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**70 WHITELEY STREET, READING
PLANT NOISE IMPACT ASSESSMENT**

Technical Report: R7655-1 Rev 0

Date: 19th November 2018

For: Greggs PLC (South East)
Gould Road
Twickenham
Middlesex
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Document Status and Approval Schedule

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1.0 INTRODUCTION

- 1.1 24 Acoustics Ltd has been commissioned to undertake an assessment of the potential noise impact from proposed plant at 70 Whitely Street, Reading. External air conditioning and extract plant is proposed for installation at the rear of the property.
- 1.2 The assessment has been undertaken following ambient noise surveys at the site undertaken between 31st October and 12th November 2018.
- 1.3 All sound pressure levels quoted in this report are in dB relative to 20 μ Pa. All sound power levels are quoted in dB relative to 10^{-12} Watts. A glossary of the acoustic terminology used in this report is provided in Appendix A.

2.0 SITE DESCRIPTION

- 2.1 The site is located in a mixed commercial and residential area in Reading. The front of the property bounds Whitely Street, a single carriageway road overlooked by retail outlets and residential properties. Access to the rear of the property is provided via a car park, associated with the building, and also provides access to neighbouring residential properties. Residential properties are located to the first and second floors of the property.
- 2.2 It is proposed to convert the ground floor retail space into a Greggs bakery. Planning consent is sought from Reading Borough Council to install two new air conditioning units and an extract vent to the rear of the property. Noise from the plant has the potential to impact nearby residential properties. An assessment has therefore been undertaken to determine the level of noise impact from the proposed plant.
- 2.3 The rear of the property comprises a small, hard surfaced, courtyard area and provides access to the rear service entrance of the ground floor retail unit.
- 2.4 It is understood that the nearest residential properties are located to the first and second floor of the property at a distance of approximately 6m from the proposed extract and 6.5m from the proposed condensers (identified as Receptor 1 in Figure 2).

- 2.5 Ambient noise from retail activities (i.e. pedestrians, commercial activities and road traffic) contributes to the surrounding noise environment. Road traffic is the dominant source of background noise at the site.
- 2.6 Figure 1 shows the existing site layout. Figure 2 shows proposed location of the plant.

3.0 STANDARDS AND GUIDANCE

National Planning Policy Framework and Noise Policy Statement for England

- 3.1 The National Planning Policy Framework (NPPF) [Reference 1], revised in July 2018, states (paragraph 180) in relation to noise that planning policies and decisions should aim to:
- 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 the quality of life;
 - Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.
- 3.2 The NPPF also refers to the Noise Policy Statement for England (NPSE) [Reference 2] which is intended to apply to all forms of noise, including environmental noise, neighbour noise and neighbourhood noise. The NPSE sets out the Government's long-term vision to 'promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development' which is supported by the following aims.
- Avoid significant adverse impacts on health and quality of life;
 - Mitigate and minimise adverse impacts on health and quality of life.
- 3.3 The NPSE defines the concept of a 'significant observed adverse effect level' (SOAEL) as 'the level above which significant adverse effects on health and quality of life occur'. The following guidance is provided within the NPSE:

"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."

- 3.4 In 2014 the Planning Practice Guidance (PPG) was finalised [Reference 3]. This is written to support the NPPF with more specific planning guidance. The PPG reflects the NPSE and states that noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. It also states that opportunities should be taken, where practicable, to achieve improvements to the acoustic environment. The PPG states that noise can override other planning concerns but should not be considered in isolation from the other economic, social and environmental dimensions of the proposed development.
- 3.5 The PPG expands upon the concept of SOAEL (together with Lowest Observable Adverse Effect Level, LOAEL and No Observed Effect Level, NOEL) as introduced in the NPSE and provides a table of noise exposure hierarchy for use in noise impact assessments in the planning system. Table 1 is reproduced from the NPPG and summarises the noise exposure hierarchy, based on the likely average response.

