Able Acoustics

MS L STEWART

REVIEW OF ENVIRONMENTAL STATEMENT, NOISE AND VIBRATION CHAPTER

NOVEMBER 2019

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Prepared By:	[redacted]	*Principal Acoustic Consultant*	
Checked By:	[redacted]	*Principal Acoustic Consultant*	
Approved By:	[redacted]	*Principal Acoustic Consultant*	

Able Acoustics
Unit 20, Connect 10
Foster Road
Ashford
Kent
TN24 0FE
England
www.ableacoustics.com
info@ableacoustics.com

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1. EXECUTIVE SUMMARY

1.1 Executive Summary

1.1.1 Able Acoustics Ltd has been commissioned by Ms L Stewart to undertake a review of the Environmental Statement, Noise and Vibration Chapter prepared in support of application number 18/506556/NSIP for the following proposal:

1.1.2 *"A solar photovoltaic array, and electrical storage and connection infrastructure, each with a generation capacity of greater than 50 MW"* at the site: *Land At Cleve Hill Graveney Kent ME13 9EE.*

1.1.3 This review makes use of publically available information which may be viewed on the planning portal page of Swale Borough Council.

1.1.4 In undertaking this review the following areas have been considered:

- Measurement Survey carried out;
- Operational Noise Referenced levels, calculations and prediction methodology;
- Construction Noise Referenced levels, calculations and prediction methodology;
- Traffic Noise calculations;
- Potential inconsistencies with supporting information;
- Areas where clarification should be sought and
- Whether or not any further assessment should be carried out.

1.1.5 This review has identified possible issues in respect of:

- Potential inconsistencies in reference levels between the report and the accompanying appendix;
- Uncertainty arising from limitations to the different calculation protocols;
- Potential errors/inconsistencies in the calculations;
- Potential uncertainty in the results;

1.1.6 This review has identified possible errors in the construction noise calculations arising as a result of potential inconsistencies between the values provided in the appendix and those used in the body of the noise and vibration chapter.

1.1.7 This report has also identified areas where uncertainty may be present. These have been identified as areas where clarification should be sought.

1.2 Experience and Qualifications

1.2.1 This review has been undertaken by the author of this report: [redacted] MSc, IEng[1], MIOA[2] the Principal Acoustic Consultant at Able Acoustics Limited, whose qualifications include, a Master of Science with Distinction in Environmental and Architectural Acoustics, The Institute of Acoustics Diploma in Acoustics and Noise Control (including all endorsements) and the Institute of Acoustics Certificate of Competence in Environmental Noise Measurement.

1.2.2 The author of this report has experience of undertaking both field work and practical assessments of environmental sound from construction, commercial & industrial operations, transport and occupational noise. The author's responsible project experience including both field work and practical assessment time exceeds 25,000 hours to date.

1.2.3 The author is also an Incorporate Member of the Chartered Institute of Building (ICIOB), an Accredited Associate Member of the Chartered Institute of Environmental Health (ACIEH) as well as an accredited expert witness (Practising Associate of the Academy of Experts) in the field of Acoustics and Noise Control and has prepared reports and given oral evidence for legal proceedings including in the High Court.

1.2.4 The author has also been commissioned to provide learning seminars on the use of acoustics related Standards and guidance to both Environmental Health Practitioners & Legal Professionals and provides continued professional development seminars on acoustics and noise control to the Chartered Institute of Building.

[1] Incorporated Engineer registered with the Engineering Council
[2] Corporate Member of the Institute of Acoustics

2. INTRODUCTION

2.1 Introduction

2.1.1 Able Acoustics Ltd has been commissioned by [redacted] to undertake a review of the Noise and Vibration Chapter of the Environmental Statement prepared by Arcus Consultancy Services Ltd (hereafter referred to as the consultant) in support of a development consent order planning portal reference number 18/506556/NSIP for: *"A solar photovoltaic array, and electrical storage and connection infrastructure, each with a generation capacity of greater than 50 MW"* at the site: *Land At Cleve Hill Graveney Kent ME13 9EE.*

2.1.2 This review makes use of publically available information which may be viewed on the planning portal page of Swale Borough Council. In undertaking this review the following have been considered:

- Measurement survey carried out by Arcus Consultancy Services Ltd;
- Measured levels, calculations and prediction methodology;
- Relevant standards; and
- Whether or not any further assessment should be carried out.

2.1.3 This review is technical in nature and technical terminology and noise units have been summarised in Section 3.0 of this review.

2.2 Scope of Assessment Review

2.2.1 Able Acoustics Ltd has been commissioned by [redacted] to undertake a review of the Noise & Vibration Chapter of the Environmental Statement (ES) prepared by the consultant in support of planning application number 18/506556/NSIP (hereafter referred to as the report).

2.2.2 The following documents have been provided to inform this review:

- Application form, dated 15/11/2018.[1]
- ES, Vol 1 Chapter 12, Noise & Vibration [2]
- ES, Vol 2 Figures, Noise & Vibration [3]
- ES, Vol 4, Technical Appendix A12.1, Survey Record Sheets[4]
- ES, Vol 4, Technical Appendix A12.3, Piling Rig Noise Data [5]
- ES, Vol 4, Technical Appendix A12.4, Piling Calculation Sheets - Ecological Receptors [6]
- ES, Vol 4, Technical Appendix A12.5, Other Construction Activities Calculation Sheets - Ecological Receptors [7]
- ES, Vol 4, Technical Appendix A12.6, Changes in Road Traffic Noise Calculation [8]
- ES, Vol 4, Technical Appendix A12.7, Inverter Noise Emission Data [9]
- ES, Vol 4, Technical Appendix A12.8, Substation Noise Emission Data [10]
- ES, Vol 4, Technical Appendix A12.9, Energy Storage Noise Data [11]
- ES, Vol 4, Technical Appendix A12.10, Outline SPA Construction Noise Management Plan [12]
- Appendix 6 – Arna Wood Solar Farm Piling Noise Investigation [13]

2.2.3 The plan showing the site and the proposed development is reproduced at Figure 01 of this review.

3. UNITS AND TERMINOLOGY

3.1 General

3.1.1 This review contains comments of a technical nature and some technical terminology is provided below.

3.1.2 The range of audible sound is generally considered to be from 0 dB to 140 dB and a range of typical levels is presented in Table 2.1 below:

Table 3.1 Typical Sound Levels

Sound Pressure Level dB(A)	Source	Subjective Level
130 - 140	Jet (at 10m)	Threshold of pain
120 – 130	Pneumatic Drill (at 1m)	Extremely Loud
110 – 120	Loud Car Horn (at 1m)	Very Loud
100 – 110	Alarm Bell (at 1m)	Very Loud
80 – 90	Inside General Factory	Loud
70 – 80	Average Traffic (on street corner)	Loud
60 – 70	Conversational Speech	Moderate
50 – 60	Typical Business Offices	Moderate
40 – 50	Living-room Urban Area	Quiet
30 – 40	Library	Quiet
20 – 30	Bedroom (at night)	Very Quiet
10 - 20	Broadcasting Studio	Very Quiet

3.1.3 Noise is a subjective term and can be defined as unwanted sound.

3.1.4 In the UK environmental noise is measured and expressed using dB(A). The (A) reference indicates the use of a frequency weighting procedure, where sound levels are attenuated at the upper and lower ends of the audible frequency range, while levels in the upper-middle region are increased. The weighting is intended to reflect the response of the human ear, which *weights* the importance of different frequencies.

3.1.5 The "loudness" of a sound is a subjective parameter, but it is generally accepted that an increase/decrease of 10 dB corresponds to a doubling/halving in perceived loudness. For road traffic or railway sound sources, a doubling of traffic flow will increase the overall sound by 3 dB. For a sound source to cause no distinguishable increase in the overall sound level, the level of sound has to be at least 10dB below the measured sound level.

3.1.6 External sound levels are rarely steady, but rise and fall according to activities within an area at any given time. In an attempt to produce a figure that relates this variable sound level to subjective response, a number of indices have been developed. These include:

i) $L_{Aeq,T}$ level

This is the "equivalent continuous A-weighted sound pressure level, in decibels", and is defined in British Standard BS 7445 [14] as:

"value of the A-weighted sound pressure level of a continuous, steady sound that,

within a specified time interval, T, has the same mean square sound pressure as a sound under consideration whose level varies with time".

The $L_{Aeq,T}$ level is a unit commonly used to describe sound attributable to music, construction and sound from industrial premises and is the most suitable unit for the description of other forms of environmental sound. In simpler terms, it is a single measure of sound energy within the varying sound.

ii) The L_{Amax} level

This is the maximum A-weighted level recorded over the measurement period. The L_{Amax} may sometimes be used for assessing environmental noise where infrequent instances of elevated levels may occur that have minimal influence on the L_{Aeq} sound level. The L_{Amax} level is measured using the "fast" time response on the sound level meter unless otherwise stated.

iii) The L_{A90} level

This is the A-weighted level that is exceeded for 90% of the measurement period and gives an indication of the level during quieter periods. It is often referred to as the "background" level and is used in the assessment of industrial and commercial sound.

3.2 Standards - Noise

BS 5228-1: 2009 – The Code of Practice for Noise and Vibration Control on Construction and Open Sites, Part 1 Noise

3.2.1 In the absence of any specific agreement between the contractor and the Local Authority noise limits may be set according to one of three methods. BS5228-1-2009 Code of practice for noise and vibration control on construction and open sites [15]. This provides a protocol for both determining the significance of noise effects based on fixed limits and well as a protocol for determining the significance of noise effects based on noise change.

3.2.2 BS 5228-1 does not provide any fixed limits per se but does make specific reference to the Noise Control on Building Sites Advisory Leaflet 72 1968 as revised in 1976 which states:

"Noise from construction and demolition sites should not exceed the level at which conversation in the nearest building would be difficult with the windows shut. The noise can be measured with a simple sound level meter, as we hear it, in A-weighted decibels (dB(A))... Noise levels, between say 07.00 and 19.00 hours, outside the nearest window of the occupied room closest to the site boundary should not exceed:

- *70 decibels (dBA) in rural, suburban and urban areas away from main road traffic and industrial noise;*
- *75 decibels (dBA) in urban areas near main roads in heavy industrial areas.*

These limits are for daytime working outside living rooms and offices. In noise-sensitive situations, for example, near hospitals and educational establishments

– and when working outside the normal hours say between 19.00 and 22.00 hours – the allowable noise levels from building sites will be less: such as the reduced values given in the contract specification or as advised by the Environmental Health Officer (a reduction of 10 dB(A) may often be appropriate). Noisy work likely to cause annoyance locally should not be permitted between 22.00 hours and 07.00 hours."

It should be noted that these are equivalent noise levels over a given period of time not instantaneous maximum noise levels.

3.2.3 The above principle has been expanded over time to include a suite of noise levels (Table E.2 of BS 5228) covering the whole day/week period and taking into account varying sensitivities. Although not mandatory these levels form the basis for the threshold above which noise insulation would be provided if temporal criteria area also exceeded. Table E.2 has been reproduced as Table 3.2 below:

Table 3.2 Examples of time periods, averaging times and noise levels associated with the determination of eligibility for noise insulation

Time	Relevant time period	Averaging time, *T*	Noise insulation trigger level dB $L_{Aeq,T}$ [A)]
Monday to Friday	07:00 - 08:00	1 h	70
	08:00 - 18:00	10 h	75
	18:00 - 19:00	1 h	70
	19:00 - 22:00	3 h	65
	22:00 - 07:00	1 h	55
Saturday	07:00 - 08:00	1 h	70
	08:00 - 13:00	5 h	75
	13:00 - 14:00	1 h	70
	14:00 - 22:00	3 h	65
	22:00 - 07:00	1 h	55
Sunday and Public Holidays	07:00 - 21:00	1 h	65
	21:00 - 07:00	1 h	55

[A)] All noise levels are predicted or measured at a point 1m in front of the most exposed of any windows and doors in any façade of any eligible dwelling.

3.2.4 Where noise levels exceed trigger levels (and if the contractor has applied best practicable means to the mitigate noise) Section E.4 of BS 5228 is applicable and states the following in respect of noise insulation and temporary rehousing:

"Noise insulation, or the reasonable costs thereof, will be offered by the developer or promoter to owners, where applied for by owners or occupiers, subject to meeting the other requirements of the proposed scheme, where the construction of the development causes, or is expected to cause, a measured or predicted airborne construction noise level that exceeds either of the following at property lawfully occupied as a permanent dwelling:

• the noise insulation trigger levels presented in Table E.2 for the corresponding times of day;

• a noise level 5 dB or more above the existing pre-construction ambient noise level for the corresponding times of day;

whichever is the higher; and for a period of 10 or more days of working in any 15 consecutive days or for a total days or for a total number of days exceeding 40 in any 6 consecutive months.

Temporary rehousing, or the reasonable costs thereof, will be offered by the developer or promoter to owners, where applied for by owners or occupiers, subject to meeting the other requirements of the proposed scheme, where the construction of the development causes, or is expected to cause, a measured or predicted airborne construction noise level that exceeds either of the following at property lawfully occupied as a permanent dwelling:

• a noise level 10 dB above any of the trigger noise levels presented in Table E.2 for the corresponding times of the day; or

• a noise level 10 dB above the pre-construction ambient noise level for the corresponding times of the day;

whichever is the higher; and for a period of 10 or more days of working in any 15 consecutive days or for a total number of days exceeding 40 in any 6 consecutive months.

Non-residential buildings the occupants of which are likely to be particularly sensitive to noise (these include commercial and educational establishments, hospitals and clinics) will be subject to individual consideration by the developer or promoter, upon application by the affected party."

3.2.5 It is noted the levels between 07:00 and 08:00 are 5dB lower than between a typical working day which is usually 10 hours from 08:00 to 18:00 Mondays to Fridays and 08:00 – 13:00 on Saturdays. Works on Sundays and Public holidays are also noted to be 10dB lower.

3.2.6 BS 5228-1 also provides two other methods to determine the threshold of potential significant effects based on noise change, the first is the ABC method the second is the 2-5dB (A) change method.

3.2.7 The ABC method determines potential significant effect by comparing pre-construction ambient levels with time period values (for day evening and night) to determine a threshold Category value. The Category value is based on whether

or not these are above, equal to, or less than the relevant period value for the same time from Category A prior to construction commencing.

3.2.8 The 2-5dB (A) change method indicates construction site activity to be significant if the total noise (i.e. pre-construction ambient plus site noise) exceeds the pre-construction ambient noise by 5 dB or more at certain buildings. This method may be limited in low noise areas because site noise maybe in excess of the pre-existing ambient noise but not meet the cut off threshold. For public open space the impact might be significant if the ambient is exceeded by 5dB or more (with no lower cut-off threshold) although this should be considered with regard to the area impacted relative to the total area available.

