ACOUSTIC CONSULTANTS LTD

Proposed Mixed use Development
Inglewood, Paignton

Noise Impact Assessment

Reference: 6583/DO/pw
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Proposed Mixed use Development
Inglewood, Paignton

Noise Impact Assessment

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1. Introduction

Acoustic Consultants Limited have been appointed by Deeley Freed Estates Limited to assess the impact of noise from and associated with the proposed Inglewood residential development scheme on existing noise sensitive receptors.

The assessment addresses noise from existing and proposed noise sources as they affect the noise sensitive residential elements of the development; consider the impact of noise generated by the proposed development on existing noise sensitive receptors, specifically due to increases in road traffic noise and construction activities; and, determines noise limiting criteria for any fixed mechanical plant associated with the proposed school.

The report is intended to address the National Planning Policy Framework, National Planning Practice Guidance, Noise Policy Statement for England and the Torbay Local Plan.

This report is intended for planning purposes only and limits itself to addressing solely on the noise aspects as included in this report.

The report has been prepared in good faith, with all reasonable skill and care, based on information provided or available at the time of its preparation and within the scope of work agreement with the client. We disclaim any responsibility to the Client and others in respect of any matters outside the scope of the above.

2. The Site

The development is located on farmland to the West of the A3022. The proposal is for a maximum of 400 dwelling houses, a Public House and a new two form entry primary school with access via Brixham Road.

The main source of noise affecting the site is road traffic along Brixham Road. The noise sensitive receptors that could potentially be affected by the development are the existing residential dwellings to the East of Brixham Road.

3. Criteria

3.1. National Planning Policy Framework

The National Planning Policy Framework was published in March 2012 and replaces Planning Policy Guidance Document 24. This is a significantly shortened document. Section 11 entitled 'Conserving and enhancing the natural environment' addresses noise as a requirement of planning.

Paragraph 109 states:

"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."*

Paragraph 123 states:

"123. Planning policies and decisions should aim to:

- *avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- *mitigate and reduce to a minimum other adverse impacts 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 changes in nearby land uses since they were established; and*
- *identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason."*

The document does not prescribe any assessment methodology or criteria to assess the adverse effect of noise.

3.2. Noise Policy Statement for England

The NPPF refers to the Noise Policy Statement for England (NPSE). This was published in March 2010 by DEFRA and aims to provide clarity regarding current policies and practices to enable noise management decisions to be made within the wider context, at the most appropriate level, in a cost-effective manner and in a timely fashion. It applies to all forms of noise including environmental noise, neighbour noise and neighbourhood noise.

The NPSE introduces the concept of "Significant Adverse" and "Adverse" impacts of noise. These are applied as follows:

NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.

The NPSE does not provide any assessment criteria for the noted effect levels.

3.3. National Planning Practice Guidance, Noise

The National Planning Practice Guidance (NPPG) on noise referred to here is based on the current version (January 2015) as provided on the Planning Guidance Website.

It states that *"Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment."*

It provides generic guidance on how to determine the noise impact and what factors could be a concern.

It includes the option types to mitigate any adverse effects of noise stating that there are four broad types of mitigation. These are engineering, layout, using planning conditions or obligations and noise insulation.

Paragraph 5 of the NPPG provides a table identifying the effect level and examples of effect relating to the impact effect levels provided in the NPSE. The table is duplicated below:

Table 1: NPPG Noise – Perception of Effect Levels

Perception	Examples of 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 Level	
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.	Significant Observed Adverse Effect	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

The table does not provide any objective assessment which equates to the noted effect levels however the NPPG identifies that where noise is audible it is not necessarily intrusive. The effect and impact on people is based primarily on the level of noise.

3.4. Torbay Local Plan

The Torbay Local Plan was adopted in December 2015 and sets out policies and proposals for future Development. It is the key planning policy document for making development control decisions.

Policy DE3 addresses amenity of future development. It states:

"POLICY DE3
All development should be designed to provide a good level of amenity for future residents or occupiers and should not unduly impact upon the amenity of neighbouring and surrounding uses. This will be assessed using the following criteria:

The impact of noise nuisance, visual intrusion overlooking and privacy, light and air pollution."

3.5. Torbay Council EIA Scoping Opinion

The Council provided an Environmental Impact Assessment (EIA) scoping opinion on the 16th February 2017. The scoping request outlined the main elements to be addressed within the noise assessment as follows:

- Increase in noise from site preparation, earthworks and construction activities.
- Increase in noise from post-construction traffic (cumulative impact with White Rock 1).
- Impact from existing and permitted noise sources on proposed noise sensitive receptors.
- Impact from proposed commercial development on new and existing noise sensitive receptors.

The response is as follows:

"The contents are broadly agreed. It is however noted that this area is particularly quiet at night. Any proposed commercial development would need to consider this in order to avoid the operation of this development affecting the proposed and existing residential accommodation in the locality. The methodology for considering noise limits for commercial and industrial activities in accordance with British Standard 4142:2014 is agreed. Whilst noted that noise levels may fall below the threshold where British Standard 4142:2014 is useful, a view of whether complaints are likely can be gained by considering the internal noise level at the proposed residential development where levels fall below the threshold of British Standard 4142:2014.

The tranquil nature of the area should be preserved and employment uses, hours of operation and deliveries should be chosen carefully to reflect this."

4. Relevant Noise Criteria

4.1. Criteria for Noise Sensitive Residential Development

The following sections outline relevant assessment criteria for the impact of noise on the noise sensitive receptors of the development and noise from the development as it affects existing sensitive receptors.

WHO Guidelines on Community Noise 1999

The World Health Organisation document entitled 'Guidelines on Community Noise' was published in 1999 and provides noise criteria for specific environments. For noise levels internally and externally to dwellings it states:

"In Dwellings. The effect of noise in dwellings, typically, are sleep disturbance, annoyance and speech interference. For bedrooms the critical effect is sleep disturbance. Indoor guideline values for bedrooms are 30 LAeq for continuous noise and 45 LAmax for single sound events. Lower noise levels may be disturbing depending on the nature of the noise source. At night-time, outside sound levels about 1 metre from façades of living spaces should not exceed 45 dB LAeq, so that people may sleep with bedroom windows open. This value was obtained by assuming the noise reduction from outside to inside with the window open is 15 dB. To enable casual conversation indoors during daytime, the sound level of interfering noise should not exceed 35 dB LAeq. The maximum sound pressure level should be measured with the sound pressure meter set at "fast"."

Based on the same methodology used to determine the night time noise level outside a residential property the daytime noise level about 1 metre from façades of living spaces should not exceed 50 dB LAeq where open windows provide ventilation.

We would point out that criteria in the WHO document 'Guidance for Community Noise' published in 1999 was reviewed in a report by the National Physical Laboratory (reference CMAM16) which states:

'Exceedance of the WHO guideline values does not necessarily imply significant noise impact and indeed, it may be that significant impacts do not occur until much higher levels of noise exposure are reached'.

Therefore it is not necessarily the case that where these levels are exceeded the noise will adversely affect nearby residential properties.

British Standard 8233:2014

British Standard 8233:2014 is titled "Guidance on sound insulation and noise reduction for buildings".

Section 7.7.2 Table 4 of the British Standard provides internal ambient noise levels for dwellings from noise sources 'without a specific character' and are based on existing guidelines issued by the World Health Organisation 1999. It is considered that road traffic noise and that from anonymous distant noise sources would be 'without a specific character' for the purposes of this assessment.

The British Standard guideline states that *"in general for steady state external noise sources it is desirable that the internal ambient noise level"* for annual average conditions does not exceed those as noted in Table 4 of the British Standard and this is summarised below in table 2:

Table 2: British Standard 8233:2014 Internal Noise Criteria

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 dB $L_{Aeq,16\ hour}$	-
Dining	Dining Room	40 dB $L_{Aeq,16\ hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16\ hour}$	30 dB $L_{Aeq,8\ hour}$

Section 7.7.2 Note 4 of the British Standard states:

"Regular individual noise events (for example, scheduled aircraft or passing trains) can cause sleep disturbance. A guideline value may be set in terms of SEL or $L_{Amax,F}$ depending on the character and number of events per night. Sporadic noise events could require separate values".

Section 3.4 of the WHO Guidance states:

"For a good sleep, it is believed that indoor sound pressure levels should not exceed approximately 45 LAmax more than 10-15 times per night (Vallet & Verbey 1991)".

As such it would be considered acceptable if the maximum noise level from individual events do not exceed 45 dB $L_{Amax(fast)}$ no more than 10-15 times during the night-time period.

