

Acoustic Associates Sussex Ltd

Commercial Noise Assessment

Replacement External Plant

Site: Butlers Restaurant, Arundel

Client: Butlers Restaurant

Report by: George Orton BEng(Hons) MIOA

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Project: J2372



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Issue 1	21/12/2017	
Issue 1	15/06/2018	<i>Additional Mitigation</i>

1 Introduction

Acoustic Associates have been appointed to undertake an acoustic assessment of the proposed replacement plant that will be installed at the “Butlers Restaurant, Arundel” development.

The plant will be installed at the rear of the existing building. 2 air-conditioning outdoor units and one cellar chiller outdoor unit will be installed. The AC plant is in a similar location to the existing AC/Cooler plant which has now been removed. The cooler unit will be moved to a more sheltered position.

Based on Local Authority planning guidance the following has been assessed:

- Commercial noise levels affecting the proposed development in terms of BS4142
- Mitigation Measures to reduce noise breakout to what is considered to be an acceptable level.

Plant noise levels have been predicted using Manufacturer’s noise data and the computer program IMMI (Wolfel).

Background noise levels have been measured at the rear of the building during a day/night when the restaurant was closed.

The noise levels for the day and the night time period have been assessed in terms of and following the guidelines of the documents listed below:

- World Health Organisation (WHO) - Guidelines for Community Noise 1999
- ISO9613 (Attenuation of sound during propagation outdoors) 1996
- BS8233 (Sound insulation and noise reduction for buildings) 2014
- BS4142 (2014) Method for rating industrial noise affecting mixed residential and industrial areas

Noise mitigation measures have been recommended and if they are implemented by the developer it is considered that the noise impact for future residents of the development would be low.

For the reasons above it is considered that planning permission would not be refused on noise grounds albeit with possible planning conditions relating to noise created by the proposed replacement plant.

2 Context, Noise Criteria & Noise Assessment Methodology

2.1 Context

Butlers is a restaurant situated at 25 Tarrant Street Arundel.

It is proposed that old rooftop plant machinery will be replaced. The plant will be installed on a flat roof at the rear of the building and in the courtyard area to the rear of the building. 2 air-conditioning outdoor units (will operate when restaurant is open) will be installed on the flat roof. One cellar chiller outdoor unit (may operate at any time) will be installed at ground floor level in the rear courtyard. This position has been chosen to reduce the night time noise levels affecting nearby noise sensitive receptors (NSRs). The AC plant is in a similar location to the existing AC/Cooler plant which has now been removed.

Details of the proposed plant can be found by following the links below:

- AC1(MOU-24HFN1-QRC8) - Sound Power Lw=68dBA:
[http://www.mideaair.com.au/\(S\(i3oibi45pvdxc2i0lbcnmm\)\)/docs/2013-2014%20Midea%20Ducted%20and%20Cassette%20brochure.pdf](http://www.mideaair.com.au/(S(i3oibi45pvdxc2i0lbcnmm))/docs/2013-2014%20Midea%20Ducted%20and%20Cassette%20brochure.pdf)
- AC2 (MOCA01-24HFN1-QRD0GW) - Sound Power Lw=69dBA:
<https://www.midea-electric.pl/Dla-Biznesu/Produkty.id.52452/moca01-24hfn1-grd0gw>
- Cooler 1 (CKA35) - Sound Power Lw=72.5dBA:
<http://www.heronhill.co.uk/downloads/pdf/pdf707e.pdf>

The closest and most affected noise sensitive receptors (NSRs) are dwellings that are above other commercial units on Tarrant Street. These dwellings have windows overlooking the plant as shown in the appendix.

There are also NSRs, to the rear of the development, approximately 15m from the end of the flat roof.

