

11 NOISE & VIBRATION

SYNOPSIS

The Site is currently used for intensive dairy farming and the associated cultivation of forage crops including maize.

The conversion of the Site to a solar park with associated low-intensity grazing grassland represents the opportunity to provide a source of sustainable energy production, while not adversely affecting the acoustic environment of the nearby residential and ecological receptors.

The early involvement of an acoustician has enabled an acoustically sympathetic approach to scheme design and outline specification, thus ensuring that no worse than a negligible effect occurs at any receptor.

The developer has committed to use of best practice in environmental controls during the construction period, as documented in the Outline Construction Environmental Management Plan, such that acoustic impacts upon the environment will be controlled at a negligible level during the construction phase.

GENERAL PRINCIPLES

- 11.1 This Chapter of the ES considers the potential noise and vibration impacts and likely effect of the Proposed Development; specifically, the effects of predicted noise effects likely to be generated by the Proposed Development on noise sensitive receptors within the study area during the construction/decommissioning works and upon completion and operation of the Proposed Development.
- 11.2 In the context of this assessment, noise is defined as unwanted or undesirable sound derived from sources such as road traffic, commercial/industrial processes or construction works that interfere with normal activities, including conversation, sleep or recreation. Vibration is defined as the transmission of energy through the medium of ground or air resulting in small movements of the transmitting medium, such as a building, which can cause discomfort to people or even damage to structures if the movements are large enough.
- 11.3 The Chapter describes the legislation and planning policy of relevance to the Site in the context of noise and vibration; the baseline conditions currently existing at the Site; the methods used to assess

the potential impacts and likely effects arising from the Proposed Development; and the residual effects following consideration of mitigation measures integral to the development proposals.

- 11.4 A glossary of acoustic terminology is provided in Technical Appendix 11.1.

SCOPING

- 11.5 The scoping response received from PINS states:

The Inspectorate welcomes the approach described in the Scoping Report regarding a proportionate assessment focussed on the construction phase. The ES should also consider decommissioning, but it is agreed that operational noise can be scoped out. The applicant should continue to engage with NCC regarding this topic.

- 11.6 The assessment has consequently considered the impacts of the construction and decommissioning of the scheme; however, for robustness, a full assessment in accordance with the relevant national standards has also been undertaken and included within the Chapter for the operation of the scheme, as on-site inverter plant does have the potential to generate operational noise.
- 11.7 No specific consultation has been undertaken with the Environmental Health Departments of Newport City Council or Monmouthshire County Council as the assessment methods, principles and criteria, for all potential areas of acoustic impact are clearly enshrined within the relevant British Standards.

LEGISLATION AND POLICY CONTEXT

Legislation

Control of Pollution Act 1974

- 11.8 The Control of Pollution Act, 1974, Part III - Noise is a combination and refinement of three earlier Acts: the Public Health Act, 1936 (replaced by the Public Health Act 1990, Part III), the Noise Abatement Act 1960 and the Public Health Act 1990, Part III). Section 60 of the Act enables a local planning authority to serve a notice on a person (this includes a company) who is carrying out, or who are planning to carry out, works of construction, demolition, road-works, railway maintenance etc. in order to control the noise from those operations. Section 61 (S61) of the Act also enables such a person to apply to the local authority for consent in respect of such works.
- 11.9 The Act introduces the concept of using 'Best Practicable Means' (BPM) to control the impact of noise, where significant impacts are likely to occur. BPM essentially means selection of the quietest techniques and equipment, in addition to considering factors such as timing, duration, location and opportunities for acoustic screening or separation, to ensure that impacts are controlled in so far as is reasonable practicable. The demonstrable use of BPM can also be used as a defence to enforcement action under nuisance legislation.

National Policy

Planning Policy Wales

- 11.10 The Government’s planning policies for Wales are contained in Planning Policy Wales (Edition 11, February 2021). The policy provides overarching requirements for developments to adequately control noise pollution, to provide appropriate soundscapes and to incorporate good acoustic design.
- 11.11 The policy is supplemented by the Noise and Soundscape Action Plan 2018-2023, which provides more detailed guidance on planning for a new development, but does not set out specific assessment methods or criteria. The guidance in this document has been used to inform a qualitative assessment of the effect the proposed development could have on the local soundscape.

Technical Advice Note (Wales) 11, Noise – October 1997

- 11.12 This note provides advice on how the planning system in Wales can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business.
- 11.13 It outlines some of the main considerations which local planning authorities should take into account in drawing-up development plan policies and when determining planning applications for development which will either generate noise or be exposed to existing noise sources.

Regional Policy

Monmouthshire County Council Adopted Local Plan – February 2014

- 11.14 Policy EP1 – Amenity and Environmental Protection, of the LDP states:

Development, including proposals for new buildings, extensions to existing buildings and advertisements, should have regard to the privacy, amenity and health of occupiers of neighbouring properties.

Development proposals that would cause or result in an unacceptable risk /harm to local amenity, health, the character /quality of the countryside or interests of nature conservation, landscape or built heritage importance due to the following will not be permitted, unless it can be demonstrated that measures can be taken to overcome any significant risk:

- *Air pollution;*
- *Light pollution;*
- *Noise pollution;*
- *Water pollution;*
- *Contamination;*

- *Land instability*
- *Or any identified risk to public safety.*

ASSESSMENT METHODOLOGY AND CRITERIA

General

- 11.15 The prediction of future noise and vibration levels associated with the Proposed Development and the significance of their potential impacts have been assessed in accordance with the appropriate British Standards, which are discussed below.