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life	No Observed Adverse Effect	No specific measures required
Lowest Observable Adverse Effect Level (LOAEL)			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/ or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level (SOAEL)			
Noticeable and disruptive	The noise causes a material change in behaviour and/ or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extension and regular changes in behaviour and/ or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/ awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Table 1: PPG Noise Exposure Hierarchy.

- 3.6 In general terms, it is considered that a noise impact with an effects level which is lower than SOAEL is acceptable (providing the effect is mitigated to a minimum). There is currently, however, a major discontinuity between the above guidance and objective technical criteria for use in planning noise impact assessments. For this site it is considered that the appropriate (technical and objective) standard for use in assessing the noise impact is those of British Standard 4142 [Reference 4]. These are described below.

British Standard 4142:2014

- 3.7 BS 4142:2014 provides a method for rating the effects of industrial and commercial sound on residential areas. The standard advocates a comparison between the typical measured L_{A90} background noise level and L_{Aeq} noise level from the source being considered. For rating purposes if the noise source is tonal, intermittent or otherwise distinctive in character, a rating correction of up to 15 dBA is applied. The standard states that a difference between the rating level and the background level of around +10 dBA is an indication of a significant adverse impact, depending on the context and a difference of around +5 dBA is likely to be an indication of an adverse impact again depending on the context. Where the rating level does not exceed the background noise level, this is an indication of the specific sound source having a low impact (depending upon the context).

Summary

- 3.8 With respect to the proposed site and typical planning conditions Reading Borough Council implements for noise from plant, it is considered that the plant rating noise level should be at least 5 dB lower than the background noise level at the nearest residential property.

4.0 ASSESSMENT METHODOLOGY

- 4.1 The following assessment methodology has been used:
- i. A background noise survey has been undertaken to determine existing levels of background noise at the nearest residential property;
 - ii. Calculations of the noise level from plant at the nearest proposed residential properties from manufacturers data;
 - iii. An assessment of the likely noise impact has been undertaken in accordance with the guidance of BS 4142. A target difference of -5 dB or lower between the rating noise level and background noise level.

5.0 ENVIRONMENTAL NOISE SURVEYS

Background Survey

- 5.1 Noise surveys were undertaken to determine the existing background noise level at the closest residential property. Noise monitoring equipment was located at the rear of the property at first floor level and at a distance of approximately 9m away from the nearest residential property. This location is considered representative of background noise levels at the nearest residential windows to the proposed plant. Measurements were undertaken in samples of 5 minutes in terms of the overall free-field A-weighted L_{eq} , L_{90} and $L_{max,f}$ noise levels. Noise measurements were undertaken between 31st October and 12th November 2018.
- 5.2 The survey location is shown in Figure 2.
- 5.3 The survey was undertaken with the following instrumentation:
- Rion NL32 Class 1 accuracy sound level meter;
 - Bruel and Kjaer Type 4231 Class 1 accuracy acoustic calibrator.
- 5.4 The instrumentations calibration was checked before and after the surveys in accordance with the manufacturer's instructions. No significant drift in calibration was recorded. The instrumentation was fitted with an environmental weather shield during the surveys.
- 5.5 Weather conditions during the survey were generally fine and dry although periods of rain have been excluded from the assessment. Due to the sheltered location of the noise monitoring equipment wind speeds were lower than 5 m/s during the measurements.
- 5.6 The results of the background noise survey are shown graphically in Appendix B and summarised in Table 2 (analysed into hourly daytime periods and 15 minute night time periods in accordance with BS 4142). BS 4142 requires a representative background noise level to be used for the assessment period under consideration. In this instance, it is considered that the typical noise level is representative (24 Acoustics determines the typical noise level to be the average minus one standard deviation). This method is considered suitable and is shown in Table 2.

- 5.7 It is understood that the proposed condenser units and extract fan will be in operation between 06:00 to 20:00 hours Monday to Saturday and 07:00 to 18:00 hours on Sundays. The following assessment has assumed these operating times.

