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Building Services Engineering | Sustainability | Acoustics

The Revelator, Brighton

Harvey's Brewery

Noise emission assessment

Revision 00

08/07/2021

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Project Particulars

Client Name: Harvey's Brewery

Project Name: The Revelator, Brighton

Disclaimer

Revision History

Revision	Description	Date	Prepared By	Checked By
00	Initial issue	08/07/2021	Jacob Perry BMus IEng MIOA	John Lloyd BEng MSc CEng MCIBSE MIOA

Contents

1 Introduction

1.1 Proposals are in place for the refurbishment of several areas within The Revelator pub in Brighton. As part of the proposals, a new kitchen extract fan will be installed (replacing an existing unit) in a new location.

1.2 This report presents an assessment of noise emission from the new kitchen extract fan, and the impact that this may have on the neighbouring properties.

1.3 In order to inform the assessment, an external noise survey was conducted at the site. Section 2 of this report presents a description of the site, the survey methodology, and the measurement results.

1.4 Section 3 details the noise emission assessment in line with British Standard 4142: 2014 (the relevant British Standard), and determines the expected impact of noise emission from the plant on the neighbouring properties.

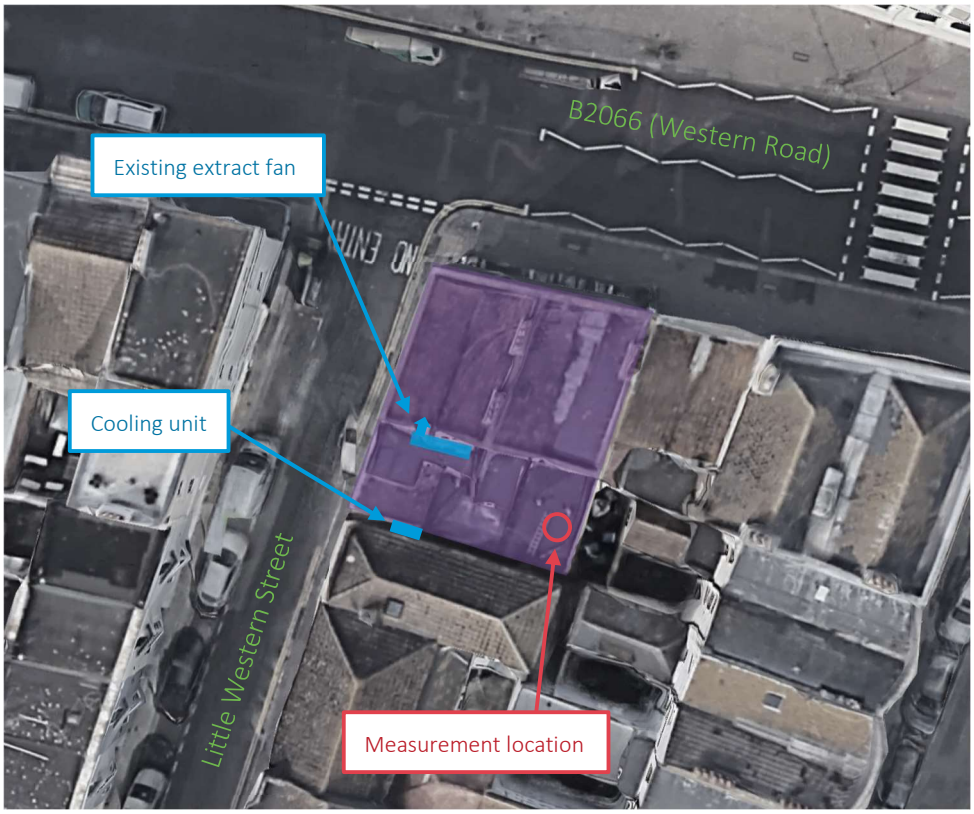
1.5 Section 4 provides conclusions drawn from the noise emission assessment.

2 External noise survey

2.1 Site description

2.1.1 The pub is located on the B2066 (Western Road) through Brighton, and the existing extract fan is located on a first-floor roof to the rear of the property (with a duct termination on the main roof of the building. Key areas are highlighted on the satellite image in Figure 2-1.

Figure 2-1 Satellite image of the site and surrounding area (courtesy of Google)



2.1.2 The existing extract fan was not in operation during the survey period. An external cooling unit, located in the gap between the rear of The Revelator and the neighbouring building, was observed to turn on for short periods while the pub was occupied.