Construction Phase

Noise

- 11.16 Noise levels generated by demolition and construction plant and activities have the potential to impact upon nearby noise-sensitive receptors.
- 11.17 BS5228 sets out an appropriate methodology for predicting, assessing and controlling noise levels arising from a wide variety of demolition and construction plant and related activities. As such, it can be used to predict noise levels arising from the operations at proposed construction sites. BS5228 also sets out tables of sound power levels generated by a wide variety of construction plant to facilitate such predictions.
- 11.18 The magnitude of the potential impact on sensitive receptors would depend upon a number of variables, the following of which are of particular relevance to this assessment:
- The amount of noise generated by plant and equipment being used at the Site, generally expressed as a sound power level;
 - The periods of operation of the plant at the Site, known as the 'on-time';
 - The distance between the noise source and the receptor, known as the 'stand-off';
 - The attenuation due to ground absorption or barrier screening effects; and
 - The reflection of noise due to the presence of hard vertical faces such as walls.
- 11.19 In order to determine the likely effect of noise during demolition and construction of the Proposed Development, noise predictions have been carried out in accordance with the procedures presented in BS5228, taking full account of BPM. The prediction method described in BS5228 comprises taking the source noise level of each item of plant and correcting it for the following variables:
- distance effects between source and receiver;
 - percentage operating time of the plant;
 - barrier attenuation effects;
 - ground absorption; and
 - facade corrections.

- 11.20 BS5228 gives several examples of acceptable limits for construction or demolition noise. The most simplistic is based upon the exceedance of fixed noise limits and Annex E.2 states that: “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.”
- 11.21 Annex E.2 goes on to state: “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 areas away from main road traffic and industrial noise or 75 decibels (dBA) in urban areas near main roads in heavy industrial areas. These limits are for daytime working outside living rooms and offices.”
- 11.22 In respect of potentially more sensitive residential receptors, this assessment considers the criteria set out in Annex E.3 of BS 5228, which considers impact significance based upon the change in ambient noise associated with construction activities. BS5228 states that this can be considered as “an alternative and/or additional method to determine the significance of construction noise levels”.
- 11.23 Paragraph E.3.2 describes Example Method 1 (The ABC Method), which considers the existing ambient noise environment (the L_{Aeq} noise level environment) at the neighbouring sensitive receptors and identifies levels that if exceeded would be considered to result in a significant adverse effect and is noted to apply to residential receptors only.
- 11.24 Table E.1 of BS5228 sets out significance effect threshold values at receptors. The process for determining this requires the determination of the ambient noise level at the relevant receptor (rounded to the nearest 5dB), which is then compared to the total noise level, including the predicted construction noise level. If the combined noise level exceeds the appropriate category value, then the impact is deemed to be significant. The relevant statistics from Table E.1 are set out in Table 11-1 below: Compliance with these guidance levels would ensure that no significant adverse effects are experienced at receptor locations.

Table 11-1 Construction Noise Impact Significance Criteria

Assessment category and threshold value period (L_{Aeq})	Threshold value in decibels – dB(A)		
	Category A	Category B	Category C
Daytime	65	70	75
NOTE 1 A significant effect has been deemed to occur if the total L_{Aeq} noise level, including construction, exceeds the threshold level for the Category appropriate to the ambient noise level.			
NOTE 2 If the ambient noise level exceeds the threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a significant effect is deemed to occur if the total L_{Aeq} noise level for the period increases by more than 3 dB due to construction activity.			
NOTE 3 Applied to residential receptors only. A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values. B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as category A values. C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than category A values.			

11.25 In addition to the above method of assessing impacts, BS 5228 also suggests the 5 dB(A) change method. This states that noise levels generated by construction activities are deemed to be significant if the total noise (pre-construction ambient noise plus construction noise) exceeds the pre-construction ambient noise by 5 dB or more, subject to lower cut-off values of 65 dB, 55 dB and 45 dB $L_{Aeq,T}$, from construction noise alone, for the daytime, evening and night-time periods, respectively; and a duration of one month or more, unless works of a shorter duration are likely to result in significant impact.

Vibration

11.26 Vibration may be impulsive such as that due to hammer-driven piling; transient such as that due to vehicle movements along a railway; or continuous such as that due to vibratory driven piling.

11.27 The primary cause of community concern in relation to vibration generally relates to building damage from both construction and operational sources of vibration, although, the human body can perceive vibration at levels which are substantially lower than those required to cause building damage.

11.28 Damage to buildings associated solely with ground-borne vibration is not common and although vibration may be noticeable, there is little evidence to suggest that they produce cosmetic damage such as a crack in plaster unless the magnitude of the vibration is excessively high. The most likely impact, where elevated levels of vibration do occur during the demolition and construction phases, is associated with perceptibility.

11.29 There are currently no British Standards that provide a methodology to predict levels of vibration from construction activities, other than that contained within BS5228: Part 2, which relates to percussive or vibratory piling only. Therefore, it is not possible to accurately predict levels of vibration during the Site preparation and construction phases of development. As such, to control the impact of vibration during site preparation and construction of a development, limits relating to the perceptibility of vibration are typically set.

