.3. The NPPF goes on to state in Paragraph 191:

"planning policies and decisions should ...

a) Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development, - and avoid noise giving rise to significant adverse impacts on health and quality of life;
b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason ...

5.4. The NPPF document does not refer to any other documents or British Standards regarding noise other than the Noise Policy Statement for England (NPSE[2]).

5.5. Paragraph 2 of the NPPF states that *"planning law requires that applications for planning permission must be determined in accordance with the development plan unless material considerations indicate otherwise."*

5.6. Paragraph 12 of the NPPF states that *"The presumption in favour of sustainable development does not change the statutory status of the development plan as the starting point for decision making. Where a planning application conflicts with an up-to-date development plan (including any neighbourhood plans that form part of the development plan), permission should not usually be granted. Local planning authorities may take decisions that depart from an up-to-date development plan, but only if material considerations in a particular case indicate that the plan should not be followed".*

5.7. Paragraph 123 states that *"Planning policies and decisions should promote an effective use of land in meeting the need for homes and other uses, while safeguarding and improving the environment and ensuring safe and healthy living conditions. Strategic policies should set out a clear strategy for accommodating objectively assessed needs, in a way that makes as much use as possible of previously-developed or 'brownfield' land".*

[2] Noise Policy Statement for England, DEFRA, March 2010

West Suffolk Council

5.8. West Suffolk Council was previously contacted to determine their plant noise emission criterion, although no confirmation had been received at the time of writing this report.

5.9. In the absence of a confirmed criterion, it is proposed to seek guidance from BS 4142:2014+A1:2019. Therefore, plant noise levels should not exceed a level equal to the representative background noise level at the most affected receptor to be considered as a 'low impact' according to BS4142:2014+A1:2019.

BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound

5.10. BS 4142:2014+A1:2019 is intended to be used to assess the likely effects of sound on people residing in nearby dwellings. The scope of BS 4142:2014+A1:2019 includes *"sound from fixed plant installations which comprise mechanical and electrical plant and equipment"*.

5.11. 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.

5.12. 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.

5.13. 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."*

5.14. 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."*

5.15. The assessment outcome results from a comparison of the rating level with the background sound level. The standard states:

- *Typically, the greater this difference, the greater the magnitude of the impact.*
- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context;*

- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context;*

- *The lower the rating level is relative to the measured background 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.*

5.16. The standard does state that "*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.*"

5.17. 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."*

5.18. 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."

5.19. 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 sound level

5.20. In view of the low night-time background sound levels, and as described in BS 4142:2014, it is proposed that noise from the new plant is limited to a rating level of 30 dB(A) outside the nearest residential windows at night. This would typically result in an internal noise level of around 15 dB(A) with windows open, a level below that produced by refrigerators and similar items within the nearest houses.

Summary of criteria

5.21. It is considered appropriate that the plant noise level of proposed plant should be controlled to a level that does not exceed the representative L_{A90} background sound level at the nearest residential property, with a lower limit of 30dBA.

5.22. The cumulative noise level for the proposed plant at the nearest residential windows should not therefore exceed the limits shown in Table 4.

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

Receptor	Period	Plant sound pressure level (dB L_{Aeq})
Residential	Daytime (07.00 – 23.00 hours)	36
	Night-time (23.00 – 07.00 hours)	30

6.0 Plant noise impact assessment

6.1. Plant noise levels at the most affected noise sensitive receptors have been predicted based on the manufacturer's noise data for the proposed equipment. The assessment has taken account of the distance between the plant and the nearest receptors, orientations, screening (from the building envelope, as appropriate), reflections and other propagation effects. Predictions of noise from the air handling units include the typical atmosphere-side attenuation shown in **Appendix E.** Predictions also include for upgraded enclose casings to the AHU's.

6.2. 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 external plant will be inverter driven and, therefore, will gently ramp up and down depending on the demands on the various systems. In order to be robust, however, a +3dB feature correction has been applied to the noise level predictions as advised in BS 4142:2014+A1:2019 for the possible presence of "*...characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment...*".

6.3. Table 5 summarises the results of the assessment outside the nearest noise-sensitive dwellings. All other nearby receptors benefit from increased distance/screening to the plant such that resulting noise levels will be lower than at the receptors considered. The full calculations are presented in **Appendix F**.

