

Côte
240a The Chimes Shopping Centre
Uxbridge
UB8 1GB

**Plant Noise Impact
Assessment Report**

On behalf of

CÔTE

Project Reference: 88564| Revision: 00| Date: 16th May 2019

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Document Information

Project Name : Côte, The Chimes Shopping Centre, Uxbridge
Project Reference : 88564
Report Title : Plant Noise Impact Assessment
Doc Reference : 88564/NIA
Date : 16th May 2019

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Revision	Date	Description	Prepared	Reviewed/ Approved

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1.0 Introduction

- 1.1. Noise Solutions Ltd (NSL) has been commissioned by Côte Restaurants to undertake a noise impact assessment for new plant serving the propose restaurant to be located at 240a The Chimes Shopping Centre, Uxbridge, UB8 1GB.
- 1.2. An environmental sound survey has been undertaken to establish the prevailing background sound levels at a location representative of the sound levels outside the nearest noise sensitive receptors to the site.
- 1.3. Cumulative plant noise emissions for the proposed plant have been predicted at the nearest noise-sensitive receptor and assessed using the local authority's typical requirements and nationally-recognised 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 proposed Côte restaurant is to occupy the ground and first floor of unit 240a, The Chimes Shopping Centre, Uxbridge.
- 2.2. A new air handling unit (AHU1) and kitchen extract fan (EF1) will be installed on the roof. A general extract fan (EF2) and a toilet extract fan (EF3) will be installed within the restaurant and will discharge at roof level. In addition, alongside the roof plant will be a total of three air conditioning (AC) units (CU1 to CU3) and a catering condensing unit (CCU1).
- 2.3. The roof top plant area is shared with the neighbouring units within the shopping centre and there is a considerable amount of similar services plant in the location.
- 2.4. The proposed AC units, extract and supply systems will operate only when the restaurant is open and will be switched off at all other times. Typically, restaurant opening hours are 06:00 hours to midnight, daily. The only item operating continuously will be the catering condenser.
- 2.5. Noise data for the proposed plant is presented in [Appendix D](#). The locations of the proposed plant are shown in [Appendix F](#).

3.0 Nearest noise-sensitive receptors

- 3.1. The area surrounding the site is predominantly commercial in nature.

- 3.2. There are residential flats above shops on the High Street (Receptor R1) and at Bonseys Yard (Receptor R2), though in both cases the upper-most windows are below the level of the roof plant and therefore benefit from substantial acoustic screening from all plant.
- 3.3. **Appendix B** contains an aerial photograph showing the site and surrounding area.

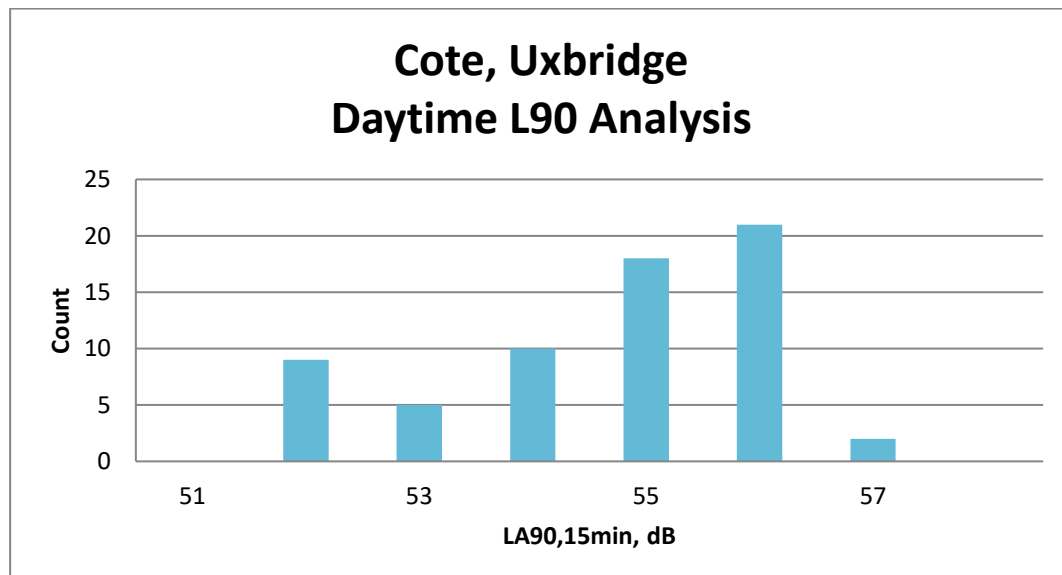
4.0 Existing noise climate

- 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} (5mins)	L _{Amax} (5mins)	L _{A10} (5mins)	L _{A90} (5mins)
Opening hours (06:00 – midnight)	53-67	59-91	53-69	52-57
Restaurant closed (midnight – 06:00)	52-55	57-73	53-56	51-54