11.30 BS5228 indicates that the threshold of human perception to vibration is around 0.15 mm/s, although it is generally accepted that for the majority of people vibration levels in excess of between 0.15 and 0.3 mm/s peak particle velocity (PPV) are just perceptible, which forms the basis of the recommend maximum permitted vibration levels of 1 mm/s PPV within occupied residential dwellings.

11.31 BS5228 also sets out the distances (based on historical field measurements) at which certain activities could give rise to a just perceptible level of vibration. These distances are presented in Table 11-2.

Table 11-2 Distances at which Vibrations may be just perceptible

Construction Activities	Distance from activity when vibration may just be perceptible (metres)
Excavation	10 - 15
Heavy Vehicles (e.g. dump trucks)	4 - 10
Hydraulic Breaker	15 - 20
Rotary Bored Piling	20 - 30

- 11.32 The approach described above, has therefore been adopted within this assessment.
- 11.33 In accordance with the guidance given in BS5228, 1 $\text{mm}\cdot\text{s}^{-1}$ PPV has been selected as the target criteria to control the impact of demolition and construction vibration, with the criteria for assessing the magnitude of vibration impacts according to the margin by which this target criterion is achieved or exceeded presented in Table 6.5. This target criterion is based on the guidance contained within BS 5228, experience from previous sites and accepted vibration policy criteria across a range of enforcing authorities elsewhere in the UK. The limits are presented in terms of peak particle velocity (PPV) as it is the simplest indicator for both perceptibility and building damage.

Table 11-3 Demolition and Construction Vibration Significance criteria

Vibration Level, $\text{mm}\cdot\text{s}^{-1}$ PPV	Significance of Effect
>1.0	Major Adverse
0.30 - 1.0	Moderate Adverse
0.15 - 0.30	Minor Adverse
<0.15	Negligible
<i>Notes</i>	
<i>The above vibration limits relate to maximum PPV ground borne vibration occurring in any one of three mutually perpendicular axes (one of which may be vertical). Vibration is to be measured on the foundation or on an external façade no more than 1m from the ground, or failing this, solid ground as near to the building façade as possible.</i>	

- 11.34 It is again worth noting that the purpose of the target construction vibration criteria is to control the impact of construction vibration insofar as is reasonably practicable and is entirely based on the likelihood of the vibration being perceptible, rather than causing damage to property. Hence, although vibration levels in excess of 1 mm/s PPV would be considered major adverse in respect of the likelihood of perceptibility, they would not be considered significant in terms of the potential for building damage, which would require levels of at least 15 mm/s PPV to result in minor cosmetic damage in light / unreinforced buildings.

Operational Phase

Noise

- 11.35 British Standard 4142:2014+A1:2019 *Method for rating and assessing industrial and commercial sound* sets out a method to assess the likely effect of sound from factories, industrial premises or

fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

- 11.36 The procedure contained in BS4142:2014+A1:2019 for assessing the effect of sound on residential receptors is to compare the measured or predicted sound level from the source in question, the $L_{Aeq,T}$ 'specific sound level', immediately outside the dwelling with the $L_{A90,T}$ background sound level.
- 11.37 Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the $L_{A,r,Tr}$ 'rating sound level'. A correction to include the consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.
- 11.38 BS4142:2014+A1:2019 states: *"The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs"*. An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:
- *"Typically, the greater this difference, the greater the magnitude of the impact."*
 - *"A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context."*
 - *"A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context."*
 - *"The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."*

BASELINE CONDITIONS

General

- 11.39 The prevailing background noise conditions in the area have been determined by an environmental noise survey conducted during both daytime and night-time periods between Tuesday 17th and Thursday 19th March 2020.
- 11.40 The survey was undertaken during the Covid-19 pandemic, meaning that road traffic movements were suppressed, giving the dataset used to derive the background sound level a high degree of statistical robustness.

Measurement Details

- 11.41 All noise measurements were undertaken by a consultant certified as competent in environmental noise monitoring, and, in accordance with the principles of British Standard 7445: 2003: *Description and measurement of environmental noise*.
- 11.42 All acoustic measurement equipment used during the noise survey conformed to Type 1 specification of British Standard 61672: 2013: *Electroacoustics. Sound level meters. Part 1 Specifications*. A full inventory of this equipment is shown in Table 11-4 below.

Table 11-4 Inventory of Sound Measurement Equipment

Make, Model & Description	Serial Number
Rion NL-52 Sound Level Meter	00965159
Rion NH-25 Preamplifier	65386
Rion UC-59 Microphone	10288
Cirrus CR:515 Acoustic Calibrator	72886

- 11.43 Measurement equipment used during the survey was field calibrated at the start and end of the measurement period. A calibration laboratory has calibrated the field calibrator used within the twelve months preceding the measurements.
- 11.44 The weather conditions during the survey were conducive to noise measurement; it being calm, with low wind speeds and misty, but without significant precipitation.
- 11.45 The microphone was fitted with a protective windshield for the measurement, which is described below and identified on Figure 11-1.
- MP1 - An unattended daytime and night-time measurement of sound under free-field conditions, at a height of 1.5 metres above local ground level on land associated with the site. The sound environment was maintained by very distant road traffic, typical rural sounds associated with farming, and natural sources. The timing of the survey, during the week immediately preceding the national pandemic lockdown, ensured that local and regional activity was heavily suppressed, resulting in a robust basis for determining background sound levels.