Monday to Saturday		Sunday Daytime Operational Hours (07:00 – 18:00) Average dB LA90, 1 hour
Daytime Operational Hours (07:00 – 20:00) Typical dB LA90, 1 hour	Night Time Operational Hours (06:00 – 07:00) Average dB LA90, 15min	
44	44	40

Table 2: Measured Background Noise Levels – Location representative of nearest residential properties.

- 5.8 Please note that 24 Acoustics' interpretation of the typical background noise level is the average less one standard deviation.

6.0 CALCULATIONS AND NOISE IMPACT ASSESSMENT

- 6.1 The proposed plant will comprise two Mitsubishi outdoor condenser units (model: PUHZ-ZRP140VKA, model: PUHZ-ZRP71VHA) and an extract fan (model: EL 315 E2 01). The extract system will include a silencer fitted between the fan and vent (silencer model: SIL 315-600). The extract fan will vent via the rear of the property at first floor level.
- 6.2 The manufacturer's stated plant noise levels are detailed in Tables 3 and 4.

Model	Sound Power Level (dB) per Octave Band Frequency, Hz								dBA
	63	125	250	500	1k	2k	4k	8k	
Kitchen Extract Fan EL 315 E2 01 (Max speed)	76	66	79	78	77	74	70	66	82

Table 3: Plant sound power levels.

Model	Sound Pressure Level at 1 m (dB) per Octave Band Frequency, Hz								dBA
	63	125	250	500	1k	2k	4k	8k	
Mitsubishi PUHZ-ZRP140VKA (Heating)	63	55	53	50	47	42	37	30	52
Mitsubishi PUHZ-ZRP71VHA (Heating)	53	51	52	44	42	38	33	27	48

Table 4: Plant sound pressure levels (at 1 metre).

- 6.3 Calculations have been undertaken to determine the noise level at the nearest residential property from the proposed plant, understood to be the first floor flat of 70 Whitely Street, approximately 6m and 6.5m from the proposed extract flue and condenser units respectively.
- 6.4 The proposed condenser units operate in two modes, heating and cooling, the heating mode presents the highest level and has therefore been used in the calculations to provide a worst-case scenario prediction. Calculations have been completed using single octave data.
- 6.5 It is understood that a silencer is to be fitted between the fan and flue. The sound reduction performance of the proposed silencer is shown in Table 5.

Model	Insertion Loss (dB) per Octave Band Frequency, Hz						
SIL 315-600	125	250	500	1k	2k	4k	8k
	5	8	16	25	19	14	15

Table 5: Extract silencer recommended sound reduction performance.

- 6.6 It is recommended that the hood of the extract flue be designed to direct the air path (and noise) away from residential properties. Please forward details of any duct/flue changes to 24 Acoustics for review.
- 6.7 Screening from the condenser units will be provided by the building. Contributions and losses due to reflections, distance and screening are shown in Appendix C.
- 6.8 Calculations indicate that, with the proposed plant installed as described above the noise level at the closest residential property (Receptor 1 as shown in Figure 2), will be 36 dB L_{Aeq} .

Noise Impact Assessment - BS 4142

- 6.9 BS 4142 states that certain acoustic features can increase the significance of impact of that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location a character correction should be applied to the specific sound level to determine the rating level. The rating correction is determined based upon the impulsivity and tonality of the sound noise level.

- 6.10 The standard states that where tonal and impulsive characteristics are present in the specific sound within the same reference period then these two corrections can both be taken into account. If one feature is dominant, then it might be appropriate to apply a single correction. Where both features are likely to affect perception and response, the corrections ought normally to be added in a linear fashion. It also states that if intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.
- 6.11 In this instance noise from the proposed plant will be continuous and contain no distinctive tones when assessed at the nearest residential property. Noise from existing plant, road traffic and background sources will assist in masking noise from the proposed plant. For this reason, it is not considered necessary to apply a rating correction for tonality or impulsivity.
- 6.12 An assessment of noise levels from the proposed plant has been carried out in accordance with the requirements of BS 4142 at the nearest residential property (Receptor 1). The assessment results are detailed in Table 6.