3.2.9 BS 5228 makes reference to Best Practicable Means (BPM). BPM is defined in Section 72 of The Control of Pollution Act 1974 [16] where "practicable" means reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to the financial implications. The “means” to be employed includes the design, installation, maintenance and manner and periods of operation of plant and machinery, and the design, construction and maintenance of buildings and acoustic structures.

3.3 Standards - Vibration

BS 5228-2: 2009 – The Code of practice for noise and vibration control on construction and open sites, Part 2 Vibration

3.3.1 Vibration from construction and demolition operations is typically measured in terms of the Peak Particle Velocity (PPV) which is the maximum instantaneous velocity of a particle at a given point during a specified time interval.

3.3.2 British Standard 5228-2:2009 provides guidance on setting limits for vibration both for human disturbance and also for building damage.

3.3.3 BS 5228-2 [17] provides guidance in terms of PPV, since this parameter is likely to be more routinely measured based upon the more casual concern over potential building damage. Vibration levels for disturbance are given in table B.1 and reproduced below.

Table 3.3 Guidance on effects of vibration levels

Vibration Level	Effect
0.14 $mm{\cdot}s^{-1}$	Vibration might just be perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration
0.3 $mm{\cdot}s^{-1}$	Vibration might be just perceptible in residential environments.
1.0 $mm{\cdot}s^{-1}$	It is likely that vibration of this level in residential environments will cause complaint but can be tolerated if prior warning and explanation has been given to residents.
10 $mm{\cdot}s^{-1}$	Vibration is likely to be intolerable for any more than a brief exposure to this level.

Below a frequency of 4 Hz where a high displacement is associated with a

relatively low component PPV a maximum displacement of 0.6 mm (zero to peak) should also be used.

3.4 Standards - Industrial and Commercial Sound

BS 4142 Method

3.4.1 BS 4142:2014+A1:2019 [18] provides methods for rating and assessing industrial and commercial sound. The Standard is used by local authorities and consultants to rate sound from fixed installations. The Standard was considerably revised 2014 and amended in 2019.

3.4.2 The Standard advocates the use of L_{Aeq}, a level which is directly measurable. The L_{Aeq} is either measured or calculated at a receptor location and this is termed the "Specific Sound Level". The Specific Sound Level may then be corrected for the character of the sound and is then termed the "Rating Level".

3.4.3 The Standard records that sound with prominent impulses has been shown to be more annoying than continuous types of sound (without impulses or tones) with the same equivalent sound pressure level and outlines a number of methods for defining appropriate “character corrections” within the Rating Sound Level to account for tonal qualities, impulsive qualities, other sound characteristics and/or intermittency. These are a) the Subjective Method, b) the Reference Method for tonality and c) the Objective Methods for assessing both tonality and impulsivity. It is noted by the Standard that where multiple features are present the corrections should be added in a linear fashion to the Specific Sound Level. The Subjective Method is based on the following corrections shown in Table 3.4 below:

Table 3.4 Subjective Method Rating Corrections

Level of Perceptibility	Tonal Correction	Impulsivity Correction	Intermittency Correction	Correction for “Other sound characteristics”
No Perceptibility	+0dB	+0dB	If intermittency is readily identifiable +3dB	When neither tonal nor impulsive, nor intermittent but clearly identifiable +3dB
Just Perceptible	+2dB	+3dB		
Clearly Perceptible	+4dB	+6dB		
Highly Perceptible	+6dB	+9dB		

3.4.4 The Objective Methods are based around the actual quantification of frequency data and the impulsive prominence of the sound under investigation where possible.

3.4.5 When used to assess the impacts, the Rating Level is determined and the L_{A90} background sound level is subtracted from it, the result is then considered alongside a range of pertinent factors to determine the context. The Standard states:

“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."

3.4.6 The level difference values are not arbitrary and the standard is clear on this using the words: *"a difference of around"* when considering the margin by which the rating level may exceed the background sound level, prior to taking context into account.

4. REVIEW

4.1 Measurement Survey and Information to be Reported

4.1.1 The measurement survey was undertaken over a seven day period at three separate locations. The report indicates that the equipment was set to measure $L_{Aeq,1hr}$ and $L_{A90,1hr}$. However no numerical data is provided to allow data to be scrutinised in further detail and it is noted the $L_{Aeq,1hr}$ data has not been presented. It is further noted the residual sound levels are required (by BS 4142) to be reported.

4.1.2 BS 4142:2014 requires the details of the latest verification test including dates this data is absent.

4.1.3 BS 4142:2014 also requires a statement of qualifications, competency, professional memberships and experience directly relevant to the application of this British Standard of all personnel contributing to the assessment. This has not been reported.

4.2 Operational Noise Assessment

4.2.1 The measurement results have been analysed and the range of background sound level values has been considered as is encouraged by BS 4142. The analyses present the data in tabular format and have considered the modal, median and mean values in determining a representative background sound level which has been used to derive a rating noise limit value. The analyses have been checked and it is considered the representative background sound levels have been determined correctly with the exception of Nagden during the daytime where a representative background sound level of 39dB $L_{A90,1hr}$ has been determined. Our analyses indicate this value to be 1dB higher and it is considered the consultant's value reflects a worse case.

4.2.2 The values have been used to set a threshold above which will result in a moderate effect. This should be read with caution because the language of BS 4142 is clear:

"*A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context"*

4.2.3 One of the contextual factors that an assessment should take into account is the residual sound level. The character of the residual sound at the time the monitors were deployed has been referred to in Section 12.3.2, but only from a subjective perspective. In the absence of the presentation of measurement data for the residual sound levels the possibility this may not have been fully considered for other times of day and/or night cannot be overlooked.

4.2.4 The report identifies the inverters and transformers as the primary sources of noise and uses a sound power level value L_{wA} 63dB calculated from a sound pressure level of L_p 55dB(A). This is confirmed to be correct.

4.2.5 The specific sound levels have been predicted using SoundPlan (the version the consultant has used is not stated). SoundPlan provides a software implantation of ISO 9613-2 which has limited accuracy beyond 500m.

4.2.6 The report identifies the inverters and transformers as the primary sources of noise across the site and states:

"Due to the high number of inverters across the site, it is not possible to input each inverter into the SoundPlan noise model."

4.2.7 The above statement maybe factually inaccurate in so far as SoundPlan has no upper limit on the number of sources that can be input into the model which can be inserted as one unit with a height relative to the ground and then copied multiplying the number of sources and moved into position in batches. However, as the solar array would consist of a series of angled panels (which would be put into the model as a series of angled floating screens) it is also possible the above statement may have been intended to be read in the context of nothing being provided within the relevant standard that specifically deals with reflections to the ground from a series of floating angled screens that would enable predictions to be made with confidence. It is further noted that depending on the number of reflections the model adopts, a large number of individual sources will significantly slow down the calculation process.

4.2.8 The model has adopted a sound power level value for the inverters calculated from the total number of sources. This is confirmed to be correct.

4.2.9 The model has adopted an area source over the areas over which the panels will be installed and it is considered that these will over predict the level of sound in the absence of any screens, but it is not possible to quantify by how much and it is considered the consultant's predictions will reflect a worst case scenario.

4.2.10 The levels used for the batteries and inverters are considered to be appropriate.

4.2.11 The levels used for the transformer cooling fan are considered appropriate in the absence of any available source data.

4.2.12 The assessment has considered the possibility the facility could generate sound from sun rise which may occur during night time hours (23:00-07:00). It is considered assessing sound over this period would reflect a worst case scenario.

4.2.13 The rating levels have been presented in Table 12.26 based on +2dB for just perceptible tonal characteristics. In the absence of data for the residual sound level data it is unclear how prevalent the specific sound may be over and above the residual sound environment, it is also possible the specific sound could be below the residual sound level. Sound from the operational facility could be controlled by condition and if necessary a condition requiring verification of commissioning.

4.2.14 BS 4142 considers the absolute level of sound to be a pertinent factor noting: Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night. It is further noted that the specific sound level at 1 Crown Cottages is 43dB$L_{Aeq,Tr.}$ An open window provides circa 10-15dB of attenuation from outside to inside indicating internal levels could be 28-33dB(A). This potentially exceeds the level of 30dB(A) that the World Health Organisation guidelines recommends should not be exceeded for a good night's sleep and further discussion in respect of this maybe required.

4.2.15 The report considers the level of operational sound at eight separate receptors as follows:

- Nagden Barn
- Nagden House
- Nagden Cottages
- Warm House
- Coneybank
- 1 Crown Cottages
- 4 Crown Cottages
- Cleve Farm

4.3 Sensitivity of Receptors

4.3.1 It has been communicated by [redacted] that there is a school for children with learning difficulties/autism in the vicinity of the application site. At the time of writing it has not been possible to verify this statement with reference to the planning portal, although it is noted that the planning portal does make reference to a school at Cleve Farm. Concerns have been raised as follows[3]:

"There is also a children's home and a small school for young people with severe autism along the main road -- and the primary school itself too of course. Any traffic noise - will have an effect on learning and in addition [redacted] *are noise sensitive."*

4.3.2 The applicant's response to consultee (on Page 12-6 of the report) considers all receptors to be of high sensitivity and further notes that during peak times there is a predicted 2dB increase. On the assumption supporting traffic information is correct it is confirmed this falls into the category of "minor" magnitude of impact.

4.3.3 The IEMA Guidelines [19] note the following in Section 2.45 page 14 in respect of Cognitive impairment to school children.

"2.45 A World Health Organisation document on Burden of Disease[41] references three European studies on cognitive impairment in school children from transport noise. There is evidence from the Munich[42] and RANCH[43] studies of an association between aircraft noise exposure and cognitive performance in school children (reading comprehension and recognition memory), but the same association was not seen for road traffic noise. Neither aircraft noise nor road traffic noise affected sustained attention, self-reported health of mental health."

4.3.4 When read in conjunction with the applicant's response (receptors being of high sensitivity) it is considered relevant guidance has been taken into account and that cognitive impairment is not anticipated. It should be noted, this does not preclude the occupants of non-residential buildings which are likely to be particularly sensitive to noise (these include commercial and educational establishments, hospitals and clinics) from applying to the developer for noise insulation mitigation.

4.3.5 It has further been communicated that there are concerns in respect of the age of

[3] Email from Ms L Stewart 15th October 2019, 14:10

residents.

"…in our village the number of older people is significant and they live mainly (100+) along the main road."

4.3.6 It is generally recognised that the risk of cardio vascular complications in humans increases with age. The IEMA Guidelines notes the following in Section 2.43 page14 in respect of Cardio vascular effects:

"2.43 It has been shown that long-term exposure to road traffic noise may increase the risk of heart disease, which includes myocardial infarctions. Both road traffic noise and aircraft noise also have been shown to increase the risk of high blood pressure."

4.3.7 The applicant's response to consultee considers all receptors to be of high sensitivity (P12-6) and indicates the level of change to be 2dB along the existing road. On the assumption supporting traffic information is correct, this is a "minor" magnitude of impact.

4.4 Construction Noise Assessment

4.4.1 The report includes three technical appendices which deal specifically with construction noise. These consist of construction calculations for human receptors, construction calculations for ecological receptors and piling calculations for ecological receptors. The report also contains a supporting Appendix: Appendix 6 - Arna Wood Solar Farm Piling Noise Investigation.

4.4.2 The calculations have been checked and verified and are reproduced in Appendices A-C. The reproduced calculations confirm the calculations from the technical appendices of the report are correct. However, areas of uncertainty have been identified in the calculations and clarification should be sought to address these.

4.4.3 The calculations are in places inconsistent. The calculation sheets for identical works and plant items for "Hardstanding and Tracks" show different percentage on times for the tracked excavator, dump truck tipping, vibratory roller and diesel bowser between the ecological receptor and human receptor calculation sheets, but no explanation is offered. As these differences range from 50% to 100% for the excavator, dump truck and vibratory roller and also from 5% to 100% for the diesel bowser there is the potential for a 3-13dB degree of uncertainty. The same differences are also present between the human and ecological receptors for the manoeuvring piling plant, PV panel installation and electrical compound installation and clarification should be sought in respect of this.

4.4.4 The calculations rely on BS 5228-1:2009+A1:2014. It is noted this standard is limited beyond 300m and does not take meteorological effects into account. On this basis it may be appropriate to consider setting controls in respect of noise from the site either through the Section 61 Consent process or by condition.

4.4.5 The calculations have calculated back to the assessment locations, but it is unclear if the receptor point is the building itself or the perimeter of the premises. This introduces a potential 3dB degree of uncertainty applicable to the presence/absence of any façade corrections, but no details are provided and clarification should be

sought in respect of this.

4.4.6 The calculations have been examined and it is noted these return an arbitrary whole-number percentage value for the soft ground adjustment, typically 6% or 20%. No overt explanation is provided for the values used, but this is not considered to be incorrect.

4.4.7 The report contains a supporting appendix (Appendix 6) where the sound power level for the same piling rig (Pauselli 500) is given as 121dB(A) when actively piling and 99dB(A) when the engine is on, but the unit is not piling. This is over 10dB higher than the values presented in the calculations for human receptors and is potentially inconsistent with the supporting appendix. It is considered the piling calculations should not be relied upon until clarification has been provided.

4.4.8 The calculations refer to 4No Pauselli 500 driven piling rigs. There is no explanation as to why driven piling is proposed for the site in preference to other piling methods for example CFA[4] drilled piling. With specific reference to the Arna Wood Solar Farm piling was identified as an activity with the potential to cause disturbance and drilled piling was presented as a possible means of reducing noise impact. See Page 3 of the Arna Wood Solar Farm, Wintering Bird Mitigation: Construction Method Statement reproduced as Appendix E.

4.4.9 It has been communicated that the duration of the construction phase for this nationally significant infrastructure project is circa 30 months. It is noted that proposed working hours are 07:00-19:00 Mondays to Fridays and from 07:00 to 13:00 on Saturdays. It is further noted these hours do not include the additionally proposed hour either side for start-up and shut down. This is unusual for a project of this nature as construction work tends to be limited to 08:00-18:00 Mondays to Fridays and 08:00 to 13:00 on Saturdays. Comparative examples of solar farms where typical working hours have been advocated include Arna Wood Solar Farm (see page 5 Construction method statement reproduced as Appendix F) and also the solar farm at Maldon Road in Birch, Colchester, (see Condition 6 on page 2 of the planning decision notice reproduced as Appendix G). Decision makers should be made aware that additional hours for start-up and shut down risk being open to abuse and were works activities to start before 07:00 this would constitute night time works. It is recommended to minimise the impact of sound during the construction phase that works be limited to 08:00-18:00 Mondays to Fridays and from 08:00-13:00 on Saturdays with no working on Sundays or Public holidays. This could be controlled either via a Section 60 notice, a Section 61 Consent or by condition.