Section 7.7.3.2 of British Standard 8233:2014 is entitled 'Design criteria for external noise and states the following:

"For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is recognised that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as inner city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practical levels in these external amenity spaces, but should not be prohibited."

The noise level at the façade of any proposed residential property will determine the noise mitigation measures required to achieve the above internal noise levels. Predominantly this is determined by the ventilation method with a partially open window provides a sound level difference (outside to inside) of 10-15 dB(A), acoustic trickle vents provide a sound level difference of up to 30 dB(A) and attenuated mechanical ventilation is required where the requirements are in excess of 30 dB(A). On the basis of the above the development site can be divided into three categories:

No Mitigation – External façade equivalent noise levels of up to 55 dB(A) in the day, 50 dB(A) at night and maximum noise levels below 60 dB(A). The walls and roof can be of a conventional construction with no specific noise attenuation measures incorporated into the design. These rooms can be ventilated via open windows.

Minor Mitigation – External façade equivalent noise levels of between 55-70 dB(A) in the day, 50-65 dB(A) at night and maximum noise levels below 60-75 dB(A). The walls and roof can be of a conventional construction with double glazed windows and attenuated ventilation in the form of acoustic trickle vents.

Significant Mitigation – External façade equivalent noise levels in excess of 70 dB(A) in the day, 65 dB(A) at night and maximum noise levels above 75 dB(A). The walls and roof can be of conventional construction with enhanced windows. The ventilation would be in the form of an attenuated mechanical ventilation system. Bedrooms within roof spaces will need to be carefully designed with suitable noise attenuation measures included to the roof construction.

4.2. Criteria for Noise Sensitive School Development

New school buildings are addressed under Part E of the Building Regulations. The normal way of demonstrating compliance with the Approved Document is to comply with the performance standards of Building Bulletin 93:2014 (BB93) published by the DfES entitled "Acoustic Design of Schools: Performance Standards".

Section 1.1 of Building Bulletin 93 gives guidance on internal ambient noise levels (IANL) within different spaces; Table 1 of Building Bulletin 93 gives the required upper limit for these levels in rooms, in terms of the 'thirty minute equivalent A-weighted noise level', in decibels, the $L_{Aeq,30min}$. This is a site-measured sound pressure level.

For typical teaching spaces within a primary school the upper internal ambient noise level criteria is 35 dB $L_{Aeq,30min}$. For naturally ventilated spaces the Building Bulletin states that the criteria can be increased by 5 decibels.

Building Bulletin 93 states that for a naturally ventilated building the sound reduction from outside to inside that can be achieved with single side ventilation is 16 decibels and for cross ventilation 20 decibels.

Therefore where the external noise level does not exceed 56 dB $L_{Aeq,30min}$ in the case of single side ventilated buildings and 60 dB $L_{Aeq,30min}$ in the case of cross ventilated buildings external noise is adequately controlled for teaching use. Where a higher noise level is experienced mechanical ventilation is required.

4.3. Criteria for the assessment of impact on existing receptors (traffic noise)

There is no standard criterion for noise from vehicle movements along a highway as a result of a new development affecting noise sensitive receivers.

To calculate and predict road traffic noise levels to the development using the 'Calculation of Road Traffic Noise' (CRTN). The parameter used in CTRN is the L10 level (18 hour) in 'A' Weighted decibels. The CTRN methodology can be used to determine changes in the L10 noise level (LA10, T dB).

The Institute of Environmental Management & Assessment (IEMA) new Guidelines on Environmental Noise Impact Assessment set out key principles and advice on how to effectively

integrate noise impacts and effects into the consenting process of all types of development. The significance of changes in noise levels from the IEMA guidelines are summarised below:

Table 3: IEMA Noise Level Changes

Noise Level Change (dB)	Category
0	No Change
0 – 2.9	Negligible
3.0 – 5.9	Minor
6.0 – 9.9	Moderate
10.0 and more	Major

A negligible impact is considered for an increase less than 3 decibels.

If the noise levels are reduced as a result of the development, this can be seen as a positive benefit.

4.4. Criteria for Construction Noise

The significance of construction noise impact on nearby noise sensitive properties is provided in British Standard 5228 part 1 2009 Annex E. Annex E1 section 'a' states:

"For Environmental Impact Assessments (EIAs). Most major developments now need to be assessed in accordance with the Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 [47]. This is where the development might result in significant effects upon the environment. Therefore, criteria are needed to allow these assessments to be undertaken. The assessments can include likely eligibility for noise insulation or temporary re-housing, as forms of mitigation, but such eligibility needs to be confirmed later in the process when a contractor is appointed and detailed method statements and programme information are available."

In the U.K. construction noise limits were first suggested by the Wilson Committee which proposed a maximum limit of 75dB(A). Advisory Leaflet 72 re-iterated the guidance suggested by Wilson. It set daytime limits between 07:00 to 19:00 hours outside the nearest occupied window of 75dB(A) for urban areas near to main roads or in heavy industrial areas, and 70dB(A) for rural, urban and suburban areas away from main traffic routes which would allow conversation to take place inside a building with windows shut. It also states that for the evening period between 19:00 to 22:00 hours a reduction of 10 dB(A) to the above limits may be appropriate. Noisy activities outside these hours should not normally be permitted.

Annex E3 of British Standard 5228:2009 Part 1 provides an assessment and provides construction noise limiting criteria based on the changes caused to the existing noise environment. The Annex provides two similar methods of assessment, the simplified version in E.3.3 is considered most appropriate for a site where the existing ambient noise levels are relatively low. It states:

"Noise levels generated by construction activities are deemed to be significant if the total noise (pre-construction ambient plus construction noise) exceeds the pre-construction ambient noise by 5 dB or more, subject to lower cut-off values of 65 dB, 55 dB and 45 dB LAeq, Period, from construction noise alone, for the daytime, evening and night-time periods, respectively; and a duration of one month or more, unless works of a shorter duration are likely to result in significant impact."

On a site where noise levels are likely to fall below the lower cut off values of the assessment a significant effect can be deemed to have occurred where the following construction noise levels are exceeded for one month or more at the nearest window or a sensitive property.

- 65 dB $L_{Aeq(12\ hour)}$ between 07:00 hours and 19:00 hours on weekdays
- 55 dB $L_{Aeq(4\ hour)}$ between 19:00 hours and 23:00 hours on weekdays
- 55 dB $L_{Aeq(16\ hour)}$ between 07:00 hours and 23:00 hours on weekends
- 45 dB $L_{Aeq(8\ hour)}$ between 23:00 hours and 07:00 hours on weekends

4.5. Criteria for fixed plant noise associated with the School

The British Standard 4142:2014 entitled "Method for rating and assessing industrial and commercial sound" was published on the 31st October 2014 and describes methods for rating and assessing sound of an industrial and/or commercial nature.

The methods described in the British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon. The principle is that of establishing the "difference" between the "rating level" and the "background noise level".

The "Rating Level" is the "specific noise level" of the source over a period of 1 hour during the day (07:00 to 23:00 hours) and over a period of 15 minutes during the night (23:00 to 07:00 hours). Section 9 entitled "Rating Level" states:

"Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features

are present at the assessment location, add a character correction to the specific sound level to obtain the rating level."

An acoustic character correction should be added to the "specific noise level" if the "specific noise level" exhibits any tonality, impulsivity, other specific characteristics and/or intermittency at the assessment location. The value of the character correction varies dependant on the prominence of the character of the noise source at the assessment location.

In Section 11 of the Standard, under "Assessment of the Impacts", it states:

"Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level (see Clause 8) from the rating level (see Clause 9), and consider the following.

a), Typically, the greater this difference, the greater the magnitude of the impact.
b), A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
c), A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
d), 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."

As such where assessments differences of 0 dB or less the impact is likely to be low depending on the context.

5. Site Noise Survey

Site noise surveys have been undertaken to determine the existing noise climate on the development site and at the nearby existing residential areas to the East of Brixham Road. The purpose of the site surveys was to determine the existing noise climate for the area.

Site surveys were undertaken between the 24th and 26th January 2017. Long term measurements were undertaken at Monitoring Location 'E' with simultaneous short term measurements undertake at all other locations. The monitoring locations are as shown on figure 1 below.

Figure 1: Noise Monitoring Locations Plan

Monitoring locations 'A', 'B', 'C', 'D' and 'F' was located on the pavements of residential streets in the residential area to the east of Brixham Road. The sound level meter was located in a free field position 1.5 metres above the ground. The main source of noise affecting the monitoring locations was road traffic noise from the A3022 Brixham Road, there was also noise from occasional road traffic on Steed Close and noise from pedestrians talking.