Figure 11-1 Background Sound Measurement Location

Summary Results

11.46 The summarised results of the environmental noise measurement are presented in Table 11-5, with a measured time history and statistical analyses presented under Appendix 11.2.

Table 11-5 Summary of Noise Measurement Results

Period	Noise Level, dB			
	L _{Aeq,T}	L _{A90}	L _{A10}	L _{AFMax}
Daytime – 07:00-23:00	55.5	39.0	49.0	73.6
Night-time – 23:00-07:00	43.6	37.0	42.6	62.4

IDENTIFICATION AND EVALUATION OF IMPACTS

Receptors

11.47 The receptors considered within the assessment are as set out in Table 11-6 and marked on Figure 11-2.

Table 11-6 Receptors Considered within the Assessment

Receptor	Receptor Type	Receptor Sensitivity
R1 - Summerleaze Villa	Residential Property	High
R2 - Summerleaze Cottage	Residential Property	High
R3 - Rock Cottage	Residential Property	High
R4 - The Stables/The Old Dairy	Residential Property	High
R5 - Longlands/The Rowans*	Residential Property	High

* denotes financially involved / inextricably linked property to scheme

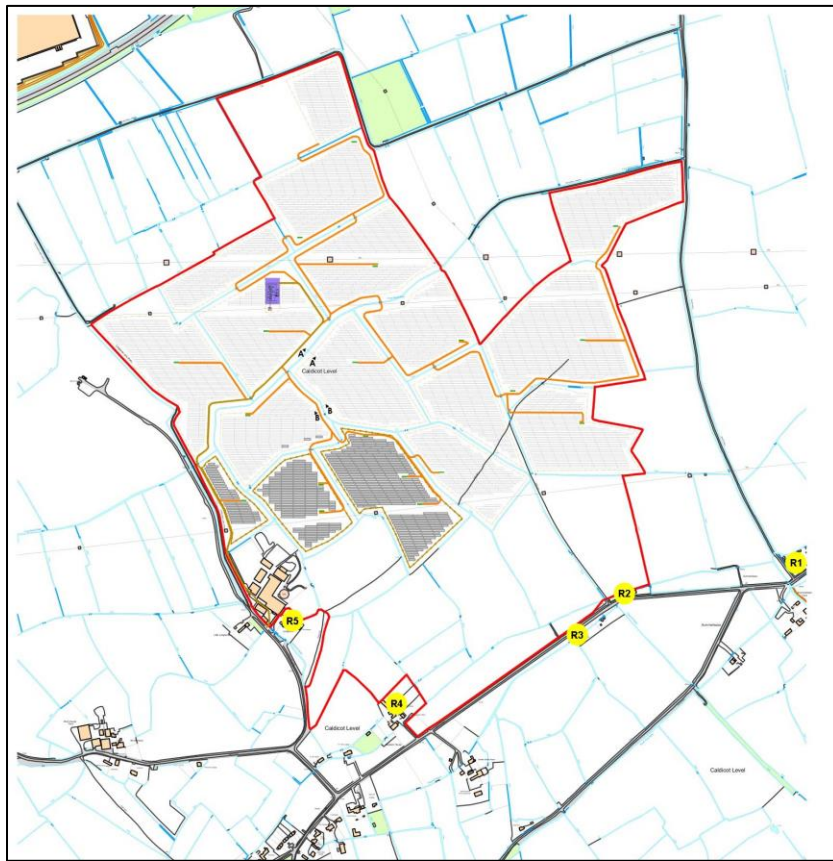


Figure 11-2 Receptors Considered within the Assessment

11.48 All considered receptors are human/residential in nature, which represent the closest and most sensitive receptors to the scheme. Although the Gwent Levels area does have a high ecological designation, ensuring that acoustic effects are minimised at the receptors set out above, will ensure that effects within the wider ecological receptor area are controlled effectively.

POTENTIAL EFFECTS DURING CONSTRUCTION AND DECOMMISSIONING STAGES

Construction & Decommissioning Noise

- 11.49 Noise predictions have been undertaken to provide an estimate of the noise emissions from the Site during the construction works at the nearest receptors. From these predictions it has been possible to determine whether the adopted target noise criterion of 65 dB $L_{Aeq,T}$ is likely to be met during the noisiest stages of the works. The magnitude of any impact has then been determined and the requirement for further mitigation measures considered.
- 11.50 The Site lies within a sparsely populated area, however residential uses, with the nearest off-site sensitive receptors lying approximately 160 metres from the closest proposed construction work.
- 11.51 Construction noise predictions have been based on the construction noise assumptions on the plant to be used and the source noise data provided in BS5228. These are provided in Technical Appendix 11.3.
- 11.52 Predicted noise levels have been based on a worst-case scenario where the noisiest item of construction plant is located at the closest point of the proposed construction works, to the sensitive off-site receptors. The predictions assume no screening between the source and receiver, so represent a worst-case scenario.
- 11.53 The results of the noise predictions are presented in Table 11-7.

