



**CAMBRIDGE  
ACOUSTICS**

# Proposed Development at Station Road, Meldreth, Cambridge

Noise Impact Assessment

---

## CONTENTS

<b>1. Introduction</b>	<b>4</b>	
<b>2. Site description</b>	<b>5</b>	
<b>3. Policy, Guidance &amp; Standards</b>	<b>6</b>	
<b>4. Noise Measurement Survey</b>	<b>9</b>	
<b>5. Measurement Results</b>	<b>11</b>	
<b>6. Noise Impact Assessment</b>	<b>12</b>	
<b>7. Conclusions</b>	<b>15</b>	
<b>Appendix A</b>	<b>Glossary of Terms</b>	<b>16</b>
<b>Appendix B</b>	<b>Noise Measurement Data</b>	<b>17</b>
<b>Appendix C</b>	<b>Time History Charts</b>	<b>22</b>
<b>Appendix D</b>	<b>Proposed Initial Design</b>	<b>23</b>
<b>Appendix E</b>	<b>Updated Design Layout</b>	<b>24</b>
<b>Appendix F</b>	<b>Noise Model Predictions</b>	<b>26</b>

**Cambridge Acoustics**  
**Project title: Station Road, Meldreth**  
**Date: August 2019**  
**Author: Marcus Watts**  
**Status: Final. V01**  
**Reference: 011908**

Cambridge Acoustics, 4 High Street, Oakington, Cambridge, CB24 3AG  
Tel+44(0) 1223 237427  
E-mail: [enquiries@cambridgeacoustics.co.uk](mailto:enquiries@cambridgeacoustics.co.uk)  
[www.cambridgeacoustics.co.uk](http://www.cambridgeacoustics.co.uk)

---

## **Disclaimer**

**This report carried out by Cambridge Acoustics has been completed based on agreed terms with the client. The report has been prepared with all reasonable skill, care and diligence taking into consideration the project objectives and scope of works. Cambridge Acoustics accepts no responsibility following the issue of the report for any matters outside the scope of the works. The report is issued in confidence to the client.**

**Cambridge acoustics takes no responsibility for any third party reliance on its contents. Unless specifically assigned or transferred Cambridge Acoustics Ltd retains all copyright and other intellectual rights, on and over the report and its contents.**

**Cambridge Acoustics certifies that all measurements contained within this report are a true and accurate reflection of the measurements taken at the dates and times given. Cambridge Acoustics does not maintain, guarantee or make any assurances that noise levels will not change or fluctuate over time. This must be taken into account when relying on the noise measurements for future assessment and calculation. It is recommended that a further detailed measurement be taken to validate the findings should the measurements be later relied on for additional calculation, analysis or design purposes.**

---

## 1. INTRODUCTION

### 1.1 Background

- 1.1.1 Outline planning permission is being sought for a new residential development consisting of seven, two and three bedroomed properties on an area of land located immediately to the West of the A10, off Station Road, Meldreth, South Cambridgeshire.
- 1.1.2 Cambridge Acoustics has been commissioned by H D Planning Ltd on behalf of [REDACTED] to provide a full noise survey to support the planning application.
- 1.1.3 This report sets out the methodology and results of a noise survey undertaken at the site. The findings of the survey are referenced to current British Standards.

### 1.2 Scope

- 1.2.1 The scope of this report is outlined below:
- I. To provide detailed measurements of noise from the adjacent A10
  - II. To detail the suitability of the site for residential use
  - III. To outline appropriate noise mitigation options to ensure compliance with recommended guidelines.

### 1.3 Acoustic Terminology

- 1.3.1 A breakdown and explanation of acoustic terms and references used within this report is provided within Appendix A.

---

## 2. SITE DESCRIPTION

- 2.1 The site is located towards to the West of the A10 and to the North of an existing access road off Station Road located at the South of the village and bordering on the village of Melbourn.
- 2.2 At the closest point, the A10 is 19m from the site boundary. The road is raised and passes over Station Road. Figures 1 & 2 details the site location



Figure 1: site location



Figure 2: Site outline

---

---

## 3. POLICY, GUIDANCE & STANDARDS

### 3.1 National Planning Policy Framework

3.1.1 The National Planning Policy Framework (NPPF) was published in March 2012 and came into force with immediate effect. This document replaced PPG24, which was formerly the central national planning guidance document relating to noise in the UK. The NPPF was revised in 2019.

3.1.2 PPG24 previously provided quantified advice to assess the suitability of sites for residential development on the basis of prevailing noise levels in the form of Noise Exposure Categories. The NPPF provides guidance only, although it does refer to the Noise Policy Statement for England (which includes assessment criteria albeit in general terms).

3.1.3 The only reference made to environmental noise within the NPPF is listed below.

Section 11 'Conserving and enhancing the natural environment' advises:

"109. The planning system should contribute to and enhance the natural and local environment by:

- .....
- Preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability.
- ....."

and

"123. Planning policies and decisions should aim to:

- Avoid noise giving rise to significant adverse impacts<sup>27</sup> on health and quality of life as a result of a new development;
- Mitigate and reduce to a minimum other adverse impacts<sup>27</sup> on health and quality of life arising from noise from new development, including through the use of conditions;
- Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of nearby land uses since they were established;<sup>28</sup> and
- Identify and protect areas of tranquillity that have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."

(Footnote 27 refers to an explanatory note in the NPSE. Footnote 28 refers to "the provisions of the Environmental Protection Act 1990 and other relevant law").

## 3.2 Planning Practice Guidance – Noise (March 2014)

3.2.1 The PPG note attempts to provide some clarity to local authorities on how to view and assess observed effect levels in line with the Explanatory Notice of the Noise Policy Statement for England. Table 1 below summarises the noise exposure hierarchy, based on the likely average response.