	Mon -Sat Daytime 07:00 – 20:00	Mon – Sat Night Time 06:00 – 07:00	Sunday Daytime 07:00 – 20:00
Typical Background Noise Level	44 dB L _{A90} , 1 hour	44 dB L _{A90} , 15 min	40 dB L _{A90} , 1 hour
Specific Source Noise Level	36 dB L _{Aeq} , 1 hour	36 dB L _{Aeq} , 15 min	36 dB L _{Aeq} , 1 hour
Character Correction	0 dB	0 dB	0 dB
Rating Noise Level	36 dB	36 dB	36 dB
BS 4142 Assessment Level	-8 dB	-8 dB	-4 dB

Table 6: BS 4142 Noise Impact Assessment, Nearest Residential Property (Receptor 1).

- 6.13 The assessment indicates that at the nearest residential property (Receptor 1) the difference between the BS 4142 rating sound level and the representative background sound level will be less than -5 dB during the Monday to Sunday daytime and night time period and -4 dB during Sunday daytime periods. This suggests noise impact from proposed plant will be better than 'low' as defined in BS 4142:2014.

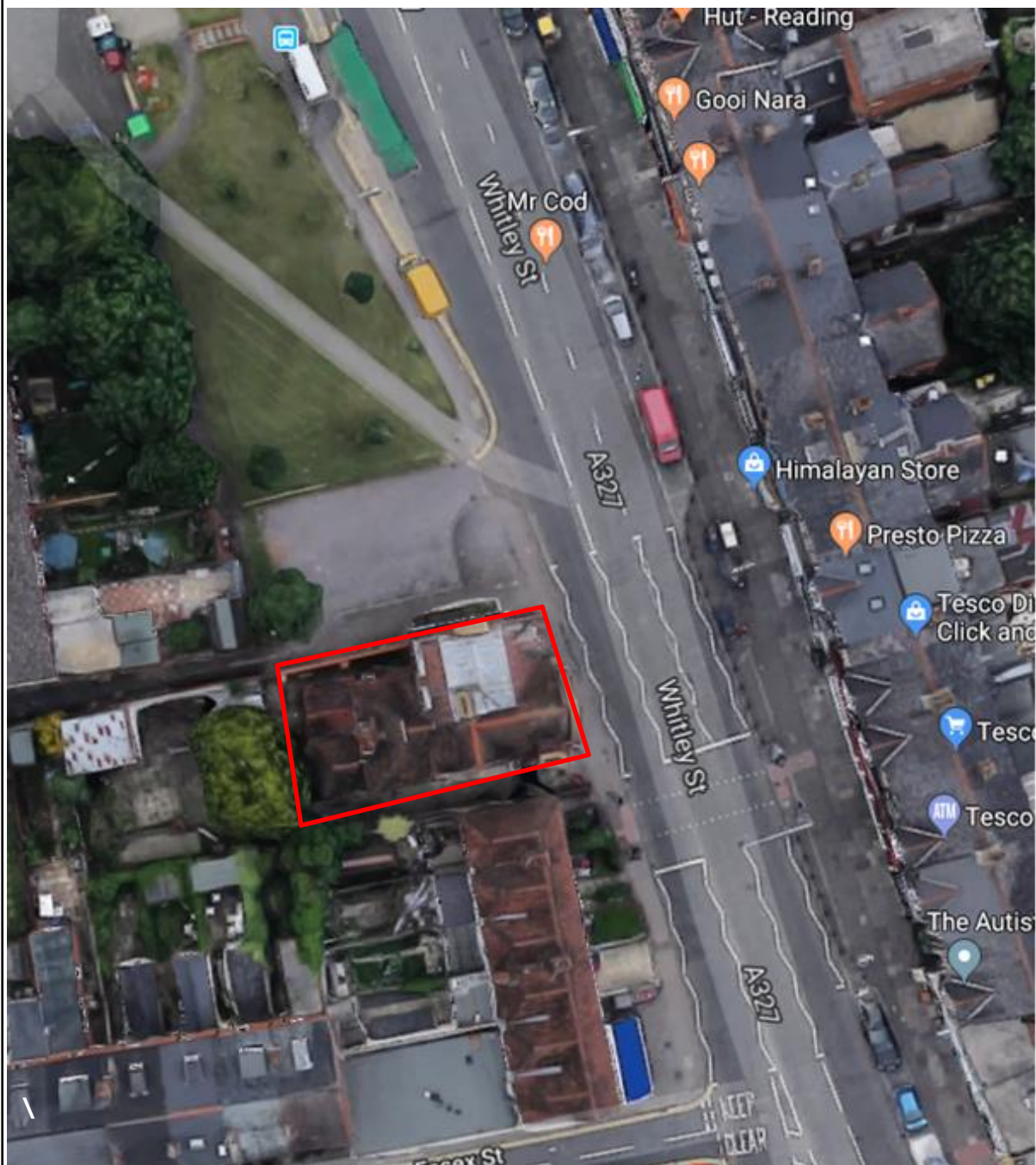
- 6.14 BS 4142 requires uncertainty to be considered as part of the assessment. At this site, an extended background noise survey has been undertaken (over a 13-day period). The sound level meter was calibrated before and after the survey and no significant drift in calibration was recorded. Standard acoustic theory has been used in the noise propagation calculations in compliance with guidance provided by ISO 9613. It is therefore considered that the uncertainty associated with the assessment has been kept to a minimum.
- 6.15 On this basis, it is considered that noise from proposed plant will not harm the amenity of nearby residents and is therefore acceptable.