4.4.10 The calculations make no reference to the use of drilling metal or the use of compressed air tools. When assembling solar arrays a significant proportion of sound is attributable to the use of compressed air tools and drilling activity (occasionally accompanied by hammering) when fixing and assembling the frames to which the panels are then fixed. Measurement data and site notes made by Able Acoustics Ltd during the construction phase of the Solar Farm at Maldon Road, Birch, Colchester in November 2015 confirm this. It is recommended this element be added to the calculations.

[4] Continuous Flight Auger.

4.4.11 The report does not provide any indication of potential cumulative noise levels although it is recognised that at the time of writing a detailed works programme may not have been drawn up. Activity on construction sites is rarely limited to one works activity and multiple activities are expect to take place simultaneously For example concreting works to form a compound or haul road construction works could take place at one location while piling works took place at another. It is recommended cumulative noise levels of the pre-construction ambient level, plus all site construction activity that would take place simultaneously, be provided to enable a more measured estimate of the likely level of construction noise impact.

4.5 Traffic Noise Assessment

4.5.1 The report contains an appendix containing road traffic calculations. The calculation process has been verified and the values for Seasalter Road have been confirmed, while a difference of 0.1dB is generated for Head Hill Road (North) and Head Hill Road (South). This is considered attributable to rounding. The calculations confirm a 1.6dB increase which is a “minor” magnitude of impact.

4.6 Vibration Assessment

4.6.1 Vibration has been reported to have been assessed, but full auditable calculations are not provided. In the absence of detailed information on intervening ground/soil types, distances, number of vibrating drums etc. it is not possible to verify any calculations or confirm any statements made in respect of vibration.

4.6.2 It is noted in reviewing the information the local authority’s Environmental Health Officer has not raised any vibration concerns and given the separation distances to the closest vibration sensitive premises it is considered vibration may not give rise to any significant impacts, but that the degree of any impact cannot be verified at the current time.

5. CONCLUSIONS

5.1 Summary of Conclusions

5.1.1 This review has considered the calculations, survey methodology and assessment methodology.

5.1.2 This review confirms the calculations finding no errors in the calculation process, but has identified some limitations to the reliability of the calculations attributable to the propagation distances involved as well as areas of uncertainty where further clarification is required.

5.1.3 This review has identified inconsistencies between supporting information and data (including absence of potential sound sources which may typically be present) used to form the basis of the calculations and also between calculations for identical activities, but for different receptors. Further clarification should be sought in respect of this.

5.1.4 This review has noted the absence of relevant data that can be used to provide a greater degree of context, including details of residual sound levels, measurement data in tabular format and details of equipment and competence. Further clarification may be required in respect of this.

5.1.5 This review has identified potential errors in respect of the source levels for the Pauselli piling rig and until adequate clarification is provided it is considered the calculations in respect of piling should treated with caution.

5.1.6 This review considers the working hours of 07:00-19:00 Mondays to Fridays and 07:00 – 13:00 on Saturdays to be in excess of typical construction hours, but notes this could be addressed through either a Section 61 agreement or by condition.

5.1.7 This review observes vibration has been reported to have been assessed, but fully auditable calculations are not provided. In the absence of this it is not possible to verify any calculations or confirm statements made by the consultant in respect of vibration.

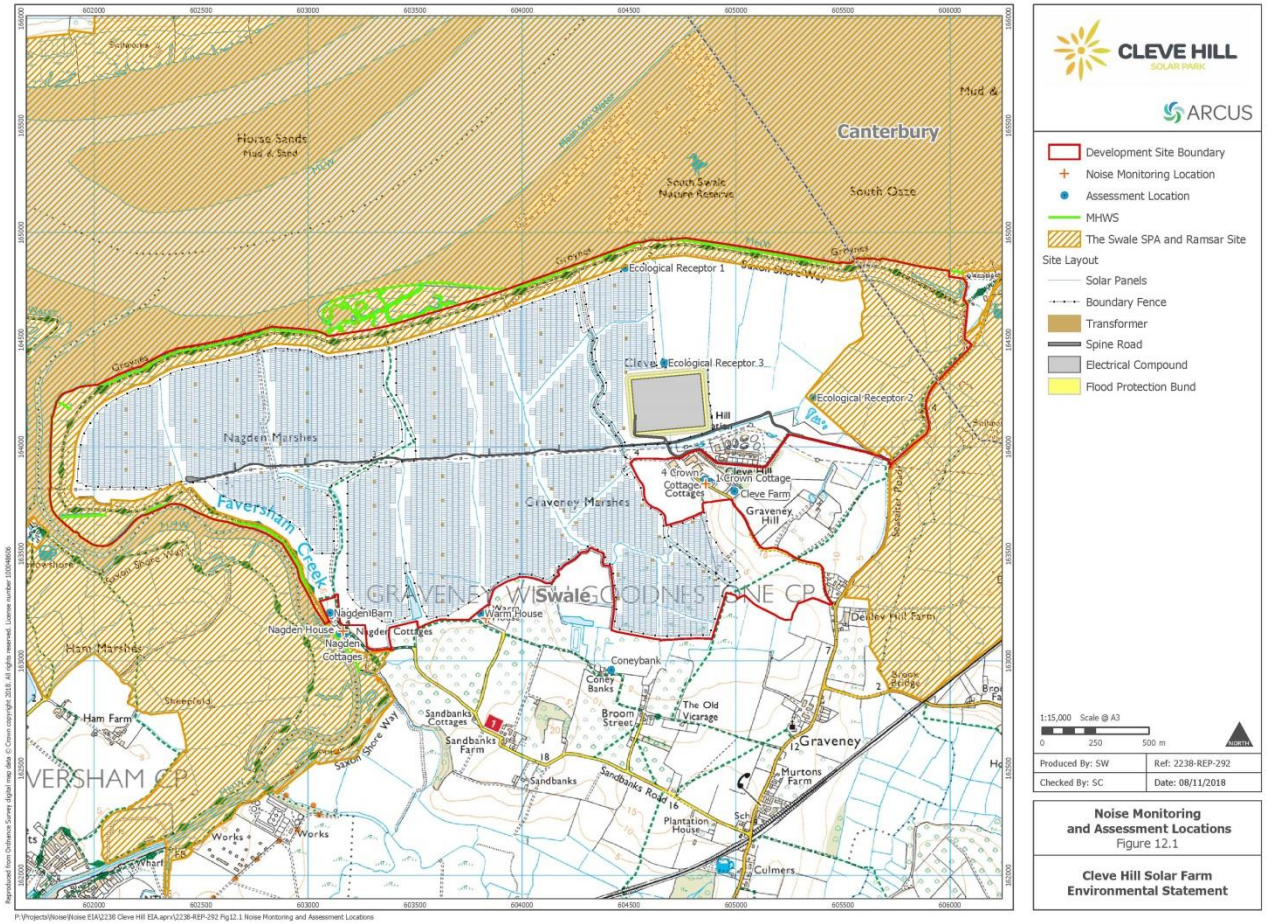
5.1.8 Based on the potential inconsistencies highlighted, this review considers the use of driven piling may give rise to significant impacts and notes that no reason has been offered as to why other methods of piling that would reduce the level of noise cannot be used.

5.1.9 It is concluded that unless there are significant changes to the design and/or working methods additional assessment is not required, but that further clarification should still be sought to address any potential inconsistencies and areas of uncertainty (i.e. data used to form the basis of any calculations and subsequent conclusions). It is further concluded that a decision in respect of noise and vibration, regardless of what that decision may be, should not be made until such time as these elements have been addressed.

6. REFERENCES

1. Planning Application Form, 18/506556/NSIP, Dated 15/11/2018.
2. 18/506556/NSIP, ES, Vol 1 Chapter 12, Noise & Vibration
3. 18/506556/NSIP, ES, Vol 2 Figures, Noise & Vibration
4. 18/506556/NSIP, Technical Appendix A12.1, Survey Record Sheets
5. 18/506556/NSIP, Technical Appendix A12.3, Piling Rig Noise Data
6. 18/506556/NSIP, Technical Appendix A12.4, Piling Calculation Sheets - Ecological Receptors
7. 18/506556/NSIP, Technical Appendix A12.5, Other Construction Activities Calculation Sheets - Ecological Receptors
8. 18/506556/NSIP, Technical Appendix A12.6, Changes in Road Traffic Noise Calculation
9. 18/506556/NSIP, Technical Appendix A12.7, Inverter Noise Emission Data
10. 18/506556/NSIP, Technical Appendix A12.8, Substation Noise Emission Data
11. 18/506556/NSIP, Technical Appendix A12.9, Energy Storage Noise Data
12. 18/506556/NSIP, Technical Appendix A12.10, Outline SPA Construction Noise Management Plan
13. 18/506556/NSIP, Arna Wood Solar Farm Piling Noise Investigation
14. British Standards Institution. British Standard 7445: Description and Measurement of Environmental Noise, Part 1. Guide to Quantities and Procedures, 2003.
15. British Standards Institution. British Standard 5228-1: The Code of Practice for Noise and Vibration Control on Construction & Open Sites, Part 1 Noise, 2009 + A1 2014.
16. Control of Pollution Act, 1974.
17. British Standards Institution. British Standard 5228-1: The Code of Practice for Noise and Vibration Control on Construction & Open Sites, Part 2 Vibration, 2009 + A1 2014.
18. British Standards Institution. British Standard 4142:2014+A1:2019: Methods for rating and assessing industrial and commercial sound.
19. Institute of Environmental Management and Assessment, Guidelines for Environmental Noise Impact Assessment, October 2014.

FIGURES



Not To Scale – Reproduced from Original Image

Project	No.	Drawing	No.	File	Date
Graveney Solar Array, ES Review	P1375	Site Location	Figure 01	P1374/Figures.ppt	06/11/2019

APPENDIX A

Comparative Calculations - Construction Calculations Human Receptors

Activity: Hardstanding and Tracks

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

Receptor Name: Nagden Barn
Receptor Height: 4

Activity Level	37.9	*6219.770217*
Haulage Level	52.0	*158386.7238*
Total	52	*164606.494*

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C2, item 21	tracked excavator	2	71	10	620	2.5	4	100	102.0	*15886564694.5*	50	0	0
Table C2, item 30	dump truck tipping	1	79	10	620	2.5	4	100	107.0	*50118723362.7*	50	0	0
Table C5, item 20	vibratory roller	1	75	10	620	2.5	4	100	103.0	*19952623149.7*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	620	2.5	4	100	117.0	*501187233627.3*	5	0	0
								Total	117.7	*587145144834.2*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
70.8	70.8	63.8	Ks (Hs or Hr > 2.5m)	3.25	-0.42	6%	Soft Ground/ No Barrier	70.4	-3.0	28.6	726.140695
70.8	70.8	63.8	Ks (Hs or Hr > 2.5m)	3.25	-0.42	6%	Soft Ground/ No Barrier	70.4	-3.0	33.6	2290.81902
70.8	70.8	63.8	Ks (Hs or Hr > 2.5m)	3.25	-0.42	6%	Soft Ground/ No Barrier	70.4	-3.0	29.6	911.991479
70.8	70.8	63.8	Ks (Hs or Hr > 2.5m)	3.25	-0.42	6%	Soft Ground/ No Barrier	70.4	-13.0	33.6	2290.81902
										38	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	620	37	15	C2.34	Haulage 40t Lorry	109	52	0	0	180	0	52.0	158386.724
											Total	52.0	

Activity: Manouvering Piling Plant

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

Receptor Name: Nagden Barn
Receptor Height: 4

Activity Level	54.9	*308543.5526*
Haulage Level	52.0	*158386.7238*
Total	57	*466930.2764*

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	120	2.5	4	100	110.0	*100237446725.5*	50	0	0
Pauselli 500	piler	4	88	1	120	2.5	4	100	102.0	*15924286822.1*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	620	2.5	4	100	117.0	*501187233627.3*	5	0	0
								Total	117.9	*617348967174.9*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
53.0	53.0	49.6	Ks (Hs or Hr > 2.5m)	3.25	-0.20	6%	Soft Ground/ No Barrier	52.8	-3.0	54.2	264269.404
53.0	53.0	49.6	Ks (Hs or Hr > 2.5m)	3.25	-0.20	6%	Soft Ground/ No Barrier	52.8	-3.0	46.2	41983.3298
70.8	70.8	63.8	Ks (Hs or Hr > 2.5m)	3.25	-0.42	6%	Soft Ground/ No Barrier	70.4	-13.0	33.6	2290.81902
										55	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	620	37	15	C2.34	Haulage 40t Lorry	109	52	0	0	180	0	52.0	158386.724
											Total	52.0	

Activity: Active Piling

Receptor Name	Nagden Barn
Receptor Height	4

Activity Level	68.9	*7698067.04*
Haulage Level	52.0	*158386.7238*
Total	69	*7856453.764*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	120	2.5	4	100	110.0	*100237446725.5*	50	0	0
Pauselli 500	piler	4	110	1	120	6	4	100	124.0	*2523829377920.8*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	620	2.5	4	100	117.0	*501187233627.3*	5	0	0
								Total	124.9	*3125254058273.5*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
53.0	53.0	49.6	Ks (Hs or Hr > 2.5m)	3.25	-0.20	6%	Soft Ground/ No Barrier	52.8	-3.0	54.2	264269.404
53.0	53.0	49.6	Ks (Hs or Hr > 2.5m)	5	-0.68	20%	Soft Ground/ No Barrier	52.3	-3.0	68.7	7431506.82
70.8	70.8	63.8	Ks (Hs or Hr > 2.5m)	3.25	-0.42	6%	Soft Ground/ No Barrier	70.4	-13.0	33.6	2290.81902
										69	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	620	37	15	C2.34	Haulage 40t Lorry	109	52	0	0	180	0	52.0	158386.724
											Total	52.0	

Activity: PV Panel Installation

Receptor Name	Nagden Barn
Receptor Height	4

Activity Level	54.3	*266560.2228*
Haulage Level	52.0	*158386.7238*
Total	56	*424946.9466*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	120	2.5	4	100	110.0	*100237446725.5*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	620	2.5	4	100	117.0	*501187233627.3*	5	0	0
Compressed air tools?								Total	117.8	*601424680352.7*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
53.0	53.0	49.6	Ks (Hs or Hr > 2.5m)	3.25	-0.20	6%	Soft Ground/ No Barrier	52.8	-3.0	54.2	264269.404
70.8	70.8	63.8	Ks (Hs or Hr > 2.5m)	3.25	-0.42	6%	Soft Ground/ No Barrier	70.4	-13.0	33.6	2290.81902
										54	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	620	37	15	C2.34	Haulage 40t Lorry	109	52	0	0	180	0	52.0	158386.724
											Total	52.0	

Activity: Electrical Compound Installation

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

Receptor Name: Nagden Barn
Receptor Height: 4

Activity Level	28.2	*658.6504979*
Haulage Level	52.0	*158386.7238*
Total	52	*159045.3743*