Table 11-7 Predicted Construction/Decommissioning Noise Levels, $L_{Aeq,T}$ – dB at Off-Site Receptors

Receptor	Site Preparation	Foundations	Structure & Decommissioning
R1 - Summerleaze Villa	41	35	35
R2 - Summerleaze Cottage	51	40	40
R3 - Rock Cottage	61	40	40
R4 - The Stables/The Old Dairy	47	41	41
R5 - Longlands/The Rowans*	48	42	42

- 11.54 The predictions presented in Table 11-7 identifies that, noise levels are not predicted to exceed the adopted 65 dB(A) limit when works are undertaken at the closest point of the works to the closest off-site sensitive receptor, equating to a Temporary Negligible to Minor Impact significance.
- 11.55 Consequently, mitigation measures are not considered necessary, however, the mitigation section of this report does set out a series of good practice measures, considered to represent Best Practicable Means, which will be incorporated into the CEMP (Appendix 2.2).

Construction & Decommissioning Vibration

- 11.56 The separation distances between the closest works and the closest receptors, coupled to the low-intensity nature of the construction works themselves, ensures that there are no construction vibration issues to specifically consider, equating to No Impact significance.

Construction & Decommissioning Traffic

- 11.57 The CTMP (Appendix 2.1) associated with the proposals identifies that a maximum of 19 vehicles per day will be attracted to the site during the construction phase, during the peak week of activity, with the majority of weeks attracting single-figure vehicle attraction rates.
- 11.58 All construction trips will be directed from Junction 23A of the M4 motorway, along the A4810 distributor road and south to Green Street, to the east of the village of Redwick, from where access to the site will be gained.
- 11.59 The routing away from the village of Redwick will minimise the level of exposure to changes in traffic noise, as a result of construction activities, which will largely be diluted within the daily variations in traffic flow along those routes, equating to no greater than a Negligible to Minor Adverse Impact significance.

POTENTIAL EFFECTS DURING OPERATIONAL STAGE

Noise Modelling

Noise Source Information

- 11.60 The A-weighted sound levels associated with the proposed development have been agreed with the Applicant and are set out in Table 11-8. It is important to note that these are candidate plant selections, used for the purposes of this assessment and that the actual specification may be quieter than quoted.

Table 11-8 Sound Source Data

Plant	Quantity	Sound Pressure Level, L _{pA} - dB	Sound Pressure Level Distance - m
String Inverters	442	64.5	1
Transformer	43	47.0	10
Substation	1	43.0	10

Calculation Process

- 11.61 Calculations were carried out using Cadna/A, which undertakes its calculations in accordance with guidance given in ISO9613-1:1993 and ISO9613-2:1996

Sound Data Assumptions

- 11.62 Given that the land between Proposed Development and nearest receptors is largely soft, the ground factor has been set to 0.8, within the calculation software.
- 11.63 The assessment considers open propagation from the site, with no perimeter acoustic barrier.

Specific Sound Level Map

- 11.64 The sound map showing the specific sound level emissions from the Proposed Development can be seen in Figure 11-3.

Specific Sound Level Summary

- 11.65 A summary of the predicted specific sound levels at the identified receptors, based on the sound map shown in Figure 11-3 can be seen in Table 11-9.

Table 11-9 Specific Sound Level Summary

Receptor	Specific Sound Level – dB(A)
R1 - Summerleaze Villa	17.4
R2 - Summerleaze Cottage	20.1
R3 - Rock Cottage	19.9
R4 - The Stables/The Old Dairy	18.4
R5 - Longlands/The Rowans*	22.8

