

Papa John's, Waterloooville

# Planning Noise Assessment

Report 18/0657/R1

Papa John's, Waterloooville

# Planning Noise Assessment

Report 18/0657/R1

## Papa John's UK

Papa John's UK & European Campus  
11 Northfield Drive  
Milton Keynes  
MK15 0DQ

| Revision | Description           | Date                      | Prepared | Approved       |
|----------|-----------------------|---------------------------|----------|----------------|
| 0        | 1 <sup>st</sup> Issue | 15 <sup>th</sup> May 2019 | Jo Lacy  | Johnny Berrill |

This report and associated surveys have been prepared and undertaken for the private and confidential use of our client only. If any third party whatsoever comes into possession of this report, they rely on it at their own risk and Cole Jarman Limited accepts no duty or responsibility (including in negligence) to any such third party.



## Planning Noise Assessment

### Table of Contents

---

|     |                                        |   |
|-----|----------------------------------------|---|
| 1   | Introduction                           | 3 |
| 2   | Site Description                       | 3 |
| 3   | Planning Guidance                      | 3 |
| 3.2 | <b>BS 4142:2014</b>                    | 4 |
| 4   | Environmental Noise Survey             | 5 |
| 4.1 | <b>Methodology and Instrumentation</b> | 5 |
| 4.2 | <b>Results</b>                         | 6 |
| 5   | Plant Noise Limits                     | 7 |
| 6   | Plant Noise Assessment                 | 7 |
| 6.1 | <b>Proposed Installation</b>           | 7 |
| 6.2 | <b>Mitigation Measures</b>             | 8 |
| 6.3 | <b>Assessment Results</b>              | 9 |
| 7   | Summary                                | 9 |

---

### Attachments

#### **Glossary of Acoustic Terms**

##### **18/0657/SP1**

Site plan showing measurement and assessment positions

##### **18/0657/TH1**

Time history of unattended survey results

##### **18/0657/PNS1**

Plant noise schedule

##### **18/0657/CS1-CS8**

External receiver and calculation sheets

 End of Section



## Planning Noise Assessment

### 1 Introduction

- 1.1 Conditional planning permission has been granted for the redevelopment 260-262 London Road, Waterloooville to include an A5 hot food takeaway at ground floor level.
- 1.2 One of the conditions relates to noise from the re-developed spaces. Cole Jarman have been instructed to undertake a noise assessment for the new use of the spaces which consists of an environmental noise survey, the setting of noise limits, assessment of the noise from the proposed new mechanical services plant items and details of the mitigation measures required to meet the noise limits.
- 1.3 Full details of the undertaken noise survey, setting of noise limits, assessment and the mitigation measures are included in this report.

### 2 Site Description

- 2.1 This site is on the ground floor of a mixed use building, where the ground floor consists of retail space and the upper floors are residential.
- 2.2 It is proposed that a cold store condenser be mounted on the south-east elevation at the rear of the building at low level. A kitchen extract duct is to penetrate the south corner of the roof, and terminate not less than 1m above the eaves.
- 2.3 To the south-east lies a car park, with residences beyond. The site is surrounded on both sides by ground floor retail space with upper floor residential spaces, and opposite similar spaces.
- 2.4 The site and surrounding area can be seen on the attached site plan 18/0657/SP1.

### 3 Planning Guidance

- 3.1 Planning permission has been granted for the site subject to a number of conditions (ref: APP/18/00059); Condition 4 details noise requirements and is reproduced below:

*The development hereby permitted shall not be occupied unless and until details to confirm that any requisite acoustic mitigation measures related to any extraction systems, air conditioning and / or cold room / chiller units and the lik , have been submitted to and approved in writing by the Local Planning Authority. It should also be noted that noise resulting from the use of any / all plant, machinery or equipment used on this site, shall be of a No Observable Adverse Effect Level (NOAEL), or better, when measured according to British Standard BS4142-2014, at the boundary of the nearest sensitive receptor. The approved measures shall be implemented prior to occupation and maintained in accordance with the approved details.*

**Reason:** *To ensure the residential amenity of the property is not unacceptably impacted upon by any internal or external noise levels, including from commercial premises below having due*



## Planning Noise Assessment

regard to policies CS16 and DM10 of the Havant Borough Local Plan (Core Strategy) 2011 and the National Planning Policy Framework 2018.

3.1.1 BS4142<sup>1</sup>, to which the condition refers, is described below.

### 3.2 **BS 4142:2014**

3.2.1 Section 1.1 of BS 4142:2014 states the following:

*This British Standard describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:*

- a) sound from industrial and manufacturing processes;*
- b) sound from fixed installations which comprise mechanical and electrical plant and equipment*
- c) sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and*
- d) sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.*

3.2.2 The methodology in the standard compares the measured or calculated rating level of the noise from the source and compares it to the representative existing measured  $L_{A90}$  background noise level for the period concerned.