Monitoring location 'E' was located 14.5 metres from the edge of the nearside carriageway of Brixham Road in a field to the east which is part of the development site. The sound level meter was located in a free field position 1.5 metres above the ground. The main source of noise affecting the monitoring locations was road traffic noise from the A3022 Brixham Road. Measurements of the weather conditions were also made in this location.

Monitoring was undertaken using Class 1 sound level meters, each with half inch condenser microphones and calibrated annually to relevant British and international standards. Table 4 provides the measurement equipment information.

Table 4: Measurement Equipment

Equipment Description / Manufacturer / Type	Serial number	Date of calibration	Calibration Certification Number
Sound Level Meter, Svantek 959	14784	10/06/2016	15011
Microphone, GRAS 40AE	98073	10/06/2016	15011
Calibrator, CEL, Type 284/2	3615153	10/06/2016	15010
Sound Level Meter, Cirrus Research, CR:171C	G068150	22/11/2016	243762
Microphone, Cirrus Research, MK224	204286A	22/11/2016	109157
Calibrator, Cirrus Research, CR:515	72878	22/11/2016	109156

The sound level meters were checked before and after use with the calibrators and no drift greater than 0.2 decibels was detected.

The weather conditions were dry throughout the monitoring exercise with a south or south westerly wind on the 24th and 25th January 2017, and a South Easterly or Easterly wind on the 26th January 2017. The wind speeds on the evening of the 24th and all of the 25th January 2017 were less than 5 metres per second, at other times the wind speed exceeded 5 metres per second. The air temperature throughout the monitoring exercise ranged between 1 and 9 degrees Celsius.

Noise measurements were undertaken generally in accordance with British Standard 7445-1:2003 and are considered representative of noise affecting the development site.

6. Measured Noise Levels

The full noise measurement data set is provided in Appendices 1-6 and the weather data is provided in Appendix 7.

From the measured data daytime and night time equivalent noise levels have been determined directly from the measured data at monitoring location 'E'.

At all monitoring locations the measured noise level is primarily determined by road traffic noise from Brixham Road. The simultaneous measurements at monitoring locations 'A', 'B', 'C', 'D' and 'F' have been used to determine the difference in Brixham road traffic noise at these locations compared to location 'E'. On this basis the equivalent noise levels at each location are as follows:

Table 5: Measured and predicted noise levels at monitoring locations

Noise Monitoring Location	Daytime $L_{Aeq,16\ hour}$	Night time $L_{Aeq,8\ hour}$
A	56 dB	49 dB
B	55 dB	48 dB
C	46 dB	39 dB
D	46 dB	39 dB
E	61 dB	54dB
F	65 dB	59 dB

Based on the measured noise levels the following background sound levels have been determined as typical for the area:

Table 6: Measured background sound levels

Time Period	Background Sound Level
Day (07:00 hours to 19:00 hours)	40 dB $L_{A90,1\ hour}$
Evening (19:00 hours to 23:00 hours)	31 dB $L_{A90,1\ hour}$
Night (23:00 hours to 07:00 hours)	18 dB $L_{A90,15\ minutes}$

7. Road Traffic Flow Changes

Changes in road traffic flows alter the noise levels affecting existing noise sensitive receptors. The existing and predicted traffic flows have been provided by the transport consultant Key Transport Consultants Limited.

The data provides baseline traffic flows for Brixham Road and the predicted number of vehicles on this road with and without the development in 2019 and 2024. The data is provided in the form of the AADT (annual average daily traffic), the data is as follows:

Table 7: Baseline and Predicted Traffic Flows

Year	AADT Traffic Flow Without development	AADT Traffic Flow With development
2017	15,965	N/A
2019	16,335	18,848
2024	17,442	19,935

It is our understanding that there are no significant changes to the layout, surface or speed limit of Brixham Road proposed as part of this development. Therefore the changes in traffic flow is the most significant factor that will change road traffic noise levels affecting existing residential noise sensitive receptors.

8. Construction Noise Assessment

A prediction methodology for construction noise is provided in British Standard 8233:2009 Part 1. To undertake a thorough and accurate prediction a high degree of detail is required as to the proposed construction works. This would include a schedule or equipment, their location and the times that they are to operate. At a planning stage this degree of detail is not available. We have based our assessment on what we consider to be the most significant noise generation operations.

It is considered that earth works to the topography of the site is likely to be the most significant noise generating activity likely on the site.

Table C.2 of British Standard 5228-1:2009 provide noise level data for different items of plant undertaking different operations for site preparation.

It is considered that ground excavations and earthworks undertaken by dozers and excavators are likely to generate the most significant noise impact. This is considered not only because of the noise level of the items of plant but also that the activity may take place in the same location (as opposed to the distribution of material where the vehicles move around the site) and for a relatively long duration.

References 10 to 25 of the British Standard provide noise level data for different dozers and tracked excavators, the loudest of which is a twenty tonne dozer with an A-weighted sound pressure level of 81 dB L_{Aeq} at a distance of 10 metres.

The exact location of the earth works and their duration are unknown. Predictions have been undertaken to determine the minimum distance required between the plant and the nearby noise sensitive properties so that plant noise does not exceed the construction noise criteria.

The prediction is based on the noise emission of a twenty tonne dozer and sound propagation of a point source over soft ground, both as stated in British Standard 5228-1:2009. This does not take into account any barriers (either man made or formed by topography) which could reduce noise levels further. The prediction is based on the plant operating continuously for eight hours per day in the noted time periods.

It is not expected that ground works will take place in the evening or night time and have therefore not been assessed.

The time period, noise criteria and distance required between plant and noise sensitive property to achieve this are as follows:

Table 8: Minimum distances between plant and a residential property

Time Period	Noise limiting criteria	Minimum distance between plant and a noise sensitive location
07:00 hours and 19:00 on weekdays	65 dB $L_{Aeq(12\ hour)}$	50 metres
07:00 hours and 23:00 on weekends	55 dB $L_{Aeq(16\ hour)}$	100 metres

Where ground works take place within the distances noted in table 8 for a month or more a significant effect would be expected. It is not generally considered that this will be the case and therefore the impact is not expected to be significant.

Where this is the case and where other construction works will also generate noise it is proposed to mitigate these as far as practical as outlined in the following section.

8.1. Noise Mitigation

Construction works will follow Best Practicable Means (Section 72 of the Control of Pollution Act 1974) to minimise noise and vibration effects. The construction programme and activities will be discussed with the LPA once a contractor has been commissioned. Such details will be set out in a Code of Construction Practice (CoCP) to be submitted to and agreed in writing with the LPA.

An appointed person will take primary responsibility for day-to-day implementation of the CoCP during the construction phase and to act as the first point of contact on environmental matters for the government authorities, other external bodies and the general public.

Standard construction working hours are Monday to Friday 08:00 to 18:00 hours, Saturdays 08:00 to 13:00 hours, with no noisy working on Sundays, Bank or Public Holidays. The principal contractor will adhere to these standard working hours as far as reasonably practicable. However, for certain activities, it may be necessary to work outside these hours and in this instance, the principal contractor will apply to the LPA for written consent prior to work commencing.

A detailed prediction of construction noise will be undertaken once a contractor has been appointed and a full work schedule has been developed. Where it is determined to be necessary site hoardings and portable acoustic barriers will be used to reduce noise emissions from the worksite.

Where possible, quieter, alternative methods or mechanical plant will be used to reduce the noise effect on noise sensitive locations. Where practicable, plant, equipment, site offices, storage areas and worksites will be positioned away from NSRs, both on and off-site.

The principal contractor will ensure that all vehicles, mechanical plant and equipment are maintained and operated in an appropriate manner, to ensure that extraneous noise from mechanical vibration, creaking and squeaking is kept to a minimum. The principal contractor will ensure that all plant complies with the relevant statutory requirements.

With respect to vibration, piling may be required for the formation of building foundations and retaining walls, and appropriate techniques will be employed. Wherever possible, piling will be carried out with the best available technique, with minimal noise generation in mind. Nevertheless, with regards to piling British Standard 5228 Part 4 states that:

"It may not be possible for technical reasons to replace a noisy process by one of the 'quieter piling' alternatives. Even if it is possible, the adoption of a quieter method may prolong the piling operation; the net result being that the overall disturbance to the community, not only that caused by noise, will not necessarily be reduced."

Construction traffic will only use designated access routes. Delivery movements will only take place during the daytime period during the working hours as agreed in consultation with the LPA.