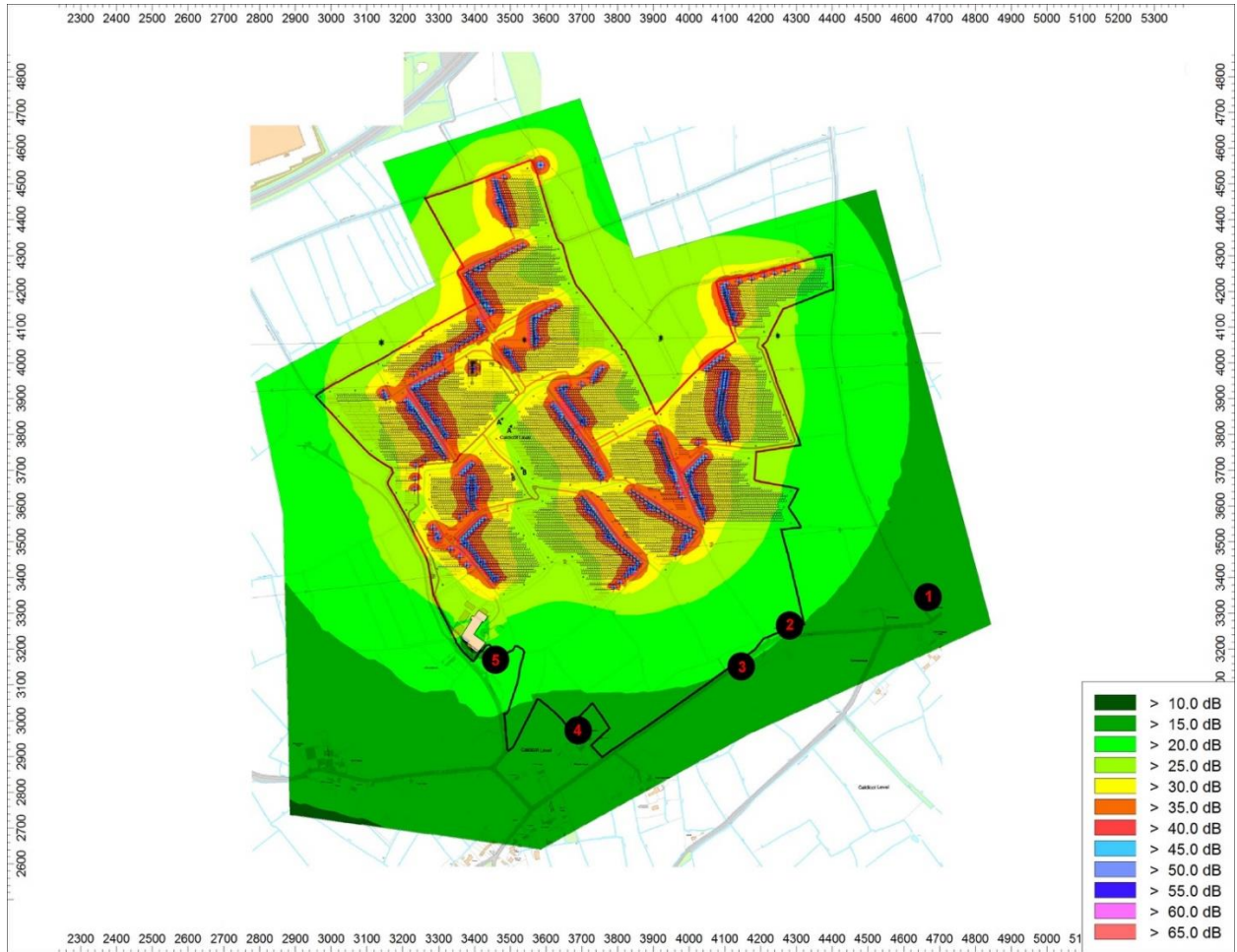


Figure 11-3 Specific Sound Level Map

Assessment

Rating Penalty Principle

- 11.66 Section 9 of BS4142:2014+A1:2019 describes how the rating sound level should be derived from the specific sound level, by determining a rating penalty. BS4142:2014+A1:2019 states:

“Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level. This can be approached in three ways:

- a) subjective method;*
- b) objective method for tonality;*
- c) reference method.”*

- 11.67 Given that the Proposed Development is not operational, the subjective method has been adopted to derive the rating sound level from the specific sound level. This is discussed in Section 9.2 of BS4142:2014+A1:2019, which states:

“Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed.

Correct the specific sound level if a tone, impulse or other characteristics occurs, or is expected to be present, for new or modified sound sources.”

- 11.68 BS4142:2014+A1:2019 defines four characteristics that should be considered when deriving a rating penalty, namely; tonality; impulsivity; intermittency; and other sound characteristics, which are defined as:

Tonality

- 11.69 A rating penalty of +2 dB is applicable for a tone which is “just perceptible”, +4 dB where a tone is “clearly perceptible”, and +6 dB where a tone is “highly perceptible”.

Impulsivity

- 11.70 A rating penalty of +3 dB is applicable for impulsivity which is “just perceptible”, +6 dB where it is “clearly perceptible”, and +9 dB where it is “highly perceptible”.

Other Sound Characteristics

- 11.71 BS4142:2014+A1:2019 states that where “the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distance against the residual acoustic environment, a penalty of +3 dB can be applied.”

Intermittency

11.72 BS4142:2014+A1:2019 states that when the “specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time ... if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied.”

Rating Penalty Assessment

11.73 Considering the content above, an assessment of the various sound sources associated with the Proposed Development, in terms of whether any rating penalties are applicable, has been carried out and has been detailed in Table 11-10.

Table 11-10 Rating Penalty Assessment

Source	Tonality	Impulsivity	Intermittency	Other Sound Characteristics	Discussion
PV Inverters and Transformers	+2 dB	0 dB	0 dB	0 dB	The PV inverters and transformers will operate as demand requires, however, once operating, do not cycle on and off. Tonality may be “just perceptible”, due to a low-frequency bias at source, but the residual acoustic environment will substantially mask any significant tones.

11.74 In summary, a rating penalty of +2 dB has been included within the assessment.

Uncertainty in Calculations

11.75 BS4142:2014+A1:2019 requires that the level of uncertainty in the measured data and associated calculations is considered in the assessment. The Standard recommends that steps should be taken to reduce the level of uncertainty.

Measurement Uncertainty

11.76 BS4142:2014+A1:2019 states that measurement uncertainty depends on a number of factors, including the following, which are applicable to the Proposed Development:

- “ ...the complexity and level of variability of the residual acoustic environment;
- ...the location(s) selected for taking the measurements;
- ...the measurement time intervals;
- the range of times when the measurements have been taken;

the range of suitable weather conditions during which measurements have been taken;
...the level of rounding of each measurement recorded; and
the instrumentation used.”

11.77 Each of the measurement uncertainty factors outlined above have been considered and discussed in Table 11-11.

Table 11-11 Measurement Uncertainty Factors

Measurement Uncertainty Factor Reference	Level of Uncertainty	Discussion
b)	0 dB	Residual acoustic environment is relatively constant, hence no correction for a complex residual acoustic environment.
d)	0 dB	Measuring at location representative of the closest affected receptors to the site has enabled the determination of robust background sound levels.
g)	0 dB	Measurement time intervals were set in accordance with BS4142:2014+A1:2019, hence no further correction needs to be made.
h)	0 dB	Measurements were undertaken over three consecutive days, when road traffic movements were suppressed due to the Covid-19 pandemic.
i)	0 dB	Where periods of wind or precipitation were measured, they were removed from the dataset.
k)	0 dB	Measured values were rounded to 0.1 dB, therefore rounding would not have had a significant impact on the overall typical background sound levels.
l)	0 dB	The acoustic measurement equipment accorded with Type 1 specification of British Standard 61672.