Figure 1 Histogram of L_{A90} background sound pressure levels during restaurant opening hours



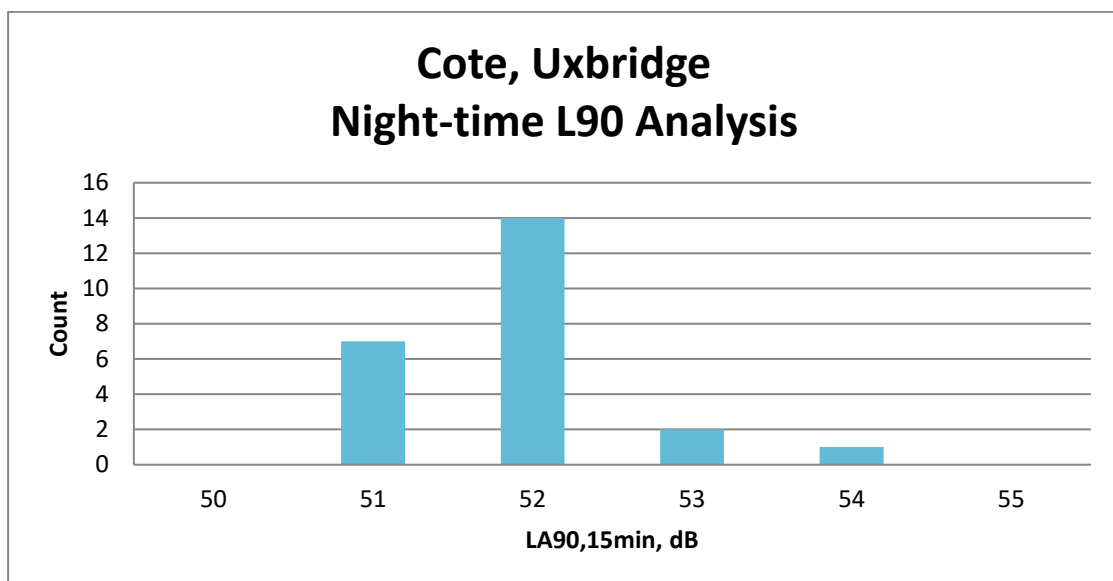
- 4.3. Further statistical analysis has been carried out on the data, and the mean and median values are shown in table 2 below.

Table 2 Statistical analysis of $L_{A90,15min}$ levels during restaurant opening hours

dB, L_{A90} 06:00 - midnight	
mean	55
modal	56
median	55

- 4.4. From the histogram analysis, 52dB has been selected to be a robust representation of the background noise level during the daytime period.

Figure 2 Histogram of background sound pressure levels (restaurant closed)



- 4.5. Further statistical analysis has been carried out on the data and the mean and median values are shown in table 3 below.

Table 3 Statistical analysis of $L_{A90,15min}$ levels (restaurant closed)

dB, L_{A90} night-time period	
mean	52
modal	52
median	52

- 4.6. Again from the histogram analysis, 51dB has been chosen to be representative of the background sound level during the night-time period.
- 4.7. The following values are considered representative of the existing background sound pressure levels at nearby noise sensitive premises:
- 52dB L_{A90} during the daytime period; and
 - 51dB L_{A90} during the night-time period

5.0 Plant noise emission criteria

- 5.1. It is understood there are no landlord's specifications, tenancy requirements etc. relating to noise from new plant to be installed at the shopping centre.