Table 5 Plant noise assessment

Receptor	Period	Predicted plant rating level at receptor, $L_{Ar,Tr}$ (dB)	Proposed design criterion (dB $L_{Ar,Tr}$)	Difference (dB)
R1	Daytime (07.00 – 23.00 hours)	35	36	-1
	Night-time (23.00 – 07.00 hours)	29	30	-1

6.4. Other small items of plant may be attenuated at source in order that the proposed criteria are not exceeded.

Assessment of uncertainties

6.5. Where possible uncertainty in this assessment has been minimised by taking the following steps:

- The measurement of the background sound levels was undertaken over a period including the quietest times of the day and night.
- The sound level meter and calibrator used have a traceable laboratory calibration and the meter was field calibrated before and after the measurements.
- Uncertainty in the calculated impact has been reduced by the use of a well-established calculation method.
- Care was taken to ensure that the measurement position was representative of the noise climate outside the nearby residential dwellings and not at a position where higher noise levels are present.

7.0 Summary

7.1. Noise Solutions Ltd (NSL) has been commissioned by RAC Engineering Services Ltd to provide a noise impact assessment for replacement plant serving an existing Sainsbury's Superstore located along Haycocks Road in Haverhill.

7.2. An environmental noise survey has been undertaken to establish the existing prevailing noise levels at a location representative of the noise climate outside the nearest noise sensitive receptors to the proposed site.

7.3. Cumulative plant noise emission levels for the replacement plant have been predicted at the most affected noise sensitive receptors and assessed against the local authority's usual requirements.

7.4. The noise level predictions demonstrate that cumulative noise emissions from the replacement plant will comply with the proposed limits at the nearest noise sensitive properties, inclusive of suitable attenuators and upgraded enclosure casings fitted to the AHU's. Noise from fixed plant should not be grounds for refusal of planning permission.

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 s1 and s2 is given by 20 $\log_{10}$ (s1/s2). 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 20μPa. 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 Photograph of 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 13.30 hours on Tuesday 22nd August and 12.15 hours on Wednesday 23rd August 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 representative measurement position was located on a lamp post along Baines Coney. This location is approximately representative of the levels of road traffic noise at the closest receptor. 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

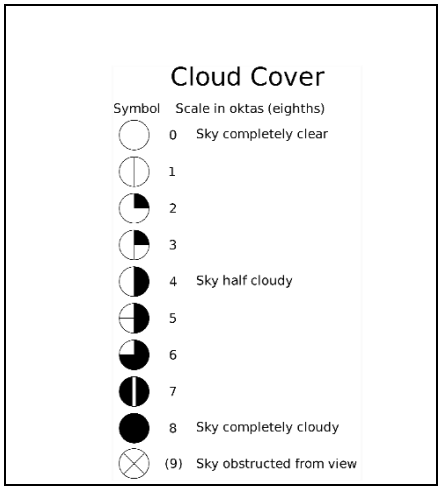
C.5 Details of the equipment used during the survey are provided in the table below. The sound level meter was calibrated before and after the survey; no significant change (+/-0.2 dB) in the calibration level was noted.

Environmental noise survey

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Svantek 977 / 36190	20/04/2023	1505154-2
Condenser microphone	ACO Pacific 7052E / 74975		
Preamplifier	Svantek SV12L / 10325		
Calibrator	Svantek SV33A / 73430	05/07/2023	1505854-1