9. Assessment of Fixed Plant Noise from the School and PH

It is likely that the school and Public House will incorporate some fixed plant, for example kitchen extract fans. To minimise impact on nearby noise sensitive residential development limits on noise emission are proposed based on British Standard 4142:2014.

The British Standard states that 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.

The background sound levels are very low. In accordance with section 11 of British Standard 4142:2014 it may be considered more appropriate to consider absolute noise levels as they affect the proposed noise sensitive properties.

The most appropriate absolute noise criteria is provided in British Standard 8233:2014. This document advises an internal noise limit of 35dB $L_{Aeq(16\ hour)}$ in the daytime and 30dB $L_{Aeq(8\ hour)}$ within bedrooms at night.

It is advised that for fixed plant this criteria is based on a rating level taking into consideration the character of the sound and is assessed over the duration of continuous operation rather than a daytime or night time average.

Based on the above and a worst case where an open window provides a sound reduction from outside to inside of 10 dB the proposed cumulative noise limit for all plant associated with the school and Public House is 40dB $L_{Ar(T)}$ (free-field) at the façades of the nearby residential properties. It is suggested that this is secured by a planning condition.

10. Road Traffic Changes Noise Assessment

The traffic flow data provided has been used to predict the change in the equivalent noise level based on the methodology of 'Calculation of Road Traffic Noise'.

The increase in noise level due to traffic associated with the development as well as the potential impact on nearby noise sensitive locations are provided in the following table. The impact is based on IEMA guidelines.

Table 9: Change of Road Traffic Noise Levels Due to Development

Year	AADT Traffic Flow Without development	AADT Traffic Flow With development	Change in Road Traffic Noise Level	Significance of Change
2019	16,335	18,848	+0.6 dB	Negligible
2024	17,442	19,935	+0.6 dB	Negligible

The change in noise level due to increases in road traffic on Brixham Road has a negligible impact on the nearby noise sensitive receptors. In terms of National Planning Policy Guidance the road traffic changes are expected to have no observed adverse effect.

11. Environmental Noise Impact on Residential Development

The proposed noise sensitive residential development will be exposed to the existing noise environment, namely road traffic noise on Brixham Road.

The proposed residential properties closest to Brixham road are at the same distance as the Monitoring Location 'E'. Therefore, the expected daytime and night time road traffic noise levels at the façade of the most exposed properties are 61 dB $L_{Aeq,16\ hour}$ and 54 $L_{Aeq,8\ hour}$.

To achieve acceptable noise levels within the properties minor noise mitigation measures will be required in the form of acoustic trickle vents to habitable rooms. This would apply to all habitable rooms of dwellings within 50 metres of Brixham Road and which have a direct line of site to the road. All other dwellings will require no noise mitigation measures to achieve acceptable internal noise levels.

12. Environmental Noise Impact on School Development

The school building is to be located in the centre of the development site approximately 200 metres from the main source of noise, Brixham Road.

Based on the measured noise levels at monitoring location 'E' and the site plan the worst case noise level at the façade of the school building is 52dB $L_{Aeq,30\ minutes}$.

Based on the guidance contained within Building Bulletin 93 the building can be ventilated via single sided opening windows whilst achieving the internal ambient noise criteria for a primary school teaching space.

The assessment demonstrates that the site is suitable for a school development in terms of environmental noise.

13. Limitations

The report limits itself to addressing solely on the noise control and acoustic aspects as included in this report. We provide advice only in relation to noise and acoustics.

The report has been prepared in good faith, with all reasonable skill and care, based on information provided or available at the time of its preparation and within the scope of work agreement with the Client. We disclaim any responsibility to the Client and others in respect of any matters outside the scope of the above.

The report is provided for the sole use of the named Client and is confidential to them and their professional advisors. No responsibility is accepted to other parties.

It should be noted that noise predictions are based on the current information as we understand it and on the performances noted in this report. Any modification to these parameters can alter the predicted level. All predictions are in any event subject to a degree of tolerance of normally plus or minus three decibels. If this tolerance is not acceptable, then it would be necessary to consider further measures.

14. Summary and Conclusions

Acoustic Consultants Limited have been appointed by Deeley Freed Estates Limited to assess the impact of noise from and associated with the proposed development on existing noise sensitive receptors.

The assessment addresses noise from existing and proposed noise sources as they affect the noise sensitive residential elements of the development; consider the impact of noise generated by the proposed development on existing noise sensitive receptors, specifically due to increases in road traffic noise and construction; and, determines noise limiting criteria for fixed plant associated with the school.

The development is located on farmland to the West of the A3022. The proposal is for a maximum of 400 dwelling houses, a Public House and a new two form entry primary school with access via Brixham Road.

The main source of noise affecting the site is road traffic along Brixham Road. The noise sensitive receptors that could potentially be affected by the development are the existing residential dwellings to the East of Brixham Road.

Road traffic noise increases due to the development along Brixham Road have been assessed. The increase is considered to be negligible. In terms of National Planning Policy Guidance the road traffic changes are expected to have no observed adverse effect. The proposals will not have a significant adverse impact on nearby noise sensitive properties and thus is considered acceptable in planning terms.

There is potential for construction noise to adversely affect the existing residential properties around the site. At this stage in the design and planning process a detailed construction schedule is not available. A method of noise control is proposed which includes design and management measures to minimise any adverse impact and where an adverse impact does occur mitigation measures have been proposed to minimise the impact.

Noise limits have been proposed for noise from fixed plant associated with the School use. With the proposed limits being achieved it is expected that fixed plant noise will have no observed adverse effect on existing or proposed residential development. The proposals will not have a significant adverse impact on nearby noise sensitive properties and thus is considered acceptable in planning terms.

The impact of road traffic noise on the proposed residential development has been considered. To achieve acceptable noise levels within the properties closest to Brixham Road minor noise mitigation measures will be required in the form of acoustic trickle vents to habitable rooms. This would apply to all habitable rooms of dwellings within 50 metres of Brixham Road and which have a direct line of site to the road. All other dwellings will require no noise mitigation measures to achieve acceptable internal noise levels.

The impact of environmental noise on the school building has been considered. Environmental noise imposes no restrictions on the design of the school building. The assessment demonstrates that the site is suitable for a school development in terms of environmental noise.

15. References

National Planning Policy Framework, Department for Communities and Local Government, (2012).

Noise Policy Statement for England, Department for Environment, Food and Rural Affairs, (2010).

National Planning Practice Guidance: Noise, Department for Communities and Local Government, (2014).

Stroud District Local Plan, Stroud District Council, (2005).

British Standard 7445-1, BSI, (2003).

WHO Guidance on Community Noise, World Health Organisation, (1999).

British Standard 8233, BSI, (2014).

British Standard 4142, BSI, (2014).

Calculation of Road Traffic Noise, Department of Transport Welsh Office, (1988).

Noise Insulation Regulations, Department for Transport, (1988).

IEMA Guidelines for Noise Impact Assessment

British Standard 5228-1, BSI, (2009).

16. Appendix 1 – Measured Noise Levels at Location 'A'

Date	Time	LAeq (dB)	LAFMax (dB)	LAF90 (dB)
24/01/2017	14:25	53.5	68.7	46.3
24/01/2017	14:30	56.3	74.4	47.2
24/01/2017	14:35	56.1	75.1	45.8
24/01/2017	14:40	57.4	76.5	45.5
24/01/2017	14:45	54.9	73.3	43.6
24/01/2017	14:50	59	74.3	49.5
26/01/2017	10:25	57.7	74.1	49.7
26/01/2017	10:30	57.2	74.1	50.7
26/01/2017	10:35	56.7	72.5	51.6
26/01/2017	10:40	55	70.6	49.9
26/01/2017	10:45	56.5	76.5	49.6
26/01/2017	10:50	56.9	74.7	49.4
26/01/2017	13:30	59	73.9	51.1
26/01/2017	13:35	59.7	75.4	50
26/01/2017	13:40	58.7	73.2	49.5
26/01/2017	13:45	57.2	71.4	50.9
26/01/2017	13:50	54.5	68.4	50.3
26/01/2017	13:55	57	77.9	50.3