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	1635	2.5	4	100	110.0	*100237446725.5*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	1635	2.5	4	100	117.0	*501187233627.3*	5	0	0
Table C4, item 50	Tracked Mobile Crane	1	71	10	1635	2.5	4	100	99.0	*7943282347.2*	50	0	0
								Total	117.8	*609367962700.0*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
81.3	81.3	72.3	Ks (Hs or Hr > 2.5m)	3.25	-0.54	6%	Soft Ground/ No Barrier	80.8	-3.0	26.2	417.066788
81.3	81.3	72.3	Ks (Hs or Hr > 2.5m)	3.25	-0.54	6%	Soft Ground/ No Barrier	80.8	-13.0	23.2	208.533394
81.3	81.3	72.3	Ks (Hs or Hr > 2.5m)	3.25	-0.54	6%	Soft Ground/ No Barrier	80.8	-3.0	15.2	33.0503157
										28	

Haul Road **Segment 1**

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	620	37	15	C2.34	Haulage 40t Lorry	109	52	0	0	180	0	52.0	158386.724
											Total	52.0	

Activity: Hardstanding and Tracks

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

Receptor Name: Nagden Barn
Receptor Height: 4

Activity Level	36.1	*4083.524978*
Haulage Level	51.3	*133605.1275*
Total	51	*137688.6525*

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C2, item 21	tracked excavator	2	71	10	735	2.5	4	100	102.0	*1588656469.4.5*	50	0	0
Table C2, item 30	dump truck tipping	1	79	10	735	2.5	4	100	107.0	*50118723362.7*	50	0	0
Table C5, item 20	vibratory roller	1	75	10	735	2.5	4	100	103.0	*19952623149.7*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	735	2.5	4	100	117.0	*501187233627.3*	5	0	0
								Total	117.7	*587145144834.2*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
72.7	72.7	65.3	Ks (Hs or Hr > 2.5m)	3.25	-0.44	6%	Soft Ground/ No Barrier	72.2	-3.0	26.8	476.740066
72.7	72.7	65.3	Ks (Hs or Hr > 2.5m)	3.25	-0.44	6%	Soft Ground/ No Barrier	72.2	-3.0	31.8	1504.01323
72.7	72.7	65.3	Ks (Hs or Hr > 2.5m)	3.25	-0.44	6%	Soft Ground/ No Barrier	72.2	-3.0	27.8	598.758452
72.7	72.7	65.3	Ks (Hs or Hr > 2.5m)	3.25	-0.44	6%	Soft Ground/ No Barrier	72.2	-13.0	31.8	1504.01323
										36	

Haul Road **Segment 1**

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	735	37	15	C2.34	Haulage 40t Lorry	109	51	0	0	180	0	51.3	133605.128
											Total	51.3	

Activity: Manouvering Piling Plant

Receptor Name	Nagden Barn
Receptor Height	4

Activity Level	51.8	*152072.1695*
Haulage Level	51.3	*133605.1275*
Total	55	*285677.297*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	160	2.5	4	100	110.0	*100237446725.5*	50	0	0
Pauselli 500	piler	4	88	1	160	2.5	4	100	102.0	*15924286822.1*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	735	2.5	4	100	117.0	*501187233627.3*	5	0	0
								Total	117.9	*617348967174.9*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
56.1	56.1	52.1	Ks (Hs or Hr > 2.5m)	3.25	-0.24	6%	Soft Ground/ No Barrier	55.9	-3.0	51.1	129927.189
56.1	56.1	52.1	Ks (Hs or Hr > 2.5m)	3.25	-0.24	6%	Soft Ground/ No Barrier	55.9	-3.0	43.1	20640.967
72.7	72.7	65.3	Ks (Hs or Hr > 2.5m)	3.25	-0.44	6%	Soft Ground/ No Barrier	72.2	-13.0	31.8	1504.01323
										52	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	735	37	15	C2.34	Haulage 40t Lorry	109	51	0	0	180	0	51.3	133605.128
											Total	51.3	

Activity: Active Piling

Receptor Name	Nagden Barn
Receptor Height	4

Activity Level	65.9	*3853034.167*
Haulage Level	51.3	*133605.1275*
Total	66	*3986639.295*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	160	2.5	4	100	110.0	*100237446725.5*	50	0	0
Pauselli 500	piler	4	110	1	160	6	4	100	124.0	*2523829377920.8*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	735	2.5	4	100	117.0	*501187233627.3*	5	0	0
								Total	124.9	*3125254058273.5*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
56.1	56.1	52.1	Ks (Hs or Hr > 2.5m)	3.25	-0.24	6%	Soft Ground/ No Barrier	55.9	-3.0	51.1	129927.189
56.1	56.1	52.1	Ks (Hs or Hr > 2.5m)	5	-0.80	20%	Soft Ground/ No Barrier	55.3	-3.0	65.7	3721602.96
72.7	72.7	65.3	Ks (Hs or Hr > 2.5m)	3.25	-0.44	6%	Soft Ground/ No Barrier	72.2	-13.0	31.8	1504.01323
										66	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	735	37	15	C2.34	Haulage 40t Lorry	109	51	0	0	180	0	51.3	133605.128
											Total	51.3	

Activity: PV Panel Installation

Receptor Name: Nagden House
Receptor Height: 4

Activity Level	51.2	*131431.2025*
Haulage Level	51.3	*133605.1275*
Total	54	*265036.33*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	160	2.5	4	100	110.0	*100237446725.5*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	735	2.5	4	100	117.0	*501187233627.3*	5	0	0
	Compressed air tools?							Total	117.8	*601424680352.7*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
56.1	56.1	52.1	Ks (Hs or Hr > 2.5m)	3.25	-0.24	6%	Soft Ground/ No Barrier	55.9	-3.0	51.1	129927.189
72.7	72.7	65.3	Ks (Hs or Hr > 2.5m)	3.25	-0.44	6%	Soft Ground/ No Barrier	72.2	-13.0	31.8	1504.01323
										51	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	735	37	15	C2.34	Haulage 40t Lorry	109	51	0	0	180	0	51.3	133605.128
											Total	51.3	

Activity: Electrical Compound Excavation

Receptor Name: Nagden House
Receptor Height: 4

Activity Level	27.9	*621.4588664*
Haulage Level	51.3	*133605.1275*
Total	51	*134226.5864*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	1675	2.5	4	100	110.0	*100237446725.5*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	1675	2.5	4	100	117.0	*501187233627.3*	5	0	0
Table C4, item 50	Tracked Mobile Crane	1	71	10	1675	2.5	4	100	99.0	*7943282347.2*	50	0	0
								Total	117.8	*609367962700.0*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
81.6	81.6	72.5	Ks (Hs or Hr > 2.5m)	3.25	-0.55	6%	Soft Ground/ No Barrier	81.1	-3.0	25.9	393.516522
81.6	81.6	72.5	Ks (Hs or Hr > 2.5m)	3.25	-0.55	6%	Soft Ground/ No Barrier	81.1	-13.0	22.9	196.758261
81.6	81.6	72.5	Ks (Hs or Hr > 2.5m)	3.25	-0.55	6%	Soft Ground/ No Barrier	81.1	-3.0	14.9	31.1840829
										28	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	735	37	15	C2.34	Haulage 40t Lorry	109	51	0	0	180	0	51.3	133605.128
											Total	51.3	

Activity: Hardstanding and Tracks

Receptor Name	Nagden Cottages
Receptor Height	4

Activity Level	35.2	*3311.52926*
Haulage Level	50.9	*122749.7109*
Total	51	*126061.2402*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C2, item 21	tracked excavator	2	71	10	800	2.5	4	100	102.0	*15886564694.5*	50	0	0
Table C2, item 30	dump truck tipping	1	79	10	800	2.5	4	100	107.0	*50118723362.7*	50	0	0
Table C5, item 20	vibratory roller	1	75	10	800	2.5	4	100	103.0	*19952623149.7*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	800	2.5	4	100	117.0	*501187233627.3*	5	0	0
								Total	117.7	*587145144834.2*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
73.6	73.6	66.1	Ks (Hs or Hr > 2.5m)	3.25	-0.45	6%	Soft Ground/ No Barrier	73.1	-3.0	25.9	386.611735
73.6	73.6	66.1	Ks (Hs or Hr > 2.5m)	3.25	-0.45	6%	Soft Ground/ No Barrier	73.1	-3.0	30.9	1219.67757
73.6	73.6	66.1	Ks (Hs or Hr > 2.5m)	3.25	-0.45	6%	Soft Ground/ No Barrier	73.1	-3.0	26.9	485.562386
73.6	73.6	66.1	Ks (Hs or Hr > 2.5m)	3.25	-0.45	6%	Soft Ground/ No Barrier	73.1	-13.0	30.9	1219.67757
										35	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	800	37	15	C2.34	Haulage 40t Lorry	109	51	0	0	180	0	50.9	122749.711
											Total	50.9	

Activity: Manouvering Piling Plant

Receptor Name	Nagden Cottages
Receptor Height	4

Activity Level	52.9	*193357.5969*
Haulage Level	50.9	*122749.7109*
Total	55	*316107.3078*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	145	2.5	4	100	110.0	*100237446725.5*	50	0	0
Pauselli 500	piler	4	88	1	145	2.5	4	100	102.0	*15924286822.1*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	800	2.5	4	100	117.0	*501187233627.3*	5	0	0
								Total	117.9	*617348967174.9*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
55.0	55.0	51.2	Ks (Hs or Hr > 2.5m)	3.25	-0.23	6%	Soft Ground/ No Barrier	54.8	-3.0	52.2	165798.27
55.0	55.0	51.2	Ks (Hs or Hr > 2.5m)	3.25	-0.23	6%	Soft Ground/ No Barrier	54.8	-3.0	44.2	26339.6494
73.6	73.6	66.1	Ks (Hs or Hr > 2.5m)	3.25	-0.45	6%	Soft Ground/ No Barrier	73.1	-13.0	30.9	1219.67757
										53	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	800	37	15	C2.34	Haulage 40t Lorry	109	51	0	0	180	0	50.9	122749.711
											Total	50.9	

Activity: Active Piling

Receptor Name: Nagden Cottages
Receptor Height: 4

Activity Level	66.9	4883410.99
Haulage Level	50.9	122749.7109
Total	67	5006160.701

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	145	2.5	4	100	110.0	*100237446725.5*	50	0	0
Pauselli 500	piler	4	110	1	145	6	4	100	124.0	*2523829377920.8*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	800	2.5	4	100	117.0	*501187233627.3*	5	0	0
								Total	124.9	*3125254058273.5*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
55.0	55.0	51.2	Ks (Hs or Hr > 2.5m)	3.25	-0.23	6%	Soft Ground/ No Barrier	54.8	-3.0	52.2	165798.27
55.0	55.0	51.2	Ks (Hs or Hr > 2.5m)	5	-0.76	20%	Soft Ground/ No Barrier	54.3	-3.0	66.7	4716393.04
73.6	73.6	66.1	Ks (Hs or Hr > 2.5m)	3.25	-0.45	6%	Soft Ground/ No Barrier	73.1	-13.0	30.9	1219.67757
										67	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	800	37	15	C2.34	Haulage 40t Lorry	109	51	0	0	180	0	50.9	122749.711
											Total	50.9	

Activity: PV Panel Installation

Receptor Name: Nagden Cottages
Receptor Height: 4

Activity Level	52.2	167017.9475
Haulage Level	50.9	122749.7109
Total	55	289767.6584

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	145	2.5	4	100	110.0	*100237446725.5*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	800	2.5	4	100	117.0	*501187233627.3*	5	0	0
Compressed air tools?								Total	117.8	*601424680352.7*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
55.0	55.0	51.2	Ks (Hs or Hr > 2.5m)	3.25	-0.23	6%	Soft Ground/ No Barrier	54.8	-3.0	52.2	165798.27
73.6	73.6	66.1	Ks (Hs or Hr > 2.5m)	3.25	-0.45	6%	Soft Ground/ No Barrier	73.1	-13.0	30.9	1219.67757
										52	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	800	37	15	C2.34	Haulage 40t Lorry	109	51	0	0	180	0	50.9	122749.711
											Total	50.9	

Activity: Electrical Compound Installation

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

Receptor Name: Nagden Cottages
Receptor Height: 4

Activity Level	28.4	*684.51777*
Haulage Level	50.9	*122749.7109*
Total	51	*123434.2287*

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	1610	2.5	4	100	110.0	*100237446725.5*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	1610	2.5	4	100	117.0	*501187233627.3*	5	0	0
Table C4, item 50	Tracked Mobile Crane	1	71	10	1610	2.5	4	100	99.0	*7943282347.2*	50	0	0
								Total	117.8	*609367962700.0*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
81.2	81.2	72.1	Ks (Hs or Hr > 2.5m)	3.25	-0.54	6%	Soft Ground/ No Barrier	80.6	-3.0	26.4	433.44631
81.2	81.2	72.1	Ks (Hs or Hr > 2.5m)	3.25	-0.54	6%	Soft Ground/ No Barrier	80.6	-13.0	23.4	216.723155
81.2	81.2	72.1	Ks (Hs or Hr > 2.5m)	3.25	-0.54	6%	Soft Ground/ No Barrier	80.6	-3.0	15.4	34.3483053
										28	

Haul Road **Segment 1**

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	800	37	15	C2.34	Haulage 40t Lorry	109	51	0	0	180	0	50.9	122749.711
											Total	50.9	

Activity: Hardstanding and Tracks

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

Receptor Name: Nagden Cottages
Receptor Height: 4

Activity Level	36.6	*4602.655438*
Haulage Level	51.5	*140285.3839*
Total	52	*144888.0393*

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C2, item 21	tracked excavator	2	71	10	700	2.5	4	100	102.0	*1588656694.5*	50	0	0
Table C2, item 30	dump truck tipping	1	79	10	700	2.5	4	100	107.0	*50118723362.7*	50	0	0
Table C5, item 20	vibratory roller	1	75	10	700	2.5	4	100	103.0	*19952623149.7*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	700	2.5	4	100	117.0	*501187233627.3*	5	0	0
								Total	117.7	*587145144834.2*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
72.1	72.1	64.9	Ks (Hs or Hr > 2.5m)	3.25	-0.43	6%	Soft Ground/ No Barrier	71.7	-3.0	27.3	537.347088
72.1	72.1	64.9	Ks (Hs or Hr > 2.5m)	3.25	-0.43	6%	Soft Ground/ No Barrier	71.7	-3.0	32.3	1695.21546
72.1	72.1	64.9	Ks (Hs or Hr > 2.5m)	3.25	-0.43	6%	Soft Ground/ No Barrier	71.7	-3.0	28.3	674.87743
72.1	72.1	64.9	Ks (Hs or Hr > 2.5m)	3.25	-0.43	6%	Soft Ground/ No Barrier	71.7	-13.0	32.3	1695.21546
										37	

Haul Road **Segment 1**

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	700	37	15	C2.34	Haulage 40t Lorry	109	51	0	0	180	0	51.5	140285.384
											Total	51.5	

