Paragon
Acoustic Consultants

Greggs Bakery / Twickenham

Environmental Noise Survey & Limiting Noise Levels

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Acoustic Consultants

Project:	Former Greggs Bakery Site Redevelopment			
Client:	London Square			
Report Title:	Environmental Noise Survey and Limiting Plant Noise Levels			
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Contents

1.0 Introduction

It is proposed to construct approximately 115 new residential properties and a B1 office building on a plot of land of approximately 1.1 ha, presently occupied by industrial units operated by Greggs bakery.

Paragon Acoustic Consultants Ltd has been commissioned to conduct an environmental noise survey to obtain statistical noise data to characterise the existing local background and ambient noise climate at the site and to derive noise limits to atmosphere based on Local Authority Noise Policy and other relevant guideline documents. This information shall be used at the appropriate stage of the project to determine if the proposed new mechanical plant selections will meet with the derived noise limits.

Given the residential nature of the site, the possibility of 24-hour plant operation has been considered.

2.0 Site Description and Proposed Plant Location

2.1 Site Description

The Greggs Bakery development site is located off the Gould Road, Twickenham, TW2 6RT in the London Borough of Richmond upon Thames in South West London, within a predominantly residential area. The site currently stands as a single industrial unit occupied by Greggs bakery. The bakery buildings includes a number of offices, sheds, production buildings and hard standings.

Immediately north of the site is the River Crane and the Waterloo to Reading railway line. Beyond which lies mixed residential, commercial and sports facility areas. To the east of the site are established residential areas and immediately to the west is ‘Crane Mews’, a collection of commercial studios, most of which have recently been converted into residential units. Edwin Road delineates the south of the site, beyond which are located Turner Automotive vehicle repair workshop and Youngs Welders outlet. To the west of the site lie residential properties on Gould Street and Crane Road.

The site is illustrated by the plan in Appendix A.

3.0 Existing Noise Climate

3.1 Road Traffic

Noise emanating from vehicular road traffic was deemed to provide a contribution to the ambient noise climate proximal to the nearest affected residential premises. The overall noise comprises both individual “event” type emissions from vehicles passing along local roads, and also continuous low frequency “rumble” due to middle distance traffic flows.

3.2 Rail Traffic

Rail traffic noise events associated with the railway lines to the north of the site were observed during the manned period at the start and end of the survey.

3.3 Aircraft

Aircraft over flights were observed during the manned survey at the start and end of the period and due to the site location in relation to the Heathrow airport approach and take of routes it is expected that Aircraft noise will have been audible for a large percentage of the survey periods. Their contribution to the background noise climate will have been included within the measurements taken.

3.4 Mechanical Noise Sources

No mechanical noise sources were observed at the site.

4.0 Environmental Noise Survey

4.1 Measurements

MP1: rear of the site (North)

- Start : 08/11/2018 at 10:57 hours
- End : 12/11/2018 at 13:32hours

The noise monitoring took place between the following dates / times:

MP2: (Front of the site (South))

- Start : 08/11/2018 at 11:32 hours
- End : 12/11/2018 at 13:37hours

The noise monitoring was generally un-manned and was undertaken at the location as described below.

- **MP1:** North of the site at 5m in height adjacent to the River Crane. Measurements considered free field
- **MP2:** South of the site external to an existing industrial building. Considered to be façade measurements

The measurement location is illustrated on the site layout drawing in Appendix A.

Various statistical broad-band and spectral sound pressure level measurements were obtained during the survey. A measurement time interval Tm = 15 minutes was used for sampling. Measurements of the percentile level $L_{A90,T}$ were made using time weighting F as per clause 3.4 of BS 4142:2014.

The quantities recorded included:

- **L_{Aeq}:** the equivalent continuous A-weighted sound pressure level over the measurement period
- **L_{Amax}:** the maximum A-weighted sound pressure level for the measurement period
- **L_{A10}:** the A-weighted sound pressure level exceeded for 10% of the measurement period
- **L_{A90}:** the A-weighted sound pressure level exceeded for 90% of the measurement period

4.2 Weather during survey period

Weather conditions at the start of the survey were mild and dry with a slight breeze. At the end of the survey the weather conditions were similar. Web site data suggests that the survey duration daytime temperatures were in the order 14 degrees at their highest and during the night time the temperature dropped as low as 5 degrees. Web site data suggests wind direction generally south west / south / south east depending on the day. As the survey was generally unmanned, full weather conditions during the survey cannot be reported accurately, however, the survey duration was considered of appropriate time to allow a reasonable representation of the noise climate to be established.