2.1.3 The site is on the corner of Little Western Street and Western Road (B2066). The former is a side street with parking, and was observed to have only occasional traffic of light vehicles/vans. The latter (Western Road) is one of the main roads through Brighton and had frequent traffic including occasional heavy goods vehicles.

2.1.4 The noise climate at the measurement location was generally dominated by background traffic noise, occasionally punctuated by louder vehicles on the B2066 and passbys on Little Western Street. When the cooling unit was operational, this was observed to be louder than the background traffic noise but not as loud as traffic passbys.

2.1.5 The survey was undertaken while only minor lockdown restrictions (owing to the ongoing COVID-19 pandemic) were in place in the UK. It is considered that the measurements represent a sufficiently "typical" noise climate for the area, but it could be considered that noise levels may increase slightly as more businesses reopen.

2.2 Measurement methodology

2.2.1 Continuous, unattended noise level measurements were conducted at a single location considered to be representative of the background sound level experienced at the neighbouring properties nearest to the proposed location for the extract fan. The measurement location is shown in Figure 2-1.

2.2.2 Measurements were conducted between 12:45 on 30/06/2021 (Wednesday) and 12:45 on 02/07/2021 (Friday).

2.2.3 The following measurement equipment was used for the survey:

Table 2.1 Measurement equipment used for noise survey

Equipment	Description	Serial number
Norsonic 131	Sound level meter	1312766
Norsonic 1218	Microphone protection system	12182561
Norsonic 1251	Portable sound calibrator	125134926

2.2.4 Statistical and octave-band data were recorded in 15-minute samples. The use of a shorter sampling period would lead to a wider range of average levels (lowest levels being lower and highest levels higher), while a longer sampling period lacks fine detail and may smooth over short changes in sound level. The sampling period used is considered suitable for representing the background sound levels at the neighbouring properties, and is in-line with the guidance in BS 4142: 2014.

2.2.5 The "fast" (125ms) time-weighting was used in accordance with current recommended practice.

2.2.6 The calibration of the sound level meters and associated microphones were checked prior to and on completion of the measurement period in accordance with recommended practice. No significant drift in calibration occurred during the measurement period.

2.2.7 The weather conditions throughout the measurement period were generally dry with little wind, and so are not expected to have significantly affected the measurement results.

2.2.8 Attended measurements were taken at the measurement location with the extract fan turned on, and the level of noise from the existing fan at this location was established to be around 49 dB L_{Aeq} (based on $L_{A90,1min}$ measurements). It was not considered that noise from the extract fan was dominant at this location, as it was quieter than the cooling unit and traffic passbys, however it could be heard in the absence of these sources.