Activity: Manouvering Piling Plant

Receptor Name	Warm House
Receptor Height	4

Activity Level	59.2	*835968.0867*
Haulage Level	51.5	*140285.3839*
Total	60	*976253.4706*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	80	2.5	4	100	110.0	*100237446725.5*	50	0	0
Pauselli 500	piler	4	88	1	80	2.5	4	100	102.0	*15924286822.1*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	700	2.5	4	100	117.0	*501187233627.3*	5	0	0
								Total	117.9	*617348967174.9*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
48.6	48.6	46.1	Ks (Hs or Hr > 2.5m)	3.25	-0.15	6%	Soft Ground/ No Barrier	48.4	-3.0	58.6	719904.739
48.6	48.6	46.1	Ks (Hs or Hr > 2.5m)	3.25	-0.15	6%	Soft Ground/ No Barrier	48.4	-3.0	50.6	114368.132
72.1	72.1	64.9	Ks (Hs or Hr > 2.5m)	3.25	-0.43	6%	Soft Ground/ No Barrier	71.7	-13.0	32.3	1695.21546
										59	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	700	37	15	C2.34	Haulage 40t Lorry	109	51	0	0	180	0	51.5	140285.384
											Total	51.5	

Activity: Active Piling

Receptor Name	Warm House
Receptor Height	4

Activity Level	72.8	*18847727.36*
Haulage Level	51.5	*140285.3839*
Total	73	*18988012.74*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	80	2.5	4	100	110.0	*100237446725.5*	50	0	0
Pauselli 500	piler	4	110	1	80	6	4	100	124.0	*2523829377920.8*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	700	2.5	4	100	117.0	*501187233627.3*	5	0	0
								Total	124.9	*3125254058273.5*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
48.6	48.6	46.1	Ks (Hs or Hr > 2.5m)	3.25	-0.15	6%	Soft Ground/ No Barrier	48.4	-3.0	58.6	719904.739
48.6	48.6	46.1	Ks (Hs or Hr > 2.5m)	5	-0.15	6%	Soft Ground/ No Barrier	48.4	-3.0	72.6	18126127.4
72.1	72.1	64.9	Ks (Hs or Hr > 2.5m)	3.25	-0.43	6%	Soft Ground/ No Barrier	71.7	-13.0	32.3	1695.21546
										73	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	700	37	15	C2.34	Haulage 40t Lorry	109	51	0	0	180	0	51.5	140285.384
											Total	51.5	

Activity: PV Panel Installation

Receptor Name: Warm House
Receptor Height: 4

Activity Level	58.6	*721599.9546*
Haulage Level	51.5	*140285.3839*
Total	59	*861885.3385*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	80	2.5	4	100	110.0	*100237446725.5*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	700	2.5	4	100	117.0	*501187233627.3*	5	0	0
	Compressed air tools?							Total	117.8	*601424680352.7*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
48.6	48.6	46.1	Ks (Hs or Hr > 2.5m)	3.25	-0.15	6%	Soft Ground/ No Barrier	48.4	-3.0	58.6	719904.739
72.1	72.1	64.9	Ks (Hs or Hr > 2.5m)	3.25	-0.43	6%	Soft Ground/ No Barrier	71.7	-13.0	32.3	1695.21546
										59	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	700	37	15	C2.34	Haulage 40t Lorry	109	51	0	0	180	0	51.5	140285.384
											Total	51.5	

Activity: Electrical Compound Excavation

Receptor Name: Warm House
Receptor Height: 4

Activity Level	32.7	*1879.273426*
Haulage Level	51.5	*140285.3839*
Total	52	*142164.6573*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	1070	2.5	4	100	110.0	*100237446725.5*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	1070	2.5	4	100	117.0	*501187233627.3*	5	0	0
Table C4, item 50	Tracked Mobile Crane	1	71	10	1070	2.5	4	100	99.0	*7943282347.2*	50	0	0
								Total	117.8	*60936796270.0*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
76.7	76.7	68.6	Ks (Hs or Hr > 2.5m)	3.25	-0.49	6%	Soft Ground/ No Barrier	76.2	-3.0	30.8	1189.98245
76.7	76.7	68.6	Ks (Hs or Hr > 2.5m)	3.25	-0.49	6%	Soft Ground/ No Barrier	76.2	-13.0	27.7	594.991224
76.7	76.7	68.6	Ks (Hs or Hr > 2.5m)	3.25	-0.49	6%	Soft Ground/ No Barrier	76.2	-3.0	19.7	94.2997541
										33	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	700	37	15	C2.34	Haulage 40t Lorry	109	51	0	0	180	0	51.5	140285.384
											Total	51.5	

Activity: Hardstanding and Tracks

Receptor Name	Coneybank
Receptor Height	4

Activity Level	33.4	*2164.933451*
Haulage Level	50.1	*103368.1776*
Total	50	*105533.1111*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C2, item 21	tracked excavator	2	71	10	950	2.5	4	100	102.0	*15886564694.5*	50	0	0
Table C2, item 30	dump truck tipping	1	79	10	950	2.5	4	100	107.0	*50118723362.7*	50	0	0
Table C5, item 20	vibratory roller	1	75	10	950	2.5	4	100	103.0	*19952623149.7*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	950	2.5	4	100	117.0	*501187233627.3*	5	0	0
								Total	117.7	*587145144834.2*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
75.4	75.4	67.6	Ks (Hs or Hr > 2.5m)	3.25	-0.47	6%	Soft Ground/ No Barrier	75.0	-3.0	24.0	252.749897
75.4	75.4	67.6	Ks (Hs or Hr > 2.5m)	3.25	-0.47	6%	Soft Ground/ No Barrier	75.0	-3.0	29.0	797.372018
75.4	75.4	67.6	Ks (Hs or Hr > 2.5m)	3.25	-0.47	6%	Soft Ground/ No Barrier	75.0	-3.0	25.0	317.439518
75.4	75.4	67.6	Ks (Hs or Hr > 2.5m)	3.25	-0.47	6%	Soft Ground/ No Barrier	75.0	-13.0	29.0	797.372018
										33	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	950	37	15	C2.34	Haulage 40t Lorry	109	50	0	0	180	0	50.1	103368.178
											Total	50.1	

Activity: Manouvering Piling Plant

Receptor Name	Coneybank
Receptor Height	4

Activity Level	50.8	*121422.55*
Haulage Level	50.1	*103368.1776*
Total	54	*224790.7276*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	175	2.5	4	100	110.0	*100237446725.5*	50	0	0
Pauselli 500	piler	4	88	1	175	2.5	4	100	102.0	*15924286822.1*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	950	2.5	4	100	117.0	*501187233627.3*	5	0	0
								Total	117.9	*617348967174.9*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
57.1	57.1	52.9	Ks (Hs or Hr > 2.5m)	3.25	-0.25	6%	Soft Ground/ No Barrier	56.8	-3.0	50.2	104089.01
57.1	57.1	52.9	Ks (Hs or Hr > 2.5m)	3.25	-0.25	6%	Soft Ground/ No Barrier	56.8	-3.0	42.2	16536.1679
75.4	75.4	67.6	Ks (Hs or Hr > 2.5m)	3.25	-0.47	6%	Soft Ground/ No Barrier	75.0	-13.0	29.0	797.372018
										51	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	950	37	15	C2.34	Haulage 40t Lorry	109	50	0	0	180	0	50.1	103368.178
											Total	50.1	

Activity: Active Piling

Receptor Name	Coneybank
Receptor Height	4

Activity Level	64.9	*3107053.569*
Haulage Level	50.1	*103368.1776*
Total	65	*3210421.747*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	175	2.5	4	100	110.0	*100237446725.5*	50	0	0
Pauselli 500	piler	4	110	1	175	6	4	100	124.0	*2523829377920.8*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	950	2.5	4	100	117.0	*501187233627.3*	5	0	0
								Total	124.9	*3125254058273.5*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
57.1	57.1	52.9	Ks (Hs or Hr > 2.5m)	3.25	-0.25	6%	Soft Ground/ No Barrier	56.8	-3.0	50.2	104089.01
57.1	57.1	52.9	Ks (Hs or Hr > 2.5m)	5	-0.84	20%	Soft Ground/ No Barrier	56.2	-3.0	64.8	3002167.19
75.4	75.4	67.6	Ks (Hs or Hr > 2.5m)	3.25	-0.47	6%	Soft Ground/ No Barrier	75.0	-13.0	29.0	797.372018
										65	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	950	37	15	C2.34	Haulage 40t Lorry	109	50	0	0	180	0	50.1	103368.178
											Total	50.1	

Activity: PV Panel Installation

Receptor Name	Coneybank
Receptor Height	4

Activity Level	50.2	*104886.3821*
Haulage Level	50.1	*103368.1776*
Total	53	*208254.5597*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	175	2.5	4	100	110.0	*100237446725.5*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	950	2.5	4	100	117.0	*501187233627.3*	5	0	0
	Compressed air tools?							Total	117.8	*601424680352.7*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
57.1	57.1	52.9	Ks (Hs or Hr > 2.5m)	3.25	-0.25	6%	Soft Ground/ No Barrier	56.8	-3.0	50.2	104089.01
75.4	75.4	67.6	Ks (Hs or Hr > 2.5m)	3.25	-0.47	6%	Soft Ground/ No Barrier	75.0	-13.0	29.0	797.372018
										50	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	950	37	15	C2.34	Haulage 40t Lorry	109	50	0	0	180	0	50.1	103368.178
											Total	50.1	

Activity: Electrical Compound Installation

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

Receptor Name: Coneybank
Receptor Height: 4

Activity Level	32.8	*1901.408353*
Haulage Level	50.1	*103368.1776*
Total	50	*105269.586*

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	1065	2.5	4	100	110.0	*100237446725.5*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	1065	2.5	4	100	117.0	*501187233627.3*	5	0	0
Table C4, item 50	Tracked Mobile Crane	1	71	10	1065	2.5	4	100	99.0	*7943282347.2*	50	0	0
								Total	117.8	*609367962700.0*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
76.7	76.7	68.5	Ks (Hs or Hr > 2.5m)	3.25	-0.49	6%	Soft Ground/ No Barrier	76.2	-3.0	30.8	1203.9986
76.7	76.7	68.5	Ks (Hs or Hr > 2.5m)	3.25	-0.49	6%	Soft Ground/ No Barrier	76.2	-13.0	27.8	601.999298
76.7	76.7	68.5	Ks (Hs or Hr > 2.5m)	3.25	-0.49	6%	Soft Ground/ No Barrier	76.2	-3.0	19.8	95.4104589
										33	

Haul Road **Segment 1**

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	950	37	15	C2.34	Haulage 40t Lorry	109	50	0	0	180	0	50.1	103368.178
											Total	50.1	

Activity: Hardstanding and Tracks

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

Receptor Name: 1 Crown Cottage
Receptor Height: 4

Activity Level	57.3	*535445.6887*
Haulage Level	60.6	*1155291.397*
Total	62	*1690737.086*

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C2, item 21	tracked excavator	2	71	10	85	2.5	4	100	102.0	*1588656694.5*	50	0	0
Table C2, item 30	dump truck tipping	1	79	10	85	2.5	4	100	107.0	*50118723362.7*	50	0	0
Table C5, item 20	vibratory roller	1	75	10	85	2.5	4	100	103.0	*19952623149.7*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	500	2.5	4	100	117.0	*501187233627.3*	5	0	0
								Total	117.7	*587145144834.2*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
49.2	49.2	46.6	Ks (Hs or Hr > 2.5m)	3.25	-0.16	6%	Soft Ground/ No Barrier	49.1	-3.0	49.9	98277.1799
49.2	49.2	46.6	Ks (Hs or Hr > 2.5m)	3.25	-0.16	6%	Soft Ground/ No Barrier	49.1	-3.0	54.9	310043.542
49.2	49.2	46.6	Ks (Hs or Hr > 2.5m)	3.25	-0.16	6%	Soft Ground/ No Barrier	49.1	-3.0	50.9	123430.557
68.5	68.5	62.0	Ks (Hs or Hr > 2.5m)	3.25	-0.16	2%	Soft Ground/ No Barrier	68.3	-13.0	35.7	3694.40917
										57	

Haul Road **Segment 1**

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	85	37	15	C2.34	Haulage 40t Lorry	109	61	0	0	180	0	60.6	1155291.4
											Total	60.6	

Activity: Manouvering Piling Plant

Receptor Name	1 Crown Cottage
Receptor Height	4

Activity Level	52.6	*180278.9187*
Haulage Level	60.6	*1155291.397*
Total	61	*1335570.316*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	150	2.5	4	100	110.0	*100237446725.5*	50	0	0
Pauselli 500	piler	4	88	1	150	2.5	4	100	102.0	*15924286822.1*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	500	2.5	4	100	117.0	*501187233627.3*	5	0	0
								Total	117.9	*617348967174.9*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
55.4	55.4	51.5	Ks (Hs or Hr > 2.5m)	3.25	-0.23	6%	Soft Ground/ No Barrier	55.2	-3.0	51.8	152325.233
55.4	55.4	51.5	Ks (Hs or Hr > 2.5m)	3.25	-0.23	6%	Soft Ground/ No Barrier	55.2	-3.0	43.8	24199.2468
68.5	68.5	62.0	Ks (Hs or Hr > 2.5m)	3.25	-0.23	4%	Soft Ground/ No Barrier	68.2	-13.0	35.7	3754.43849
										53	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	85	37	15	C2.34	Haulage 40t Lorry	109	61	0	0	180	0	60.6	1155291.4
											Total	60.6	

Activity: Active Piling

Receptor Name	1 Crown Cottage
Receptor Height	4

Activity Level	66.5	*4509352.686*
Haulage Level	60.6	*1155291.397*
Total	68	*5664644.083*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	150	2.5	4	100	110.0	*100237446725.5*	50	0	0
Pauselli 500	piler	4	110	1	150	6	4	100	124.0	*2523829377920.8*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	500	2.5	4	100	117.0	*501187233627.3*	5	0	0
								Total	124.9	*3125254058273.5*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
55.4	55.4	51.5	Ks (Hs or Hr > 2.5m)	3.25	-0.23	6%	Soft Ground/ No Barrier	55.2	-3.0	51.8	152325.233
55.4	55.4	51.5	Ks (Hs or Hr > 2.5m)	5	-0.78	20%	Soft Ground/ No Barrier	54.6	-3.0	66.4	4353132.12
68.5	68.5	62.0	Ks (Hs or Hr > 2.5m)	3.25	-0.39	6%	Soft Ground/ No Barrier	68.1	-13.0	35.9	3895.33662
										67	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	85	37	15	C2.34	Haulage 40t Lorry	109	61	0	0	180	0	60.6	1155291.4
											Total	60.6	