3.2.3 The higher the excess of rating level over background noise level, the greater the likelihood of an adverse noise impact. BS 4142:2014 gives the following guidance:

*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.*

---

<sup>1</sup> BS4142:2014 Methods for rating and assessing industrial and commercial sound, BSI



## Planning Noise Assessment

- 3.2.4 In the case of mechanical services noise, this is a constant noise source operating for much of the day and night, mechanical services plant is also inherently amenable to noise control. We would therefore suggest that plant noise at existing residences should be designed to a rating level no higher than 5 dB below the existing  $L_{A90}$  background noise levels recorded during the relevant time period, in line with local planning guidance, with the following exception.
- 3.2.5 In instances of low background noise, it is not considered reasonable to design plant noise levels with reference to the  $L_{A90}$  background level. The current version of BS 4142 states:
- “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.”*
- 3.2.6 We would in these circumstances recommend a reasonable minimum plant noise emission limit in absolute terms of 30 dB(A). In the previous version of BS 4142 (1997) it noted that *“rating levels below 35 dB are considered very low”*.
- 3.2.7 Taking the typical loss through a partially open window of 10-15 dB(A), the proposed minimum plant noise limit of 30 dB(A) would result in levels no greater than 20 dB(A) within any nearby property, which is 10 dB(A) lower than the standard for bedrooms indicated in BS 8233:2014.
- 3.2 Criteria at relevant times will therefore be set at 5 dB below representative  $L_{A90}$  background noise levels with a minimum cap of 30 dB(A).

## 4 Environmental Noise Survey

### 4.1 Methodology and Instrumentation

- 4.1.1 An unattended noise survey was undertaken at the site between 12:00 on 19<sup>th</sup> March and 11:00 on 20<sup>th</sup> March 2019.
- 4.1.2 Measurements of the noise climate were made in a free-field position on the rear roof of the property approximately 1.8m above the level of the flat roof. The measurement position is indicated at MP1 on the attached site plan 18/0657/SP1.
- 4.1.3 This position was selected to quantify the representative noise levels at the noise sensitive receptors nearest to the proposed items of mechanical services plant.
- 4.1.4 Measurements of the  $L_{Aeq}$ ,  $L_{Amax}$  and  $L_{A90}$  indices were recorded over consecutive 15 minute periods for the duration of the survey using the equipment listed within table T1 below (see attached Glossary of Acoustic Terms for an explanation of the noise units used).



## Planning Noise Assessment

| Item                    | Manufacturer | Type |
|-------------------------|--------------|------|
| Sound Level Analyser    | Norsonic     | 118  |
| Acoustic Calibrator     | Norsonic     | 1251 |
| Weatherproof windshield | Norsonic     | 1212 |

T1 Equipment used during unattended noise survey.

- 4.1.5 The microphone was extended via a cable and fitted within a weatherproof enclosure, and the sound level meter was calibrated before and after the survey period in order to confirm an acceptable level of accuracy. No significant drift was noted to have occurred.
- 4.1.6 The weather conditions when setting up and collecting the survey were cool, dry and overcast with a very mild breeze. These conditions are deemed acceptable for environmental noise measurement and are not considered to have affected measurement levels.

### 4.2 Results

- 4.2.1 The results of the noise measurements are presented in the attached time history figure 18/0657/TH1.
- 4.2.2 The noise climate to the rear of the building was observed to consist primarily of construction works from the residential extension on the roof of the building, with some noise from seagulls and barely audible road traffic noise.
- 4.2.3 The minimum measured background noise levels can be seen in table T2 below:

| Location | Minimum Background Noise Level, dB(A) |                         |
|----------|---------------------------------------|-------------------------|
|          | Daytime<br>(0700-2300 only)           | Night time<br>(24-hour) |
| MP1      | 33                                    | 29                      |

T2 Measured minimum background noise levels,  $L_{A90,15min}$



## Planning Noise Assessment

### 6 Plant Noise Limits

- 6.1 Using the planning condition in combination with the results of the noise survey detailed in section 4, the following plant noise emission limits have been defined:

| Location                                      | Noise Emission Limit, dB    |                         |
|-----------------------------------------------|-----------------------------|-------------------------|
|                                               | Daytime<br>(0700-2300 only) | Night time<br>(24-hour) |
| All nearby noise sensitive receptor locations | 30                          | 30                      |

T3 Plant noise emission limits at the nearest residential properties.

- 6.2 These noise limits are to apply at the façade of the nearest noise sensitive receptors, as per the planning condition. Any plant with tonal, impulsive, intermittent or otherwise defined acoustic characteristics would be subject to a further penalty in line with BS 4142:2014.

### 7 Plant Noise Assessment

#### 7.1 Proposed Installation

- 7.1.1 The proposed plant items to be installed with external noise emissions are as follows:

- Cold Store Condenser: Karbox 2464
- Extract Fan: Woods Powerbox 67-500-1

- 7.1.2 The cold store condenser is proposed to be mounted at low level on the south-east façade of the store. The new extract ducting will pierce the roof of the lower level at the rear of the building and run up the wall of the adjacent building, terminating a minimum of 1m above the eaves.

- 7.1.3 Noise from the proposed plant has been assessed to the two most noise sensitive windows detailed below and shown on the attached site plan 18/0657/SP1:

- AP1 – Side window, top floor of 258 London Road
- AP2 – Rear window, top floor of 258 London Road

- 7.1.4 The noise data from the proposed plant items has been provided by the manufacturers and is shown in the attached plant noise schedule 18/0657/PNS1.