National Planning Policy Framework

- 5.2. A new edition of NPPF was published in February 2019 and came into effect immediately. The original National Planning Policy Framework (NPPF¹) was published in March 2012, with a revision in July 2018 - this document replaced the existing Planning Policy Guidance Note 24 (PPG 24) "Planning and Noise." The 2019 revised edition contains no new directions or guidance with respect to noise, and hence, all previous references remain extant. The paragraph references quoted below relate to the February 2019 edition.
- 5.3. Paragraph 170 of the NPPF states that the planning system should contribute to and enhance the natural and local environment by, (amongst others) *"preventing both 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 stability."*
- 5.4. The NPPF goes on to state in Paragraph 180:
- "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 ...*
- 5.5. The NPPF document does not refer to any other documents or British Standards regarding noise other than the Noise Policy Statement for England (NPSE²).
- 5.6. 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."*
- 5.7. 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-*

¹ National Planning Policy Framework, DCLG, March 2012

² Noise Policy Statement for England, DEFRA, March 2010

date development plan, but only if material considerations in a particular case indicate that the plan should not be followed".

London Borough of Hillingdon

- 5.8. The London Borough of Hillingdon Council Supplementary Planning Document Noise (dated April 2006) contains the following:

Key Point 6: Industrial Uses

Industrial uses will require particular attention as they can often cause severe noise problems due to both the character of industrial noise and its level. Sudden impulses, irregular noise or noise which contains a distinguishable continuous tone will require special consideration.

In considering new industrial development, the Council will apply policies OE1 and OE3 of the UDP and will have regard to, amongst other considerations, the British Standard 4142:1997 "Method for rating industrial noise affecting mixed residential and industrial areas", and internal and external noise criteria. Specific consideration will also be given to the features and characteristics of the noise.

British Standard 4142:1997 gives advice on measuring and assessing the noise from machinery or plant and is relevant if surrounding residential areas might be affected. Developments with a BS4142 assessment of marginal significance or above would not ordinarily be permitted. Consequently, the development should be controlled such that the rating level of the noise from the proposed development determined according to BS4142 is at least 5 dB below the background noise level LA90,T. Ideally, the assessment of noise should give a positive indication that complaints are unlikely...

Before the proposed use commences, the local planning authority may require that a noise control scheme is agreed. This will need to have regard to the British Standard 4142:1997 and internal noise criteria.

To ensure that the proposed use does not have an unacceptable impact, conditions may be required.

- 5.9. It should be noted that BS 4142:1997 has been superseded with the 2014 version. The latest version of the standard has been adopted for this assessment.

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

- 5.10. BS 4142:2014 is intended to be used to assess the likely effects of sound on people residing in nearby dwellings. The scope of BS 4142:2014 includes *"sound from fixed plant installations which comprise mechanical and electrical plant and equipment"*.
- 5.11. The procedure contained in BS 4142:2014 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 Standard also notes: *"Where the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied."*
- 5.16. 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.*

- 5.17. 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."*
- 5.18. 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."*
- 5.19. 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."*
- 5.20. BS 4142:2014 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.

Summary of proposed criteria

- 5.21. Given the typical council requirements, the external plant noise rating levels should be at least 5 dB(A) below the prevailing background outside any nearby noise sensitive window. In accordance with BS 4142:2013, this will ensure plant noise is of 'low impact'.
- 5.22. Table 4 below presents the proposed plant noise rating level at the nearest residences, based on a BS 4142:2014 assessment.

Table 4 Proposed plant noise emissions level limits at nearest receptors

Period	Residential
	Plant rating noise level, dB
Operating hours (06.00 – 00.00 hours)	47
All other times (00.00 – 06.00 hours)	46

6.0 Plant noise impact assessment

- 6.1. Cumulative noise emissions from the new proposed plant have been predicted at the nearest residential property to the site based on the noise output information shown in [Appendix D](#).

- 6.2. Noise levels for the proposed air supply and extract systems have been predicted taking into account ductwork system losses, aperture size, directivity of sound propagation, screening (where applicable) and distance attenuation. Predictions are inclusive of the following atmospheric-side attenuators fitted to the ventilation systems.

Table 5 Proposed atmospheric-side attenuators to ventilation systems

Attenuator	Insertion losses dB, at octave band centre frequencies (Hz)							
	63	125	250	500	1k	2k	4k	8k
AHU1 Supply Intake	3	3	4	12	14	13	12	12
EF1 Kitchen Extract	3	3	4	10	12	10	8	7

- 6.3. The predictions during operating-hours period have been based on the proposed plant operating simultaneously at full capacity. Night-time predictions have been based upon the catering condensing unit being the only operational item of plant.
- 6.4. It should be noted that the proposed plant is not anticipated to exhibit any tonal or impulsive characteristics providing 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.
- 6.5. Table 6, below, summarises the assessment of predicted noise rating levels. The full set of calculations is presented in [Appendix E](#).