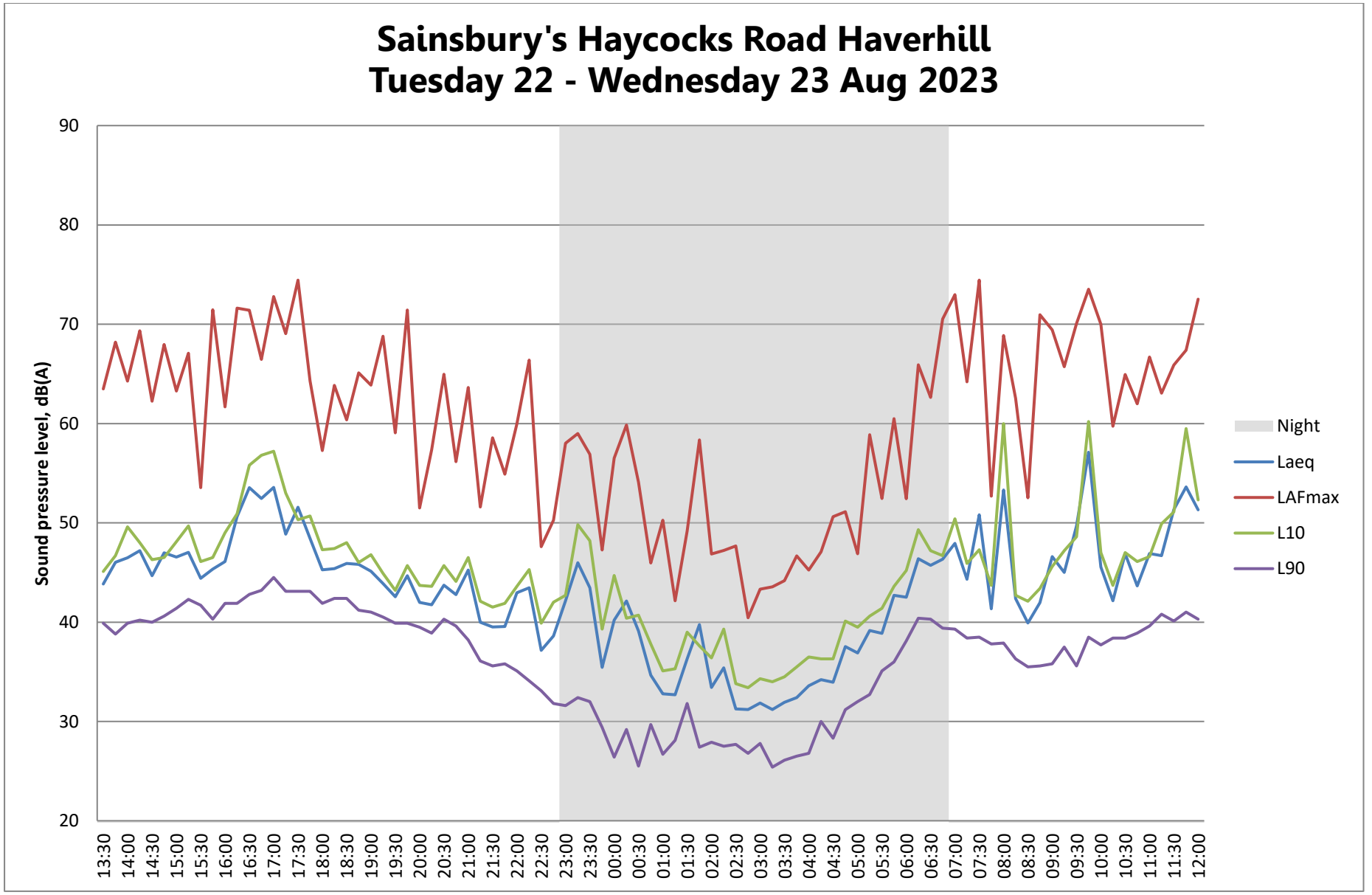
Weather conditions

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 on Appendix B	13.30 22/8/23 - 12.15 23/8/23	Temperature (°C)	23	25
		Precipitation:	No	No
		Cloud cover (oktas - see guide)	2	4
		Presence of fog/snow/ice	No	no
		Presence of damp roads/wet ground	No	No
		Wind Speed (m/s)	1	3
		Wind Direction	South westerly	South westerly
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	N

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. The predominant noise source affecting the area was distant traffic. The results of the survey are presented in a time history graph overleaf.