2.3 Measurement results

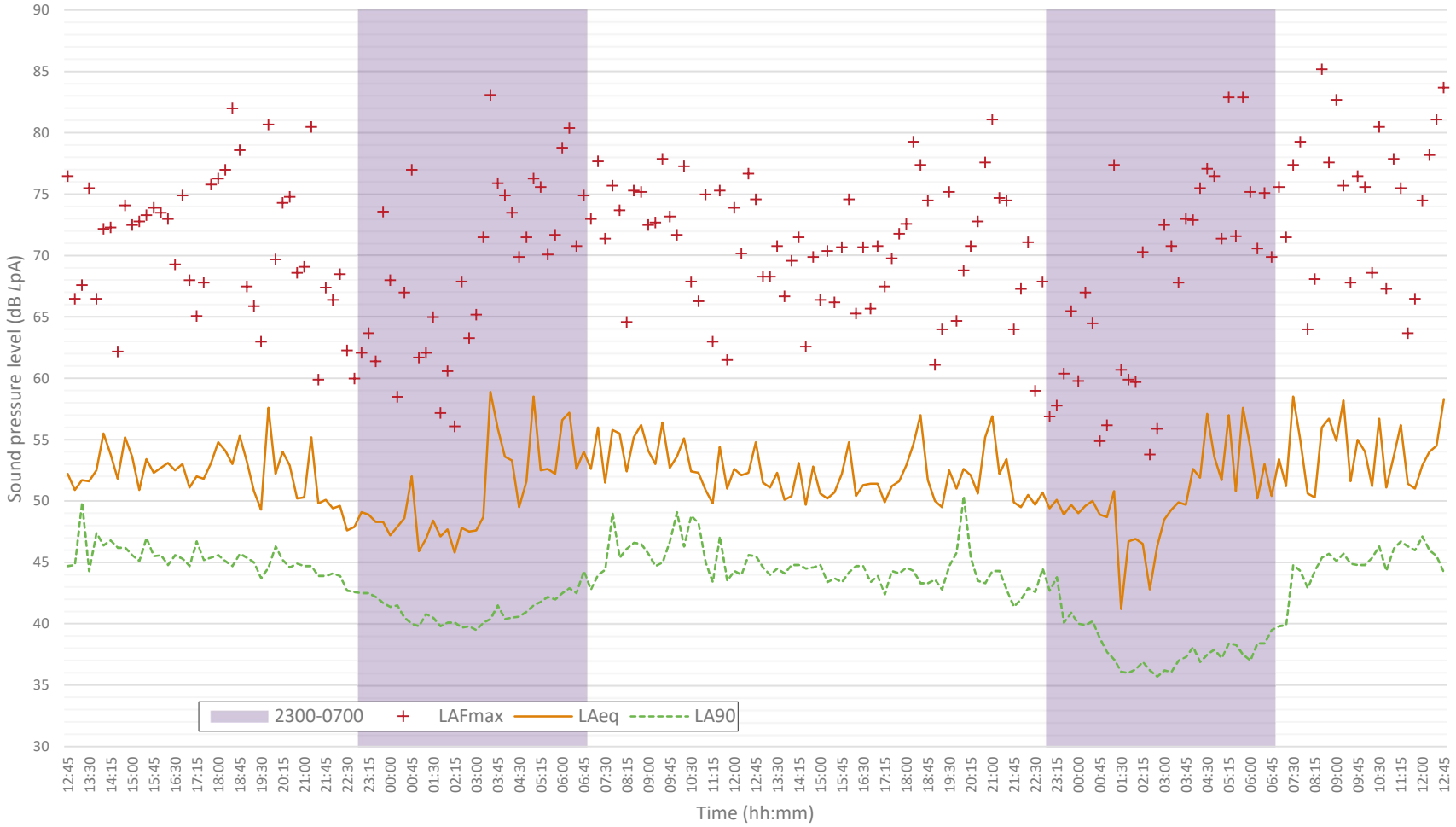
2.3.1 A level-history graph of the results is presented in Figure 2-2. The full data are available in electronic format on request.

2.3.2 The data can be seen to follow a slight diurnal pattern, with the quietest levels measured overnight before rising to their highest point during the day. This is typical for sites exposed to road traffic noise.

2.3.3 The occasional spikes in the $L_{A90,15min}$ data may have been caused by the operation of the cooling unit or particularly high levels of traffic flow on the B2066. It is possible that, as the pub becomes more busy and other local businesses reopen, these spikes could become more frequent.

2.3.4 The majority of the maxima are believed to have been caused by traffic passbys on Little Western Street, however it is noted that there was a sharp increase at c.0400 on both of the measured mornings. The spectral data suggests that this could be due to birdsong/chirps, and it was noted while on site that a number of seagulls were present in the lightwell behind the pub and neighbouring residences.

Figure 2-2 Level-history graph of external noise survey results, 30/06/2021 to 02/07/2021



3 Assessment of noise impact

3.1 Criteria

3.1.1 Brighton and Hove City Council are not believed to have specific criteria that potentially noise generating developments must achieve, but their website recommends that an assessment of new plant be completed in line with BS 4142:2014.

3.1.2 BS 4142: 2014 (+A1:2019) *Methods for rating and assessing industrial and commercial sound* is the relevant industry standard for assessing the impact of industrial noise sources on noise-sensitive receivers.

3.1.3 When considering appropriate criteria for planning decisions relating to noise emission from new plant, it is also important to consider the aims of the Noise Policy Statement for England (NPSE). This document is referenced in the National Planning Policy Framework (NPPF), and lists the following aims:

> *Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:*
>
> – *avoid significant adverse impacts on health and quality of life;*
> – *mitigate and minimise adverse impacts on health and quality of life; and*
> – *where possible, contribute to the improvement of health and quality of life.*

3.1.4 It is believed that, by targeting a low impact according to the BS 4142: 2014 methodology, the local authority will be satisfied that the level of noise emission is appropriate for the area – and that the risk of adverse impact on the neighbours' health and quality of life is satisfactorily minimised.