4.3 Instrumentation

Sound pressure level measurements were obtained using the following instrumentation, complying with the Type 1 specification of BS EN 60804, BS EN 60651, BS EN 60942, BS EN 61260, and BS EN 61672-1, as follows:

- **Position MP1:** Norsonic Type 118 Sound level analyser, serial number 31663, Norsonic Type 1225 ½" microphone
- **Position MP2**: SVAN 971 Sound level meter serial number 56214, pre-amplifier type SV18 serial number 57317, and type 7052E ½" microphone serial number 65484.

Calibration checks were made prior to and after completion of measurements using a Norsonic Type 1251 acoustical calibrator complying with Class 1 of BS EN 60942, calibration level 114.0 dB ± 0.3 dB, @ 1.0 kHz. All instrumentation carries a current manufacturer's certificate of conformance a copy of which is available upon request.

4.4 Results

Broadband sound pressure level data over the survey period (L_{A90} background levels, L_{Aeq} and L_{Amax} measurements) are shown graphically below:

Figure 1: Graphical Survey Data – MP 1 – North of site

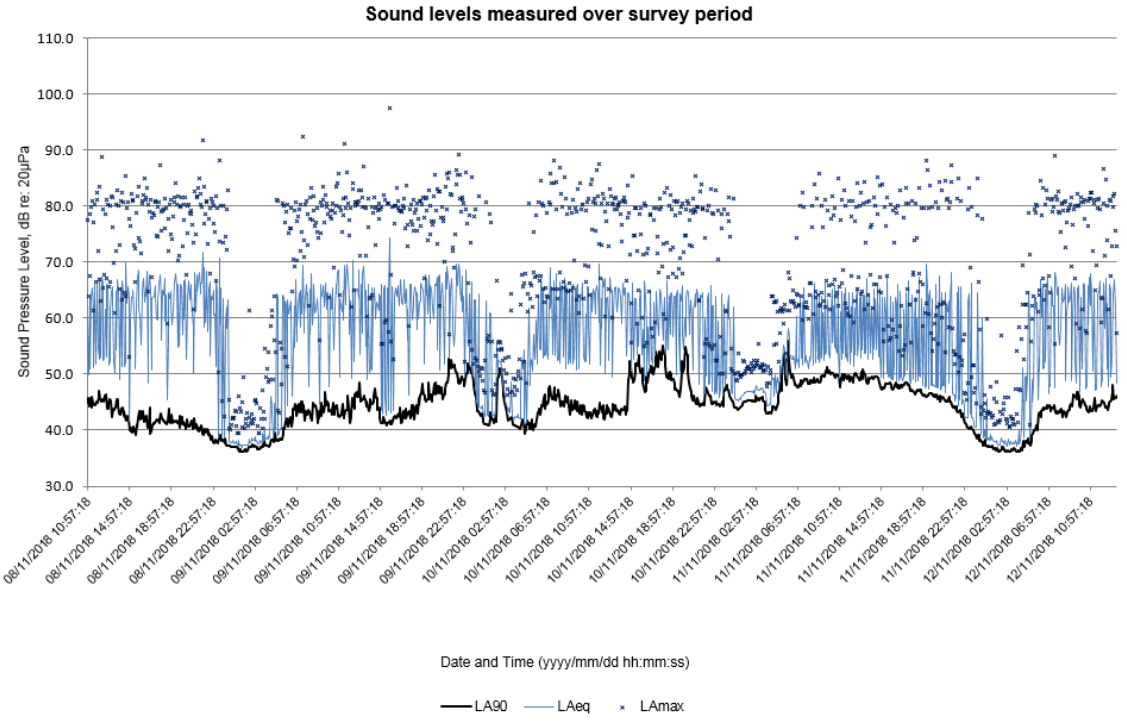
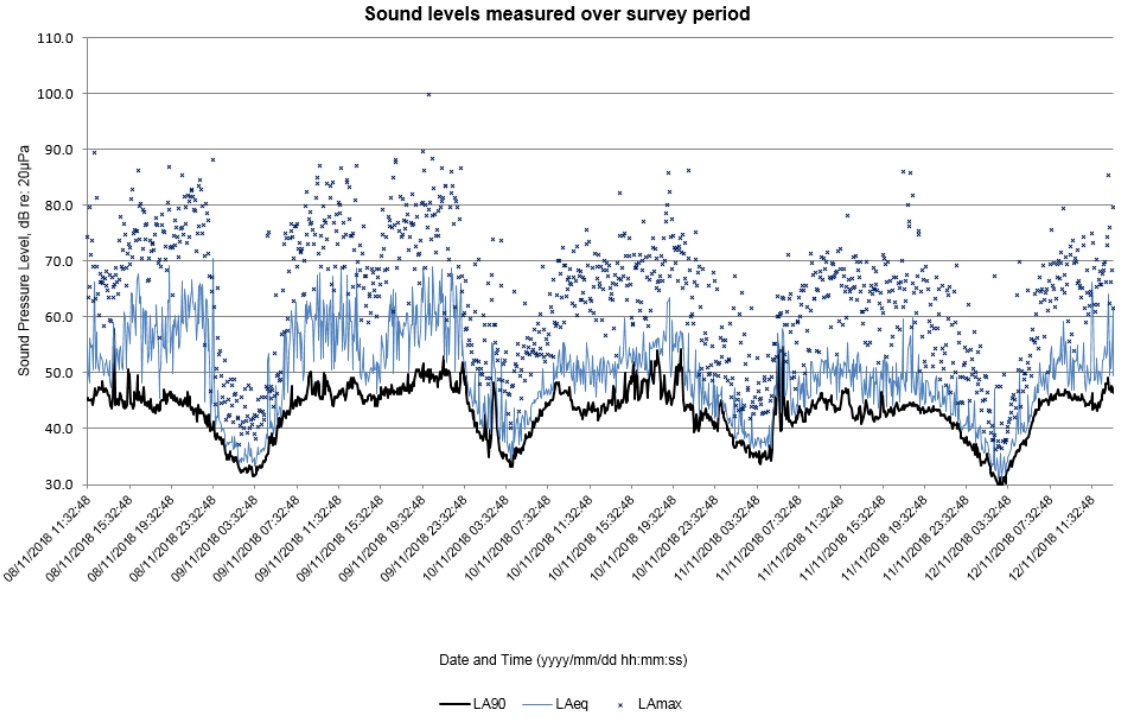