Sainsbury's Haycocks Road Haverhill
Tuesday 22 - Wednesday 23 Aug 2023
Sound pressure level, dB(A)
90
80
70
60
50
40
30
20
13:30
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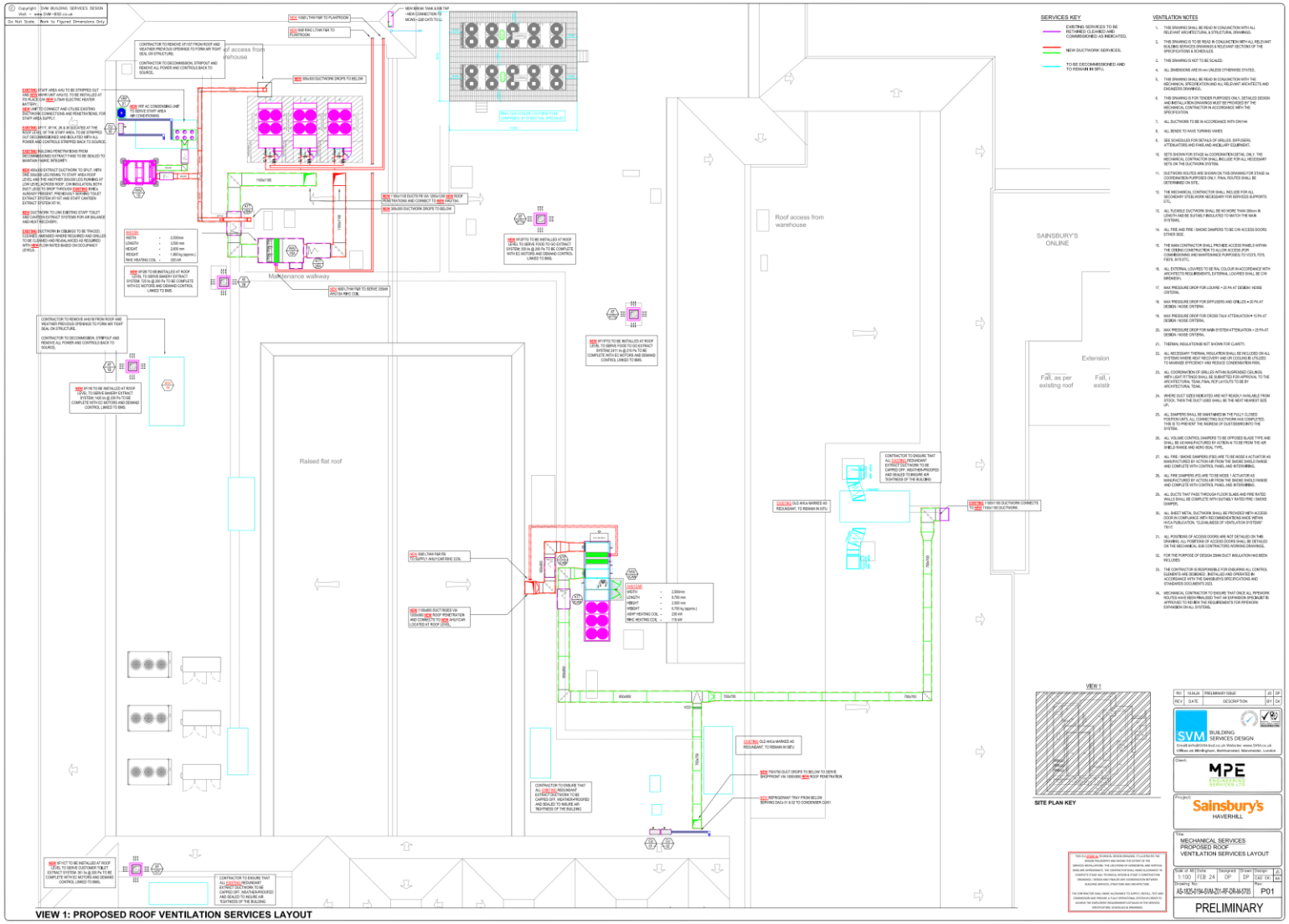
10:00
10:30
11:00
11:30
12:00
Night
Laeq
LAFmax
L10
L90

Appendix D Proposed plant layout



Appendix E Plant noise data

Plant	Unit/Model	No. of units	Sound Level Daytime	Sound Level Night-time
Gas Coolers 311.1, 312.1	Kelvion GF-PC205G4H-091R-AMHE-10FPI	2	41dBA at 10m, each	41dBA at 10m, each
Air Source Heat Pumps 1-3	EcoAirBox 200kW	3	59dBA at 3m, each (70% duty)	50dBA at 3m, each (50% duty)
Air Source Heat Pump (AHU1CAR)	EcoAirBox 300kW	1	61dBA at 3m (70% duty)	52dBA at 3m, each (50% duty)