7.0 CONCLUSIONS

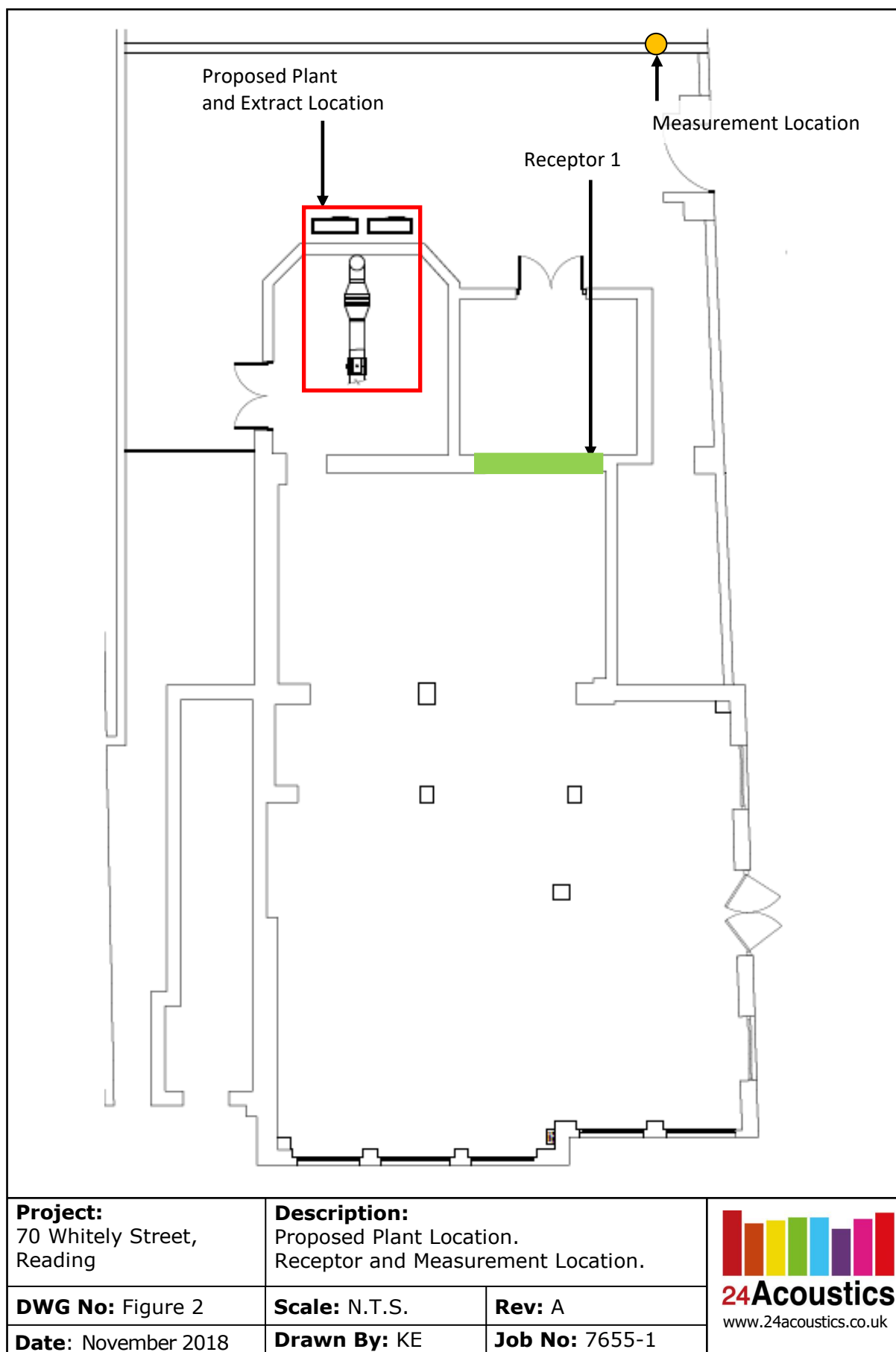
- 7.1 24 Acoustics Ltd has been instructed by Greggs PLC (South East) to undertake an assessment of the noise impact from plant associated with a proposed bakery store at 70 Whitely Street, Reading.
- 7.2 An assessment has been undertaken following background noise measurements at the site undertaken between 31st October and 12th November 2018.
- 7.3 The assessment has indicated that noise impact from the proposed plant at the nearest residential property will be low and is therefore considered acceptable.