Activity: PV Panel Installation

Receptor Name: 1 Crown Cottage
Receptor Height: 4

Activity Level	51.9	*156220.5701*
Haulage Level	60.6	*1155291.397*
Total	61	*1311511.967*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	150	2.5	4	100	110.0	*100237446725.5*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	500	2.5	4	100	117.0	*501187233627.3*	5	0	0
	Compressed air tools?							Total	117.8	*601424680352.7*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
55.4	55.4	51.5	Ks (Hs or Hr > 2.5m)	3.25	-0.23	6%	Soft Ground/ No Barrier	55.2	-3.0	51.8	152325.233
68.5	68.5	62.0	Ks (Hs or Hr > 2.5m)	3.25	-0.39	6%	Soft Ground/ No Barrier	68.1	-13.0	35.9	3895.33662
										52	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	85	37	15	C2.34	Haulage 40t Lorry	109	61	0	0	180	0	60.6	1155291.4
											Total	60.6	

Activity: Electrical Compound Excavation

Receptor Name: 1 Crown Cottage
Receptor Height: 4

Activity Level	45.9	*39069.58532*
Haulage Level	60.6	*1155291.397*
Total	61	*1194360.982*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	280	2.5	4	100	110.0	*100237446725.5*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	500	2.5	4	100	117.0	*501187233627.3*	5	0	0
Table C4, item 50	Tracked Mobile Crane	1	71	10	280	2.5	4	100	99.0	*7943282347.2*	50	0	0
								Total	117.8	*60936796270.0*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
62.2	62.2	56.9	Ks (Hs or Hr > 2.5m)	3.25	-0.31	6%	Soft Ground/ No Barrier	61.9	-3.0	45.1	32591.543
68.5	68.5	62.0	Ks (Hs or Hr > 2.5m)	3.25	-0.39	6%	Soft Ground/ No Barrier	68.1	-13.0	35.9	3895.33662
62.2	62.2	56.9	Ks (Hs or Hr > 2.5m)	3.25	-0.31	6%	Soft Ground/ No Barrier	61.9	-3.0	34.1	2582.70573
										46	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	85	37	15	C2.34	Haulage 40t Lorry	109	61	0	0	180	0	60.6	1155291.4
											Total	60.6	

Activity: Hardstanding and Tracks

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

Receptor Name: 4 Crown Cottage
Receptor Height: 4

Activity Level	57.9	*621035.1132*
Haulage Level	60.9	*1227497.109*
Total	63	*1848532.222*

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C2, item 21	tracked excavator	2	71	10	80	2.5	4	100	102.0	*15886564694.5*	50	0	0
Table C2, item 30	dump truck tipping	1	79	10	80	2.5	4	100	107.0	*50118723362.7*	50	0	0
Table C5, item 20	vibratory roller	1	75	10	80	2.5	4	100	103.0	*19952623149.7*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	500	2.5	4	100	117.0	*501187233627.3*	5	0	0
								Total	117.7	*587145144834.2*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
48.6	48.6	46.1	Ks (Hs or Hr > 2.5m)	3.25	-0.15	6%	Soft Ground/ No Barrier	48.4	-3.0	50.6	114097.212
48.6	48.6	46.1	Ks (Hs or Hr > 2.5m)	3.25	-0.15	6%	Soft Ground/ No Barrier	48.4	-3.0	55.6	359952.37
48.6	48.6	46.1	Ks (Hs or Hr > 2.5m)	3.25	-0.15	6%	Soft Ground/ No Barrier	48.4	-3.0	51.6	143299.619
68.5	68.5	62.0	Ks (Hs or Hr > 2.5m)	3.25	-0.15	2%	Soft Ground/ No Barrier	68.3	-13.0	35.7	3685.91226
										58	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	80	37	15	C2.34	Haulage 40t Lorry	109	61	0	0	180	0	60.9	1227497.11
											Total	60.9	

Activity: Manouvering Piling Plant

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

Receptor Name: 4 Crown Cottage
Receptor Height: 4

Activity Level	51.3	*133586.6193*
Haulage Level	60.9	*1227497.109*
Total	61	*1361083.728*

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	170	2.5	4	100	110.0	*100237446725.5*	50	0	0
Pauselli 500	piler	4	88	1	170	2.5	4	100	102.0	*15924286822.1*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	500	2.5	4	100	117.0	*501187233627.3*	5	0	0
								Total	117.9	*617348967174.9*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
56.8	56.8	52.6	Ks (Hs or Hr > 2.5m)	3.25	-0.25	6%	Soft Ground/ No Barrier	56.5	-3.0	50.5	111912.268
56.8	56.8	52.6	Ks (Hs or Hr > 2.5m)	3.25	-0.25	6%	Soft Ground/ No Barrier	56.5	-3.0	42.5	17779.0148
68.5	68.5	62.0	Ks (Hs or Hr > 2.5m)	3.25	-0.39	6%	Soft Ground/ No Barrier	68.1	-13.0	35.9	3895.33662
										51	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	80	37	15	C2.34	Haulage 40t Lorry	109	61	0	0	180	0	60.9	1227497.11
											Total	60.9	

Activity: Active Piling

Receptor Name: 4 Crown Cottage
Receptor Height: 4

Activity Level	65.2	3336191.842
Haulage Level	60.9	1227497.109
Total	67	4563688.951

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	170	2.5	4	100	110.0	*100237446725.5*	50	0	0
Pauselli 500	piler	4	110	1	170	6	4	100	124.0	*2523829377920.8*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	500	2.5	4	100	117.0	*501187233627.3*	5	0	0
								Total	124.9	*3125254058273.5*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
56.8	56.8	52.6	Ks (Hs or Hr > 2.5m)	3.25	-0.25	6%	Soft Ground/ No Barrier	56.5	-3.0	50.5	111912.268
56.8	56.8	52.6	Ks (Hs or Hr > 2.5m)	5	-0.83	20%	Soft Ground/ No Barrier	55.9	-3.0	65.1	3220384.24
68.5	68.5	62.0	Ks (Hs or Hr > 2.5m)	3.25	-0.39	6%	Soft Ground/ No Barrier	68.1	-13.0	35.9	3895.33662
										65	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	80	37	15	C2.34	Haulage 40t Lorry	109	61	0	0	180	0	60.9	1227497.11
											Total	60.9	

Activity: PV Panel Installation

Receptor Name: 4 Crown Cottage
Receptor Height: 4

Activity Level	50.6	115880.0242
Haulage Level	60.9	1227497.109
Total	61	1343377.133

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	170	2.5	4	100	110.0	*100237446725.5*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	500	2.5	4	100	117.0	*501187233627.3*	5	0	0
Compressed air tools?								Total	117.8	*601424680352.7*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
56.8	56.8	52.6	Ks (Hs or Hr > 2.5m)	3.25	-0.25	6%	Soft Ground/ No Barrier	56.5	-3.0	50.5	111912.268
68.5	68.5	62.0	Ks (Hs or Hr > 2.5m)	3.25	-0.47	7%	Soft Ground/ No Barrier	68.0	-13.0	36.0	3967.75633
										51	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	80	37	15	C2.34	Haulage 40t Lorry	109	61	0	0	180	0	60.9	1227497.11
											Total	60.9	

Activity: Electrical Compound Installation

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

Receptor Name: 4 Crown Cottage
Receptor Height: 4

Activity Level	47.2	*52896.3089*
Haulage Level	60.9	*1227497.109*
Total	61	*1280393.418*

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	245	2.5	4	100	110.0	*100237446725.5*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	500	2.5	4	100	117.0	*501187233627.3*	5	0	0
Table C4, item 50	Tracked Mobile Crane	1	71	10	245	2.5	4	100	99.0	*7943282347.2*	50	0	0
								Total	117.8	*609367962700.0*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
60.7	60.7	55.8	Ks (Hs or Hr > 2.5m)	3.25	-0.30	6%	Soft Ground/ No Barrier	60.4	-3.0	46.6	45403.025
68.5	68.5	62.0	Ks (Hs or Hr > 2.5m)	3.25	-0.39	6%	Soft Ground/ No Barrier	68.1	-13.0	35.9	3895.33662
60.7	60.7	55.8	Ks (Hs or Hr > 2.5m)	3.25	-0.30	6%	Soft Ground/ No Barrier	60.4	-3.0	35.6	3597.94726
										47	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	80	37	15	C2.34	Haulage 40t Lorry	109	61	0	0	180	0	60.9	1227497.11
											Total	60.9	

Activity: Hardstanding and Tracks

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

Receptor Name: Clevel Farm
Receptor Height: 4

Activity Level	56.1	*407491.3285*
Haulage Level	60.1	*1033681.776*
Total	62	*1441173.105*

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C2, item 21	tracked excavator	2	71	10	95	2.5	4	100	102.0	*1588656694.5*	50	0	0
Table C2, item 30	dump truck tipping	1	79	10	95	2.5	4	100	107.0	*50118723362.7*	50	0	0
Table C5, item 20	vibratory roller	1	75	10	95	2.5	4	100	103.0	*19952623149.7*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	500	2.5	4	100	117.0	*501187233627.3*	5	0	0
								Total	117.7	*587145144834.2*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
50.4	50.4	47.6	Ks (Hs or Hr > 2.5m)	3.25	-0.17	6%	Soft Ground/ No Barrier	50.3	-3.0	48.7	74591.7827
50.4	50.4	47.6	Ks (Hs or Hr > 2.5m)	3.25	-0.17	6%	Soft Ground/ No Barrier	50.3	-3.0	53.7	235321.166
50.4	50.4	47.6	Ks (Hs or Hr > 2.5m)	3.25	-0.17	6%	Soft Ground/ No Barrier	50.3	-3.0	49.7	93683.0435
68.5	68.5	62.0	Ks (Hs or Hr > 2.5m)	3.25	-0.39	6%	Soft Ground/ No Barrier	68.1	-13.0	35.9	3895.33662
										56	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	95	37	15	C2.34	Haulage 40t Lorry	109	60	0	0	180	0	60.1	1033681.78
											Total	60.1	

Activity: Manouvering Piling Plant

Receptor Name: Cleve Farm
Receptor Height: 4

Activity Level	51.0	*124520.5146*
Haulage Level	60.1	*1033681.776*
Total	61	*1158202.291*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	175	2.5	4	100	110.0	*100237446725.5*	50	0	0
Pauselli 500	piler	4	88	1	175	2.5	4	100	102.0	*15924286822.1*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	500	2.5	4	100	117.0	*501187233627.3*	5	0	0
								Total	117.9	*617348967174.9*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
57.1	57.1	52.9	Ks (Hs or Hr > 2.5m)	3.25	-0.25	6%	Soft Ground/ No Barrier	56.8	-3.0	50.2	104089.01
57.1	57.1	52.9	Ks (Hs or Hr > 2.5m)	3.25	-0.25	6%	Soft Ground/ No Barrier	56.8	-3.0	42.2	16536.1679
68.5	68.5	62.0	Ks (Hs or Hr > 2.5m)	3.25	-0.39	6%	Soft Ground/ No Barrier	68.1	-13.0	35.9	3895.33662
										51	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	95	37	15	C2.34	Haulage 40t Lorry	109	60	0	0	180	0	60.1	1033681.78
											Total	60.1	

Activity: Active Piling

Receptor Name: Cleve Farm
Receptor Height: 4

Activity Level	64.9	*3110151.534*
Haulage Level	60.1	*1033681.776*
Total	66	*4143833.31*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	175	2.5	4	100	110.0	*100237446725.5*	50	0	0
Pauselli 500	piler	4	110	1	175	6	4	100	124.0	*2523829377920.8*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	500	2.5	4	100	117.0	*501187233627.3*	5	0	0
								Total	124.9	*3125254058273.5*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
57.1	57.1	52.9	Ks (Hs or Hr > 2.5m)	3.25	-0.25	6%	Soft Ground/ No Barrier	56.8	-3.0	50.2	104089.01
57.1	57.1	52.9	Ks (Hs or Hr > 2.5m)	5	-0.84	20%	Soft Ground/ No Barrier	56.2	-3.0	64.8	3002167.19
68.5	68.5	62.0	Ks (Hs or Hr > 2.5m)	3.25	-0.39	6%	Soft Ground/ No Barrier	68.1	-13.0	35.9	3895.33662
										65	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	95	37	15	C2.34	Haulage 40t Lorry	109	60	0	0	180	0	60.1	1033681.78
											Total	60.1	

Activity: PV Panel Installation

Receptor Name: Cleve Farm
Receptor Height: 4

Activity Level	50.3	*107984.3467*
Haulage Level	60.1	*1033681.776*
Total	61	*1141666.123*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	175	2.5	4	100	110.0	*100237446725.5*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	500	2.5	4	100	117.0	*501187233627.3*	5	0	0
	Compressed air tools?							Total	117.8	*601424680352.7*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
57.1	57.1	52.9	Ks (Hs or Hr > 2.5m)	3.25	-0.25	6%	Soft Ground/ No Barrier	56.8	-3.0	50.2	104089.01
68.5	68.5	62.0	Ks (Hs or Hr > 2.5m)	3.25	-0.39	6%	Soft Ground/ No Barrier	68.1	-13.0	35.9	3895.33662
										50	

Haul Road **Segment 1**

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	95	37	15	C2.34	Haulage 40t Lorry	109	60	0	0	180	0	60.1	1033681.78
											Total	60.1	

Activity: Electrical Compound Excavation

Receptor Name: Cleve Farm
Receptor Height: 4

Activity Level	44.7	*29202.58704*
Haulage Level	60.1	*1033681.776*
Total	60	*1062884.363*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	320	2.5	4	100	110.0	*100237446725.5*	50	0	0
Table C6, item 36	diesel bowser	1	89	10	500	2.5	4	100	117.0	*501187233627.3*	5	0	0
Table C4, item 50	Tracked Mobile Crane	1	71	10	320	2.5	4	100	99.0	*7943282347.2*	50	0	0
								Total	117.8	*60936796270.0*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
63.6	63.6	58.1	Ks (Hs or Hr > 2.5m)	3.25	-0.33	6%	Soft Ground/ No Barrier	63.3	-3.0	43.7	23449.0393
68.5	68.5	62.0	Ks (Hs or Hr > 2.5m)	3.25	-0.39	6%	Soft Ground/ No Barrier	68.1	-13.0	35.9	3895.33662
63.6	63.6	58.1	Ks (Hs or Hr > 2.5m)	3.25	-0.33	6%	Soft Ground/ No Barrier	63.3	-3.0	32.7	1858.21114
										45	

Haul Road **Segment 1**

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	95	37	15	C2.34	Haulage 40t Lorry	109	60	0	0	180	0	60.1	1033681.78
											Total	60.1	

APPENDIX B

Comparative Calculations - Construction Calculations Ecological Receptors

Activity: Hardstanding and Tracks

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

Receptor Name: SPA
Receptor Height: 1

Activity Level	49.2	*83429.65797*
Haulage Level	52.9	*196399.5375*
Total	54	*279829.1954*