2.2 Local Authority Noise Criteria

Based upon Local Authority guidance documents it is recommended in this case that appropriate criteria are provided by:

- BS8233 (Sound insulation and noise reduction for buildings) 2014
- World Health Organisation (WHO) - Guidelines for Community Noise 1999
- BS4142 (2014) Method for rating industrial noise affecting mixed residential and industrial areas

Assessment methodology, predictions of building envelope sound insulation and calculations of noise propagation will follow the principles detailed within:

- ISO9613 (1996) Attenuation of sound during propagation outdoors
- BS8233 (Sound insulation and noise reduction for buildings) 2014

2.3 BS8233 Noise Criteria

Table 5 of BS8233 provides the following guideline values:

Activity	Location	Time period of day	
		07:00-23:00	23:00-07:00
Resting	Living Rooms	35dB L _{Aeq,16hour}	-
Dining	Dining Room/Area	40dB L _{Aeq,16hour}	-
Sleeping (daytime resting)	Bedroom	35dB L _{Aeq,16hour}	30dB L _{Aeq,8hour}

Table 1: BS8233 Criteria

2.4 WHO Noise Criteria

The target internal levels are based on guidelines laid out by the World Health Organisation (WHO) and are as follows:

Room Type Target Maximum Internal Level - L_{Aeq} dB (A)

Living rooms 35 (Daytime only)

Bedrooms 30 (Night)

With regard to outdoor amenity areas WHO states the following:

To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55dB(A) on balconies, terraces and in outdoor living areas.

To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 50dB(A) on balconies, terraces and in outdoor living areas.

2.5 BS4142: 2014: Method for rating and assessing industrial and commercial sound

This document provides a means of assessing the impact of industrial or commercial sound upon nearby noise-sensitive receptors, including residential properties.

It does this by comparing the Rating Level of the noise from the industrial or commercial source with the pre-existent L₉₀ background noise level affecting the same noise-sensitive premises. The Standard provides guidance that:

- Typically, the greater the difference, the greater the magnitude of the impact.
- A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5dB 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 noise level, this is an indication of the specific sound source having a low impact, depending on the context.

3 Background Noise Survey Baseline Conditions and Results

A noise survey was carried out from the 11th to the 12th December 2017 in order to measure noise levels affecting the nearby NSRs. Noise measurements were conducted on top of the flat roof at the back of the property.

As the initial plant modifications have already been made the survey was conducted at a time when the restaurant was closed.

This means the proposed plant would have been switched off with the exception of the cellar cooler outdoor unit. However when on site (setup and pack down visits) the cooler was not audibly running at any time. It is considered that the day and night time background noise would not have been greatly affected by the cooler even if it switched on occasionally. As it was cold during the survey it is likely that the cooler would have rarely switched on as the fridge doors would have been kept closed.

The above methodology does mean that the background noise may be lower than the representative background noise for all days. The representative level for all days would be made up from extraneous noise sources and noise created by Butlers' staff/patrons and Butlers' extract plant which has already been installed some time ago (and not part of this planning application). This would have less effect on the night time background noise levels as the restaurant shuts at 23:00hrs.

3.1 Baseline Conditions

- Survey carried out by: George Orton BEng (Hons) MIOA
- Equipment used: Rion NL18 - Type 1 Sound Level Meter
- Weather conditions: Variable (dry); Wind: variable direction possibly greater than 5ms⁻² for the first few hours of the survey

Meters were calibrated before and after commencing the noise measurements (@94dB no drift).

The microphone was approximately 1.5m from the flat roof and at least 3m from other reflective facades i.e. free-field values. All noise levels in the report, including those predicted by the calculation model, will be free-field unless stated otherwise.

3.2 Noise Survey Results

The survey data can be seen in the graph below:

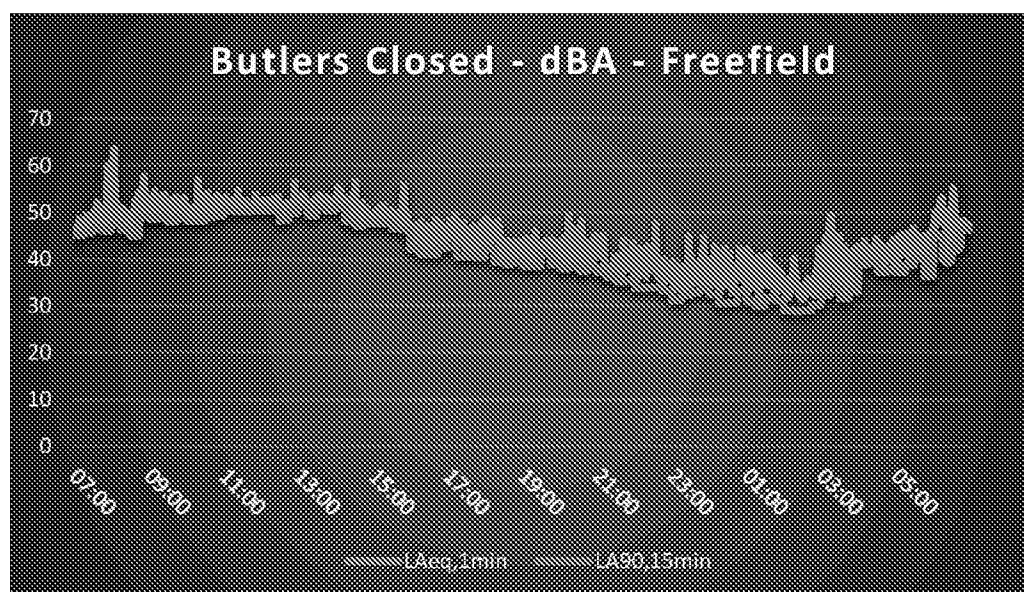


Figure 1: Butlers Closed Survey Data

3.3 Representative Background Sound Level

BS4142 states the following on page 11 (Note 1):

To obtain a representative background sound level a series of either sequential or disaggregated measurements ought to be carried out for the period(s) of interest, possibly on more than one occasion. A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum/modal value.

Further statistical analysis has been completed to establish the most commonly occurring value for the each period:

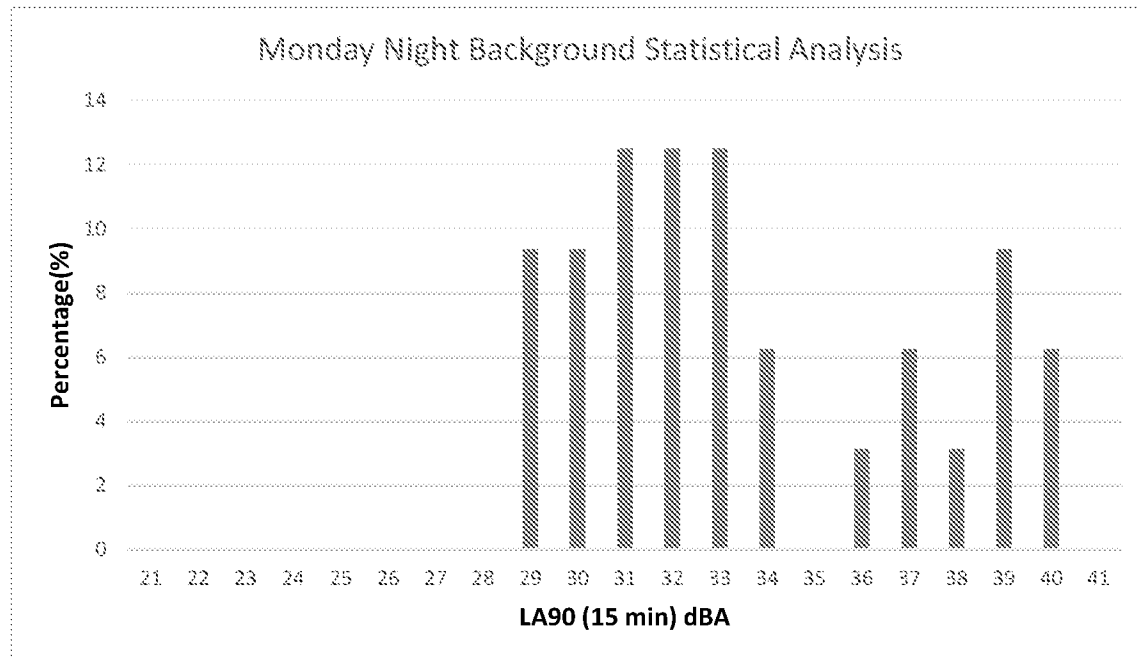


Figure 2: 23:00-07:00hrs L90 Analysis

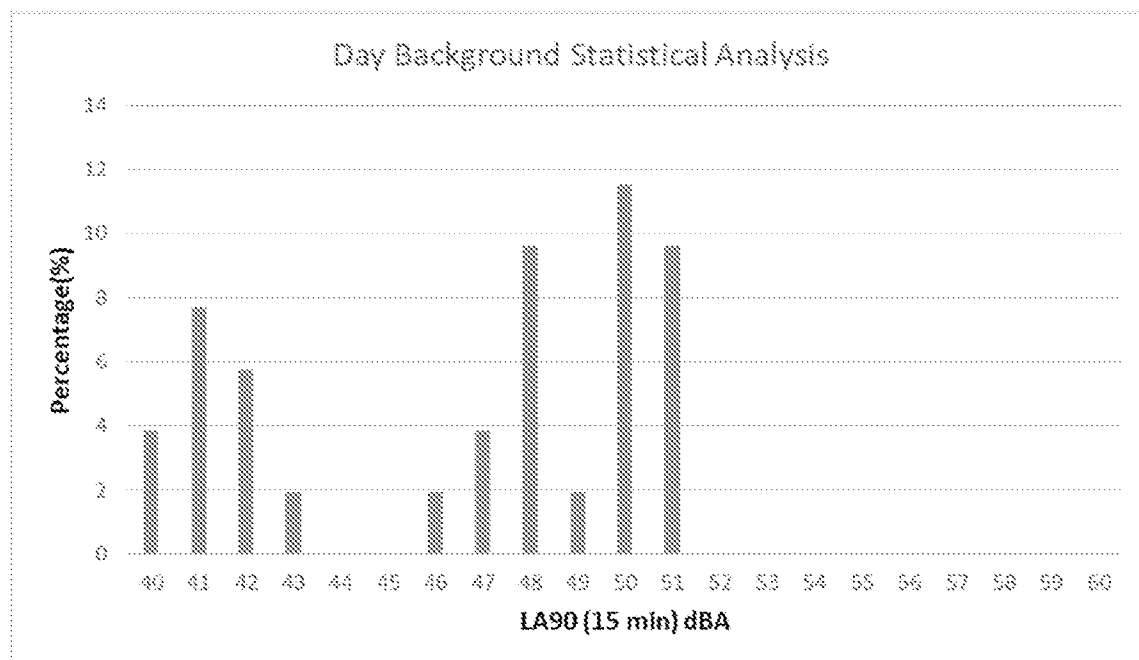


Figure 3: 11:00-23:00 L90 Analysis

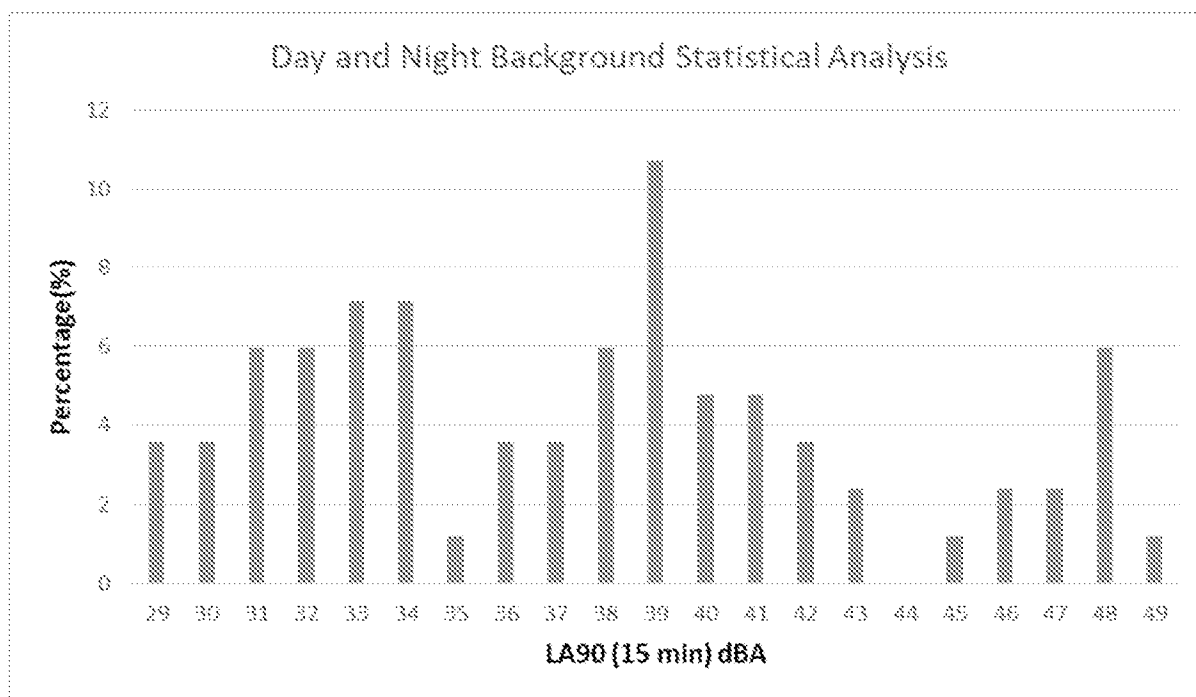


Figure 4: 11:00-07:00hrs L90 Analysis

4 Modified Plant Noise Model

In order to see how noise varies at different positions around the proposed plant it is possible to produce a noise contour map. The proposed site plans and the computer programme IMMI have been used to generate a computer noise contour model of the whole site.

IMMI faithfully implements the propagation method of ISO-9613:1996; Acoustics – Attenuation of sound during propagation outdoors. This includes barrier attenuation, ground affects, and attenuation due to air absorption.

Butlers and other nearby buildings have been added to the model. Reception Points (RP) have also been added to the noise model (at different locations). The RP's predict the noise level at that particular position. RPs can also be used to calibrate noise sources.

The AC1, AC2 and Cooler noise sources noise source have been added to the noise model as point sources with the correct sound power level as detailed in section 2.1.

The noise model for the plant and proposed mitigation measures can be found below:

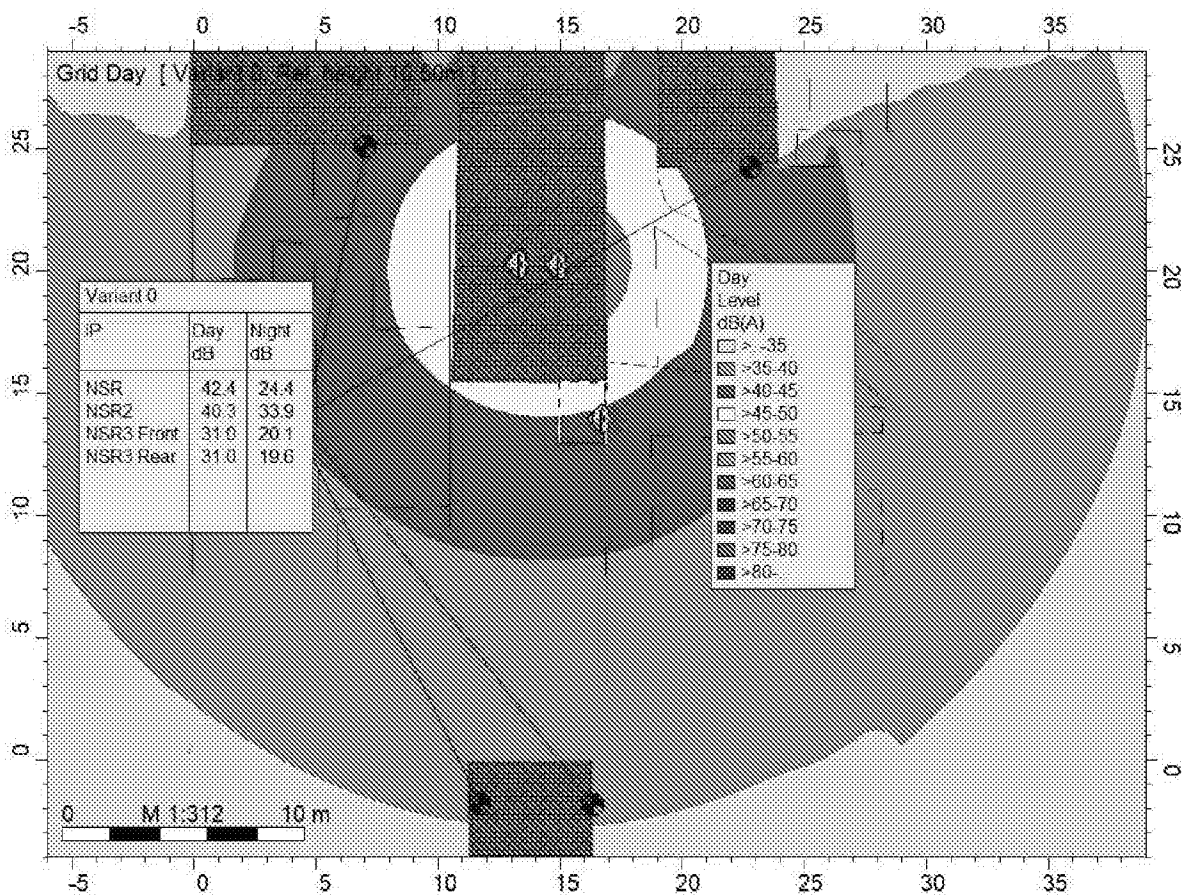


Figure 5: With Mitigation Day Noise Model

The night time noise model can be seen below:

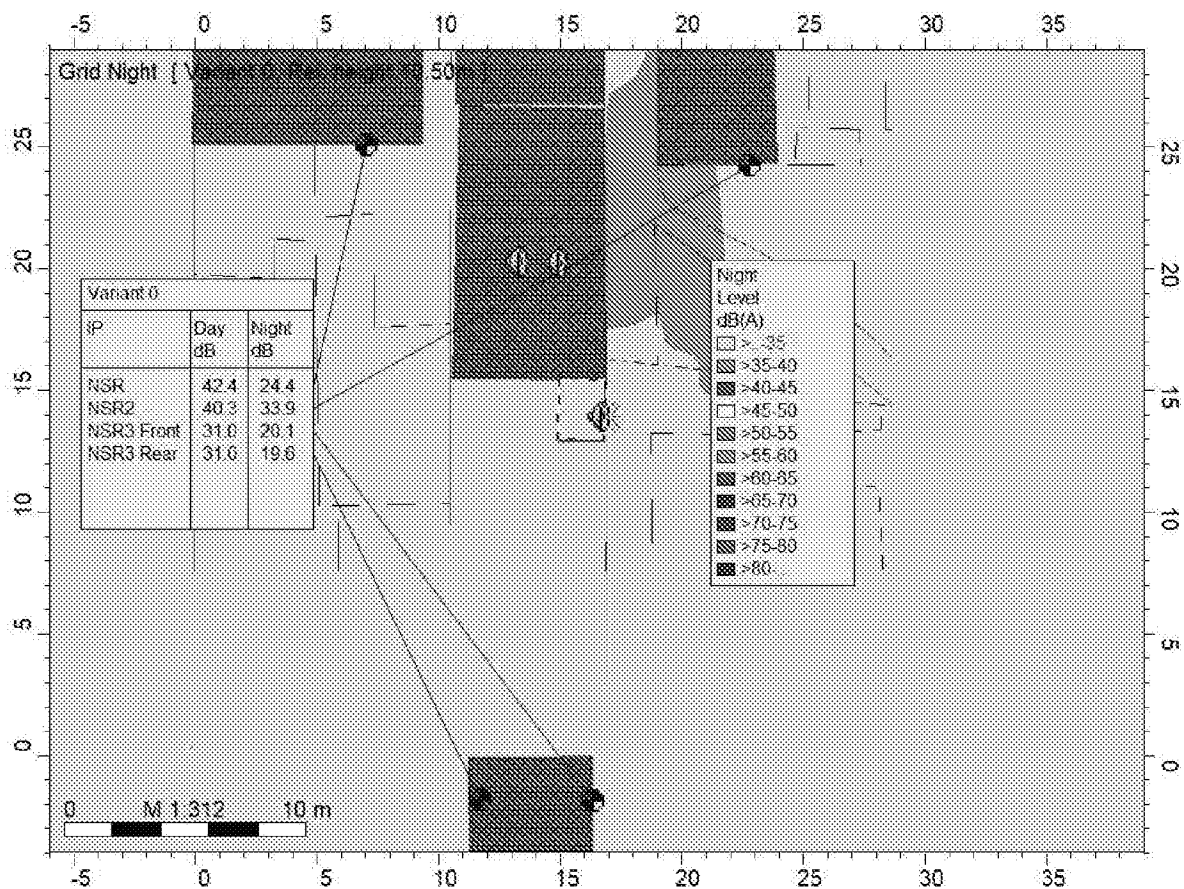


Figure 6: Night Time Noise Model

5 Mitigation measures

Initially all of the new plant was installed on the flat roof of the restaurant. When the retrospective planning application was being completed a noise model was generated with the AC units and the cooler unit on the flat roof.

The noise model was used to demonstrate that mitigation measures would probably be required. This is because the Local Authority would require the noise rating level to be equal to or lower than the relevant background sound level.

The proposed mitigation measures are as follows:

- Move Cooler to under fire escape stairs in courtyard (this location will shelter the NSRs from noise created by the cooler). The cooler noise requires extra mitigation as it has a higher sound power and it may operate at night time to maintain the correct temperature within the fridge/freezers.
- Fill in gaps within stair treads of the fire escape (metal or timber)
- In addition the AC units will be rotated to face away from the closer NSR windows which overlook the flat roof.

6 Basic BS4142 Assessment

6.1 Rating Level

It is important to differentiate between noise rating level and specific noise level. Certain acoustic features can increase the likelihood of complaint. The combination of plant items make it unlikely for tones to be clearly perceptible. Although the assessment is based on laboratory sound power figures it should be noted when the AC plant was running the noise was very faint and was not noted to be tonal.

Therefore the specific noise levels will be used as the rating level:

- Worst Case Daytime Rating Level 42dBA
- Worst Case Night-time Rating Level 34dBA

6.2 Representative Background Noise level

- The day time background sound level has been calculated to be 50dBA.
- The night time background sound level has been calculated to be 31-33dBA. To complete a single figure assessment 33dBA will be used which is a relatively low level for an urban environment.
- For further reference the day/night time background sound level has been calculated to be 39dBA.

6.3 BS4142 and Contextual Information

The following has been copied from section 11 of BS4142:

The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. 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.

The following contextual information is considered relevant in completing the noise assessment:

- Cooler plant may sometimes operate during the night time which may increase the likelihood of complaint
- Fluctuating residual sound levels during the day are significantly higher than the specific noise level which may reduce the likelihood of complaint.
- The noise sources will be installed in place of older plant which may have been as noisy or possibly noisier.
- In order to achieve a noise rating level close to the background sound level Night-time predicted noise levels are very low.
- There are other commercial kitchen noise sources relatively close to the neighbouring noise sensitive receptors

6.4 BS4142 Assessment of Impacts – New Replacement Plant

- Worst Case Daytime Rating Level is 8dB lower than representative daytime background sound level
- Worst Case Night time Rating Level is 1dB higher than representative night time background sound level (5dB lower than day/night background sound level). However the calculations were completed using single figure values as no frequency data was available for the plant. This means that the noise barrier sections in the noise model will probably overestimate the noise level at the NSRs. Furthermore no on time correction has been added so if in a set period the plant does not operate continuously the rating level will be lower.

A difference of around +5dB 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 noise level, this is an indication of the specific sound source having a low impact, depending on the context.

Based on the above and the fact that the contextual “pros” outnumber the one “con” demonstrates that the sound created by the replacement plant have a very low (or no) impact on the nearby NSRs if the mitigation measures are completed. It is also likely that the noise level of the original cooler, mounted on flat roof, would have been significantly higher for the NSRs overlooking the flat roof.

6.5 Uncertainty

Noise levels detailed in the report were completed during suitable weather conditions (days with higher wind speeds and poor weather were not included).

As the plant modifications have already been made the survey was conducted at a time when the restaurant was closed.

Measured background noise levels may be lower than the representative level for all days. The representative level for all days would be made up from extraneous noise sources and noise created by Butlers’ staff/patrons and Butlers’ plant which has already been installed and will not be replaced or modified (this plant is not part of this planning application as has been installed before the current proposed changes). This would have less effect on the night time background noise levels as the restaurant shuts at 23:00hrs.