REFERENCES

1. Department for Communities and Local Government. The National Planning Policy Framework (NPPF), 2018.
2. Noise Policy Statement for England, Defra, 2010.
3. Planning Practice Guidance, Department of Communities and Local Government, March 2014.
4. British Standards Institution. British Standard 4142: 'Method for Rating and Assessing Industrial and Commercial Sound', 2014.



Project: 70 Whitley Street, Reading	Description: Site Layout Plan		 24Acoustics www.24acoustics.co.uk
DWG No: Figure 1	Scale: N.T.S.	Rev: A	
Date: November 2018	Drawn By: KE	Job No: 7655-1	



APPENDIX A – ACOUSTIC TERMINOLOGY

Noise is defined as unwanted sound. The range of audible sound is from 0 to 140 dB. The frequency response of the ear is usually taken to be around 18 Hz (number of oscillations per second) to 18000 Hz. The ear does not respond equally to different frequencies at the same level.

It is more sensitive in the mid-frequency range than the lower and higher frequencies and because of this, the low and high frequency components of a sound are reduced in importance by applying a weighting (filtering) circuit to the noise measuring instrument. The weighting which is most widely used and which correlates best with subjective response to noise is the dBA weighting. This is an internationally accepted standard for noise measurements.

For variable sources, such as traffic, a difference of 3 dBA is just distinguishable. In addition, a doubling of traffic flow will increase the overall noise by 3 dBA. The 'loudness' of a noise is a purely subjective parameter, but it is generally accepted that an increase/ decrease of 10 dBA corresponds to a doubling/ halving in perceived loudness.

External noise levels are rarely steady, but rise and fall according to activities within an area. In attempt to produce a figure that relates this variable noise level to subjective response, a number of noise indices have been developed. These include:

i) The L_{Amax} noise level

This is the maximum noise level recorded over the measurement period.

ii) The L_{Aeq} noise level

This is "equivalent continuous A-weighted sound pressure level, in decibels" and is defined in British Standard BS 7445 as the "value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time interval, T , has the same mean square sound pressure as a sound under consideration whose level varies with time".