- 7.1.5 The intake air supply is a passive system, and so does not explicitly include a fan or silencer in its design, and is therefore not considered in our calculations.



## Planning Noise Assessment

### 7.2 Mitigation Measures

- 7.2.1 Details of mitigation measures being installed have been provided by Papa John's and assessed to determine compliance with the noise emission limits set out in table T3 above.
- 7.2.2 A Melinex faced silencer of 38% free area, with 2100mm length (or similar) is proposed as an atmospheric-side silencer within the extract fan ducting. We would expect such a silencer to have minimum insertion losses in each octave band as defined in table T4 below:

| Silencer    | Insertion Loss (dB) at             |     |     |     |    |    |    |    |
|-------------|------------------------------------|-----|-----|-----|----|----|----|----|
|             | Octave Band Centred Frequency (Hz) |     |     |     |    |    |    |    |
|             | 63                                 | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
| Extract Fan | 9                                  | 19  | 36  | 45  | 47 | 38 | 25 | 15 |

T4 Attenuator insertion losses (Atmospheric Side)

- 7.2.3 Any pressure drops from the attenuator or the atmospheric duct termination grilles will be limited to 40 Pa.
- 7.2.4 The silencer will be located within the hot food takeaway demise, close to the fan so that noise breakout from the duct is also attenuated.
- 7.2.5 The fan will be mounted on anti-vibration mounts and will have flexible ductwork connections to control structure-borne sound transmission. The fresh air intake and extract air discharge louvres will be sized at a face velocity of not more than 2m/s.
- 7.2.6 A high performance enclosure such as those produced by Environ Technologies Ltd<sup>2</sup> or Sound Planning Ltd<sup>3</sup> is proposed around the cold store condenser. The enclosure will meet the following performance specification at a minimum:

| Enclosure           | Insertion Loss (dB) at             |     |     |     |    |    |    |    |
|---------------------|------------------------------------|-----|-----|-----|----|----|----|----|
|                     | Octave Band Centred Frequency (Hz) |     |     |     |    |    |    |    |
|                     | 63                                 | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
| Condenser Enclosure | 9                                  | 10  | 14  | 18  | 26 | 26 | 25 | 24 |

T5 Attenuator insertion losses (enclosure)

<sup>2</sup> <http://www.environ.co.uk>

<sup>3</sup> <http://www.soundplanning.co.uk/>



## Planning Noise Assessment

- 7.2.7 It must be ensured that the silencers and enclosure described above meet the performance requirements outlined in tables T4 and T5 above respectively, as a minimum.

### 7.3 Assessment Results

- 7.3.1 It is understood that all plant is operational during the opening (daytime) hours, while only the cold store condenser is required when the store is closed. Therefore, both the day-and night-time hours have been assessed separately.
- 7.3.2 With the specified mitigation measures in place, we have assessed the following noise levels at the nearest noise sensitive residences:

| Location                                        | Rating Noise Level, dB(A) <i>(Limit)</i> |                           |
|-------------------------------------------------|------------------------------------------|---------------------------|
|                                                 | Daytime<br>(0700-2300)                   | Night time<br>(2300-0700) |
| AP1 – Side window, top floor of 258 London Road | 29 (30)                                  | 23 (30)                   |
| AP2 – Rear window, top floor of 258 London Road | 28 (30)                                  | 27 (30)                   |

T6 Rating noise levels at nearest noise sensitive residences

- 7.3.3 The results of the calculations can be found in the attached calculation sheets 18/0657/CS1-CS8. It can be seen from the results in table T6 above that with the specified mitigation measures in place, the calculated noise rating levels will meet the noise limits. No further mitigation measures or alterations to the proposed mitigation measures are required.

## 8 Summary

- 8.1 Conditional planning permission has been granted for the redevelopment 260-262 London Road, Waterlooville. One of the conditions relates to noise from the proposed use of the site.
- 8.2 This report has provided details of an environmental noise survey undertaken at the site and used the results of the survey to set noise limits for the proposed plant items in line with the planning condition.
- 8.3 A noise impact assessment has been conducted of noise from the proposed plant items. The assessment has shown that with the proposed mitigation measures in place, the plant noise limits will be achieved.



## Planning Noise Assessment

 End of Section



## Planning Noise Assessment

# Glossary of Acoustic Terms

---

### $L_{Aeq}$ :

The notional steady sound level (in dB) which over a stated period of time, would have the same A-weighted acoustic energy as the A-weighted fluctuating noise measurement over that period. Values are sometimes written using the alternative expression dB(A)  $L_{eq}$ .

### $L_{Amax}$ :

The maximum A-weighted sound pressure level recorded over the period stated.  $L_{Amax}$  is sometimes used in assessing environmental noise when occasional loud noises occur, which may have little effect on the  $L_{Aeq}$  noise level. Unless described otherwise,  $L_{Amax}$  is measured using the “fast” sound level meter response.