Figure 2: Graphical Survey Data – MP 2 – south of site



The Tabulated recorded survey data is available upon request.

The lowest daytime and night-time background sound levels obtained are summarised below:

Table 1: Lowest background sound levels

Measurement Position	**Daytime 07:00-23:00 $L_{A90,(15\ min)}$**	**Night-time 23:00-07:00 $L_{A90,(15\ min)}$**
MP1 measurement position rear of the site (North)	38 dB	36 dB
MP2 measurement position Front of the site (South)	39 dB	29 dB

5.0 Evaluation of External Noise Criteria

The local vicinity contains properties of mixed usage, which must be given due consideration in terms of acceptable levels of noise exposure from the new plant.

5.1 Noise Sensitive Properties

It is necessary to consider the requirements of the Local Authority.

The London Borough of Richmond Upon Thames Supplementary Planning Document (SPD) document headed “Development Control for Noise Generating and Noise Sensitive Development” adopted September 2018 discusses noise issues with building services plant, usually air-conditioning, in Section 6.0. Although this Section of the document deals with New Noise generating industrial and commercial Development it is considered reasonable to

consider the requirements for mechanical plant that may be associated with the proposed redevelopment of Greggs Bakery site.

The document refers to BS4142:2014: "Methods for Rating and Assessing Industrial and Commercial Sound". Table 2 of the document is reproduced as follows:

Table 2: New Industrial and Commercial Development

Noise Significance Risk	BS4142 Outcome	Planning Advice
Minimal	$L_{A,Tr} - L_{A90,T} \leq -5$	Where the rating level of noise is below the background noise level by at least 5dB, this indicates that the proposed NGD is likely to be acceptable from a noise perspective. The Borough will seek this level of compliance in most noise sensitive areas and/or where there is a requirement to mitigate creeping background effects.
Low	$L_{A,Tr} - L_{A90,T}$ is > -5 & ≤ 0	Where the rating level of noise is equal to, or below the background noise level by up to 5dB, this indicates that the proposed NGD may be acceptable from a noise perspective but will be more context dependent, i.e. extent and effect on noise sensitive receivers (externally and internally). Compliance within this range is more applicable to less sensitive sites or where there is no requirement to mitigate creeping background effects.
Medium	$L_{A,Tr} - L_{A90,T}$ is > 0 & $\leq +5$	Where the rating level of noise is equal to, or above the background noise level by up to 5dB, this indicates that the proposed NGD is less likely to be acceptable from a noise perspective and will be context dependent, i.e. extent and effect on noise sensitive receivers (externally and internally). Compliance within this range is typically only applicable to non-sensitive sites or where there are overriding other reasons why development should be considered. It will typically be necessary for the applicant to confirm how adverse impacts from the NGD will be mitigated and minimised. It is less likely that planning consent will be granted.
High	$L_{A,Tr} - L_{A90,T} > +5$	Where the rating level of noise is above the background noise level by more than 5dB, this indicates that the proposed NGD is unlikely to be acceptable from a noise perspective and planning consent is likely to be refused on noise grounds.