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

Table 1. PPG noise exposure hierarchy

---

### 3.3 BS 8233: 2014 Guidance on sound insulation and noise reduction for buildings

3.3.1 The British Standard BS8233:2014 recommends design criteria for internal noise levels within residential properties. This standard suggests some criteria, such as resting/sleeping conditions and proposes noise limits that will normally satisfy these criteria for most people. A summary of the noise guidelines for reasonable resting/sleeping conditions in living rooms and bedrooms has been reproduced in Table 2.

Activity	Room	Daytime Design Range (LAeq t)	Night-time Design Range (LAeq t)
Resting	Living Rooms	35 dB	-
Dining	Dining Room	40 dB	-
Sleeping (daytime resting)	Bedroom	35 dB	30 dB

Table 2. Summary of Recommended Guidance from BS 8233:2014

3.3.2 On the design criteria for external noise the standard also states, “for traditional amenity space such as gardens and patios, it is desirable that the external noise level does not exceed 50dB A, with an upper guideline value of 55dB LAeq which would be acceptable in noisier environments.” However, “it is also recognised that the guideline values are not achievable in all circumstances where the development might be desirable.”

3.3.3 Notwithstanding the above, BS 8233 states that where development is considered necessary or desirable, despite external noise levels above external values of 50 -55 dB, the internal target levels may be relaxed by up to 5dB.

### 3.4 Professional Practice Guidance on Planning & Noise, 2017

3.4.1 The Professional Practice Guidance on Planning and Noise (Pro PG) for new residential developments was published in May 2017. It was produced to provide practitioners with guidance on a recommended approach to the management of noise within the planning system in England.

---

3.4.2 The guidance “does not constitute an official government code of practice and neither replaces nor provides an authoritative interpretation of the law or government policy on which users should take their own advice as appropriate.”

3.4.3 The scope of the Pro PG is restricted to the consideration of new residential development that will be exposed predominantly to airborne noise from transport sources.

3.4.4 The Pro PG advocates a systematic, proportionate, risk based, 2-stage approach:

Stage 1 – an initial noise risk assessment of the proposed development site;

Stage 2 – a systematic consideration of four key elements:

- demonstrating a “Good Acoustic Design Process”;
- observing internal “Noise Level Guidelines”;
- undertaking an “External Amenity Area Noise Assessment”
- consideration of “Other Relevant Issues”

3.4.5 The Pro PG reflects and extends on BS8233:2014 to include guidance on circumstances where most people are likely to regard the internal  $L_{Aeq}$  noise levels as “unreasonable” or “unacceptable”. It also expands on the potential impact of noise events on sleep disturbance; stating that “individual noise events should not normally exceed 45dB  $L_{Amax,F}$  more than 10 times a night”.

## 4. NOISE MEASUREMENT SURVEY

### 4.1 Measurement Location

4.1.1 A series of 15-minute noise measurements were taken from the evening of 28<sup>th</sup> April until the evening of 30<sup>th</sup> April 2019. These measurements were taken from a boundary position away from any reflective surfaces and at a height of 1.4m.



Figure 3. Measurement Location

## 4.2 Instrumentation

4.2.1 The noise survey instrumentation is set out below. The microphone was calibrated before and after the survey in order to ensure a consistent and acceptable level of accuracy. No significant drift of +0.5dB was noted.

Equipment Description	Model	Serial No
Cirrus Optimus Green SLM	HCR:171B	G061637
Cirrus Acoustic Calibrator	HCR:515	60462

Table 3. Instrumentation

4.2.2 The meter is subject to annual calibration using equipment referenced to the British Calibration Service and National Physical Laboratory. Calibration certificates for the noise instrumentation can be made available on request.

4.2.3 Measurements consisted of LAeq, L10 & Lmax readings.

---

### 4.3 Weather Conditions

4.3.1 The weather conditions at the time of the assessment is provided below:

Date	Temperature	Wind speed	Wind direction	Precipitation
28 <sup>th</sup> April	12 (ave)	<4m/s	North Westerly	None
29 <sup>th</sup> April	10° (ave)	<2.5 m/s	Northerly	None
30 <sup>th</sup> April	11° (ave)	<2 m/s	Northerly	None

Table 4. Weather conditions

## 5. MEASUREMENT RESULTS

### 5.1 Measurement Results

5.1.1 A summary of the measured sound pressure levels from the road traffic noise survey are presented in Table 5.

Date	Day/Night	L <sub>Aeq</sub>	L <sub>Amax</sub> (Highest)	L90
28 <sup>th</sup> April	Night	53	82.5	52
29 <sup>th</sup> April	Day	58	82.5	54.3
29 <sup>th</sup> April	Night	53	76.5	53
30 <sup>th</sup> April	Day	58	87	55

Table 5. Summary road traffic noise measurements

5.1.2 More detailed noise data is provided in Appendix B. Corresponding time history charts are provided in Appendix C.

---

## 6. NOISE IMPACT ASSESSMENT

### 6.1 Risk Assessment

6.1.1 The Pro PG advises on a risk assessment method to assess the suitability of the site for residential development. Based on daytime levels of 58dB LAeq, the guidance document suggests that that site should be classed as low risk. At night, the site is classed as low to medium risk. The site should be regarded as acceptable for residential use provided that a good acoustic design process is followed and that adverse impacts are mitigated and minimised where possible.

### 6.2 External Noise Levels

6.2.1 Given the elevated position of the A10, there is no prospect of mitigation at source. Details of the original design for the development is provided in Appendix D. To assess compliance with the noise criteria given in S.3 of this report a numerical noise model demonstrating the attenuation across the proposed development has been used. The model was created using DataKustik CADNA A, noise modelling software which meets the requirements of ISO 9613 Part 2: 1996. The noise model takes account of the following in its calculation procedures:

- Source sound power level for line sources
- Distance from the noise source
- Acoustic screening
- Reflections from nearby structures and source directivity
- Ground absorption
- Ground effects.