### $L_{A10}$ & $L_{A90}$ :

If non-steady noise is to be described, it is necessary to know both its level and degree of fluctuation. The  $L_{An}$  indices are used for this purpose. The term refers to the A-weighted level (in dB) exceeded for n% of the time specified.  $L_{A10}$  is the level exceeded for 10% of the time and as such gives an indication of the upper limit of fluctuating noise. Similarly  $L_{A90}$  gives an indication of the lower levels of fluctuating noise. It is often used to define the background noise.

$L_{A10}$  is commonly used to describe traffic noise. Values of dB  $L_{An}$  are sometimes written using the alternative expression dB(A)  $L_n$ .

### $L_{AX}$ , $L_{AE}$ or SEL

The single event noise exposure level which, when maintained for 1 second, contains the same quantity of sound energy as the actual time varying level of one noise event.  $L_{AX}$  values for contributing noise sources can be considered as individual building blocks in the construction of a calculated value of  $L_{Aeq}$  for the total noise. The  $L_{AX}$  term can sometimes be referred to as Exposure Level ( $L_{AE}$ ) or Single Event Level (SEL).

■ End of Section

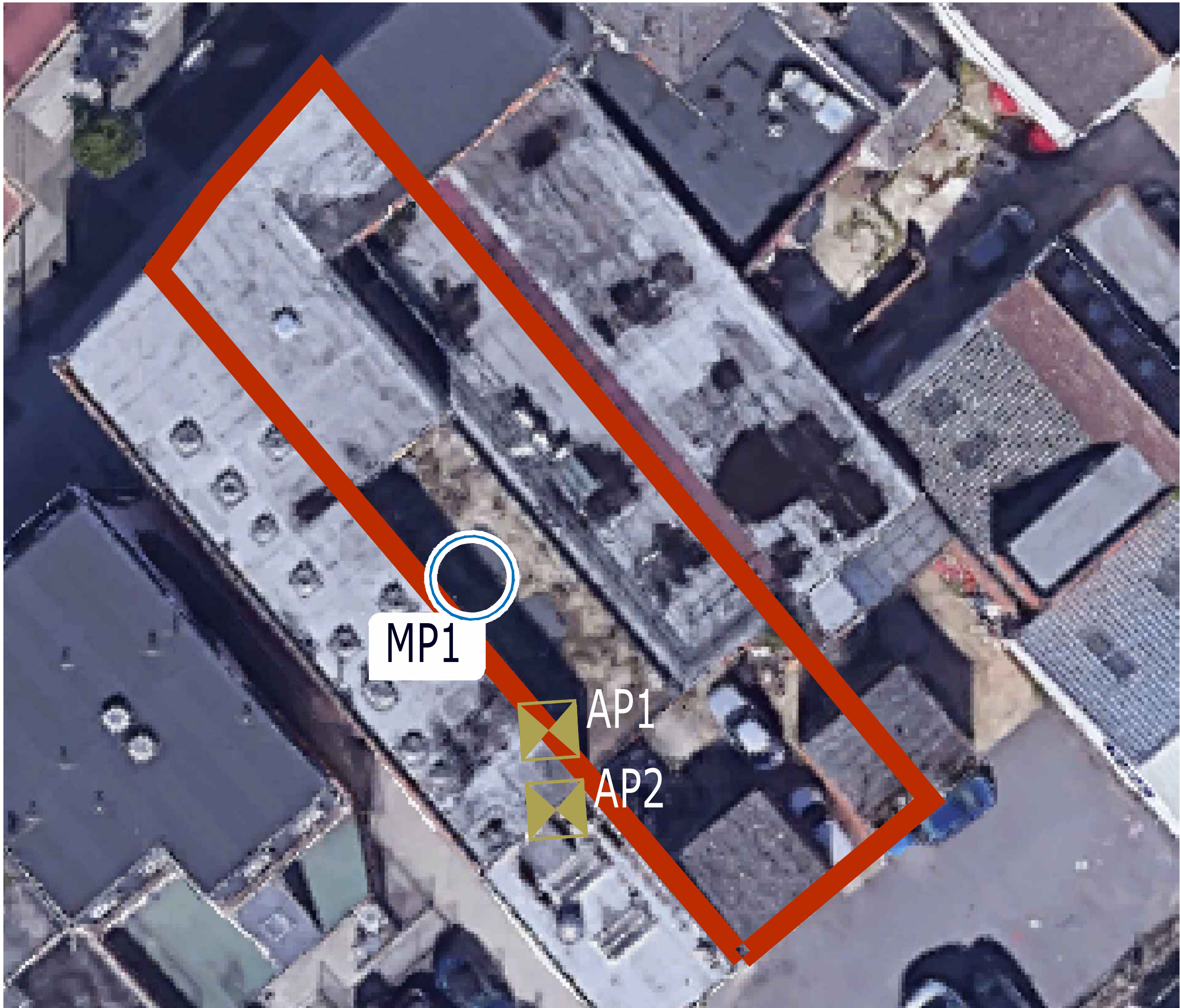


Figure 18/0657/SP1

Title:

Site plan showing measurement and  
assessment positions



Measurement Position



Assessment Position



Project:

Papa John's, Waterloooville

Date:

May 2019

Revision:

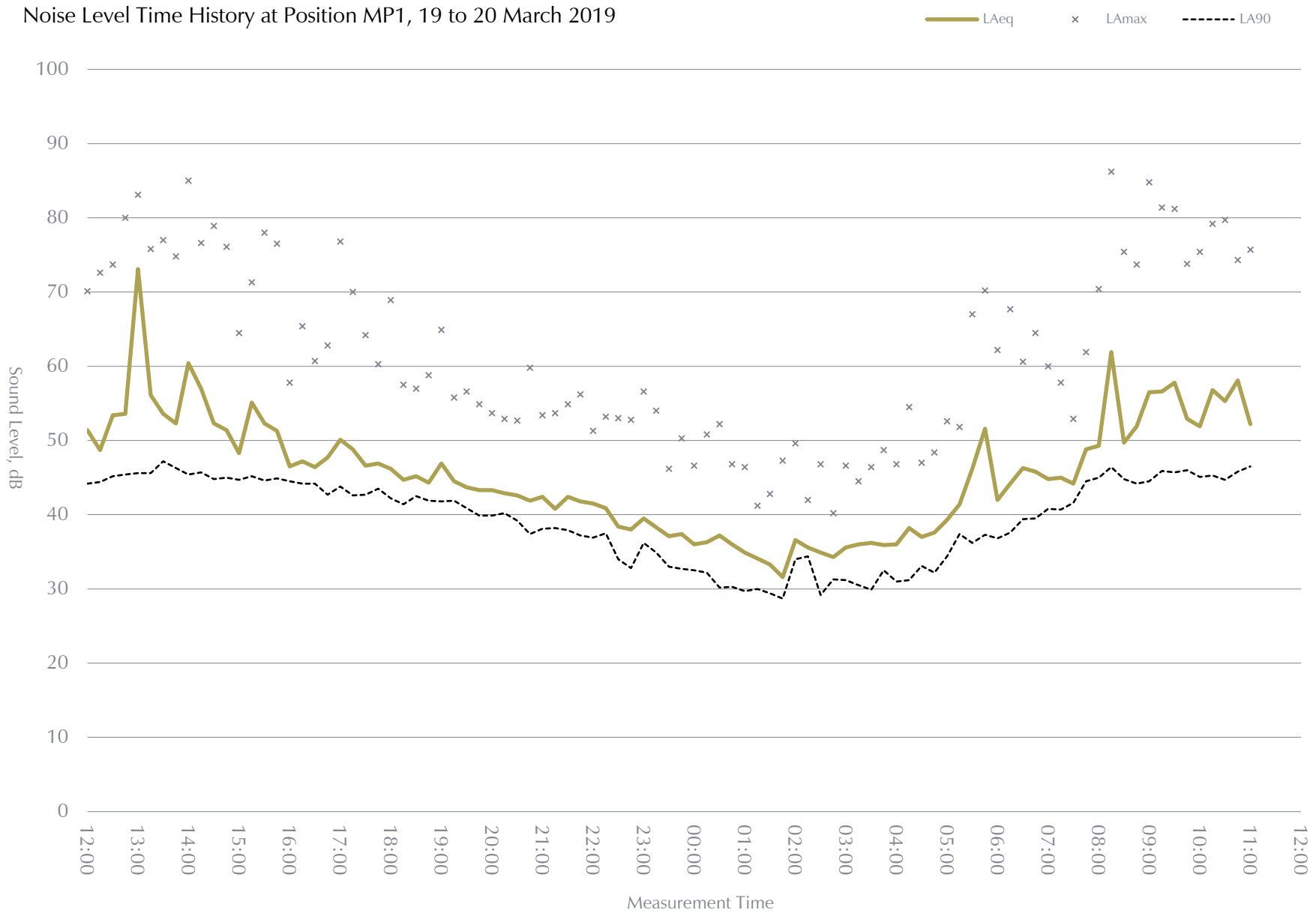
-

Scale:

Not to scale



Figure 18/0657/TH01





Schedule of Plant and Air Handling Equipment Sound Levels, dB

| Reference | Description             | Data <sup>1</sup><br>Source | Noise Level Type | Noise Levels (dB) |      |      |     |      |      |      |      |
|-----------|-------------------------|-----------------------------|------------------|-------------------|------|------|-----|------|------|------|------|
|           |                         |                             |                  | 63                | 125  | 250  | 500 | 1k   | 2k   | 4k   | 8k   |
| CR1       | Karbox 2464             | Man                         | Sound Power, Lw  | 64                | 61.5 | 61.5 | 63  | 59.4 | 57.3 | 54.1 | 46.9 |
| EX1       | Woods Powerbox 67-500-1 | Man                         | Sound Power, Lw  | 73                | 89   | 84   | 76  | 73   | 66   | 62   | 59   |

Notes

1 - Man refers to data supplied by the equipment manufacturer or supplier, Emp refers to data calculated using empirical formulae, and Meas refers to data measured by Cole Jarman