Table 6 Assessment of predicted noise levels at the nearest noise sensitive receptors (ventilation systems only)

Receptor	Period	Predicted noise level at receptor, L_{Aeq} (dB)	Design criterion (dB)	Difference (dB)
Receptor R1. South side of High Street	Operating hours (06.00 – 00.00 hours)	42	47	-5
	All other times (00.00 – 06.00 hours)	19	46	-27

- 6.6. External noise level predictions demonstrate that cumulative noise emissions from the proposed plant meet the proposed criteria given in Table 4 of this report, being at least 5 dBA below the representative background sound levels outside the nearest residential windows. Plant noise should therefore be acceptable to London Borough of Hillingdon.
- 6.7. Plant noise predictions include the following mitigation measures:
- Atmospheric-side attenuators fitted to the AHU intake and kitchen, general and toilet extract fans.

Vibration control

- 6.8. It is recommended that all plant is mounted on suitable vibration isolators to limit structural noise and vibration from the plant into the building.

Context and assessment of uncertainties

- 6.9. As BS 4142:2014 advises, the estimated 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 assessments are undertaken at the nearest residential windows. The impact on all other residential premises will be lower due to distance losses.

- 6.10. 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 (i.e. when existing plant was switched off).
- The sound level meter and calibrator used have a traceable laboratory calibration and were 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

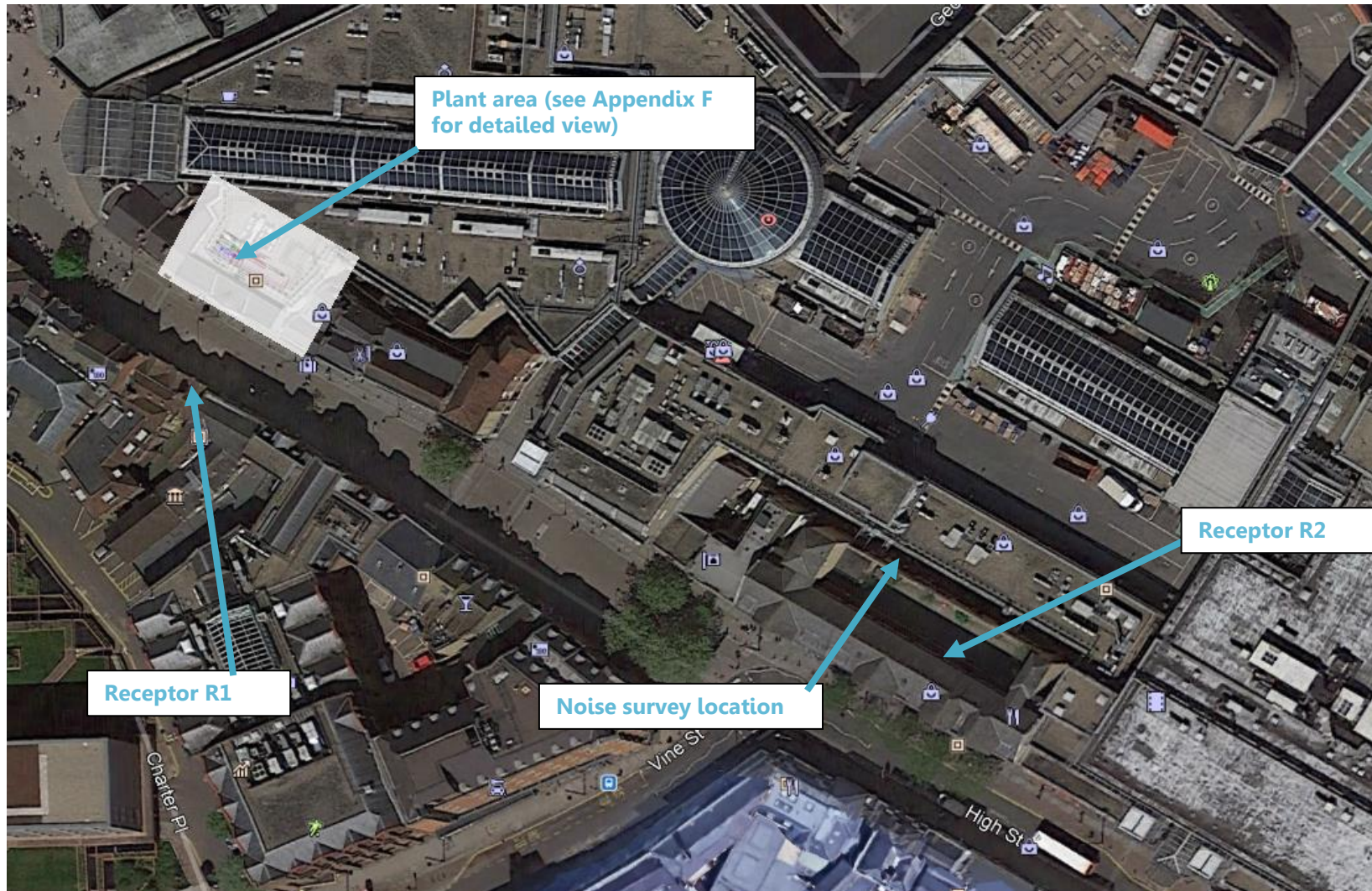
- 7.1. Noise Solutions Ltd (NSL) has been commissioned by Côte Restaurants to undertake a noise impact assessment for new plant at the proposed restaurant in the Chimes Shopping Centre, Uxbridge.
- 7.2. An environmental sound survey was undertaken at the site in order to establish the typical background sound levels at the nearest residential window.
- 7.3. The cumulative plant noise emission levels for the proposed plant have been predicted at the most affected noise sensitive receptor and assessed against the typical requirements of London Borough of Hillingdon and other guidance.
- 7.4. The results of the assessment demonstrate that cumulative noise levels at the most affected noise sensitive windows should be acceptable to the local planning authority during both the