17. Appendix 2 – Measured Noise Levels at Location 'B'

Date	Time	LAeq (dB)	LAFMax (dB)	LAF90 (dB)
24/01/2017	15:00	57.2	77.9	41.5
24/01/2017	15:05	54.6	68.9	43.5
24/01/2017	15:10	53.2	74.2	38.8
24/01/2017	15:15	54	72.4	41.1
24/01/2017	15:20	67.8	95.7	47.7
24/01/2017	15:25	56.2	77.3	44.1
24/01/2017	17:00	54.1	72.4	41.4
24/01/2017	17:05	44.2	56.1	41.8
24/01/2017	17:10	55.4	75.3	42.7
24/01/2017	17:15	56	77.1	41.6
24/01/2017	17:20	56.3	77.3	40.6
24/01/2017	17:25	57.3	77.6	42.3
26/01/2017	11:00	68.1	89.3	45.3
26/01/2017	11:05	55.2	79.2	43.2
26/01/2017	11:10	52.1	78.3	42.4
26/01/2017	11:15	48.7	61.3	44
26/01/2017	11:20	46.9	67.3	43.2
26/01/2017	11:25	58.4	77.6	42.4
26/01/2017	14:05	50.2	69.4	42.6
26/01/2017	14:10	54.2	69	43.7
26/01/2017	14:15	50.4	68.4	42.1
26/01/2017	14:20	60.9	81.9	44.2
26/01/2017	14:25	57.4	75	43.9
26/01/2017	14:30	71.2	93.6	45.6
26/01/2017	14:35	51.9	71.8	43.1
26/01/2017	14:40	51.8	73.2	41.6

18. Appendix 3 – Measured Noise Levels at Location 'C'

Date	Time	LAeq (dB)	LAFMax (dB)	LAF90 (dB)
24/01/2017	15:35	47.3	69	37.9
24/01/2017	15:40	51.3	66	38.5
24/01/2017	15:45	48.6	63.1	37.3
24/01/2017	15:50	50.8	66.5	38.5
24/01/2017	15:55	42.6	55.9	39.2
24/01/2017	16:00	52.9	72.2	39
24/01/2017	16:05	50.8	72.2	39
26/01/2017	12:15	47.2	74.3	40.9
26/01/2017	12:20	41.2	49	39.2
26/01/2017	12:25	43.5	56.2	39.9
26/01/2017	12:30	44.2	59.1	40.7
26/01/2017	12:35	43.6	60.5	40.2
26/01/2017	12:40	46.3	60.4	40.9
26/01/2017	14:55	46.2	62.2	40.9
26/01/2017	15:00	46.1	63.6	40.7
26/01/2017	15:05	46.2	59.2	41.7
26/01/2017	15:10	45.4	68.6	41
26/01/2017	15:15	43	55.9	40.6
26/01/2017	15:20	47.2	66.9	40.7

19. Appendix 4 – Measured Noise Levels at Location 'D'

Date	Time	LAeq (dB)	LAFMax (dB)	LAF90 (dB)
24/01/2017	16:20	47.1	50.9	35.9
24/01/2017	16:25	51	56	37.3
24/01/2017	16:30	52.5	63.9	35.8
24/01/2017	16:35	50.3	62.6	37.7
24/01/2017	16:40	50.3	56.6	40.9
24/01/2017	16:45	56.1	58.4	40
26/01/2017	12:55	46.7	60.9	41.5
26/01/2017	13:00	51	64.3	41.2
26/01/2017	13:05	47.8	66	41.5
26/01/2017	13:10	44.4	62.3	40.1
26/01/2017	13:15	46.9	59.9	40
26/01/2017	13:20	49	65.1	41.6
26/01/2017	15:35	46.5	63.1	40.5
26/01/2017	15:40	42.7	58.7	40
26/01/2017	15:45	45.6	63.7	39.9
26/01/2017	15:50	42.6	63.8	39.4
26/01/2017	15:55	43.1	61.8	39.9
26/01/2017	16:00	47.8	55.9	38.9

20. Appendix 5 – Measured Noise Levels at Location 'E'

Date and Time	LAFMax (dB)	LAF90 (dB)	LAeq (dB)
24/01/2017 13:29:58	76.8	50.5	61.4
24/01/2017 13:34:58	67.6	46.2	60.0
24/01/2017 13:39:58	66.9	55.4	60.8
24/01/2017 13:44:58	67.3	54.2	60.8
24/01/2017 13:49:58	69.0	53.1	60.9
24/01/2017 13:54:58	68.7	54.0	60.9
24/01/2017 13:59:58	68.5	56.6	61.6
24/01/2017 14:04:58	65.4	52.9	60.1
24/01/2017 14:09:58	68.2	51.0	60.4
24/01/2017 14:14:58	65.6	52.8	60.2
24/01/2017 14:19:58	69.4	54.9	61.7
24/01/2017 14:24:58	68.8	53.0	61.3
24/01/2017 14:29:58	70.1	48.6	60.1
24/01/2017 14:34:58	70.4	49.1	61.8
24/01/2017 14:39:58	70.1	53.1	61.4
24/01/2017 14:44:58	69.5	53.6	61.4
24/01/2017 14:49:58	69.5	50.2	60.8
24/01/2017 14:54:58	69.2	52.4	61.7
24/01/2017 14:59:58	69.9	54.2	61.2
24/01/2017 15:04:58	71.3	48.8	60.8
24/01/2017 15:09:58	71.4	50.1	61.4
24/01/2017 15:14:58	69.9	47.2	61.2
24/01/2017 15:19:58	69.0	45.1	60.0
24/01/2017 15:24:58	72.1	47.1	60.8
24/01/2017 15:29:58	68.7	53.6	62.0
24/01/2017 15:34:58	73.2	56.0	62.7
24/01/2017 15:39:58	68.8	56.2	62.5
24/01/2017 15:44:58	69.9	55.2	62.6
24/01/2017 15:49:58	69.1	50.6	61.9
24/01/2017 15:54:58	70.9	55.1	62.2
24/01/2017 15:59:58	67.9	56.8	62.5
24/01/2017 16:04:58	69.0	54.5	62.5
24/01/2017 16:09:58	69.8	55.9	62.8
24/01/2017 16:14:58	70.0	52.4	62.8
24/01/2017 16:19:58	69.4	57.3	62.9
24/01/2017 16:24:58	71.0	57.6	63.1
24/01/2017 16:29:58	74.2	56.1	63.5
24/01/2017 16:34:58	70.6	56.5	63.3
24/01/2017 16:39:58	79.5	53.4	63.6
24/01/2017 16:44:58	70.0	55.8	62.8
24/01/2017 16:49:58	72.2	55.4	63.0

24/01/2017 16:54:58	71.4	57.6	63.2
24/01/2017 16:59:58	71.7	58.0	63.3
24/01/2017 17:04:58	71.0	54.1	63.0
24/01/2017 17:09:58	69.1	59.2	63.1
24/01/2017 17:14:58	68.8	57.9	62.3
24/01/2017 17:19:58	72.3	58.0	62.6
24/01/2017 17:24:58	71.1	53.4	61.8
24/01/2017 17:29:58	68.6	53.7	62.2
24/01/2017 17:34:58	71.5	52.7	63.4
24/01/2017 17:39:58	71.2	55.5	62.1
24/01/2017 17:44:58	69.3	49.1	62.1
24/01/2017 17:49:58	69.6	49.8	61.8
24/01/2017 17:54:58	69.5	57.1	62.8
24/01/2017 17:59:58	75.6	52.2	62.8
24/01/2017 18:04:58	70.1	56.0	62.8
24/01/2017 18:09:58	68.8	55.8	62.2
24/01/2017 18:14:58	68.9	53.9	62.0
24/01/2017 18:19:58	69.7	54.5	62.9
24/01/2017 18:24:58	69.6	51.2	62.2
24/01/2017 18:29:58	71.5	50.9	61.5
24/01/2017 18:34:58	70.0	52.1	61.0
24/01/2017 18:39:58	74.1	53.8	62.4
24/01/2017 18:44:58	69.3	54.8	61.8
24/01/2017 18:49:58	70.4	52.7	61.6
24/01/2017 18:54:58	69.2	50.8	60.6
24/01/2017 18:59:58	68.8	46.8	59.9
24/01/2017 19:04:58	71.3	50.3	59.8
24/01/2017 19:09:58	69.4	47.0	60.4
24/01/2017 19:14:58	69.9	48.8	60.3
24/01/2017 19:19:58	70.3	51.1	61.8
24/01/2017 19:24:58	72.4	51.2	61.3
24/01/2017 19:29:58	80.4	49.1	61.3
24/01/2017 19:34:58	69.4	45.2	58.7
24/01/2017 19:39:58	69.3	45.7	58.9
24/01/2017 19:44:58	71.8	50.0	60.5
24/01/2017 19:49:58	69.3	48.6	59.6
24/01/2017 19:54:58	69.9	43.2	58.8
24/01/2017 19:59:58	71.8	48.3	59.8
24/01/2017 20:04:58	69.0	43.2	58.6
24/01/2017 20:09:58	71.6	48.8	59.3
24/01/2017 20:14:58	68.7	50.1	60.1
24/01/2017 20:19:58	71.4	44.9	59.6
24/01/2017 20:24:58	70.6	45.7	59.9
24/01/2017 20:29:58	69.5	45.2	58.1
24/01/2017 20:34:58	75.4	44.6	58.7