11.78 In summary, a correction of 0 dB has been included in the assessment, to account for measurement uncertainty.

Calculation Uncertainty

11.79 BS4142:2014+A1:2019 states that calculation uncertainty depends on a number of factors, including the following, which are applicable to the Proposed Development:

“ ...uncertainty in the operation or sound emission characteristics of the specific sound source and any assumed sound power levels;
uncertainty in the calculation method;
simplifying the real situation to “fit” the model (user influence on modelling); and
error in the calculation process.”

11.80 Each of the calculation uncertainty factors outlined above have been considered and discussed in Table 11-12.

Table 11-12 Calculation Uncertainty Factors

Measurement Uncertainty Factor Reference	Level of Uncertainty	Discussion
b)	0 dB	Sound source levels for all plant are worst-case candidate data.
c)	0 dB	Calculations were undertaken in accordance with ISO 9613-2, which is considered a “validated method” by BS4142:2014+A1:2019.
d)	0 dB	The real situation has been simplified for the purposes of this assessment, with all on-site screening effects removed, resulting in a worst-case propagation model.
e)	+1 dB	ISO 9613-2 indicates that there is a ± 3 dB accuracy to the prediction method, dependent upon input variables and propagation complexities.

11.81 In summary, a +1 dB has been included in the assessment, for calculation uncertainty

Rating Sound Level

11.82 Incorporating the rating penalties detailed in Table 11-10 with the predicted specific sound levels, as detailed in Table 11-9, the rating sound levels have been derived and have been detailed in Table 11-13.

Table 11-13 Rating Sound Levels

Receptor	Specific Sound Level – dB(A)	Rating Sound Level - dB
R1 - Summerleaze Villa	17	19
R2 - Summerleaze Cottage	20	22
R3 - Rock Cottage	20	22
R4 - The Stables/The Old Dairy	18	20
R5 - Longlands/The Rowans*	22	24

BS4142 Assessment

11.83 The rating sound level, as calculated from the predicted specific sound level, has been assessed in accordance with BS4142:2014+A1:2019, at all NSRs.

11.84 The resultant assessment summary, during the daytime period, can be seen in Table 11-14.

Table 11-14 Daytime BS4142:2014+A1:2019 Assessment Summary

Receptor	Rating Sound Level - dB	Uncertainty Correction - dB	Daytime Background Sound Level – dB(A)	Excess of Rating over Daytime Background Sound Level - dB
R1 - Summerleaze Villa	19	+1	39	-19
R2 - Summerleaze Cottage	22	+1	39	-16
R3 - Rock Cottage	22	+1	39	-16
R4 - The Stables/The Old Dairy	20	+1	39	-18
R5 - Longlands/The Rowans*	24	+1	39	-14

11.85 It can be seen that the Proposed Development is likely to have a ‘low impact’ at the receptors during the daytime period.

11.86 The resultant assessment summary, during the night-time period, can be seen in Table 11-15.

Table 11-15 Night-time BS4142:2014+A1:2019 Assessment Summary

Receptor	Rating Sound Level - dB	Uncertainty Correction - dB	Daytime Background Sound Level – dB(A)	Excess of Rating over Daytime Background Sound Level - dB
R1 - Summerleaze Villa	19	+1	37	-17
R2 - Summerleaze Cottage	22	+1	37	-14
R3 - Rock Cottage	22	+1	37	-14
R4 - The Stables/The Old Dairy	20	+1	37	-16
R5 - Longlands/The Rowans*	24	+1	37	-12

11.87 It can be seen that the Proposed Development is likely to have a ‘low impact’ at the receptors during the night-time period.

Discussion and Operational Recommendations

11.88 The results set out above identify that the operation of the Proposed Development can occur without affecting the amenity of the closest residential receptors to the site, equating to a Negligible Impact.

MITIGATION REQUIREMENTS

Construction & Decommissioning Phase

11.89 Although the assessment of construction and decommissioning noise and vibration has identified no significant impact, the following good practice measures, comprising Best Practicable Means will be incorporated into the CEMP.

11.90 Effective co-ordination and time management of construction operations would be important in avoiding noise and vibration nuisance to surrounding uses. Early and helpful communications with the

surrounding and on-site receptors would assist reducing potential for and in managing any complaints arising during the demolition and construction works of the Proposed Development.