restaurant's potential operating hours and at all other times, inclusive of mitigation measures stated in section 6.0. These include the installation of suitable atmospheric-side silencers to the proposed supply and extract systems.

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 Aerial photograph of site showing areas of interest



Appendix C Environmental noise survey

Details of sound surveys

- C.1 Measurements of the existing background sound levels were undertaken between 16.15 hours on Monday 13th May and 14.30 hours on Tuesday 14th May 2019.
- 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 5-minute sample periods for the duration of the noise survey.

Measurement position

- C.3 The representative measurement position was located on the roof of the shopping centre, overlooking Bonseys Yard (location indicated on the site plan in [Appendix B](#)). 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.4 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.

Description	Model / serial no.	Calibration date	Calibration certificate no.
Class 1 Sound level meter	Rion NL-52 / 00654035	27/06/2018	UCRT18/1652
Condenser microphone	Rion UC-59 /08290		
Preamplifier	Rion NH-25 / 54080		
Calibrator	Rion NC-74 /34535932	09/10/2017	1657

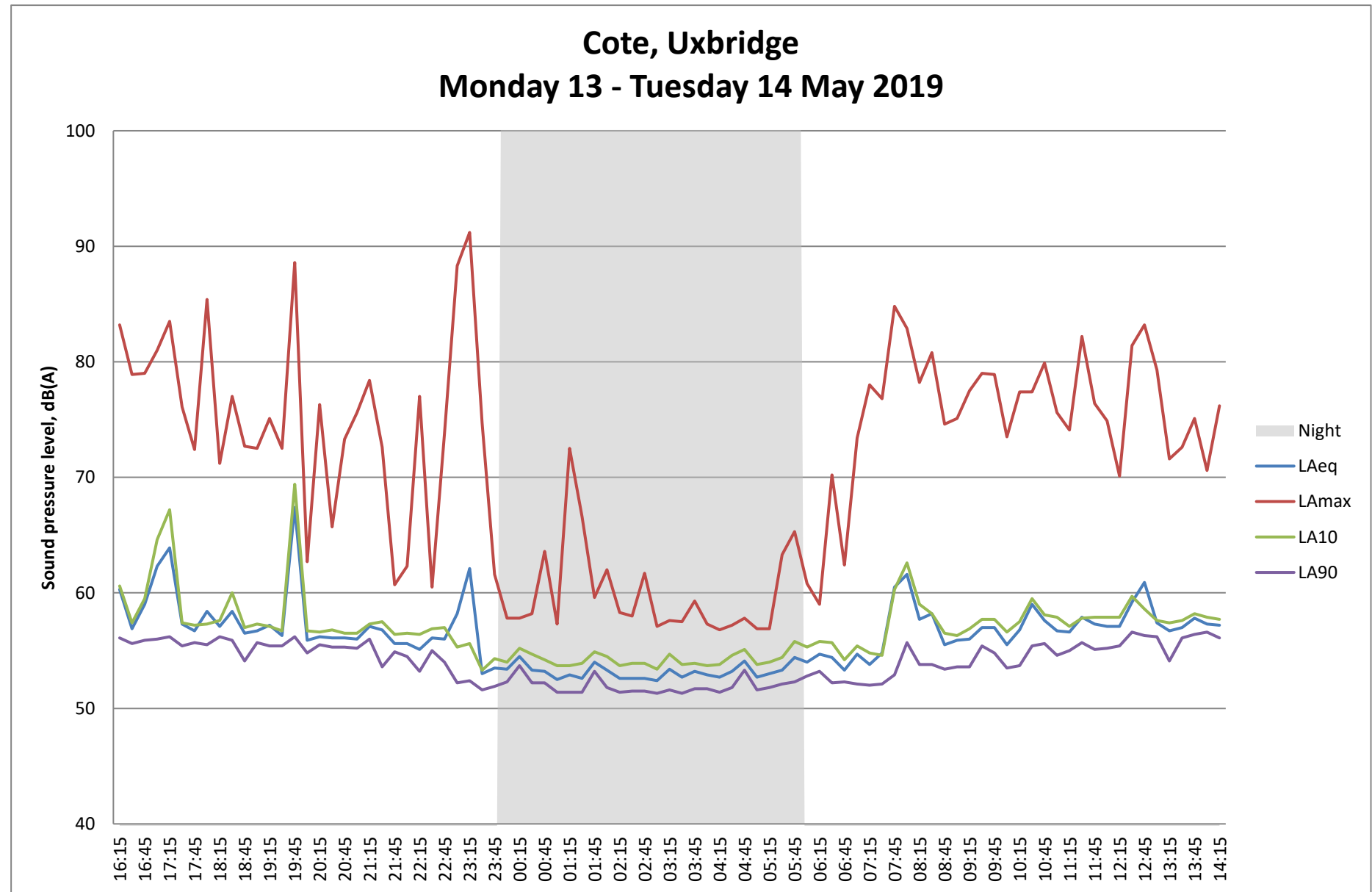
Weather conditions

- C.5 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	16.15 13 May – 14.30 14 May 2019	Temperature (°C)	20	20
Cloud Cover Symbol Scale in oktas (eighths) 0 Sky completely clear 1 2 3 4 Sky half cloudy 5 6 7 8 Sky completely cloudy (9) Sky obstructed from view		Precipitation:	No	No