24/01/2017 20:39:58	69.6	44.8	57.7
24/01/2017 20:44:58	71.6	42.9	58.6
24/01/2017 20:49:58	70.4	44.1	58.6
24/01/2017 20:54:58	70.7	45.1	57.9
24/01/2017 20:59:58	70.8	45.3	59.1
24/01/2017 21:04:58	73.1	48.6	59.1
24/01/2017 21:09:58	71.8	51.1	60.0
24/01/2017 21:14:58	70.7	42.2	57.3
24/01/2017 21:19:58	71.0	47.4	59.3
24/01/2017 21:24:58	72.8	49.9	60.0
24/01/2017 21:29:58	71.6	41.2	57.0
24/01/2017 21:34:58	71.3	41.3	58.9
24/01/2017 21:39:58	70.3	40.4	56.0
24/01/2017 21:44:58	71.6	40.0	55.9
24/01/2017 21:49:58	69.3	41.6	57.1
24/01/2017 21:54:58	69.1	39.9	56.4
24/01/2017 21:59:58	69.0	36.7	55.6
24/01/2017 22:04:58	71.3	39.0	55.8
24/01/2017 22:09:58	70.7	44.5	58.1
24/01/2017 22:14:58	70.0	40.1	55.5
24/01/2017 22:19:58	71.4	46.4	59.6
24/01/2017 22:24:58	69.0	40.6	57.4
24/01/2017 22:29:58	70.6	31.2	53.8
24/01/2017 22:34:58	67.4	37.7	53.7
24/01/2017 22:39:58	68.7	34.2	54.2
24/01/2017 22:44:58	70.5	35.6	55.9
24/01/2017 22:49:58	70.0	33.8	56.3
24/01/2017 22:54:58	67.7	28.5	53.8
24/01/2017 22:59:58	74.9	31.8	56.3
24/01/2017 23:04:58	69.8	38.2	54.4
24/01/2017 23:09:58	71.2	29.2	54.0
24/01/2017 23:14:58	70.4	21.3	52.8
24/01/2017 23:19:58	72.3	32.1	55.6
24/01/2017 23:24:58	68.7	29.2	49.3
24/01/2017 23:29:58	69.0	21.4	51.7
24/01/2017 23:34:58	66.0	27.1	49.3
24/01/2017 23:39:58	67.5	28.5	53.2
24/01/2017 23:44:58	69.7	26.3	51.8
24/01/2017 23:49:58	67.2	23.0	46.1
24/01/2017 23:54:58	71.3	28.2	52.1
24/01/2017 23:59:58	68.8	28.5	52.7
25/01/2017 00:04:58	69.2	19.7	51.8
25/01/2017 00:09:58	68.9	20.4	49.8
25/01/2017 00:14:58	70.0	26.9	53.1
25/01/2017 00:19:58	70.2	20.4	54.1

25/01/2017 00:24:58	72.2	21.9	54.3
25/01/2017 00:29:58	71.4	21.0	50.1
25/01/2017 00:34:58	71.6	19.2	49.8
25/01/2017 00:39:58	70.1	18.6	49.8
25/01/2017 00:44:58	69.0	23.8	50.8
25/01/2017 00:49:58	70.6	23.3	52.6
25/01/2017 00:54:58	70.4	19.1	50.4
25/01/2017 00:59:58	70.6	21.1	51.7
25/01/2017 01:04:58	65.9	18.6	47.4
25/01/2017 01:09:58	69.8	19.8	52.2
25/01/2017 01:14:58	34.0	18.3	23.7
25/01/2017 01:19:58	66.8	19.7	47.9
25/01/2017 01:24:58	70.2	22.2	52.3
25/01/2017 01:29:58	64.6	18.2	43.2
25/01/2017 01:34:58	67.1	20.5	47.6
25/01/2017 01:39:58	65.4	18.3	46.1
25/01/2017 01:44:58	70.5	19.9	49.7
25/01/2017 01:49:58	67.1	18.8	48.3
25/01/2017 01:54:58	69.9	23.6	53.3
25/01/2017 01:59:58	45.3	18.4	27.1
25/01/2017 02:04:58	29.7	18.1	20.2
25/01/2017 02:09:58	28.6	17.6	18.6
25/01/2017 02:14:58	67.7	18.3	50.5
25/01/2017 02:19:58	67.8	20.1	51.1
25/01/2017 02:24:58	65.9	17.7	45.0
25/01/2017 02:29:58	66.9	19.5	47.1
25/01/2017 02:34:58	67.8	18.6	45.0
25/01/2017 02:39:58	67.9	20.4	46.4
25/01/2017 02:44:58	70.3	27.6	52.4
25/01/2017 02:49:58	66.9	23.2	50.0
25/01/2017 02:54:58	65.0	18.2	47.2
25/01/2017 02:59:58	62.7	18.3	42.0
25/01/2017 03:04:58	37.3	18.6	25.0
25/01/2017 03:09:58	69.1	27.0	52.1
25/01/2017 03:14:58	65.9	20.3	48.6
25/01/2017 03:19:58	40.1	18.5	22.8
25/01/2017 03:24:58	64.4	18.5	43.7
25/01/2017 03:29:58	36.3	18.6	24.9
25/01/2017 03:34:58	67.6	19.6	47.0
25/01/2017 03:39:58	69.1	23.4	52.4
25/01/2017 03:44:58	71.4	22.7	51.0
25/01/2017 03:49:58	66.6	20.7	48.9
25/01/2017 03:54:58	69.5	19.9	50.9
25/01/2017 03:59:58	69.2	23.2	49.9
25/01/2017 04:04:58	39.2	19.5	27.8

25/01/2017 04:09:58	63.9	21.7	45.5
25/01/2017 04:14:58	61.5	20.3	41.3
25/01/2017 04:19:58	67.0	20.4	47.2
25/01/2017 04:24:58	69.3	24.7	52.3
25/01/2017 04:29:58	65.8	19.4	45.5
25/01/2017 04:34:58	66.1	27.4	48.4
25/01/2017 04:39:58	56.4	24.3	42.2
25/01/2017 04:44:58	69.3	29.7	52.5
25/01/2017 04:49:58	70.4	33.5	55.5
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25/01/2017 05:09:58	70.3	31.2	53.2
25/01/2017 05:14:58	68.4	36.5	55.7
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25/01/2017 05:49:58	67.7	40.7	57.2
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25/01/2017 05:59:58	73.1	33.9	56.6
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25/01/2017 07:44:58	69.9	54.4	63.0
25/01/2017 07:49:58	72.2	55.4	63.3

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26/01/2017 00:44:58	66.9	23.9	47.8
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26/01/2017 02:19:58	74.8	38.4	58.1
26/01/2017 02:24:58	72.8	38.3	54.2
26/01/2017 02:29:58	71.3	27.1	47.8
26/01/2017 02:34:58	67.6	26.2	49.9

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26/01/2017 06:04:58	76.8	53.0	63.0
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26/01/2017 08:44:58	69.5	56.3	62.4
26/01/2017 08:49:58	73.1	55.3	62.5
26/01/2017 08:54:58	76.8	58.1	64.9
26/01/2017 08:59:58	77.5	59.8	64.9
26/01/2017 09:04:58	75.6	58.9	65.2
26/01/2017 09:09:58	82.0	59.6	65.6
26/01/2017 09:14:58	74.8	59.0	64.9
26/01/2017 09:19:58	75.5	59.1	64.8
26/01/2017 09:24:58	74.6	58.6	64.5
26/01/2017 09:29:58	70.7	55.1	62.6
26/01/2017 09:34:58	73.9	55.2	62.3
26/01/2017 09:39:58	77.5	56.4	62.6
26/01/2017 09:44:58	78.3	58.2	64.5
26/01/2017 09:46:30	74.5	57.6	64.4
26/01/2017 10:15:02	79.8	54.6	63.1
26/01/2017 10:20:02	72.1	55.7	62.2
26/01/2017 10:25:02	71.5	57.4	62.4