As stated above the calculations were completed using single figure values as no frequency data was available for the plant. This means that the noise barrier sections in the noise model will probably overestimate the noise level at the NSRs.

7 Conclusion

Noise levels around the development have been measured during a day and night when the restaurant was closed.

Plant noise levels have been predicted using Manufacturer's noise data and the computer program IMMI (Wolfel).

If the recommended noise mitigation measures are completed the resulting sound level at the NSRs will be very low:

- Worst Case Daytime Level 42dBA
- Worst Case Night-time Level 34dBA

Inside the NSRs the noise level is likely to be approximately 12dB lower if a window is left open. Therefore the daytime and night time target levels, detailed in WHO and BS8233 will easily be achieved. It should be noted that the more stringent night time criterion would also be achieved during the day for all NSRs.

Outdoor noise levels are also significantly lower than the WHO lower limit of 50dBA for external amenity areas.

The noise breakout from the proposed plant will at worst be 1dB higher than the relevant background sound level as predicted by the model. The way the model was completed means that actual noise levels may be marginally lower. Therefore in reality the worst case noise rating should be equal to or lower than the representative background noise level.

The above along with the low rating level and the additional contextual information would demonstrate that there should be low impact relating to the installation of the new machinery.

For the reasons above it is considered that planning permission would not be refused on noise grounds albeit with possible planning conditions relating to noise created by the proposed replacement plant.

8 Appendix



Figure 7: NSR and Plant (cooler not yet moved)

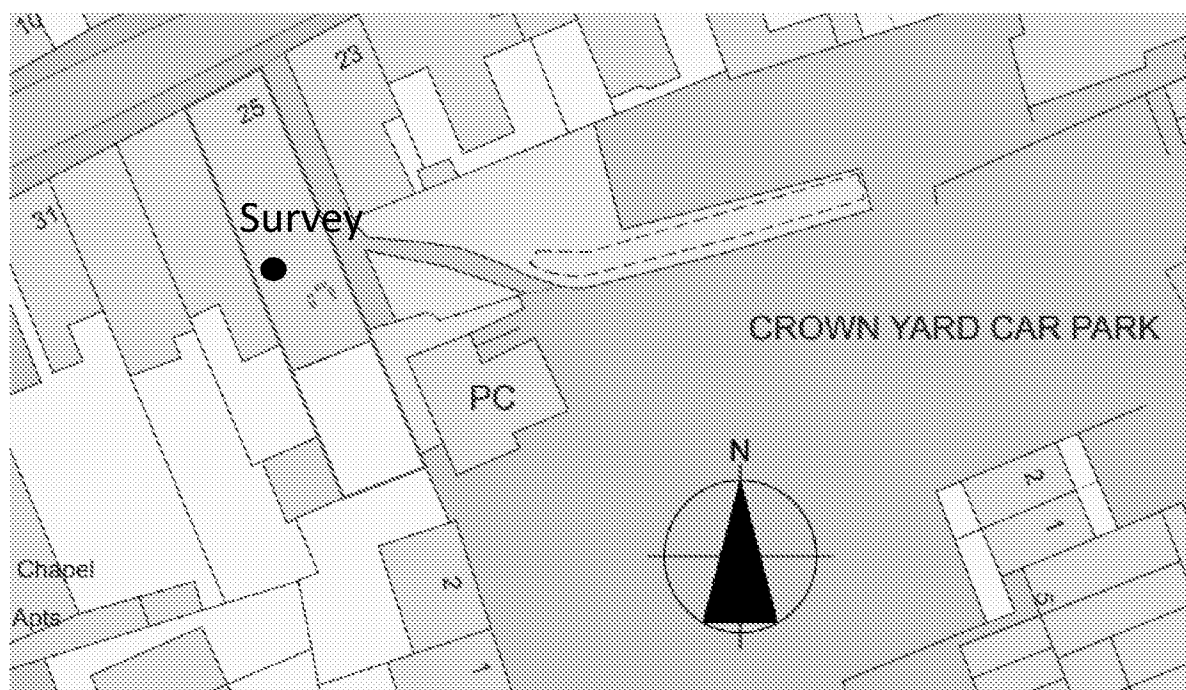


Figure 8: Survey Location