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C2, item 21	tracked excavator	2	71	10	500	2.5	1	100	102.0	*15886564694.5*	100	0	0
Table C2, item 30	dump truck tipping	1	79	10	500	2.5	1	100	107.0	*50118723362.7*	100	0	0
Table C5, item 20	vibratory roller	1	75	10	500	2.5	1	100	103.0	*19952623149.7*	100	0	0
Table C6, item 36	diesel bowser	1	89	10	500	2.5	1	100	117.0	*501187233627.3*	100	0	0
								Total	117.7	*587145144834.2*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
68.5	68.5	62.0	Ks (Rh ≤ 2.5m)	-	0.00	0%	Soft Ground/ No Barrier	68.5	0.0	33.5	2257.38162
68.5	68.5	62.0	Ks (Rh ≤ 2.5m)	-	0.00	0%	Soft Ground/ No Barrier	68.5	0.0	38.5	7121.55757
68.5	68.5	62.0	Ks (Rh ≤ 2.5m)	-	0.00	0%	Soft Ground/ No Barrier	68.5	0.0	34.5	2835.14313
68.5	68.5	62.0	Ks (Rh ≤ 2.5m)	-	0.00	0%	Soft Ground/ No Barrier	68.5	0.0	48.5	71215.5757
										49	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	500	37	15	C2.34	Haulage 40t Lorry	109	53	0	0	180	0	52.9	196399.537
											Total	52.9	

Activity: Hardstanding and Tracks

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

Receptor Name: MHWS
Receptor Height: 1

Activity Level	48.0	*62845.67664*
Haulage Level	47.4	*55452.66695*
Total	51	*118298.3436*

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C2, item 21	tracked excavator	2	71	10	560	2.5	1	100	102.0	*15886564694.5*	100	0	5
Table C2, item 30	dump truck tipping	1	79	10	560	2.5	1	100	107.0	*50118723362.7*	100	0	5
Table C5, item 20	vibratory roller	1	75	10	560	2.5	1	100	103.0	*19952623149.7*	100	0	5
Table C6, item 36	diesel bowser	1	89	10	560	2.5	1	100	117.0	*501187233627.3*	100	0	5
								Total	117.7	*587145144834.2*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
69.7	69.7	63.0	Ks (Rh ≤ 2.5m)	-	0.00	0%	Soft Ground/ No Barrier	69.7	0.0	32.3	1700.43458
69.7	69.7	63.0	Ks (Rh ≤ 2.5m)	-	0.00	0%	Soft Ground/ No Barrier	69.7	0.0	37.3	5364.50843
69.7	69.7	63.0	Ks (Rh ≤ 2.5m)	-	0.00	0%	Soft Ground/ No Barrier	69.7	0.0	33.3	2135.64927
69.7	69.7	63.0	Ks (Rh ≤ 2.5m)	-	0.00	0%	Soft Ground/ No Barrier	69.7	0.0	47.3	53645.0843
										48	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	560	37	15	C2.34	Haulage 40t Lorry	109	52	0	5	180	0	47.4	55452.6669
											Total	47.4	

Activity: Manouvering Piling Plant

Receptor Name: SPA
Receptor Height: 1

Activity Level	76.6	*46097200.76*
Haulage Level	52.9	*196399.5375*
Total	77	*46293600.29*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	20	2.5	1	100	110.0	*100237446725.5*	100	0	0
Pauselli 500	piler	4	88	1	20	2.5	1	100	102.0	*15924286822.1*	100	0	0
Table C6, item 36	diesel bowser	1	89	10	500	2.5	1	100	117.0	*501187233627.3*	100	0	0
								Total	117.9	*617348967174.9*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
33.5	33.5	34.0	K'h (Source to receptor ≤ 25m)	-	0.00	0%	Hard Ground/ No Barrier	34.0	0.0	76.0	39716411.7
33.5	33.5	34.0	K'h (Source to receptor ≤ 25m)	-	0.00	0%	Hard Ground/ No Barrier	34.0	0.0	68.0	6309573.44
68.5	68.5	62.0	Ks (Rh ≤ 2.5m)	-	0.00	0%	Soft Ground/ No Barrier	68.5	0.0	48.5	71215.5757
										77	

Haul Road **Segment 1**

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	500	37	15	C2.34	Haulage 40t Lorry	109	53	0	0	180	0	52.9	196399.537
											Total	52.9	

Activity: Manouvering Piling Plant

Receptor Name: MHWS
Receptor Height: 1

Activity Level	59.8	*963313.4889*
Haulage Level	47.4	*55452.66695*
Total	60.1	*1018766.156*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	80	2.5	1	100	110.0	*100237446725.5*	100	0	5
Pauselli 500	piler	4	88	1	80	2.5	1	100	102.0	*15924286822.1*	100	0	5
Table C6, item 36	diesel bowser	1	89	10	560	2.5	1	100	117.0	*501187233627.3*	100	0	5
								Total	117.9	*617348967174.9*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
48.6	48.6	46.1	Ks (Rh ≤ 2.5m)	-	0.00	0%	Hard Ground/ No Barrier	51.1	0.0	58.9	784964.51
48.6	48.6	46.1	Ks (Rh ≤ 2.5m)	-	0.00	0%	Hard Ground/ No Barrier	51.1	0.0	51.0	124703.895
69.7	69.7	63.0	Ks (Rh ≤ 2.5m)	-	0.00	0%	Soft Ground/ No Barrier	69.7	0.0	47.3	53645.0843
										60	

Haul Road **Segment 1**

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	560	37	15	C2.34	Haulage 40t Lorry	109	52	0	5	180	0	47.4	55452.6669
											Total	47.4	

Activity: PV Panel Installation

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

Receptor Name: SPA
Receptor Height: 1

Activity Level	76.5	*44580950.36*
Haulage Level	52.9	*196399.5375*
Total	77	*44777349.9*

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	20	2.5	1	100	110.0	*100237446725.5*	100	0	0
Table C6, item 36	diesel bowser	1	89	10	500	2.5	1	100	117.0	*501187233627.3*	100	0	0
	Compressed air tools?							Total	117.8	*601424680352.7*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
33.5	33.5	34.0	Ks (Hs or Hr > 2.5m)	-	0.00	0%	Soft Ground/ No Barrier	33.5	0.0	76.5	44509734.8
68.5	68.5	62.0	Ks (Hs or Hr > 2.5m)	-	0.00	0%	Soft Ground/ No Barrier	68.5	0.0	48.5	71215.5757
										76	

Haul Road **Segment 1**

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	500	37	15	C2.34	Haulage 40t Lorry	109	53	0	0	180	0	52.9	196399.537
											Total	52.9	

Activity: PV Panel Installation

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

Receptor Name: MHWS
Receptor Height: 1

Activity Level	59.2	*838609.5942*
Haulage Level	52.4	*175356.7299*
Total	60	*1013966.324*

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	80	2.5	1	100	110.0	*100237446725.5*	100	0	5
Table C6, item 36	diesel bowser	1	89	10	560	2.5	1	100	117.0	*501187233627.3*	100	0	5
	Compressed air tools?							Total	117.8	*601424680352.7*			*Not applied at end = K's*

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
48.6	48.6	46.1	K'h (Source to receptor ≤ 25m)	-	0.00	0%	Hard Ground/ No Barrier	51.1	0.0	58.9	784964.51
69.7	69.7	63.0	Ks (Rh ≤ 2.5m)	-	0.00	0%	Soft Ground/ No Barrier	69.7	0.0	47.3	53645.0843
			Original calculations cite K's this may be a typographical error							59	

Haul Road **Segment 1**

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	560	37	15	C2.34	Haulage 40t Lorry	109	52	0	0	180	0	52.4	175356.73
											Total	52.4	

Activity: Electrical Compound Installation

Receptor Name	SPA
Receptor Height	1

Activity Level	49.5	*88690.52317*
Haulage Level	57.4	*545554.2708*
Total	58	*634244.7939*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	475	2.5	1	100	110.0	*100237446725.5*	100	0	0
Table C6, item 36	diesel bowser	1	89	10	500	2.5	1	100	117.0	*501187233627.3*	100	0	0
Table C4, item 50	Tracked Mobile Crane	1	71	10	475	2.5	1	100	99.0	*7943282347.2*	100	0	0
								Total	117.8	*609367962700.0*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
67.9	67.9	61.5	Ks (Rh ≤ 2.5m)	-	0.00	0%	Soft Ground/ No Barrier	67.9	0.0	42.1	16191.8313
68.5	68.5	62.0	Ks (Rh ≤ 2.5m)	-	0.00	0%	Soft Ground/ No Barrier	68.5	0.0	48.5	71215.5757
67.9	67.9	61.5	Ks (Rh ≤ 2.5m)	-	0.00	0%	Soft Ground/ No Barrier	67.9	0.0	31.1	1283.11616
										49	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	180	37	15	C2.34	Haulage 40t Lorry	109	57	0	0	180	0	57.4	545554.271
											Total	57.4	

Activity: Electrical Compound Installation

Receptor Name	MHWS
Receptor Height	1

Activity Level	48.6	*73113.09396*
Haulage Level	47.4	*55452.66695*
Total	51	*128565.7609*

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAeq,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Table C4, item 54	telehandler	2	79	10	535	2.5	1	100	110.0	*100237446725.5*	100	0	5
Table C6, item 36	diesel bowser	1	89	10	535	2.5	1	100	117.0	*501187233627.3*	100	0	5
Table C4, item 50	Tracked Mobile Crane	1	71	10	535	2.5	1	100	99.0	*7943282347.2*	100	0	5
								Total	117.8	*609367962700.0*			

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAeq,T	antilog
69.2	69.2	62.6	Ks (Rh ≤ 2.5m)	-	0.00	0%	Soft Ground/ No Barrier	69.2	0.0	40.8	12026.674
69.2	69.2	62.6	Ks (Rh ≤ 2.5m)	-	0.00	0%	Soft Ground/ No Barrier	69.2	0.0	47.8	60133.3702
69.2	69.2	62.6	Ks (Rh ≤ 2.5m)	-	0.00	0%	Soft Ground/ No Barrier	69.2	0.0	29.8	953.049691
										49	

Haul Road Segment 1

Segment	Distance to Haulage, m	Movements Per Hour	Average Speed km/h	BS 5228 Reference	Plant	LWA	LAeq,t	Façade Correction	Screening Correction	Angle of View	Angle of View Correction	Corrected LAeq,T	Antilog
1	560	37	15	C2.34	Haulage 40t Lorry	109	52	0	5	180	0	47.4	55452.6669
											Total	47.4	

APPENDIX C

Comparative Calculations - Piling Calculations Ecological Receptors

p2 of 2

listed as pv panel installation but plant is different and shows piling rig actively piling.

Activity: Active Piling

Receptor Name: SPA — **Activity Level:** 100.0

Receptor Height: 1

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAMax,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Pauselli 500	piler	4	120	1	20	6	1	100	134.0	*2523829377920 7.9*	100	0	0
			No overt evidence to identify where this figure is from					Total	134.0	*2523829377920 7.9*			

LAMax,f only not LAeq,t

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAMax	antilog
33.5	33.5	34.0	K'h (Source to receptor ≤ 25m)	-	0.04	8%	Hard Ground/ No Barrier	34.0	0.0	100.0	1E+10
										100	

p13 of 21

listed as pv panel installation but plant is different and shows piling rig actively piling.

Activity: Active Piling

Receptor Name: MHWS — **Activity Level:** 83.0

Receptor Height: 1

Façade Correction Options	Screening Correction Options
0	0
3	5
	10

BS 5228 Reference	Plant	Quantity	SPL LAMax,dB	Distance to SPL (m)	Distance to Receptor (time weighted average for mobile plant)	Source height (Hs)	Receptor height (Hr)	% Soft ground	Lw	*antilog*	% on time	façade correction	screening correction
Pauselli 500	piler	4	120	1	80	6	1	100	134.0	*2523829377920 7.9*	100	0	5
			No overt evidence to identify where this figure is from					Total	134.0	*2523829377920 7.9*			

LAMax,f only not LAeq,t

K's	K'm	K'h	Distance adjustment assumed based on distance to receptor plus source and receiver heights and soft ground %	Ave propagation height if soft ground and Hs & Hr >2.5	Soft ground adjustment for Source or Receiver height ≥ 2.5m	Arbitrary percentage value used to determine soft ground adjustment	Ground type/barriers assumed based on distance adjustment assumed and screening	Distance attenuation given ground type K' dB	on time correction	Results level LAMax	antilog
48.6	48.6	46.1	Ks (Hs or Hr > 2.5m)	3.5	-	-	Hard Ground/ Barrier	51.1	0.0	83.0	197642354
										83	

APPENDIX D

Comparative Calculations - Traffic Calculations

Baseline

Location	AADT	Low Flows	% HGV	#HGV	Ave Speed	BNL	Speed ΔpV	L10 18hr @10m	distance from road edge, d (m)	h^2	Receiver height, H (m)	$(d+3.5)^2$	Slant distance, d'(m)	Distance correction, dB	Façade Correction, dB	Low flow Correction	Noise Level, corrected for 4m distance, facades and low flows, dB
Head Hill Road (South)	2920	Correction	7	204	81	63.8	2.2	66.0	1.0	*20.3*	1.5	*2.3*	4.7	4.5	2.5	-0.2	63.7
Head Hill Road (North)	2525	Correction	5	177	81	63.1	1.8	64.9	1.0	*20.3*	1.5	*2.3*	4.7	4.5	2.5	-0.5	62.4
Seasalter Road	1675	Correction	4	117	81	61.3	1.6	62.9	1.0	*20.3*	1.5	*2.3*	4.7	4.5	2.5	-1.9	59.0

Additional Traffic Due to Development

Location	All Vehicles	HGVs	Difference	Magnitude of Impact	
Head Hill Road (South)	222	60	0.7	No Change	*0.1dB difference*
Head Hill Road (North)	222	60	0.8	No Change	*0.1dB difference*
Seasalter Road	222	60	1.6	Minor	

Noise Change $L_{A10,\ 18\ Hour}$	Magnitude of Impact
0	No Change
0.1 - 0.9	Negligible
1 - 2.9	Minor
3 - 4.9	Moderate
>5	Major

With Development

Location	AADT	Low Flows	% HGV	#HGV	Ave Speed	BNL	Speed ΔpV	L10 18hr @10m	distance from road edge, d (m)	h^2	Receiver height, H (m)	$(d+3.5)^2$	Slant distance, d'(m)	Distance correction, dB	Façade Correction, dB	Low flow Correction	Noise Level, corrected for 4m distance, facades and low flows, dB	
Head Hill Road (South)	3142	Correction	8.4	220	81	64.1	2.5	66.5	1.0	*20.3*	1.5	*2.3*	4.7	4.5	2.5	-0.1	64.4	*0.1dB difference*
Head Hill Road (North)	2747	Correction	6.8	192	81	63.5	2.2	65.7	1.0	*20.3*	1.5	*2.3*	4.7	4.5	2.5	-0.4	63.2	*0.1dB difference*
Seasalter Road	1897	Correction	6.7	133	81	61.9	2.1	64.0	1.0	*20.3*	1.5	*2.3*	4.7	4.5	2.5	-1.4	60.6	