6.2.2 The graphical information relating to noise propagation is also shown in Appendix D. As can be seen, noise levels across the site show a level of compliance, however, more importantly, much of the development does not. Consequently, on advice and in accordance with the principles of Pro PG, the site was redesigned. Appendix E provides an outline of the current proposal. Corresponding noise model predictions are given in Appendix F. Based on this new design, garden areas will be adequately screened from adverse levels with levels within garden areas ranging from 49-54dB LAeq.

---

### 6.3 Internal Noise Levels

6.3.1 The architect has adopted the principles of good acoustic design with regards to site layout. However, further mitigation will be necessary to ensure compliance with accepted internal noise criteria as part of any detailed design. Table 6 provides information on the calculated noise levels at the westerly façades.

Plot	L <sub>Aeq</sub> / Day (At 1.8m)	L <sub>Aeq</sub> / Night (At 4.5m)
1	59.7	56.3
2	59.9	55.2
3	59.6	56
4	59.4	56.2
5	59.4	56.3
6	58.7	56.6
7	58.8	56.4

Table 6. Summary of (westerly) façade levels

- 6.3.2 Assuming that the proposed construction will be based on solid masonry brick block cavity construction, attention will need to be given to the openings, namely, windows, doors and associated ventilation.
- 6.3.3 Given that the dwellings have yet to be subject to internal design, it is recommended that, where possible, non-sensitive rooms such as kitchens, bathrooms and dining rooms are oriented towards the A10 and sensitive rooms oriented to the rear gardens.
- 6.3.4 During the day, external levels at the westerly façade are up to 60dB. A brick block construction is likely to provide a façade reduction of approximately 45-50dB. To meet the internal noise standards of 35dB LAeq in living rooms and 40dB LAeq in dining rooms (oriented with openings on the western façade), the combined attenuation afforded by the windows, casings and ventilation will need to provide a minimum sound reduction of 25dB (Living rooms) and 20dB (Dining rooms). This level of sound reduction can be easily achieved using well-sealed double glazed units and doors and attenuated passive ventilation systems.
- 6.3.5 With windows open, internal levels will exceed the daytime noise criteria. Therefore, the ventilation will need to be designed to draw air from the rear (quieter) protected façade to

---

allow effective ventilation rates without the need to open windows. Alternatively, consideration should be given to forced or whole house mechanical ventilation systems.

- 6.3.6 At night, consideration needs to be given to both the LAeq and LAmax noise levels in bedroom locations. Guideline night-time requirements are for individual internal noise events not to exceed 45dB for more than 10-15 times per night. An assessment of LAmax levels show that on the evening of 28 April, LAmax levels range from 59 – 82.5 dB. The LAmax of 82.5dB appears to be an outlier and on analysis the noise is more likely to arise from birdsong. Noise from passing vehicles are typically 62-66dB LAmax at the monitoring position. Excluding the highest LAmax, the average is 66.5dB. On the night of 29 April, the highest LAmax was 76.5dB, the average being 66.5dB.
- 6.3.7 Based on 66.5dB, calculated for distance the LAmax at the closest dwelling will be 66dB at the ground floor level. At first floor level, the LAmax is predicted to increase to 68.5dB due to direction line of sight from traffic on the A10. To be confident that internal noise levels do not regularly exceed 45dB LAmax, the minimum sound reduction value provided by the glazing and ventilation will need to be 23.5dB. Therefore, with an estimated sound reduction of 26.5dB, internal levels should meet both the LAeq and LAmax target noise levels.
- 6.3.8 As noted earlier, the above estimated values are based on windows being closed and attenuated passive ventilators open. Should the Local Authority require more robust ventilation design, forced whole house or mechanical can be adopted.
- 6.3.10 As the detailed design work for a reserved matters application is not available, it is not possible to calculate internal noise levels in accordance with the recommended calculation given in BS 8233:2014. Therefore, it is recommended that on completion of the internal design, further work is carried to ensure with reasonable accuracy compliance with the set noise criteria as set out in BS8233: 2014.

---

## 7. CONCLUSIONS

- 7.1 Representative noise measurements from the A10 adjacent to the proposed development site have been taken and the site should be regarded as low to medium risk when assessed in accordance with the Pro PG.
- 7.2 The site layout has changed significantly to ensure that the principles of good acoustic design are adopted. Each dwelling has amenity space that complies with external amenity criteria.
- 7.3 Further mitigation and measures will need to be considered at the detailed design stage to ensure that internal noise criteria listed within this report can be achieved. Compliance with internal amenity requirements can be achieved through careful internal planning of sensitive, non-sensitive rooms and common areas, such as utility rooms, kitchens, landings and walkways. Where sensitive rooms may be adversely affected by road noise, enhanced glazing and ventilation measures will need to be adopted. Further information on this can be determined during the reserved matters assessment.
- 7.4 It is considered that this can be addressed using reasonable planning conditions. For this reason, noise impact should not be a reason for refusal.

---

## Appendix A. Glossary of Terms

### **Free Field:**

The term 'free field' applies to a measurement location which is in the open/clear and is away (>3.5m) from any solid surfaces

### **A weighting:**

The human ear is not equally sensitive to sounds of different frequencies. Human hearing is more sensitive at the higher or lower frequencies. When measuring sound a weighting filter is applied to reduce the effects of low and high frequency noise. An A weighting is the filter most commonly used and reduces the effect of lower frequency noise and very high frequency noise, therefore approximating the response of a human ear.

### **Decibel (dB):**

10<sup>6</sup>:1 (On million to one). For convenience a logarithmic measurement scale is used. The resulting parameter unit is the sound pressure level (SPL or Lp) and the associated measurement is the decibel (dB). As it's a logarithmic ration, the laws of logarithmic addition and subtraction apply

### **LAeq:**

The Equivalent continuous sound level. This is typically a steady noise level which presents the same energy over time as the actual fluctuating sound

### **L90:**

The dB(A) level which is exceeded for 90% of the time. It is commonly used to express the background noise level.