		Cloud cover (oktas - see guide)	7	8
		Presence of fog/snow/ice	No	No
		Presence of damp roads/wet ground	No	No
		Wind Speed (m/s)	<1	2
		Wind Direction	N	E
		Conditions that may cause temperature inversion (i.e. calm nights with no cloud)	No	No

Results

- C.6 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. The noise climate during the survey period was dominated by existing plant serving other units in the shopping centre and on the High Street, though the plant nearest to the measurement position was not operational at the time of the survey due to ongoing refit works. The results of the survey are presented in a time history graph overleaf.



Appendix D Plant information and manufacturer published sound pressure levels

Unit	Mark / Model	No. units	Notes	Sound levels, dB, at octave band frequencies (Hz)								
				63	125	250	500	1K	2K	4K	8K	dBA
AHU1	Systemair MUB/T 062 630D4-A2 IE2	1	Inlet L _w	99	91	88	84	80	76	71	66	
EF1	Flaktwoods Estoc Targe 80-630-3	1	In-duct L _w (outlet)	101	98	92	88	85	82	77	71	
EF2	Systemair K250L Sileo	1	Outlet, L _w	74	78	72	64	65	63	60	53	
EF3	Systemair K315L Sileo	1	Outlet, L _w	83	81	76	73	71	69	63	59	
CU1	Toshiba RAV-GM801ATP-E	1		L _w 65 dBA				Equivalent to 37dBA at 10m				
CU2 – CU3	Toshiba RAV-GM1401ATP-E	2	L _w	L _w 70 dBA				Equivalent to 42dBA at 10m				
CCU1	Catering condenser ¹	1	L _p at 10m									35

Note 1: The model of the catering condensing unit is unknown. The sound pressure level at 10m has been estimated based on typical catering condensing units selections.