It is a unit commonly used to describe construction noise and noise from industrial premises and is the most suitable unit for the description of other forms of environmental noise. In more straightforward terms, it is a measure of energy within the varying noise.

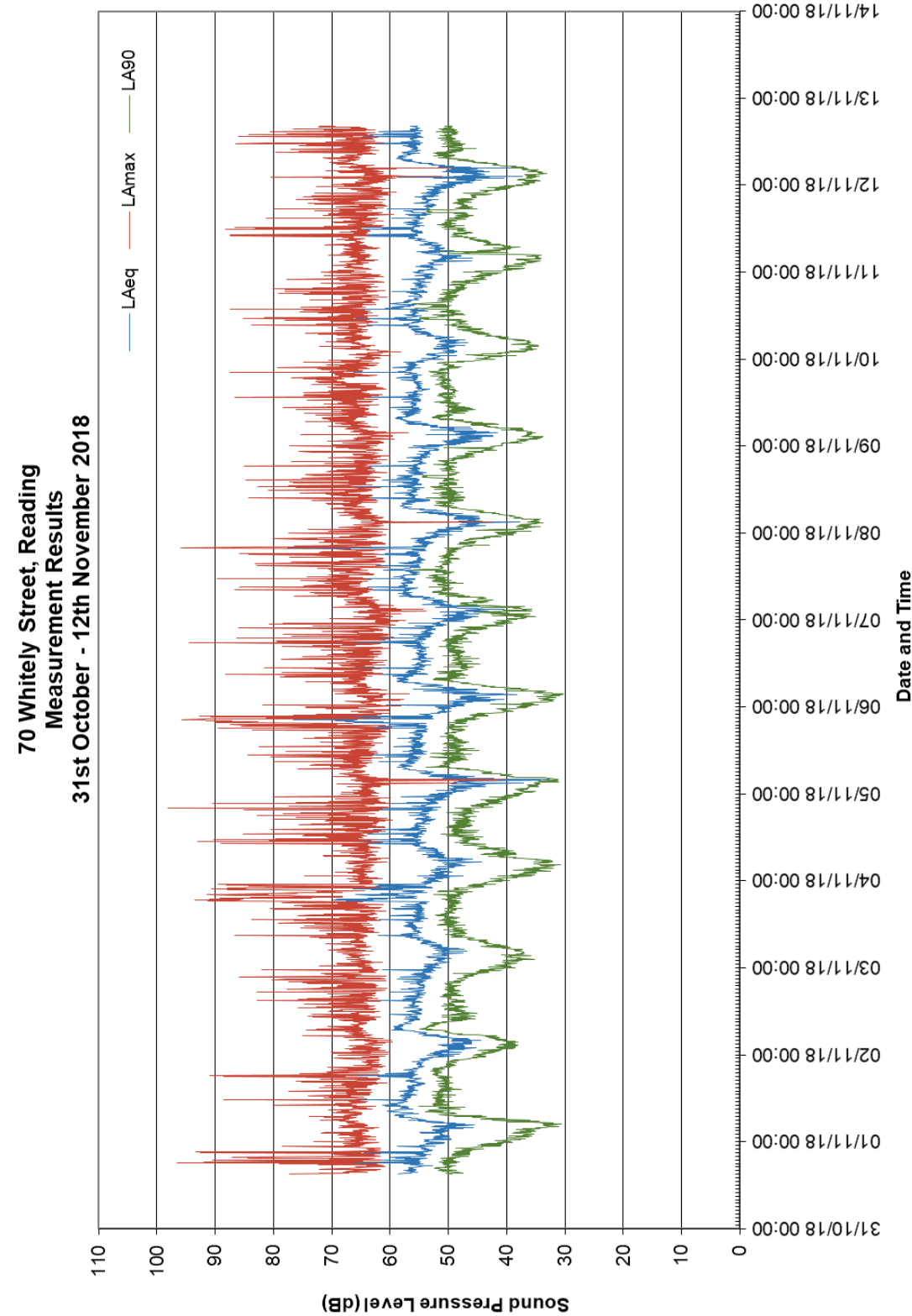
iii) The L_{A10} noise level

This is the noise level that is exceeded for 10% of the measurement period and gives an indication of the noisier levels. It is a unit that has been used over many years for the measurement and assessment of road traffic noise.