3.2 BS 4142: 2014

3.2.1 The methodology within BS 4142: 2014 is to establish a *rating level* for the new noise source(s) at each noise-sensitive receiver, and compare this to the established *background sound level* for the same receiver.

3.2.2 The methodology also allows for the estimate of the impact to be modified depending on the context surrounding the new noise source. Considerations such as the character of the existing noise climate and the sensitivity of the receiver may influence the assessed impact.

3.2.3 The *rating level* is established from the *specific sound level*¸ a quantitative value for the predicted noise contribution from the new plant as it would be experienced at the noise-sensitive receiver. The *rating level* is the *specific sound level* plus a number of corrections to account for any characteristics to the noise that might make them particularly noticeable or unpleasant. These may include tonality (e.g. humming, whistling), impulsivity (e.g. banging, rattling), and intermittency.

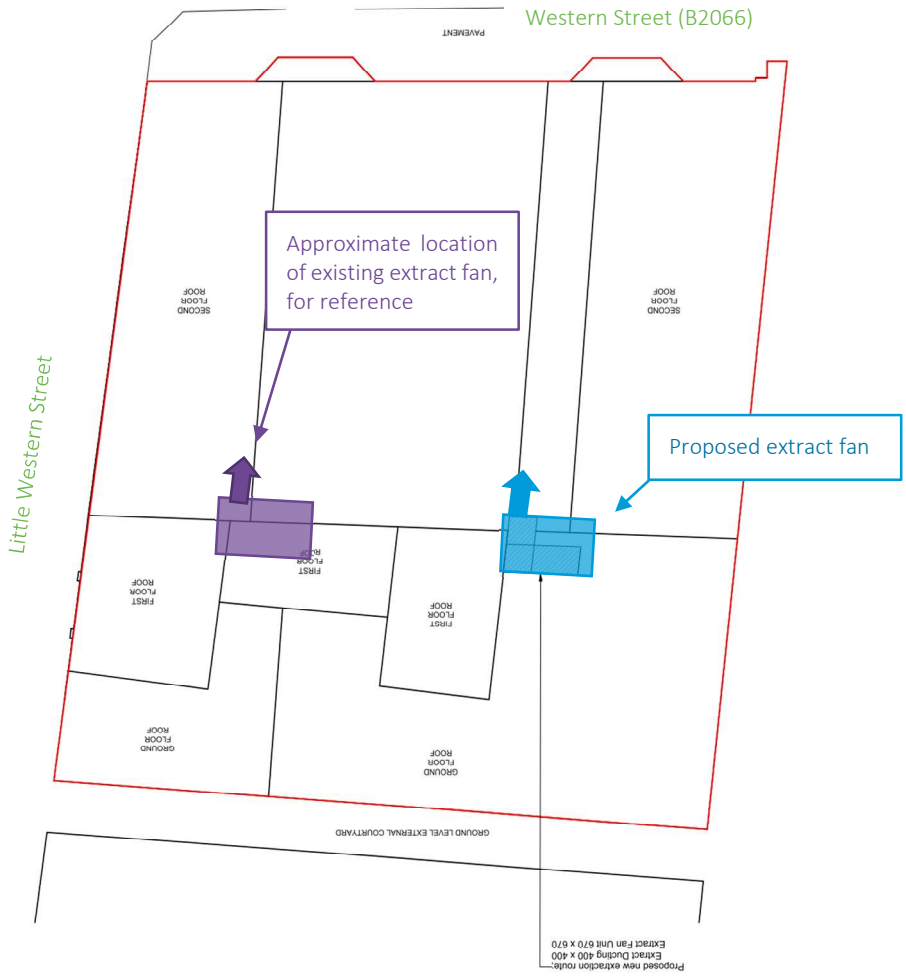
3.2.4 The following advice is given to qualify the numerical difference between the assessed *rating level* and the *background sound level*:

> Typically; the higher the rating level is relative to the *background sound level,* the greater the magnitude of the impact. The lower the rating level is relative to the *background sound level,* the less likely it is that the specific sound level will have an ***adverse impact***
>
> A *rating level* that is 10 dB or more above the *background sound level* is likely to be an indication of a **significant adverse impact**
>
> A *rating level* that is 5 dB or more above the *background sound level* is likely to be an indication of an **adverse impact**
>
> A *rating level* that does not exceed the *background sound level* is likely to be an indication of a **low impact**