Appendix E Plant noise calculations

Summary of predictions

Equipment	L _{Aeq} (dB)
	Receptor R1
AHU	35
EF1	40
EF2	22
EF3	29
CU1	21
CU2	26
CU3	26
CCU1 ¹	19
Cumulative Daytime Period	42
BS4142 feature correction ²	0
BS 4142:2104 Rating Level	42
Cumulative Night-time Period	19
BS4142 feature correction ²	0
BS 4142:2104 Rating Level	19

Notes:

1 - Operates overnight

2 – As there is a large number of similar plant items in the area noise from the new plant will not be distinguishable against the prevailing noise climate

Receptor R1 – Air Conditioning and Catering Condensers

Plant item	Manufacturer noise data		Distance correction		Directivity correction (dB)	Screening correction (dB)	Resultant sound pressure level at receptor, L_{Aeq} (dB)
	Noise level, L_{Aeq} (dB)	Distance (m)	Distance (m)	Corr'n (dB)			
CU1	37	10	21	-6	0	-10	21
CU2	42	10	21	-6	0	-10	26
CU3	42	10	21	-6	0	-10	26
CCU1	35	10	21	-6	0	-10	19

Receptor R1 – AHU

Description	Notes	L_{eq} (dB)								L_{Aeq} (dB)
		63	125	250	500	1K	2K	4K	8K	
Fan L_w		99	91	88	84	80	76	71	66	
System losses		-9	-5	-1	0	0	0	0	0	
Atmospheric side attenuator	I.L	-3	-3	-4	-12	-14	-13	-12	-12	
Sound power level leaving terminal		87	83	83	72	66	63	59	54	
Directivity correction	500 x 500 (90,0)	0	0	0	0	-4	-7	-7	-7	
Distance correction (m)	18 m	-33	-33	-33	-33	-33	-33	-33	-33	
Screening correction		-6	-6	-8	-9	-12	-14	-17	-20	
Resultant at receptor	L_p	48	44	42	30	17	9	2	-6	35

Receptor R1 – Kitchen Extract EF1

Description	Notes	L_{eq} (dB)								L_{Aeq} (dB)
		63	125	250	500	1K	2K	4K	8K	
Fan L_w		101	98	92	88	85	82	77	71	
System losses		-8	-3	-1	0	0	0	0	0	
Atmospheric side attenuator	I.L	-3	-3	-4	-10	-12	-10	-8	-7	
Sound power level leaving terminal		90	92	87	78	73	72	69	64	
Directivity correction	600 x 600 (0,90)	0	0	0	0	-4	-7	-7	-7	
Distance correction (m)	20 m	-34	-34	-34	-34	-34	-34	-34	-34	
Screening correction		-6	-6	-8	-9	-12	-14	-17	-20	
Resultant at receptor	L_p	50	52	45	35	23	17	11	3	40