iv) The L_{A90} noise level

This is the noise level that is exceeded for 90% of the measurement period and gives an indication of the noise level during the quieter periods. It is often referred to as the background noise level and is used in the assessment of disturbance from industrial noise.

APPENDIX B – AMBIENT NOISE SURVEY RESULTS



APPENDIX C – CALCULATIONS

Unit	63	125	250	500	1k	2k	4k	8k	dB(A)	Comments
Unit Lp at 1m/Lw										
1) Mitsubishi PUHZ-ZRP140VKA	63	55	53	50	47	42	37	30	52	Max heating condition at 1m
2) Mitsubishi PUHZ-ZRP71VHA	53	51	52	44	42	38	33	27	48	Max heating condition at 1m
3) EL 315 E2 01	76	66	79	78	77	74	70	66	82	Max speed, sound power level
Distance Loss										
1) Mitsubishi PLA-ZRP140BA	-16	-16	-16	-16	-16	-16	-16	-16		Distance to nearest window = 6.5 m
2) Mitsubishi PLA-ZRP71BA	-16	-16	-16	-16	-16	-16	-16	-16		Distance to nearest window = 6.5 m
3) EL 315 E2 01	-24	-24	-24	-24	-24	-24	-24	-24		Distance to nearest window = 6 m
Screening										
1) Mitsubishi PLA-ZRP140BA	-10	-10	-10	-10	-10	-10	-10	-10		Building
2) Mitsubishi PLA-ZRP71BA	-10	-10	-10	-10	-10	-10	-10	-10		Building
3) EL 315 E2 01	-5	-5	-5	-5	-5	-5	-5	-5		Partial line of sight
Reflections										
1) Mitsubishi PLA-ZRP140BA	41	33	31	28	25	20	15	8		Courtyard and mounting wall direct reflection
2) Mitsubishi PLA-ZRP71BA	31	29	30	22	20	16	11	5		Courtyard and mounting wall direct reflection
3) EL 315 E2 01	-12	-8	-4	-1	0	0	0	0		Flue end reflection (250mm diameter)
Other losses										
1) Mitsubishi PLA-ZRP140BA	0	0	0	0	0	0	0	0		None
2) Mitsubishi PLA-ZRP71BA	0	0	0	0	0	0	0	0		None
3) EL 315 E2 01	-5	-5	-8	-16	-25	-19	-14	-15		Proposed Silencer (model: SIL 315-600)
Directivity										
1) Mitsubishi PLA-ZRP140BA	0	0	0	0	0	0	0	0		None
2) Mitsubishi PLA-ZRP71BA	0	0	0	0	0	0	0	0		None
3) EL 315 E2 01	-3	-3	-3	-3	-3	-3	-3	-3		Directed flue/vent
Levels at nearest sensitive window										
1) Mitsubishi PLA-ZRP140BA	37	29	27	24	21	16	11	4	26	Direct noise level from condenser unit
1) Mitsubishi PLA-ZRP140BA (Direct Reflection)	41	33	31	28	25	20	15	8	30	Reflected noise level from condenser unit
2) Mitsubishi PLA-ZRP71BA	27	25	26	18	16	12	7	1	22	Direct noise level from condenser unit
2) Mitsubishi PLA-ZRP71BA (Direct Reflection)	31	29	30	22	20	16	11	5	26	Reflected noise level from condenser unit
3) EL 315 E2 01	28	22	35	30	20	23	24	20	32	Noise level from extract system
Total									36	Level from plant at nearest residential window