### **L10:**

The dB(A) level which is exceeded for 10% of the time.

### **LAm<sub>ax</sub>:**

This is the maximum noise level recorded over the measurement period

### **LAm<sub>in</sub>:**

This is the minimum noise level recorded over the measurement period

### **Noise:**

This is defined as unwanted sound. The range of audible sound is from 0dB to 140dB, which is taken to be the threshold of pain. The sound pressure detected by the human ear covers an extremely wide range. The decibel (dB) scale condenses this range into a manageable scale.

### **Frequency:**

The unit of frequency is Hz. 1 Hz is one pressure fluctuation in one second. The frequency response of the ear is usually taken to be about 16Hz (number of oscillations per second) to 18,000Hz.

### **Perception of loudness:**

The ear can just distinguish a difference in loudness between two noise sources when there is a 3dB (A) difference between them. Also, when two sound sources of the same noise level are combined the resultant level is 3dB (A) higher than the single source. When two sounds differ by 10dB (A) one is said to be twice as loud as the other.

---

**Appendix B     Noise Measurement Data**Night 28<sup>th</sup> April

Time	Duration	LAeq (dB)	LAFMax (dB)	Ln5 (90) (dB)
28/04/2019 23:00	00:15:00	53.6	66.7	41.9
28/04/2019 23:15	00:15:00	53.6	66.3	37.8
28/04/2019 23:30	00:15:00	52.3	65.9	35.6
28/04/2019 23:45	00:15:00	51.5	66.6	32.7
29/04/2019 00:00	00:15:00	49.8	64.1	32.8
29/04/2019 00:15	00:15:00	51	64.5	31.5
29/04/2019 00:30	00:15:00	49.8	62.7	29.2
29/04/2019 00:45	00:15:00	49.7	67.3	28
29/04/2019 01:00	00:15:00	49	65.4	21.3
29/04/2019 01:15	00:15:00	45.3	61.5	23.8
29/04/2019 01:30	00:15:00	46.7	65.8	24.2
29/04/2019 01:45	00:15:00	36.4	58.9	21.8
29/04/2019 02:00	00:15:00	45.7	64.6	21.4
29/04/2019 02:15	00:15:00	43.8	67.3	21.3
29/04/2019 02:30	00:15:00	49.4	68	25.1
29/04/2019 02:45	00:15:00	44.9	65.3	20.8
29/04/2019 03:00	00:15:00	43.7	61.3	20.2
29/04/2019 03:15	00:15:00	47.8	66.4	22.8
29/04/2019 03:30	00:15:00	47.7	66.3	26.1
29/04/2019 03:45	00:15:00	46.6	68.5	26.5
29/04/2019 04:00	00:15:00	45.3	63.4	27.8
29/04/2019 04:15	00:15:00	48.7	65.6	29.8
29/04/2019 04:30	00:15:00	49.7	62.2	33.6
29/04/2019 04:45	00:15:00	52.9	66.5	41.7
29/04/2019 05:00	00:15:00	53.1	69	44.1
29/04/2019 05:15	00:15:00	54.7	70.6	42.4
29/04/2019 05:30	00:15:00	55.7	77.2	43
29/04/2019 05:45	00:15:00	56.3	69.3	42.4
29/04/2019 06:00	00:15:00	56.8	71.4	44.3
29/04/2019 06:15	00:15:00	58.7	82.5	46.6
29/04/2019 06:30	00:15:00	58.6	68.2	49.2
29/04/2019 06:45	00:15:00	59.7	66.1	51.8

Daytime 29<sup>th</sup> April

Time	Duration	LAeq (dB)	LAFMax (dB)	Ln5 (90) (dB)
29/04/2019 07:00	00:15:00	59.8	68	52
29/04/2019 07:15	00:15:00	59.5	68	52.2
29/04/2019 07:30	00:15:00	60	70.6	53.7
29/04/2019 07:45	00:15:00	60	70.8	53.5
29/04/2019 08:00	00:15:00	59.6	67.6	53.5
29/04/2019 08:15	00:15:00	59.6	77.1	52.4
29/04/2019 08:30	00:15:00	59.5	68.6	53.6
29/04/2019 08:45	00:15:00	59.9	69.5	54.3
29/04/2019 09:00	00:15:00	59.2	68	52.4
29/04/2019 09:15	00:15:00	59	66.7	51.9
29/04/2019 09:30	00:15:00	58.2	68.3	50.7
29/04/2019 09:45	00:15:00	58.2	67.9	50.9
29/04/2019 10:00	00:15:00	58	68	49.2
29/04/2019 10:15	00:15:00	57.8	75.5	49.9
29/04/2019 10:30	00:15:00	59	77.8	51.2
29/04/2019 10:45	00:15:00	57.5	69.5	48.9
29/04/2019 11:00	00:15:00	57.5	67.3	49.8
29/04/2019 11:15	00:15:00	57.8	75.6	48.5
29/04/2019 11:30	00:15:00	57.2	65.2	49.7
29/04/2019 11:45	00:15:00	57.3	67.4	48.6
29/04/2019 12:00	00:15:00	56.9	66.8	48.8
29/04/2019 12:15	00:15:00	57.6	64.7	50.3
29/04/2019 12:30	00:15:00	57.8	74.4	49.5
29/04/2019 12:45	00:15:00	57.7	75.6	49.7
29/04/2019 13:00	00:15:00	57.3	66.9	50.1
29/04/2019 13:15	00:15:00	57.1	67	49
29/04/2019 13:30	00:15:00	57.5	65.3	50.5
29/04/2019 13:45	00:15:00	57.9	74.4	48.4
29/04/2019 14:00	00:15:00	57.5	67.3	49.6
29/04/2019 14:15	00:15:00	58.3	69.2	49.9
29/04/2019 14:30	00:15:00	57.6	66.4	50
29/04/2019 14:45	00:15:00	57.7	67.7	50.8
29/04/2019 15:00	00:15:00	57.5	67.7	50.6
29/04/2019 15:15	00:15:00	57.3	65.2	50.2
29/04/2019 15:30	00:15:00	58.3	78.4	51.2
29/04/2019 15:45	00:15:00	58.5	68.4	51.3
29/04/2019 16:00	00:15:00	59.3	80.3	51.7
29/04/2019 16:15	00:15:00	58.5	72	51.7
29/04/2019 16:30	00:15:00	58.7	66	52.9
29/04/2019 16:45	00:15:00	58	64.8	52.1
29/04/2019 17:00	00:15:00	58.3	64.6	51.5
29/04/2019 17:15	00:15:00	58.6	68.8	52.1