- 11.91 Contractors would be required to ensure that works are carried out in accordance with Best Practice Means as stipulated in the Control of Pollution Act 1974. A full explanation of measures to control construction noise would be incorporated within a CEMP and detailed in all demolition and construction method statements.
- 11.92 The proposals in regard to general noise mitigation would be in accordance with BPM as specified in BS5228 and would comprise the following, where possible:
- Using 'silenced' plant and equipment;
 - Switching off engines where vehicles are standing for a significant period of time;
 - Fitting of acoustic enclosures to suppress noisy equipment as appropriate;
 - Operating plant at low speeds and incorporating of automatic low speed idling;
 - Selecting electrically driven equipment in preference to internal combustion powered, hydraulic power in preference to pneumatic and wheeled in lieu of tracked plant;
 - Properly maintaining all plant (greased, blown silencers replaced, saws kept sharpened, teeth set and blades flat, worn bearings replaced, etc.);
 - Considering the use of temporary screening or enclosures for static noisy plant to reduce noise emissions as appropriate;
 - Certifying plant to meet any relevant EC Directive standards; and
 - Undertaking awareness training of all contractors in regards to BS5228 (Parts 1 and 2) which would form a prerequisite of their appointment.
- 11.93 Typically, adopting BPM would have the potential to reduce overall construction noise levels by approximately 5 dB; however this is dependent upon the type and extent of activities being carried out.
- 11.94 Should any non-routine activities be identified that would make it impracticable to work to the target criterion, provisions would be set out in advance and with the agreement of the Local Authority, to reduce the effect.
- 11.95 Noise monitoring would be carried out during particularly noisy phases of work and when work is undertaken in close proximity to the Site boundary so that such situations can be actively managed in accordance with the CEMP for the Site.
- 11.96 For any proposed construction works to be undertaken outside of the permitted working day, particularly at night, prior consent would be sought from the Authority. Dispensation procedures for works would be agreed in advance and included within Construction Method Statements and the CEMP or Section 61 Agreement where adopted. Section 61 of the Control of Pollution Act, 1974, allows a contractor to apply to the local planning authority for prior consent for construction works.

11.97 Deliveries and removal of material off-site, would be subject to the following controls:

- Ensuring that construction traffic is parked off the public highway;
- Controlling the discharge of trucks from Site to avoid congestion; and
- Implementing traffic management systems at the entrance to the Site at all times to control the traffic into the Site.

Operational Phase

11.98 No measures considered necessary, beyond an appropriately worded, noise-limiting planning condition.

RESIDUAL EFFECTS

Construction & Decommissioning Phases

11.99 The adoption of the BPM measures set out above is expected to minimise the potential for noise impacts rather than achieve significant reductions, on the basis of the input parameters considered.

11.100 Consequently, the predicted impacts remain unchanged, with no worse than Temporary Negligible to Minor Impact significance anticipated.

Operational Phase

11.101 On the basis of the worst-case candidate input parameters considered within the assessment, no mitigation measures are considered necessary, meaning that predicted operational noise effects will remain unchanged, equating to no worse than a Negligible Impact.

SUMMARY

Construction & Decommissioning Phases

11.102 The assessment of noise and vibration, arising from construction activities has considered a robust set of input parameters and concluded that effects will typically be Temporary Negligible to no worse than Minor, at the closest receptor to any works.

11.103 No mitigation measures are considered necessary on this basis, however a range of best practice measures, typically considered to constitute Best Practicable Means, have been set out for inclusion within the CEMP, which will ensure that all construction noise and vibration effects will be kept to an absolute minimum.

Operational Phase

11.104 The assessment has considered a set of worst-case, candidate input parameters and on this basis has been predicted to give rise to no worse than a Negligible Impact at the assessed receptors.

CUMULATIVE EFFECTS

11.105 The cumulative effects of the project in conjunction with other proposed schemes have been considered. The nearby schemes are described in Table 11-16 alongside their potential for giving rise to potential cumulative noise and/or vibration effects.

Table 11-16 Cumulative Schemes and Potential Noise & Vibration Impacts

Project	Details and status	Potential Cumulative Effects
1.6km rail formation - Land Adjacent And North Of Branch Railway Line, Seven Stiles Avenue, Newport	Approved. NCC Planning application (ref. 18/1109) for the construction of 1.6km of rail formation in connection with the stabling of trains including associated engineering and landscaping works.	Solar scheme effects are very localised and these schemes are sufficiently separated to ensure that no cumulative operational effects would occur at common receptors.
Land at Vinegar Hill - Hybrid app for 155 dwellings	In planning. MCC Planning application (ref: DM/2019/01937) for 155 dwellings cumulative.	Solar scheme effects are very localised and the proximity of this scheme to the application and the M4 motorway will ensure that no cumulative operational effects would occur.
Land at Rockfield Farm - Outline consent for 266 house and approx. 5575m ² of employment space	Approved. MCC Planning application (ref: DC/2016/00883) Master planned development of 13.8 hectares of land for residential use and employment use; up to 266 Proposed residential units and approximately 5575 square meters of B1 floor space.	Solar scheme effects are very localised and the proximity of this scheme to the application and the M4 motorway will ensure that no cumulative operational effects would occur.
Land at Rockfield Farm partial RM for the above site - 144 dwellings	Approved and under construction. MCC Planning application (ref: DM/2018/01606) for reserved matter application relating to the above site at Rockfield Farm - 144 dwellings.	Solar scheme effects are very localised and the proximity of this scheme to the application and the M4 motorway will ensure that no cumulative operational effects would occur.
Magor Brewery. Erection of sixteen fermentation vessels, enclosed supporting structure and associated works.	In planning. MCC Planning application (ref: DM/2020/00103) for works at Magor Brewery. Erection of sixteen fermentation vessels, enclosed supporting structure and external stairs; extension of existing high level access walkway; earth works; and temporary works including re-use of existing car park as vessel assembly site, creation of two temporary replacement car parks, temporary site roads and walkways, and associated works.	Solar scheme effects are very localised and the proximity of this scheme to the application and the M4 motorway will ensure that no cumulative operational effects would occur.