**Project Name** Papa John's, Waterlooville

**Project Reference** 18/0657

**Receiver Reference** AP1 - Day

**Description** Side Window, Top Floor, 258 London Road

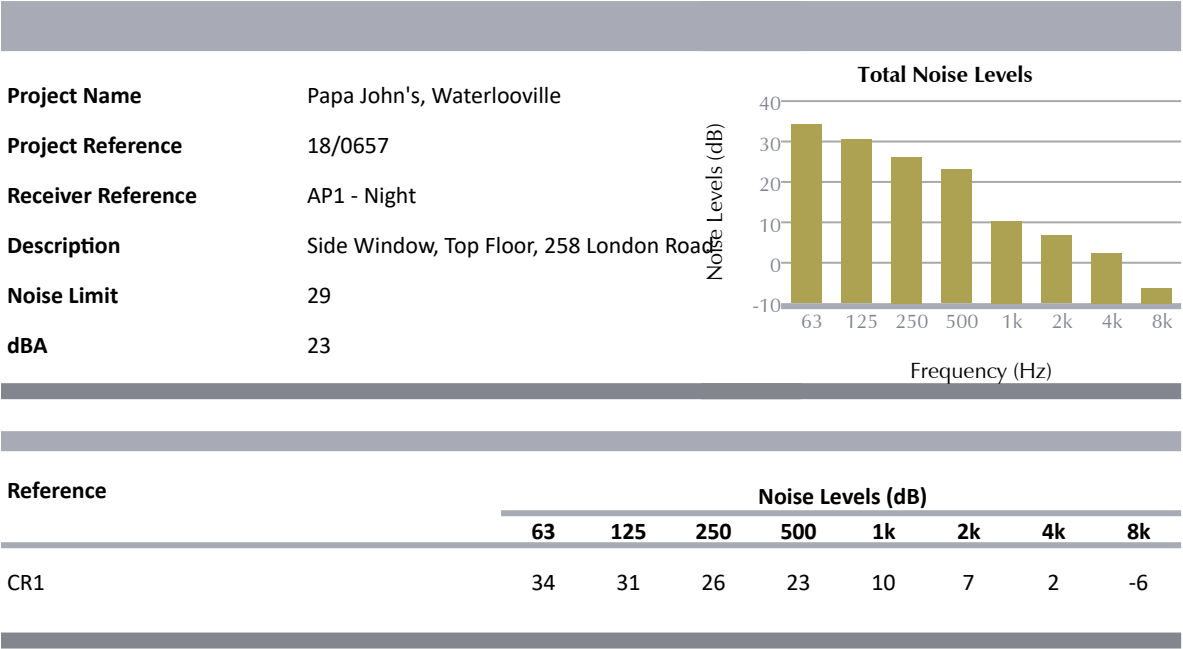
**Noise Limit** 30

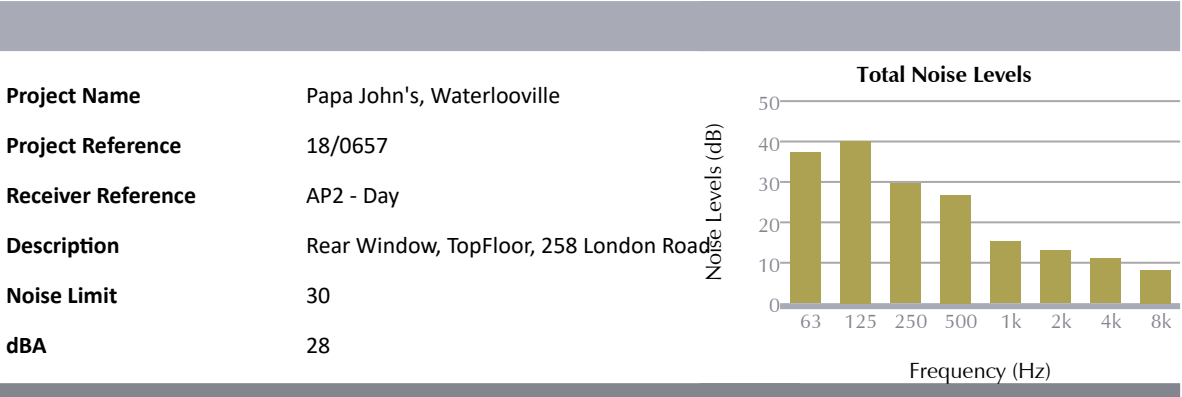
**dBA** 29

**Total Noise Levels**

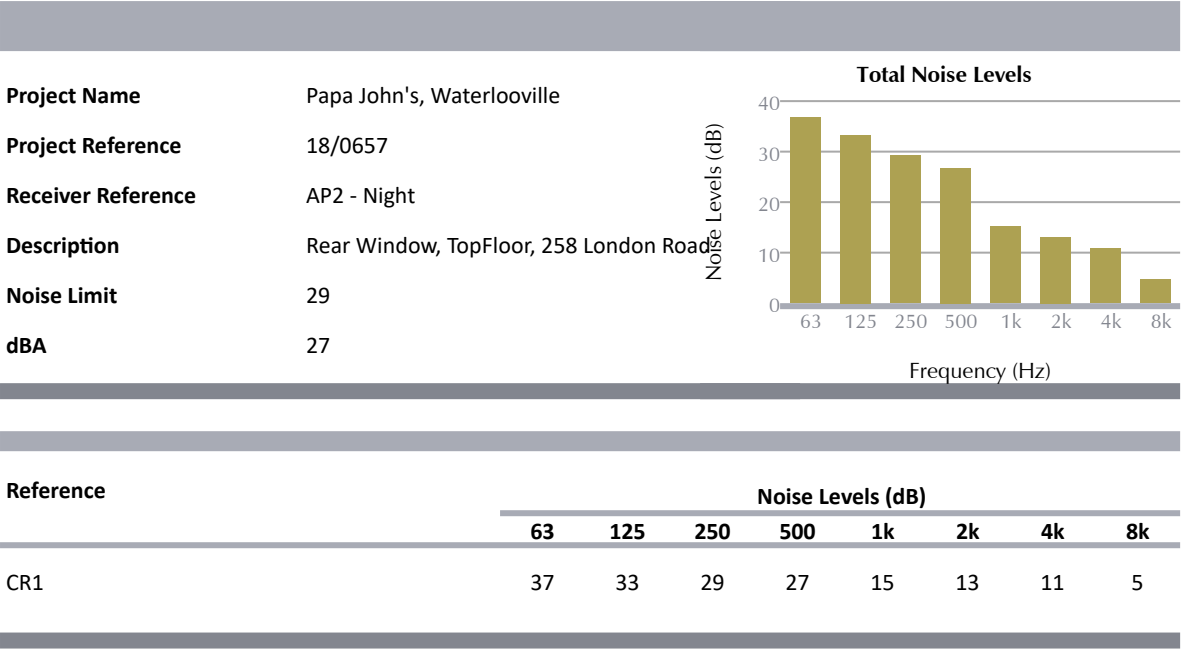
| Frequency (Hz) | Noise Levels (dB) |
|----------------|-------------------|
| 63             | 38                |
| 125            | 45                |
| 250            | 28                |
| 500            | 23                |
| 1k             | 10                |
| 2k             | 7                 |
| 4k             | 5                 |
| 8k             | 10                |

| Reference | Noise Levels (dB) |     |     |     |    |    |    |    |
|-----------|-------------------|-----|-----|-----|----|----|----|----|
|           | 63                | 125 | 250 | 500 | 1k | 2k | 4k | 8k |
| CR1       | 34                | 31  | 26  | 23  | 10 | 7  | 2  | -6 |
| EX1       | 33                | 44  | 24  | 1   | -8 | -6 | 3  | 10 |





| Reference | Noise Levels (dB) |     |     |     |     |     |    |    |
|-----------|-------------------|-----|-----|-----|-----|-----|----|----|
|           | 63                | 125 | 250 | 500 | 1k  | 2k  | 4k | 8k |
| EX1       | 28                | 39  | 19  | -4  | -13 | -10 | -1 | 6  |
| CR1       | 37                | 33  | 29  | 27  | 15  | 13  | 11 | 5  |







18/0657/CS5



|                               | Octave Band Centre Frequency (Hz) |             |             |             |             |            |            |             |
|-------------------------------|-----------------------------------|-------------|-------------|-------------|-------------|------------|------------|-------------|
|                               | 63                                | 125         | 250         | 500         | 1k          | 2k         | 4k         | 8k          |
| <b>External Receiver</b>      |                                   |             |             |             |             |            |            |             |
| External Receiver - AP1 - Day |                                   |             |             |             |             |            |            |             |
| <b>Sound Pressure, Lp:</b>    | <b>34.3</b>                       | <b>30.6</b> | <b>26.2</b> | <b>23.0</b> | <b>10.4</b> | <b>6.7</b> | <b>2.4</b> | <b>-6.2</b> |





## Calculation Sheet

18/0657/CS6

CR1 to AP2 - Day

| Octave Band Centre Frequency (Hz)  |             |             |             |             |             |             |             |             |
|------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                                    | 63          | 125         | 250         | 500         | 1k          | 2k          | 4k          | 8k          |
| <b>Noise Source</b>                |             |             |             |             |             |             |             |             |