29/04/2019 17:30	00:15:00	58.5	69.9	51.7
29/04/2019 17:45	00:15:00	57.7	66.6	50.4
29/04/2019 18:00	00:15:00	58.6	67.1	51.5
29/04/2019 18:15	00:15:00	58.3	66.7	51.7
29/04/2019 18:30	00:15:00	58	65.9	49.9
29/04/2019 18:45	00:15:00	58.6	73.4	49.8
29/04/2019 19:00	00:15:00	57.8	67.3	49.8
29/04/2019 19:15	00:15:00	56.8	66.9	47.5
29/04/2019 19:30	00:15:00	56.5	70.6	46.4
29/04/2019 19:45	00:15:00	55.5	65.7	44.9
29/04/2019 20:00	00:15:00	55.1	65.1	44.3
29/04/2019 20:15	00:15:00	55.6	65.6	45.5
29/04/2019 20:30	00:15:00	55.6	69	44.6
29/04/2019 20:45	00:15:00	54.9	63.7	45.1
29/04/2019 21:00	00:15:00	53.4	68	42.4
29/04/2019 21:15	00:15:00	53.1	69.2	39.2
29/04/2019 21:30	00:15:00	54.6	70	43.2
29/04/2019 21:45	00:15:00	52.7	65.6	40.4
29/04/2019 22:00	00:15:00	57.1	82.4	40.8
29/04/2019 22:15	00:15:00	52.8	63.9	41.9
29/04/2019 22:30	00:15:00	52.5	65.5	37.5
29/04/2019 22:45	00:15:00	52.3	66	38.2

Night 29<sup>th</sup> April 2019

Time	Duration	LAeq (dB)	LAFMax (dB)	Ln5 (90) (dB)
29/04/2019 23:00	00:15:00	50.4	63.8	34.5
29/04/2019 23:15	00:15:00	51.2	62.3	35.9
29/04/2019 23:30	00:15:00	50.8	65.7	32.1
29/04/2019 23:45	00:15:00	50.4	62.5	31.9
30/04/2019 00:00	00:15:00	50.3	67	30.3
30/04/2019 00:15	00:15:00	49	64.3	31.4
30/04/2019 00:30	00:15:00	47.2	65.4	27.2
30/04/2019 00:45	00:15:00	46	62.4	26.9
30/04/2019 01:00	00:15:00	47.4	64.8	29.6
30/04/2019 01:15	00:15:00	46.1	64	27.4
30/04/2019 01:30	00:15:00	45.7	65.8	26.7
30/04/2019 01:45	00:15:00	43.5	63.5	27.7
30/04/2019 02:00	00:15:00	45.5	66.3	27.6
30/04/2019 02:15	00:15:00	47.9	65	27.6
30/04/2019 02:30	00:15:00	46.3	63.2	29.6
30/04/2019 02:45	00:15:00	43.1	62.7	27.2
30/04/2019 03:00	00:15:00	45	64.2	27.6

30/04/2019 03:15	00:15:00	47.4	65	29
30/04/2019 03:30	00:15:00	45.6	64.2	28.9
30/04/2019 03:45	00:15:00	45.7	63.4	28.1
30/04/2019 04:00	00:15:00	43.4	60.1	30
30/04/2019 04:15	00:15:00	48.3	64.8	33.2
30/04/2019 04:30	00:15:00	49.9	66.4	36.1
30/04/2019 04:45	00:15:00	53.2	67.2	43.7
30/04/2019 05:00	00:15:00	53.6	67	46.3
30/04/2019 05:15	00:15:00	54.8	67.1	46.5
30/04/2019 05:30	00:15:00	57.7	73.7	45.9
30/04/2019 05:45	00:15:00	57.4	76.6	47
30/04/2019 06:00	00:15:00	57.3	68	49.3
30/04/2019 06:15	00:15:00	58.8	68.9	52
30/04/2019 06:30	00:15:00	60.1	76.1	51.9
30/04/2019 06:45	00:15:00	60	68.6	53