3.3 External plant proposals

3.3.1 The proposed location of the new extract fan is shown in Figure 3-1.

Figure 3-1 Plan view showing the layout of external plant



3.3.2 As with the previous location, the fan will be located at low level and ducted to roof level. In the new location the duct run will be approximately 5m from the unit. At the top of the duct is a 90-degree bend, so that the exhaust termination points north, into the central channel of the roof slopes. This can be seen in the elevation drawing presented in Figure 3-2

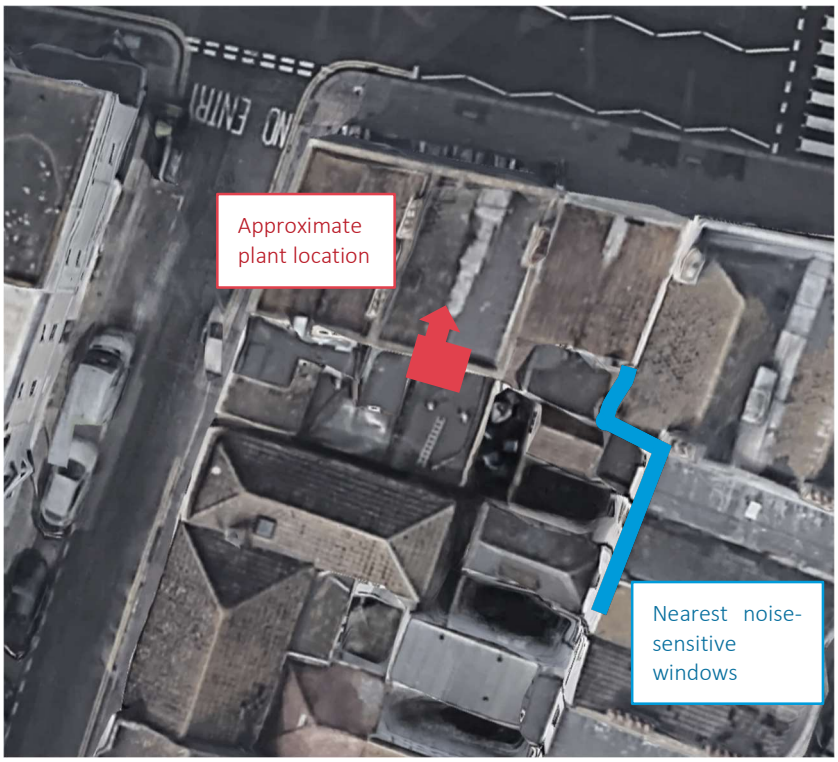
Figure 3-2 Rear elevation drawing showing termination of duct at roof level

3.4 Nearest noise-sensitive receiver

3.4.1 The nearest noise-sensitive receivers to the proposals are considered to be the windows that face into the lightwell at the rear of the pub. It is believed that these windows are part of residential properties. Other noise-sensitive receivers are either subject to greater screening or propagation losses by virtue of increased distance to the plant proposals, or would be expected to be subject to higher background sound levels due to proximity to the B2066.

3.4.2 The locations used for the assessment are shown in Figure 3-3

Figure 3-3 Nearest noise sensitive receivers highlighted on satellite image (courtesy of Google)



3.4.3 The measurement location used in the external noise survey is considered to be representative of *background sound levels* in the vicinity of the nearest noise-sensitive receivers. The data have therefore been used to determine *background sound levels* for the purposes of the BS 4142:2014 assessment. These levels are as follows:

- Daytime (0700-1900): 44 dB $L_{A90,15min}$
- Evening (1900-2300): 42 dB $L_{A90,15min}$
- Night-time (2300-0700): 36 dB $L_{A90,15min}$

3.5 Calculation of *specific sound level*

3.5.1 The manufacturer has provided noise data for the proposed unit, this is as follows:

- Outlet (of unit): 79 dB L_{wA}
- Case breakout: 62 dB L_{wA}

3.5.2 In accordance with industry practice, the noise level of the outlet has been corrected to account for the influence of the associated ductwork. This includes the c.5m vertical duct run, the 90-degree bend, and “end-reflection loss” which occurs at the boundary between the duct termination and the atmosphere.

3.5.3 As the termination does not point directly at the neighbouring property, a further correction for directivity has also been established in accordance with recommended practice. This predominantly affects frequencies from 1 kHz up.