Reference	Make / Model	No. units	Notes	Sound power level, dB re 1pW, at octave band frequencies (Hz)							
				63	125	250	500	1K	2K	4K	8K
AHU1CAR	EcoAirBox	1	Inlet	84	97	88	81	80	78	73	70
			Casing	77	88	78	67	63	60	55	51
AHU1SA	EcoAirBox	1	Inlet	77	96	85	79	78	76	72	69
			Casing	72	87	75	64	61	59	55	51
AHU1D	EcoAirBox	1	Inlet	69	68	78	78	73	69	67	63
			Discharge	77	76	84	84	81	77	72	68
			Casing	66	62	70	60	56	52	47	45

AHU Attenuation required

Reference	Notes	Typical size	Sound power level, dB re 1pW, at octave band frequencies (Hz)							
			63	125	250	500	1K	2K	4K	8K
AHU1CAR	Inlet	2100mm w x 1950mm h x 2100 mm l	7	18	36	45	45	45	45	45
AHU1SA	Inlet	2100mm w x 1950mm h x 1500 mm l	6	13	26	41	45	45	43	36
AHU1D	Inlet	1750mm w x 750mm h x 900 mm l	4	6	11	21	28	25	21	16
	Discharge	1750mm w x 750mm h x 1200 mm l	5	9	17	28	37	34	29	20
All	Casing	Enhanced panel system*	12	12	12	15	15	15	15	12

**values shown are typical improvement over standard Sainsbury's specification*

Appendix F Plant noise calculations

Receptor R1 – Day time

Plant	Plant noise level at source		Distance		Directivity	Screening	BS4142 Feature	Rating Level at Receptor (dB)
	Noise level (dBA)	Distance (m)	m	Correction (dB)	Correction (dB)	Correction (dB)	Correction (dB)	
Gas Cooler 311.1	41	10	76	-18	0	-5	3	21
Gas Cooler 312.1	41	10	76	-18	0	-5	3	21
ASHP1	59	3	103	-31	0	-5	3	26
ASHP2	59	3	100	-30	0	-5	3	27
ASHP3	59	3	97	-30	0	-5	3	27
AHU1CAR Intake	62	Lw	81	-46	0	0	3	19
AHU1CAR Casing	62	Lw	81	-46	0	0	3	19
ASHP4	61	3	81	-29	0	-5	3	30
AHU1SA Intake	66	Lw	100	-48	-4	0	3	17
AHU1SA Casing	61	Lw	100	-48	0	0	3	16
AHU1D Intake	60	Lw	115	-49	-1	0	3	13
AHU1D Discharge	60	Lw	115	-49	-1	0	3	13
AHU1D Casing	51	Lw	115	-49	0	0	3	5
Combined sound rating level at receptor, daytime								**35**

Receptor R1 – Night-time

Plant	Plant noise level at source		Distance		Directivity	Screening	BS4142 Feature	Rating Level at Receptor (dB)
	Noise level (dBA)	Distance (m)	m	Correction (dB)	Correction (dB)	Correction (dB)	Correction (dB)	
Gas Cooler 311.1	41	10	76	-18	0	-5	3	21
Gas Cooler 312.1	41	10	76	-18	0	-5	3	21
ASHP1	50	3	103	-31	0	-5	3	17
ASHP2	50	3	100	-30	0	-5	3	18
ASHP3	50	3	97	-30	0	-5	3	18
AHU1CAR Intake	62	Lw	81	-46	0	0	3	19
AHU1CAR Casing	62	Lw	81	-46	0	0	3	19
ASHP4	52	3	81	-29	0	-5	3	21
AHU1SA Intake	66	Lw	100	-48	-4	0	3	17
AHU1SA Casing	61	Lw	100	-48	0	0	3	16
AHU1D Intake	60	Lw	115	-49	-1	0	3	13
AHU1D Discharge	60	Lw	115	-49	-1	0	3	13
AHU1D Casing	51	Lw	115	-49	0	0	3	5
Combined sound rating level at receptor, night-time								**29**