26/01/2017 10:30:02	72.7	55.1	61.9
26/01/2017 10:35:02	72.0	53.9	62.9
26/01/2017 10:40:02	72.9	58.1	63.4
26/01/2017 10:45:02	74.8	55.2	63.3
26/01/2017 10:50:02	68.7	52.3	60.8
26/01/2017 10:55:02	78.6	54.5	62.8
26/01/2017 11:00:02	72.6	56.1	62.7
26/01/2017 11:05:02	73.4	56.2	63.3
26/01/2017 11:10:02	72.3	56.0	62.3
26/01/2017 11:15:02	69.5	53.1	60.7
26/01/2017 11:20:02	68.7	57.1	61.7
26/01/2017 11:25:02	71.0	54.5	62.5
26/01/2017 11:30:02	68.1	55.5	61.6
26/01/2017 11:35:02	72.8	56.2	62.0
26/01/2017 11:40:02	73.1	53.3	62.4
26/01/2017 11:45:02	69.2	51.5	60.0
26/01/2017 11:50:02	68.9	51.4	60.6
26/01/2017 11:55:02	69.7	49.2	60.9
26/01/2017 12:00:02	72.1	53.9	61.2
26/01/2017 12:05:02	75.2	53.4	61.5
26/01/2017 12:10:02	68.0	54.0	61.0
26/01/2017 12:15:02	70.1	55.6	61.2
26/01/2017 12:20:02	72.8	55.4	61.5
26/01/2017 12:25:02	71.3	52.7	60.7
26/01/2017 12:30:02	69.8	50.6	60.9
26/01/2017 12:35:02	68.3	52.3	61.0
26/01/2017 12:40:02	71.0	53.0	60.8
26/01/2017 12:45:02	71.0	52.9	61.2
26/01/2017 12:50:02	71.5	53.4	60.9
26/01/2017 12:55:02	73.1	54.0	61.8
26/01/2017 13:00:02	72.7	56.4	62.2
26/01/2017 13:05:02	73.7	53.6	61.4
26/01/2017 13:10:02	73.1	55.3	62.7
26/01/2017 13:15:02	75.7	55.9	63.6
26/01/2017 13:20:02	67.9	52.1	60.6
26/01/2017 13:25:02	70.6	55.0	61.9
26/01/2017 13:30:02	71.6	54.8	62.6
26/01/2017 13:35:02	75.0	51.8	61.3
26/01/2017 13:40:02	74.9	54.6	62.3
26/01/2017 13:45:02	72.0	53.3	63.2
26/01/2017 13:50:02	71.4	56.1	62.2
26/01/2017 13:55:02	72.7	53.2	61.5
26/01/2017 14:00:02	74.5	55.0	62.7
26/01/2017 14:05:02	72.2	52.3	61.3
26/01/2017 14:10:02	69.4	51.3	60.6

26/01/2017 14:15:02	71.3	54.4	61.2
26/01/2017 14:20:02	79.5	52.0	61.9
26/01/2017 14:25:02	72.0	52.2	61.3
26/01/2017 14:30:02	71.3	52.8	61.1
26/01/2017 14:35:02	71.1	53.8	61.7
26/01/2017 14:40:02	71.0	54.1	61.8
26/01/2017 14:45:02	69.4	54.2	60.7
26/01/2017 14:50:02	68.7	52.1	61.2
26/01/2017 14:55:02	68.5	53.9	61.2
26/01/2017 15:00:02	69.5	52.7	61.0
26/01/2017 15:05:02	70.6	50.9	60.5
26/01/2017 15:10:02	69.2	51.7	61.1
26/01/2017 15:15:02	69.7	51.5	61.1
26/01/2017 15:20:02	68.1	53.8	61.4
26/01/2017 15:25:02	77.0	52.4	62.3
26/01/2017 15:30:02	68.0	55.2	61.5
26/01/2017 15:35:02	67.5	52.6	61.5
26/01/2017 15:40:02	78.4	51.2	62.0
26/01/2017 15:45:02	69.7	52.7	61.6
26/01/2017 15:50:02	77.4	52.3	62.6
26/01/2017 15:55:02	68.2	55.4	61.7
26/01/2017 16:00:02	70.8	49.1	61.9
26/01/2017 16:05:02	69.0	56.4	62.2
26/01/2017 16:10:02	67.7	51.3	60.9

21. Appendix 6 – Measured Noise Levels at Location 'F'

Date	Time	LAeq (dB)	LAFMax (dB)	LAF90 (dB)
24/01/2017	13:40	65.3	74.2	52.5
24/01/2017	13:45	65.8	74.1	50.3
24/01/2017	13:50	65.6	75.6	54.4
24/01/2017	13:55	66.2	73.2	58.3
24/01/2017	14:00	64.9	72.1	53.7
24/01/2017	14:05	65.9	72.5	54.3

22. Appendix 7 – Weather Data During Survey

Date	Time	Temperature	Wind Direction	Max Wind Speed	Rainfall
24/01/2017	13:00	12.2	ENE	1.8	0
24/01/2017	13:15	7.3	ENE	1.3	0
24/01/2017	13:30	6.9	N	1.8	0
24/01/2017	13:45	7.5	WSW	4.5	0
24/01/2017	14:00	7.8	WSW	4.5	0
24/01/2017	14:15	8.3	SW	5.4	0
24/01/2017	14:30	8.3	SSW	3.6	0
24/01/2017	14:45	8.2	SSW	3.1	0
24/01/2017	15:00	7.9	SSW	3.1	0
24/01/2017	15:15	8	SSW	3.6	0
24/01/2017	15:30	8.2	SW	2.2	0
24/01/2017	15:45	8.2	SSW	3.6	0
24/01/2017	16:00	7.8	SSW	1.8	0
24/01/2017	16:15	7.1	SSW	1.8	0
24/01/2017	16:30	6.4	SSW	0.9	0
24/01/2017	16:45	5.8	SSW	1.3	0
24/01/2017	17:00	5.7	SSW	1.3	0
24/01/2017	17:15	5.6	SW	1.3	0
24/01/2017	17:30	5.1	SSW	1.3	0
24/01/2017	17:45	4.6	SSW	1.3	0
24/01/2017	18:00	4.3	SSW	0.9	0
24/01/2017	18:15	4.2	SSW	0.9	0
24/01/2017	18:30	3.9	SSW	0.9	0
24/01/2017	18:45	3.8	SSW	0.9	0
24/01/2017	19:00	3.3	SSW	0.9	0
24/01/2017	19:15	3.2	SSW	0.9	0
24/01/2017	19:30	3.3	SSW	0.4	0
24/01/2017	19:45	3.3	SSW	0.4	0
24/01/2017	20:00	3.4	SSW	0.4	0
24/01/2017	20:15	3.4	SSW	0.4	0
24/01/2017	20:30	3.3	SSW	0.4	0
24/01/2017	20:45	3.2	---	0	0
24/01/2017	21:00	2.8	SSW	0.4	0
24/01/2017	21:15	2.8	SSW	0.4	0
24/01/2017	21:30	2.8	SSW	0.4	0
24/01/2017	21:45	2.7	SSW	0.9	0
24/01/2017	22:00	2.6	SSW	0.9	0
24/01/2017	22:15	2.7	SSW	1.3	0
24/01/2017	22:30	2.6	SSW	0.4	0
24/01/2017	22:45	2.6	SSW	0.4	0
24/01/2017	23:00	1.8	---	0	0