3.5.4 The distance between the noise sources and the nearest noise-sensitive window have been estimated, and the attenuation due to geometric divergence over this distance has been calculated.

3.5.5 It is believed to be possible that the highest neighbouring window may have line of sight to the duct termination, and many of the other windows will have line-of-sight to the extract fan unit. No corrections for screening have been applied in this assessment.

3.5.6 The *specific sound level* at the nearest noise-sensitive window has been calculated as 40 dB L_{Aeq}, with the extract fan running at design duty.

3.6 Calculation of *rating level* and assessment of impact

3.6.1 In accordance with the standard, corrections to the *specific sound level* should be considered where the character of the emitted noise contains certain characteristics which may increase the impact. The following corrections have been considered:

- Tonality (humming or whistling): a +2 dB correction has been applied to account for tonal qualities being "just perceptible" at the receiver location.
- Impulsivity (banging or rattling): no correction has been applied. Properly maintained fans would not be expected to exhibit such characteristics.
- Intermittency (turning on and off): no correction has been applied. It is expected that the fan will be turned on when the pub begins serving food, and will not be turned off until service is complete.
- Other: the lightwell is also subject to building services noise from the cooling unit described in Section 2, and continuous traffic noise. Noise from building services is therefore not considered to be out-of-character for the area, and so no further corrections have been applied.

3.6.2 The *rating level* is therefore 2 dB higher than the *specific sound level*; giving 42 dB L_{ArTr}.

3.6.3 As the *background sound level* changes throughout the day, the assessment of impact is different depending on the operating times of the equipment. The following assessment would apply if the equipment were operating during the time periods described:

- Daytime (0700-1900): *rating level* is 2 dB below the *background sound level*.
  - This is considered to be indicative of a low impact
- Evening (1900-2300): *rating level* is equal to the *background sound level.*
  - This is considered to be indicative of a low impact
- Night-time (2300-0700): *rating level* is 6 dB above the *background sound level*
  - This would be considered to be indicative of an adverse impact

3.6.4 As the neighbouring properties are already exposed to building services noise, and the proposed kitchen extract fan will replace one that has already been in operation, it is not considered necessary to adjust the findings of the assessment based on the context.

3.7 Uncertainty

3.7.1 The methodology of BS 4142: 2014 requires that consideration be given to the uncertainty in the assessment procedure and its possible effect on the outcome. This section presents a selection of the considerations used in the production of this assessment.

3.7.2 The external noise survey was conducted over a 48-hour period, recording every 15 minutes. It can be seen from the level-history graph that the background sound levels used in the assessment represent measurements that are among the lowest for the time period. This means that the assessment simulates a worst-case scenario.

3.7.3 Noise level data for the proposed fan was provided by the manufacturer for the fan operating at its design duty. Changes in duty may affect the noise emission level and so care should be taken during the commissioning of the new fan to ensure that the duty is set correctly.

3.7.4 Calculations for losses due to duct elements and directivity were based on industry standard methods, with a generally pessimistic approach applied – again to ensure simulation of a worst-case scenario.

3.7.5 The propagation distance was estimated using the available drawings and satellite imagery. Minor errors in measurement for this purpose will have an insignificant effect on the *specific sound level* due to the logarithmic formulae used to calculate geometric divergence.

3.7.6 Screening was not calculated for the duct termination or casing breakout, however many of the windows on the neighbouring façades will have their line-of-sight to the plant at least partially obscured. This could be expected to lead to a c.5 dB reduction in noise emission level, however as the presence of screening could not be confirmed this was not accounted for in the assessment.

3.7.7 The *rating level* corrections were determined using the subjective method, based on experience with similar units. Well-maintained and correctly commissioned building services equipment of this type would be expected to have a generally neutral, broadband quality – and so the +2 dB tonality correction applied in the assessment is considered to be reasonably pessimistic.

4 Conclusions

4.1 This assessment has found that noise emission from the extract fan is expected to have a low impact on the nearest noise-sensitive properties during the daytime and evening periods (0700-2300). It is therefore considered that the proposals as they currently stand would be considered acceptable from a noise emission perspective if the fan is not operated outside of these times.

4.2 The noise emission from the termination could be reduced further by installing an in-line silencer/attenuator into the ductwork. It is believed that by installing even a modestly sized attenuator, it would be possible to ensure a low impact even if the fan were to run 24 hours a day.

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