Note: All terms as defined in BS4142

The document confirms that "As a general rule, the Borough will seek to achieve the external noise standards detailed in Table 2 above.

BS4142:2014: "Methods for Rating and Assessing Industrial and Commercial Sound" also advises the following:

"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."

Under the circumstances, the background noise level and the rating level at night are considered to be low at night at the front of the site.

World Health Organisation Night Noise Guidelines for Europe also provide details of the Health effects observed in the population based on the average night noise level over a year Lnight,outside.

Table 3 – "Effects of different levels of night noise on the population's health" given in the document is reproduced as follows:

Average night noise level over a year $L_{night,outside}$	Health effects observed in the population
Up to 30 dB	Although individual sensitivities and circumstances may differ, it appears that up to this level no substantial biological effects are observed. $L_{night,outside}$ of 30 dB is equivalent to the no observed effect level (NOEL) for night noise.
30 to 40 dB	A number of effects on sleep are observed from this range: body movements, awakening, self-reported sleep disturbance, arousals. The intensity of the effect depends on the nature of the source and the number of events. Vulnerable groups (for example children, the chronically ill and the elderly) are more susceptible. However, even in the worst cases the effects seem modest. $L_{night,outside}$ of 40 dB is equivalent to the lowest observed adverse effect level (LOAEL) for night noise.
40 to 55 dB	Adverse health effects are observed among the exposed population. Many people have to adapt their lives to cope with the noise at night. Vulnerable groups are more severely affected.
Above 55 dB	The situation is considered increasingly dangerous for public health. Adverse health effects occur frequently, a sizeable proportion of the population is highly annoyed and sleep-disturbed. There is evidence that the risk of cardiovascular disease increases.

It will be seen that up to 30 dB “Although individual sensitivities and circumstances may differ, it appears that up to this level no substantial biological effects are observed. Lnight,outside of 30 dB is equivalent to the no observed effect level (NOEL) for night noise”.

It is also noted that “40 dB is equivalent to the lowest observed adverse effect level (LOAEL) for night noise”.

Under the circumstances, it is considered reasonable to consider absolute noise levels based on the information given above and the following:

If a night time noise level of 40 dB was achieved external to the residential properties, based on the World Health Organisation Night Noise Guidelines for Europe – “Effects of different levels of night noise on the population’s health” this would be *equivalent to the lowest observed adverse effect level (LOAEL) for night noise*”. If 30 dB could be achieved the documents advises that “*it appears that up to this level no substantial biological effects are observed. Lnight,outside of 30 dB is equivalent to the no observed effect level (NOEL) for night noise”.*

As such, it is proposed that the cumulative noise of future mechanical plant associated with the site shall be designed such that the Rating Level (LAr,Tr) is at least 5 dB(A) below the Background Level LA90 during the daytime (07:00-23:00 hours) and no greater than a Rating Level (LAr,Tr) of 30 dB during the night time (23:00-07:00 hours)

5.2 Commercial Properties

British Standard BS 4142:2014 use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling. It is considered that this relates to residential premises and it would be reasonable to assess noise emissions to commercial properties in line with the guidelines provided in BS 8233:2014.

Figure 3: BS8233:2014 table of typical noise levels in non-domestic buildings

Table 6 **Typical noise levels in non-domestic buildings**

Activity	Location	Design range dB $L_{Aeq,\,T}$
Speech or telephone communications	Department store Cafeteria, canteen, kitchen	50 – 55
	Concourse Corridor, circulation space	45 – 55
Study and work requiring concentration	Library, gallery, museum	40 – 50
	Staff/meeting room, training room	35 – 45
	Executive office	35 – 40
Listening	Place of worship, counselling, meditation, relaxation	30 – 35

Figure 4: BS8233:2014 table of indoor ambient noise levels

Table 2 **Indoor ambient noise levels in spaces when they are unoccupied and privacy is also important**

Objective	Typical situations	Design range $L_{Aeq,T}$ dB
Typical noise levels for acoustic privacy in shared spaces	Restaurant	40 – 55
	Open plan office	45 – 50
	Night club, public house	40 – 45
	Ballroom, banqueting hall	35 – 40
	Living room	35 – 40

NOTE See Noise control in building services [28] and BS EN ISO 3382.