| Noise Source - CR1                 |             |             |             |             |             |             |             |             |
| <b>Sound Power Levels</b>          | <b>64.0</b> | <b>61.5</b> | <b>61.5</b> | <b>63.0</b> | <b>59.4</b> | <b>57.3</b> | <b>54.1</b> | <b>46.9</b> |
| <b>Lw or Lp</b>                    |             |             |             |             |             |             |             |             |
| Lw or Lp? - Sound Power (Lw)       |             |             |             |             |             |             |             |             |
|                                    | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         |
| <b>Point Source Radiation Loss</b> |             |             |             |             |             |             |             |             |
| Radiation - Eighthspherical        |             |             |             |             |             |             |             |             |
|                                    | -2.0        | -2.0        | -2.0        | -2.0        | -2.0        | -2.0        | -2.0        | -2.0        |
| <b>Point Source Distance Loss</b>  |             |             |             |             |             |             |             |             |
| End Distance (m) 6.5               |             |             |             |             |             |             |             |             |
|                                    | -16.3       | -16.3       | -16.3       | -16.3       | -16.3       | -16.3       | -16.3       | -16.3       |
| <b>Arithmetic Subtract</b>         |             |             |             |             |             |             |             |             |
|                                    | -9.0        | -10.0       | -14.0       | -18.0       | -26.0       | -26.0       | -25.0       | -24.0       |
| <b>Bypass Switch</b>               |             |             |             |             |             |             |             |             |
| Mitigation? - With Mitigation      |             |             |             |             |             |             |             |             |
|                                    | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         |
| <b>Bypass Switch</b>               |             |             |             |             |             |             |             |             |
| Screening? - No Screening          |             |             |             |             |             |             |             |             |
|                                    | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         |
| <b>External Receiver</b>           |             |             |             |             |             |             |             |             |
| External Receiver - AP2 - Day      |             |             |             |             |             |             |             |             |
| <b>Sound Pressure, Lp:</b>         | <b>36.8</b> | <b>33.3</b> | <b>29.3</b> | <b>26.8</b> | <b>15.2</b> | <b>13.1</b> | <b>10.9</b> | <b>4.7</b>  |