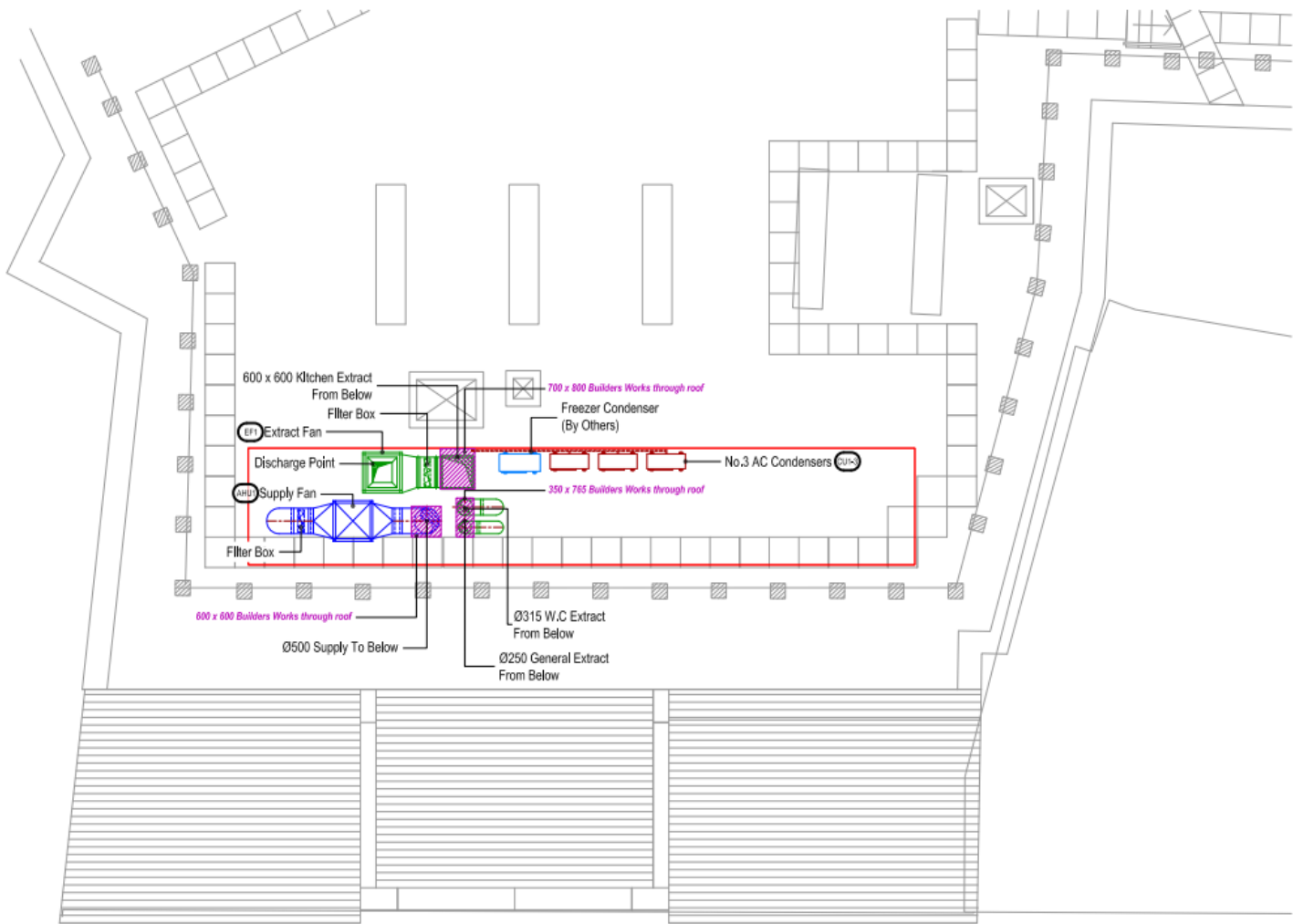
Receptor R1 – General Extract EF2

Description	Notes	L _{eq} (dB)								L _{Aeq} (dB)
		63	125	250	500	1K	2K	4K	8K	
Fan L _w		74	78	72	64	65	63	60	53	
System losses		-13	-9	-5	-1	0	0	0	0	
Atmospheric side attenuator	I.L	0	0	0	0	0	0	0	0	
Sound power level leaving terminal		61	69	67	63	65	63	60	53	
Directivity correction	250 x 250 (90,0)	0	0	0	0	-4	-7	-7	-7	
Distance correction (m)	20 m	-34	-34	-34	-34	-34	-34	-34	-34	
Screening correction		-6	-6	-8	-9	-12	-14	-17	-20	
Resultant at receptor		21	29	25	20	15	8	2	-8	22

Receptor R1 – Toilet Extract EF3

Description	Notes	L _{eq} (dB)								L _{Aeq} (dB)
		63	125	250	500	1K	2K	4K	8K	
Fan L _w		83	81	76	73	71	69	63	59	
System losses		-12	-8	-4	-1	0	0	0	0	
Atmospheric side attenuator	I.L	0	0	0	0	0	0	0	0	
Sound power level leaving terminal		71	73	72	72	71	69	63	59	
Directivity correction	315 x 315 (135,0)	-1	-1	-3	-6	-9	-8	-8	-8	
Distance correction (m)	9 m	-27	-27	-27	-27	-27	-27	-27	-27	
Screening correction		-6	-6	-8	-9	-12	-14	-17	-20	
Resultant at receptor		37	39	34	30	23	20	11	4	

Appendix F Plan showing roof plant



Roof