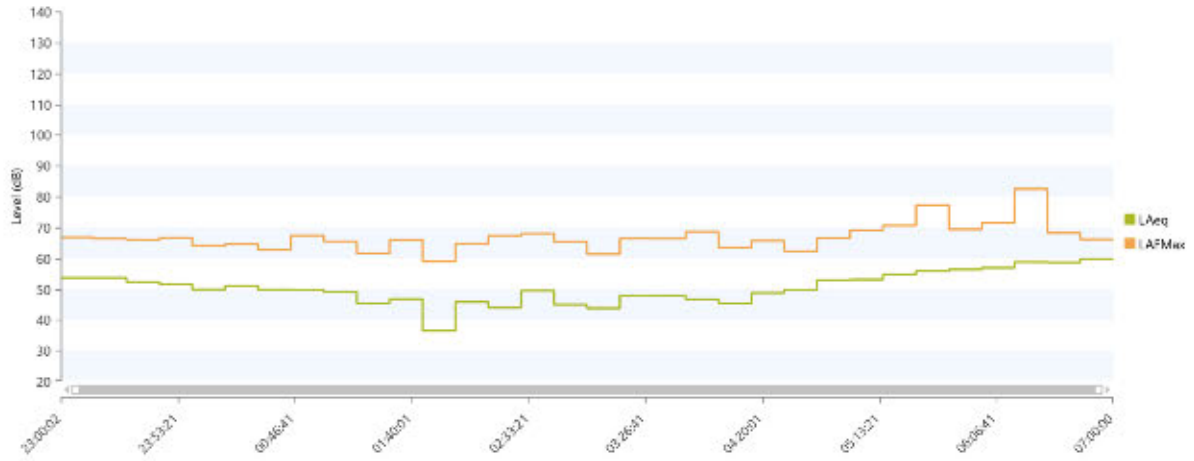
Daytime 29<sup>th</sup> April

Time	Duration	LAeq (dB)	LAFMax (dB)	Ln5 (90) (dB)
30/04/2019 07:00	00:15:00	60.5	68.2	54.7
30/04/2019 07:15	00:15:00	60.5	70.8	55
30/04/2019 07:30	00:15:00	60.2	66.9	55
30/04/2019 07:45	00:15:00	60.1	72.7	53.4
30/04/2019 08:00	00:15:00	59.5	71.3	53.2
30/04/2019 08:15	00:15:00	59.8	76	52.3
30/04/2019 08:30	00:15:00	59.8	69.4	53.7
30/04/2019 08:45	00:15:00	59.6	74.3	53
30/04/2019 09:00	00:15:00	60.6	76.7	52.9
30/04/2019 09:15	00:15:00	58.8	76.8	51.3
30/04/2019 09:30	00:15:00	57.7	66.6	50
30/04/2019 09:45	00:15:00	57.6	67.2	47.8
30/04/2019 10:00	00:15:00	57	67.5	48.9
30/04/2019 10:15	00:15:00	58.1	67.3	50.4
30/04/2019 10:30	00:15:00	59.7	77.2	52.5
30/04/2019 10:45	00:15:00	57.2	66.3	50.4
30/04/2019 11:00	00:15:00	56.8	66.6	47.7
30/04/2019 11:15	00:15:00	58.4	75.6	49.8
30/04/2019 11:30	00:15:00	57.1	66.1	49.1
30/04/2019 11:45	00:15:00	57.6	70.4	49.1
30/04/2019 12:00	00:15:00	57	66.2	48.7
30/04/2019 12:15	00:15:00	56.3	65.7	48.2
30/04/2019 12:30	00:15:00	57.2	64.4	49.2
30/04/2019 12:45	00:15:00	58.5	75.2	50.7

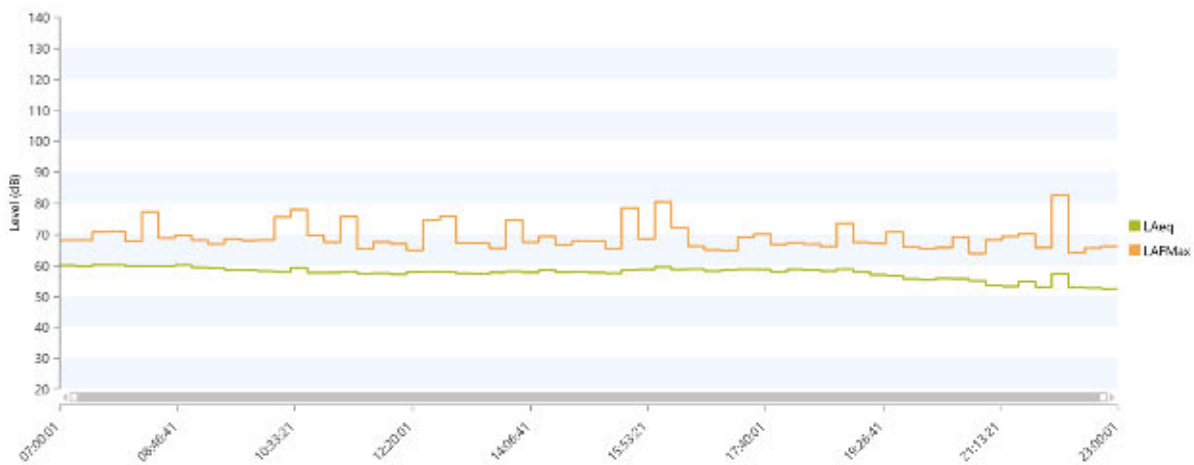
30/04/2019 13:00	00:15:00	57	65.7	49.1
30/04/2019 13:15	00:15:00	58.2	72.5	49.6
30/04/2019 13:30	00:15:00	58.2	76.2	49.9
30/04/2019 13:45	00:15:00	57	69.3	49.7
30/04/2019 14:00	00:15:00	56.6	66.3	48.8
30/04/2019 14:15	00:15:00	57.6	68	48.8
30/04/2019 14:30	00:15:00	57.4	67.2	49.5
30/04/2019 14:45	00:15:00	64.3	86.4	49.1
30/04/2019 15:00	00:15:00	58.4	77.8	51.1
30/04/2019 15:15	00:15:00	57.9	66	49.8
30/04/2019 15:30	00:15:00	58.4	81.7	50
30/04/2019 15:45	00:15:00	57.8	73.7	50.8
30/04/2019 16:00	00:15:00	56.8	66.8	50.5
30/04/2019 16:15	00:15:00	57.9	64	51.3
30/04/2019 16:30	00:15:00	58.1	78.7	52.3
30/04/2019 16:45	00:15:00	57.8	73.1	51
30/04/2019 17:00	00:15:00	58.4	69.9	52.6
30/04/2019 17:15	00:15:00	58.1	69.9	52
30/04/2019 17:30	00:15:00	60	77.3	52.8
30/04/2019 17:45	00:15:00	59.7	72.7	51.7
30/04/2019 18:00	00:15:00	58.4	66.4	51.4
30/04/2019 18:15	00:15:00	58.1	64.5	50.7
30/04/2019 18:30	00:15:00	57.8	65.1	51.2
30/04/2019 18:45	00:15:00	58.3	77.1	50.1
30/04/2019 19:00	00:15:00	62.4	87.1	46.9
30/04/2019 19:15	00:15:00	56.8	76.4	48.3
30/04/2019 19:30	00:15:00	56.5	66.2	48.6
30/04/2019 19:45	00:15:00	56.7	72.5	48.1
30/04/2019 20:00	00:15:00	55.9	68.7	46.3
30/04/2019 20:15	00:15:00	61.1	82.4	47
30/04/2019 20:30	00:15:00	54.8	67	45.5
30/04/2019 20:45	00:15:00	54.2	64.1	44.9
30/04/2019 21:00	00:15:00	53.6	62.7	43.5
30/04/2019 21:15	00:15:00	53.7	66.7	43.7
30/04/2019 21:30	00:15:00	54.9	76.4	43.5
30/04/2019 21:45	00:15:00	53.4	65.2	41.4
30/04/2019 22:00	00:15:00	52.8	63.7	41.3
30/04/2019 22:15	00:15:00	53.2	63.2	42.5
30/04/2019 22:30	00:15:00	53.3	64.9	42.3
30/04/2019 22:45	00:15:00	52.5	63	42
30/04/2019 23:00	00:15:00	51.5	64.2	38