## Calculation Sheet

18/0657/CS7

CR1 to AP1 - Night

| Octave Band Centre Frequency (Hz)  |             |             |             |             |             |             |             |             |
|------------------------------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
|                                    | 63          | 125         | 250         | 500         | 1k          | 2k          | 4k          | 8k          |
| <b>Noise Source</b>                |             |             |             |             |             |             |             |             |
| Noise Source - CR1                 |             |             |             |             |             |             |             |             |
| <b>Sound Power Levels</b>          | <b>64.0</b> | <b>61.5</b> | <b>61.5</b> | <b>63.0</b> | <b>59.4</b> | <b>57.3</b> | <b>54.1</b> | <b>46.9</b> |
| <b>Lw or Lp</b>                    |             |             |             |             |             |             |             |             |
| Lw or Lp? - Sound Power (Lw)       |             |             |             |             |             |             |             |             |
|                                    | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         |
| <b>Point Source Radiation Loss</b> |             |             |             |             |             |             |             |             |
| Radiation - Eighthspherical        |             |             |             |             |             |             |             |             |
|                                    | -2.0        | -2.0        | -2.0        | -2.0        | -2.0        | -2.0        | -2.0        | -2.0        |
| <b>Point Source Distance Loss</b>  |             |             |             |             |             |             |             |             |
| End Distance (m)                   |             |             |             |             |             |             |             |             |
|                                    | 4.9         |             |             |             |             |             |             |             |
|                                    | -13.8       | -13.8       | -13.8       | -13.8       | -13.8       | -13.8       | -13.8       | -13.8       |
| <b>Arithmetic Subtract</b>         |             |             |             |             |             |             |             |             |
|                                    | -9.0        | -10.0       | -14.0       | -18.0       | -26.0       | -26.0       | -25.0       | -24.0       |
| <b>Bypass Switch</b>               |             |             |             |             |             |             |             |             |
| Mitigation? - With Mitigation      |             |             |             |             |             |             |             |             |
|                                    | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         |
| <b>Maekawa Screening Loss</b>      |             |             |             |             |             |             |             |             |
| Path Difference (m)                |             |             |             |             |             |             |             |             |
|                                    | 0.0         |             |             |             |             |             |             |             |
|                                    | -5.0        | -5.2        | -5.5        | -6.2        | -7.3        | -8.8        | -10.9       | -13.4       |
| <b>Bypass Switch</b>               |             |             |             |             |             |             |             |             |
| Screening? - With Screening        |             |             |             |             |             |             |             |             |
|                                    | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         | 0.0         |



18/0657/CS7



|                                 | Octave Band Centre Frequency (Hz) |             |             |             |             |            |            |             |
|---------------------------------|-----------------------------------|-------------|-------------|-------------|-------------|------------|------------|-------------|
|                                 | 63                                | 125         | 250         | 500         | 1k          | 2k         | 4k         | 8k          |
| <b>External Receiver</b>        |                                   |             |             |             |             |            |            |             |
| External Receiver - AP1 - Night |                                   |             |             |             |             |            |            |             |
| <b>Sound Pressure, Lp:</b>      | <b>34.3</b>                       | <b>30.6</b> | <b>26.2</b> | <b>23.0</b> | <b>10.4</b> | <b>6.7</b> | <b>2.4</b> | <b>-6.2</b> |





**Cole Jarman Limited** Reg. in England and Wales No. 7102436  
An RSK Company  
Registered Office Spring Lodge, 172 Chester Road, Helsby WA6 0AR  
**www.colejarman.com** info@colejarman.com

**Head Office** +44 (0)1932 829007  
John Cree House, 24b High Street, Addlestone, Surrey, United Kingdom KT15 1TN  
**Manchester** 0161 470 8888 | Fourways House, 57 Hilton Street, Manchester M1 2EJ  
**Bristol** 0117 287 2633 | The Old School, Stillhouse Lane, Bristol BS3 4EB