In view of the details presented above it is considered reasonable to adopt a noise criterion of 40 dB $L_{Aeq,T}$ for commercial office space in the proximity of the site

It is also reasonable to consider a noise criterion external to commercial property windows that takes account of the internal design range, plus the loss expected through an openable window. In a research study conducted for DEFRA NANR116: "Open/Closed Window Research", numerous references are provided which quantify losses through open and partially open windows:

Figure 5: DEFRA NANR16 Summary of findings

Information Source	Summary of Findings
PPG 24 (1994) [2]	A reduction of 13 dB(A) from the facade level is assumed for an open window
WHO (1999) [4]	A reduction of 15 dB from the facade level is assumed for a partially open window. (no reference)
BS 8233 (1999) [5]	Windows providing rapid ventilation and summer cooling are assumed to provide 10 - 15 dB attenuation (no specific reference)
BRE Digest 338 (1988) [6]	A partly open window has an averaged level difference, $D_{1m+av100-3150}$ of 15 dB
DoE Design Bulleting 26 (1972) [7]	A reduction of 5 dB(A) with a window wide open
Nelson - Transportation Noise (1987) [8]	Sound insulation of an open single window is 5 – 15 dB. (theoretical)
Mackenzie & Williamson DoE Report (1972–73) [9],[10]	A vertical sliding sash window open 0.027 m^2 (summer night-time ventilation) and 0.36 m^2 (daytime summer ventilation) provided a sound level reduction of 16 and 11 dB(A) respectively. (Lab Study)
Kerry and Ford (1973 – 74) [11], [12]	A horizontal sliding sash window open 25 mm and 200 mm provided averaged sound reduction indices, R_{av} of 14 and 9 dB respectively. (Field Study)
Lawrence and Burgess (1982 – 83) [13],[14]	A vertical sliding sash open 9% of the total façade provided a sound reduction index R_w 10 dB. (Field study)
Hopkins (2004) [15]	Road traffic noise reductions through window openings resulted in reductions of between $D_{2m,n,T}$ 8 and 14 dB. (Field Study)

Table 1.1 Summary of open-window acoustic transmission literature

The findings of the study are referenced in this report to substantiate the use of a 13dB(A) loss through a partially open window.

5.3 External Noise Criteria

The derived external noise criteria which the new building services plant shall be required to achieve are shown below. For the sake of robustness, the lowest of the LA90 noise level has been used during the daytime for both measurement positions.

Table 2: Limiting Noise Criteria applicable at the affected premises

Plant Location	Receptor	Daytime 07:00-23:00 L_{ArT}	Night-time 23:00-07:00 L_{ArT}
Any Location on the site	Noise Sensitive Developments [3]	33 dB [1] [2]	30 dB [1] [2]
	Commercial	53 dB L_{Aeq} [2]	

[1] Note: LArT – Assessed in accordance with BS 4142:2014.

[2] Note: The limiting noise levels are deemed to be considered at a position 1 metre outside the nearest affected premises.

[3] Note: All residential properties including those of the proposed development.

5.4 Vibration

It is recommended that the client provisions for appropriate vibration isolation mountings for the proposed mechanical plant items. It is recommended that for all future plant located within or connected structurally to buildings containing residential dwellings the plant be installed on vibration isolation mounts providing a minimum of 98% isolation efficiency at all forcing frequencies using an isolation mount system approved by the plant supplier. In addition, all pipework should be suitably isolated from the building structure.

For plant located outside of buildings on the ground vibration isolation shall be assessed and reasonable precautions taken to limit vibration transmission to buildings including the introduction of suitably isolation mounts to pipework.

6.0 Conclusions

A background noise survey has been undertaken to determine the noise climate likely to exist in the vicinity of the proposed Greggs Baker development site off the Gould Road, Twickenham, TW2 6RT, where the positioning of new mechanical plant is proposed.

Appropriate external noise criteria have been identified on the basis of Local Authority noise policy, and other industry standards, codes of practice and references. These external noise criteria will be used in the future selection of mechanical plant and any noise mitigation scheme necessary.

With due consideration to achieving compliance with these external noise criteria, future objections would not be expected in respect of noise emissions from any new fixed mechanical plant which may form part of the planning application.

Appendix A: Site Plan