## Appendix C Time History Graphs

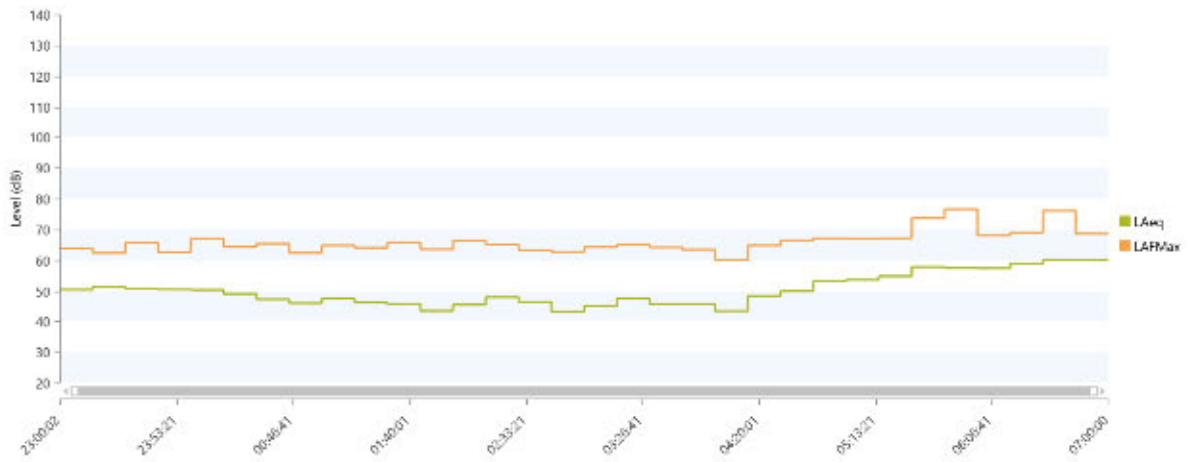
### Night-time 28<sup>th</sup> April 2019