APPENDIX E

Arna Wood Solar Farm, Wintering Bird Construction Method Statement

ARNA WOOD SOLAR FARM

Wintering Bird Mitigation: Construction Method Statement

Arna Wood Solar Farm (14/00907/FUL) was awarded planning permission subject to the following Planning Condition 7:

> *Prior to the commencement of the development hereby approved, the following information shall be submitted to and approved in writing by the Local Planning Authority:*
>
> - *Ecological construction method statement*
> - *Bird mitigation strategy including monitoring*
> - *A comprehensive and detailed Habitat Management Plan covering the anticipated lifetime of the solar farm (25 years) in relation to both the land containing the solar panels and the land identified as Unit 5 in Appendix 3 of the Further Ecological Information 7th May 2015. It shall include details of grazing and shall be implemented prior to the first operation of the development hereby approved.*
>
> *The development shall be carried out in full accordance with the approved details.*
>
> *REASON: To ensure that protected species and the nearby designated areas are protected during construction activities and to mitigate any loss of habitat caused as a result of the scheme and to ensure that it is enhanced and managed.*

A document ('Discharge of Planning Conditions – Condition 7', BE Renewables 2016) presenting the above information was submitted to Lancaster City Council and approved in principle on 21/03/2016. The information submitted included mitigation to safeguard birds during both the breeding and wintering seasons, the latter specifically targeted at birds associated with the Morecombe Bay Special Protected Area (SPA) and Lune Estuary Site of Special Scientific Interest (SSSI). The principal mitigation proposed was to reduce disturbance to wintering birds by programming works to wholly avoid the period November to March inclusive; this mitigation consequently informed the Construction Method Statement (CMS) submitted in February 2016 to discharge Condition 3 ('Discharge of Planning Conditions – Condition 3', BE Renewables 2016). Further mitigation was proposed in the form of Toolbox talks and an Ecological Clerk of Works (ECoW); see page 10 of the submitted document.

The proposed construction programme has been planned to avoid the main bird breeding season (March to August) but will take place during the main wintering period (November to March) for birds associated with the SPA, with construction programmed January to March 2017. This Construction Method Statement (CMS) sets out mitigation for wintering birds to facilitate construction in the winter period. This CMS supplements the information previously submitted pursuant to the discharge of Condition 7 and therefore should be read in combination. In summary, the proposed additional mitigation includes Phased Construction and ECoW/Ornithological Monitoring.

Ornithological Monitoring

An ornithologist will attend site during construction to supervise works and advise the workforce. The ornithologist can either fulfil the ECoW role or be a different person, but it is important that she/he has demonstrable ornithological expertise. An adaptive programme of ornithological attendance is proposed so that the disturbance effects of the development can be properly monitored and works adjusted accordingly.

The ornithologist will attend site daily or as regularly as necessary during the first two weeks of construction. During this time the ornithologist will record bird activity (associated with SPA

species) and disturbance events from a suitable vantage point. If possible, monitoring of bird activity during this period will cover periods throughout the tidal cycle including both high and low tides. The ornithologist will advise the workforce in a timely manner about potential disturbance and agree suitable ways to mitigate effects, such as limiting noisy or visually disturbing works at certain times of day or in particular parts of the site. This adaptive mitigation is flexible and responsive to the prevailing conditions and will be compliant with the overall Construction Method Statement for the project.

At the end of the first week of monitoring, the ornithologist will have gained sufficient understanding of the disturbance effects and prevailing programme to be able to advise about the likelihood of further disturbance and appropriate mitigation. The ornithologist will submit a brief report of results and actions to the LPA and monitoring will revert to a minimum weekly attendance, subject to the prevailing programme and likely sensitivities, and agreement with the LPA. It is anticipated that the information from the surveys will be incorporated into the operational phase bird monitoring reports.

Phased Construction

Construction activities in the western and northern parts of the site, closest to the river, are likely to be more disturbing to SPA birds than those in more distant areas. Similarly, construction activities during high tide are more likely to disturb birds because the availability of intertidal habitats is reduced and birds may be forced inland towards the site.

The ECoW/ornithologist will continually review programme and activities and agree an appropriate programme to ensure that the most disturbing works (e.g. piling or elevated operations such as crane lifting) are scheduled for locations and times of least risk, even if this is out of coordination with other works.

The overall CMS for the project describes the equipment, process, and schedule of works. These elements are summarised in Appendix A with activities with potential to cause disturbance highlighted.

It is not expected that small-scale works (e.g. occasional vehicle or routine workforce movements) at any time or location will significantly disturb SPA birds and so these kinds of activities are likely to be unrestricted.

Prior to consent, 'Further Ecological Information' (Bowland Ecology, May 2015) was submitted in support of the Planning Application and also proposed limiting construction in the period November to March inclusive, but only in the areas (i.e. Fields 1 and 2) closest to the river. The requirement for limiting works in only part of the site was accidentally omitted from the documents submitted to discharge condition 7.

Appendix A: Construction Activities with potential to cause disturbance to wintering birds. *See Discharge of Planning Conditions – Condition 3' (BE Renewables 2016) for full details.*

The underlined items have the potential to cause disturbance if undertaken in the period November to March. Activities confirmed to be scheduled early in the programme and/or distant from the SSSI/SPA are unlikely to be a concern and so are not highlighted.

Equipment

- Crane – Unloading and lifting inverter and transformer cabinets in to place
- Dump trucks – Trenching and distribution of topsoil and subsoil materials to dedicated areas and for transport for reinstatement activities
- Fuel bowser – Refuel plant as required
- Excavators – Trenching for cables – primary these will be mini-excavators using rubber tracks or similar
- Mini piling machine(s) – Installing piles into the ground for fixing of mounting frames. *[N.B. push or drilled piling, therefore reducing noise impact]*
- Telehandler(s) – Unloading and Distributing materials
- Vibrating roller – Compacting access track / construction compound
- Hand held tools – During the installation works there will be a variety of hand held tools used. Process

Process

During the construction period the following activities will be undertaken:

- Erecting construction traffic signage
- Installing the temporary construction compound with wheel wash facilities
- Site preparation will involve mowing the site if required and setting out the site
- Erecting the security fence
- Identifying and marking the hedgerows and trees that are to be removed
- Installing the tree protection fencing
- Installing the root protection matting (to the designated trees)
- Removing the hedgerows and trees at the approved locations (in accordance with the planning consent)
- Piling the frame supports into the ground
- Affixing the mounting frames and panels
- Installing the concrete bases for the switchroom and cabinets
- Switchroom construction and installation of the inverters and transformer cabinets in accordance with the submitted details
- Trenching for the cable runs, and laying cables
- Connecting cables and backfilling the cable trenches
- Removal of construction compound
- Installation of wildlife and ecology mitigation measures

APPENDIX F

Arna Wood Solar Farm, Construction Method Statement

Construction Operations

The site will be constructed in accordance with Drawing No. 1495-D001-v.13-Indicative Site Plan and associated detail drawings referenced within our planning application:

- Solar PV Plant Layout
- PV Tables
- Elevations, DNO Switch Room & Ancillary Structure
- Fence Design

Hours of Operation

Construction and deliveries to the site will take place within the hours of:

- 08:00 to 18:00 Monday to Friday and;
- 08:00 to 13:00 on Saturdays.

At the end of the life of the site, decommissioning will take place during the same hours.

Staff

During the construction period it is expected that up to 40 staff may be on site (dependent upon the phases of the construction schedule).

Once the site is operational there will be no staff based on the site, operational staff will visit the site periodically to carry out maintenance and repair works, otherwise the operation and monitoring of the site will be undertaken remotely

Risk Assessment

The Principal Contractor shall maintain a weekly Health and Safety Board identifying activities and any potential hazards and where necessary this will be updated daily. All visitors will be required to report to the onsite security, required to sign into the site registration register and attend the site Health and Safety Site Induction and then adhere to this and the onsite Health and Safety practices, whilst they are present onsite. When leaving the site, the visitor will again report to the onsite security and 'sign-out'.

All personnel working on site will be required to wear a high visibility vest and/or jacket, safety boots, hard hat and any other appropriate personal protective equipment required for the works activity.

The appointed sub-Contractor will be responsible for risk assessment of their specific equipment and works activity, construction methods employed, this will be submitted to the Principal Contractor in a timely manner and the works authorised by the Principal contractor and with any update being completed to the Health and Safety Board.

Equipment

Plant equipment will include but not be limited to the following:

EQUIPMENT	PRIMARY FUNCTION

APPENDIX G

Planning Decision Notice, Solar Farm, Birch, Colchester

Colchester Borough Council

Planning Services

Rowan House
33 Sheepen Road
Colchester
CO3 3WG

Notice of Planning Decision

TOWN AND COUNTRY PLANNING ACT 1990
TOWN AND COUNTRY PLANNING (DEVELOPMENT MANAGEMENT PROCEDURE) ORDER (ENGLAND) ORDER 2015

In pursuance of the powers exercised by it as District Planning Authority this Council, having considered your application to carry out the development detailed below in accordance with the plan(s) accompanying the said application, DOES HEREBY GIVE NOTICE of its decision to GRANT PERMISSION for the said development subject to additional condition(s) set out below.

APPLICATION NO: 150614

APPLICATION DATE: 27 March 2015

PROPOSAL: Installation and operation of a solar farm and associated infrastructure, including PV panels, mounting frames, inverters, transformers, pole mounted CCTV cameras, substations, composting toilet and fence.

LOCATION: Land Adjacent, Claypits Farm, Maldon Road, Birch, Colchester, CO2 0NU

APPLICANT: Mr Joshua Mellor, 7th Floor, 33 Holborn, London, EC1N 2HT

1. The development hereby permitted shall be begun before the expiration of three years from the date of this permission. Reason: To comply with the requirements of Section 91 of the Town and Country Planning Act 1990, as amended by the Planning and Compulsory Purchase Act 2004.
2. The development hereby permitted shall be carried out in accordance with the details shown on the submitted Drawing Numbers: AT_01 - Site Aux Transformer (09/01/15) CCTV_01 – CCTV Pole Details (10/12/13) CSR_01 – Client Side Substation Details (06/12/13) CB_01 – Communications Building (19/12/13) Deer Fence – Inc. Mammal Gates DNO_01 – DNO Building Details (06/12/13) XXX_01_A – GRP Cabinet (10/09/13) TD_01 – Transformer Details (27/11/13) ID_01 – Inverter Details (29/11/13) TC_01 – Toilet Cabinet (12/01/15) TYP_P_E_4L – Panels Elevation 4 Landscape (21/10/14) SB_01 – Storage Building Details (18/12/13) FIG 1 Issue 2 – Planting Plan (15/06/15) BEF_01_Rev3 – Birch Estate Farm Proposed Layout Rev 3 (29/05/15) BCH_01 – Birch Estate Site Local Plan (27/03/15) together with submitted supporting documentation as applicable. Reason: For the avoidance of doubt as to the scope of this permission and in the interests of proper planning.
3. No works shall take place until full details of all landscape works have been submitted to and agreed, in writing, by the Local Planning Authority and the works

IMPORTANT – ATTENTION IS DRAWN TO THE NOTES ATTACHED

shall be carried out prior to the occupation of any part of the development unless an alternative implementation programme is subsequently agreed, in writing, by the Local Planning Authority. The submitted landscape details shall include: • PROPOSED FINISHED LEVELS OR CONTOURS; • MEANS OF ENCLOSURE; • CAR PARKING LAYOUTS; • OTHER VEHICLE AND PEDESTRIAN ACCESS AND CIRCULATION AREAS; • HARD SURFACING MATERIALS; • MINOR ARTEFACTS AND STRUCTURES (E.G. FURNITURE, PLAY EQUIPMENT, REFUSE OR OTHER STORAGE UNITS, SIGNS, LIGHTING ETC.); • PROPOSED AND EXISTING FUNCTIONAL SERVICES ABOVE AND BELOW GROUND (E.G. DRAINAGE POWER, COMMUNICATIONS CABLES, PIPELINES ETC. INDICATING LINES, MANHOLES, SUPPORTS ETC.); • RETAINED HISTORIC LANDSCAPE FEATURES; • PROPOSALS FOR RESTORATION; • PLANTING PLANS; • WRITTEN SPECIFICATIONS (INCLUDING CULTIVATION AND OTHER OPERATIONS ASSOCIATED WITH PLANT AND GRASS ESTABLISHMENT); • SCHEDULES OF PLANTS, NOTING SPECIES, PLANT SIZES AND PROPOSED NUMBERS/DENSITIES WHERE APPROPRIATE; AND • IMPLEMENTATION TIMETABLES AND MONITORING PROGRAMS. Reason: To ensure that there is a suitable landscape proposal to be implemented at the site for the enjoyment of future users and also to satisfactorily integrate the development within its surrounding context in the interest of visual amenity.

4. Prior to the first occupation of the development, a landscape management plan including long term design objectives, management responsibilities and maintenance schedules for all landscape areas other than small, privately owned, domestic gardens shall be submitted to and agreed, in writing, by the Local Planning Authority. The landscape management plan shall thereafter be carried out as approved at all times. Reason: To ensure the proper management and maintenance of the approved landscaping in the interests of amenity and the character and appearance of the area.

5. Prior to the commencement of the development hereby permitted, details of the proposed security cameras, including their position, shall be submitted to and agreed in writing by the Local Planning Authority and the development shall be carried out in accordance with the approved details. Reason: The application does not provide sufficient information to allow full consideration of this aspect of the proposal.

6. No demolition or construction work shall take outside of the following times; Weekdays: 08:00 - 18:00 Saturdays: 08:00 - 13:00 Sundays and Bank Holidays: No working. Reason: To ensure that the construction phase of the development hereby permitted is not detrimental to the amenity of the area and/or nearby residents by reason of undue noise at unreasonable hours.

7. Any lighting of the development (including resultant sky glow, light trespass, source intensity and building luminance) shall fully comply with the figures and advice specified in the CBC External Artificial Lighting Planning Guidance Note (EZ2 rural, small village or dark urban areas). Reason: In order to safeguard the amenity of the surrounding area by preventing the undesirable, disruptive and disturbing effects of light pollution.

8. No external lighting fixtures shall be constructed, installed or illuminated at any time within the application site, other than during the initial construction phase, unless otherwise agreed in writing with the Local Planning Authority. During the construction phase of the development hereby permitted, any lighting of the development (including resultant sky glow, light trespass, source intensity and building luminance) shall fully comply with the figures and advice specified in the CBC External Artificial Lighting Planning Guidance Note for EZ2 rural areas.