24/01/2017	23:15	2.2	SSW	0.4	0
24/01/2017	23:30	2.1	SSW	0.4	0
24/01/2017	23:45	1.9	SSW	0.4	0
25/01/2017	00:00	1.5	SSW	0.4	0
25/01/2017	00:15	1.4	SSW	0.4	0
25/01/2017	00:30	1.3	SSW	0.4	0
25/01/2017	00:45	1.2	SSW	0.4	0
25/01/2017	01:00	1.2	SSW	0.9	0
25/01/2017	01:15	1.2	SSW	0.9	0
25/01/2017	01:30	1	SSW	0.9	0
25/01/2017	01:45	0.8	SSW	0.4	0
25/01/2017	02:00	0.5	SSW	0.4	0
25/01/2017	02:15	0.7	SSW	1.3	0
25/01/2017	02:30	0.6	SSW	0.9	0
25/01/2017	02:45	1.1	SSW	1.3	0
25/01/2017	03:00	1.2	SSW	0.9	0
25/01/2017	03:15	1.1	SSW	0.9	0
25/01/2017	03:30	1.2	SSW	1.3	0
25/01/2017	03:45	1.1	SSW	1.3	0
25/01/2017	04:00	1.2	SSW	0.9	0
25/01/2017	04:15	1.3	SSW	0.9	0
25/01/2017	04:30	1.3	SSW	0.9	0
25/01/2017	04:45	1.3	S	1.3	0
25/01/2017	05:00	0.9	S	0.9	0
25/01/2017	05:15	1.3	SSW	1.3	0
25/01/2017	05:30	1.3	SSW	0.9	0
25/01/2017	05:45	1.3	SSW	0.9	0
25/01/2017	06:00	1.7	SSW	1.3	0
25/01/2017	06:15	1.9	SSW	1.3	0
25/01/2017	06:30	2.1	S	0.9	0
25/01/2017	06:45	1.9	S	0.4	0
25/01/2017	07:00	1.8	S	0.9	0
25/01/2017	07:15	1.8	S	0.9	0
25/01/2017	07:30	1.9	S	0.9	0
25/01/2017	07:45	1.8	S	0.9	0
25/01/2017	08:00	1.5	S	1.3	0
25/01/2017	08:15	1.7	SSW	1.8	0
25/01/2017	08:30	1.8	S	2.2	0
25/01/2017	08:45	2.7	SSW	1.3	0
25/01/2017	09:00	3.7	S	2.7	0
25/01/2017	09:15	4.3	S	2.7	0
25/01/2017	09:30	5	SSE	2.7	0
25/01/2017	09:45	5.7	SSE	4.5	0
25/01/2017	10:00	6.3	SSE	4.5	0
25/01/2017	10:15	6.8	SSE	4.5	0

25/01/2017	10:30	7.1	SSE	5.4	0
25/01/2017	10:45	7.6	SSE	5.4	0
25/01/2017	11:00	7.9	SSE	4.9	0
25/01/2017	11:15	8.1	SSE	5.4	0
25/01/2017	11:30	8.2	SSE	6.3	0
25/01/2017	11:45	8.4	SSE	5.4	0
25/01/2017	12:00	8.6	SSE	4.9	0
25/01/2017	12:15	8.6	SSE	6.3	0
25/01/2017	12:30	8.7	SSE	4.9	0
25/01/2017	12:45	8.7	SSE	4.5	0
25/01/2017	13:00	8.9	SSE	4.5	0
25/01/2017	13:15	8.9	SSE	4.9	0
25/01/2017	13:30	8.8	SSE	4.5	0
25/01/2017	13:45	8.9	SSE	4.9	0
25/01/2017	14:00	8.9	SSE	4.9	0
25/01/2017	14:15	7.8	SSE	4.9	0
25/01/2017	14:30	6.9	SSE	5.4	0
25/01/2017	14:45	6.9	SSE	5.4	0
25/01/2017	15:00	6.5	SSE	4.9	0
25/01/2017	15:15	6.3	SSE	4.5	0
25/01/2017	15:30	6.4	SSE	4.5	0
25/01/2017	15:45	6.2	SSE	4.5	0
25/01/2017	16:00	5.9	SSE	4	0
25/01/2017	16:15	5.6	SSE	3.1	0
25/01/2017	16:30	5.2	SSE	3.1	0
25/01/2017	16:45	4.7	SE	3.6	0
25/01/2017	17:00	4.4	SE	4	0
25/01/2017	17:15	4.6	SSE	4	0
25/01/2017	17:30	4.7	SSE	4.5	0
25/01/2017	17:45	4.8	SSE	3.6	0
25/01/2017	18:00	4.7	SSE	4	0
25/01/2017	18:15	4.8	SE	4	0
25/01/2017	18:30	4.8	SE	4.9	0
25/01/2017	18:45	4.8	SE	5.8	0
25/01/2017	19:00	4.6	SE	4	0
25/01/2017	19:15	4.4	SE	4	0
25/01/2017	19:30	4.4	ESE	4.9	0
25/01/2017	19:45	4.4	SE	4.5	0
25/01/2017	20:00	4.4	SE	5.4	0
25/01/2017	20:15	4.4	SE	4.9	0
25/01/2017	20:30	4.2	SE	4	0
25/01/2017	20:45	4.1	SE	4.9	0
25/01/2017	21:00	3.9	SE	5.8	0
25/01/2017	21:15	3.6	SE	3.6	0
25/01/2017	21:30	3.4	SE	5.8	0

25/01/2017	21:45	3.2	SE	5.4	0
25/01/2017	22:00	3.1	SE	4.9	0
25/01/2017	22:15	2.9	SE	5.8	0
25/01/2017	22:30	2.8	SE	5.4	0
25/01/2017	22:45	2.6	SE	5.8	0
25/01/2017	23:00	2.4	SE	5.8	0
25/01/2017	23:15	2.2	SE	5.8	0
25/01/2017	23:30	2.1	SE	5.4	0
25/01/2017	23:45	1.9	SE	6.7	0
26/01/2017	00:00	1.9	SE	4.5	0
26/01/2017	00:15	1.8	SE	5.8	0
26/01/2017	00:30	1.7	SE	3.6	0
26/01/2017	00:45	1.8	SE	4.9	0
26/01/2017	01:00	1.8	SE	5.4	0
26/01/2017	01:15	1.8	SE	4	0
26/01/2017	01:30	1.7	SE	4	0
26/01/2017	01:45	1.8	SE	4	0
26/01/2017	02:00	1.8	SE	4.5	0
26/01/2017	02:15	1.8	SE	5.4	0
26/01/2017	02:30	1.8	SE	6.3	0
26/01/2017	02:45	1.7	SE	4.9	0
26/01/2017	03:00	1.8	SE	4	0
26/01/2017	03:15	1.9	SE	4.9	0
26/01/2017	03:30	1.9	SE	6.7	0
26/01/2017	03:45	1.9	SE	6.3	0
26/01/2017	04:00	1.8	SE	4.5	0
26/01/2017	04:15	1.7	SE	5.8	0
26/01/2017	04:30	1.4	SE	6.3	0
26/01/2017	04:45	1.4	SE	5.4	0
26/01/2017	05:00	1.4	SE	5.8	0
26/01/2017	05:15	1.4	SE	6.3	0
26/01/2017	05:30	1.4	SE	5.8	0
26/01/2017	05:45	1.4	SE	5.4	0
26/01/2017	06:00	1.3	SE	5.8	0
26/01/2017	06:15	1.2	SE	5.8	0
26/01/2017	06:30	1.1	SE	6.3	0
26/01/2017	06:45	0.8	SE	6.3	0
26/01/2017	07:00	0.8	SE	5.4	0
26/01/2017	07:15	0.7	SE	6.7	0
26/01/2017	07:30	0.5	SE	5.4	0
26/01/2017	07:45	0.5	SE	6.3	0
26/01/2017	08:00	0.6	SE	4.9	0
26/01/2017	08:15	0.6	SE	6.7	0
26/01/2017	08:30	0.5	SE	6.3	0
26/01/2017	08:45	0.6	SE	4.9	0

26/01/2017	09:00	0.6	SE	6.3	0
26/01/2017	09:15	0.6	SE	5.8	0
26/01/2017	09:30	0.7	SE	5.8	0
26/01/2017	09:45	0.7	SE	5.4	0
26/01/2017	10:00	0.7	SE	8	0
26/01/2017	10:15	0.9	SE	8.5	0
26/01/2017	10:30	0.9	SE	7.2	0
26/01/2017	10:45	0.9	SE	7.6	0
26/01/2017	11:00	0.9	SE	6.7	0
26/01/2017	11:15	1.1	SE	7.6	0
26/01/2017	11:30	1.2	SE	6.3	0
26/01/2017	11:45	1.3	SE	7.2	0
26/01/2017	12:00	1.6	SE	5.8	0
26/01/2017	12:15	1.8	SE	7.2	0
26/01/2017	12:30	2.1	SE	7.6	0
26/01/2017	12:45	2.3	SE	6.7	0
26/01/2017	13:00	2.3	SE	6.7	0
26/01/2017	13:15	2	SE	8	0
26/01/2017	13:30	2	SE	6.7	0
26/01/2017	13:45	2	SE	7.6	0
26/01/2017	14:00	2.1	SE	8	0
26/01/2017	14:15	2.4	SE	5.8	0
26/01/2017	14:30	2.4	SE	5.8	0
26/01/2017	14:45	2.7	SE	6.7	0
26/01/2017	15:00	2.9	SE	5.4	0
26/01/2017	15:15	3.2	SE	4.9	0
26/01/2017	15:30	3.3	SE	4.9	0
26/01/2017	15:45	3.4	SE	5.4	0
26/01/2017	16:00	3.5	SE	8.5	0
26/01/2017	16:15	3.6	SE	4.9	0
26/01/2017	16:30	4.6	E	2.2	0.2

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