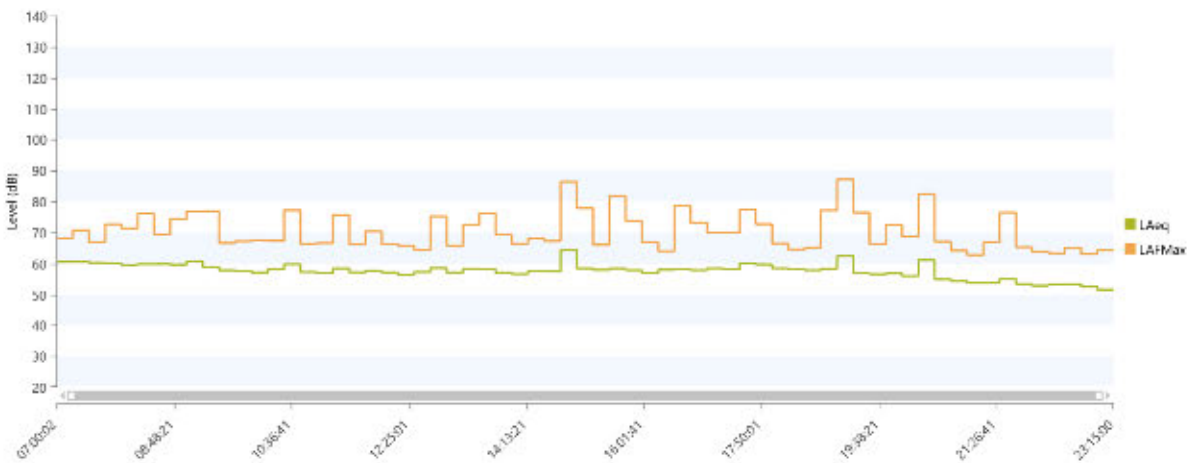
### Daytime 29<sup>th</sup> April 2019



### Night-time 29<sup>th</sup> April 2019



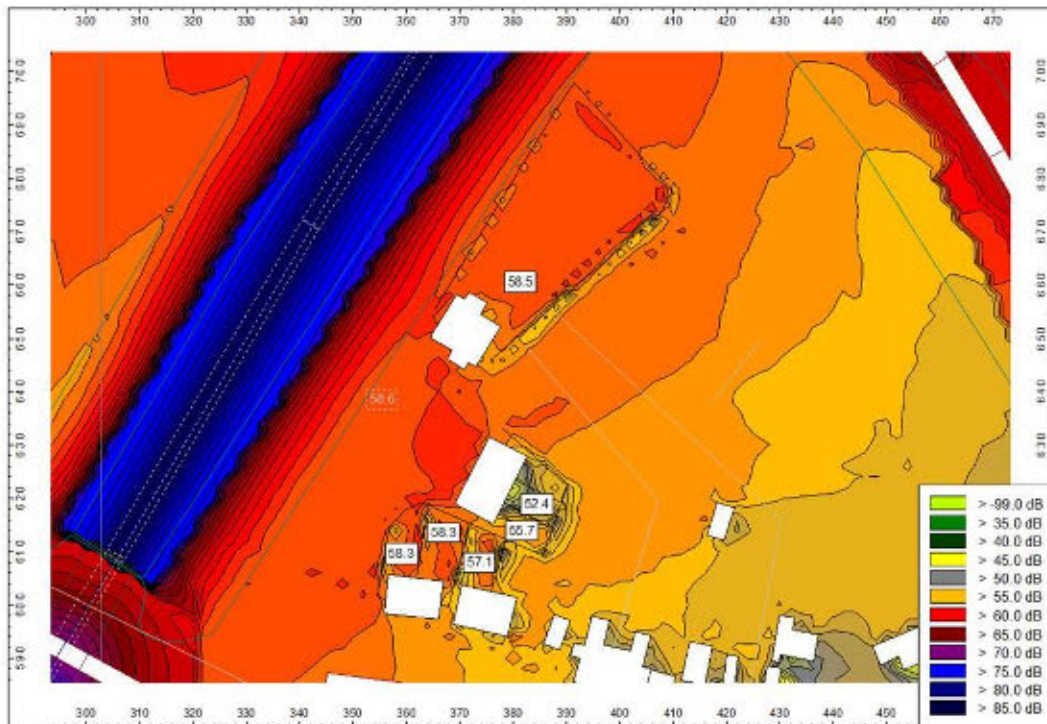
### Daytime 30<sup>th</sup> April 2019



Appendix D Proposed Initial Design & Acoustic Model



Daytime with development and 1.8m fencing (1.5m prediction height, 2m grid spacing, G=0.0, 2<sup>nd</sup> order reflections)

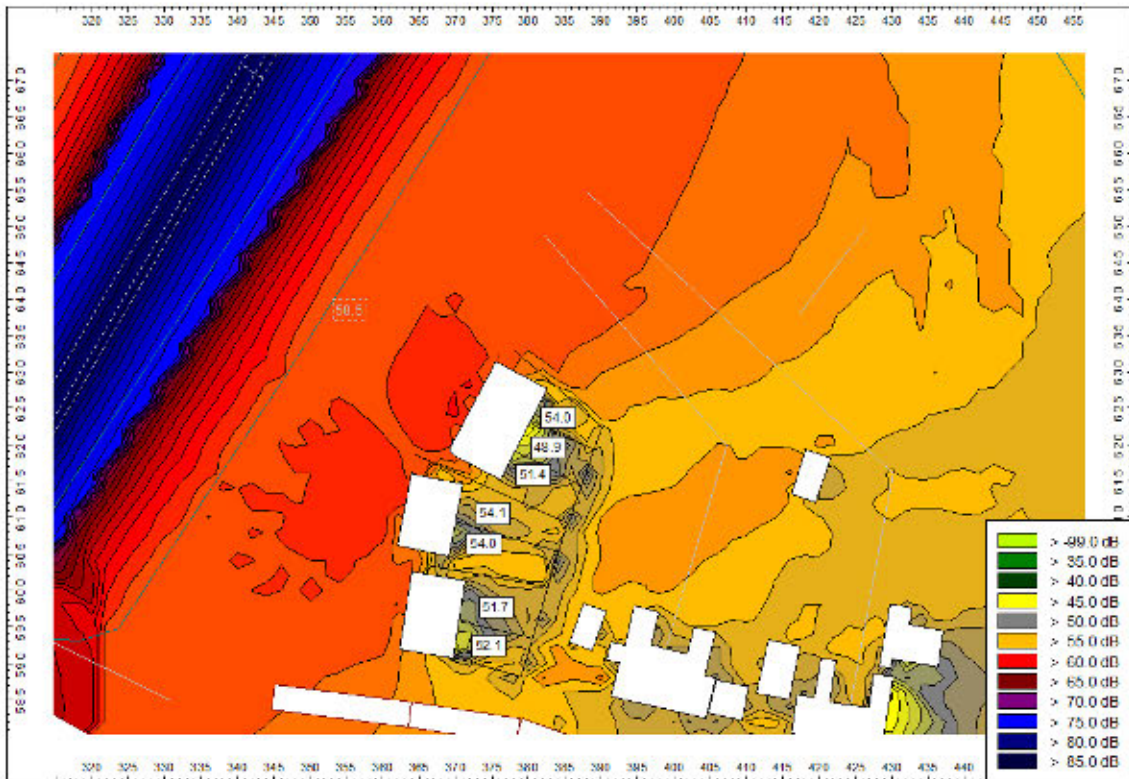


Appendix E Updated Design Layout



## Appendix F Noise Model Predictions

Daytime with development and 1.8m fencing (1.5m prediction height, 2m grid spacing, G=0.0, 2nd order reflections)



Night time with development and 1.8m high fencing (4.5m prediction height, 2m grid spacing, G=0.0, 2nd order reflections)

